



( A subsidiary of  
IRB INFRASTRUCTURE DEVELOPERS LTD )

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CIN : U45200MH2002PTC135512

October 29, 2024

To,  
**National Stock Exchange of India Limited**  
Exchange Plaza  
Plot no. C/1, G Block  
Bandra-Kurla Complex, Bandra (East)  
Mumbai 400051

Dear Sir,

**Ref.: NSE Symbol: IRBIT / Series: IV**

**Subject: Valuation Report & Toll Revenue Projection Report for September 30, 2024**

We are enclosing herewith the Valuation Report dated October 28, 2024, issued by M/s. KPMG Valuation Services LLP [IBBI Reg. No. IBBI/RV-E/06/2020/115], as on September 30, 2024, for IRB Infrastructure Trust (the “Trust”).

The Net Asset Value pursuant to Regulation 10 of SEBI (Infrastructure Investment Trusts) Regulations, 2014 based on the Valuation Report issued by the Valuer is as follows:

Particulars	(Rs. in Crore)
A. Assets	60,526
B. Liabilities (at book value)	27,704
C. Net Assets [A-B]	32,822
D. Outstanding Units (in Crore)	111.37
E. NAV at Fair Value (Rupees/per Unit) [C/D]	294.72

You are requested to note the same.

**For MMK Toll Road Private Limited**  
(in its capacity as Investment Manager to IRB Infrastructure Trust)

**Kaustubh Shevade**  
Company Secretary & Compliance Officer

**Encl.: As above.**



# Valuation Report

October 2024



# IRB Infrastructure Trust

Valuation of IRB Infrastructure Trust and its SPVs

Valuation Report

—  
October 2024





**Strictly private and confidential**

28 October 2024

**IRB Infrastructure Trust  
(IDBI Trusteeship Services Limited acting on  
behalf of IRB Infrastructure Trust)**

1101, Hiranandani Knowledge Park,  
Technology Street, Hill Side Avenue,  
Powai, Mumbai – 400 076

**MMK Toll Road Private Limited**

Office No-11th Floor, 1101  
Hiranandani Knowledge Park, Technology  
Street  
Hill Side Avenue, Powai, Mumbai 400 076

Dear Sir,

**Valuation Report (“Valuation Report”)**

This is in accordance with the terms of reference set out in our Letter of Engagement dated 17 September 2024 (“LoE”), wherein KPMG Valuation Services LLP (Registered valuer entity under Companies (Registered Valuers and Valuation) Rules, 2017 having IBBI Registration No. IBBI/RV-E/06/2020/115) (hereinafter referred to as “KPMG ” or “us” or “we” or “Valuer”) has been appointed by IRB Infrastructure Trust (“IRBI Trust/Trust” or “the Company”), MMK Toll Road Private Limited (“Investment Manager”) and IDBI Trusteeship Services Limited (“Trustee”) (together referred as “the Clients” or “You”) in relation to carrying out Enterprise Valuation of 15 Special Purpose Vehicles (“SPVs” or “IRBI Trust Assets”) of IRBI Trust and Equity Valuation of IRBI Trust (jointly referred as “Targets”) as on the agreed date of the valuation in accordance with Regulation 21 of the Securities Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 (“SEBI InvIT Regulations”) where valuation is required to be conducted by a registered valuer (as defined under section 247 of the Companies Act, 2013) and such valuation report (“Report”) is required to be in compliance with the SEBI InvIT Regulations (“Engagement”).

The date for the valuation is 30 September 2024 (“Valuation Date”).

We hereby enclose our Valuation Report dated 28 October 2024. This is our deliverable and sets out KPMG’s conclusions on the valuation of the Targets and has been prepared in accordance with the LoE as of Valuation Date.

The report is based on the information provided to KPMG by the management of the Targets (“Management”). In arriving at our conclusion, KPMG has applied generally accepted valuation methodologies as on the Valuation Date. As detailed in the enclosed Valuation Report, the NAV at fair value per unit of IRBI Trust is **INR 294.72 per unit** as on 30 September 2024.

The Valuation Report is confidential to the Clients and will be used by the Clients only for the purpose, as indicated in this Report, for which we have been appointed. The results of our valuation analysis and our Report cannot be used or relied by the Clients for any other purpose or by any other party for any other purpose whatsoever.

The Valuation Report is issued by us on the express understanding that it shall not be copied, disclosed or circulated or referred to in correspondence or in discussion with any third party or used for any other purpose without KPMG’s prior written consent. We are aware that the Report may have to be shared with certain regulatory authorities in India and stock exchanges in India and therefore Report may enter the public domain and hereby provide our consent to such sharing. It is clarified that reference to this Valuation Report in any document and/ or filing with aforementioned regulatory authorities/ stock exchanges in India, shall not be deemed to be an acceptance by the Valuer of any responsibility or liability to any person/ party other than the Clients.

We will not, pursuant to the LoE, perform any management functions for You, nor make any decisions. You are responsible for making management decisions, including accepting responsibility for the results. Additionally, the Clients are responsible for designating a management-level individual or individuals responsible for overseeing the services provided, evaluating the adequacy of the services provided, evaluating any findings or recommendations, establishing and maintaining internal controls, and monitoring ongoing activities.

The Valuation Report does not constitute an offer or invitation to any section of the public to subscribe for or purchase any securities in, or the other business or assets or liabilities of the Targets or Clients. This letter forms an integral part of the Valuation Report and should be read in conjunction with the Valuation Report enclosed herein.

The Valuation Report has been prepared by KPMG Valuation Services LLP (IBBI Registration No. IBBI/RV-E/06/2020/115) solely for the purpose as stated above. The Valuation Report forms an integral whole and cannot be split into parts. The outcome of the valuation can only lead to proper conclusions if the Valuation Report as a whole is taken into account.

Yours faithfully

**For KPMG Valuation Services LLP**

Registered Valuer Entity under Companies (Registered Valuers and Valuation) Rules, 2017  
IBBI Registration No. IBBI/RV-E//06/2020/115

Asset Class : Securities or Financial Assets

**Amit Jain, Partner**

IBBI Registration No. IBBI/RV/06/2018/10501



# Glossary

<b>%</b>	Percentage	<b>IGTPL</b>	IRB Gwalior Tollway Private Limited	<b>NHAI</b>	National Highways Authority of India
<b>AETL</b>	AE Tollway Limited	<b>IKTPL</b>	IRB Kota Tollway Private Limited	<b>NHIDCL</b>	National Highway and Infrastructure Development Corporation Limited
<b>bn</b>	Billion	<b>ILTPL</b>	IRB Lalitpur Tollway Private Limited	<b>NWC</b>	Net Working Capital
<b>CAGR</b>	Compounded Annual Growth Rate	<b>IMF</b>	International Monetary Fund	<b>O&amp;M</b>	Operation and Maintenance
<b>Capex</b>	Capital Expenditure	<b>IMHTL</b>	IRB Hapur Moradabad Tollway Limited	<b>PAT</b>	Profit After Tax
<b>CGTL</b>	CG Tollway Limited	<b>INR</b>	Indian Rupee	<b>PBT</b>	Profit Before Tax
<b>Clients</b>	IRB Infrastructure Trust, MMK Toll Road Private Limited and IDBI Trusteeship Services Limited	<b>InvIT</b>	Investment Trust	<b>PDTPL</b>	Palsit Dankuni Private Tollway Limited
<b>CoCo</b>	Comparable Companies	<b>IRBI Trust</b>	IRB Infrastructure Trust	<b>PIB</b>	Press Information Bureau
<b>COD</b>	Commercial operation date	<b>IRBIDL</b>	IRB Infrastructure Developers Limited	<b>PV</b>	Present Value
<b>CoTrans</b>	Comparable Transactions	<b>IWTL</b>	IRB Westcoast Tollway Limited	<b>R(f)</b>	Risk free rate of Return
<b>Cr</b>	Crore	<b>k</b>	Thousands	<b>R(m)</b>	Market rate of Return
<b>CWIP</b>	Capital Work In Progress	<b>Kd</b>	Cost of Debt	<b>Rf</b>	Risk-free Rate
<b>DBFOT</b>	Design, Build, Finance, Operate and Transfer	<b>Ke</b>	Cost of Equity	<b>SEBI</b>	Securities and Exchange Board of India
<b>DCF</b>	Discounted Cash Flow	<b>KGTL</b>	Kishangarh Gulabpura Tollway Limited	<b>Sponsor</b>	IRB Infrastructure Developers Limited
<b>EBIT</b>	Earnings Before Interest and Tax	<b>Km</b>	Kilometer	<b>SPV</b>	Special Purpose Vehicle
<b>EBITDA</b>	Earnings Before Interest, Tax, Depreciation and Amortization	<b>KPMG</b>	KPMG Valuation Services LLP	<b>STPL</b>	Samakhiali Tollway Private Limited
<b>EV</b>	Enterprise Value	<b>KTL</b>	Kaithal Tollway Limited	<b>SYTL</b>	Solapur Yedeshi Tollway Limited
<b>FCFF</b>	Free Cash Flows to Firm	<b>LoE</b>	Letter of Engagement	<b>t</b>	Trillion
<b>FV</b>	Fair Value	<b>Management</b>	Management of IRBI Trust and its 15 SPVs	<b>TOT</b>	Toll operate transfer
<b>FY</b>	Financial Year	<b>MAT</b>	Minimum Alternate Tax	<b>UTL</b>	Udaipur Tollway Limited
<b>IDBI</b>		<b>MMK Toll Road Private Limited</b>	Investment Manager	<b>Valuation Date</b>	30 September 2024
<b>Trusteeship Services Ltd</b>	Trustee	<b>mn</b>	Million	<b>WACC</b>	Weighted Average Cost Of Capital
<b>IBEF</b>	India Brand Equity Foundation	<b>MoRTH</b>	The Ministry of Road Transport and Highways	<b>WPI</b>	Wholesale Price Index
<b>IGEPL</b>	IRB Golconda Expressway Private Limited	<b>NA</b>	Not applicable	<b>YATL</b>	Yedeshi Aurangabad Tollway Limited
		<b>NAV</b>	Net Asset Value		

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1.

# Executive Summary

# Overview

## Terms of the Engagement

- We have been appointed by IRBI Trust, Investment Manager and Trustee to undertake Enterprise Valuation of 15 Special Purpose Vehicles of IRBI Trust and Equity Valuation of IRBI Trust in accordance with Regulation 21 of the SEBI InvIT Regulations where valuation is required to be conducted by a registered valuer and such valuation report is required to be in compliance with the SEBI InvIT Regulations.
- As per the LoE, the valuation is to be carried out as on 30 September 2024. This report has been prepared by KPMG pursuant to terms of LoE.
- As at 30 September 2024 IRBI Trust assets comprised of the following 15 SPVs.
  - IRB Westcoast Tollway Limited ("IWTL")
  - Solapur Yedeshi Tollway Limited ("SYTL")
  - Yedeshi Aurangabad Tollway Limited ("YATL")
  - Kaithal Tollway Limited ("KTL")
  - AE Tollway Limited ("AETL")
  - Udaipur Tollway Limited ("UTL")
  - Chittorgarh Gulabpura Tollway Limited ("CGTL")
  - Kishangarh Gulabpura Tollway Limited ("KGTL")
  - IRB Hapur Moradabad Tollway Limited ("IHMTL")
  - Palsit Dankuni Tollway Private Limited ("PDTPL")
  - IRB Golconda Expressway Private Limited ("IGEPL")
  - Samakhiali Tollway Private Limited ("STPL")
  - IRB Kota Tollway Private Limited ("IKTPL")
  - IRB Lalitpur Tollway Private Limited ("ILTPL")
  - IRB Gwalior Tollway Private Limited ("IGTPL")

## Valuation Approach and Methodology

Approach	Method
Income Approach	Discounted Cash Flow Method (DCF)

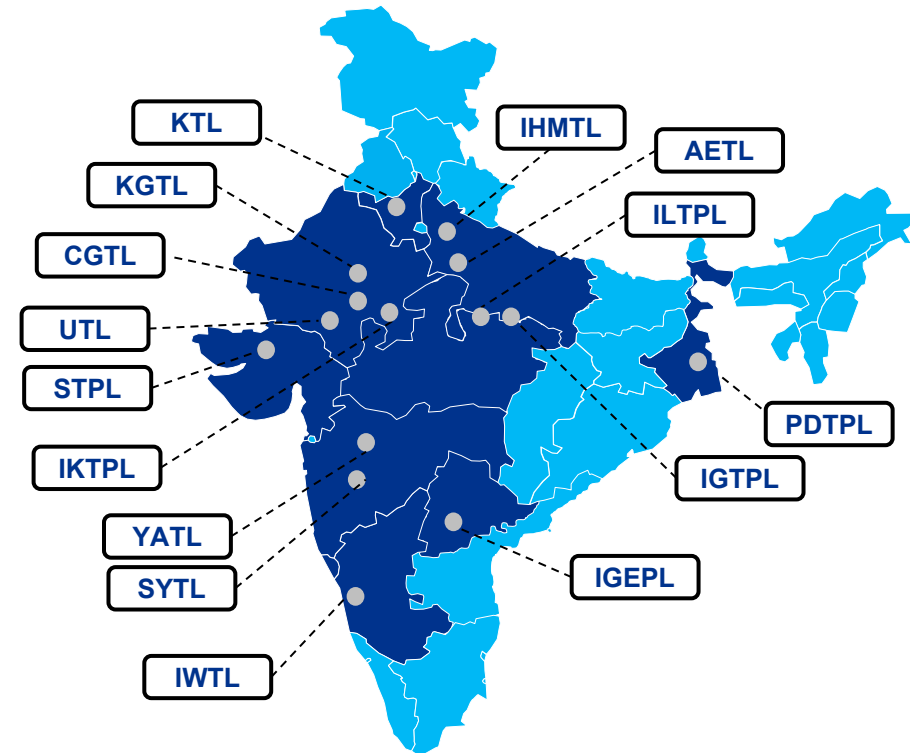
Source(s): Management information, KPMG analysis



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## SPV Overview

IRBI Trust has acquired 11 DBFOT assets and 4 TOT asset in the states of Maharashtra, Gujarat, Rajasthan, Goa, Karnataka, Haryana, Madhya Pradesh, Uttar Pradesh, Telangana and West Bengal, which are being managed in pursuant to concessions granted by the National Highways Authority of India ("NHAI") / Hyderabad Metropolitan Development Authority. The map below represents the locations of the SPVs.



# Valuation Conclusion

## Valuation Conclusion (INR Crs)

Valuation Conclusion 30 September 2024	INR Crore
IRB Golconda Expressway Private Limited	15,803
IRB Westcoast Tollway Limited	3,255
Solapur Yedeshi Tollway Limited	2,884
Yedeshi Aurangabad Tollway Limited	5,289
Kaithal Tollway Limited	2,354
AE Tollway Limited	3,441
Udaipur Tollway Limited	2,650
CG Tollway Limited	2,750
Kishangarh Gulabpura Tollway Limited	1,623
IRB Hapur Moradabad Tollway Limited	4,400
Palsit Dankuni Tollway Private Limited	2,003
Samakhiyal Tollway Private Limited	715
Lalitpur Tollway Private Limited	5,874
IRB Kota Tollway Private Limited	926
IRB Gwalior Tollway Private Limited	1,537
<b>Enterprise Value of the SPVs</b>	<b>55,505</b>
Cash and cash Equivalents	54
Surplus	241
Debt	(22,360)
PV of standalone expenses pertaining to IRBI Trust	(235)
Capital Creditors	(384)
<b>Equity Value of IRBI Trust</b>	<b>32,822</b>

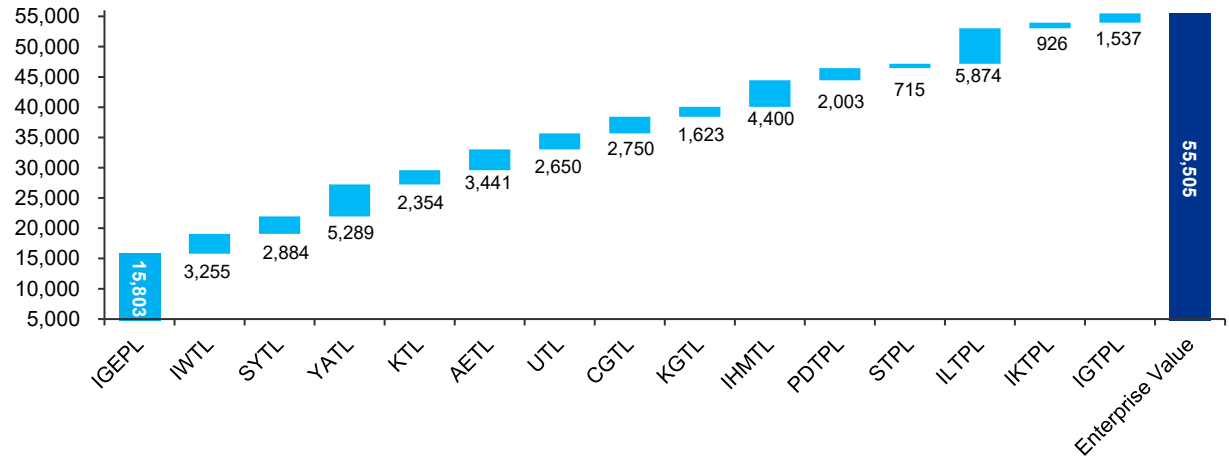
### NAV at fair value per unit as on 30 September 2024

Equity Value of IRBI Trust (INR Cr)	32,822
Units outstanding (No.)	1,113,693,265
<b>NAV at fair value per unit (INR)</b>	<b>294.72</b>

Source(s): Management information, KPMG analysis

## Enterprise Value of SPVs

### INR Crore



**The Enterprise Value of the SPVs is INR 55,505 crores and the 100% Equity Value of the IRBI Trust is INR 32,822 crores as on 30 September 2024.**

**The NAV at fair value per unit of IRBI Trust as on 30 September 2024 is INR 294.72 per unit.**

Note: SPVs are individually referred as “Target”, “Business”, “Company”, “SPV” or the “Asset” Collectively referred as SPVs or Assets

2.

# IRBI Trust Overview

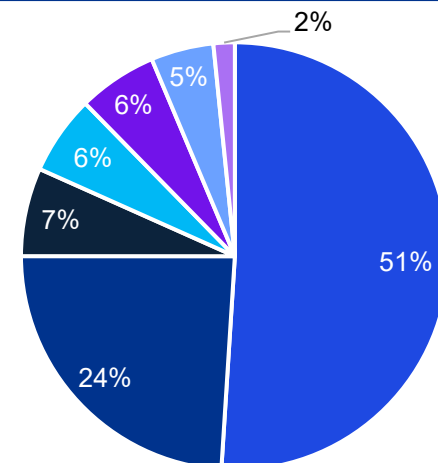
# IRBI Trust Overview

## IRBI Trust - Overview

- IRB Infrastructure Developers Limited (“IRBIDL” or “Sponsor”) is one of the largest infrastructure development and construction companies in India in the roads and highways sector. It was incorporated on 27 July 1998 and is based in Mumbai, India.
- IRBI Trust has been settled by the Sponsor as an irrevocable trust under the provisions of the Trusts Act in New Delhi, India pursuant to the Indenture of Trust dated August 27, 2019, as amended. The Indenture of Trust is registered under the Registration Act. IRBI Trust is registered with the SEBI as an infrastructure investment trust under the InvIT regulations.
- The object and purpose of IRBI Trust is to carry on the activity of an infrastructure investment trust under the InvIT regulations. Investment by IRBI Trust shall only be in holding companies, SPVs, infrastructure projects, securities in India or other permitted investments in accordance with the InvIT regulations, the investment strategy and IRBI Trust documents.
- As at 30 September 2024 IRBI Trust assets comprised of 15 SPVs. IRBI Trust has acquired 11 DBFOT road assets and 4 TOT road asset. All SPVs of IRBI Trust are revenue generating. Refer subsequent slides for more details.
- IRBI trust is held by IRBIDL as Sponsor with 51% stake, Cintra InvIT Investments B.V. with 24% stake and remaining 25% stake is held by GIC through its affiliates.
- In June 2024 Cintra InvIT Investments B.V has acquired ~24 per cent of the Units i.e. 26.72 Cr units of IRBI Trust from GIC Affiliates.
- The IRBI Trust is required to make distributions to the unitholders in accordance with the InvIT regulations and the distribution policy.

Source(s): Management information, IRBI Trust website, Provisional Consolidated Trust Financials  
Sept 2024

## Shareholding Pattern of IRBI Trust as on 30 September 2024

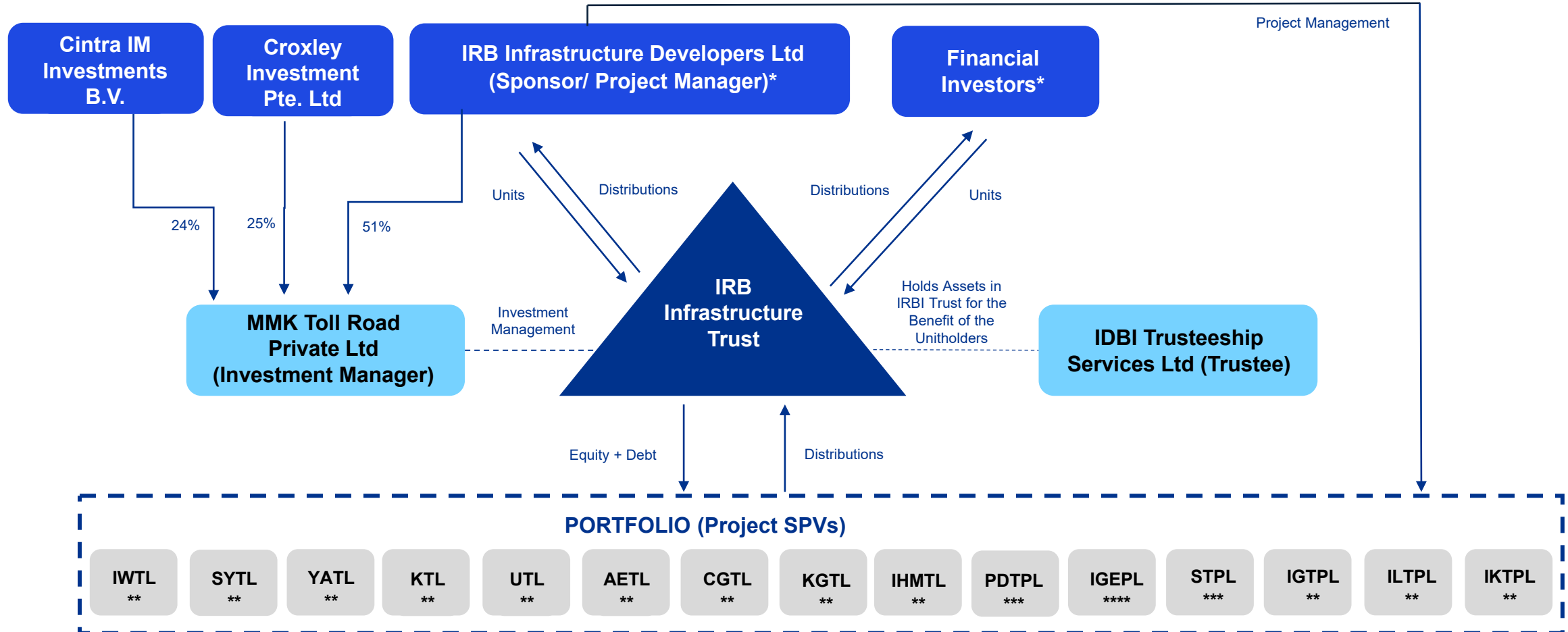


- IRB Infrastructure Developers Ltd
- Cintra InvIT Investments B.V.
- Anahera Investments Pte Ltd
- Bricklayers Investment Pte Ltd
- Chiswick Investments Pte Ltd
- Stretford End Investments Pte Ltd
- Dangenham Investments Pte Ltd

## Key related parties of IRBI Trust

Role	Entity Name
Sponsor	IRB Infrastructure Developers Limited
Investment Manager	MMK Toll Road Private Limited
Trustee	IDBI Trusteeship Services Limited

# Structure of the IRBI Trust



\* Unitholders in the IRBI Trust

\*\* 100% of each project SPV held by the IRBI Trust, together with nominee shareholders.

\*\*\* 99.96% held by the IRBI Trust, with the Sponsor and Sponsor's nominee shareholders holding the remaining 0.04%.

Source(s): IRBI Trust Corporate Presentation, Management

\*\*\*\* 99.99% of IGEPL held by the IRBI Trust, with the Sponsor and Sponsor's nominee shareholders holding the remaining 0.01%.

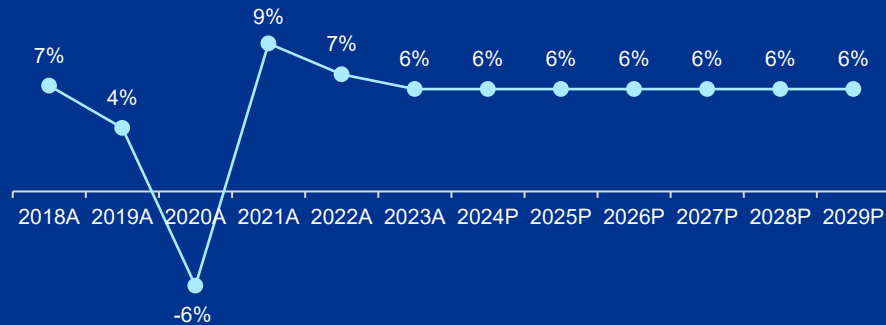
**3.**

# **Industry Overview**

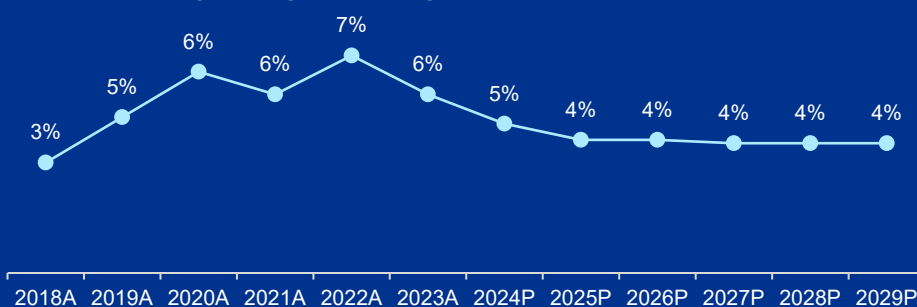
# Indian Economy Outlook

Strong economic growth in the first quarter of 2023 helped India overcome the UK to become the fifth-largest economy after it recovered from the COVID-19 pandemic shock. Also, according to IMF economic outlook, India continues to be the fastest-growing economy in the world.

Real GDP growth rate (%)



Annual percentage changes of average consumer prices (%)



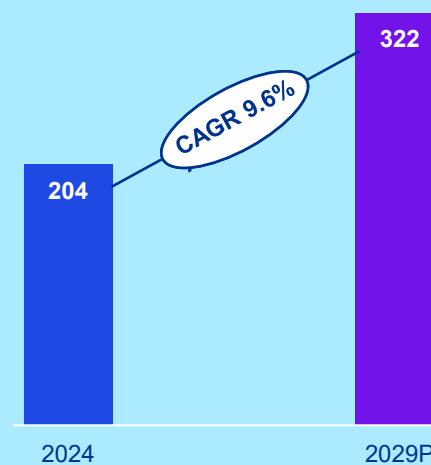
Source(s): International Monetary Fund ("IMF"), India Brand Equity Foundation ("IBEF"), Modor intelligence, EMIS

## Infra Sector

Infrastructure is a key enabler in helping India become a USD 26 trillion economy by 2047. The government has announced a strong pipeline of infra projects across sectors.

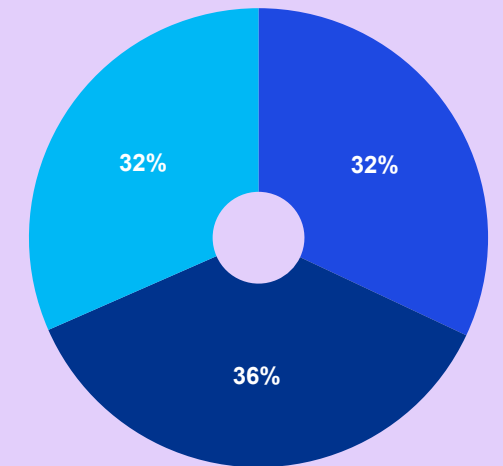
Capital investment outlay for infrastructure is being increased by 33 per cent, which would be 3.3 per cent of GDP and almost three times the outlay in 2019-20.

India Infrastructure market (USD billion)



## Construction Industry

Market segmentation of India's Construction industry (2024)



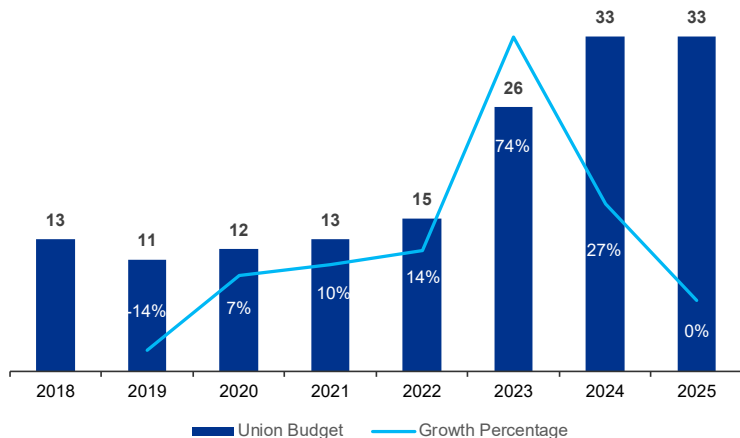
- Infrastructure construction
- Residential construction
- Commercial and special economic zones

# Road Transport and Highways

## Road Transport and Highways sector

- The Ministry of Road Transport and Highways ("MoRTH") formulates and administers policies for road transport, national highways and transport research. It is also involved with the construction and maintenance of the National Highways ("NHs") through the National Highways Authority of India ("NHAI"), and the National Highway and Infrastructure Development Corporation Limited ("NHIDCL"). NHAI is an agency of MoRTH which is also responsible for the toll collection on several highways.
- Under Interim Budget 2024-25, capital investment outlay for infrastructure has been increased by 11.1% to RS 11.1 lakh crore, which is 3.4% of GDP.

### Outlay for Roads under the Union Budget (USD billion)

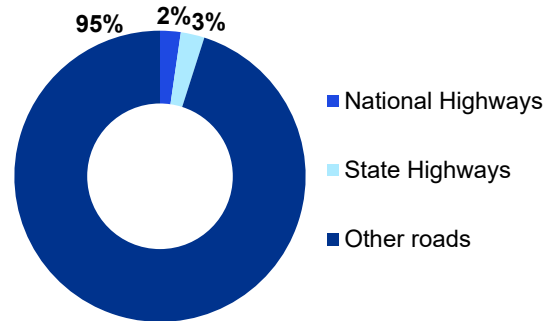


Source(s): MoRTH, IBEF, Invest India

# 2<sup>nd</sup>

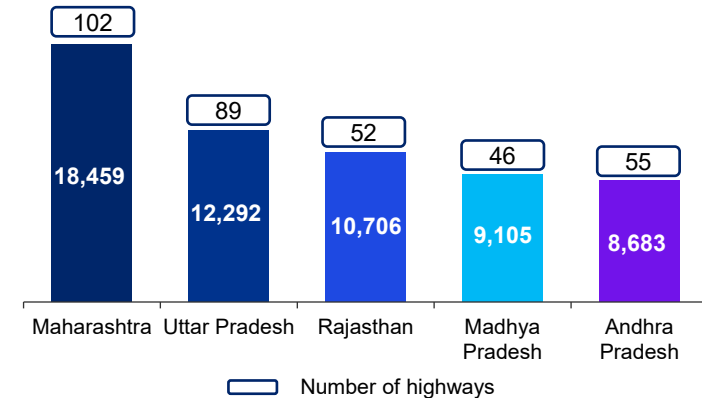
India has the second largest road network in the world of about 67 lakh km. This comprises National Highways, Expressways, State Highways, District Roads, Other District Roads and Village Roads.

### Road & Highway – classification breakup



As per the data from Ministry of Road Transport and Highways, National Highways (NHs) make up for about 2.2 per cent (1,46,145 km) of the total road network of India (66,71,083 km).

### Top 5 states by length of NHs in India (Km)



National Highways carry over 40 per cent of the total traffic across the length and breadth of the country. Maharashtra has the largest network of National Highways with 18,459 km (12.7%). As per MoRTH, there are 970 highways in India.

(State-wise split is as per March 2024)

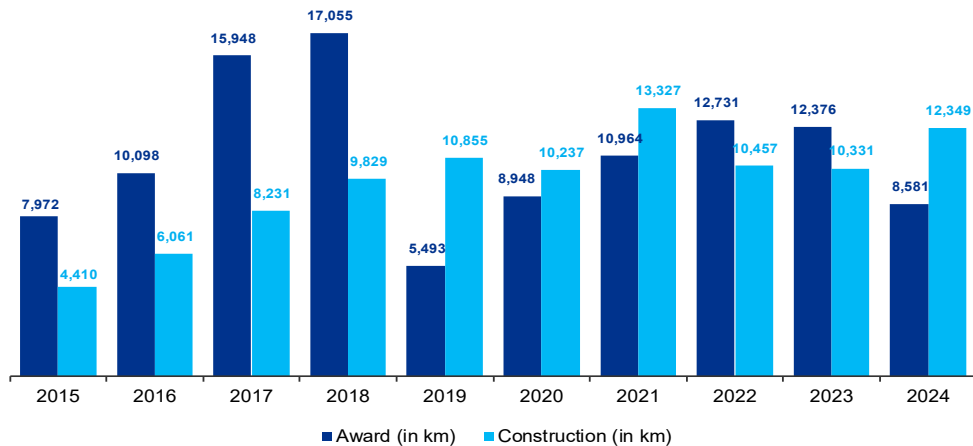
# 36.2%

The market for roads and highways in India is projected to grow at a CAGR of 36.2 per cent during 2016-2025, on account of growing government initiatives to improve transportation infrastructure in the country.

# Key drivers of the sector

## Pace of length of highways awarded and constructed (in kms)

The awarding of projects has picked up pace after the sanction of ambitious Bharatmala programme. The Government of India has allocated INR 1.9 lakh crore under the National Infrastructure Pipeline for 2025. The government also aims to construct 23 new national highways by 2025.



CAGR - Length of highways constructed



Estimated toll collection (in INR lakh crore)



Road construction target (in km)



Estimated road constructed per day

Source(s): MoRTH, Press Information Bureau ("PIB"), Money control

## Toll operations efficiency increased due to adoption and growth of FASTag

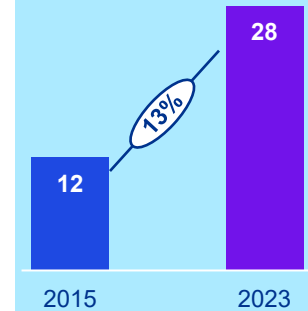
**8.8 Cr**

As of 31st March 2024, banks have issued over 8.8 crore FASTags

**190 Cr**

The average daily collection via FASTag on NH fee plaza is INR 190.6 crore thereby increasing efficiency in toll operations.

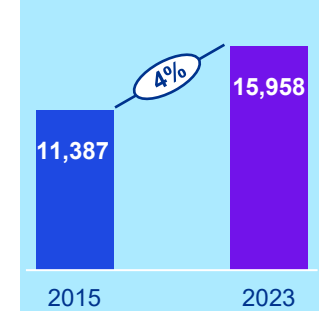
### Highway construction per day accelerates (in km)



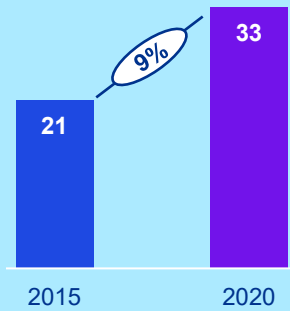
2023 data is as of 05 January 2024

○ - CAGR

### Toll collection over the period (INR crore)



### Total number of registered vehicles (in crore)



Government has implemented multiple initiatives in the last 9 years to augment the capacity of the National Highway infrastructure in the country. The pace of National Highways construction has increased consistently between 2014-15 and 2022-23 due to the systematic push through corridor-based National Highway development approach.

# Financing in road infrastructure

## Financing infrastructure

Investment in road infrastructure is long-term and returns are seen several years after construction. Roads and highways are financed through Government and private sources. Funding from Government sources includes budgetary allocations.

## Private financing

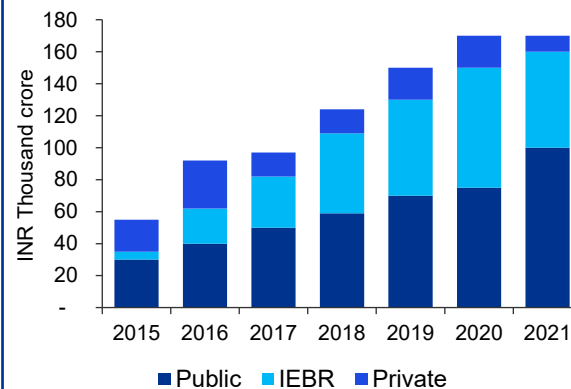
Under private financing, the private developer builds a road, and in return has the right to collect toll for a specified period of time. The developer is responsible for the maintenance of roads during this period.

## Public financing

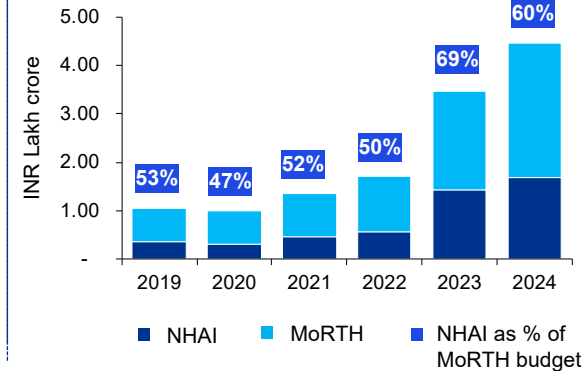
Funding from government sources includes budgetary allocations, which are financed from taxes, cesses, or dedicated road funds. Publicly funded projects are usually given to contractors under various contract models such as the Engineering Procurement Construction (EPC).

## Financing in road sector & MoRTH, NHAI budget

Investment sources (Public, Private or Internal and Extra-Budgetary Resources) for road construction projects over the past six years.



With the high share of NHAI funding in MoRTH budget, NHAI is expected to account for 5k - 5.5k km in this fiscal and 5.8k - 6.2k km in the next.



## Types of projects awarded by NHAI

### a. Engineering Procurement & Construction

Under the EPC model, Government pays private players to lay roads. The private player has no role in the road's ownership, toll collection or maintenance.

### b. Build Operate Transfer ("BOT")

Private players build, operate and maintain the road for a specified period before transferring the asset back to the Government. The private player arranges all the finances for the project, while collecting toll revenue/annuity fee from the Government.

### c. Hybrid Annuity Model ("HAM")

HAM is a hybrid model, a mix of the EPC and BOT (build, operate, transfer) models. HAM combines EPC (40 per cent) and BOT-Annuity (60 per cent). On behalf of the government, NHAI releases 40 per cent of the total project cost. The balance 60 per cent is arranged by the developer.

## Investment Opportunities in Roads & Highways

5,954

Projects

2568

Promoters

701

District

392

Opportunity (USD billion)

Source(s): PRS Legislative research, IBEF, CRISIL, MoRTH, Invest India

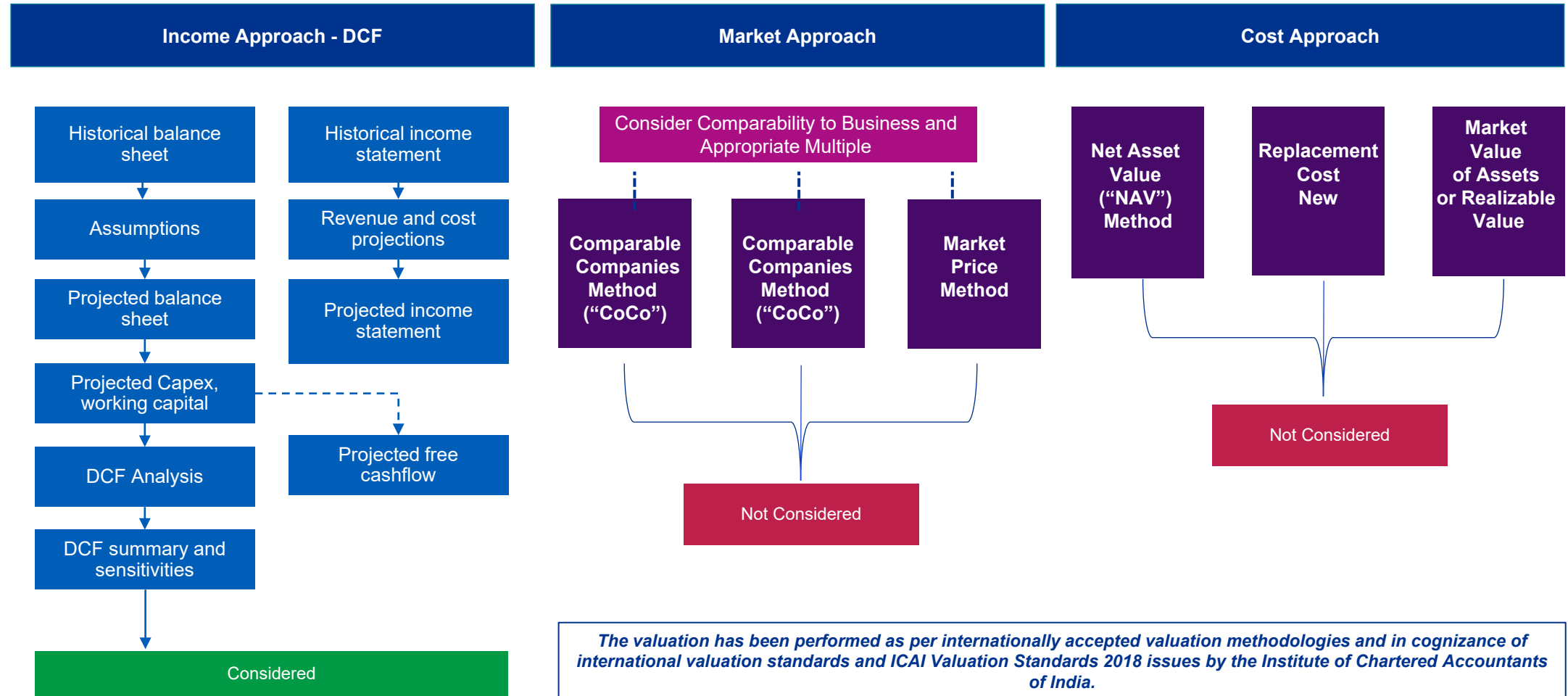
4.

# Valuation Methodology and Approach



# Valuation Methodology and Approach

# Methodology and Approach



# Valuation Methodologies - Income Approach



## Discounted Cash Flows (“DCF”)

- Under a DCF approach, forecast cash flows are discounted back to the present date, generating a net present value for the cash flow stream of the business. A terminal value at the end of the explicit forecast period is then determined and that value is also discounted back to the valuation date to give an overall value for the business.
- A discounted cash flow methodology typically requires the forecast period to be of such a length to enable the business to achieve a stabilized level of earnings, or to be reflective of an entire operation cycle for more cyclical industries.
- The rate at which the future cash flows are discounted (“the discount rate”) should reflect not only the time value of money, but also the risk associated with the business’ future operations. The discount rate most generally employed is weighted average cost of capital (“WACC”), reflecting an optimal as opposed to actual financing structure.
- In calculating the terminal value, regard must be had to the business’ potential for further growth beyond the explicit forecast period. The “constant growth model”, which applies an expected constant level of growth to the cash flow forecast in the last year of the forecast period and assumes such growth is achieved in perpetuity, is a common method. These results would be cross-checked, however, for reasonability to implied exit multiples.
- Due to the finite life of the concession period of the SPVs, we have not computed a terminal value for the valuation of the SPVs.
- The rate at which future cash flows are discounted should reflect not only the time value of the cash flows but also the risk associated with the business’ future operations. This means that in order for a DCF to produce a sensible valuation figure, the importance of the quality of the underlying cash flow forecasts is fundamental.
- The DCF approach has been applied in the valuation of the SPVs.

# Valuation Methodologies - Market Approach



## Comparable Companies ("CoCo")

- Under comparable companies method, the value of shares / business of a company is determined based on market multiples of publicly traded comparable companies. Although no two companies are entirely alike, the companies selected as comparable companies should be engaged in the same or a similar line of business as the subject company.
- The appropriate multiple is generally based on the performance of listed companies with similar business models and size.
- The CoCo methodology has been not been applied in the valuation of IRBI Trust and SPVs.
- The list of companies in the road segment have mix of assets which are at different stages of operation / development / revenue mix/ leasing period. Therefore, comparable companies' method is not considered.



## Comparable Transactions ("CoTrans")

- Under comparable transactions method, the value of shares / business of a company is determined based on market multiples of publicly disclosed transactions in the similar space as that of the subject company. Due to different purposes of investments, transaction rationale and synergy benefits, different control premiums and minority discounts are embedded in the transaction values.
- Multiples are generally based on data from recent transactions in a comparable sector, but with appropriate adjustment after consideration has been given to the specific characteristics of the business being valued.
- The list of transactions in the road segment have mix of assets which are at different stages of operation / development / revenue mix/ leasing period. Therefore, Therefore, comparable transactions method has not been considered for the valuation of IRBI Trust and SPVs.



## Market Price Method

- Under this approach, the value of the business is arrived at considering the market price of the company based on the daily moving averages of the last six-month volume traded weighted average of closing price on the stock exchange where the company's shares are most frequently traded.
- The market price methodology has not been considered in the valuation of IRBI Trust and SPVs as it is not publicly listed or traded on any stock exchange.

# Valuation Methodologies – Cost Approach



## Net Asset Value (“NAV”) Method

- Under the net asset value approach, total value is based on the sum of net asset value as recorded on the balance sheet.
- A net asset methodology is most applicable for businesses where the value lies in the underlying assets and not the ongoing operations of the business.
- The net assets methodology has not been considered for the valuation of IRBI Trust and SPVs as the Targets are operational and the financials are made on a going concern basis.



## Replacement Cost New

- The replacement cost of a business is the cost of acquiring similar assets employed in the business and/or reaching a similar level of development. A purchaser, faced with a build versus buy scenario, may be prepared to pay significantly over and above this cost to obtain advantages including time saved in developing a similar business, and risk of failure.
- The replacement cost method quantifies the cost and risk to reach the present stage of development.
- This approach is often used for start-up/non-mature technology or biotech businesses.
- Hence, the replacement cost method has not been considered.



## Market Value of Assets or Realizable Value

- Under the market value methodology, total value is based on the sum of market value of asset value less market value of liabilities plus, the value of intangible assets not recorded on the balance sheet.
- This methodology is most applicable for businesses where the value lies in the underlying assets and not the ongoing operations of the business.
- Hence, the market value method has not been considered.



# Procedures adopted

# Procedures adopted

We have carried out the Enterprise Valuation of the SPVs, in accordance with valuation standards as specified / applicable as per SEBI InvIT Regulations, to the extent applicable.

In connection with this analysis, we have adopted the following procedures to carry out the valuation analysis:

- Requested and received financial and qualitative information relating to the SPVs.
- Considered the key terms of concession agreements;
- Analysis of the Management Business Plan;
- Considered the Traffic Study Reports from the independent consultant;
- Discussed with the Management on: background of the SPVs– business and fundamental factors that affect its earning-generating capacity and historical and expected financial performance;
- Analysis of the key economic and industry factors which may affect the valuation of the SPVs;
- Analysis of the information available in public domain/ subscribed databases in respect of the comparable companies/ comparable transactions, as considered relevant by us;
- Conducted site visits in February/March 2024 to assess the operating condition of the projects under the SPVs as per the requirements of SEBI (InvIT Regulations) 2014; SEBI (InvIT Regulations) 2014 requires the valuer to conduct site visit once a year.
- Selection of valuation approach and valuation methodology, in accordance with SEBI (InvIT Regulations), as considered appropriate and relevant by us;
- Analysis of other publicly available information, as considered relevant by us; and
- Determination of Enterprise Value of the SPVs and equity value of IRBI Trust as on the Valuation Date.



# WACC Analysis

# Discount Rate and Terminal Value

## Discount rate

In order to determine the discount rate, we have used the WACC methodology as set out below:

$$WACC = K_e * (E/(D + E)) + K_d * (1-T) * (D/(D + E))$$

Where:

$K_e$	=	cost of equity
$E$	=	market value of equity
$K_d$	=	cost of debt
$D$	=	market value of debt
$T$	=	corporate taxation rate

## Terminal Value

- Due to the finite life of the concession period of the SPVs, we have not computed a terminal value for the valuation of the SPVs.

## The cost of equity is derived using the Capital Asset Pricing Model (“CAPM”) as follows:

Where:

$K_e$	=	$R_f + \beta * (R_m - R_f) + \alpha$
$R_f$	=	the current return on risk-free assets
$R_m$ market	=	the expected average return of the market
$(R_m - R_f)$	=	the average risk premium above the risk - free rate that a “market” portfolio of assets is earning
$\beta$	=	the beta factor, being the measure of the systematic risk of a particular asset relative to the risk of a portfolio of all risky assets
$\alpha$	=	company specific risk factor (alpha)

# Summary - WACC

Weighted Average Cost of Capital															
Name of SPV	IWTL	SYTL	YATL	CTL	AETL	UTL	CGTL	KGTL	IHMTL	PDTPL	IGEPL	STPL	ILTPL	IKTPL	IGTPL
Risk free rate of return	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%	6.9%
Equity risk premium	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%	7.0%
Beta	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91	0.91
Alpha	-	-	-	-	-	-	-	-	-	1.0%	-	1.0%	-	-	-
<b>Cost of Equity</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>14.3%</b>	<b>13.3%</b>	<b>14.3%</b>	<b>13.3%</b>	<b>13.3%</b>	<b>13.3%</b>
Cost of Debt	9.00%	8.60%	8.60%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%	9.00%
Tax Rate	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%	25.2%
<b>After Tax Cost of Debt</b>	<b>6.7%</b>	<b>6.4%</b>	<b>6.4%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>	<b>6.7%</b>
Debt to Capital %	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%	60.0%
Equity to Capital %	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%	40.0%
<b>Weighted Average Cost of Capital</b>	<b>9.35%</b>	<b>9.18%</b>	<b>9.18%</b>	<b>9.35%</b>	<b>9.35%</b>	<b>9.35%</b>	<b>9.35%</b>	<b>9.35%</b>	<b>9.35%</b>	<b>9.75%</b>	<b>9.35%</b>	<b>9.75%</b>	<b>9.35%</b>	<b>9.35%</b>	<b>9.35%</b>

Source: KPMG analysis

Refer annexure 2a, 2b and 2c for detailed WACC workings.

Refer subsequent slides for valuation of each SPV based on the discount rates.

**5.**

# **Valuation of Individual SPVs**



# IRB Westcoast Tollway Limited

# Overview



## Project details

IWTL was engaged for four laning the existing two lane highway on DBFOT basis. The project stretch is 187.28 kms long involving the Goa/Karnataka border to Kundapur Section of NH-17 from 93.7 kms to 283.3 kms in Karnataka with 3 toll plazas.



## Concession period

IWTL is required to construct, operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 28 years commencing from the appointed date. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 5.6 years.



## Premium

There is no premium clause in the concession agreement.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Goa/Karnataka border to Kundapur
<b>Concessionaire</b>	IWTL
<b>State</b>	Karnataka
<b>Tollable length (kms)</b>	187.28
<b>No. of toll plazas</b>	3
<b>Concession agreement date</b>	25-Mar-13
<b>Appointed date</b>	3-Mar-14
<b>Four laning completion certificate date</b>	19-Mar-23
<b>Scheduled end date</b>	2-Mar-42
<b>New scheduled end date</b>	6-Feb-48

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHA and IWTL, *“In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”*.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (Management estimate)	44%
1.5% increase for every 1% decrease	67%
Maximum increase in concession period	20%
Increase in concession period (years)	5.6
Revised concession period	33.6
Scheduled end date	02-Mar-42
<b>New scheduled end date</b>	<b>06-Feb-48</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 124 days on account of covid-19. (included above)
- The Management has confirmed to us to consider revised concession period till 6 February 2048. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 6 February 2048.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 2% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## g. Tax

- Management represented that IWTL has 80IA benefit from FY2024 to FY2033, the same has been considered while calculating forecast tax outflows along with any carried forward business loss and unabsorbed depreciation. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows (1/3)

Discounted Cash Flow										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		92	173	193	217	241	270	299	335	370
EBITDA	[A]	57	145	163	187	99	198	266	301	334
EBITDA margin		62%	84%	84%	86%	41%	73%	89%	90%	90%
Depreciation		(15)	(30)	(33)	(37)	(42)	(44)	(45)	(50)	(55)
EBIT		42	115	129	149	58	154	222	251	278
EBIT margin		46%	67%	67%	69%	24%	57%	74%	75%	75%
Less: Tax on EBIT	[B]	(7)	(20)	(23)	(26)	(10)	(27)	(39)	(44)	(49)
Change in working capital	[C]	41	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	91	125	140	161	89	171	228	257	285
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
Present value of cash flows	[E*F]	89	115	117	123	62	109	133	137	139

Source(s): Management information, KPMG analysis



# Discounted Cash Flows (2/3)

Discounted Cash Flow										
INR crores	FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months
Revenue	412	460	512	568	632	703	783	870	967	1,077
EBITDA [A]	365	257	472	529	592	514	688	826	921	1,028
EBITDA margin	88%	56%	92%	93%	94%	73%	88%	95%	95%	95%
Depreciation	(62)	(69)	(77)	(85)	(94)	(105)	(117)	(130)	(145)	(161)
EBIT	303	188	396	444	497	409	571	696	776	867
EBIT margin	73%	41%	77%	78%	79%	58%	73%	80%	80%	81%
Less: Tax on EBIT [B]	(53)	(33)	(69)	(78)	(87)	(71)	(117)	(172)	(203)	(259)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	312	224	403	452	505	443	571	653	718	769
Discounting period	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000
Discount factor [F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200
Present value of cash flows [E*F]	139	92	151	154	158	127	149	156	157	154

Source(s): Management information, KPMG analysis



# Discounted Cash Flows (3/3)

Discounted Cash Flow						
		FY2044	FY2045	FY2046	FY2047	FY2048
INR crores		12 months	12 months	12 months	12 months	10.2 months
Revenue		1,203	1,337	1,487	1,652	1,566
EBITDA	[A]	1,151	1,284	1,431	1,592	1,513
EBITDA margin		96%	96%	96%	96%	97%
Depreciation		(180)	(200)	(222)	(247)	(234)
EBIT		972	1,084	1,209	1,345	1,279
EBIT margin		81%	81%	81%	81%	82%
Less: Tax on EBIT	[B]	(290)	(323)	(360)	(401)	(381)
Change in working capital	[C]	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	862	961	1,071	1,192	1,132
Discounting period		19.000	20.000	21.000	22.000	22.925
Discount factor	[F]	0.183	0.167	0.153	0.140	0.129
Present value of cash flows	[E*F]	158	161	164	167	146

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	3,256
Present value of release of working capital	(1)
<b>Enterprise Valuation</b>	<b>3,255</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent negative working capital of INR 10 Cr released at the end of the concession period.

**Basis the above and using a WACC of 9.35%, the Enterprise Value of IWTL, as on 30 September 2024 is INR 3,255 crore.**

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



# Solapur Yedeshi Tollway Limited

# Overview



## Project details

SYTL was engaged for four laning the existing two lane highway on DBFOT basis the project stretch is 98.7 kms long involving the Solapur to Yedeshi section of NH-211 from 0.00 kms to 100 kms in Maharashtra with 2 toll plazas.



## Concession period

SYTL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 29 years commencing from the appointed date.

Probable reduction of concession period is estimated according to article 29 of concession agreement is zero years. Refer key assumptions on the next slide.



## Premium

There is no premium clause in the concession agreement.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Solapur Yedeshi
<b>Concessionaire</b>	SYTL
<b>State</b>	Maharashtra
<b>Tollable length (kms)</b>	98.7
<b>No. of toll plazas</b>	2
<b>Concession agreement date</b>	3-Mar-14
<b>Appointed date</b>	21-Jan-15
<b>Four laning completion certificate date</b>	15-Oct-19
<b>Scheduled end date</b>	21-Jan-44
<b>New scheduled end date</b>	20-Apr-44

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and SYTL, *“In the event actual average traffic shall have exceeded the target traffic, then for every 1% excess as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be reduced by 0.75% thereof; provided such reduction in concession period shall not in any case exceed 10% of the concession period”*.
- Based on the concession agreement, traffic study report and Management estimate for SYTL we note that the actual traffic for SYTL has exceeded the projected traffic. Pursuant to clause 29 of the concession agreement, concession period will need to be reduced by 1.4 years to account for excess traffic. However, Management has represented that concession period of SYTL will not be reduced as reduction in the concession period necessitated due to excess traffic will be offset by the extension in the concession period due to augmentation of capacity to serve excess traffic. We have not been provided with approval from authority for extension of concession period and have relied on the Management representation for the same.
- Management represented that the concession period will only be increased by 115 days on account of covid-19.
- The Management has confirmed to us to consider revised concession period till 20 April 2044. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 20 April 2044.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 4% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## g. Tax

- Management represented that SYTL has 80IA benefit from FY2025 to FY2034, the same has been considered while calculating forecast tax outflows along with any carried forward business loss and unabsorbed depreciation. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

Source(s): Management information



# Discounted Cash Flows (1/2)

Discounted Cash Flow											
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033	FY2034
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		76	185	204	228	252	282	314	351	389	433
EBITDA	[A]	51	146	163	206	230	258	289	325	301	340
EBITDA margin		68%	79%	80%	90%	91%	92%	92%	92%	77%	79%
Depreciation		(9)	(22)	(24)	(27)	(30)	(33)	(37)	(41)	(46)	(51)
EBIT		42	124	139	179	200	225	252	283	255	289
EBIT margin		56%	67%	68%	79%	79%	80%	80%	81%	65%	67%
Less: Tax on EBIT	[B]	(7)	(22)	(24)	(31)	(35)	(39)	(44)	(50)	(45)	(51)
Change in working capital	[C]	9	19	15	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	53	144	154	175	195	219	245	275	256	290
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
Discount factor	[F]	0.978	0.916	0.839	0.768	0.704	0.645	0.591	0.541	0.495	0.454
Present value of cash flows	[E*F]	52	131	129	134	137	141	144	149	127	132

Source(s): Management information, KPMG analysis



# Discounted Cash Flows (2/2)

Discounted Cash Flow												
		FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043	FY2044	FY2045
INR crores		12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	0.7 months
Revenue		485	540	597	668	740	830	915	1,016	1,131	1,261	77
EBITDA	[A]	388	508	563	630	699	787	868	924	1,033	1,158	63
EBITDA margin		80%	94%	94%	94%	94%	95%	95%	91%	91%	92%	82%
Depreciation		(57)	(64)	(70)	(79)	(87)	(98)	(108)	(120)	(133)	(149)	(9)
EBIT		330	444	493	552	612	689	761	804	900	1,009	54
EBIT margin		68%	82%	82%	83%	83%	83%	83%	79%	80%	80%	70%
Less: Tax on EBIT	[B]	(58)	(78)	(86)	(96)	(163)	(185)	(205)	(219)	(247)	(281)	(16)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	330	430	477	534	537	602	663	705	787	877	47
Discounting period		10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000	19.528
Discount factor	[F]	0.416	0.381	0.349	0.319	0.293	0.268	0.245	0.225	0.206	0.189	0.180
Present value of cash flows	[E*F]	137	164	166	171	157	161	163	159	162	165	8

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	2,890
Present value of release of working capital	(6)
<b>Enterprise Valuation</b>	<b>2,884</b>
<b>WACC</b>	<b>9.18%</b>

Present value of release in working capital represent working capital of negative INR 31 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.18%, the Enterprise Value of SYTL, as on 30 September 2024 is INR 2,884 crore.

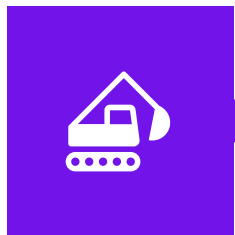
*Please refer annexure 2b for WACC breakup.*

Source(s): Management information, KPMG analysis



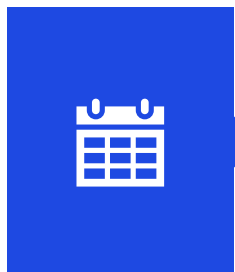
# Yedeshi Aurangabad Tollway Limited

# Overview



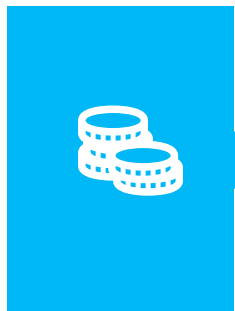
## Project details

YATL was engaged for four laning the existing two lane highway on DBFOT basis. The project stretch is 189.1 kms long involving the Yedeshi Aurangabad section of NH-211 from 100.0 kms to 290.2 kms in Maharashtra with 3 toll plazas.



## Concession period

YATL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 26 years commencing from the appointed date. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 3.2 years.



## Premium

There is no premium clause in the concession agreement.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Yedeshi Aurangabad
<b>Concessionaire</b>	YATL
<b>State</b>	Maharashtra
<b>Tollable length (kms)</b>	189.1
<b>No. of toll plazas</b>	3
<b>Concession agreement date</b>	30-May-14
<b>Appointed date</b>	1-Jul-15
<b>Four laning completion certificate date</b>	24-Sep-20
<b>Scheduled end date</b>	1-July-41
<b>New scheduled end date</b>	25-Jan-45

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and YATL, *“In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”*.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (Management estimate)	8%
1.5% increase for every 1% decrease	12%
Maximum increase in concession period	20%
Increase in concession period (years)	3.2
Revised concession period	29.2
Scheduled end date	1-July-41
<b>New scheduled end date</b>	<b>25-Jan-45</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 151 days on account of covid-19 and Kannad ghat crisis. (included above)
- The Management has confirmed to us to consider revised concession period till 25 January 2045. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 25 January 2045.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 4% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## g. Tax

- Management represented that YATL has 80IA benefit from FY2026 to FY2035, the same has been considered while calculating forecast tax outflows along with any carried forward business loss and unabsorbed depreciation. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows [1/2]

Discounted Cash Flow										
INR crores	FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months	FY2034 12 months
Revenue	145	367	400	441	481	529	580	636	693	759
EBITDA [A]	110	309	340	411	449	496	545	599	545	604
EBITDA margin	75%	84%	85%	93%	93%	94%	94%	94%	79%	80%
Depreciation	(25)	(58)	(58)	(58)	(64)	(70)	(77)	(84)	(92)	(101)
EBIT	85	250	282	352	386	426	468	515	453	503
EBIT margin	58%	68%	70%	80%	80%	80%	81%	81%	65%	66%
Less: Tax on EBIT [B]	(15)	(44)	(49)	(62)	(67)	(74)	(82)	(90)	(79)	(88)
Change in working capital [C]	(5)	31	27	19	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>	<b>90</b>	<b>296</b>	<b>318</b>	<b>368</b>	<b>382</b>	<b>422</b>	<b>463</b>	<b>509</b>	<b>466</b>	<b>516</b>
Discounting period	0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000
Discount factor [F]	0.978	0.916	0.839	0.768	0.704	0.645	0.591	0.541	0.495	0.454
<b>Present value of cash flows [E*F]</b>	<b>88</b>	<b>271</b>	<b>267</b>	<b>283</b>	<b>269</b>	<b>272</b>	<b>274</b>	<b>275</b>	<b>231</b>	<b>234</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/2]

Discounted Cash Flow												
		FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043	FY2044	FY2045
INR crores		12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12.0 months	12.0 months	10 months
Revenue		830	908	989	1,083	1,184	1,298	1,415	1,548	1,696	1,860	1,669
EBITDA	[A]	667	864	943	1,034	1,132	1,183	1,296	1,422	1,634	1,795	1,612
EBITDA margin		80%	95%	95%	96%	96%	91%	92%	92%	96%	96%	97%
Depreciation		(110)	(121)	(131)	(144)	(157)	(172)	(188)	(206)	(225)	(247)	(222)
EBIT		557	744	812	890	975	1,011	1,108	1,217	1,408	1,548	1,391
EBIT margin		67%	82%	82%	82%	82%	78%	78%	79%	83%	83%	83%
Less: Tax on EBIT	[B]	(97)	(130)	(142)	(156)	(170)	(177)	(284)	(349)	(411)	(452)	(406)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	570	734	801	878	962	1,007	1,011	1,073	1,222	1,343	1,207
Discounting period		10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000	19.910
Discount factor	[F]	0.416	0.381	0.349	0.319	0.293	0.268	0.245	0.225	0.206	0.189	0.174
Present value of cash flows	[E*F]	237	280	279	281	281	270	248	241	252	253	210

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	5,296
Present value of release of working capital	(7)
<b>Enterprise Valuation</b>	<b>5,289</b>
<b>WACC</b>	<b>9.18%</b>

Present value of release in working capital represent working capital of negative INR 43 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.18%, the Enterprise Value of YATL, as on 30 September 2024 is INR 5,289 crore.

*Please refer annexure 2b for WACC breakup.*

Source(s): Management information, KPMG analysis



# Kaithal Tollway Limited

# Overview



## Project details

KTL was engaged to expand the existing two-lane road to a four-lane road in the Kaithal to Rajasthan border section of NH-152/65 from 33.25 Km to 241.58 Km i.e. total design length of 166.3 Km in the state of Haryana under National Highway Development Program Phase IV on a DBFOT basis.



## Concession period

KTL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 27 years commencing from the appointed date. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 5.4 years.



## Premium

There is no premium clause in the concession agreement.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Kaithal – Rajasthan border
<b>Concessionaire</b>	KTL
<b>State</b>	Haryana
<b>Tollable length (kms)</b>	166.3
<b>No. of toll plazas</b>	3
<b>Concession agreement date</b>	23-Jun-14
<b>Appointed date</b>	15-Jul-15
<b>Four laning completion certificate date</b>	29-Mar-19
<b>Scheduled end date</b>	14-Jul-42
<b>New scheduled end date</b>	6-Feb-49

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHA and KTL, “In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (Management estimate)	32%
1.5% increase for every 1% decrease	48%
Maximum increase in concession period	20%
Increase in concession period (years)	5.4
Revised concession period	32.4
Scheduled end date	14-July-42
<b>New scheduled end date</b>	<b>06-Feb-49</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 446 days on account of covid-19 and farmer protests (included above).
- The Management has confirmed to us to consider revised concession period till 06 February 2049. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 06 February 2049.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 4% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## g. Tax

- Management represented that KTL has 80IA benefit from FY2025 to FY2034, the same has been considered while calculating forecast tax outflows along with any carried forward business loss and unabsorbed depreciation. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows [1/3]

Discounted Cash Flow										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		87	167	181	198	215	234	254	277	300
EBITDA	[A]	41	97	158	173	189	207	226	119	135
EBITDA margin		47%	58%	87%	88%	88%	88%	89%	43%	45%
Depreciation		(14)	(27)	(29)	(32)	(34)	(37)	(41)	(44)	(48)
EBIT		27	70	129	141	154	169	185	75	87
EBIT margin		31%	42%	71%	72%	72%	72%	73%	27%	29%
Less: Tax on EBIT	[B]	(5)	(12)	(22)	(25)	(27)	(30)	(32)	(13)	(15)
Change in working capital	[C]	45	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	82	84	135	148	162	177	193	106	120
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
Present value of cash flows	[E*F]	80	77	113	113	113	113	113	57	59

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/3]

Discounted Cash Flow										
INR crores	FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months
Revenue	326	356	387	420	457	496	541	585	636	690
EBITDA [A]	153	321	350	382	416	454	402	440	483	639
EBITDA margin	47%	90%	91%	91%	91%	92%	74%	75%	76%	93%
Depreciation	(52)	(57)	(62)	(67)	(73)	(79)	(84)	(90)	(98)	(107)
EBIT	101	264	289	315	344	375	319	350	385	533
EBIT margin	31%	74%	75%	75%	75%	76%	59%	60%	61%	77%
Less: Tax on EBIT [B]	(18)	(46)	(50)	(55)	(60)	(66)	(56)	(90)	(101)	(156)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>	<b>135</b>	<b>275</b>	<b>300</b>	<b>327</b>	<b>356</b>	<b>388</b>	<b>347</b>	<b>350</b>	<b>383</b>	<b>484</b>
Discounting period	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000
Discount factor [F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200
<b>Present value of cash flows [E*F]</b>	<b>61</b>	<b>112</b>	<b>112</b>	<b>112</b>	<b>111</b>	<b>111</b>	<b>91</b>	<b>84</b>	<b>84</b>	<b>97</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [3/3]

Discounted Cash Flow							
		FY2044	FY2045	FY2046	FY2047	FY2048	FY2049
INR crores		12 months	12 months	12 months	12 months	12 months	10.2 months
Revenue		752	815	884	960	1,000	928
EBITDA	[A]	698	759	825	897	934	870
EBITDA margin		93%	93%	93%	94%	93%	94%
Depreciation		(116)	(126)	(136)	(148)	(155)	(143)
EBIT		582	633	688	749	780	726
EBIT margin		77%	78%	78%	78%	78%	78%
Less: Tax on EBIT	[B]	(176)	(191)	(208)	(226)	(235)	(219)
Change in working capital	[C]	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	522	568	617	672	699	651
Discounting period		19.000	20.000	21.000	22.000	23.000	23.925
Discount factor	[F]	0.183	0.167	0.153	0.140	0.128	0.118
Present value of cash flows	[E*F]	95	95	94	94	89	77

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	2,357
Present value of release of working capital	(2)
<b>Enterprise Valuation</b>	<b>2,354</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent working capital of negative INR 20 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of KTL, as on 30 September 2024 is INR 2,354 crore.

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



# AE Tollway Limited

# Overview



## Project details

AETL was engaged to expand the Agra to Etawah bypass section of NH-2 from 199.66 Km to 323.52 Km in the state of Uttar Pradesh from four to six lanes under National Highway Development Program Phase V on a DBFOT basis.



## Concession period

AETL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 24 years commencing from the appointed date. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 4.8 years.



## Premium

AETL was engaged on payment of premium of INR 81 Crs to NHAI in the remaining period of the year of appointed date and for each subsequent year the premium shall increase by an additional 5% as compared to the previous year.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Agra Etawah
<b>Concessionaire</b>	AETL
<b>State</b>	Uttar Pradesh
<b>Tollable length (kms)</b>	124.52
<b>No. of toll plazas</b>	2
<b>Concession agreement date</b>	01-Sep-15
<b>Appointed date</b>	01-Aug-16
<b>Six laning completion certificate date</b>	24-Nov-20
<b>Scheduled end date</b>	31-Jul-40
<b>New scheduled end date</b>	19-Oct-45

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and AETL, *“In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”*.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (pessimistic scenario)	37%
1.5% increase for every 1% decrease	55%
Maximum increase in concession period	20%
Increase in concession period (years)	4.8
Revised concession period	28.8
Scheduled end date	31-Jul-40
<b>New scheduled end date</b>	<b>19-Oct-45</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 163 days on account of covid-19 and demonetization (included above).
- The Management has confirmed to us to consider revised concession period till 19 October 2045. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 19 October 2045.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 4% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## h. Tax

- Management represented that AETL has 80IA benefit from FY2027 to FY2036, the same has been considered while calculating forecast tax outflows along with any carried forward business loss and unabsorbed depreciation. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows [1/3]

Discounted Cash Flow										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		84	168	196	227	263	303	349	402	460
EBITDA	[A]	34	86	153	181	215	252	173	216	266
EBITDA margin		40%	51%	78%	80%	82%	83%	50%	54%	58%
Depreciation		(20)	(42)	(47)	(52)	(58)	(65)	(73)	(81)	(91)
EBIT		13	44	106	129	157	188	100	135	176
EBIT margin		16%	26%	54%	57%	60%	62%	29%	34%	38%
Less: Tax on EBIT	[B]	(2)	(8)	(19)	(23)	(27)	(33)	(18)	(24)	(31)
Change in working capital	[C]	39	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	71	78	134	159	188	220	155	193	236
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
Present value of cash flows	[E*F]	69	71	112	121	131	140	91	103	115

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/3]

Discounted Cash Flow										
INR crores	FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months
Revenue	526	601	678	761	854	959	1,081	1,193	1,327	1,472
EBITDA [A]	465	537	611	690	707	804	918	1,108	1,237	1,378
EBITDA margin	88%	89%	90%	91%	83%	84%	85%	93%	93%	94%
Depreciation	(101)	(113)	(124)	(118)	(121)	(134)	(149)	(163)	(179)	(197)
EBIT	363	423	486	573	586	670	769	945	1,057	1,181
EBIT margin	69%	70%	72%	75%	69%	70%	71%	79%	80%	80%
Less: Tax on EBIT [B]	(63)	(74)	(85)	(100)	(102)	(117)	(171)	(269)	(311)	(347)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>	<b>401</b>	<b>463</b>	<b>526</b>	<b>590</b>	<b>604</b>	<b>687</b>	<b>747</b>	<b>839</b>	<b>926</b>	<b>1,031</b>
Discounting period	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000
Discount factor [F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200
<b>Present value of cash flows [E*F]</b>	<b>179</b>	<b>189</b>	<b>197</b>	<b>202</b>	<b>189</b>	<b>196</b>	<b>195</b>	<b>201</b>	<b>202</b>	<b>206</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [3/3]

Discounted Cash Flow				
INR crores		FY2044 12 months	FY2045 12 months	FY2046 6.6 months
Revenue		1,639	1,810	1,100
EBITDA	[A]	1,539	1,706	1,040
EBITDA margin		94%	94%	95%
Depreciation		(218)	(238)	(144)
EBIT		1,322	1,467	896
EBIT margin		81%	81%	81%
Less: Tax on EBIT	[B]	(387)	(429)	(262)
Change in working capital	[C]	-	-	-
Less : Capex	[D]	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>1,152</b>	<b>1,276</b>	<b>778</b>
Discounting period		19.000	20.000	20.776
Discount factor	[F]	0.183	0.167	0.156
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>211</b>	<b>213</b>	<b>121</b>

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	3,458
Present value of release of working capital	(16)
<b>Enterprise Valuation</b>	<b>3,441</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent working capital of negative INR 107 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of AETL, as on 30 September 2024 is INR 3,441 crore.

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis





# Udaipur Tollway Limited

# Overview



## Project details

UTL was engaged to expand the Udaipur bypass (287.40 Km) to the Rajasthan/Gujarat border (401.20 Km) section of NH-8 in the states of Rajasthan & Gujarat (approx. length 113.80 Km) from four to six lanes under National Highway Development Program Phase V on a DBFOT basis.



## Concession period

UTL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 21 years commencing from the appointed date.

Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 4.2 years.



## Premium

UTL was engaged on payment of premium of INR 163.8 Crs to NHAI immediately after the 3<sup>rd</sup> anniversary year of COD and for each subsequent year till the 9th anniversary of COD, the premium shall increase by an additional 3% as compared to the previous year. From the 9th anniversary of COD until the end of the concession period, the premium shall increase by an additional 8% each year as compared to the previous year. UTL has filed Writ petition with Rajasthan High Court with prayer to commence payment of premium to NHAI, six months post actual completion of the project construction work. The High Court prima facie agreed with the contention and have provided interim relief from payment of premium. The matter is currently under arbitration.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Udaipur Gujarat border
<b>Concessionaire</b>	UTL
<b>State</b>	Rajasthan/ Gujarat
<b>Tollable length (kms)</b>	113.8
<b>No. of toll plazas</b>	1
<b>Concession agreement date</b>	09-Dec-16
<b>Appointed date</b>	03-Sep-17
<b>Six laning completion certificate date</b>	01-Jun-21
<b>Scheduled end date</b>	02-Sep-38
<b>New scheduled end date</b>	13-Feb-43

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and UTL, *“In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”*.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (pessimistic scenario)	17%
1.5% increase for every 1% decrease	25%
Maximum increase in concession period	20%
Increase in concession period (years)	4.2
Revised concession period	25.2
Scheduled end date	02-Sep-38
<b>New scheduled end date</b>	<b>13-Feb-43</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 106 days on account of covid-19. (included above)
- The Management has confirmed to us to consider revised concession period till 13 February 2043. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 13 February 2043.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 2% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## h. Tax

- Management represented that UTL has 35AD benefit for income tax and the same has been considered while calculating forecast tax outflows along with any carried forward business loss and mat credit. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows [1/2]

Discounted Cash Flow										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		86	180	213	250	279	312	350	390	435
EBITDA	[A]	29	81	185	226	134	161	195	358	406
EBITDA margin		34%	45%	87%	90%	48%	51%	56%	92%	93%
Depreciation		(21)	(48)	(53)	(59)	(65)	(72)	(79)	(88)	(96)
EBIT		8	33	132	167	68	89	116	270	310
EBIT margin		9%	18%	62%	67%	25%	28%	33%	69%	71%
Less: Tax on EBIT	[B]	(1)	(6)	(23)	(29)	(12)	(15)	(20)	(47)	(54)
Change in working capital	[C]	-	-	-	39	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	28	75	162	236	122	145	175	311	352
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
Present value of cash flows	[E*F]	27	69	136	180	85	93	102	166	172

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/2]

Discounted Cash Flow										
	FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043
INR crores	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	10.4 months
Revenue	483	540	598	661	730	812	901	986	1,084	1,040
EBITDA	[A]	368	418	448	629	697	779	866	949	1,004
EBITDA margin		76%	78%	75%	95%	96%	96%	96%	96%	97%
Depreciation		(106)	(117)	(128)	(124)	(104)	(114)	(126)	(137)	(143)
EBIT		262	302	320	505	593	664	740	812	862
EBIT margin		54%	56%	53%	76%	81%	82%	82%	82%	83%
Less: Tax on EBIT	[B]	(46)	(53)	(56)	(88)	(104)	(189)	(218)	(239)	(253)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>		<b>322</b>	<b>365</b>	<b>392</b>	<b>541</b>	<b>594</b>	<b>589</b>	<b>648</b>	<b>710</b>	<b>751</b>
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.935
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.201
<b>Present value of cash flows [E*F]</b>		<b>144</b>	<b>149</b>	<b>147</b>	<b>185</b>	<b>186</b>	<b>168</b>	<b>169</b>	<b>170</b>	<b>151</b>

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	2,671
Present value of release of working capital	(21)
<b>Enterprise Valuation</b>	<b>2,650</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent working capital of negative INR 109 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of UTL, as on 30 September 2024 is INR 2,650 crore.

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



# Chittorgarh Gulabpura Tollway Limited

# Overview



## Project details

CGTL was engaged for six laning the existing four lane highway on DBFOT basis. The project stretch is 124.87 kms long involving the Kishangarh Udaipur Ahmedabad section from 90 kms (near Gulabpara) to 214.87 kms (end of Chittorgarh Bypass) of NH-79 in Rajasthan with 2 toll plazas.



## Concession period

CGTL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 20 years commencing from the appointed date.

Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 4 years.



## Premium

CGTL was engaged on payment of premium of INR 228.6 Crs to NHAI immediately after the 3<sup>rd</sup> anniversary year of COD and for each subsequent year till the 9th anniversary of COD, the premium shall increase by an additional 3% as compared to the previous year. From the 9th anniversary of COD until the end of the concession period, the premium shall increase by an additional 8% each year as compared to the previous year. CGTL has filed Writ petition with Rajasthan High Court with prayer to commence payment of premium to NHAI, six months post actual completion of the project construction work. The High Court prima facie agreed with the contention and have provided interim relief from payment of premium. The matter is currently under arbitration.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Gulabpura Chittorgarh
<b>Concessionaire</b>	CGTL
<b>State</b>	Rajasthan
<b>Tollable length (kms)</b>	124.87
<b>No. of toll plazas</b>	2
<b>Concession agreement date</b>	9-Dec-16
<b>Appointed date</b>	4-Nov-17
<b>Six laning completion certificate date</b>	14-Aug-21
<b>Scheduled end date</b>	3-Nov-37
<b>New scheduled end date</b>	3-Feb-42

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession Agreement between NHAI and CGTL, *“In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”*.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (pessimistic scenario)	28%
1.5% increase for every 1% decrease	43%
Maximum increase in concession period	20%
Increase in concession period (years)	4
Revised concession period	24
Scheduled end date	03-Nov-37
<b>New scheduled end date</b>	<b>03-Feb-42</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 117 days on account of covid-19. (included above)
- The Management has confirmed to us to consider revised concession period till 3 February 2042. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 3 February 2042.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 4% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## h. Tax

- Management represented that CGTL has 35AD benefit for income tax and the same has been considered while calculating forecast tax outflows along with any carried forward business loss and mat credit. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows [1/2]

Discounted Cash Flow									
INR crores	FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue	93	189	230	276	310	354	394	438	485
EBITDA [A]	55	123	160	234	266	308	260	297	337
EBITDA margin	59%	65%	70%	85%	86%	87%	66%	68%	70%
Depreciation	(24)	(45)	(50)	(55)	(61)	(68)	(74)	(82)	(89)
EBIT	31	78	111	179	205	240	185	215	248
EBIT margin	33%	41%	48%	65%	66%	68%	47%	49%	51%
Less: Tax on EBIT [B]	(5)	(14)	(19)	(31)	(36)	(42)	(32)	(38)	(43)
Change in working capital [C]	-	-	-	50	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>	<b>50</b>	<b>109</b>	<b>141</b>	<b>253</b>	<b>230</b>	<b>266</b>	<b>227</b>	<b>259</b>	<b>294</b>
Discounting period	0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor [F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows [E*F]</b>	<b>49</b>	<b>100</b>	<b>118</b>	<b>193</b>	<b>161</b>	<b>170</b>	<b>133</b>	<b>138</b>	<b>144</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/2]

Discounted Cash Flow										
		FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042
INR crores		12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	10.1 months
Revenue		541	601	664	732	809	894	989	1,087	1,014
EBITDA	[A]	485	534	555	617	688	818	908	1,000	934
EBITDA margin		90%	89%	84%	84%	85%	92%	92%	92%	92%
Depreciation		(98)	(108)	(118)	(129)	(141)	(154)	(169)	(184)	(170)
EBIT		387	427	437	488	547	664	739	816	763
EBIT margin		72%	71%	66%	67%	68%	74%	75%	75%	75%
Less: Tax on EBIT	[B]	(68)	(75)	(80)	(155)	(173)	(206)	(229)	(252)	(235)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>418</b>	<b>460</b>	<b>475</b>	<b>462</b>	<b>515</b>	<b>612</b>	<b>680</b>	<b>748</b>	<b>699</b>
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	16.921
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.220
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>187</b>	<b>188</b>	<b>178</b>	<b>158</b>	<b>161</b>	<b>175</b>	<b>178</b>	<b>179</b>	<b>154</b>

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	2,763
Present value of release of working capital	(13)
<b>Enterprise Valuation</b>	<b>2,750</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent working capital of negative INR 60 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of CGTL, as on 30 September 2024 is INR 2,750 crore.

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



# Kishangarh Gulabpura Tollway Limited

# Overview



## Project details

KGTL was engaged for six laning the existing four lane highway on DBFOT basis. The project stretch is 90 kms long involving the Kishangarh to Gulabpura section of NH-79A and NH-79 in Rajasthan with a single toll plaza.



## Concession period

KGTL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 20 years commencing from the appointed date. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 4 years.



## Premium

KGTL was engaged on payment of premium of INR 186.3 Crs to NHAI immediately after the 3<sup>rd</sup> anniversary year of COD and for each subsequent year till the 9th anniversary of COD, the premium shall increase by an additional 3% as compared to the previous year. From the 9th anniversary of COD until the end of the concession period, the premium shall increase by an additional 8% each year as compared to the previous year. KGTL has filed Writ petition with Rajasthan High Court with prayer to commence payment of premium to NHAI, six months post actual completion of the project construction work. The High Court prima facie agreed with the contention and have provided interim relief from payment of premium. The matter is currently under arbitration.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Kishangarh Gulabpura
<b>Concessionaire</b>	KGTL
<b>State</b>	Rajasthan
<b>Tollable length (kms)</b>	90
<b>No. of toll plazas</b>	1
<b>Concession agreement date</b>	22-Feb-17
<b>Appointed date</b>	21-Feb-18
<b>Six laning completion certificate date</b>	20-Jul-22
<b>Scheduled end date</b>	20-Feb-38
<b>New scheduled end date</b>	20-Jun-42

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and KGTL, “In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (pessimistic scenario)	32%
1.5% increase for every 1% decrease	48%
Maximum increase in concession period	20%
Increase in concession period (years)	4
Revised concession period	24
Scheduled end date	20-Feb-38
<b>New scheduled end date</b>	<b>20-Jun-42</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 136 days on account of covid-19 (included above).
- The Management has confirmed to us to consider revised concession period till 20 June 2042. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 20 June 2042.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 4% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## h. Tax

- Management represented that KGTL has 35AD benefit for income tax and the same has been considered while calculating forecast tax outflows along with any carried forward business loss and mat credit. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

# Discounted Cash Flows [1/2]

Discounted Cash Flow										
INR crores		FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue		58	95	121	150	181	205	231	261	292
EBITDA	[A]	54	69	(7)	121	151	174	198	226	151
EBITDA margin		94%	72%	-6%	81%	83%	85%	86%	87%	52%
Depreciation		(19)	(34)	(35)	(39)	(43)	(47)	(52)	(57)	(63)
EBIT		35	35	(42)	82	108	127	146	169	88
EBIT margin		61%	37%	-35%	55%	60%	62%	63%	65%	30%
Less: Tax on EBIT	[B]	(3)	(6)	-	(13)	(19)	(22)	(26)	(29)	(15)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>51</b>	<b>63</b>	<b>(7)</b>	<b>108</b>	<b>132</b>	<b>152</b>	<b>172</b>	<b>197</b>	<b>136</b>
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>50</b>	<b>57</b>	<b>(6)</b>	<b>82</b>	<b>92</b>	<b>97</b>	<b>101</b>	<b>105</b>	<b>66</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/2]

Discounted Cash Flow											
		FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043
INR crores		12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	2.7 months
Revenue		328	367	412	456	507	564	629	700	767	188
EBITDA	[A]	187	216	369	409	456	509	570	637	700	163
EBITDA margin		57%	59%	89%	90%	90%	90%	91%	91%	91%	87%
Depreciation		(69)	(76)	(84)	(92)	(101)	(111)	(122)	(133)	(145)	(35)
EBIT		118	139	285	317	355	398	449	504	554	128
EBIT margin		36%	38%	69%	70%	70%	71%	71%	72%	72%	68%
Less: Tax on EBIT	[B]	(21)	(24)	(50)	(55)	(62)	(128)	(144)	(160)	(176)	(41)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>166</b>	<b>191</b>	<b>319</b>	<b>354</b>	<b>394</b>	<b>381</b>	<b>427</b>	<b>477</b>	<b>524</b>	<b>122</b>
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	17.611
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.207
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>74</b>	<b>78</b>	<b>119</b>	<b>121</b>	<b>123</b>	<b>109</b>	<b>112</b>	<b>114</b>	<b>114</b>	<b>25</b>

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	1,636
Present value of release of working capital	(13)
<b>Enterprise Valuation</b>	<b>1,623</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent working capital of negative INR 62 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of KGTL, as on 30 September 2024 is INR 1,623 crore.

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



# IRB Hapur Moradabad Tollway Limited

# Overview



## Project details

IHMTL was engaged for six laning the existing four lane highway on DBFOT basis. The project stretch is 99.87 kms long involving the Hapur bypass to Moradabad section from 50 kms to 148.277 kms (Design chainage 149.87 kms) of NH-24 in Uttar Pradesh with 2 toll plazas.



## Concession period

IHMTL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 22 years commencing from the appointed date.

Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about ~4 years.



## Premium

IHMTL was engaged on payment of premium of INR 31.5 Crs to NHAI immediately after the 3<sup>rd</sup> anniversary year of COD and for each subsequent year till the 9th anniversary of COD, the premium shall increase by an additional 3% as compared to the previous year. From the 9th anniversary of COD until the end of the concession period, the premium shall increase by an additional 8% each year as compared to the previous year.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Hapur Moradabad
<b>Concessionaire</b>	IHMTL
<b>State</b>	Uttar Pradesh
<b>Tollable length (kms)</b>	99.87
<b>No. of toll plazas</b>	2
<b>Concession agreement date</b>	29-May-18
<b>Appointed date</b>	28-May-19
<b>Six laning completion certificate date</b>	7-Apr-23
<b>Scheduled end date</b>	31-May-41
<b>New scheduled end date</b>	29-Aug-45

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and IHMTL, *“In the event actual average traffic shall have fallen short of the target traffic, then for every 1% shortfall as compared to the target traffic, the concession period shall, subject to payment of concession fee in accordance with this agreement, be increased by 1.5% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”*.
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (pessimistic scenario)	12%
1.5% increase for every 1% decrease	18%
Maximum increase in concession period	20%
Increase in concession period (years)	4
Revised concession period	26
Scheduled end date	31-May-41
<b>New scheduled end date</b>	<b>29-Aug-45</b>

- Besides the extension mentioned in the agreement, Management represented that the concession period will be increased by further 105 days on account of covid-19. (included above)
- The Management has confirmed to us to consider revised concession period till 29 August 2045. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 29 August 2045.

## b. Traffic Volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

Source(s): Management information

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2030. For the forecast period post FY2030 (i) routine maintenance has been increased by 2% to 5% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue.

## h. Tax

- Management represented that IHMTL has 35AD benefit for income tax and the same has been considered while calculating forecast tax outflows along with any carried forward business loss and mat credit. The SPV will initially pay tax under MAT and gradually shift to the new regime of income tax once its MAT credit is exhausted.

## i. Capex

- Management has forecasted capex of INR 14 Cr in second half of FY2025.

# Discounted Cash Flows [1/3]

Discounted Cash Flow										
INR crores		FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue		152	319	354	391	429	475	517	570	624
EBITDA	[A]	152	220	254	295	419	459	432	481	555
EBITDA margin		100%	69%	72%	76%	98%	97%	83%	85%	89%
Depreciation		(27)	(56)	(58)	(64)	(70)	(77)	(84)	(92)	(101)
EBIT		125	164	196	232	349	382	348	389	454
EBIT margin		83%	51%	55%	59%	81%	80%	67%	68%	73%
Less: Tax on EBIT	[B]	(22)	(29)	(34)	(40)	(61)	(67)	(61)	(68)	(79)
Change in working capital	[C]	4	-	-	-	-	-	-	-	-
Less : Capex	[D]	(14)	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>120</b>	<b>191</b>	<b>220</b>	<b>255</b>	<b>358</b>	<b>392</b>	<b>371</b>	<b>413</b>	<b>476</b>
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>117</b>	<b>175</b>	<b>184</b>	<b>195</b>	<b>250</b>	<b>251</b>	<b>217</b>	<b>221</b>	<b>233</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/3]

Discounted Cash Flow										
INR crores	FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months
Revenue	681	745	807	875	948	1,025	1,117	1,198	1,302	1,407
EBITDA [A]	667	732	581	630	695	1,002	1,098	1,175	1,275	1,378
EBITDA margin	98%	98%	72%	72%	73%	98%	98%	98%	98%	98%
Depreciation	(110)	(120)	(130)	(141)	(153)	(165)	(180)	(193)	(210)	(227)
EBIT	557	612	450	489	542	837	918	982	1,066	1,152
EBIT margin	82%	82%	56%	56%	57%	82%	82%	82%	82%	82%
Less: Tax on EBIT [B]	(97)	(107)	(79)	(159)	(175)	(252)	(276)	(296)	(321)	(347)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>	<b>570</b>	<b>625</b>	<b>502</b>	<b>472</b>	<b>520</b>	<b>750</b>	<b>821</b>	<b>880</b>	<b>954</b>	<b>1,031</b>
Discounting period	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000
Discount factor [F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200
<b>Present value of cash flows [E*F]</b>	<b>255</b>	<b>256</b>	<b>188</b>	<b>161</b>	<b>163</b>	<b>214</b>	<b>215</b>	<b>210</b>	<b>209</b>	<b>206</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [3/3]

Discounted Cash Flow				
INR crores		FY2044 12 months	FY2045 12 months	FY2046 5.0 months
Revenue		1,529	1,650	739
EBITDA	[A]	1,497	1,616	731
EBITDA margin		98%	98%	99%
Depreciation		(246)	(266)	(119)
EBIT		1,251	1,350	612
EBIT margin		82%	82%	83%
Less: Tax on EBIT	[B]	(377)	(407)	(184)
Change in working capital	[C]	-	-	-
Less : Capex	[D]	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>1,121</b>	<b>1,209</b>	<b>547</b>
Discounting period		19.000	20.000	20.707
Discount factor	[F]	0.183	0.167	0.157
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>205</b>	<b>202</b>	<b>86</b>

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	4,412
Present value of release of working capital	(12)
<b>Enterprise Valuation</b>	<b>4,400</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent working capital of negative INR 80 Cr released at the end of the concession period.

**Basis the above and using a WACC of 9.35%, the Enterprise Value of IHMTL, as on 30 September 2024 is INR 4,400 crore.**

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis





# Palsit Dankuni Tollway Private Limited

# Overview



## Project details

PDTPL was engaged for six laning the existing four lane highway on DBFOT basis. The project stretch is 74.72 kms long involving the Palsit to Dankuni (up to NH-6 Connector) section from 588.87 kms to 652.7 kms (total design length - 63.83 kms) of NH-19 in West Bengal with 1 toll plaza.



## Concession period

PDTPL is required to construct; operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 17 years commencing from the appointed date. Probable shortening of concession period is estimated according to Article 29 of concession agreement for all cases which comes to about 0.5 years.



## Premium

PDTPL has to pay premium after the 1<sup>st</sup> anniversary of project completion date for every year of the remaining concession period, calculated on total realizable fee. For the 2nd year after project completion date premium shall equal to 10.8% of the total realizable fee during that year. For all subsequent years, the premium shall be determined on the total realizable fee by increasing the percentage of premium by an additional 1% as compared to the immediately preceding year.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project</b>	Dankuni to Palsit
<b>Concessionaire</b>	PDTPL
<b>State</b>	West Bengal
<b>Tollable length (kms)</b>	63.83
<b>No. of toll plazas</b>	1
<b>Concession agreement date</b>	14-Jun-21
<b>Appointed date</b>	1-Apr-22
<b>Completion certificate date</b>	Under construction
<b>Scheduled end date</b>	1-Apr-39
<b>New scheduled end date</b>	21-Sep-38

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust</b>	99.96%
<b>IRB Infrastructure Developers Ltd and its nominees</b>	0.04%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2.2 of the concession agreement between NHAI and PDTPL, “In the event actual average traffic shall have exceeded the target traffic by more than 5%, then for every 1% increase as compared to the target traffic, the remaining concession period shall, be reduced by 1% thereof; provided that such reduction in concession period shall not exceed 20% of the concession period.”
- Thus, the concession period is decreased as per the above clause as follows:

Particulars	Details
Excess traffic (pessimistic scenario)	9%
1% decrease for every 1% increase beyond 5%	4%
Maximum decrease in concession period	20%
Decrease in concession period (years)	0.5
Revised concession period	16.5
Scheduled end date	1-April-39
<b>New scheduled end date</b>	<b>21-Sep-38</b>

- The Management has confirmed to us to consider revised concession period till 21 September 2038. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 21 September 2038.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto.

- Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.
- Additional PDTPL has forecasted the toll rate to increase from 75% of the toll rates to 100% of the toll rates (close to 32% increase), once it receives its provisional completion certificate in FY2025.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2032. For the forecast period post FY2032 (i) routine maintenance has been increased by 5.1% to 5.3% till FY2035, thereafter reduced by 44% in FY2036 due to higher periodic maintenance and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue and capex being incurred in the forecast period.

## h. Tax

- Management represented that the SPV has adopted the new tax regime. Thus, tax outflows for the forecast have been calculated based on the new regime of income tax. Carried forward business loss and unabsorbed depreciation if any has been considered while calculating tax outflows.

## i. Capex

- Capex has been forecasted to be INR 249 Cr in the second half of FY2025 based on Management estimates. Management have provided statement of expenses/work in progress pertaining to capex as at 30 September 2024.

Source(s): Management information



# Discounted Cash Flows [1/2]

Discounted Cash Flow										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		119	279	289	318	347	379	411	445	480
EBITDA	[A]	97	234	242	268	262	286	318	383	414
EBITDA margin		82%	84%	84%	84%	76%	75%	77%	86%	86%
Depreciation		(40)	(85)	(94)	(105)	(116)	(128)	(140)	(154)	(168)
EBIT		57	149	148	163	147	158	178	230	247
EBIT margin		48%	53%	51%	51%	42%	42%	43%	52%	51%
Less: Tax on EBIT	[B]	-	(20)	(23)	(29)	(28)	(34)	(42)	(58)	(66)
Change in working capital	[C]	(85)	-	-	85	-	-	-	-	-
Less : Capex	[D]	(249)	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	(237)	214	219	324	235	252	276	325	348
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.977	0.911	0.830	0.756	0.689	0.628	0.572	0.521	0.475
Present value of cash flows	[E*F]	(232)	195	182	245	162	159	158	170	165

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/2]

Discounted Cash Flow							
INR crores		FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12.0 months	FY2038 12 months	FY2039 5.7 months
Revenue		520	564	605	650	696	358
EBITDA	[A]	449	488	480	525	568	278
EBITDA margin		86%	87%	79%	81%	82%	78%
Depreciation		(184)	(202)	(219)	(238)	(259)	(134)
EBIT		266	287	261	287	309	144
EBIT margin		51%	51%	43%	44%	44%	40%
Less: Tax on EBIT	[B]	(75)	(85)	(83)	(94)	(105)	(52)
Change in working capital	[C]	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>374</b>	<b>404</b>	<b>398</b>	<b>431</b>	<b>463</b>	<b>226</b>
Discounting period		9.000	10.000	11.000	12.000	13.000	13.738
Discount factor	[F]	0.433	0.394	0.359	0.327	0.298	0.278
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>162</b>	<b>159</b>	<b>143</b>	<b>141</b>	<b>138</b>	<b>63</b>

Valuation conclusion	
<b>INR Crore</b>	
Present value of cash flows	2,010
Present value of release of working capital	(7)
<b>Enterprise Valuation</b>	<b>2,003</b>
<b>WACC</b>	<b>9.75%</b>

Present value of release in working capital represent negative working capital of INR 26 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.75%, the Enterprise Value of PDTPL, as on 30 September 2024 is INR 2,003 crore.

*Please refer annexure 2c for WACC breakup.*

Source(s): Management information, KPMG analysis





# IRB Golconda Expressway Private Limited

# Overview



## Project details

IGEPL is engaged to carry out the operation and maintenance of Nehru Outer Ring Road project in accordance with the concession agreement on TOT basis. The project stretch is 158 kms, 8 lane ring road encircling Hyderabad. with 22 toll plazas.



## Concession period

IGEPL is required to operate and maintain and modify, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 30 years commencing from the appointed date. Article 24 of the concession agreement stipulates increase or decrease in the concession period on the basis of toll collection in April 2033 (Target point 1) and April 2043 (Target point2). As per the traffic report, no shortening or extension of concession period is estimated.



## Upfront Concession fee

As per the concession agreement, IGEPL has paid INR 7,380 crores as upfront concession fee to Hyderabad Metropolitan Development Authority.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project</b>	Nehru Outer Ring Road, Hyderabad
<b>Concessionaire</b>	IGEPL
<b>State</b>	Telangana
<b>Tollable length (kms)</b>	158
<b>No. of toll plazas</b>	22
<b>Concession agreement date</b>	26-Mar-23
<b>Appointed date</b>	12-Aug-23
<b>Completion certificate date</b>	NA
<b>Scheduled end date</b>	11-Aug-53
<b>New scheduled end date</b>	NA

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust</b>	99.99%
<b>IRB Infrastructure Developers Ltd and its nominees</b>	0.01%

# Key Assumptions

## a. Modification in concession period

- Article 24 of the concession agreement of IGEPL provides for modification of the concession period.
- As per Article 24.5.1, "In the event actual fee 1 shall have fallen short of or exceeded the target fee 1 by more than 20%, then for every 1% shortfall or increase as compared to the target fee 1, the concession period, subject to fulfillment of terms of this agreement, shall be increased by 1.5% or decreased by 0.75% thereof. In the event of a shortfall or increase by 30% in target fee 1, the concession period shall be increased by 15% or decreased by 7.5% thereof."
- As per Article 24.5.2, "In the event actual fee 2 shall have fallen short of or exceeded the target fee 2 by more than 30%, then for every 1% shortfall or increase as compared to the target fee 2, the concession period, subject to fulfillment of terms of this agreement, shall be increased by 1.5% or decreased by 0.75% thereof. In the event of a shortfall or increase by 40% in target fee 2, the concession period shall be increased by 15% or decreased by 7.5% thereof."
- As per the traffic report, revenue variance is estimated to be lower than the caps mentioned above. Thus, there shall be no modification to the concession period in line with the above articles of the concession agreement.
- The Management has confirmed to us to consider concession period to end on 11 August 2053. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 11 August 2053.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

## c. Toll rates

- The toll rates have been forecasted in accordance with the concession agreement with Hyderabad Metropolitan Development Authority and Hyderabad Growth Corridor Ltd and in accordance to Telangana Infrastructure Development Enabling Act, 2001 (Act No. 36 of 2001), Nehru Outer Ring Road, Hyderabad (Toll) Rules, 2012 issued vide G.O.Ms. No. 365 dated September 22, 2012 [published by Municipal Administration & Urban Development

- (12) Department], the Andhra Pradesh Reorganisation Act, 2014, Amendment to Nehru Outer Ring Road, Hyderabad (Toll) Rules 2012 issued vide GOMs. No 5 dated 12 January 2023 [published by Municipal Administration & urban Development (Plg.II) Department] and any further amendments issued till bid due date (the "Fee Rules"). The toll rates shall be revised annually on April 01, subject to and in accordance with provisions of the Fee rules.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2033. For the forecast period post FY2033 (i) routine maintenance has been increased by 2% to 3% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Fast tag charges

- Fast tag charges have been considered at 1.7 per cent (including GST) of toll revenue in the forecast period as compared to 2 per cent (including GST) considered previously. We understand from the Management that the fast tag charges have been renegotiated with the vendor.

## g. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue in the forecast period.

## h. Tax

- Management represented that the SPV has adopted the new tax regime. Thus, tax outflows for the forecast have been calculated based on the new regime of income tax. Carried forward business loss and unabsorbed depreciation if any has been considered while calculating tax outflows.

Source(s): Management information



# Discounted Cash Flows [1/3]

Discounted Cash Flow										
INR crores		FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue		421	898	1,000	1,114	1,220	1,338	1,479	1,641	1,802
EBITDA	[A]	386	715	759	862	796	904	1,034	1,183	1,494
EBITDA margin		92%	80%	76%	77%	65%	68%	70%	72%	83%
Depreciation		(29)	(61)	(68)	(76)	(84)	(92)	(102)	(113)	(124)
EBIT		358	654	691	786	712	812	932	1,070	1,370
EBIT margin		85%	73%	69%	71%	58%	61%	63%	65%	76%
Less: Tax on EBIT	[B]	(26)	(113)	(124)	(150)	(133)	(160)	(193)	(230)	(309)
Change in working capital	[C]	-	-	126	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>360</b>	<b>602</b>	<b>762</b>	<b>712</b>	<b>663</b>	<b>744</b>	<b>841</b>	<b>952</b>	<b>1,185</b>
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>352</b>	<b>551</b>	<b>637</b>	<b>545</b>	<b>464</b>	<b>476</b>	<b>492</b>	<b>509</b>	<b>579</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/3]

Discounted Cash Flow											
INR crores		FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months
Revenue		1,976	2,157	2,369	2,598	2,825	3,082	3,366	3,665	3,991	4,361
EBITDA	[A]	1,656	1,439	1,637	1,856	2,070	2,699	2,969	3,019	3,331	3,686
EBITDA margin		84%	67%	69%	71%	73%	88%	88%	82%	83%	85%
Depreciation		(136)	(148)	(163)	(179)	(195)	(212)	(232)	(252)	(275)	(300)
EBIT		1,520	1,291	1,474	1,677	1,875	2,487	2,737	2,767	3,056	3,386
EBIT margin		77%	60%	62%	65%	66%	81%	81%	75%	77%	78%
Less: Tax on EBIT	[B]	(350)	(295)	(345)	(400)	(454)	(612)	(680)	(693)	(771)	(861)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	1,307	1,144	1,292	1,456	1,616	2,087	2,289	2,326	2,560	2,825
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200
Present value of cash flows	[E*F]	584	468	483	498	505	597	598	556	560	565

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [3/3]

Discounted Cash Flow												
INR crores	FY2044 12 months	FY2045 12 months	FY2046 12 months	FY2047 12 months	FY2048 12 months	FY2049 12.0 months	FY2050 12.0 months	FY2051 12.0 months	FY2052 12.0 months	FY2053 12.0 months	FY2054 4.4 months	
Revenue	4,740	5,125	5,573	6,048	6,606	7,109	7,706	8,341	9,068	9,788	3,861	
EBITDA [A]	4,047	4,654	5,085	5,013	5,550	6,038	6,616	7,762	8,466	8,762	3,465	
EBITDA margin	85%	91%	91%	83%	84%	85%	86%	93%	93%	90%	90%	
Depreciation	(326)	(353)	(384)	(416)	(455)	(489)	(531)	(574)	(624)	(674)	(266)	
EBIT	3,721	4,301	4,702	4,597	5,095	5,549	6,086	7,187	7,841	8,088	3,199	
EBIT margin	79%	84%	84%	76%	77%	78%	79%	86%	86%	83%	83%	
Less: Tax on EBIT [B]	(951)	(1,104)	(1,213)	(1,195)	(1,329)	(1,453)	(1,598)	(1,886)	(2,063)	(2,138)	(848)	
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-	-	
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-	-	
Free cash flows to the firm E = [A+B+C+D]	3,096	3,550	3,873	3,819	4,220	4,586	5,018	5,875	6,402	6,624	2,617	
Discounting period	19.000	20.000	21.000	22.000	23.000	24.000	25.000	26.000	27.000	28.000	28.682	
Discount factor [F]	0.183	0.167	0.153	0.140	0.128	0.117	0.107	0.098	0.089	0.082	0.077	
Present value of cash flows [E*F]	566	593	592	534	540	536	537	574	572	542	201	

Valuation conclusion	
INR Crores	
Present value of cash flows	15,805
Present value of release of working capital	(2)
Enterprise Valuation	15,803
WACC	9.35%

Present value of release in working capital represents negative working capital of INR 25 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of IGEPL, as on 30 September 2024 is INR 15,803 crore.

Please refer annexure 2a for WACC breakup.

Source(s): Management information, KPMG analysis



# Samakhiyali Tollway Private Limited

# Overview



## Project details

STPL is engaged in six laning the existing four lane highway on DBFOT basis. The project stretch is 90.90 kms long involving the Samakhiyali to Santalpur section of NH-27 in Gujarat.



## Concession period

STPL is required to construct, obtain and maintain the project highway in accordance with the concession agreement for a period of 20 years commencing from the appointed date. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 1.7 years.



## Premium

STPL has agreed to pay to NHAI immediately after the 1<sup>st</sup> anniversary of project completion date, a premium in the form of additional concession fee for every year of the remaining concession period, to be calculated on total realizable fee. The premium to be paid for the 2<sup>nd</sup> year after project completion date shall equal to 42.84% of the total realizable fee. For all subsequent years, premium shall be determined by increasing percentage of premium by additional 1% as compared to immediately preceding year.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Samakhiyali to Santalpur
<b>Concessionaire</b>	STPL
<b>State</b>	Gujarat
<b>Tollable length (kms)</b>	90.90
<b>No. of toll plazas</b>	1
<b>Concession agreement date</b>	12-May-23
<b>Appointed date</b>	28-Dec-23
<b>Six laning completion certificate date</b>	Under construction
<b>Scheduled end date</b>	27-Dec-43
<b>New scheduled end date</b>	13-Sep-45

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust</b>	99.96%
<b>IRB Infrastructure Developers Ltd and its nominees</b>	0.04%

# Key Assumptions

## a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI and STPL, *“In the event actual average traffic shall have fallen short of the target traffic by more than 5%, then for every 1% shortfall as compared to the target traffic, the remaining concession period shall, subject to payment of concession and additional concession fee in accordance with this agreement, be increased by 1% thereof; provided such increase in concession period shall not in any case exceed 20% of the concession period”.*
- Thus, the concession period is increased as per the above clause as follows:

Particulars	Details
Shortfall in traffic (pessimistic scenario)	16%
1% increase for every 1% decrease beyond 5%	11%
Maximum increase in concession period	20%
Increase in concession period (years)	1.7
Revised concession period	21.7
Scheduled end date	27-Dec-43
<b>New scheduled end date</b>	<b>13-Sep-45</b>

- The Management has confirmed to us to consider revised concession period till 13th September 2045. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 13 September 2045.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

## c. Toll rates

Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto.

Source(s): Management information

- Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Premium payable

- The premium payable to NHAI is considered and corroborated from the concession agreement as given by the Management.

## f. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2033. For the forecast period post FY2033 (i) routine maintenance has been increased by 2% to 3% and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## g. Depreciation & Amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue and capex being incurred in the forecast period.

## h. Tax

- Management represented that the SPV has adopted the new tax regime. Thus, tax outflows for the forecast have been calculated based on the new regime of income tax. Carried forward business loss and unabsorbed depreciation if any has been considered while calculating tax outflows.

## i. Capex

- Capex has been forecasted to be INR 1,362 Cr between second half of FY2025 (INR 681 Cr) and FY2026 (INR 681 Cr) based on Management estimates. Management have provided statement of expenses/work in progress pertaining to capex as at 30 September 2024.

# Discounted Cash Flows [1/3]

Discounted Cash Flow										
INR crores		FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue		87	187	239	173	190	208	229	252	275
EBITDA	[A]	85	175	215	148	165	182	203	188	210
EBITDA margin		98%	94%	90%	86%	87%	88%	88%	75%	76%
Depreciation		(14)	(27)	(39)	(44)	(49)	(55)	(61)	(69)	(77)
EBIT		71	149	176	104	115	128	141	120	134
EBIT margin		82%	80%	74%	60%	61%	61%	62%	47%	49%
Less: Tax on EBIT	[B]	(15)	(24)	(29)	(13)	(17)	(21)	(26)	(23)	(28)
Change in working capital	[C]	-	(100)	-	100	-	-	-	-	-
Less : Capex	[D]	(681)	(681)	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>(611)</b>	<b>(630)</b>	<b>186</b>	<b>236</b>	<b>148</b>	<b>161</b>	<b>176</b>	<b>166</b>	<b>182</b>
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.977	0.911	0.830	0.756	0.689	0.628	0.572	0.521	0.475
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>(597)</b>	<b>(574)</b>	<b>154</b>	<b>178</b>	<b>102</b>	<b>101</b>	<b>101</b>	<b>86</b>	<b>86</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [2/3]

Discounted Cash Flow										
INR crores	FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months
Revenue	299	324	351	379	409	443	479	516	558	602
<b>EBITDA</b> [A]	233	294	321	348	378	411	403	439	480	568
EBITDA margin	78%	91%	91%	92%	92%	93%	84%	85%	86%	94%
Depreciation	(85)	(94)	(105)	(116)	(129)	(142)	(157)	(174)	(192)	(212)
<b>EBIT</b>	148	200	216	232	249	268	245	266	288	355
EBIT margin	49%	62%	62%	61%	61%	61%	51%	51%	51%	59%
Less: Tax on EBIT [B]	(34)	(49)	(56)	(63)	(70)	(79)	(77)	(86)	(96)	(118)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b> E = [A+B+C+D]	<b>199</b>	<b>245</b>	<b>265</b>	<b>285</b>	<b>308</b>	<b>332</b>	<b>326</b>	<b>353</b>	<b>384</b>	<b>449</b>
Discounting period	9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000
Discount factor [F]	0.433	0.394	0.359	0.327	0.298	0.272	0.248	0.226	0.205	0.187
<b>Present value of cash flows</b> [E*F]	<b>86</b>	<b>97</b>	<b>95</b>	<b>93</b>	<b>92</b>	<b>90</b>	<b>81</b>	<b>80</b>	<b>79</b>	<b>84</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows [3/3]

Discounted Cash Flow				
INR crores		FY2044 12 months	FY2045 12 months	FY2046 5 months
Revenue		652	692	346
<b>EBITDA</b>	<b>[A]</b>	617	656	329
EBITDA margin		95%	95%	95%
Depreciation		(235)	(13)	-
<b>EBIT</b>		382	643	329
EBIT margin		59%	93%	95%
Less: Tax on EBIT	<b>[B]</b>	(130)	(140)	(72)
Change in working capital	<b>[C]</b>	-	-	-
Less : Capex	<b>[D]</b>	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>486</b>	<b>516</b>	<b>258</b>
Discounting period		19.000	20.000	20.726
Discount factor	<b>[F]</b>	0.171	0.155	0.145
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>83</b>	<b>80</b>	<b>37</b>

Valuation conclusion	
<b>INR Crores</b>	
Present value of cash flows	715
Present value of release of working capital	0.07
<b>Enterprise Valuation</b>	<b>715</b>
<b>WACC</b>	<b>9.75%</b>

Present value of release in working capital represents positive working capital of INR 0.48 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.75%, the Enterprise Value of STPL, as on 30 September 2024 is INR 715 crore.

*Please refer annexure 2c for WACC breakup.*

Source(s): Management information, KPMG analysis



# IRB Gwalior Tollway Private Limited

# Overview



## Project details

IGTPL is engaged to carry out the operation and maintenance of the Gwalior – Jhansi section on the NH75 in accordance with the concession agreement on a TOT basis. The project stretch is 82.5 kms, 4 lane road stretching between Gwalior and Jhansi.



## Concession period

IGTPL is required to operate, manage and maintain, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 20 years commencing from the appointed date. The concession agreement also stipulates that the concession period shall not be reduced by more than 5 years or increased by more than 10 years whatsoever. As per the traffic report, no shortening or extension of concession period is estimated.



## Upfront Concession Fee

As per the concession agreement, IGTPPL is required to pay INR 1,161 crores as upfront concession fee to NHAI which has been paid in March 2024.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Gwalior-Jhansi stretch on NH75
<b>Concessionaire</b>	IGTPL
<b>State</b>	Madhya Pradesh and Uttar Pradesh
<b>Tollable length (kms)</b>	82.5
<b>Concession agreement date</b>	12-Jan-24
<b>Appointed date</b>	1-Apr-24
<b>Completion certificate date</b>	NA
<b>Scheduled end date</b>	31-Mar-44

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- Article 24 of the concession agreement of IGTPPL provides for modification of the concession period.
- As per Article 24.5.1, “in the event Actual Fee 1 shall have fallen short of or exceeded the Target Fee 1 by more than 20% (twenty percent), then for every 1% (one percent) shortfall or increase as compared to the Target Fee 1, the Concession Period, subject to fulfilment of terms of this Agreement, shall be increased by 1.5% (one and a half percent) or decreased by 0.75% (point seven five percent) thereof; provided that such increase or decrease in concession period shall not in any case exceed not more than limits specified in Clause 3.1.”
- As per Article 24.5.2, “in the event Actual Fee 2 shall have fallen short of or exceeded the Target Fee 2 by more than 30% (thirty percent), then for every 1% (one percent) shortfall or increase as compared to the Target Fee 2, the concession period, subject to fulfilment of terms of this Agreement, shall be increased by 1.5% (one and a half percent) or decreased by 0.75% (point seven five percent) thereof; provided that such increase or decrease in Concession Period shall not in any case exceed not more than limits specified in Clause 3.1.”
- As per the traffic report, revenue variance is estimated to be lower than the caps mentioned above. Thus, there shall be no modification to the concession period in line with the above articles of the concession agreement.
- The Management have paid the upfront fee and confirmed to us to consider concession appointment date as 01 April 2024. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 31 March 2044.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by independent consultant in October 2024.

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the

increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2034. For the forecast period post FY2034 (i) routine maintenance has been increased by an average of 3.6 per cent each year (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue and capex being incurred in the forecast period.

## g. Tax

- Management represented that the SPV has adopted the new tax regime. Thus, tax outflows for the forecast have been calculated based on the new regime of income tax.

## h. Capex

- Capex is forecasted to be INR 27 Cr in the second half of FY2025. Management represented that the capex pertains to EPC cost and preliminary and pre-operative cost. Management has provided project cost and completion certificate as at 30 September 2024.

Source(s): Management information



# Discounted Cash Flows (1/2)

Discounted Cash Flow									
INR crores	FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue	63	135	149	165	179	195	213	234	254
<b>EBITDA</b> [A]	55	119	120	113	121	123	124	195	214
EBITDA margin	88%	88%	81%	68%	68%	63%	58%	83%	84%
Depreciation	(13)	(26)	(29)	(32)	(36)	(39)	(42)	(47)	(51)
<b>EBIT</b>	42	93	91	80	86	85	82	149	164
EBIT margin	68%	69%	61%	49%	48%	43%	38%	64%	64%
Less: Tax on EBIT [B]	(6)	(14)	(14)	(13)	(15)	(15)	(16)	(33)	(38)
Change in working capital [C]	5	-	-	41	-	-	-	-	-
Less : Capex [D]	(27)	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm E = [A+B+C+D]</b>	<b>27</b>	<b>105</b>	<b>106</b>	<b>141</b>	<b>107</b>	<b>108</b>	<b>109</b>	<b>162</b>	<b>176</b>
Discounting period	0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor [F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows [E*F]</b>	<b>27</b>	<b>96</b>	<b>88</b>	<b>108</b>	<b>74</b>	<b>69</b>	<b>64</b>	<b>86</b>	<b>86</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows (2/2)

Discounted Cash Flow												
INR crores		FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months	FY2044 12 months
Revenue		277	299	325	350	379	410	442	477	513	555	599
EBITDA	[A]	227	238	261	270	282	361	393	403	426	456	483
EBITDA margin		82%	80%	80%	77%	74%	88%	89%	84%	83%	82%	81%
Depreciation		(55)	(60)	(65)	(70)	(75)	(82)	(88)	(95)	(103)	(111)	(120)
EBIT		172	179	196	200	206	280	304	307	323	345	363
EBIT margin		62%	60%	60%	57%	54%	68%	69%	64%	63%	62%	61%
Less: Tax on EBIT	[B]	(41)	(44)	(50)	(52)	(55)	(75)	(83)	(86)	(91)	(99)	(106)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>186</b>	<b>194</b>	<b>211</b>	<b>218</b>	<b>226</b>	<b>286</b>	<b>310</b>	<b>317</b>	<b>334</b>	<b>357</b>	<b>377</b>
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200	0.183
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>83</b>	<b>79</b>	<b>79</b>	<b>74</b>	<b>71</b>	<b>82</b>	<b>81</b>	<b>76</b>	<b>73</b>	<b>71</b>	<b>69</b>

Valuation conclusion	
INR Crores	
Present value of cash flows	1,537
Present value of release of working capital	(0)
<b>Enterprise Valuation</b>	<b>1,537</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent negative working capital of INR 0.10 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of IGTPPL on 30 September 2024 is **INR 1,537 crore.**

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



# IRB Lalitpur Tollway Private Limited

# Overview



## Project details

ILTPL is engaged to carry out the operation and maintenance of the Lalitpur – Sagar – Lakhnadon stretch on NH26 in accordance with the concession agreement on a TOT basis. The project stretch is 316 kms, 4 lane road stretching through Uttar Pradesh and Madhya Pradesh.



## Concession period

ILTPL is required to operate, manage and maintain, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 20 years commencing from the appointed date. The concession agreement also stipulates that the concession period shall not be reduced by more than 5 years or increased by more than 10 years whatsoever. As per the traffic report, no shortening or extension of concession period is estimated.



## Upfront Concession Fee

As per the concession agreement, ILTPL is required to pay INR 4,428 crores as upfront concession fee to NHAI which the Management has paid in March 2024.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Lalitpur-Sagar-Lakhnadon stretch on NH26
<b>Concessionaire</b>	ILTPL
<b>State</b>	Uttar Pradesh and Madhya Pradesh
<b>Tollable length (kms)</b>	316.1
<b>Concession agreement date</b>	24-Nov-23
<b>Appointed date</b>	1-Apr-24
<b>Completion certificate date</b>	NA
<b>Scheduled end date</b>	31-Mar-44

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- Article 24 of the concession agreement of ILTPL provides for modification of the concession period.
- As per Article 24.5.1, “in the event Actual Fee 1 shall have fallen short of or exceeded the Target Fee 1 by more than 20% (twenty percent), then for every 1% (one percent) shortfall or increase as compared to the Target Fee 1, the concession period, subject to fulfilment of terms of this agreement, shall be increased by 1.5% (one and a half percent) or decreased by 0.75% (point seven five percent) thereof; provided that such increase or decrease in concession period shall not in any case exceed not more than limits specified in Clause 3.1.”
- As per Article 24.5.2, “in the event Actual Fee 2 shall have fallen short of or exceeded the Target Fee 2 by more than 30% (thirty percent), then for every 1% (one percent) shortfall or increase as compared to the Target Fee 2, the concession period, subject to fulfilment of terms of this Agreement, shall be increased by 1.5% (one and a half percent) or decreased by 0.75% (point seven five percent) thereof; provided that such increase or decrease in Concession Period shall not in any case exceed not more than limits specified in Clause 3.1.”
- As per the traffic report, revenue variance is estimated to be lower than the caps mentioned above. Thus, there shall be no modification to the concession period in line with the above articles of the concession agreement.
- The Management have paid the upfront fee and confirmed to us to consider concession appointment date as 01 April 2024. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 31 March 2044.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by independent consultant in October 2024.

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the

increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2034. For the forecast period post FY2034 (i) routine maintenance has been increased by 2.4 per cent to 3.4 per cent and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue and capex being incurred in the forecast period.

## g. Tax

- Management represented that the SPV has adopted the new tax regime. Thus, tax outflows for the forecast have been calculated based on the new regime of income tax.

## h. Capex

- Capex is forecasted to be INR 258 Cr in the second of FY2025. Management represented that the capex pertains to EPC cost and preliminary and pre-operative cost. Management has provided project cost and completion certificate as at 30 September 2024.

Source(s): Management information



# Discounted Cash Flows (1/2)

Discounted Cash Flow										
INR crores		FY2025 6 months	FY2026 12 months	FY2027 12 months	FY2028 12 months	FY2029 12 months	FY2030 12 months	FY2031 12 months	FY2032 12 months	FY2033 12 months
Revenue		233	491	537	591	637	696	762	835	912
EBITDA	[A]	201	424	468	518	495	549	608	676	747
EBITDA margin		86%	86%	87%	88%	78%	79%	80%	81%	82%
Depreciation		(55)	(107)	(117)	(129)	(141)	(154)	(168)	(185)	(202)
EBIT		146	318	351	389	354	395	440	491	546
EBIT margin		63%	65%	65%	66%	56%	57%	58%	59%	60%
Less: Tax on EBIT	[B]	(18)	(43)	(54)	(67)	(61)	(75)	(90)	(107)	(125)
Change in working capital	[C]	37	-	-	156	-	-	-	-	-
Less : Capex	[D]	(258)	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>(38)</b>	<b>381</b>	<b>413</b>	<b>608</b>	<b>434</b>	<b>474</b>	<b>519</b>	<b>569</b>	<b>623</b>
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>(37)</b>	<b>348</b>	<b>346</b>	<b>465</b>	<b>303</b>	<b>303</b>	<b>303</b>	<b>304</b>	<b>304</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows (2/2)

Discounted Cash Flow												
INR crores		FY2034 12 months	FY2035 12 months	FY2036 12 months	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months	FY2044 12 months
Revenue		998	1,080	1,171	1,264	1,369	1,481	1,602	1,722	1,858	2,003	2,169
EBITDA	[A]	908	987	958	1,044	1,143	1,249	1,362	1,611	1,745	1,703	1,864
EBITDA margin		91%	91%	82%	83%	83%	84%	85%	94%	94%	85%	86%
Depreciation		(221)	(239)	(259)	(279)	(303)	(327)	(354)	(381)	(411)	(443)	(479)
EBIT		687	748	699	765	840	921	1,007	1,231	1,334	1,260	1,385
EBIT margin		69%	69%	60%	61%	61%	62%	63%	71%	72%	63%	64%
Less: Tax on EBIT	[B]	(165)	(185)	(178)	(199)	(224)	(251)	(279)	(342)	(376)	(365)	(406)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>743</b>	<b>802</b>	<b>780</b>	<b>845</b>	<b>919</b>	<b>998</b>	<b>1,082</b>	<b>1,269</b>	<b>1,369</b>	<b>1,337</b>	<b>1,458</b>
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200	0.183
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>332</b>	<b>328</b>	<b>292</b>	<b>289</b>	<b>287</b>	<b>285</b>	<b>283</b>	<b>303</b>	<b>299</b>	<b>267</b>	<b>267</b>

Valuation conclusion	
<b>INR Crores</b>	
Present value of cash flows	5,874
Present value of release of working capital	(0)
<b>Enterprise Valuation</b>	<b>5,874</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent negative working capital of INR 0.08 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of ILTPL on 30 September 2024 is **INR 5,874 crore.**

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis





# IRB Kota Tollway Private Limited

# Overview



## Project details

IKTPL is engaged to carry out the operation and maintenance of the Kota bypass and cable stay bridge on NH76 in accordance with the concession agreement on a TOT basis. The project stretch is 27.8 kms, 4 lane road near Kota, Rajasthan.



## Concession period

IKTPL is required to operate, manage and maintain, repair or otherwise make improvements to the project highway in accordance with the concession agreement for a period of 20 years commencing from the appointed date. The concession agreement also stipulates that the concession period shall not be reduced by more than 5 years or increased by more than 10 years whatsoever. As per the traffic report, no shortening or extension of concession period is estimated.



## Upfront Concession Fee

As per the concession agreement, IKTPL is required to pay INR 522 crores as upfront concession fee to NHAI which the Management has paid in March 2024.

Source(s): Management information

## Highlights

Particulars	Details
<b>Project location</b>	Kota Bypass and Cable Stay Bridge
<b>Concessionaire</b>	IKTPL
<b>State</b>	Rajasthan
<b>Tollable length (kms)</b>	27.8
<b>Concession agreement date</b>	12-Jan-24
<b>Appointed date</b>	1-Apr-24
<b>Completion certificate date</b>	NA
<b>Scheduled end date</b>	31-Mar-44

## Shareholding as at 30 September 2024

Particulars	Stake %
<b>IRB Infrastructure Trust and its nominees</b>	100%

# Key Assumptions

## a. Modification in concession period

- Article 24 of the concession agreement of IKTPL provides for modification of the concession period.
- As per Article 24.5.1, “in the event Actual Fee 1 shall have fallen short of or exceeded the Target Fee 1 by more than 20% (twenty percent), then for every 1% (one percent) shortfall or increase as compared to the Target Fee 1, the Concession Period, subject to fulfilment of terms of this Agreement, shall be increased by 1.5% (one and a half percent) or decreased by 0.75% (point seven five percent) thereof; provided that such increase or decrease in concession period shall not in any case exceed not more than limits specified in Clause 3.1.”
- As per Article 24.5.2, “in the event Actual Fee 2 shall have fallen short of or exceeded the Target Fee 2 by more than 30% (thirty percent), then for every 1% (one percent) shortfall or increase as compared to the Target Fee 2, the concession period, subject to fulfilment of terms of this Agreement, shall be increased by 1.5% (one and a half percent) or decreased by 0.75% (point seven five percent) thereof; provided that such increase or decrease in Concession Period shall not in any case exceed not more than limits specified in Clause 3.1.”
- As per the traffic report, revenue variance is estimated to be lower than the caps mentioned above. Thus, there shall be no modification to the concession period in line with the above articles of the concession agreement.
- The Management have paid the upfront fee and confirmed to us to consider concession appointment date as 01 April 2024. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 October 2024 to 31 March 2044.

## b. Traffic volume

- Traffic volume for the forecast period has been considered based on the traffic report prepared by an independent consultant in October 2024.

## c. Toll rates

- Annual revision of toll rate for the forecast period shall be in accordance with National Highway Fee (Determination of Rates and Collection) Rules, 2008 and amendment thereto. Additionally, the applicable base rate shall be revised annually on April 1 to reflect the increase in wholesale price index (“WPI”) but such revision shall be restricted to 40% of the

increase in WPI on overall basis during the concession period. As given in the traffic report, WPI has been projected to grow by 5% initially and stepped down for the future years.

## d. Revenue

- Toll revenue has been considered basis the pessimistic scenario from the traffic report prepared by an independent consultant.

## e. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY2034. For the forecast period post FY2034 (i) routine maintenance has been increased by 2.5 per cent to 3.5 per cent and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management.

## f. Depreciation & amortization

- Forecasted depreciation on assets has been provided by the Management. Management has forecasted depreciation to increase in line with the increase in revenue and capex being incurred in the forecast period.

## g. Tax

- Management represented that the SPV has adopted the new tax regime. Thus, tax outflows for the forecast have been calculated based on the new regime of income tax.

## h. Capex

- Capex is forecasted to be INR 24 Cr in the second half of FY2025. Management represented that the capex pertains to EPC cost and preliminary and pre-operative cost. Management has provided project cost and completion certificate as at 30 September 2024.

Source(s): Management information

# Discounted Cash Flows (1/2)

Discounted Cash Flow										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		37	82	91	100	109	119	130	142	155
EBITDA	[A]	26	62	69	77	77	86	104	116	128
EBITDA margin		71%	75%	76%	77%	71%	73%	80%	81%	82%
Depreciation		(6)	(12)	(13)	(15)	(16)	(18)	(20)	(21)	(23)
EBIT		20	50	55	63	61	68	85	94	104
EBIT margin		55%	60%	61%	63%	56%	58%	65%	66%	67%
Less: Tax on EBIT	[B]	(3)	(8)	(10)	(12)	(12)	(14)	(19)	(22)	(25)
Change in working capital	[C]	5	-	-	22	-	-	-	-	-
Less : Capex	[D]	(24)	-	-	-	-	-	-	-	-
<b>Free cash flows to the firm</b>	<b>E = [A+B+C+D]</b>	<b>4</b>	<b>54</b>	<b>59</b>	<b>88</b>	<b>65</b>	<b>72</b>	<b>85</b>	<b>94</b>	<b>103</b>
Discounting period		0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000
Discount factor	[F]	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489
<b>Present value of cash flows</b>	<b>[E*F]</b>	<b>4</b>	<b>49</b>	<b>49</b>	<b>67</b>	<b>46</b>	<b>46</b>	<b>50</b>	<b>50</b>	<b>50</b>

Source(s): Management information, KPMG analysis



# Discounted Cash Flows (2/2)

Discounted Cash Flow												
		FY2034	FY2035	FY2036	FY2037	FY2038	FY2039	FY2040	FY2041	FY2042	FY2043	FY2044
INR crores		12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		169	183	198	214	232	251	271	293	316	341	370
EBITDA	[A]	122	135	168	183	200	206	226	258	280	305	309
EBITDA margin		72%	74%	85%	85%	86%	82%	83%	88%	89%	89%	84%
Depreciation		(25)	(27)	(30)	(32)	(35)	(38)	(41)	(44)	(48)	(51)	(56)
EBIT		96	107	138	150	165	168	185	214	233	253	253
EBIT margin		57%	59%	70%	70%	71%	67%	68%	73%	74%	74%	68%
Less: Tax on EBIT	[B]	(23)	(26)	(35)	(39)	(43)	(44)	(49)	(57)	(63)	(69)	(70)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	98	108	133	144	157	162	176	200	217	235	238
Discounting period		9.000	10.000	11.000	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000
Discount factor	[F]	0.447	0.409	0.374	0.342	0.313	0.286	0.261	0.239	0.219	0.200	0.183
Present value of cash flows	[E*F]	44	44	50	49	49	46	46	48	47	47	44

Valuation conclusion	
<b>INR Crores</b>	
Present value of cash flows	926
Present value of release of working capital	(0)
<b>Enterprise Valuation</b>	<b>926</b>
<b>WACC</b>	<b>9.35%</b>

Present value of release in working capital represent negative working capital of INR 0.01 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.35%, the Enterprise Value of IKTPL on 30 September 2024 is **INR 926 crore.**

*Please refer annexure 2a for WACC breakup.*

Source(s): Management information, KPMG analysis



**6.**

# **Valuation Conclusion**

# Valuation Conclusion (1/2)

## Valuation Conclusion (INR Crs)

Valuation Conclusion 30 September 2024	INR Crore
IRB Golconda Expressway Private Limited	15,803
IRB Westcoast Tollway Limited	3,255
Solapur Yedeshi Tollway Limited	2,884
Yedeshi Aurangabad Tollway Limited	5,289
Kaithal Tollway Limited	2,354
AE Tollway Limited	3,441
Udaipur Tollway Limited	2,650
CG Tollway Limited	2,750
Kishangarh Gulabpura Tollway Limited	1,623
IRB Hapur Moradabad Tollway Limited	4,400
Palsit Dankuni Tollway Private Limited	2,003
Samakhiyali Tollway Private Limited	715
Lalitpur Tollway Private Limited	5,874
IRB Kota Tollway Private Limited	926
IRB Gwalior Tollway Private Limited	1,537
<b>Enterprise Value of the SPVs</b>	<b>55,505</b>
Cash and cash Equivalents	54
Surplus	241
Debt	(22,360)
PV of standalone expenses pertaining to IRBI Trust	(235)
Capital Creditors	(384)
<b>Equity Value of IRBI Trust</b>	<b>32,822</b>

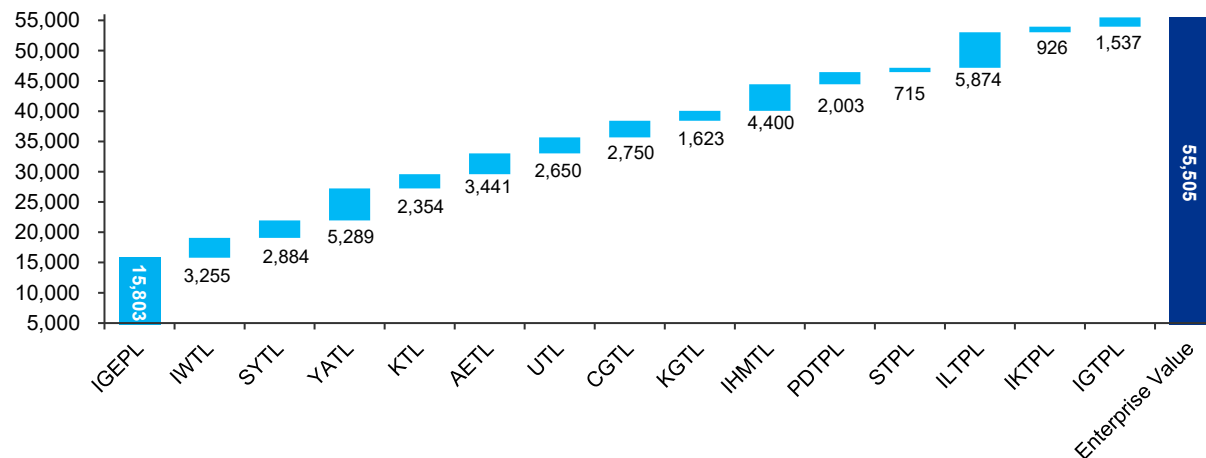
### NAV at fair value per unit as on 30 September 2024

Equity Value of IRBI Trust (INR Cr)	32,822
Units outstanding (No.)	1,113,693,265
<b>NAV at fair value per unit (INR)</b>	<b>294.72</b>

Source(s): Management information, KPMG analysis

## Enterprise Value of SPVs

INR Crore



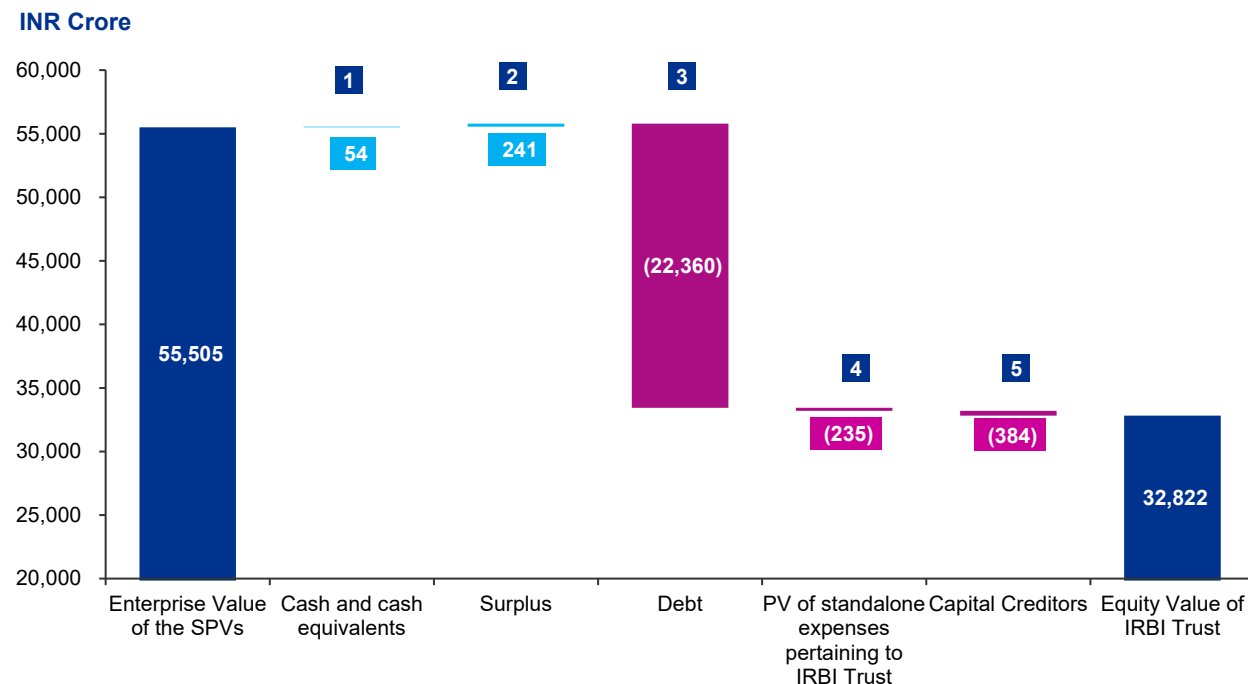
**The Enterprise Value of the SPVs is INR 55,505 crores and the 100% Equity Value of IRBI Trust is INR 32,822 crores as on 30 September 2024.**

**The NAV at fair value per unit of IRBI Trust as on 30 September 2024 is INR 294.72 per unit.**

Note: SPVs are individually referred as "Target", "Business", "Company", "SPV" or the "Asset" Collectively referred as SPVs or Assets

# Valuation Conclusion (2/2)

## Calculation of Equity Value of IRBI Trust from Enterprise Value of the SPVs



**The Enterprise Value of the SPVs is INR 55,505 crores and the 100% Equity Value of the IRBI Trust is INR 32,822 crores as on 30 September 2024.**

**The NAV at fair value per unit of IRBI Trust as on 30 September 2024 is INR 294.72 per unit.**

Source(s): Management information, KPMG analysis

- 1 Cash and cash equivalents comprise cash in hand and balance with banks as at 30 September 2024.
- 2 Surplus assets primarily comprise investment in mutual funds of INR 213 Cr and advance tax net of provisions of INR 19 Cr as at 30 September 2024.
- 3 Debt primarily represents loan from banks and financial institutions of INR 19,847 Cr and non-convertible debentures of INR 2,800 Cr as at 30 September 2024. The debt has been reduced by INR 288 Cr, which represents the present value of the release of DSRA, cash reserves and cash margin of INR 319 Cr as at 30 September 2024, maintained by the Management in the standalone books of the Trust. The release schedule of the DSRA, cash reserves and cash margin along with applicable interest earned on the balance has been provided by the Management.
- 4 Present value of standalone expenses of the IRBI Trust represent the present value of the investment manager fee in the books of the IRBI Trust. The expenses have been forecasted to increase by 10% each year till 11 August 2053 (FY2054).
- 5 Capital creditors of INR 384 Cr have been considered debt like in nature and adjusted from the Enterprise Value to arrive at the Equity Value of IRBI Trust. Management represented that they do not consider these liabilities as part of the working capital and thus they have not been considered as part of the forecast working capital.

**7.**

# **Annexures**

# Annexure 1: Sources of Information (1/2)

This Report is prepared based on the below sources of information as provided to us by the Management:

The following information provided to KPMG by Management was used in preparation of the Valuation Report:

- Audited financial statements for FY2020, FY2021, FY2022 and FY2023 of all the SPVs except IGEPL, STPL, ILTPL, IGTPPL and IKTPPL.
- Audited financial statements for all SPVs FY2024 except ILTPL, IGTPPL and IKTPPL.
- Consolidated audited financial statements for FY2020, FY2021, FY2022, FY2023 and FY2024 of IRBI Trust.
- Provisional financial statements for 30 September 2024 for all the SPVs and IRBI Trust (standalone and consolidated).
- Financial projections of SPV's from 1 October 2024 till the end of the concession period of the respective SPV's
- Other data for all the SPVs which is as follows –
  - Concession Agreements
  - Completion Certificates
  - Traffic Reports prepared by GMD consultants
  - Toll Rate Notifications
  - Extract of O&M agreement with IRBIDL
- Since PDTPL and STPL are still under construction, the Management has provided statement of expenses/work in progress pertaining to capex as at 30 September 2024.
- Management has provided project cost completion certificate for ILTPL, IGTPPL and IKTPPL as at 30 September 2024.
- List of approvals, permits, licenses and litigations for the SPVs as on 30 September 2024.
- Management has provided Traffic consultant reports prepared by GMD Consultants (appointed independently by IRBI Trust) dated October 2024 for all the SPVs. Management has confirmed that the traffic studies shared are the most recent studies available. Forecast revenue has been considered from the aforesaid traffic study reports for each of the SPVs. We have compared the revenue considered in the forecast model with the revenue forecasted in the traffic study reports and noted that the Management has considered the pessimistic revenue scenario in their forecast.
- Management has informed that O&M for the SPVs projects would be done by IRBIDL based on fixed price contract. O&M payments are fixed for the contract period of 10 years (till FY2032 for PDTPL, FY2033 for IGEPL and STPL, FY2034 for ILTPL, IGTPPL and IKTPPL and till FY2030 for other SPVs) after which terms of the contract may get renegotiated upon renewal. Management has shared extract of the contract and we have validated forecasted periodic and routine maintenance expense for contract period from the same. For the forecast period post the contract period (i) routine maintenance has been increased by 2% to 5% annually for inflation and (ii) periodic maintenance has been considered based on the technical feasibility study conducted by the Management. While the inflation considered is in line with long term inflation forecast for India, we have gone ahead with Management assumption on periodic maintenance. Given the technical nature of this study, review of the same is not part of our scope of work.
- We noted that for IWTL, SYTL, KTL and YATL the target traffic dates for traffic sampling as per the concession agreement has already passed before the Valuation Date. Management represented that independent engineer's recommendation, based on traffic sampling is not yet provided. Hence, we have relied on Management estimates for any shortfall/excess traffic, considered for calculation in modification of the concession period, as per article 29 of the concession agreement for the above-mentioned assets.

# Annexure 1: Sources of Information (2/2)

- We understand that CGTL, UTL and KGTL have filed Writ petition with Hon'ble Rajasthan High Court with prayer to commence payment of premium to NHAI, six months post actual completion of the project construction work. The Hon'ble High Court prima facie agreed with the contention of the SPVs and have provided interim relief from payment of premium. The matter is currently under arbitration. Forecast provided is based on assumption that said relief will be granted to respective SPV's.
- The investment management fees is computed assuming 10% markup on the cost incurred by investment manager. The said expenses are projected to increase by 10 per cent annually which is in line with agreement between the Trust and Investment Manager.
- Based on the concession agreement, traffic study report and Management estimate for SYTL we note that the actual traffic for SYTL as on target traffic date is expected to exceed the target traffic. Pursuant to clause 29 of the concession agreement, concession period will need to be reduced by 1.4 year to account for excess traffic. However, Management has confirmed that concession period of SYTL will not be reduced as reduction in the concession period necessitated due to excess traffic will be offset by the extension in the concession period due to augmentation of capacity to serve excess traffic pursuant to clause 29.2.3 of the concession agreement. Management has confirmed that considering uncertainty of capex and corresponding extension of concession period they have neither factored in capex required for capacity augmentation nor any extension in concession period as per clause 29.2.3 or reduction in concession period due to excess traffic in their forecast. We have gone ahead with the same assumption.
- Management represented that due to covid 19 the concession period end dates across all SPVs (besides PDTPL, IGEPL, STPL, ILTPL, IKTPL and IGTPPL) increased by 90-139 days pursuant to notification no F.184/2020-PPD dated 13<sup>th</sup> May 2020 and Notification no. Covid-19/Roadmap/JS(H)/2020 dated 26<sup>th</sup> August 2021. Concession period of Kaithal Tollways Limited in addition to covid 19 increase, increased by further 356 days due to farmer agitations on its route. Apart from this, concession period is increased for AETL due to demonetization and for SYTL and YATL due to Kannad Ghat crisis. Based on this representation from Management, we have considered extended concession period in our analysis.
- We noted that other financial liabilities of INR 4,114 Cr and sub-debt of INR 1,692 Cr is outstanding in the consolidated financials of IRBI Trust is payable to IRBIDL as at 30 September 2024. These liabilities have not been considered as debt like in nature for the purpose of valuation analysis. We have been given to understand that SPV's have ongoing claims and litigations with NHAI for respective projects. IRBI Trust and its SPV's have entered into a debt novation agreement with IRBIDL pursuant to which any amount received by SPVs or Trust towards these NHAI claims will be paid to IRBIDL. Management has also confirmed that these claims and liabilities have no financial impact on the SPVs or the IRBI Trust and the claim amounts from NHAI are significantly higher than the liabilities recognized by the IRBI Trust. Based on the above, we have not considered any impact of these liabilities in our valuation analysis.
- Given the nature of the liability, capital creditors of INR 384 Cr outstanding in the books of the SPVs have been considered debt like in nature and adjusted from the Enterprise Value to arrive at the Equity Value of IRBI Trust.
- Besides the above, there may be other information provided by the Management which may not have been perused by us in any detail, if not considered relevant for our defined scope.
- In addition to the above, we have also obtained such other information and explanations from the Management, either verbally or in written form, as were considered relevant for the purpose of the valuation. We had discussions with the key members of the Management, including Mr. Tushar Kawedia and Ms. Shilpa Todankar;
- The following external sources were used in the preparation of the report:
  - External databases such as Capital IQ etc.
  - Relevant information made available to us by Management at our request.
  - Publicly available information and secondary information.

# Annexure 2a: WACC – IWTL, KTL, AETL, UTL, CGTL, KGTL, IHMTL, IGEPL, ILTPL, IKTPL and IGTPPL (1/2)

<p>Risk free rate (Rf) 6.9%</p>	<ul style="list-style-type: none"> <li>The nominal risk-free rate is based on our understanding of the analysis of 10 year benchmark government of India securities yield as well analysis of the consensus forecast yield.</li> </ul>
<p>Equity risk premium 7.0%</p>	<ul style="list-style-type: none"> <li>Equity risk premium is estimated based on KPMG's understanding of prevailing market return in India.</li> </ul>
<p>Relevered beta 0.91</p>	<ul style="list-style-type: none"> <li>Beta is a measure of the risk of the shares of a company. <math>\beta</math> is the co-variance between the return on sample stock and the return on the market. In order to determine the appropriate beta factor for the Company, consideration must be given either to the market beta of the Company or betas of comparable quoted companies.</li> <li>We have considered companies involved in the road operating industry and infrastructure investment trusts.</li> <li>Betas are low in this industry due to the stable nature of the road operating industry and low level of cash flow volatility due to the relatively steady usage of roads. Refer annexure 3.</li> </ul>
<p>Cost of equity 13.3%</p>	<ul style="list-style-type: none"> <li>Based on above parameters cost of equity is 13.3%.</li> </ul>

Source: KPMG analysis

# Annexure 2a: WACC – IWTL, KTL, AETL, UTL, CGTL, KGTL, IHMTL, IGEPL, ILTPL, IKTPL and IGTPPL (2/2)

Cost of debt 9.0%	<ul style="list-style-type: none"> <li>As per the Management, the average cost of debt for the SPVs is 9.0%.</li> </ul>
Tax rate 25.17%	<ul style="list-style-type: none"> <li>We understand that eventually all the SPVs will transition to the new tax regime once its MAT credit is exhausted, hence we have considered tax rate of 25.17% for the WACC analysis which is the long term tax rate applicable to all SPVs.</li> </ul>
Post-tax cost of debt 6.7%	<ul style="list-style-type: none"> <li>The average post tax cost of debt is 6.7% for all SPVs</li> </ul>
Debt Equity Ratio 150%	<ul style="list-style-type: none"> <li>We have considered a debt to equity ratio of 150% i.e. debt to capital of 60% and equity to capital of 40%. The median debt to equity ratio for comparable companies is 64.2%. Based on discussion with the Management we understand that all the assets of the IRBI Trust are operational and thus the SPVs and IRBI Trust can infuse higher leverage in their capital structure in the long term. Based on our analysis and discussion with the Management we have considered the debt to equity ratio to be 150%.</li> </ul>
WACC 9.35%	<ul style="list-style-type: none"> <li>Based on the optimal capital structure, the weighted average cost of capital is 9.35%.</li> </ul>

Source: KPMG analysis

# Annexure 2b: WACC – SYTL and YATL(1/2)

<p>Risk free rate (Rf) 6.9%</p>	<ul style="list-style-type: none"> <li>The nominal risk-free rate is based on our understanding of the analysis of 10 year benchmark government of India securities yield as well analysis of the consensus forecast yield.</li> </ul>
<p>Equity risk premium 7.0%</p>	<ul style="list-style-type: none"> <li>Equity risk premium is estimated based on KPMG's understanding of prevailing market return in India.</li> </ul>
<p>Relevered beta 0.91</p>	<ul style="list-style-type: none"> <li>Beta is a measure of the risk of the shares of a company. <math>\beta</math> is the co-variance between the return on sample stock and the return on the market. In order to determine the appropriate beta factor for the Company, consideration must be given either to the market beta of the Company or betas of comparable quoted companies.</li> <li>We have considered companies involved in the road operating industry and infrastructure investment trusts.</li> <li>Betas are low in this industry due to the stable nature of the road operating industry and low level of cash flow volatility due to the relatively steady usage of roads. Refer annexure 3.</li> </ul>
<p>Cost of equity 13.3%</p>	<ul style="list-style-type: none"> <li>Based on above parameters cost of equity is 13.3%.</li> </ul>

Source: KPMG analysis

# Annexure 2b: WACC – SYTL and YATL(2/2)

Cost of debt 8.60%	<ul style="list-style-type: none"> <li>As per the Management, the average cost of debt for the SPVs is 8.60%.</li> </ul>
Tax rate 25.17%	<ul style="list-style-type: none"> <li>We understand that eventually the SPVs will transition to the new tax regime once its MAT credit is exhausted, hence we have considered tax rate of 25.17% for the WACC analysis which is the long term tax rate applicable to the SPVs.</li> </ul>
Post-tax cost of debt 6.4%	<ul style="list-style-type: none"> <li>The average post tax cost of debt is 6.4% for the SPVs</li> </ul>
Debt Equity Ratio 150%	<ul style="list-style-type: none"> <li>We have considered a debt to equity ratio of 150% i.e. debt to capital of 60% and equity to capital of 40%. The median debt to equity ratio for comparable companies is 64.2%. Based on discussion with the Management we understand that all the assets of the IRBI Trust are operational and thus the SPVs and IRBI Trust can infuse higher leverage in their capital structure in the long term. Based on our analysis and discussion with the Management we have considered the debt to equity ratio to be 150%.</li> </ul>
WACC 9.18%	<ul style="list-style-type: none"> <li>Based on the optimal capital structure, the weighted average cost of capital is 9.18%.</li> </ul>

Source: KPMG analysis

# Annexure 2c: WACC – PDTPL and STPL (1/2)

<p>Risk free rate (Rf) 6.9%</p>	<ul style="list-style-type: none"> <li>The nominal risk-free rate is based on our understanding of the analysis of 10 year benchmark government of India securities yield as well analysis of the consensus forecast yield.</li> </ul>
<p>Equity risk premium 7.0%</p>	<ul style="list-style-type: none"> <li>Equity risk premium is estimated based on KPMG's understanding of prevailing market return in India.</li> </ul>
<p>Relevered beta 0.91</p>	<ul style="list-style-type: none"> <li>Beta is a measure of the risk of the shares of a company. <math>\beta</math> is the co-variance between the return on sample stock and the return on the market. In order to determine the appropriate beta factor for the Company, consideration must be given either to the market beta of the Company or betas of comparable quoted companies.</li> <li>We have considered companies involved in the road operating industry and infrastructure investment trusts.</li> <li>Betas are low in this industry due to the stable nature of the road operating industry and low level of cash flow volatility due to the relatively steady usage of roads. Refer annexure 3.</li> </ul>
<p>Alpha 1.0%</p>	<ul style="list-style-type: none"> <li>Alpha is business specific risk premium. The quantification of alpha is based on but not limited to the following factors: Inherent execution risk in the Management business plan, size of operations and uncertainty related to expected growth in revenue.</li> <li>Alpha has been considered at 1% only for PDTPL and STPL SPVs because as at Valuation Date, construction for all other SPVs is complete and although tolling has commenced in PDTPL and STPL, its construction is expected to be completed in FY2025 and FY2026 respectively.</li> </ul>
<p>Cost of equity 14.3%</p>	<ul style="list-style-type: none"> <li>Based on above parameters cost of equity is 14.3%.</li> </ul>

Source: KPMG analysis

# Annexure 2c: WACC – PDTPL and STPL (2/2)

Cost of debt 9.0%	<ul style="list-style-type: none"> <li>As per the Management, the average cost of debt for PDTPL and STPL is 9.0%.</li> </ul>
Tax rate 25.2%	<ul style="list-style-type: none"> <li>We have considered tax rate of 25.17% for the WACC analysis which is the tax rate applicable to PDTPL and STPL.</li> </ul>
Post-tax cost of debt 6.7%	<ul style="list-style-type: none"> <li>The post tax cost of debt is 6.7% for PDTPL and STPL.</li> </ul>
Debt Equity Ratio 150%	<ul style="list-style-type: none"> <li>We have considered a debt to equity ratio of 150% i.e. debt to capital of 60% and equity to capital of 40%. The median debt to equity ratio for comparable companies is 64.2%. Based on discussion with the Management we understand that all the assets of the IRBI Trust are operational and thus the SPVs and IRBI Trust can infuse higher leverage in their capital structure in the long term. Based on our analysis and discussion with the Management we have considered the debt to equity ratio to be 150%.</li> </ul>
WACC 9.75%	<ul style="list-style-type: none"> <li>Based on the optimal capital structure, the weighted average cost of capital is 9.75%.</li> </ul>

Source: KPMG analysis

# Annexure 3: Beta Computation

Beta computation 30 September 2024										
	Market Capitalization	Total Debt	Debt / Equity	Debt / Total Capital	Beta	Tax Rate	Unlevered Beta	Target's Debt Equity	Target's Tax Rate	Re Levered Beta
IRB Infrastructure Developers Limited	396,786	186,490	47.0%	32.0%	1.47	25.17%	1.09	150.0%	25.17%	2.31
PNC Infratech Limited	124,798	80,165	64.2%	39.1%	1.15	25.17%	0.78	150.0%	25.17%	1.66
Dilip Buildcon Limited	79,189	72,404	91.4%	47.8%	1.48	25.17%	0.88	150.0%	25.17%	1.87
Bharat Road Network Limited	4,310	14,578	338.2%	77.2%	0.74	25.17%	0.21	150.0%	25.17%	0.45
National Highways Infra Trust	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
India Infrastructure Trust	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
Bharat Highways InvIT	47,817	11,376	23.8%	19.2%	0.40	25.17%	0.34	150.0%	25.17%	0.72
India Grid Trust	108,762	186,972	171.9%	63.2%	0.42	25.17%	0.19	150.0%	25.17%	0.39
Powergrid Infrastructure Investment Trust	84,743	5,692	6.7%	6.3%	0.45	25.17%	0.43	150.0%	25.17%	0.91
IRB InvIT Fund	37,475	25,123	67.0%	40.1%	0.44	25.17%	0.29	150.0%	25.17%	0.62
G R Infraprojects Limited	161,816	38,028	23.5%	19.0%	1.02	25.17%	0.87	150.0%	25.17%	1.84
<b>Median</b>										<b>0.91</b>

Note:

- (a) Market capitalization of comparable companies has been considered based on 3-month volume weighted average share prices till 30 September 2024.
- (b) Beta has been computed based on 1-year daily average adjusted beta.
- (c) Although, India Infrastructure Trust and National Highways Infra Trust are a part of our comparable companies set, they have been excluded while calculating the beta due to low trading.

Source(s): KPMG analysis based on data sourced from S&P Capital IQ database.

# Annexure 4: Investment Management Expenses

Present value of stand alone expenses pertaining to InvIT												
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033	FY2034	FY2035	FY2036
INR crores	6 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Trust expenses	3.7	8.2	9.0	9.9	10.9	12.0	13.2	14.5	16.0	17.6	19.3	21.3
Discounting period	0.250	1.000	2.000	3.000	4.000	5.000	6.000	7.000	8.000	9.000	10.000	11.000
Discount factor	0.978	0.914	0.836	0.765	0.699	0.639	0.585	0.535	0.489	0.447	0.409	0.374
<b>Present value of cash flows</b>	<b>3.6</b>	<b>7.5</b>	<b>7.5</b>	<b>7.6</b>	<b>7.6</b>	<b>7.7</b>	<b>7.7</b>	<b>7.8</b>	<b>7.8</b>	<b>7.9</b>	<b>7.9</b>	<b>8.0</b>

Present value of stand alone expenses pertaining to InvIT													
	FY2037	FY2038	FY 2039	FY2040	FY2041	FY2042	FY2043	FY2044	FY2045	FY2046	FY2047	FY2048	FY2049
INR crores	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Trust expenses	23.4	25.7	28.3	31.1	34.3	37.7	41.5	45.6	50.2	55.2	60.7	66.8	73.4
Discounting period	12.000	13.000	14.000	15.000	16.000	17.000	18.000	19.000	20.000	21.000	22.000	23.000	24.000
Discount factor	0.342	0.313	0.286	0.261	0.239	0.219	0.200	0.183	0.167	0.153	0.140	0.128	0.117
<b>Present value of cash flows</b>	<b>8.0</b>	<b>8.0</b>	<b>8.1</b>	<b>8.1</b>	<b>8.2</b>	<b>8.2</b>	<b>8.3</b>	<b>8.3</b>	<b>8.4</b>	<b>8.4</b>	<b>8.5</b>	<b>8.5</b>	<b>8.6</b>

Present value of stand alone expenses pertaining to InvIT					
	FY2050	FY2051	FY2052	FY2053	FY2054
INR crores	12 months	12 months	12 months	12 months	4.4 months
Trust expenses	80.8	88.9	97.8	107.5	43.0
Discounting period	25.000	26.000	27.000	28.000	28.682
Discount factor	0.107	0.098	0.089	0.082	0.077
<b>Present value of cash flows</b>	<b>8.6</b>	<b>8.7</b>	<b>8.7</b>	<b>8.8</b>	<b>3.3</b>

Valuation conclusion	
INR Crore	
<b>Present value of cash flows</b>	<b>235</b>
<b>WACC</b>	<b>9.35%</b>

The investment management fees have been forecasted to increase by 10% each year. Management represented that the fees is computed as cost incurred by investment manager +10% markup. We have relied on Management representation for the same.

Source(s): Management information, KPMG analysis

# Annexure 5: Other disclosures as required under SEBI InvIT Regulations

The following disclosures are as at 30 September 2024 for the SPVs

1. **Valuation of the project in the previous 3 years:** Refer annexure 5a for the aforementioned information.
2. **List of one-time sanctions/approvals which are obtained or pending/ List of up to date/overdue periodic clearances:** Refer annexure 5b for the aforementioned information.
3. **Estimates of already carried as well as proposed major repairs and improvements along with estimated time of completion:** Refer annexure 5c for the aforementioned information.
4. **Purchase price of the project by the InvIT:** Refer annexure 5d for the aforementioned information.
5. **On-going and closed material litigations including tax disputes in relation to the assets, if any:** Management represented that there are no on-going and closed material litigations in PDTPL, IHMTL, STPL, IKTPL, IGTPPL and ILTPL. Refer annexure 5e for the aforementioned information for other SPV's.
6. **Statement of assets:** Refer annexure 5f for the aforementioned information.
7. **Revenue pendencies including local authority taxes associated with InvIT asset and compounding charges, if any:** Management represented that there are no revenue pendencies including local authority taxes and compounding charges with respect to the 15 SPVs.
8. **Vulnerability to natural or induced hazards that may not have been covered in town planning/ building control:** Management represented that there are no such natural or induced hazards which have been not considered in town planning/building control with respect to the 15 SPVs.
9. **Latest pictures of the SPVs:** Refer annexure 5g for the aforementioned information
10. **Date of site inspection:** During the month of February/March 2024.
11. **In term of the SEBI InvIT Regulations, we hereby confirm that:**
  - We are competent to undertake the valuation.
  - We are independent and have prepared this Report on fair and unbiased basis.
  - The Valuation has been performed as per internationally accepted valuation methodologies and in cognizance of international valuation standards and ICAI Valuation Standards 2018 issued by the Institute of Chartered Accountants of India.
  - KPMG is not affiliated to the Client in any manner whatsoever. Further KPMG does not have a prospective interest in the Targets which is the subject of this Valuation and KPMG's fee is not contingent on an action or event resulting from the analysis, opinions or conclusions in the Valuation.

## Caveat to disclosures

KPMG has not independently verified the documents related to disclosures mentioned in the annexures and have relied on Management representation for the same.

Source(s): Management information, KPMG analysis

# Annexure 5a: Valuation of the projects in the previous 3 years

Valuation summary			
INR Crore			
Name of the SPV	Sep23	Dec23/ Jan24	Mar24
IRB Westcoast Tollway Limited	3,741	3,392	3,435
Solapur Yedeshi Tollway Limited	2,403	2,625	2,610
Yedeshi Aurangabad Tollway Limited	4,216	4,411	4,396
Kaithal Tollway Kimited	2,506	2,366	2,373
AE Tollway Limited	3,259	3,509	3,552
Udaipur Tollway Limited	2,673	2,663	2,647
CG Tollway Limited	2,803	2,854	2,827
Kishangarh Gulabpura Tollway Limited	2,206	2,068	2,053
IRB Hapur Moradabad Tollway Limited	4,176	4,303	4,318
Palsit Dankuni Private Tollway Limited	1,576	1,662	1,795
IRB Golconda Expressway Private Limited	12,682	14,025	14,428
Samakhiyali Tollway Private Limited	NA	365	497
IRB Lalitpur Tollway Private Limited**	NA	222	4,988
IRB Kota Tollway Private Limited**	NA	149	719
IRB Gwalior Tollway Private Limited**	NA	90	1,342

Source(s): Company website and Management Information

\*\* Valuation carried out as of 31 January 2024.

# Annexure 5b: One-time sanctions and approvals and overdue periodic clearances (1/3)

Sr. No.	Description	Remarks
<b>IRB Westcoast Tollway Limited</b>		
A	Permission of State government for extraction of boulders from quarry.	Received
B	Permission of Village Panchayat & Pollution control board for installation of crushers	Received
C	License for use of explosives.	Received
D	Permission of state government for drawing water from Rivers & reservoir	Not Applicable
E	License from Inspector of factories or competent authorities for setting up Batching Plant.	Received
F	Clearance from Pollution control board for Setting up Batching Plant	Received
G	Permission of Village Panchayat & Pollution control board for Asphalt Plant	Received
H	Permission of Village Panchayat & State government for Borrow earth	Received
I	Permission of State Government for Cutting of trees	Received
J	Any other permits or clearance required under applicable Laws	Labour License taken

Sr. No.	Description	Remarks
<b>Palsit Dankuni Private Tollway Limited</b>		
A	Permission of the State Government for extraction of boulder from quarry.	Applied
B	Permission of Village Panchayat and Pollution Control Board for installation of crusher;	Applied
C	License for use of explosives	Applied
D	Permission of state government for drawing water from river/reservoir	Not Applicable
E	License from the inspector of factories or other competent authority for setting up Batching plant.	Received
F	Clearance of Pollution Control Board for setting up Batching Plant;	Received
G	Clearance of Village Panchayats and Pollution Control Board for Asphalt Plant	Received
H	Permission of Village Panchayat and State Government for borrow areas	Received
I	Permission of State Government for cutting of trees	Received
J	Any other permits or clearances required under Applicable Laws	Labour License taken.

Source(s): Management information

# Annexure 5b: One-time sanctions and approvals and overdue periodic clearances (2/3)

Sr. No.	Description	Remarks
<b>Samakhiyali Tollway Private Limited</b>		
A	Permission of the State Government for extraction of boulder from quarry.	Received
B	Permission of Village Panchayat and Pollution Control Board for installation of crusher;	Received
C	License for use of explosives	Received
D	Permission of state government for drawing water from river/reservoir	Not Applicable
E	License from the inspector of factories or other competent authority for setting up Batching plant.	Not Received
F	Clearance of Pollution Control Board for setting up Batching Plant;	Application Done
G	Clearance of Village Panchayats and Pollution Control Board for Asphalt Plant	Application Done
H	Permission of Village Panchayat and State Government for borrow areas	Received
I	Permission of State Government for cutting of trees	Received
J	Any other permits or clearances required under Applicable Laws	Labour License taken.

Sr. No.	Description	Remarks
<b>IRB Gwalior Tollway Private Limited</b>		
A	Permission of the State Government for extraction of boulder from quarry.	Not Applicable
B	Permission of Village Panchayat and Pollution Control Board for installation of crusher;	Not Applicable
C	License for use of explosives	Not Required
D	Permission of state government for drawing water from river/reservoir	The SPV is in process of identifying land for plant set-up and borrow areas. Once identified, Applicable permits and Clearances shall be obtained.
E	License from the inspector of factories or other competent authority for setting up Batching plant.	
F	Clearance of Pollution Control Board for setting up Batching Plant;	
G	Clearance of Village Panchayats and Pollution Control Board for Asphalt Plant	
H	Permission of Village Panchayat and State Government for borrow areas	Not Required
I	Permission of State Government for cutting of trees	
J	Any other permits or clearances required under Applicable Laws	Not Applicable

Source(s): Management information

# Annexure 5b: One-time sanctions and approvals and overdue periodic clearances (3/3)

Sr. No.	Description	Remarks
<b>IRB Lalitpur Tollway Private Limited</b>		
A	Permission of the State Government for extraction of boulder from quarry.	Not Applicable
B	Permission of Village Panchayat and Pollution Control Board for installation of crusher;	Not Applicable
C	License for use of explosives	Not Required
D	Permission of state government for drawing water from river/reservoir	The SPV is in process of identifying land for plant set-up and borrow areas. Once identified, Applicable permits and Clearances shall be obtained.
E	License from the inspector of factories or other competent authority for setting up Batching plant.	
F	Clearance of Pollution Control Board for setting up Batching Plant;	
G	Clearance of Village Panchayats and Pollution Control Board for Asphalt Plant	
H	Permission of Village Panchayat and State Government for borrow areas	Not Required
I	Permission of State Government for cutting of trees	
J	Any other permits or clearances required under Applicable Laws	Not Applicable

Sr. No.	Description	Remarks
<b>IRB Kota Tollway Private Limited</b>		
A	Permission of the State Government for extraction of boulder from quarry.	Not Applicable
B	Permission of Village Panchayat and Pollution Control Board for installation of crusher;	Not Applicable
C	License for use of explosives	Not Required
D	Permission of state government for drawing water from river/reservoir	The SPV is in process of identifying land for plant set-up and borrow areas. Once identified, Applicable permits and Clearances shall be obtained.
E	License from the inspector of factories or other competent authority for setting up Batching plant.	
F	Clearance of Pollution Control Board for setting up Batching Plant;	
G	Clearance of Village Panchayats and Pollution Control Board for Asphalt Plant	
H	Permission of Village Panchayat and State Government for borrow areas	Not Required
I	Permission of State Government for cutting of trees	
J	Any other permits or clearances required under Applicable Laws	Not Applicable

The information has been represented by the Management. The above disclosure is not required in case of SYTL, YATL, AETL, UTL, KTL, CGTL, KGTL, IHMTL and IGEPL since the projects have received COD.

Source(s): Management information

# Annexure 5c: Estimates of already carried as well as proposed major repairs and improvements (1/4)

## Estimates of already carried out as well as proposed major repairs and improvements

INR Crore								
Name of the SPV	FY 2023	FY 2024	FY 2025	FY 2026	FY 2027	FY 2028	FY 2029	FY 2030
IRB Westcoast Tollway Limited	41	41	43	-	1	-	111	41
Solapur Yedeshi Tollway Limited	-	-	18	19	20	-	-	-
Yedeshi Aurangabad Tollway Limited	-	-	29	31	32	-	-	-
Kaithal Tollway Limited	-	43	45	48	-	-	-	-
AE Tollway Limited	-	37	39	41	-	-	-	-
Udaipur Tollway Limited	-	57	69	76	4	-	120	125
CG Tollway Limited	-	-	27	28	30	-	-	-
Kishangarh Gulabpura Tollway Limited	-	-	-	-	100	-	-	-
IRB Hapur Moradabad Tollway Limited	-	4	-	89	90	85	-	5
Palsit Dankuni Private Tollway Limited	-	-	-	-	-	-	55	61
IRB Golconda Expressway Private Limited	-	-	-	-	-	-	161	161
Samakhiyali Tollway Private Limited	-	-	-	-	0	-	-	-
IRB Lalitpur Tollway Private Limited	-	-	-	-	-	-	66	69
IRB Kota Tollway Private Limited	-	-	2	-	-	-	8	8
IRB Gwalior Tollway Private Limited	-	-	0	-	11	22	23	36

Source(s): Management information

# Annexure 5c: Estimates of already carried as well as proposed major repairs and improvements (2/4)

## Estimates of already carried out as well as proposed major repairs and improvements

INR Crore

Name of the SPV	FY 2031	FY 2032	FY 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038
IRB Westcoast Tollway Limited	-	-	2	12	166	2	-	-
Solapur Yedeshi Tollway Limited	-	-	61	64	67	-	-	-
Yedeshi Aurangabad Tollway Limited	-	-	110	115	121	-	-	-
Kaithal Tollway Limited	-	128	134	140	-	-	-	-
AE Tollway Limited	123	130	135	-	-	-	-	73
Udaipur Tollway Limited	127	5	-	86	91	119	-	-
CG Tollway Limited	86	91	95	-	9	46	48	51
Kishangarh Gulabpura Tollway Limited	-	-	104	102	110	-	-	-
IRB Hapur Moradabad Tollway Limited	74	77	57	2	-	212	229	238
Palsit Dankuni Private Tollway Limited	57	-	-	-	-	80	80	80
IRB Golconda Expressway Private Limited	161	161	-	-	386	387	386	386
Samakhiyali Tollway Private Limited	-	36	37	38	-	-	-	-
IRB Lalitpur Tollway Private Limited	72	75	78	-	-	117	121	124
IRB Kota Tollway Private Limited	-	-	-	19	19	-	-	-
IRB Gwalior Tollway Private Limited	52	-	-	11	21	22	35	50

Source(s): Management information



# Annexure 5c: Estimates of already carried as well as proposed major repairs and improvements (3/4)

Estimates of already carried out as well as proposed major repairs and improvements								
INR Crore								
Name of the SPV	FY 2039	FY 2040	FY 2041	FY 2042	FY 2043	FY 2044	FY 2045	FY 2046
IRB Westcoast Tollway Limited	148	53	-	-	-	-	-	-
Solapur Yedeshi Tollway Limited	-	-	-	42	44	46	-	-
Yedeshi Aurangabad Tollway Limited	-	60	63	66	-	-	-	-
Kaithal Tollway Limited	-	94	99	104	-	-	-	-
AE Tollway Limited	77	81	-	-	-	-	-	-
Udaipur Tollway Limited	-	-	-	-	-	-	-	-
CG Tollway Limited	-	-	-	-	-	-	-	-
Kishangarh Gulabpura Tollway Limited	-	-	-	-	-	-	-	-
IRB Hapur Moradabad Tollway Limited	7	-	-	-	-	-	-	-
Palsit Dankuni Private Tollway Limited	38	-	-	-	-	-	-	-
IRB Golconda Expressway Private Limited	-	-	235	235	235	236	-	-
Samakhiyali Tollway Private Limited	-	43	44	45	-	-	-	-
IRB Lalitpur Tollway Private Limited	128	132	-	-	185	185	-	-
IRB Kota Tollway Private Limited	11	12	-	-	-	23	-	-
IRB Gwalior Tollway Private Limited	-	-	26	38	49	61	-	-

Source(s): Management information

# Annexure 5c: Estimates of already carried as well as proposed major repairs and improvements (4/4)

## Estimates of already carried out as well as proposed major repairs and improvements

INR Crore

Name of the SPV	FY 2047	FY 2048	FY 2049	FY 2050	FY 2051	FY 2052	FY 2053	FY 2054
IRB Westcoast Tollway Limited	-	-	-	-	-	-	-	-
Solapur Yedeshi Tollway Limited	-	-	-	-	-	-	-	-
Yedeshi Aurangabad Tollway Limited	-	-	-	-	-	-	-	-
Kaithal Tollway Limited	-	-	-	-	-	-	-	-
AE Tollway Limited	-	-	-	-	-	-	-	-
Udaipur Tollway Limited	-	-	-	-	-	-	-	-
CG Tollway Limited	-	-	-	-	-	-	-	-
Kishangarh Gulabpura Tollway Limited	-	-	-	-	-	-	-	-
IRB Hapur Moradabad Tollway Limited	-	-	-	-	-	-	-	-
Palsit Dankuni Private Tollway Limited	-	-	-	-	-	-	-	-
IRB Golconda Expressway Private Limited	531	532	531	531	-	-	404	150
Samakhiyali Tollway Private Limited	-	-	-	-	-	-	-	-
IRB Lalitpur Tollway Private Limited	-	-	-	-	-	-	-	-
IRB Kota Tollway Private Limited	-	-	-	-	-	-	-	-
IRB Gwalior Tollway Private Limited	-	-	-	-	-	-	-	-

Source(s): Management information



# Annexure 5d: Purchase price of the SPVs by the InvIT

Purchase price of the SPVs			
Name of the SPV	No. of equity shares transferred to the Trust	No. of units of trust issued to the Sponsor	% Stake in SPV
IRB Westcoast Tollway Limited	174,194,303	17,419,000	100.00%
Solapur Yedeshi Tollway Limited	98,250,000	9,825,000	100.00%
Yedeshi Aurangabad Tollway Limited	215,757,001	21,576,000	100.00%
Kaithal Tollway Kimited	328,000,000	32,800,000	100.00%
AE Tollway Limited	436,500,000	43,650,000	100.00%
Udaipur Tollway Limited	116,800,000	11,680,000	100.00%
CG Tollway Limited	203,500,000	20,350,000	100.00%
Kishangarh Gulabpura Tollway Limited	155,500,000	15,550,000	100.00%
IRB Hapur Moradabad Tollway Limited	189,500,000	18,950,000	100.00%

The table above presents the number of equity shares transferred to the Trust and the number of units issued by the Trust to the Sponsor to acquire 100% of the equity stake in the aforementioned SPVs. The transfer is as per the share purchase agreement between the Trust and Sponsor dated 19 February 2020.

## PDTPL

IRBI Trust acquired 99.96% stake in PDTPL by acquiring 121,200,000 equity shares in PDTPL through an equity infusion of INR 121.2 Cr in April 2022.

## IGEPL

IRBI Trust issued and allotted 142,400,000 units to the eligible unitholders of the Trust for cash at an Issue price of INR 200.98 per unit, aggregating to approximately INR 2,861.95 Cr. The Sponsor of the Trust, has been allotted 72,800,000 units of the Trust while GIC Affiliates have been allotted 69,600,000 units. Proceeds from the issue were used for acquisition of IGEPL through subscription to the equity shares of IGEPL pursuant to the IGEPL share subscription agreement for a consideration of INR 715.45 Cr.

## STPL

IRBI Trust acquired 99.96% stake in STPL by acquiring 116,200,000 equity shares in STPL through an equity infusion of INR 116.2 Cr on 04 January 2024.

## IGTPL, IKTPL and ILTPL

IRBI Trust acquired 100% stake in IGTPPL, IKTPL and ILTPL by acquiring 103,285,000; 39,347,500 and 50,000 equity shares in the 3 entities through an equity infusion of INR 103.2, INR 39.3 and INR 420.5 Cr in March 2024.

Source(s): Management information

# Annexure 5e: Pending litigations – IWTL (1/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Mr. Sachhidananda Shetty.	The Chief General Manager, Modern Road Makers Pvt. Ltd.	Judicial Magistrate First Class Court, Kundapura.	The plaintiff has filed this suit praying that stay should be given for the stoppage work of NH-66 to set right certain anomalies in the tree cutting tender awarded to him by the NHAI in Kundapur forest division in respect of cutting of reserved categories of trees like teak, Bethonne, Matti, Sandalwood & season.	The plaintiff has withdrawn the suit. The matter is disposed by the court. This matter is now closed.	Land acquisition and related cost, cutting the necessary trees for road widening work, and related cost, etc are the sole responsibilities of NHAI. Further the concessionaire is not a party in the tender awarded to the plaintiff for cutting of the trees. Hence, there are no financial implications in this matter.
2	Laxman Neelakanth Desai, Goangeri, Majali, Karwar	IRB West Coast Tollway Pvt Ltd,	Civil Judge & JMFC II Court, Karwar	The plaintiff has filed the suit to restrain the defendants from undertaking the blasting of the rocks/hill in unscientific manner as it has caused loss to the plaintiff.	There are no Adverse orders against the company. The matter is pending	The company and plaintiff had mediated the dispute partly and the company has paid a sum of Rs. 175000/- to the plaintiff in the interest of the project. The matter is pending for final determination. As the company has complied with all the necessary provisions and undertaken the work with all safety precautions, the company feels that there are no financial implications in this matter.
3	Venkatramana S	Chief General Manager (IRB), Kumta	JMFC at Bhatkal (O.S. No. 103/2018)	The plaintiff has filed this suit challenging the land acquisition and has prayed that the respondents should be restrained from doing the work against the provisions of the land acquisition act.	The matter is disposed by the court.	The responsibility of the entire process of land acquisition and payment of compensation is of NHAI. Hence, that there are no financial implications in this matter.

Source(s): Management information

# Annexure 5e: Pending litigations – IWTL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
4	Mr. Vithobha Ganesh Naik	IRB West Coast Tollway Pvt Ltd,	Principal Judge, Karwar	The complainant is alleging that IRB WTL is encroaching upon the Petitioner's land to construct the highway	There are no Adverse orders against the company. The matter is pending	
5	IRB Westcoast Tollway Ltd	NHAI	Arbitration	Claimants filed an interim claim for compensation under Clause 35.2 & 35.3 along with claim on account of pending Change of Scope, Change in Law, additional works, inter alia, The dispute was crystallised with respect to above claims, inter alia, including other matters and the arbitration was invoked	Presiding Arbitrator to be appointed.	Rs 3107.07 Cr + 1316.37 Days (under CI 35.3)

Source(s): Management information

# Annexure 5e: Pending litigations – SYTL (1/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Raosaheb Chadre	Modern Road Makers Pvt. Ltd.	Civil Judge, Senior Division, Osmanabad (Special suit number 73/2018)	The plaintiffs have prayed that due to mining work by the defendant, the levelling of the ground has been disturbed and there have been huge holes in the ground which should be filled by the defendants and that the plaintiffs should pay Rs. 82,41,800/- towards the extraction cost.	The matter is pending	The company had undertaken the work with the consent of the plaintiff after obtaining necessary permissions. The claim of the plaintiff is false. The company has denied all the allegations. Considering the merits of the matter, there are no financial implications in this matter.
2	Bhagwan Rambhau Jadhwar	Solapur Yedeshi Tollway Pvt. Ltd. and others	Civil Judge, Junior Division, Kallam (regular civil suit number 1139/2018)	The plaintiff has filed suit claiming that due to the negligence of the defendants, in construction of drainage adjoining the road, the water from the drainage had entered in field of the plaintiff and has caused loss to the tune of Rs. 2,00,000/-, which should be made good by the respondents.	The matter is pending	The company has taken all the necessary safety measures while construction of the road and denied any negligence on its part. Considering the merits of the matter, there are no financial implications in this matter.

Source(s): Management information

# Annexure 5e: Pending litigations – SYTL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
3	Solapur Yedeshi Tollway Ltd.	NHAI	Arbitration	SYTL (Claimant) had submitted claims to NHAI for compensation as per Clause 35.2 and Clause 35.3 of the Concession Agreement on account of delays attributable to NHAI. The claim for cost stands at Rs. 571.36 Crore in terms of Clause 35.2 and extension of Concession Period for 539.20 days in terms of Clause 35.3 of the Concession Agreement. Since there was no response received from NHAI, SYTL crystallised the matter as contractual dispute on 09.03.2022 and requested for amicable settlement through Conciliation as per Clause 44.2 of the Concession Agreement.	Arbitration proceedings are in progress. Next hearing is on 22.10.2024	Rs. 790.54 Cr + interest & extension of extension of 647.43 days

Source(s): Management information

# Annexure 5e: Pending litigations - YATL (1/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Shaikh Rafiq and others	IRB Infrastructure Developers Limited and others	Bombay High Court Aurangabad Bench  Writ Petition 5410/2015	This matter is pertaining to Yedeshi Aurangabad Project.  The petitioner is aggrieved by the award wherein his land is acquired by NHAI, for construction of highway. Hence, the petitioners have prayed not to change the existing alignment of the proposed road widening of NH 211 passing through petitioners village and to restrain respondents from proceeding further with any change in the existing alignment.	The matter is pending.	The responsibility of the entire process of land acquisition and payment of compensation is of NHAI. Hence, there are no financial implications on the company.
2	Panditrao Chausalkar and others	IRB Infrastructure Developers Limited And Others	Bombay High Court Aurangabad Bench  Writ Petition 92/2017	This matter is pertaining to Yedeshi Aurangabad Project.  The petitioner is aggrieved by the award wherein his land is acquired by NHAI, for construction of highway. Hence, the petitioners have prayed that the land acquisition should be set aside, the respondents should be restrained from acquiring the land belonging to the petitioners, etc..	The matter is pending.	The responsibility of the entire process of land acquisition and payment of compensation is of NHAI. Hence, there are no financial implications on the company.

Source(s): Management information

# Annexure 5e: Pending litigations - YATL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
3	Pruthviraj shahane	IRB Infrastructure Developers Limited and others	Civil Judge senior division, Beed.  Civil suit number 10/2016	This matter is pertaining to Yedeshi Aurangabad Project.  The Plaintiff claims that the electricity poles & DP coming within road alignment / area have been replaced but erected & installed within his private land which has not been acquired.	The matter is pending.	The responsibility of the entire process of land acquisition and payment of compensation is of NHAI. Utility shifting is being done on the land provided by NHAI Hence, there are no financial implications on the company.
4	Yedeshi Aurangabad Tollway Ltd	NHAI	Arbitration	YATL (Claimant) had submitted claims to NHAI for compensation as per Clause 35.2 and Clause 35.3 of the Concession Agreement on account of delays attributable to NHAI. The claim for cost stands at Rs. 1,501.84 Crore in terms of Clause 35.2 and extension of Concession Period for 831.08 days in terms of Clause 35.3 of the Concession Agreement. YATL had proposed to NHAI for amicable settlement through CCIE. Since no written settlement reached between the Parties, YATL invoked arbitration on 09.03.2022 in terms of Clause 44.3 of the Concession Agreement.	Arbitral Tribunal pronounced Award in favour of YATL granting compensation of Rs 1719.48 Cr (as on 27.01.2024) along with applicable interest till realisation of payment and extension to Concession Period by 689 days.  NHAI filed section 34 in the Delhi High Court challenging the Award and YATL filed application for enforcement of Award. The matters are pending	Rs 1719.48 Cr (as on 27.01.2024) along with applicable interest till realisation of payment and extension to Concession Period by 689 days.

Source(s): Management information

# Annexure 5e: Pending litigations - KTL (1/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	SirsaEagle CHS Ltd. and another	National Highways Authority of India and Others (Kaithal Tollway Pvt. Ltd. is Respondent Number 5)	Punjab and Haryana High Court, Writ Petition Number 27756/2017	The Petitioner has challenged the levy and collection of toll on the project, and has prayed that the notification by which the toll is collected should be quashed and issue the directions for frame policy for the local transporters which may not act against the financial interest of the poor local villagers who travel in busses.	The matter is pending.	<p>Financial implications cannot be ascertained as not mentioned in the petition.</p> <p>Similar writ petition challenging the toll collection on the project was filed in Punjab and Haryana High Court by Azad Singh (reported under closed litigations writ petition number. 22648/2017), has been dismissed by the High Court.</p> <p>The concessionaire has been collecting the toll on the project as per the concession agreement and the toll notification. The provisional completion certificate has been issued to the concessionaire as per the terms of the concession agreement. Considering the merits of the case, there are no financial implications in this matter.</p>

Source(s): Management information

# Annexure 5e: Pending litigations - KTL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
2	Kaithal Tollway Ltd	NHAI	Arbitration	<p>Claimant had submitted claims to NHAI for compensation as per Clause 35.2 and Clause 35.3 of the Concession Agreement on account of delays attributable to NHAI. The claim for cost stands at Rs. 190.68 Crore in terms of Clause 35.2 and extension of Concession Period for 136.77 days in terms of Clause 35.3 of the Concession Agreement. The Claimant crystallised dispute on 09.03.2022 (and subsequently invoked arbitration on 19.04.2022)</p> <p>Against the claim of Rs 100.1 Cr on account of Farmer's strike, Rs 58.48 Cr was released by NHAI on 10.10.2022 NHAI recommended extension of Concession Period of 365 days. The Balance claim amount of Rs 41.62 Crore was disputed. and arbitration was invoked</p> <p>This matter is clubbed with the above referred arbitration.</p>	Arbitration proceedings are in progress. Next hearing is on 16.11.2024	Rs. 288.07 Cr + 582.77 days of extension of Concession Period

Source(s): Management information



# Annexure 5e: Pending litigations - AETL

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	AE Tollway Limited	NHAI	Arbitration	Arbitration is invoked. AETL filed Statement of Claim account of delay in completion of construction and other Force Majeure claims such as Covid 19 etc. along with claim for loss of revenue during the delayed period..Upon successful completion of arbitration in AETL vs NHAI, with the award in favour of the Company and after receipt of the amount from NHAI, a part of such amount received would have to be paid to the sub-contractor in terms of their sub-contract agreement	Arbitration proceedings are in progress. Next hearing date is on 24.10.2024	Rs. 1317.98 Cr + interest & Extension to Concession Period by 351.41 days
2	Hakim Singh Yadav and others	AE Tollway Private Limited	High Court of Allahabad	The petitioner filed a writ petition before the High Court of Allahabad against the Sponsor and others (the "Respondents") in relation to the drainage system for the road asset operated by AETL. AETL had crystallised dispute and requested NHAI to take up the matter of payment of premium with proportionate reduction of revenue losses (the figures under dispute are excess payment of Premium of Rs. 12.84 Cr and outstanding payment of Premium including interest of Rs.55.34 Cr as on June 07, 2021) on account of Covid and delay in completion of construction as a dispute and for amicable settlement through Conciliation. Since no written settlement reached between the Parties, the AETL on 14.03.2022 invoked arbitration as per Clause 44.3 of the Concession Agreement. The matter is pending.	the matter is pending.	

Source(s): Management information

# Annexure 5e: Pending litigations - UTL

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Hiteshkumar Ramanlal Gandhi (Shift Incharge Khandiobri Toll)	Bhairulal Salvi (Bus Driver) Dist - Bhilwada.	FIR number 0299 dated 18/11/2017, Kherwada Police Station Tah – Kherwara, Dist – Udaipur State – Rajasthan Arbitration	Bus driver Mr. Bhairulal Salvi has damaged the toll booths by pelting the stone & created violence in smooth tolling operations at Khandiobri Toll.	The matter is being investigated by the police.	The FIR is filed against the Bus driver, by the employee of the company. The FIR is filed by the employee of the company against the bus driver. There are no proceedings against the company.
2	Udaipur Tollway Ltd	NHAI		Claimants filed Statement of Claim including the claim on account of compensation of Force Majeure Cost and extension in Concession Period on account of COVID 19) , Claim for compensation under Clause 35.2 & 35.3 along with a prayer that Premium is applicable after 6 months of Actual completion	Arbitration proceedings are in progress. Next hearing is on 06.12.2024	Commencement of Premium after 6 months of actual completion  Claim Rs. 906.08 Cr + interest & extension of 214.99 days

Source(s): Management information

# Annexure 5e: Pending litigations - CGTL

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Shri Azad Sharma & Other	NHAI and others (The Manager, IRB is respondent number 7)	Lok Adalat, Bhilwara	The plaintiff has filed case challenging the collection of toll without completion of six lane. Plaintiff /Petitioners have prayed that collection of toll shall be stopped until works of six lanes are completed and toll collected in the name of six laning shall be returned with interest.	The matter is disposed by the court. Hence, this matter is closed.	The company is collecting the toll as per the toll notification and concession agreement with NHAI. Since, the project consists from 4 laning to 6 laning, hence, during the construction period, the company collects only 75% of the prescribed toll amount as per the toll fee notification. These toll rates are fixed for construction period. The company has good case on merits. The company has not violated any of the concession agreement provisions and hence, there are no financial implications in the matter.
2	CGTollway Ltd	NHAI	Arbitration	Claimants filed Statement of Claim including the claim on account of compensation of Force Majeure Cost and extension in Concession Period on account of COVID 19) , Claim for compensation under Clause 35.2 & 35.3 along with a prayer that Premium is applicable after 6 months of Actual completion	Arbitration proceedings are in progress. Next hearing is on 06.12.2024	Commencement of Premium after 6 months of actual completion  Claim: Rs. 502.12 + + interest & extension of 241.37 days

Source(s): Management information



# Annexure 5e: Pending litigations - KGTL

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Kishangarh Gulabpura Tollway Ltd	NHAI	Arbitration	Claimants filed Statement of Claim including the claim on account of compensation of Force Majeure Cost and extension in Concession Period on account of COVID 19) , Claim for compensation under Clause 35.2 & 35.3 along with a prayer that Premium is applicable after 6 months of Actual completion	Arbitration proceedings are in progress. Next hearing is on 06.12.2024	Commencement of Premium after 6 months of actual completion  Claim :Rs. 868.96 + + interest & extension of 387.18 days

Source(s): Management information



# Annexure 5e: Pending litigations - IGEPL (1/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
1	Gadeela Raghuveer Reddy	1.State of Telangana, 2. Hyderabad Metropolitan Development Authority (HMDA), 3. Hyderabad Growth Corridor Ltd (HGCL), 4. IRB Golconda Expressway Pvt Ltd (IRB GEPL) and 5. IRB Infrastructure Developers Ltd. (IRB)	High Court of State of Telangana	The Petitioner had filed a Writ Petition (PIL) against the Respondents The Petitioner is seeking (i) to direct the State of Telangana (Municipal Administration and Urban Development) & HMDA to disclose the Initial Estimated Concession Value (IECV) for the Nehru Outer Ring Road (NORR) for the period of concession of the concession agreement and to direct the Comptroller and Auditor General of India (CAG) to check the veracity of the IECV arrived at by the these Respondents; and (ii) in the event that the concession amount realized is undervalued, to declare the action of the HMDA in signing a concession agreement with the IRB GEPL for Tolling, Operations and Maintenance of the Nehru Outer Ring Road is illegal and to annul the Concession Agreement.	The matter is disposed	Nil

Source(s): Management information



# Annexure 5e: Pending litigations - IGEPL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on 30 September 2024	Financial implications
2	Kanugula Mahesh Kumar (Petitioner)	1.State of Telangana, 2. Hyderabad Metropolitan Development Authority (HMDA), 3. Hyderabad Growth Corridor Ltd (HGCL), 4. IRB Golconda Expressway Pvt Ltd (IRB GEPL) and 5. IRB Infrastructure Developers Ltd. (IRB)	High Court of State of Telangana	<p>The Petitioner filed a public interest litigation before the High Court of Telangana against Respondents, praying, inter alia, to set aside the award of the Toll, Operate and Transfer ("TOT") tender for the Nehru Outer Ring Road project to the IRB and IRB GEPL by entering into a concession agreement for a period of 30 years by not disclosing the initial estimated concession value for the project and seeking to illegally and unlawfully divert the funds from. The Petitioner has also sought quashing or setting aside of the concession agreement and all other agreements entered into by State of Telangana, HMDA and HGCL with IRB and IRB GEPL in relation to the Project.</p> <p>The Petitioner has also prayed, inter alia, to pass an order directing the IRB and IRB GEPL to not transfer the bid concession fee of ₹7,380 Crores to the HMDA or alternatively, not to transfer any funds from the bid concession fee of ₹7,380 Crores to the State of Telangana.</p>	The matter is pending	Nil

Source(s): Management information

# Annexure 5f: Statement of assets as at 30 September 2024

Statement of assets					
INR Crore					
Name of the SPV	Net tangible assets	Intangible assets	Other non current assets	Non current assets	Current assets
IRB Westcoast Tollway Limited	-	3,010	0	3,010	78
Solapur Yedeshi Tollway Limited	-	1,293	-	1,293	60
Yedeshi Aurangabad Tollway Limited	-	3,391	0	3,391	110
Kaithal Tollway Limited	-	1,932	-	1,932	92
AE Tollway Limited	0	2,972	0	2,972	84
Udaipur Tollway Limited	-	2,534	-	2,534	82
CG Tollway Limited	0	2,043	10	2,053	82
Kishangarh Gulabpura Tollway Limited	0	1,604	-	1,604	38
IRB Hapur Moradabad Tollway Limited	0	3,092	-	3,092	54
Palsit Dankuni Private Tollway Limited	-	2,014	1	2,015	48
IRB Golconda Expressway Private Limited	-	7,943	0	7,943	270
Samakhiyali Tollway Private Limited	-	667	0	667	9
IRB Lalitpur Tollway Private Limited	-	4,677	-	4,677	212
IRB Kota Tollway Private Limited	-	550	0	550	36
IRB Gwalior Tollway Private Limited	-	1,194	-	1,194	62

Source(s): Management information



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# Annexure 5g: Site pictures - IWTL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - SYTL

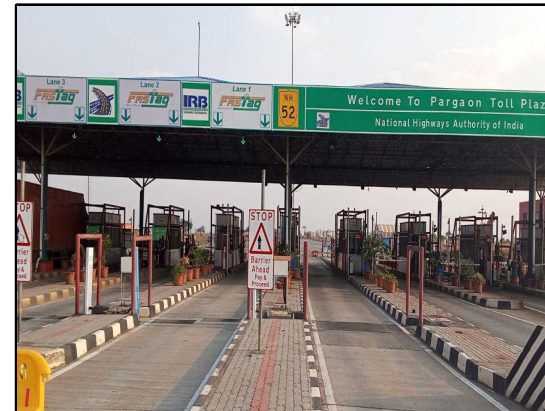
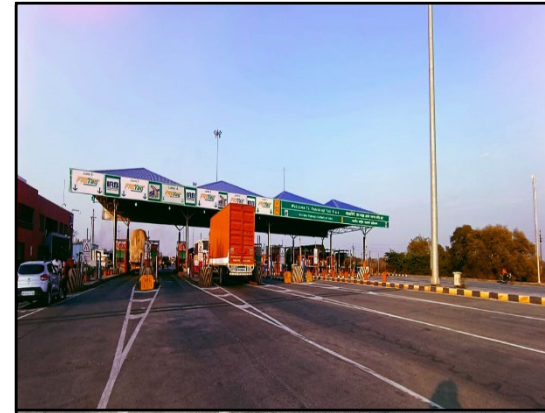


भारतीय राष्ट्रीय राजमार्ग प्राधिकरण वाहन शुल्क (₹)				जिला अंतर्गत नौदणी कृत वाणिज्य वाहनाच्या प्रत्येक फेऱ्यासाठी
वाहन प्रकार	एक ताफी यात्रे करीता	२४ तासांमध्ये एका वेळा	मासिक पास	
	75	110	2420	35
	115	175	3905	60
	245	370	8185	125
	270	400	8925	135
	385	575	12835	190
	470	705	15620	235



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - YATL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - KTL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - AETL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - UTL



National Highways Authority of India USER FEE (Udaipur - Shimla) Section from km. 333-585 to 447-385 on NH-6			
Type of Vehicle	Single Journey Rate (Rs.)*	Return Journey Rate Valid for 24 Hrs. (Rs.)*	Monthly Pass 50 & more Single journey (Rs.)*
Car, Jeep, Van or LMV	175	260	5750
LCV, LGV or Mini Bus	280	420	9290
Bus / Truck (2 Axles)	585	875	19470
Commercial Vehicles (3 Axles)	635	955	21240
HCM, EME or Multi Axles Vehicles (4 to 6 Axle)	915	1375	30530
Oversized Vehicles (7 or More Axles)	1115	1675	37170
* All Rates are Applicable only Payment through FASTAG			

National Highways Authority of India EXEMPTED VEHICLES	
B) USED FOR OFFICIAL PURPOSES BY:-	
1. The Ministry of Defence Including Those Which are Eligible For Exemption In Accordance With The Provision of The Indian Toll (Army and Air Force) Act 1901 and Rules Made There Under, As Extended to Navy also	
2. The Central and State Armed Forces in Uniform Including Para Milita Forces and Police	
3. An Executive Mangistrate	
4. The Fire Fighting Department or Organization	
5. The National Highways Authority of India or any Other Government Organization Using Such Vehicle For Inspection, Survey, Construction or Operation of National Highways and Maintenance There of	
C) Used As Ambulance,	
D) Used As Funeral Van	
E) Mechanical vehicles Specially Designed and Constructed for use of a Person Suffering From Physical Disability	

National Highways Authority of India EXEMPTED DIGITARIES	
A) TRANSPORTING AND ACCOMPANYING:	
1. The President of India	
2. The Vice - President of India	
3. The Prime Minister of India	
4. The Governor of a State	
5. The Chief Justice of India	
6. The Speaker of the House of People	
7. The Chief Minister of the Union	
8. The Judge of The Supreme Court	
9. The Minister of The State of The Union	
10. The Lieutenant Governor of a Union Territory	
11. The Chief of a Staff Holding The Rank of Field General or Equivalent Rank	
12. The Chairman of The Legislative Council of a State	
13. The Speaker of The Legislative Assembly of a State	
14. The Judge of a High Court	
15. The Member of Parliament	
16. The Army Commander or Vice - Chief of Army Staff And Equivalent in other Services	
17. The Chief Secretary to a State Government Within Concerned State	
18. The Secretary to The Government of India	
19. The Secretary, Council of States	
20. The Secretary, House of People	
21. The Foreign Dignitary on State Visit	
22. The Member of Legislative Assembly of a State and The Member of Legislative Council of a State Within Their Respective State if Her or She Produces His or Her Identity Card Issued by The Concerned Legislature of The State	
23. The Awardee of Param Vir Chakra, Ashok Chakra, Maha Vir Chakra, Kirti Chakra, Vir Chakra and Shaurya Chakra If Such Awardee Produces His or Her Photo Identity Card Duly Authenticated by The Appropriate or Competent Authority for Such Award	

Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - CGTL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - KGTL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - IHMTL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - PDTPL



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - IGEPL



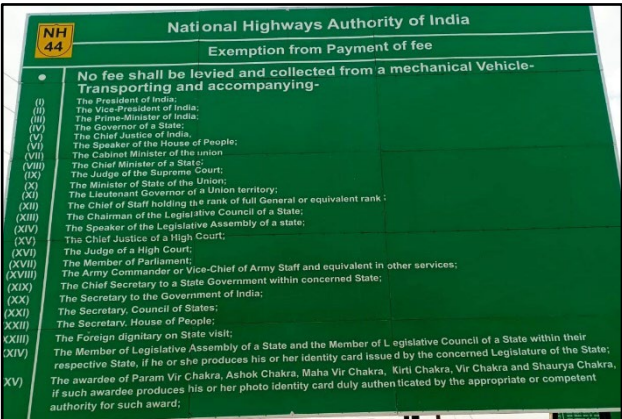
Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - STPL

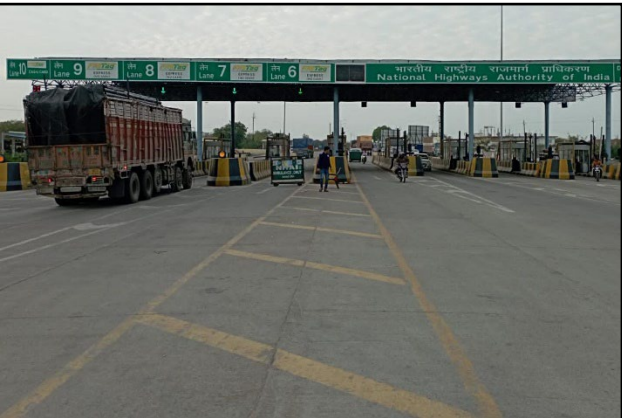


Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - IGTPL



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण		
वाहन का प्रकार	एक मासिक यात्रा के लिए शुल्क	वार्षिक यात्रा शुल्क निर्धारित समय में
कार/वीप/बैक का हल्के वाहन (कुल वजन 7500 किलो तक)	140	210
हल्के वाणिज्यिक वाहन का निर्भर बस (कुल वजन 7500 किलो से अधिक व 12000 किलो तक)	225	340
बस/ट्रक (सी एक्सएल) (कुल वजन 12000 किलो से अधिक व 16200 किलो तक)	475	710
वाणिज्यिक वाहन (सीएन एक्सएल) (कुल वजन 16200 किलो से अधिक व 25000 किलो तक)	515	775
हवी कंस्ट्रक्शन मशीनरी/अर्थ मूविंग मशीनरी/मलुमतीय वाहन (वार से ऊँ. एक्सएल) (कुल वजन 25000 किलो से अधिक व 54200 किलो तक)	745	1115
गामन्य से अधिक बड़े वाहन (वार से अधिक एक्सएल) (कुल वजन 54200 किलो से अधिक)	905	1355



Source(s): Site visits conducted in February/March 2024.

# Annexure 5g: Site pictures - ILTPL



National Highways Authority of India Toll Plaza-Chitora				
Toll Free For Stretch- From Km 99.005 To Km 415.089 of NH-44				
Category of Vehicle	Single Journey	Return Journey Within 24 Hrs (Fastag Only)	Monthly Pass 50 Trip	Local Commercial Vehicle Registered Within District Plaza
Car/ Jeep/ Van of LMV	150	225	5055	75
LCV/LGV/or Mini Bus	245	365	8150	120
Bus/Truck (Tow Axle)	510	777	17080	255
3Axle Commercial Vehicles	560	840	18635	280
HCM/EME/MAV (4-6 Axles)	805	1205	26785	400
Oversized Vehicles (7 Or More Axles)	980	1465	32610	490

Note: The Rate for Monthly Pass (For FY 2023-24) will be Rs. 330/- per month for the Local Non-Commercial Vehicle Registered within a distance of 20 Km. from the Toll Plaza



Source(s): Site visits conducted in February/March 2024.

Annexures

# Annexure 5g: Site pictures - IKTPL



Source(s): Site visits conducted in February/March 2024.

**8.**

# **Scope & Limitations**

# Scope & Limitations (1/3)

## Terms of Engagement

- KPMG Valuation Services LLP (“KPMG” or “we” or “us” or “Valuer”) has been appointed by IRB Infrastructure Trust (“IRBI Trust/Trust” or “the Company”), MMK Toll Road Private Limited (“Investment Manager”) and IDBI Trusteeship Services Limited (“Trustee”) (together referred as “the Clients” or “You”) in relation to carrying out Enterprise Valuation of 15 Special Purpose Vehicles (“SPVs” or “IRBI Trust Assets”) of IRBI Trust and Equity Valuation of IRBI Trust (jointly referred as “Targets”) as on the agreed date of the valuation in accordance with Regulation 21 of the Securities Exchange Board of India (Infrastructure Investment Trusts) Regulations, 2014 where valuation is required to be conducted by a registered valuer (as defined under section 247 of the Companies Act, 2013) and such valuation report (“Report”) is required to be in compliance with the SEBI InvIT Regulations (“Engagement” or “Valuation”).
- The terms of the Engagement are set out in our letter of engagement dated 17 September 2024 (“LoE”). This letter of engagement is preceded by signed undertaking dated 17 June 2024 (“Undertaking letter”) provided by us. As agreed, Undertaking letter shall be read in conjunction and shall form part of the aforesaid letter of engagement.
- The date of Valuation is 30 September 2024 (“Valuation Date”).
- This Report sets out KPMG’s conclusions on the Valuation and has been prepared in accordance with LoE. Our Report is confidential to the Clients and will be used by the Clients only for purposes mentioned in the LoE. The Report will be issued by us on the express understanding that it shall not be copied, disclosed or circulated or referred to in correspondence or discussion with any third party. This Report is confidential to the Clients and it is given on the express understanding that it is not communicated, in whole or in part, to any third party without KPMG’s prior written consent. Neither the Report nor its content may be used for any other purpose without prior written consent of KPMG. This Report has a limited scope as specified in it. KPMG will not accept any responsibilities to any other party to whom the Report may be shown or who may acquire a copy of the Report.
- We are not responsible to any other person/ party for any decision of such person/ party based on this Report. Any person/ party intending to provide finance/ invest in the shares/ businesses of the Targets/ their holding companies/ subsidiaries/ group companies, if any, shall do so after seeking their own professional advice and after carrying out their own due diligence procedures to ensure that they are making an informed decision. If any person/ party (other than the Clients) chooses to place reliance upon any matters included in the report, they shall do so at their own risk and without recourse to the Valuer. It is hereby notified that usage, reproduction, distribution, circulation, copying or otherwise quoting of this Report or any part thereof, except for the purpose as set out earlier in this report, without our prior written consent, is not permitted, unless there is a statutory or a regulatory requirement to do so.
- We are aware that the Report may have to be shared with certain regulatory authorities in India and stock exchanges in India and therefore Report may enter the public domain and hereby provide our consent to such sharing subject to the following:
  - You shall indemnify and hold us harmless against any loss that may be incurred by us arising out of or relating to sharing of the Report with regulatory authorities in India or stock exchanges in India, or the Report entering the public domain as mentioned herein, as also against all costs, charges and expenses (including legal expenses) suffered or incurred by us on account of the aforesaid. In this clause “us” shall include all Firm Persons and “you” shall include Other Beneficiaries (as these terms have been defined in the LoE).
  - Such Report shall be disclosed in full and strictly in such forms as KPMG has provided to the Clients without any deviation.
  - KPMG shall not be liable to any person or party for any reason and under any circumstances.
  - The readers of the Report shall not bring any claim against KPMG for matters arising out of or consequent upon disclosure of the Report.
  - The Report shall be issued with all the disclaimers as provided by KPMG at the time of issuance of the Report.

# Scope & Limitations (2/3)

## Disclosure of Interest/Conflict

- KPMG is not affiliated to IRBI Trust in any manner whatsoever. Further, KPMG does not have a prospective interest in the business which is the subject of this Report.
- KPMG's fee is not contingent on an action or event resulting from the analyses, opinions or conclusions in this Report.
- You are aware that KPMG is already providing/has provided valuation services to IRB InvIT Fund and IRBIDL. Notwithstanding the aforesaid past/ongoing relationship with you, we do not perceive any conflict in undertaking this engagement.
- We have previously carried out valuation of IRBI Trust and its SPVs as per SEBI InvIT Regulations in FY2024, pursuant to appointment as a registered valuer by IRBI Trust.

## Basis of Value

- The report has been prepared on the basis of "Fair Value" as at Valuation Date. The generally accepted definition of "Fair Value" is the value as applied between a hypothetical willing vendor and a hypothetical willing prudent buyer in an open market and with access to all relevant information.

## Premise of Value

- The report has adopted "Going Concern Value" as the premise of value in the given circumstances. The generally accepted definition of Going concern value is the value of a business enterprise that is expected to continue to operate in the future.
- The valuation has been performed as per internationally accepted valuation methodologies and in cognizance of international valuation standards and ICAI Valuation Standards 2018 issued by the Institute of Chartered Accountants of India.

## Scope and Limitations

- This Report is based on the information provided by the Clients and has been confirmed by the Clients. KPMG have not independently verified or checked the accuracy or timeliness of the same. KPMG have indicated within this Report the sources of the information presented and have satisfied ourselves, so far as possible, that the information presented is consistent with other information which is made available to us in the course of our work in accordance with the terms of this engagement letter. KPMG have not, however, sought to establish the reliability of the sources by reference to other evidence, except as may be specifically agreed in writing between us.
- KPMG has read, analyzed and discussed the financial information and underlying management assumptions pertaining to the Targets as provided by the Management of the Targets ("Management"). This information has been solely relied upon by KPMG for the Valuation.
- We have based our analysis on the historical audited financial statements of the Targets (other than ILTPL, IGTPPL and IKTPL) and provisional financial statements of the Targets for the period from 01 April 2024 to 30 September 2024. Additionally, our analysis is based on the business plan of the SPVs for the period from 1 October 2024 to the end of the concession periods of respective SPVs as provided by the Management ("Management Business Plan") and key underlying assumptions. Any changes in the assumptions or methodology used to consolidate the financial statements may significantly impact our analysis and therefore the Valuation.
- KPMG has read and analyzed but have not commented on the appropriateness of or independently verified the Management Business Plan and underlying data and assumptions and accordingly provided no opinion on the same. If there were any omissions, inaccuracies or misrepresentations of the information provided by the Management, this may have a material effect on our findings and therefore the Valuation.
- The realization of the projections in the Management Business Plan will be dependent on the continuing validity of assumptions on which it is based. Our analysis therefore will not and cannot be directed to providing any assurance about the achievability of the future plans. Since the projections relate to the future, actual results are likely to be different from the projected results because events and circumstances do not occur as expected and the differences may be material.

# Scope & Limitations (3/3)

- This Report makes reference to 'KPMG analysis'. This indicates only that we have (where specified) undertaken certain analytical activities on the underlying data to arrive at the information presented.
- Our work did not constitute an audit of the financial statements and accordingly, we do not express any opinion on the truth and fairness of the financial position as indicated in this Report. Our work did not constitute a validation of the financial statements of the Targets, and accordingly, we do not express any opinion on the same.
- We have carried out the Valuation based on Management Business Plan received. Our scope of work does not include any commercial / legal / technical due diligence or carrying out any environmental / technical feasibility analysis or comparison of Management Business Plan with approved budgets / annual operating plans of the Targets. We have relied on Management's representation on such considerations and any changes in the same may significantly impact our analysis and therefore the Valuation.
- Wherever applicable, we have relied upon the legal opinion document / affidavit copies provided by Management in relation to the current status of the projects. We have not carried out / sought any independent legal opinion, nor have we verified the accuracy of the legal opinion shared. Any discrepancy in the same may significantly impact our analysis and therefore the Valuation.
- Our opinion is based on prevailing market, economic, and other conditions at the Valuation Date. It should be appreciated that these conditions can change over relatively short periods of time, not only as a result of internal factors, but because of external factors, which could impact the value, either positively or negatively.
- For our analysis, we have relied on published and secondary sources of data, whether or not made available by the Clients. We have not independently verified the accuracy or timeliness of the same.
- Neither KPMG nor any of its affiliates worldwide are responsible for updating this Report because of events or transactions occurring subsequent to the date of this Report. Any updates or second opinions in this Report cannot be sought by the Management from external agencies including global offices of KPMG without the prior written permission of KPMG.
- KPMG has not considered any finding made by other external agencies in carrying out the Valuation analysis other than the one mentioned herein.
- For the purpose of the Valuation, our scope does not include valuation or legal due diligence of current assets and liabilities and as represented by the Management, the same has been considered at their respective book value.
- For the purpose of this Engagement and Report, we have made no investigation of, and assume no responsibility for the title to, or liabilities against the Targets. Our conclusion of value assumes that the title to the assets and liabilities of the Targets reflected in the financial statements as on Valuation Date is intact as at the date of this Report.
- Any discrepancies in any table/ annexure between the total and the sums of the amounts listed are due to rounding-off.
- The Report should be read in the light of these limitations, and we caution that had these matters been within the scope of our review, our conclusions may have changed, and that change could be material.
- The information presented in this Report does not reflect the outcome of any due diligence procedures. The reader is cautioned that the outcome of due diligence process could change the information herein and our Valuation, and that change could be material.
- This Report forms an integral whole and cannot be split in parts. The outcome of the Valuation can only lead to proper conclusions if the Report as a whole is taken into account.

## Management representation

- This Report is prepared on the basis of the sources of information listed in Annexure 1. KPMG has relied upon written representation by the Management that the information contained in the Report is materially accurate and complete, fair in its manner of portrayal and therefore forms a reliable basis for the Valuation.



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The information contained herein is of a general nature and is not intended to address the circumstances of any particular individual or entity. Although we endeavor to provide accurate and timely information, there can be no guarantee that such information is accurate as of the date it is received or that it will continue to be accurate in the future. No one should act on such information without appropriate professional advice after a thorough examination of the particular situation.

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**AGRA TO ETAWAH (KM 199.660 TO KM 323.525) SECTION OF NH-2 IN  
THE STATE OF UTTAR PRADESH.**



**OCTOBER 2024**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**



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**AGRA TO ETAWAH (KM 199.660 TO KM 323.525)**  
**SECTION OF NH-2 IN THE STATE OF**  
**UTTAR PRADESH.**

**TRAFFIC STUDY & REVENUE**  
**PROJECTION REPORT**  
**(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

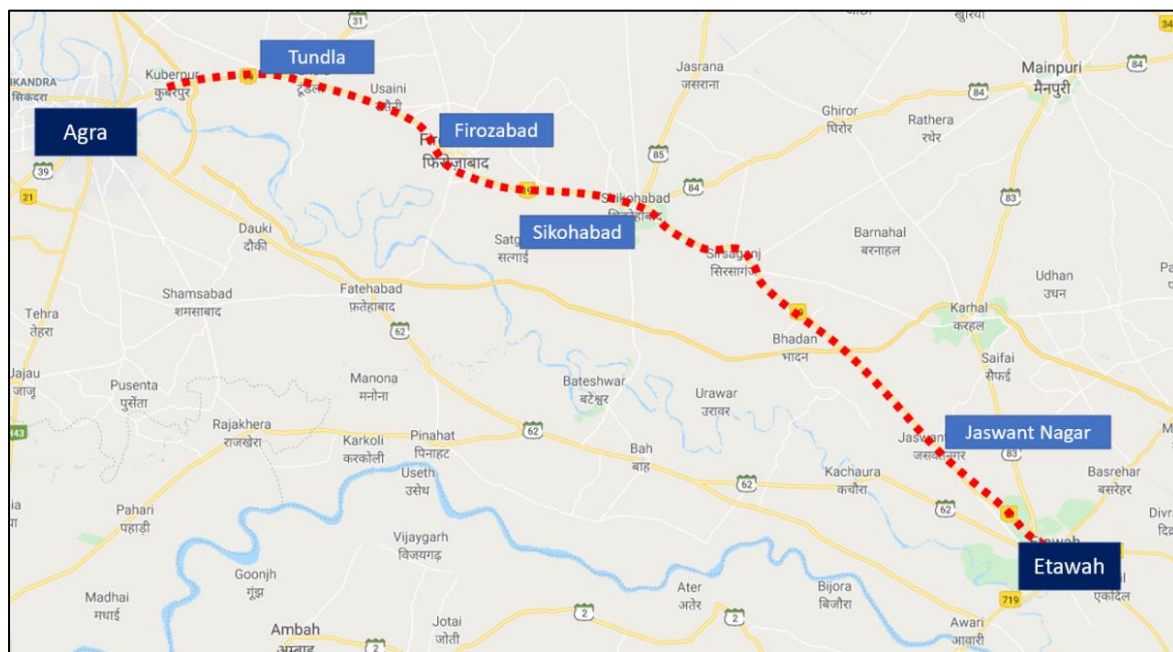
### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, **Agra to Etawah** section of NH-2 from km 199.660 to km 323.525 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s AE Tollway. Ltd.* (Concessionaire) has been awarded the Project for a concession period of 24 years starting from 1<sup>st</sup> August 2016. The Project has been commissioned and is currently in the operation / maintenance phase. Six Laning of project has also been completed in Nov 2020.

Length of project road is 123.865 Kms. The project road is section of NH-2, which starts from Delhi and ends at Kolkata and is a part of the Golden Quadrilateral Project. The project road section passes through the districts of Agra, Firozabad and Etawah.

Project road alignment passes through the towns/ built-up areas of Tundla, Firozabad, Shikohabad, Sirsaganj, & Jaswantnagar. The following figure shows alignment of project road section from Agra to Etawah.



**Figure 1-1: Alignment of Project Stretch**

### 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### **1.2.1 Scope of Services**

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

National Highway 2 (NH 2) which is now renumbered as NH-19 is oldest highway in India and connects state of Delhi, Haryana, Uttar Pradesh, Bihar, Jharkhand and West Bengal. It constitutes a major portion of the historical grand truck road.

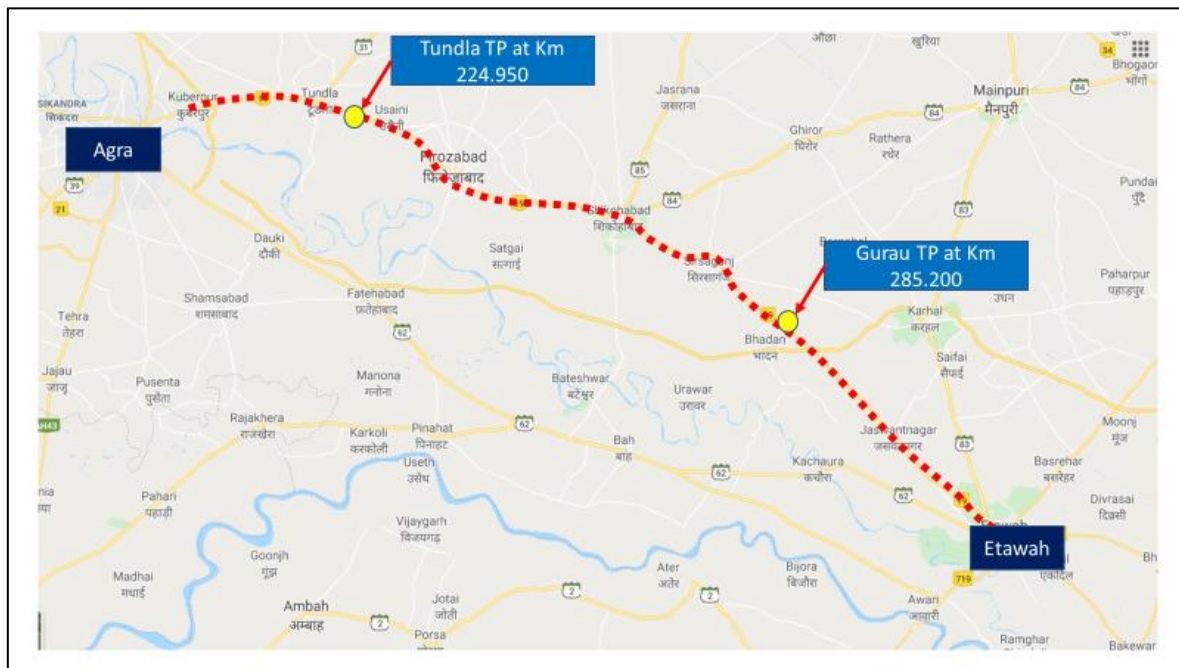
It connects the national capital Delhi to Kolkata, as well as important cities Mathura, Agra, Kanpur, Allahabad, Varanasi, Dhanbad, Asansol, Durgapur and Bardhaman. The highway is part of the Golden Quadrilateral project undertaken by National Highways Authority of India (NHAI).

The project road is a link between Agra and Kanpur in the state of Uttar Pradesh. The main project influence area of the project road consists of the three districts through which the project road passes. In addition, the project influence area includes the districts of Kanpur, Mathura and Aligarh also.

#### 2.2 Project Stretch Description

Section of NH-2 from Agra to Etawah is part of the major transportation link in the area connecting industrial cities of Agra- Kanpur and Lucknow. Important cities of Firozabad, Shikohabad, and Jaswant Nagar fall on project alignment. Firozabad has a famous glass work industry. Like other parts of India rapid ribbon development is happening around these cities on project highway. This also contributes to sustainable traffic growth.

There are two operative toll plazas at project stretch. The first is at Tundla at Km 224.950 and second at Gurau at Km 285.200. The following figure shows project alignment and toll plaza locations.



**Figure 2-1: Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Six laning of project stretch is complete. The following photographs illustrate the project section along the corridor.



**Figure 2-2: Photographs showing Project Corridor**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Agra- Etawah section of NH-2 for years 2017-18, 2018-19, 2019-20, 2020-21,2021-22,22-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 224.950 Toll Plaza at Tundla	AADT for Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 &

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		April 2024 to July 2024	month from April 2024 to July 2024	month from April 2024 to July 2024	month from April 2024 to July 2024	Four month from April 2024 to July 2024
2	Km 285.200 Toll Plaza at Gurau	AADT for Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024

Toll plaza no. 1 & 2 are located in Uttar Pradesh.

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)

Vehicle Type	
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

*Source - IRC: 64 – 1990*

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Bus
- Truck
- 3-Axle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Gurau Toll Plaza at Km 285.200**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2071	3535	5268	3371	3525	3615

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
2	LCV	1097	1286	919	748	742	728
3	Bus	494	492	635	530	559	527
4	Truck	891	1100	1351	1410	1532	1547
5	3-Axle	901	909	882	839	826	727
6	Multi Axle	1426	1760	2138	2386	2685	2853
7	Oversize Vehicle	11	8	4	10	10	8
	<b>Total</b>	<b>6892</b>	<b>9090</b>	<b>11197</b>	<b>9292</b>	<b>9880</b>	<b>10004</b>

*Table 3-4 : Traffic Data at Tundla Toll Plaza at Km 224.950*

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	8324	5849	7347	8954	9575	10010
2	LCV	1917	1514	1012	1082	1067	1053
3	Bus	1148	777	856	1181	1328	1225
4	Truck	1309	1272	1506	1775	1957	1987
5	3-Axle	955	948	924	887	879	799
6	Multi Axle	1255	1725	2179	2372	2764	2911
7	Oversize Vehicle	10	11	8	10	10	9
	<b>Total</b>	<b>14918</b>	<b>12096</b>	<b>13832</b>	<b>16260</b>	<b>17580</b>	<b>17994</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 3-5.

**Table 3-5 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

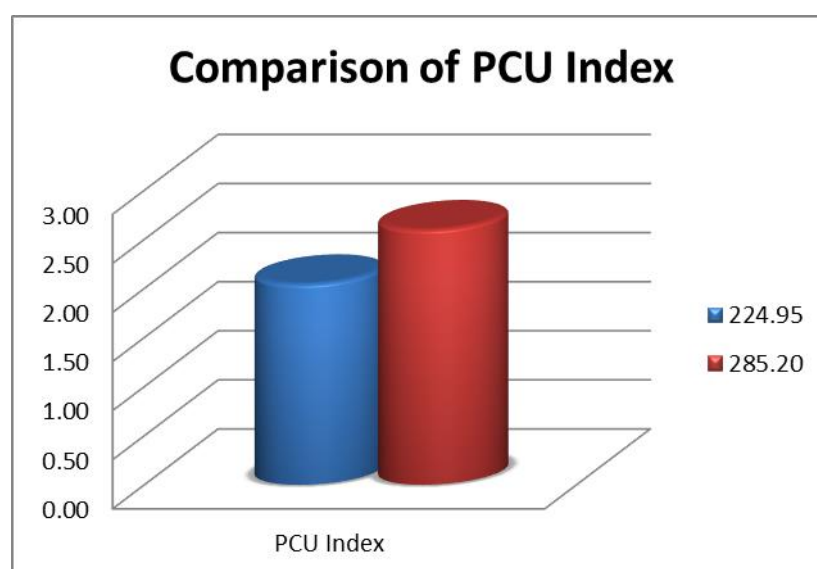
Traffic volume at each toll plaza was converted to PCU and same is presented as under

**Table 3-6 : Traffic in PCU at Project Stretch Base Year 2023-24**

Year	Toll Plaza Location (Km)	Traffic No.	PCU	PCU Index
2019-2020	Gurau Km 285.200	6892	17043	2.47
	Tundla Km 224.950	14918	27128	1.82

Year	Toll Plaza Location (Km)	Traffic No.	PCU	PCU Index
2020-2021	Gurau Km 285.200	9090	20922	2.30
	Tundla Km 224.950	12096	24923	2.06
2021-2022	Gurau Km 285.200	11197	24889	2.22
	Tundla Km 224.950	13832	28565	2.07
2022-2023	Gurau Km 285.200	9292	23606	2.54
	Tundla Km 224.950	16260	32820	2.02
2023-2024	Gurau Km 285.200	9880	25521	2.58
	Tundla Km 224.950	17580	36151	2.06
2024-2025	Gurau Km 285.200	10004	25981	2.60
	Tundla Km 224.950	17994	36761	2.04

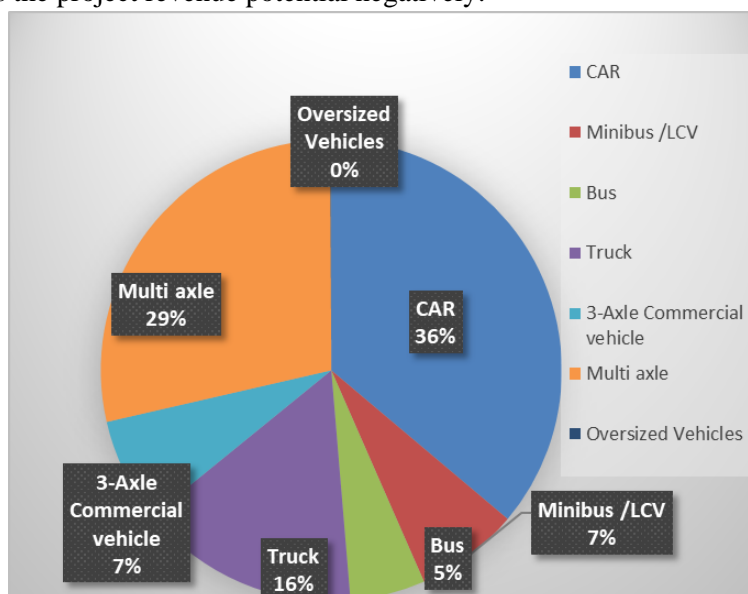
It can be observed from above that project traffic has PCU index close to 2.5 at Guarau which is an indicator of high proportion of commercial traffic in traffic mix. At Tundla the index is more toward passenger traffic due to urban impact. The following figure illustrates variation of PCU index at two toll plaza locations.



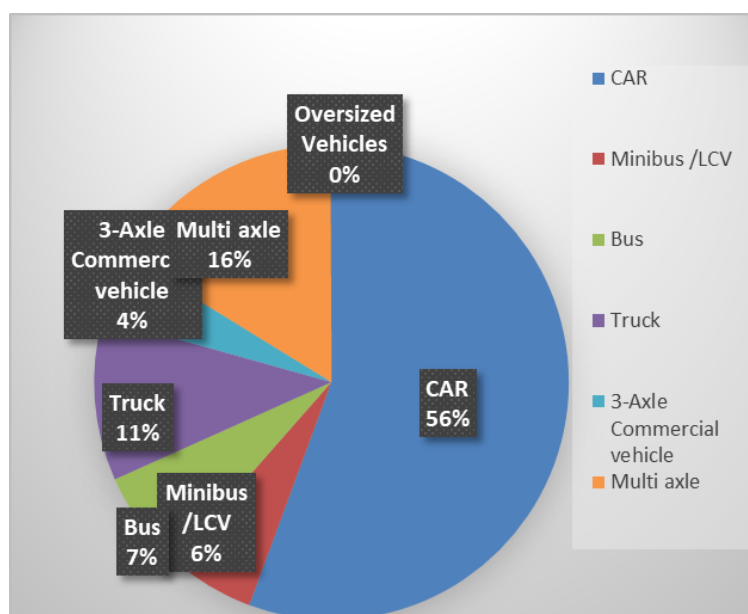
**Figure 3-1: Comparison of PCU Index**

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-2 :Model Split of Tollable Vehicle-Km 285.200**



**Figure 3-3 :Model Split of Tollable Vehicle-Km 224.950**

It is observed that car traffic forms about 36% of total traffic at Gurau toll plaza location while multi axle commercial vehicles and trucks are about 64% of total traffic.

While at Tundla toll plaza car share rises to 56% and commercial vehicles multi axle and trucks share about 44%. This is due to the presence of strong urban impact of Tundla.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

#### 1. Single Journey

2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-7 : Journey Type Bifurcation of Traffic at Gurau Toll Plaza KM 285.200**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	6854
2	Return Journey	3126
3	Local Commercial Single Journey	13
4	Monthly Pass Local	11
5	Monthly Pass	0

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 69%. Return journey component is 31%.

The following tables give the details of journey distribution at Tundla toll plaza at Km 224.950.

**Table 3-8 : Journey Type Bifurcation of Traffic at Tundla Toll Plaza KM 224.950**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	8752
2	Return Journey	8935
3	Local Commercial Single Journey	114
4	Monthly Pass Local	185
5	Monthly Pass	8

At Tundla toll plaza single journey share drops to 49% while return share is 50% respectively. Monthly pass is 0% and Local 1%.

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

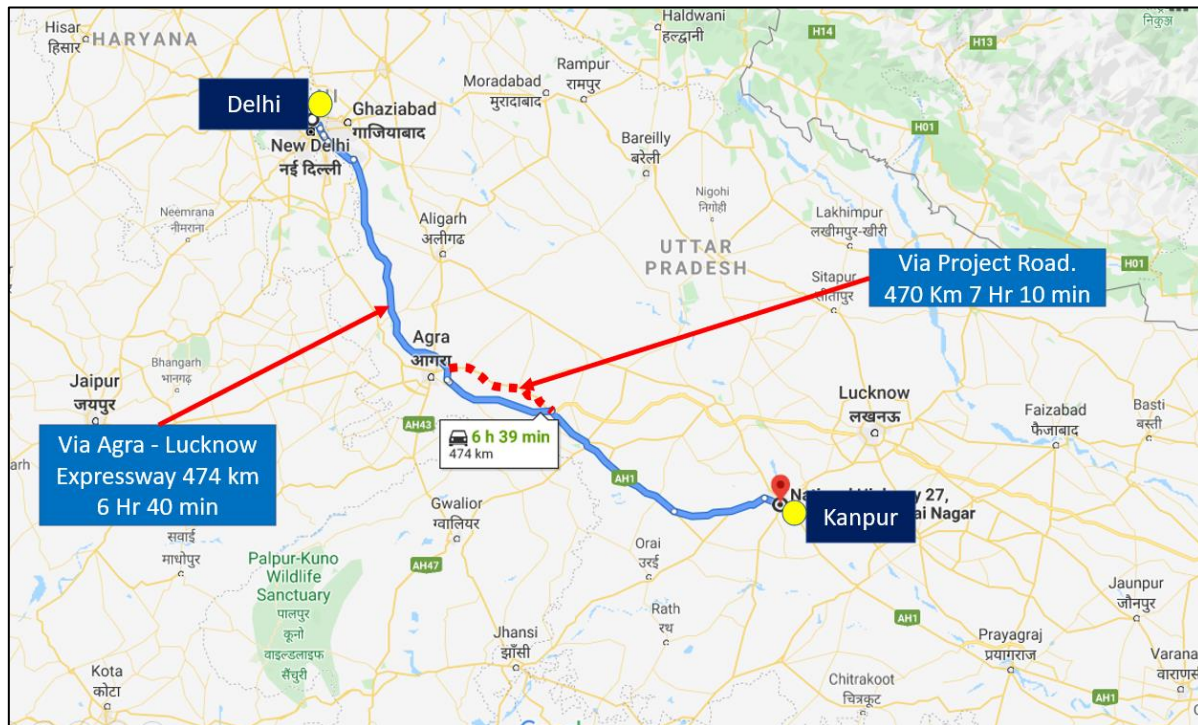
- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

Project stretch has toll application history from last few years, and it can be assumed that project traffic is settled. However, from an analysis point of view there can be one alternate route using Agra Lucknow Expressway at local level.

At the regional level, this route connects Delhi to Kanpur and then goes towards Prayagraj and West Bengal. Most obvious alternate route is through Lucknow - Agra Expressway again.

The following maps show these routes in relation to project stretches at both local and regional level.



**Figure 4-1: Alternate route at regional level.**



**Figure 4-2: Alternate route at local level.**

It can be observed that the project highway forms one of the main spines of the corridor between Agra and Etawah. Agra – Lucknow Expressway is a faster connectivity for obvious regions. It's been in operation for the last few years and most of the traffic which had potential of diversion had done so. Traffic on project road is now settled and it can be assumed as dedicated traffic on project road for logistic obligations. With six laning now complete, project stretch has become slightly more attractive due to the improved level of service.

At regional level also the difference between two alignment is only of Agra- Lucknow Expressway. Hence there too, regional level traffic is expected to have settled.

The following table provides summary of analysis of alternate route/ roads discussed above.

**Table 4-1 : Competing Roads Details**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
<b>Regional Level</b>						
1	Delhi to Kanpur Via Agra- Lucknow Expressway	Alternate Route	474	70	6 Hr 40 Min	Alternate route running for years after toll on project road.
	Delhi to Kanpur Via Project Road (NH-19)	Project Road	470	65	7 Hr 10 Min	Traffic Settled. No further diversion expected
<b>Local Level</b>						
2	Agra to Etawah Via Agra- Lucknow Expressway	Alternate Route	123	65	1 Hr. 52 Min	Alternate route running for years after toll on project road.
	Agra to Etawah Via Project Road (NH-19)	Project Road	129	50	2 Hr. 30 Min	Traffic Settled. No further diversion expected

Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road. Further, it may be noted that during its construction phase, the project road had many bottlenecks like Firozabad bypass etc. Due to this part of traffic preferred Agra Lucknow expressway over project road despite higher toll tariff at Agra – Lucknow Expressway. Now as these bottlenecks are removed it is expected that some part of traffic would return to Project Corridor due to improved level of service and low toll fee as compared to Agra – Lucknow Expressway.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Surat- Dahisar section of NH-8 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

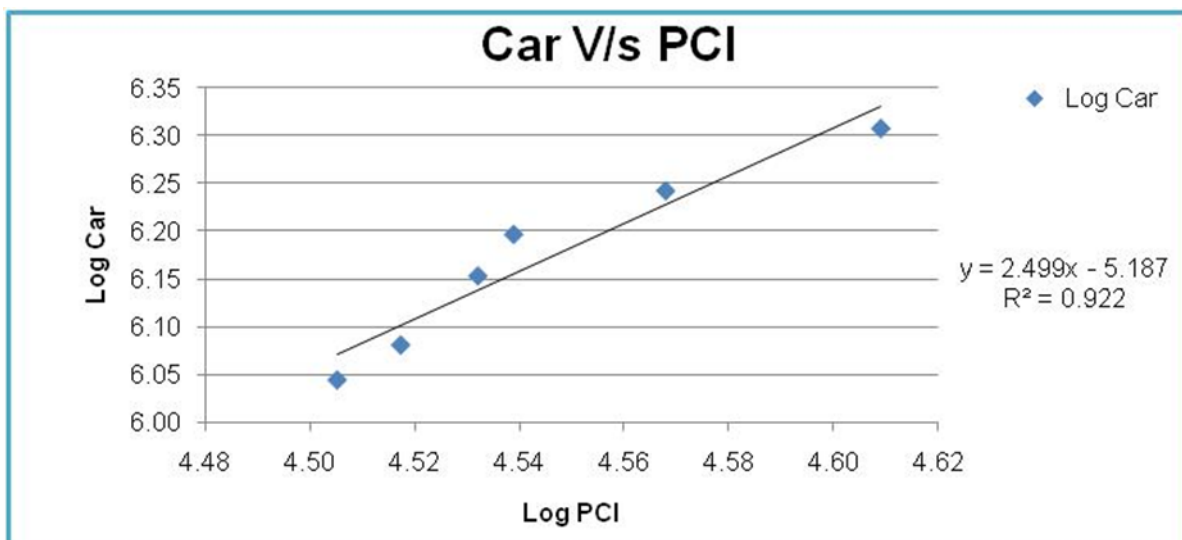
The project corridor spreads across the state of Uttar. Toll plazas at Tunda and Gurau are in the state of Uttar Pradesh. Project corridor has certain impact of traffic from Delhi, and Haryana also. For elasticity calculations, working data from these states has been analyzed.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Uttar Pradesh State.

**Table 5-1 : Per Capita Income Vs Car Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	32002	1108100	4.51	6.04		
2013	32908	1205374	4.52	6.08	3%	
2014	34044	1423020	4.53	6.15	3%	
2015	34583	1572217	4.54	6.20	2%	
2016	36973	1746117	4.57	6.24	7%	
2017	40641	2027972	4.61	6.31	10%	4.94%

Regression analysis of same is given in figure below.

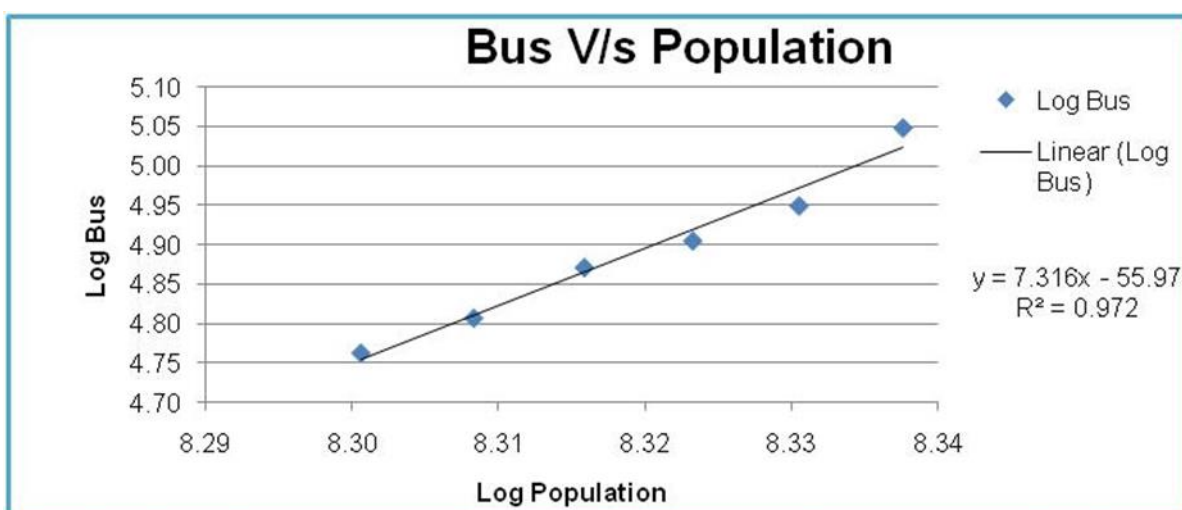


**Figure 5-1: Regression and Elasticity PCI vs. Car-Extrapolation Uttar Pradesh**

**Table 5-2 : Population Vs Bus Uttar Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	199812341	57901	8.30	4.76		
2013	203382046	64147	8.31	4.81	2%	
2014	206942855	74389	8.32	4.87	2%	
2015	210493544	80460	8.32	4.91	2%	
2016	214032922	89127	8.33	4.95	2%	
2017	217559836	112020	8.34	5.05	2%	1.72%

Regression analysis of same is given in figure below.



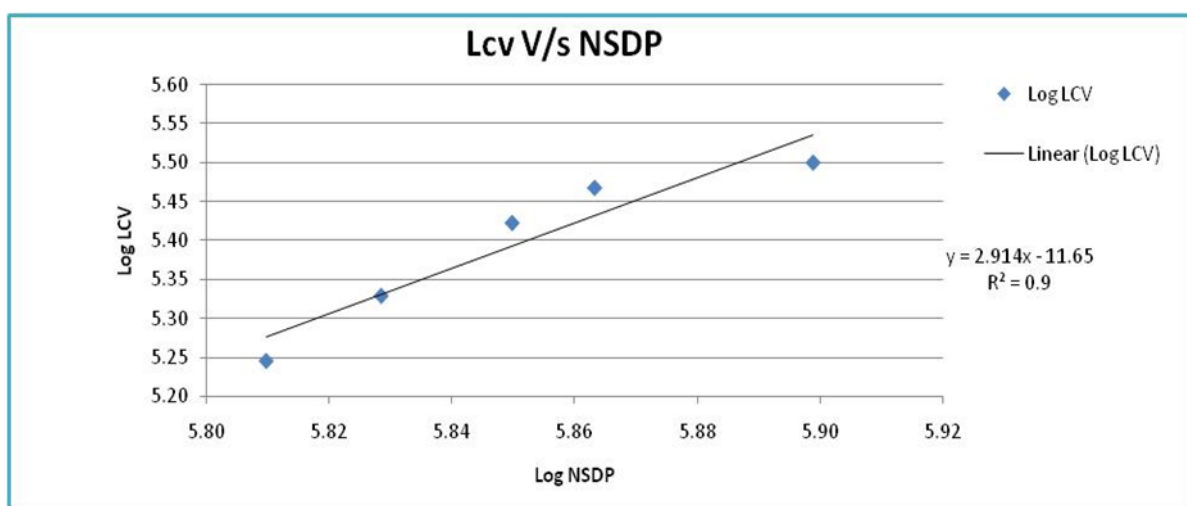
**Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh**

The elasticity of goods traffic has been worked out by regression analysis with NSDP.  
The following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	645132	176164	5.81	5.25		
2013	673552	213657	5.83	5.33	4%	
2014	707469	265025	5.85	5.42	5%	
2015	729686	294022	5.86	5.47	3%	
2016	792049	316815	5.90	5.50	9%	5.28%

The following figure depicts regression analysis and extrapolation.

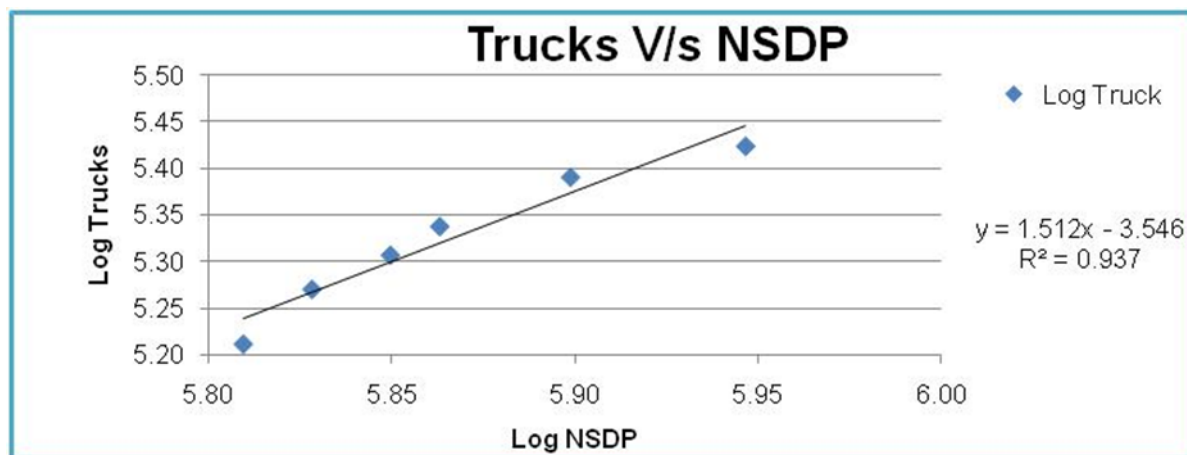


**Figure 5-3: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Uttar Pradesh.**

**Table 5-4 : Truck Traffic Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	645132	162813	5.81	5.21		
2013	673552	186404	5.83	5.27	4%	
2014	707469	202761	5.85	5.31	5%	
2015	729686	217609	5.86	5.34	3%	
2016	792049	245688	5.90	5.39	9%	
2017	883962	265167	5.95	5.42	12%	6.55%

The following figure depicts regression analysis and extrapolation.



**Figure 5-4: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Uttar Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-5 : Summary Regression Analysis Uttar Pradesh**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Uttar Pradesh	Car/Jeep	PCI	$y = 2.499x + -5.1874$	$R^2 = 0.922$	2.4990	4.94%	12.34%	Good Regression
	Bus	Population	$y = 7.3167x - 55.9791$	$R^2 = 0.9726$	7.3167	1.72%	12.56%	Good Regression
	LCV	NSDP	$y = 2.9149x - 11.6585$	$R^2 = 0.9$	2.9149	5.28%	15.40%	Good Regression
	Truck	NSDP	$y = 1.5121x - 3.5463$	$R^2 = 0.9373$	1.5121	6.55%	9.90%	Good Regression

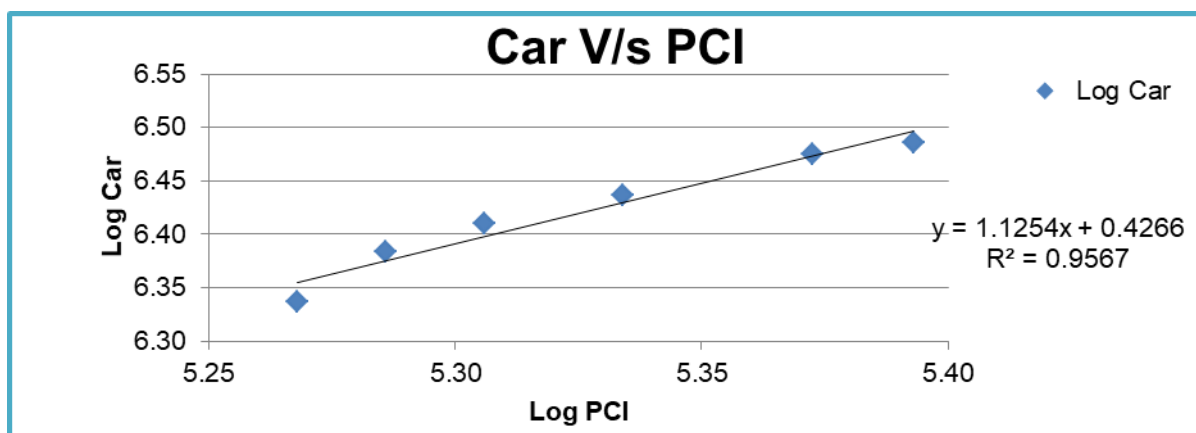
The following tables and graphs depict regression and elasticity of growth model for stretch falling in Delhi State.

**Table 5-6 : Per Capita Income Vs Car Delhi**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	185361	2172069	5.27	6.34		
2013	193175	2416974	5.29	6.38	4%	

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2014	202216	2568380	5.31	6.41	5%	
2015	215726	2730071	5.33	6.44	7%	
2016	235737	2986579	5.37	6.48	9%	
2017	247255	3061817	5.39	6.49	5%	5.95%

Regression analysis of same is given in figure below.

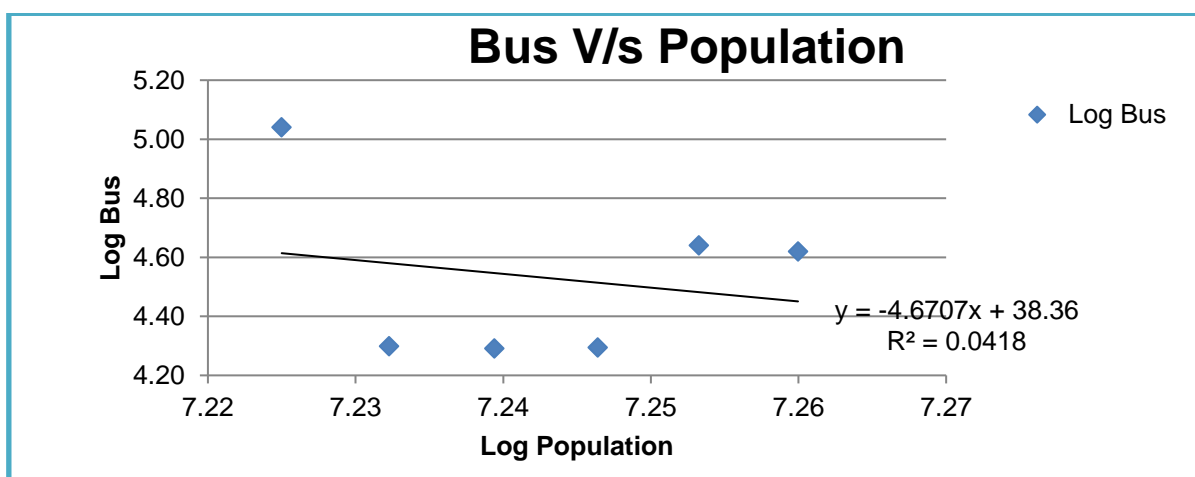


*Figure 5-5: Regression and Elasticity PCI vs. Car–Extrapolation Delhi*

*Table 5-7 : Population Vs Bus Delhi*

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	16787941	109790	7.22	5.04		
2013	17071599	19917	7.23	4.30	2%	
2014	17354281	19595	7.24	4.29	2%	
2015	17635897	19700	7.25	4.29	2%	
2016	17916359	43723	7.25	4.64	2%	
2017	18195583	41686	7.26	4.62	2%	1.62%

Regression analysis of same is given in figure below.



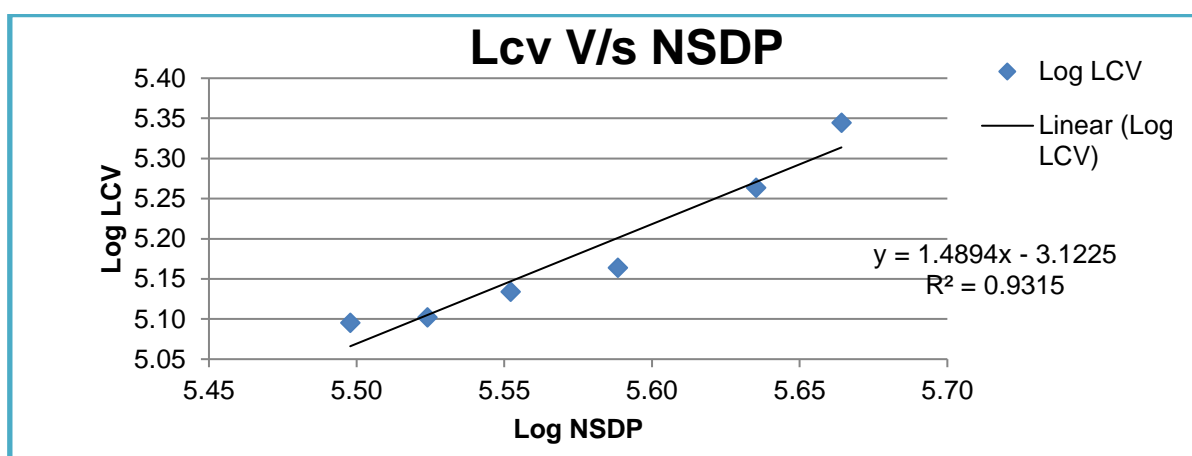
*Figure 5-6: Regression and Elasticity Population vs. Bus – Extrapolation Delhi*

The elasticity of goods traffic has been worked out by regression analysis with NSDP.  
The following table represents the data and details.

**Table 5-8 : LCV Traffic Vs NSDP Delhi**

Year	NSDP	LCV	Log NDSP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	314650	124547	5.50	5.10		
2013	334193	126539	5.52	5.10	6%	
2014	356528	136110	5.55	5.13	7%	
2015	387639	145903	5.59	5.16	9%	
2016	431730	183486	5.64	5.26	11%	
2017	461476	221068	5.66	5.34	7%	7.98%

The following figure depicts regression analysis and extrapolation.

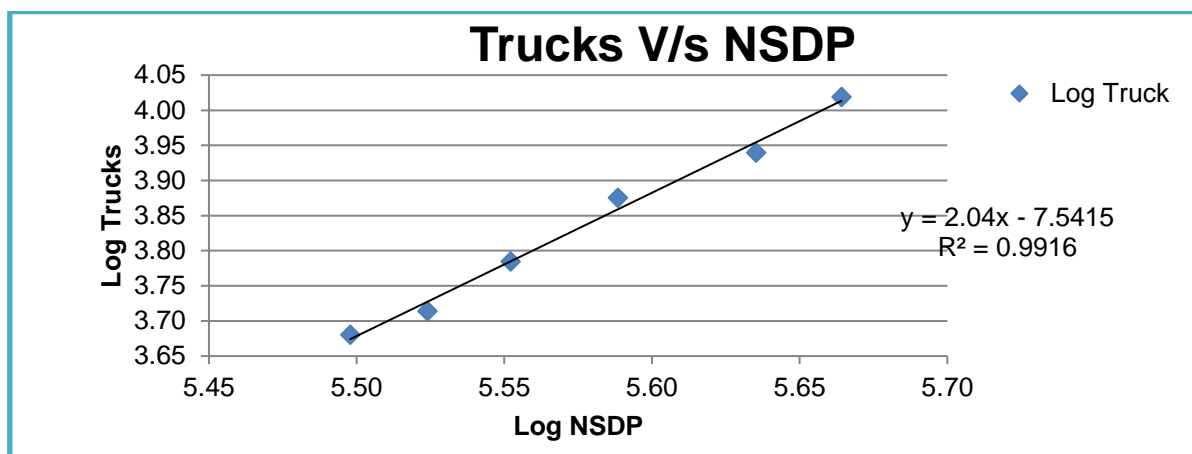


**Figure 5-7: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Delhi.**

**Table 5-9 : Truck Traffic Vs NSDP Delhi**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	314650	4792	5.50	3.68		
2013	334193	5176	5.52	3.71	6%	
2014	356528	6093	5.55	3.78	7%	
2015	387639	7503	5.59	3.88	9%	
2016	431730	8703	5.64	3.94	11%	
2017	461476	10440	5.66	4.02	7%	7.98%

The following figure depicts regression analysis and extrapolation.



**Figure 5-8: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Delhi.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-10 : Summary Regression Analysis Delhi**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Delhi	Car/Jeep	PCI	$y = 1.1254x + 0.4266$	$R^2 = 0.9567$	1.1254	5.95%	6.69%	Good Regression
	Bus	Population	$y = -4.6707x - 38.36$	$R^2 = 0.0418$	-4.6707	1.62%	-7.58%	Poor Regression
	LCV	NSDP	$y = 1.4894x - 3.1225$	$R^2 = 0.9315$	1.4894	7.98%	11.88%	Good Regression
	Truck	NSDP	$y = 2.04x - 7.5415$	$R^2 = 0.9916$	2.0400	7.98%	16.27%	Good Regression

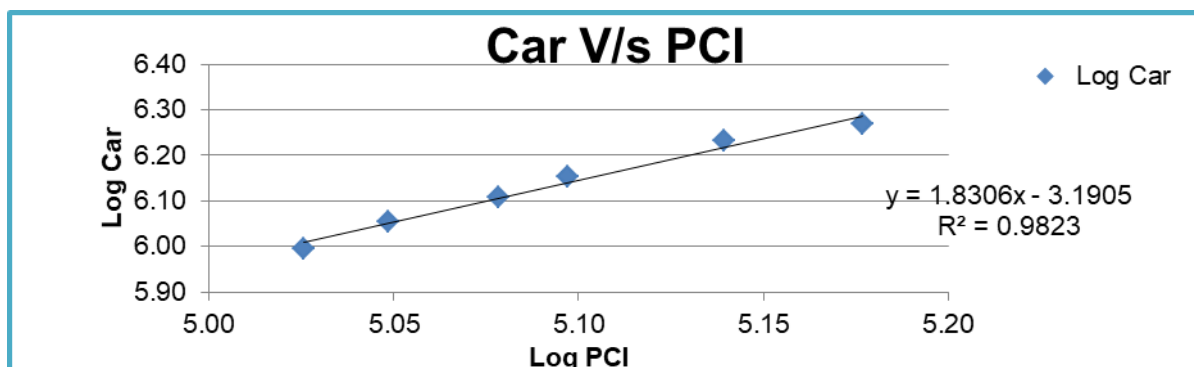
The following tables and graphs depict regression and elasticity of growth model for stretch falling in Haryana State.

**Table 5-11 : Per Capita Income Vs Car Haryana**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	106085	989519	5.03	6.00		
2013	111780	1134616	5.05	6.05	5%	
2014	119791	1278272	5.08	6.11	7%	
2015	125032	1420621	5.10	6.15	4%	

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2016	137818	1711692	5.14	6.23	10%	
2017	150241	1851788	5.18	6.27	9%	7.23%

Regression analysis of same is given in figure below.

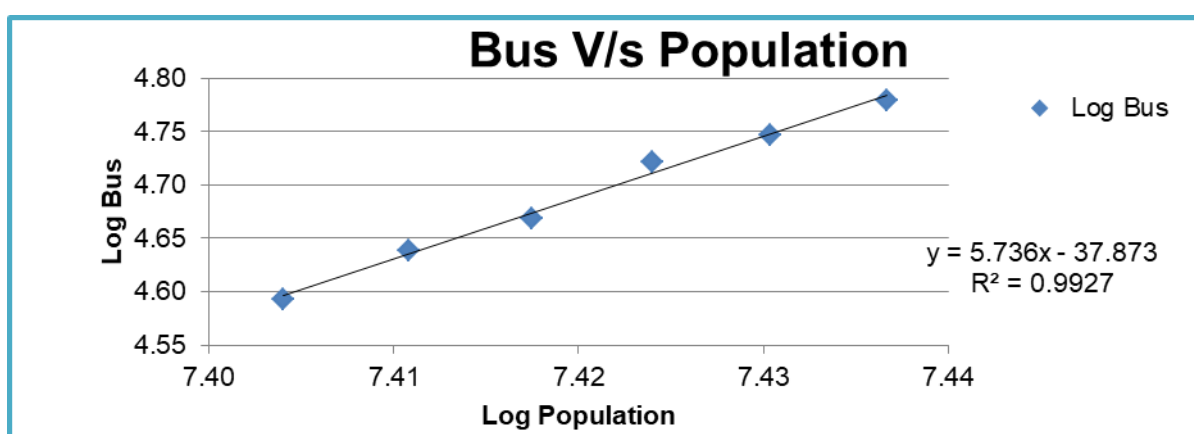


**Figure 5-9: Regression and Elasticity PCI vs. Car–Extrapolation Haryana**

**Table 5-12 : Population Vs Bus Haryana**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	25351462	39153	7.40	4.59		
2013	25751257	43456	7.41	4.64	2%	
2014	26149236	46558	7.42	4.67	2%	
2015	26545282	52640	7.42	4.72	2%	
2016	26939286	55781	7.43	4.75	1%	
2017	27331141	60129	7.44	4.78	1%	1.52%

Regression analysis of same is given in figure below.



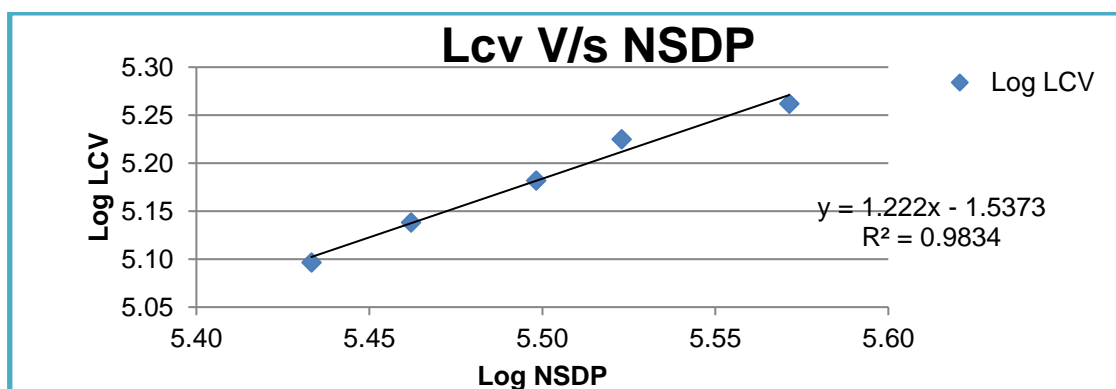
**Figure 5-10: Regression and Elasticity Population vs. Bus – Extrapolation Haryana**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-13 : LCV Traffic Vs NSDP Haryana**

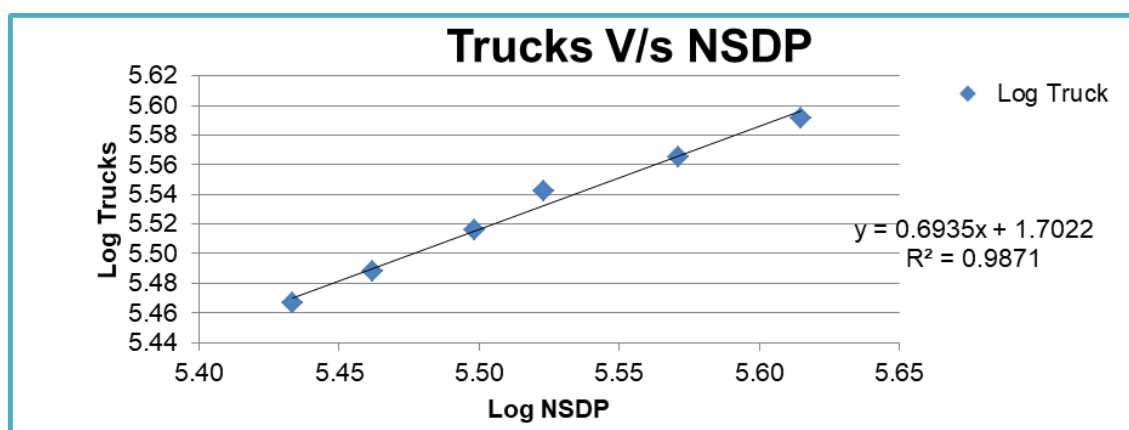
Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	271152	124897	5.43	5.10		
2013	289756	137511	5.46	5.14	7%	
2014	314931	152069	5.50	5.18	9%	
2015	333359	167901	5.52	5.23	6%	
2016	372659	182776	5.57	5.26	12%	

The following figure depicts regression analysis and extrapolation.

**Figure 5-11: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Haryana.****Table 5-14 : Truck Traffic Vs NSDP Haryana**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	271152	292735	5.43	5.47		
2013	289756	307509	5.46	5.49	7%	
2014	314931	327882	5.50	5.52	9%	
2015	333359	348732	5.52	5.54	6%	
2016	372659	367730	5.57	5.57	12%	
2017	412006	390321	5.61	5.59	11%	8.75%

The following figure depicts regression analysis and extrapolation.



**Figure 5-12: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Haryana.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-15 : Summary Regression Analysis Haryana**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Haryana	Car/Jeep	PCI	$y = 1.8306x + -3.1905$	$R^2 = 0.9823$	1.8306	7.23%	13.24 %	Good Regression
	Bus	Population	$y = 5.736x - 37.8732$	$R^2 = 0.9927$	5.7360	1.52%	8.69%	Good Regression
	LCV	NSDP	$y = 1.222x - 1.5373$	$R^2 = 0.9834$	1.2220	8.30%	10.14 %	Good Regression
	Truck	NSDP	$y = 0.6935x - 1.7022$	$R^2 = 0.9871$	0.6935	8.75%	6.07%	Good Regression

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Agra to Etawah has recently been commissioned and is under tolling operation since 2016-17. As traffic data is available with the project concessionaire of three years, we do not have sufficient data points to be able to establish a reliable past trend of traffic growth. Moreover, the part two years traffic is affected by COVID-19 impact. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

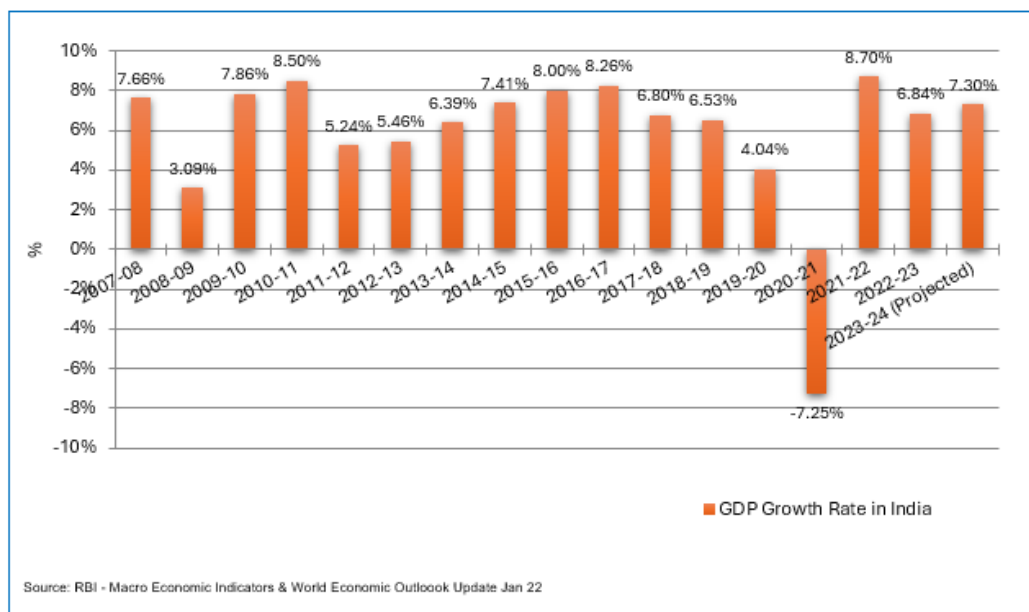
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

## ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-13 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In-India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

### 5.6 Developments along and around the Project Corridor & State

Though the growth of Delhi has been consistently below the national average economic growth, it is the largest state in terms of population and consumption driven demand for goods and services will remain significantly high. The rate of growth of NSDP also seems to be catching up with the national average over the years. Other regions in the influenced area states, namely Delhi, Haryana and Uttarakhand are all growing significantly faster than the national average. Considering the scenario, it may be assumed that the traffic

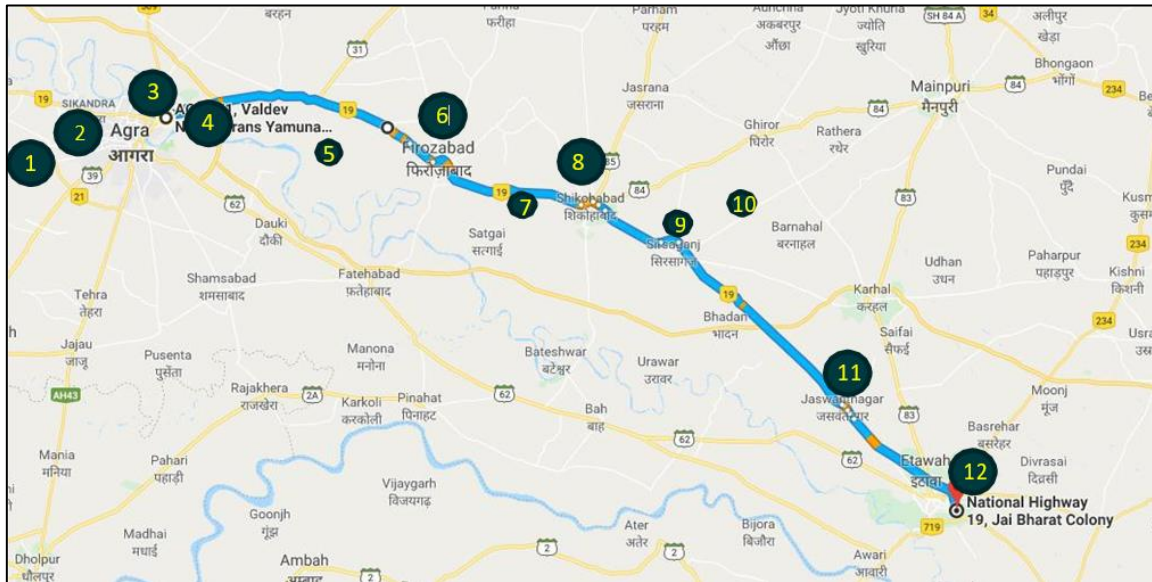
growth on the project highway would remain high and there are minimal risks in terms of growth.

**Table 5-16 : GDP of India, UP and other important states**

Year	India (GDP)	Bihar	Haryana	Madhya Pradesh	Maharashtra	Odisha	Punjab	Rajasthan	Uttar Pradesh	Uttarakhand	West Bengal	Delhi
1980-81	12336	514	357	623	1464	529	504	560	1631	138	830	269
1981-82	13030	543	371	639	1498	528	551	607	1670	141	808	291
1982-83	13411	548	394	668	1556	497	568	620	1800	152	840	328
1983-84	14464	601	402	702	1654	597	578	761	1871	158	939	320
1984-85	15037	658	418	668	1675	569	623	706	1900	161	964	333
1985-86	15663	672	493	726	1807	635	670	704	1975	167	1005	386
1986-87	16339	725	493	694	1832	643	694	771	2060	174	1045	411
1987-88	16917	685	484	789	1955	623	730	718	2154	182	1101	447
1988-89	18635	772	602	847	2159	754	769	1014	2434	206	1148	486
1989-90	19778	759	610	865	2515	805	834	993	2502	212	1188	531
1990-91	20824	831	674	987	2629	668	849	1149	2651	224	1251	553
1991-92	21122	784	688	916	2620	753	888	1061	2662	225	1349	638
1992-93	22254	737	688	983	3017	740	930	1220	2690	228	1389	660
1993-94	23519	755	719	1088	3349	788	970	1121	2757	233	1490	705
1994-95	25023	842	771	1107	3414	826	995	1325	2901	254	1594	790
1995-96	26846	712	787	1174	3791	864	1032	1374	2995	251	1713	804
1996-97	28987	893	879	1252	3941	804	1107	1535	3327	267	1832	915
1997-98	30234	850	887	1318	4158	920	1137	1721	3292	270	1985	1063
1998-99	32255	904	934	1405	4324	948	1203	1797	3316	274	2112	1116
1999-00	34837	950	1002	1552	4735	1008	1267	1801	3440	274	2264	1170
2000-01	36282	1106	1081	1426	4589	982	1309	1743	3511	308	2343	1215
2001-02	38236	1043	1165	1528	4751	1042	1326	1941	3575	323	2512	1262
2002-03	39719	1175	1236	1449	5079	1034	1348	1708	3690	353	2600	1359
2003-04	42883	1099	1358	1611	5471	1185	1433	2251	3885	381	2753	1433
2004-05	45906	1238	1475	1664	5948	1340	1504	2196	4079	431	2936	1588
2005-06	50257	1207	1608	1748	6810	1399	1577	2344	4317	492	3121	1752
2006-07	55066	1416	1791	1907	7748	1574	1748	2620	4660	551	3366	1969
2007-08	60199	1489	1931	1997	8650	1708	1899	2739	4959	648	3627	2191
2008-09	64248	1716	2080	2250	8786	1837	2004	2969	5336	716	3774	2464
2009-10	69769	1798	2340	2463	9634	1852	2132	3142	5668	839	4067	2667
2010-11	75987	2073	2498	2592	10732	1968	2270	3614	6120	927	4313	2888
2011-12	81069	2285	2712	2824	11222	2042	2392	3953	6451	1020	4471	3147
2012-13	85463	2369	2894	3069	11842	2163	2518	4098	6736	1095	4838	3342
2013-14	90636	2469	3142	3226	12671	2331	2675	4343	7075	1178	5247	3565
2014-15	97121	2557	3314	3394	13322	2359	2777	4656	7297	1257	5633	3882
2015-16	105033	2749	3612	3597	14417	2557	2926	4981	7894	1355	-	4291
2016-17	112476	3033	3927	4129	15744	2828	3095	5352	8457	1448	-	4658
2017-18	119762	-	-	4432	-	3029	-	5736	9011	1547	-	5035
Growth 1981-2018	6.34	5.05	6.88	5.44	6.82	4.83	5.17	6.49	4.73	6.75	5.79	8.24
Growth 1994-2018	7.02	6.23	7.66	6.03	6.96	5.77	5.17	7.04	5.06	8.20	6.54	8.53
Growth 2000-2018	7.10	7.07	8.37	6.00	7.32	6.30	5.40	6.65	5.50	10.10	6.27	8.45

## 5.7 Industrial Units along Project Corridor

There are a number of big and small industrial units along the project corridor. The following figure shows some of these along corridors.



**Figure 5-14 : Industrial Units along project corridor.**

The following is the list of industrial units along the project corridor.

1. Leather Park, **Agra**
2. Export Promotional Industrial Park (EPIP)
3. Foundry Nagar (BK Casting, Agricultural Industries, Paint Industries, Plastic Industries, Metal Industries), **Agra**
4. Industrial Estate, **Agra**
5. Agarbatti Industry
6. Glass Industries, **Firozabad**
7. Pipe Industries, Glass Bulb Industries
8. Agro Industries, Glass Industries, Cold Storage
9. Food Processing Industries
10. PVC Pipe Industries
11. Rural Industrial Estate, **Jaswant Nagar**
12. **Etawah** (Caplock Industries Private Limited, Rice Mills)

Such industries along project corridor and urban development around major cities of Firozabad, Tundla, Shikohabad, Jaswantnagar and Etawah provide impetus to project traffic on corridor.

## 5.8 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. Same growth rate is not sustainable for long. Hence growth rates have been suitably stepped down in future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation from Most Likely case for corridor in both states.

### 5.8.1 Recommended Growth Rates of Traffic for Project Stretch

*Table 5-17 : Recommended Growth Rates Optimistic*

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.96%	8.75%	8.71%	7.42%	6.23%	5.15%
Bus	4.86%	4.70%	4.68%	3.29%	2.58%	1.95%
LCV	5.91%	5.71%	5.65%	4.63%	3.71%	3.16%
2- Axle	6.25%	6.07%	6.01%	5.06%	4.20%	3.42%
3 - Axle	6.59%	6.39%	6.33%	5.32%	4.41%	3.59%
4 to 6 Axle	6.93%	6.72%	6.64%	5.58%	4.62%	3.76%
7 and Above Axle	6.93%	6.72%	6.64%	5.58%	4.62%	3.76%

*Table 5-18 : Recommended Growth Rates Pessimistic*

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.46%	8.25%	8.21%	6.92%	5.73%	4.65%
Bus	4.36%	4.20%	4.18%	2.79%	2.08%	1.45%
LCV	5.41%	5.21%	5.15%	4.13%	3.21%	2.66%
2- Axle	5.75%	5.57%	5.51%	4.56%	3.70%	2.92%
3 - Axle	6.09%	5.89%	5.83%	4.82%	3.91%	3.09%
4 to 6 Axle	6.43%	6.22%	6.14%	5.08%	4.12%	3.26%
7 and Above Axle	6.43%	6.22%	6.14%	5.08%	4.12%	3.26%

*Table 5-19 : Recommended Growth Rates Most Likely*

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.71%	8.50%	8.46%	7.17%	5.98%	4.90%
Bus	4.61%	4.45%	4.43%	3.04%	2.33%	1.70%
LCV	5.66%	5.46%	5.40%	4.38%	3.46%	2.91%
2- Axle	6.00%	5.82%	5.76%	4.81%	3.95%	3.17%
3 - Axle	6.34%	6.14%	6.08%	5.07%	4.16%	3.34%
4 to 6 Axle	6.68%	6.47%	6.39%	5.33%	4.37%	3.51%
7 and Above Axle	6.68%	6.47%	6.39%	5.33%	4.37%	3.51%

Traffic and revenue have been worked out on the basis of the above growths and some are presented in subsequent chapters of the report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 224.95 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	10010	1053	1225	1987	799	2911	9	17994	36761
2025-26	10886	1113	1282	2106	849	3107	9	19352	39289
2026-27	11839	1177	1342	2234	904	3316	9	20821	42007
2027-28	12876	1244	1405	2370	962	3539	9	22405	44919
2028-29	14003	1315	1471	2514	1024	3777	9	24113	48040
2029-30	15228	1389	1540	2666	1090	4030	9	25952	51375
2030-31	16554	1468	1612	2826	1159	4298	9	27926	54929
2031-32	17995	1551	1687	2995	1233	4583	9	30053	58731
2032-33	19562	1639	1765	3175	1311	4887	9	32348	62806
2033-34	21265	1731	1847	3366	1394	5212	9	34824	67177
2034-35	23116	1828	1934	3568	1482	5558	9	37495	71862
2035-36	24830	1913	1998	3748	1561	5868	9	39927	76067
2036-37	26672	2001	2063	3937	1644	6195	9	42521	80524
2037-38	28650	2093	2131	4136	1731	6541	9	45291	85259
2038-39	30776	2190	2201	4345	1823	6906	9	48250	90286
2039-40	33060	2291	2273	4565	1920	7292	9	51410	95625
2040-41	35121	2376	2332	4757	2005	7629	9	54229	100338
2041-42	37311	2464	2392	4957	2093	7982	9	57208	105293
2042-43	39639	2555	2454	5165	2185	8351	9	60358	110504
2043-44	42111	2649	2517	5382	2282	8737	9	63687	115985
2044-45	44737	2747	2582	5607	2382	9141	9	67205	121746
2045-46	47041	2833	2633	5799	2468	9484	9	70267	126709

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage 285.20 KM****(Optimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted )
2024-25	3615	728	527	1547	727	2853	8	10004	25981
2025-26	3933	769	551	1641	773	3045	8	10720	27720
2026-27	4277	813	577	1741	823	3250	8	11489	29581
2027-28	4651	860	604	1847	876	3468	8	12314	31564
2028-29	5058	909	633	1959	932	3700	8	13199	33680
2029-30	5501	961	662	2078	991	3948	8	14149	35938
2030-31	5980	1016	693	2203	1054	4210	8	15164	38335
2031-32	6500	1073	725	2336	1121	4489	8	16252	40892
2032-33	7067	1133	758	2476	1192	4787	8	17421	43622
2033-34	7682	1197	793	2625	1267	5104	8	18676	46537
2034-35	8350	1265	830	2782	1347	5443	8	20025	49654
2035-36	8970	1324	857	2923	1419	5747	8	21248	52451
2036-37	9636	1385	885	3071	1495	6068	8	22548	55409
2037-38	10351	1449	914	3226	1574	6407	8	23929	58534
2038-39	11118	1516	944	3389	1658	6765	8	25398	61844
2039-40	11942	1586	975	3560	1746	7142	8	26959	65339
2040-41	12686	1645	1000	3709	1823	7471	8	28342	68405
2041-42	13477	1706	1026	3865	1903	7816	8	29801	71626
2042-43	14317	1769	1052	4027	1987	8178	8	31338	75006
2043-44	15209	1834	1079	4196	2075	8555	8	32956	78544
2044-45	16157	1902	1107	4372	2166	8950	8	34662	82256
2045-46	16989	1962	1129	4521	2244	9286	8	36139	85437

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 1- Chainage 224.95 KM****(Pessimistic Growth Scenario)**

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted )
2024-25	10010	1053	1225	1987	799	2911	9	17994	36761
2025-26	10837	1108	1276	2097	846	3092	9	19265	39111
2026-27	11732	1166	1329	2215	896	3285	9	20632	41624
2027-28	12701	1227	1384	2338	950	3489	9	22098	44299
2028-29	13749	1291	1442	2469	1006	3706	9	23672	47154
2029-30	14884	1358	1502	2607	1066	3936	9	25362	50199
2030-31	16106	1428	1565	2751	1128	4177	9	27164	53417
2031-32	17428	1501	1630	2903	1194	4433	9	29098	56850
2032-33	18859	1578	1698	3063	1263	4705	9	31175	60511
2033-34	20407	1659	1769	3231	1337	4994	9	33406	64420
2034-35	22082	1744	1843	3409	1415	5301	9	35803	68594
2035-36	23610	1815	1894	3565	1483	5570	9	37946	72264

Year	Car	Minib us /LCV	Bus	Truck	3-Axle Commercia l vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Includin g Exempted )
2036-37	25244	1889	1947	3728	1555	5853	9	40225	76147
2037-38	26991	1967	2001	3898	1630	6150	9	42646	80244
2038-39	28858	2048	2057	4076	1709	6463	9	45220	84580
2039-40	30855	2132	2114	4262	1791	6792	9	47955	89159
2040-41	32624	2200	2158	4420	1861	7072	9	50344	93106
2041-42	34494	2271	2203	4583	1934	7363	9	52857	97235
2042-43	36472	2344	2249	4753	2009	7666	9	55502	101559
2043-44	38562	2420	2296	4929	2088	7981	9	58285	106086
2044-45	40772	2497	2344	5111	2169	8310	9	61212	110825
2045-46	42669	2564	2378	5261	2236	8580	9	63697	114791

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 2- Chainage 285.20KM  
(Pessimistic Growth Scenario)**

Year	Car	Minib us /LCV	Bus	Truck	3-Axle Commerci al vehicle	Multi axle	Oversize d Vehicles	Total Tollabl e Traffic	PCU (Inclu ding Exem pted)
2024-25	3615	728	527	1547	727	2853	8	10004	25981
2025-26	3914	766	548	1633	770	3031	8	10670	27592
2026-27	4236	806	571	1723	815	3219	8	11378	29294
2027-28	4586	847	594	1819	863	3419	8	12136	31106
2028-29	4964	891	619	1920	914	3631	8	12947	33035
2029-30	5373	938	645	2027	968	3856	8	13815	35088
2030-31	5814	986	672	2138	1024	4092	8	14734	37245
2031-32	6291	1037	700	2255	1083	4343	8	15717	39540
2032-33	6807	1090	729	2379	1146	4609	8	16768	41981
2033-34	7366	1146	759	2510	1213	4892	8	17894	44581
2034-35	7971	1205	791	2648	1283	5193	8	19099	47349
2035-36	8522	1254	813	2769	1345	5457	8	20168	49777
2036-37	9112	1306	836	2896	1410	5734	8	21302	52336
2037-38	9742	1359	859	3028	1478	6025	8	22499	55024
2038-39	10416	1415	882	3166	1550	6331	8	23768	57858
2039-40	11136	1474	907	3310	1625	6652	8	25112	60843
2040-41	11774	1522	926	3432	1689	6926	8	26277	63401
2041-42	12449	1571	945	3559	1755	7211	8	27498	66068
2042-43	13163	1622	965	3690	1823	7508	8	28779	68852
2043-44	13918	1674	985	3826	1895	7817	8	30123	71760
2044-45	14715	1727	1005	3968	1969	8139	8	31531	74793
2045-46	15399	1772	1019	4084	2030	8404	8	32716	77310

Traffic projections for Most Likely scenario is given as under

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 1-Tundla- Chainage 224.95 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	10010	1053	1225	1987	799	2911	9	17994	36761
2025-26	10862	1110	1280	2102	848	3100	9	19311	39208
2026-27	11786	1171	1337	2225	900	3300	9	20728	41819
2027-28	12788	1235	1396	2355	956	3513	9	22252	44611
2028-29	13875	1302	1458	2493	1015	3740	9	23892	47597
2029-30	15056	1373	1523	2638	1078	3981	9	25658	50788
2030-31	16329	1447	1591	2790	1144	4236	9	27546	54177
2031-32	17709	1525	1661	2950	1213	4506	9	29573	57786
2032-33	19206	1607	1735	3120	1287	4793	9	31757	61652
2033-34	20831	1693	1812	3300	1366	5100	9	34111	65795
2034-35	22592	1784	1892	3489	1449	5426	9	36641	70216
2035-36	24212	1862	1949	3657	1523	5716	9	38928	74155
2036-37	25949	1944	2008	3833	1600	6020	9	41363	78319
2037-38	27810	2029	2068	4017	1681	6341	9	43955	82727
2038-39	29804	2117	2131	4210	1766	6679	9	46716	87397
2039-40	31942	2210	2195	4412	1855	7035	9	49658	92341
2040-41	33854	2286	2246	4587	1932	7343	9	52257	96662
2041-42	35879	2365	2298	4768	2012	7664	9	54995	101189
2042-43	38025	2447	2351	4956	2095	7999	9	57882	105938
2043-44	40302	2532	2405	5152	2182	8348	9	60930	110924
2044-45	42714	2620	2461	5356	2273	8713	9	64146	116163
2045-46	44806	2696	2503	5526	2349	9018	9	66907	120606

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 2- Gurau - Chainage 285.20 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	3615	728	527	1547	727	2853	8	10004	25981
2025-26	3922	767	550	1637	772	3038	8	10694	27657
2026-27	4256	808	575	1732	819	3234	8	11432	29435
2027-28	4618	852	601	1833	870	3442	8	12224	31333
2028-29	5010	899	627	1940	924	3665	8	13073	33360
2029-30	5435	948	655	2053	981	3902	8	13982	35519
2030-31	5894	999	684	2171	1040	4151	8	14947	37793
2031-32	6392	1052	714	2296	1103	4416	8	15981	40217
2032-33	6933	1109	746	2428	1170	4698	8	17092	42806
2033-34	7520	1169	779	2568	1242	4998	8	18284	45568
2034-35	8156	1232	814	2716	1318	5317	8	19561	48511
2035-36	8741	1285	839	2846	1385	5601	8	20705	51119
2036-37	9368	1341	864	2983	1455	5899	8	21918	53867
2037-38	10040	1400	890	3126	1529	6213	8	23206	56770
2038-39	10760	1461	917	3276	1606	6544	8	24572	59833
2039-40	11531	1525	945	3433	1687	6893	8	26022	63068
2040-41	12221	1578	967	3569	1757	7194	8	27294	65876
2041-42	12952	1633	989	3710	1830	7508	8	28630	68811

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2042-43	13727	1689	1012	3857	1906	7836	8	30035	71884
2043-44	14548	1748	1035	4009	1985	8179	8	31512	75099
2044-45	15419	1808	1059	4167	2068	8536	8	33065	78461
2045-46	16174	1860	1077	4299	2137	8835	8	34390	81297

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Agra-Etawah project, the Target Date and Target Traffic are defined as under:

Target Date - 1st April 2025

Target Traffic - 52995 PCU

It was observed that as per traffic projections, average traffic volume falls short of target traffic in all scenarios. The probable extension of the concession period is estimated according to article 29 of the concession agreement which comes to about 5 years. Traffic forecast and revenue projections are done for probable extended period accordingly.

### *Most Likely*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2025	52995	33477	-37%	55%	20%	24	4.8

### *Optimistic*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2025	52995	33556	-37%	55%	20%	24	4.8

### *Pessimistic*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2025	52995	33393	-37%	55%	20%	24	4.8

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Surat-Dahisar section of NH-8 is based on the old toll policy. As per the Toll Notification (Schedule -G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

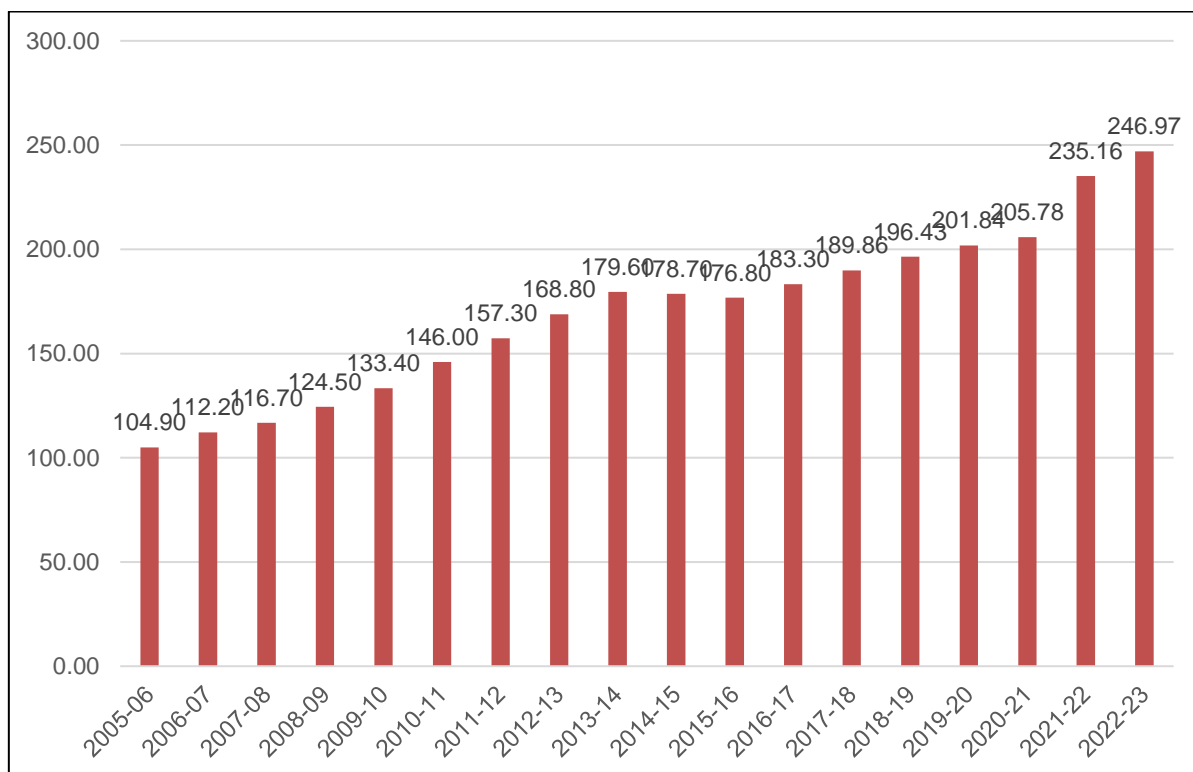
1. Monthly Pass: For frequent user's monthly pass would be issued at fee 50 time the single journey fee at 2/3<sup>rd</sup> Rate.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: Local Car Jeep Van -Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza). Additionally, local commercial vehicles are charged at 50% rate of single journey.

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is takes 5% and Suitably Stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey@ Km 224.95**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	105	175	365	365	395	570	695
2025-26	115	180	380	380	415	600	730
2026-27	120	190	400	400	435	630	765
2027-28	125	200	420	420	460	660	805
2028-29	130	210	440	440	485	695	845
2029-30	135	220	465	465	505	730	890
2030-31	145	235	490	490	535	765	935
2031-32	150	245	515	515	560	805	980
2032-33	160	260	540	540	590	850	1035
2033-34	170	270	570	570	620	890	1085
2034-35	175	285	600	600	655	940	1145
2035-36	185	300	630	630	690	990	1205
2036-37	195	315	665	665	725	1040	1265
2037-38	205	335	700	700	760	1095	1335
2038-39	215	350	735	735	805	1155	1405
2039-40	230	370	775	775	845	1215	1480
2040-41	240	390	815	815	890	1280	1560
2041-42	255	410	860	860	940	1350	1645
2042-43	270	435	905	905	990	1425	1730
2043-44	285	455	955	955	1045	1500	1825
2044-45	300	480	1010	1010	1100	1580	1925
2045-46	315	510	1065	1065	1160	1670	2030

**Table 7-3 : Toll Rates for Single Journey @ Km 285.20**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	115	185	390	390	425	615	750
2025-26	120	195	410	410	450	645	785
2026-27	125	205	430	430	470	680	825
2027-28	130	215	455	455	495	710	865
2028-29	140	230	475	475	520	750	910
2029-30	145	240	500	500	545	785	960
2030-31	155	250	525	525	575	825	1005
2031-32	160	265	555	555	605	870	1060
2032-33	170	280	585	585	635	915	1115
2033-34	180	295	615	615	670	965	1170
2034-35	190	310	645	645	705	1015	1235
2035-36	200	325	680	680	740	1065	1300
2036-37	210	340	715	715	780	1125	1365
2037-38	220	360	755	755	820	1180	1440

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2038-39	230	380	795	795	865	1245	1515
2039-40	245	400	835	835	910	1310	1595
2040-41	255	420	880	880	960	1380	1680
2041-42	270	445	930	930	1015	1455	1775
2042-43	285	465	980	980	1070	1535	1870
2043-44	300	495	1030	1030	1125	1620	1970
2044-45	315	520	1090	1090	1185	1705	2080
2045-46	335	550	1150	1150	1250	1800	2190

**Table 7-4 : Toll Rates for Return Journey @ Km 224.95**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	160	260	545	545	595	855	1040
2025-26	170	275	570	570	625	895	1090
2026-27	180	285	600	600	655	940	1145
2027-28	185	300	630	630	690	990	1205
2028-29	195	315	665	665	725	1040	1265
2029-30	205	335	700	700	760	1095	1330
2030-31	215	350	735	735	800	1150	1400
2031-32	230	370	770	770	840	1210	1470
2032-33	240	385	810	810	885	1270	1550
2033-34	250	405	855	855	930	1340	1630
2034-35	265	430	900	900	980	1410	1715
2035-36	280	450	945	945	1030	1485	1805
2036-37	295	475	995	995	1085	1560	1900
2037-38	310	500	1050	1050	1145	1645	2000
2038-39	325	525	1105	1105	1205	1730	2105
2039-40	345	555	1165	1165	1270	1825	2220
2040-41	360	585	1225	1225	1335	1920	2340
2041-42	380	615	1290	1290	1410	2025	2465
2042-43	400	650	1360	1360	1485	2135	2600
2043-44	425	685	1435	1435	1565	2250	2740
2044-45	445	720	1515	1515	1650	2375	2890
2045-46	470	760	1595	1595	1740	2505	3045

**Table 7-5 : Toll Rates for Return Journey @ Km 285.20**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	170	280	585	585	640	920	1120
2025-26	180	295	615	615	675	970	1180
2026-27	190	310	650	650	705	1015	1235
2027-28	195	325	680	680	745	1070	1300
2028-29	210	340	715	715	780	1120	1365
2029-30	220	360	750	750	820	1180	1435
2030-31	230	380	790	790	865	1240	1510
2031-32	240	395	830	830	910	1305	1590
2032-33	255	420	875	875	955	1370	1670

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2033-34	265	440	920	920	1005	1445	1760
2034-35	280	460	970	970	1055	1520	1850
2035-36	295	485	1020	1020	1115	1600	1945
2036-37	310	510	1075	1075	1170	1685	2050
2037-38	330	540	1130	1130	1235	1775	2160
2038-39	345	570	1190	1190	1300	1865	2275
2039-40	365	600	1255	1255	1370	1965	2395
2040-41	385	630	1320	1320	1440	2075	2525
2041-42	405	665	1395	1395	1520	2185	2660
2042-43	425	700	1470	1470	1600	2305	2805
2043-44	450	740	1550	1550	1690	2430	2955
2044-45	475	780	1630	1630	1780	2560	3115
2045-46	500	820	1720	1720	1880	2700	3285

**Table 7-6 : Toll Rates for Monthly pass Local @ 224.95**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940
2045-46	990	990

**Table 7-7 : Toll Rates for Monthly pass Local @ 285.20**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355

Year	Car	Minibus /LCV
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940
2045-46	990	990

**Table 7-8 : Toll Rates for Monthly Pass @ Km 224.95**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	3575	5775	12100	12100	13200	18975	23100
2025-26	3755	6065	12710	12710	13865	19930	24265
2026-27	3945	6375	13350	13350	14565	20940	25490
2027-28	4145	6695	14030	14030	15305	22000	26785
2028-29	4355	7040	14745	14745	16085	23125	28150
2029-30	4580	7400	15500	15500	16910	24305	29590
2030-31	4815	7780	16295	16295	17780	25555	31115
2031-32	5065	8180	17140	17140	18695	26875	32720
2032-33	5325	8605	18030	18030	19665	28270	34420
2033-34	5605	9055	18970	18970	20690	29745	36210
2034-35	5895	9525	19960	19960	21775	31300	38105
2035-36	6205	10025	21010	21010	22920	32945	40110
2036-37	6535	10555	22120	22120	24130	34685	42225
2037-38	6880	11115	23290	23290	25410	36525	44465
2038-39	7250	11710	24530	24530	26760	38470	46830
2039-40	7635	12335	25840	25840	28190	40525	49335
2040-41	8045	12995	27230	27230	29705	42700	51985
2041-42	8480	13695	28695	28695	31305	45000	54785
2042-43	8935	14435	30250	30250	33000	47435	57745
2043-44	9420	15220	31890	31890	34790	50010	60885
2044-45	9935	16050	33630	33630	36685	52735	64200
2045-46	10480	16930	35470	35470	38690	55620	67710

**Table 7-9 : Toll Rates for Monthly Pass @ Km 285.20**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	3780	6230	13055	13055	14240	20470	24920
2025-26	3970	6545	13710	13710	14955	21500	26175
2026-27	4175	6875	14405	14405	15715	22590	27500
2027-28	4390	7225	15135	15135	16510	23735	28895
2028-29	4615	7590	15905	15905	17355	24945	30365
2029-30	4850	7980	16720	16720	18240	26220	31920
2030-31	5100	8390	17580	17580	19180	27570	33565
2031-32	5365	8825	18490	18490	20170	28995	35295
2032-33	5645	9280	19450	19450	21215	30500	37130
2033-34	5945	9765	20460	20460	22320	32085	39060
2034-35	6255	10275	21530	21530	23490	33765	41105
2035-36	6585	10815	22665	22665	24725	35540	43265
2036-37	6935	11390	23860	23860	26030	37415	45550
2037-38	7305	11990	25125	25125	27410	39400	47965
2038-39	7695	12630	26460	26460	28870	41500	50520
2039-40	8110	13305	27875	27875	30410	43715	53220
2040-41	8550	14020	29375	29375	32045	46065	56075
2041-42	9010	14775	30955	30955	33770	48545	59100
2042-43	9500	15575	32630	32630	35595	51170	62295
2043-44	10020	16420	34400	34400	37530	53950	65675
2044-45	10565	17315	36275	36275	39575	56890	69255
2045-46	11145	18260	38260	38260	41740	60000	73045

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2045-46 years starting from the year 2023-24 are shown in tables below.

**Table 7-10 : Toll Revenue Optimistic Scenario****(Rs. Crores)**

Year	TP-1	TP2	Total
2024-25	117.68	144.51	262.19
2025-26	131.90	162.68	294.58
2026-27	147.85	182.66	330.51
2027-28	165.57	204.71	370.28
2028-29	185.85	229.29	415.13
2029-30	207.67	257.28	464.96
2030-31	232.97	289.38	522.35

Year	TP-1	TP2	Total
2031-32	262.10	326.03	588.14
2032-33	293.61	365.84	659.45
2033-34	329.74	410.60	740.35
2034-35	369.95	461.99	831.94
2035-36	411.61	516.00	927.61
2036-37	456.73	572.80	1029.54
2037-38	507.32	637.77	1145.08
2038-39	564.06	709.77	1273.83
2039-40	629.34	795.50	1424.84
2040-41	691.35	873.34	1564.69
2041-42	763.61	966.66	1730.27
2042-43	842.47	1069.20	1911.66
2043-44	932.33	1186.56	2118.90
2044-45	1025.35	1306.76	2332.11
2045-46	1124.10	1433.92	2558.02

**Table 7-11 : Toll Revenue Pessimistic Scenario**

*(Rs. Crores)*

Year	TP-1	TP2	Total
2024-25	117.68	144.51	262.19
2025-26	131.28	161.93	293.20
2026-27	146.47	180.99	327.46
2027-28	163.28	201.85	365.13
2028-29	182.44	225.02	407.46
2029-30	202.94	251.32	454.26
2030-31	226.53	281.35	507.89
2031-32	253.70	315.48	569.17
2032-33	282.85	352.36	635.22
2033-34	316.23	393.61	709.84
2034-35	353.10	440.82	793.92
2035-36	391.06	490.07	881.13
2036-37	431.85	541.47	973.32
2037-38	477.39	600.05	1077.44
2038-39	528.21	664.67	1192.88
2039-40	586.51	741.46	1327.97
2040-41	641.28	810.23	1451.51
2041-42	704.97	892.54	1597.52
2042-43	774.05	982.53	1756.57
2043-44	852.58	1085.17	1937.75
2044-45	933.09	1189.39	2122.48
2045-46	1018.04	1298.77	2316.82

**Table 7-12 : Toll Revenue Most Likely Scenario****(Rs. Crores)**

<b>Year</b>	<b>TP-1</b>	<b>TP2</b>	<b>Total</b>
<b>2024-25</b>	117.68	144.51	<b>262.19</b>
<b>2025-26</b>	131.65	162.29	<b>293.94</b>
<b>2026-27</b>	147.21	181.83	<b>329.04</b>
<b>2027-28</b>	164.44	203.30	<b>367.74</b>
<b>2028-29</b>	184.17	227.20	<b>411.37</b>
<b>2029-30</b>	205.41	254.36	<b>459.76</b>
<b>2030-31</b>	229.87	285.42	<b>515.29</b>
<b>2031-32</b>	257.96	320.82	<b>578.78</b>
<b>2032-33</b>	288.31	359.12	<b>647.43</b>
<b>2033-34</b>	323.03	402.15	<b>725.18</b>
<b>2034-35</b>	361.52	451.45	<b>812.97</b>
<b>2035-36</b>	401.31	503.11	<b>904.42</b>
<b>2036-37</b>	444.28	557.21	<b>1001.49</b>
<b>2037-38</b>	492.27	618.95	<b>1111.22</b>
<b>2038-39</b>	545.96	687.26	<b>1233.22</b>
<b>2039-40</b>	607.74	768.43	<b>1376.17</b>
<b>2040-41</b>	666.13	841.63	<b>1507.76</b>
<b>2041-42</b>	733.96	929.25	<b>1663.21</b>
<b>2042-43</b>	807.76	1025.28	<b>1833.05</b>
<b>2043-44</b>	891.80	1135.10	<b>2026.89</b>
<b>2044-45</b>	978.41	1247.13	<b>2225.54</b>
<b>2045-46</b>	1070.15	1365.12	<b>2435.26</b>

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Agra to Etawah section of NH-2 in state of Delhi from km 199.660 to km 323.525 is currently six lane road. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the most busy and prominent national highway NH-2 which connects political and cultural capitals of India. This is one of the most important trunk roads which spreads across many states. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As discussed, the dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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**GULABPURA TO CHITTORGARH SECTION OF NH 79**  
**(KM 90.000 TO KM 214.870)**  
**IN THE STATE OF RAJASTHAN**



**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

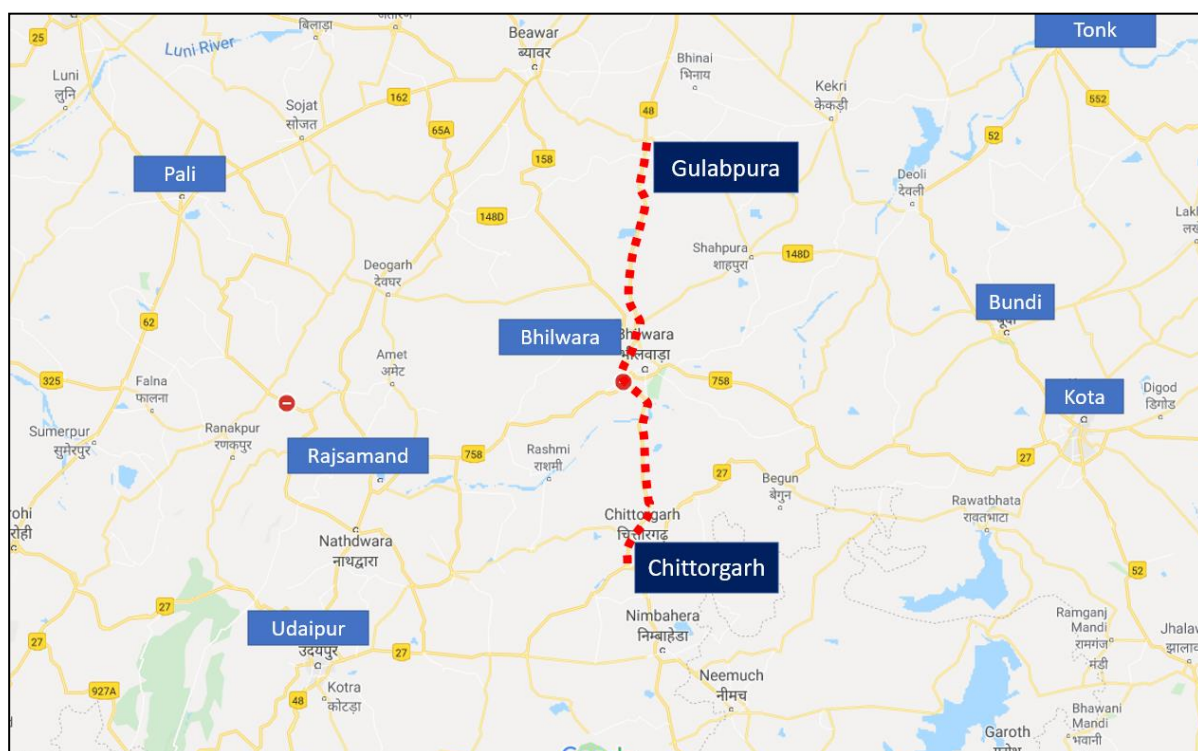
### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Six Laning of Gulabpura to Chittorgarh section of NH-79 from km 90.000 to km 214.870 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. M/s CG Tollway Ltd. (Concessionaire) has been awarded the Project for a concession period of 20 years starting from 4th November 2017. The Project has been commissioned and is currently in the operation / maintenance phase for four laning. Six laning of project has also been completed in August 2021.

Length of project road is 124.870 Kms. The project road is section of NH-79, which connects Ajmer to Ghat Bilod. Project section of NH-79 passes through district of Bhilwara and Chittorgarh. Project road connects to Udaipur via NH-76.

Project road alignment passes through the towns/ built-up areas Fakirabad, Bhilwara, Gulabpura, & Chittorgarh. Following figure shows alignment of project road section from Gulabpura to Chittorgarh



**Figure 1-1: Alignment of Project Stretch**

## 1.2 Objective of the Study

M/s IRB INFRASTRUCTURE TRUST has engaged GMD Consultants to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “Traffic Study & Toll Revenue Projection Report” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

National Highway 79 (NH-79) is an important link for traffic connecting Delhi, Jaipur to Udaipur, Chittorgarh and down south.

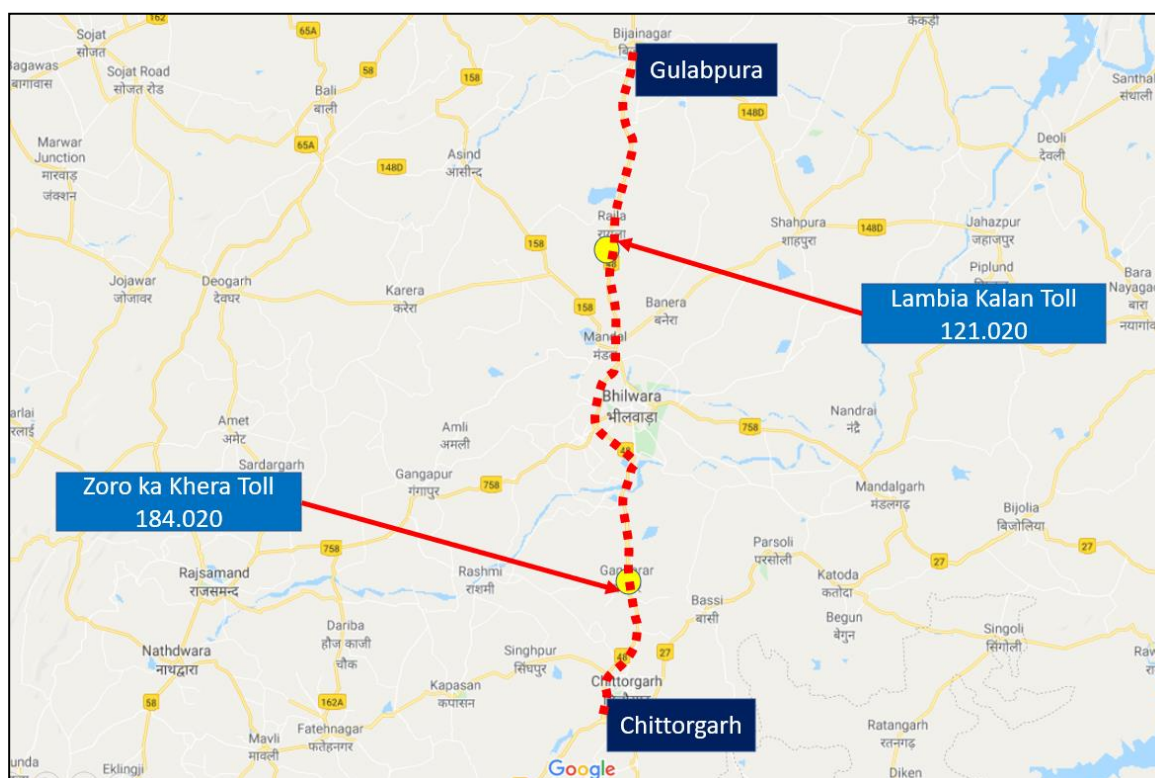
It is one of the major north-south road connectivity for the traffic from northern states of Haryana, Punjab and Delhi to Industrial and tourist areas of Rajasthan like Jaipur, Chittorgarh, Udaipur and then to Dahod, Ratlam and other parts of Madhya Pradesh.

#### 2.2 Project Stretch Description

Section of NH-79 from Gulabpura to Chittorgarh is part of major transportation link in the area connecting industrial / tourist cities of Jaipur, Bhilwara, Chittorgarh and Udaipur. Important cities of Firozabad, Shikohabad, and Jaswant Nagar fall on project alignment. Major mining industries of marble, Zink, felspar, quarts of Udaipur and textile industry of Bhiwara provide are major contributor of commercial traffic on project corridor. Additionally, Udaipur, Chittorgarh and Bhilwara major tourist centers of India. This adds substantial value for passenger traffic on the project corridor section.

Like other parts of India rapid ribbon development is happening around these cities on project highway. This also contributes to sustainable traffic growth.

There are two operative toll plazas at project stretch. First is at Lambia Kalan at Km 121.020 and second at Zoro ka Khera at Km 184.020. The following figure show project alignment and toll plaza locations.



**Figure 2-1: Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Six laning of project stretch is in progress and soon will be completed. The following photographs illustrate the project section along the corridor.



*Figure 2-2: Photographs showing Project Corridor*

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Gulabpura- Chittorgarh section of NH-79 for years 2018-19, 2019-20, 2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	<b>Km 121.020 Toll Plaza at Lambia Kalan</b>	AADT for Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		November 2023 & Four month from April 2024 to July 2024	to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024	to November 2023 & Four month from April 2024 to July 2024
2	<b>Km 184.020 Toll Plaza at Jojro ka Khera</b>	AADT for Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

*Source - IRC: 64 – 1990*

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Bus
- Truck
- 3-Axle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Lambial Kalan Toll Plaza at Km 121.020**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	3563	3366	4812	6301	6851	6867
2	Minibus /LCV	1266	933	585	768	754	808
3	Bus	428	270	376	446	455	414
4	Truck	1587	1321	1788	2455	2520	2478
5	3-Axle Commercial vehicle	2139	1591	1771	2006	1869	1699
6	Multi axle	4606	4011	4587	5086	5130	5136
7	Oversized Vehicle	23	19	30	11	12	9
<b>Total</b>		<b>13612</b>	<b>11511</b>	<b>13949</b>	<b>17072</b>	<b>17590</b>	<b>17411</b>

**Table 3-4 : Traffic Data at Jojro ka Khera Toll Plaza at Km 184.0200**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	3042	3077	4440	5603	6077	6908
2	Minibus /LCV	1081	824	549	716	777	871

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
3	Bus	423	265	347	408	435	410
4	Truck	1285	1164	1634	2306	2613	2811
5	3-Axle Commercial vehicle	1568	1344	1666	1950	2042	2053
6	Multi axle	4360	4201	4934	5536	5971	6344
7	Oversized Vehicle	21	21	21	14	12	8
<b>Total</b>		<b>11781</b>	<b>10896</b>	<b>13592</b>	<b>16532</b>	<b>17926</b>	<b>19404</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 3-5.

**Table 3-5 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5

Vehicle Type	PCUs
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under.

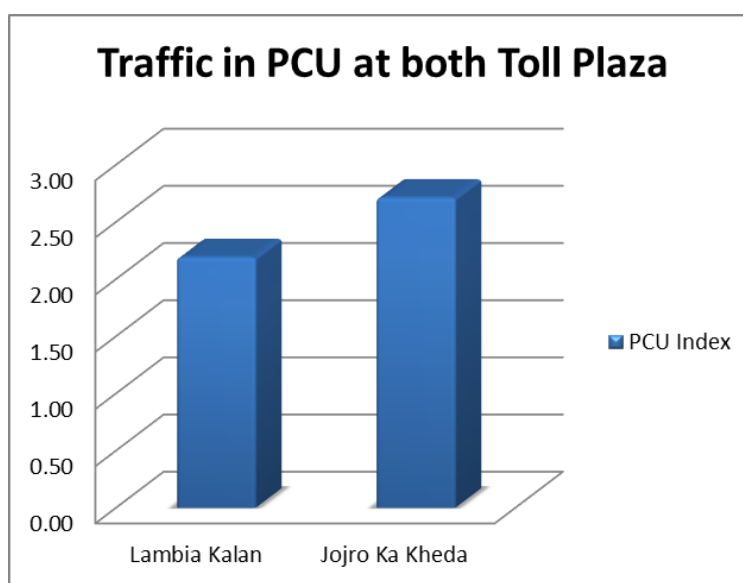
**Table 3-6 : Traffic in PCU at Project Stretch Base Year 2023-24**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2019-2020	Lambia Kalan Km 121.020	13612	38754	2.85
	Jojro ka Khera Km 184.020	11781	34208	2.90
2020-2021	Lambia Kalan Km 121.020	11511	32446	2.82
	Jojro ka Khera Km 184.020	10896	31630	2.90
2021-2022	Lambia Kalan Km 121.020	13949	38721	2.74
	Jojro ka Khera Km 184.020	13592	38503	2.83
2022-23	Lambia Kalan Km 121.020	17072	45107	2.64
	Jojro ka Khera Km 184.020	16532	45642	2.76
2023-24	Lambia Kalan Km 121.020	17590	45650	2.60
	Jojro ka Khera Km 184.020	17926	49431	2.76
2024-25	Lambia Kalan Km 121.020	17411	45002	2.58

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
	Jojro ka Khera Km 184.020	19404	52617	2.71

It can be observed from above that project traffic has PCU index close to 3 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at four toll plaza locations.

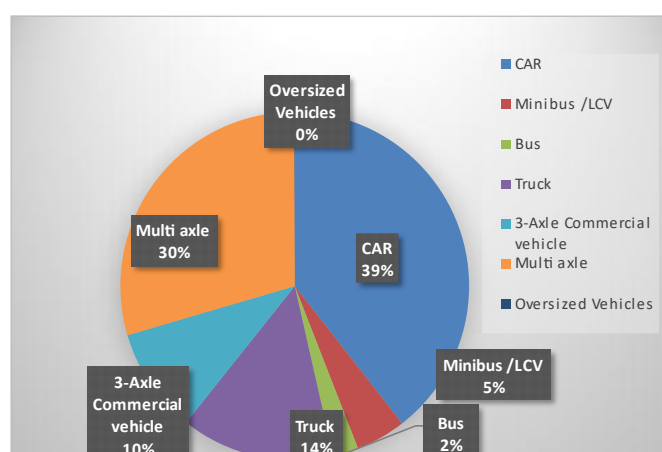
It can be observed that PCU index is consistent at both toll plaza locations.



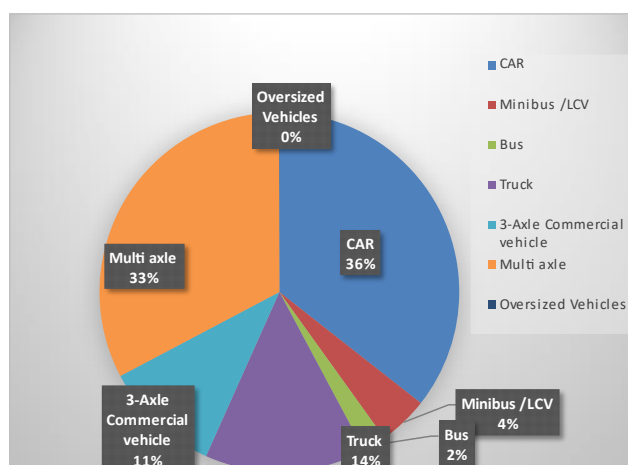
*Figure 3-1: Comparison of PCU Index*

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



*Figure 3-2 :Model Split of Tollable Vehicle-Km 121.020*



**Figure 3-3 :Model Split of Tollable Vehicle- Km 184.020**

It is observed that car traffic forms about 39% & 36% of total traffic at toll plaza locations while multi axle commercial vehicles are about 40% & 44% of total traffic. Truck / Bus and LCV share about 21% and 20% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category for year 2024-25

**Table 3-7 : Journey Type Bifurcation of Traffic at Lambia Kalan TP KM 121.020**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	12501
2	Return Journey	4632
3	Local Commercial Single Journey	236
4	Monthly Pass Local	33
5	Monthly Pass	10

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 72%. Return journey component is 27%. The number of monthly pass Local is 0% and Local commercial Single Journey 1% at Lambia Kalan toll plaza.

The following tables give the details of journey distribution at Jojro ka Khera toll plaza at Km 184.020.

**Table 3-8 : Journey Type Bifurcation of Traffic at Jojro ka KheraTPKm 184.020**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	13651
2	Return Journey	5446
3	Local Commercial Single Journey	282
4	Monthly Pass Local	13
5	Monthly Pass	12

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth

- d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

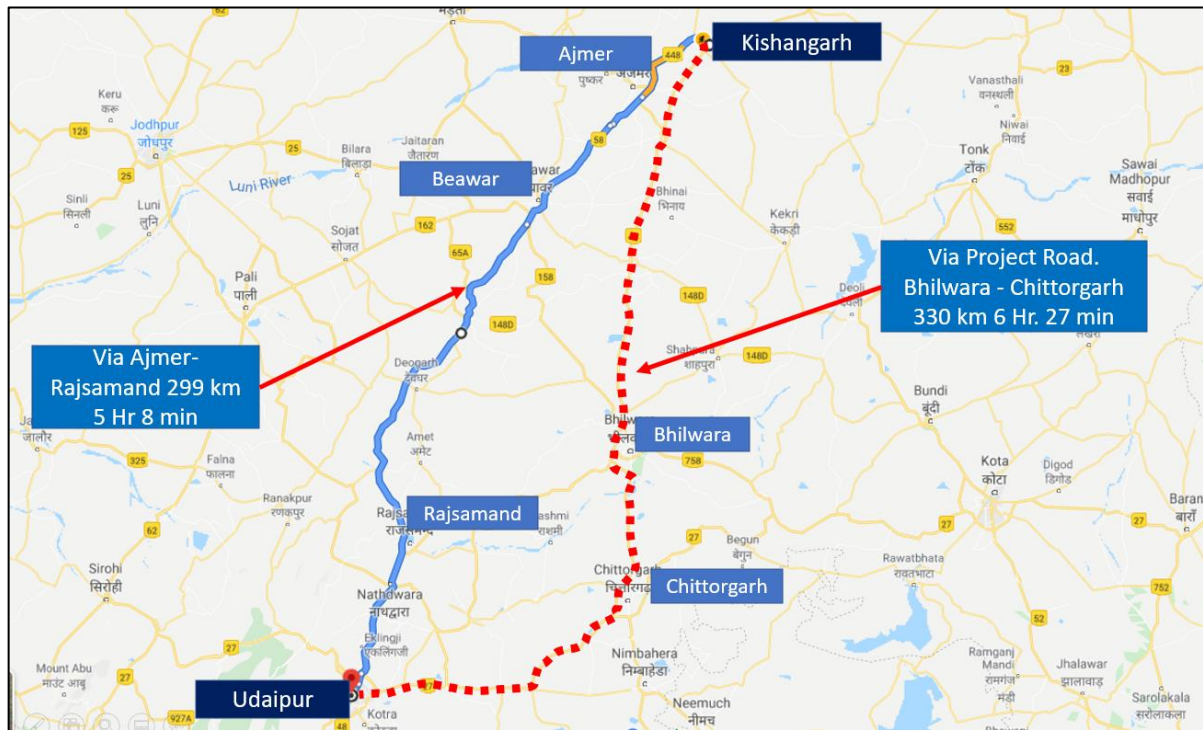
- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

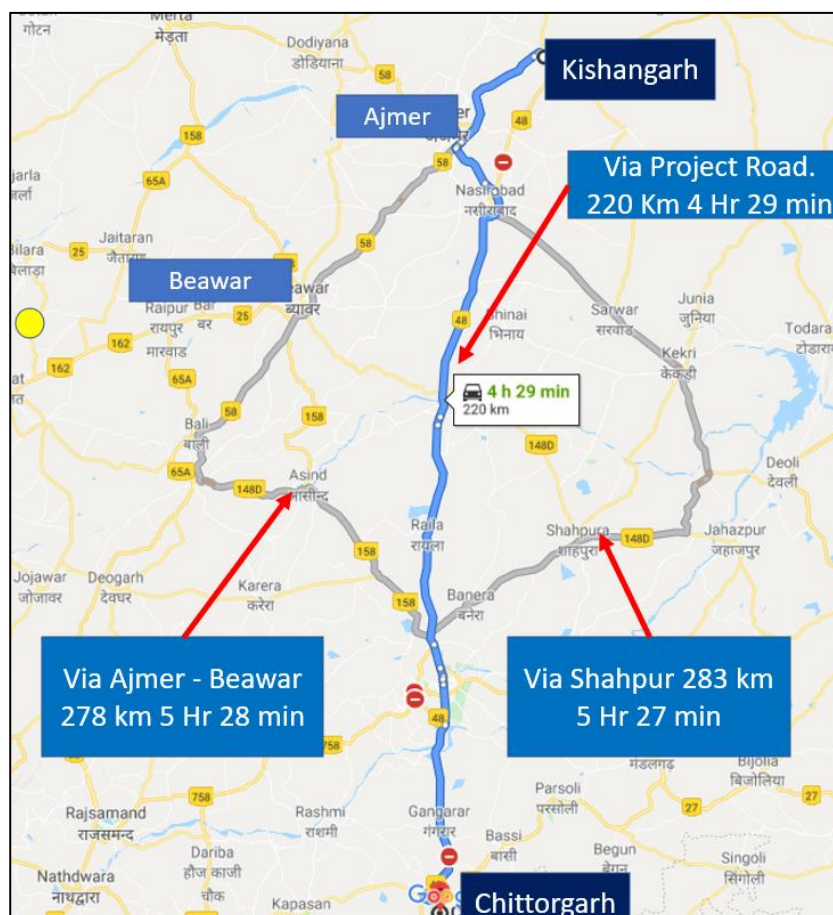
Project stretch has toll application history from last few years, and it can be assumed that project traffic is settled. However, from an analysis point of view there can be two alternate routes at local level. One uses Ajmer Road to go from Kishangarh to Chittorgarh and the other on east side via Shapur.

At regional level, there can be two alternates for Udaipur traffic after Kishangarh. One via project road (Kishangarh – Bhiwara- Chittorgarh- Udaipur)

The following maps show these routes in relation to project stretches at both local and regional level.



**Figure 4-1: Alternate route at regional level.**



**Figure 4-2: Alternate route at local level.**

It can be observed that the project highway forms one of the main spines of the corridor between Kishangarh / Jaipur and Chittorgarh. Traffic on project road is now settled and it can be assumed as dedicated traffic on project road for logistic obligations.

At regional level for Udaipur traffic alternate route is faster and traffic is already using this alternate.

With six laning now nearing completion, the project stretch would become slightly more attractive due to the improved level of service. In such a case further diversion of traffic from the project road is not envisaged.

The following table provides summary of analysis of alternate route/ roads discussed above.

**Table 4-1 : Competing Roads Details**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
Regional Level						
1	Kishangarh – Ajmer- Udaipur	Alternate Route	299	58	5 Hr 8 Min	Alternate route has clear advantage for this pair of destination. Traffic Settled. No further diversion expected
	Kishangarh- Chittorgarh- Udaipur	Project Road	330	51	6 Hr 127 Min	
Local Level						
2	Kishangarh – Ajmer- Chittorgarh (West)	Alternate Route	278	50	5 Hr. 28 Min	Project Road has advantage. Alternate route running for years after toll on project road. Traffic Settled. No further diversion expected
	Kishangarh – Shahpur- Chittorgarh (East)	Alternate Route	283	51	5 Hr. 28 Min	
	Kishangarh – Bhilwara- Chittorgarh	Project Road	220	50	4 Hr. 29 Min	

Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road. Further, it may be noted that since the project highway has already been commissioned and has a tolling history, the current traffic traversing the project corridor already factors in traffic diversion (if any) that may have taken place.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Gulabpur- Chittorgarh section of NH-79 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a

similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

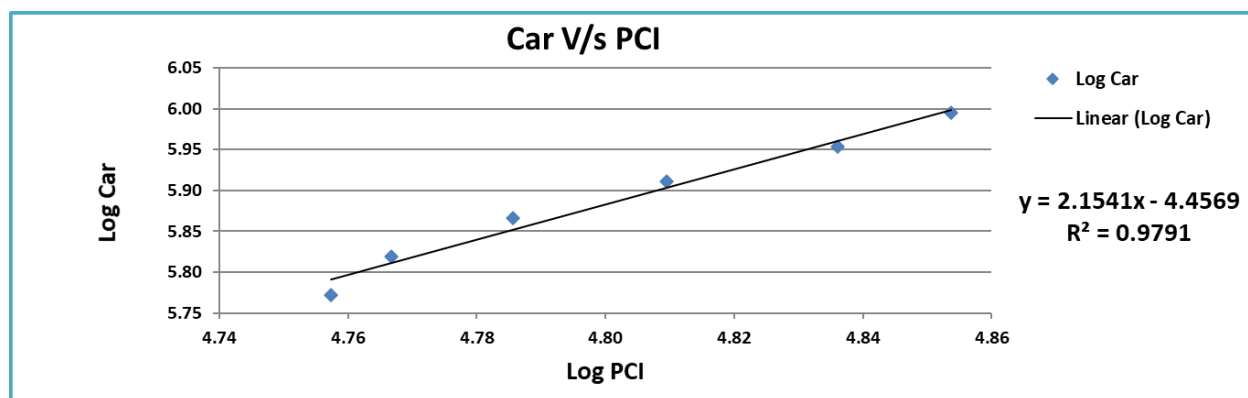
The project corridor spreads across the state of Rajasthan. Toll plazas at Lambia Kalan and Jojro ka Khera are in the state of Rajasthan. For elasticity calculations, working data from Rajasthan has been analyzed. Additionally, data of Gujarat is also analyzed as project corridor has close transportation link with Gujarat also.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-1 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	57192	591069	4.76	5.77		
2013	58441	659542	4.77	5.82	2%	
2014	61053	733916	4.79	5.87	4%	
2015	64496	814079	4.81	5.91	6%	
2016	68565	899307	4.84	5.95	6%	
2017	71394	988391	4.85	5.99	4%	4.55%

Regression analysis of same is given in figure below.

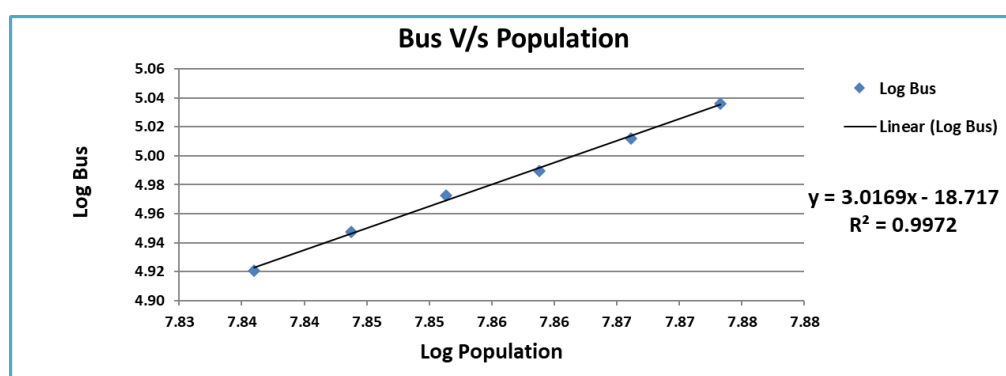


**Figure 5-1: Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**

**Table 5-2 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	68548437	83345	7.84	4.92		
2013	69783885	88616	7.84	4.95	2%	
2014	71016445	93892	7.85	4.97	2%	
2015	72245688	97650	7.86	4.99	2%	
2016	73471198	102818	7.87	5.01	2%	
2017	74692571	108680	7.87	5.04	2%	1.73%

Regression analysis of same is given in figure below.



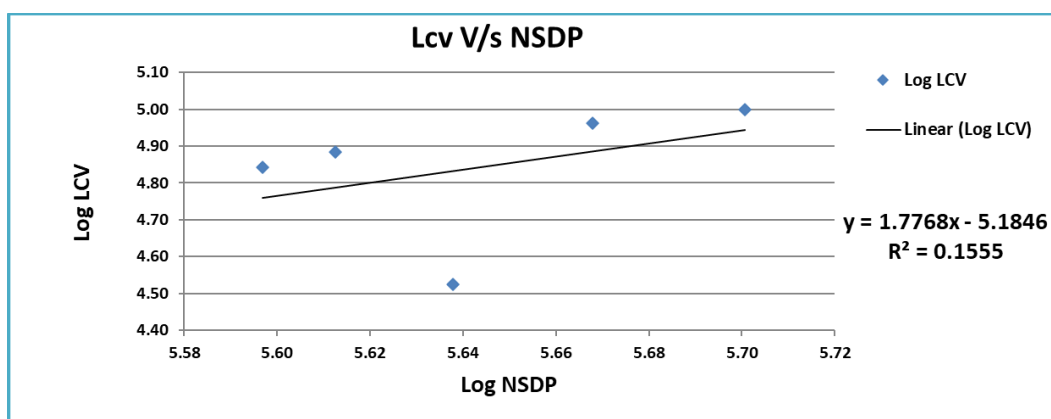
**Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Rajasthan**

Year	NSDP	LCV	Log NDSP	Log LCV	NSDP Growth	Average Growth
2012	395331	69509	5.60	4.84		
2013	409802	76396	5.61	4.88	4%	
2014	434292	33379	5.64	4.52	6%	
2015	465408	91787	5.67	4.96	7%	
2016	501922	99763	5.70	5.00	8%	6.16%

The following figure depicts regression analysis and extrapolation.

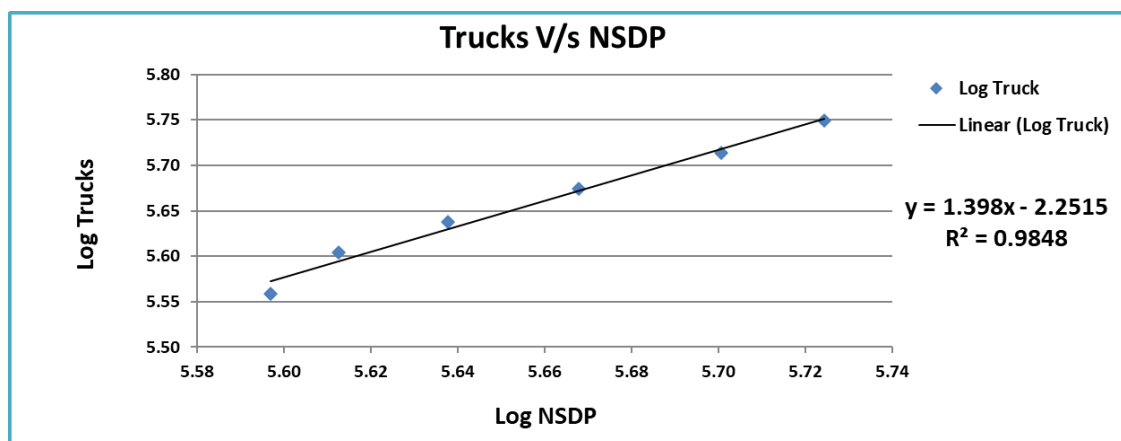


**Figure 5-3: Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.**

The following figure depicts regression analysis and extrapolation.

**Table 5-4 : Truck Traffic Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth
2012	395331	362028	5.60	5.56		
2013	409802	401983	5.61	5.60	4%	
2014	434292	434379	5.64	5.64	6%	
2015	465408	472365	5.67	5.67	7%	
2016	501922	517604	5.70	5.71	8%	
2017	530172	561158	5.72	5.75	6%	6.06%



**Figure 5-4: Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Rajasthan.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for the good fit regression as reflected by R2 values are presented in the Table below.

**Table 5-5 : Summary Regression Analysis Rajasthan**

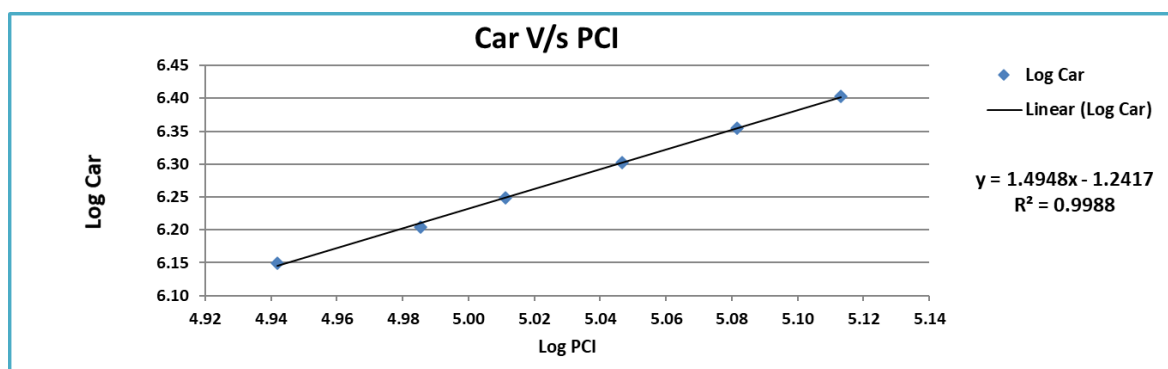
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Rajasthan	Car/Jeep	PCI	$y = 2.1541x - 4.4569$	$R^2 = 0.9791$	2.1541	4.55%	9.79%	Good Regression
	Bus	Population	$y = 3.0169x - 18.7174$	$R^2 = 0.9972$	3.0169	1.73%	5.22%	Good Regression
	LCV	NSDP	$y = 1.7768x - 5.1846$	$R^2 = 0.1555$	1.7768	6.16%	10.95%	Poor Regression
	Truck	NSDP	$y = 1.398x - 2.2515$	$R^2 = 0.9848$	1.3980	6.06%	8.46%	Good Regression

**Table 5-6 : Per Capita Income Vs Car Gujarat**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	87481	1411898	4.94	6.15		
2013	96683	1602129	4.99	6.20	11%	
2014	102589	1771298	5.01	6.25	6%	
2015	111370	2008748	5.05	6.30	9%	

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2016	120683	2260084	5.08	6.35	8%	
2017	129738	2527537	5.11	6.40	8%	8.21%

Regression analysis of same is given in figure below.

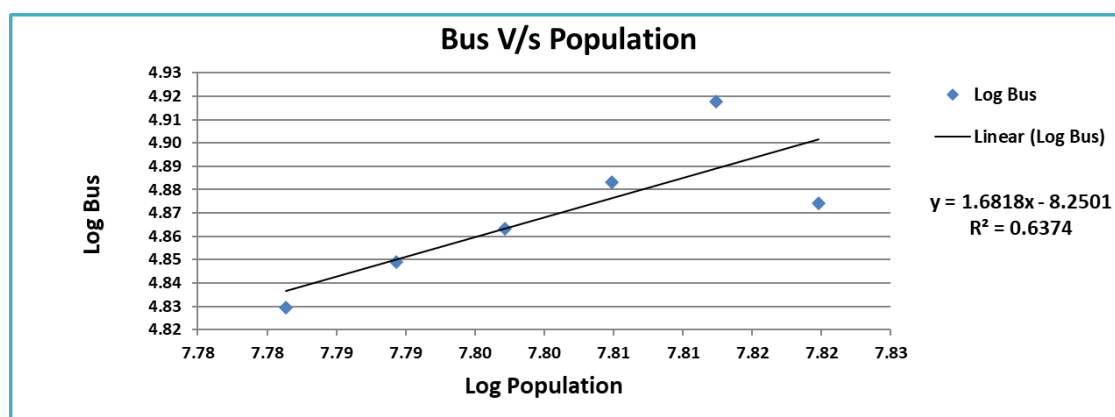


**Figure 5-5: Regression and Elasticity PCI vs. Car – Extrapolation Gujarat**

**Table 5-7 : Population Vs Bus Gujarat**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	60439692	67546	7.78	4.83		
2013	61563037	70615	7.79	4.85	2%	
2014	62684375	72998	7.80	4.86	2%	
2015	63803304	76435	7.80	4.88	2%	
2016	64919427	82734	7.81	4.92	2%	
2017	66032362	74855	7.82	4.87	2%	1.79%

Regression analysis of same is given in figure below.



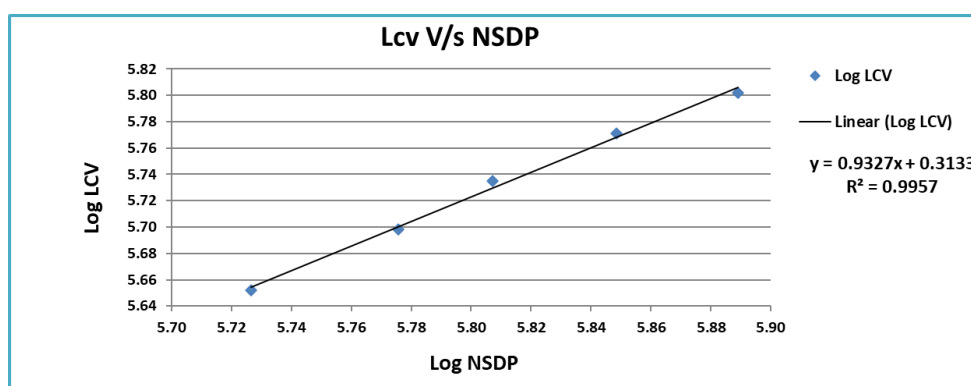
**Figure 5-6: Regression and Elasticity Population vs. Bus – Extrapolation Gujarat**

The elasticity of goods traffic has been worked out by regression analysis with NSDP.  
The following table represents the data and details.

**Table 5-8 : LCV Traffic Vs NSDP Gujarat**

Year	NSDP	LCV	Log NDSP	Log LCV	NSDP Growth	Average Growth
2012	532809	448958	5.73	5.65		
2013	596659	499277	5.78	5.70	12%	
2014	641489	542918	5.81	5.73	8%	
2015	705629	589984	5.85	5.77	10%	
2016	774775	633599	5.89	5.80	10%	9.82%

The following figure depicts regression analysis and extrapolation.

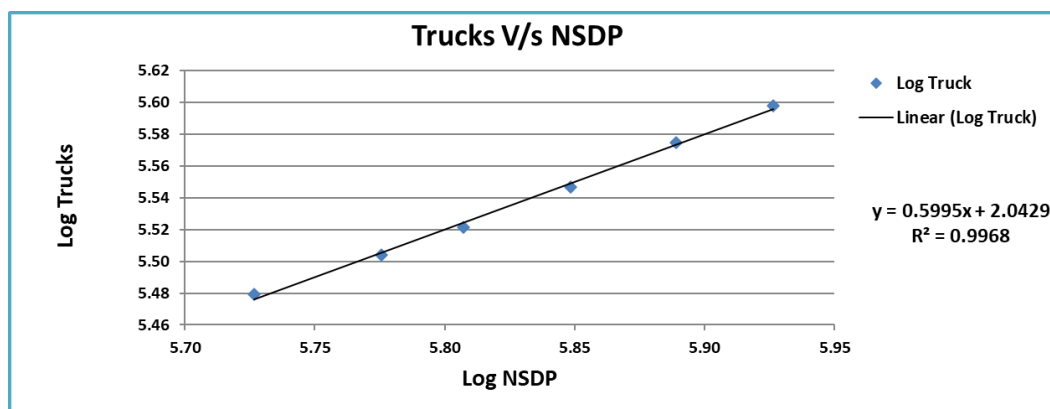


**Figure 5-7: Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Gujarat.**

The following figure depicts regression analysis and extrapolation.

**Table 5-9 : Truck Traffic Vs NSDP Gujarat**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth
2012	532809	301533	5.73	5.48		
2013	596659	319207	5.78	5.50	12%	
2014	641489	332185	5.81	5.52	8%	
2015	705629	352225	5.85	5.55	10%	
2016	774775	375265	5.89	5.57	10%	
2017	843930	396061	5.93	5.60	9%	9.64%



**Figure 5-8: Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Gujarat.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-10 : Summary Regression Analysis Gujarat**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Gujarat	Car/Jeep	PCI	$y = 1.4948x - 1.2417$	$R^2 = 0.9988$	1.4948	8.21%	12.27%	Good Regression
	Bus	Population	$y = 1.6818x - 8.2501$	$R^2 = 0.6374$	1.6818	1.79%	3.00%	Fair Regression
	LCV	NSDP	$y = 0.9327x - 0.3133$	$R^2 = 0.9957$	0.9327	9.82%	9.16%	Good Regression
	Truck	NSDP	$y = 0.5995x - 2.0429$	$R^2 = 0.9968$	0.5995	9.64%	5.78%	Good Regression

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

## 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Gulabpura to Chittorgarh is under tolling operation with current concessionaire and has two years of tolling history from 2018-19. As traffic data available with the project concessionaire is of year two years and that too affected by COVI-19, we do not have sufficient data points to be

able to establish a reliable past trend of traffic growth. A minimum of about 5 -6 years' consistent traffic data is required for establishing a reliable past trend.

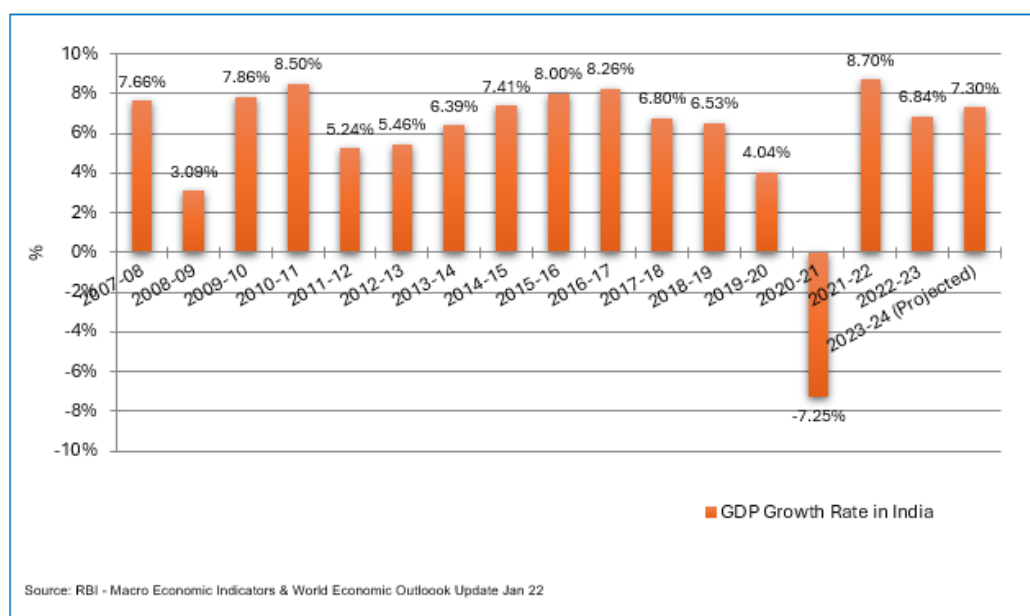
## 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-9 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on Make -In- India it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

This Asset primarily serves traffic travelling between Delhi, Rajasthan, Gujarat and Maharashtra. It is observed that the vehicle distribution to be dominated by heavy vehicles. We further noticed several textile industries and marble/granite industries bordering the Asset. Udaipur serves as a big tourism hub as well as a consumption center which also results in traffic feeding into the demand being generated.

In addition, Chittorgarh has 4 major cement plants located in Chanderiya and Nimbahera villages. There is a regular movement of Cement bulkers to and from these locations along asset. Chanderiya Lead-Zinc Smelter, is the one of the largest zinc-lead smelting complexes in the world, is also located in Chittorgarh. Bhilwara is home to the textile industry and the only center in the country producing insulation bricks. Mining is another major sector for large scale mining of sandstone, soapstone feldspar, quartz, mica China clay and granite. Also, Iron Ore, Led, and Zinc are mined and processed in Bhilwara.

Rajasthan is rich in natural resources and benefits from its strategic geographic location in India. The state is pre-eminent in quarrying, mining in India and has been a leader in crude oil extraction over the past few years. Moreover, Rajasthan is also major tourism attractor in India. Considering the scenario, it may be assumed that the traffic growth on the project highway would remain high and there are minimal risks in terms of growth.

### 5.6.1 Industrial Units along Project Corridor

Bhilwara district occupies an important place in the mineral map of Rajasthan. The main minerals are lead Zinc, Soap Stone, China Clay, Feldspar, Quartz, Mica, Asbestos and Garnet.

Besides being a major tourist attraction in India Chittorgarh has a very rich profile in industrial mineral extraction. Limestone (Cement Grade), Red Occur, Silica sand, China Clay and Quartz are major minerals which are in abundance. There are a large number of cement plants in the area. Chanderiya Lead-Zinc Smelter is one of the largest zinc-lead smelting complexes in the world.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. The same growth rate is not sustainable for long. Traffic growth is suitably stepped down from future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic, Pessimistic and Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

**Table 5-11 : Recommended Growth Rates Optimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
<b>Car/Jeep/Van</b>	8.61%	8.31%	7.01%	6.58%	6.33%	6.09%
<b>Bus</b>	4.93%	4.73%	3.77%	3.56%	3.41%	3.26%
<b>LCV</b>	5.19%	4.89%	3.83%	3.34%	3.08%	2.83%
<b>2- Axle</b>	5.68%	5.38%	4.55%	4.05%	3.78%	3.53%
<b>3 – Axle</b>	6.02%	5.71%	4.55%	4.05%	3.78%	3.53%
<b>4 to 6 Axle</b>	6.37%	6.03%	4.55%	4.05%	3.78%	3.53%
<b>7 and Above Axle</b>	6.02%	5.71%	4.55%	4.05%	3.78%	3.53%

**Table 5-12 : Recommended Growth Rates Pessimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
<b>Car/Jeep/Van</b>	8.11%	7.81%	6.51%	6.08%	5.83%	5.59%
<b>Bus</b>	4.43%	4.23%	3.27%	3.06%	2.91%	2.76%
<b>LCV</b>	4.69%	4.39%	3.33%	2.84%	2.58%	2.33%
<b>2- Axle</b>	5.18%	4.88%	4.05%	3.55%	3.28%	3.03%
<b>3 – Axle</b>	5.52%	5.21%	4.05%	3.55%	3.28%	3.03%
<b>4 to 6 Axle</b>	5.87%	5.53%	4.05%	3.55%	3.28%	3.03%
<b>7 and Above Axle</b>	5.52%	5.21%	4.05%	3.55%	3.28%	3.03%

**Table 5-13 : Recommended Growth Rates Most Likely**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
<b>Car/Jeep/Van</b>	8.36%	8.06%	6.76%	6.33%	6.08%	5.84%
<b>Bus</b>	4.68%	4.48%	3.52%	3.31%	3.16%	3.01%
<b>LCV</b>	4.94%	4.64%	3.58%	3.09%	2.83%	2.58%
<b>2- Axle</b>	5.43%	5.13%	4.30%	3.80%	3.53%	3.28%
<b>3 - Axle</b>	5.77%	5.46%	4.30%	3.80%	3.53%	3.28%
<b>4 to 6 Axle</b>	6.12%	5.78%	4.30%	3.80%	3.53%	3.28%
<b>7 and Above Axle</b>	5.77%	5.46%	4.30%	3.80%	3.53%	3.28%

Traffic and revenue have been worked out on the basis of the above growths and some is presented in subsequent chapter of report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Lambia Kalan 121.020 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	6867	808	414	2478	1699	5136	9	17411	45002
2025-26	7496	847	455	2619	1823	5498	9	18747	48239
2026-27	8017	888	450	2752	1896	5768	9	19780	50640
2027-28	8745	930	493	2910	2031	6171	9	21289	54252
2028-29	9362	975	489	3057	2116	6479	9	22487	57007
2029-30	10209	1020	534	3231	2267	6929	9	24199	61056
2030-31	10807	1059	526	3367	2337	7176	9	25281	63418
2031-32	11643	1098	570	3531	2474	7565	9	26890	67098
2032-33	12332	1140	562	3680	2553	7839	9	28115	69743
2033-34	13282	1182	608	3859	2702	8259	9	29901	73768
2034-35	14077	1228	601	4022	2790	8562	9	31289	76728
2035-36	15094	1266	648	4197	2937	8975	9	33126	80767
2036-37	15945	1309	641	4353	3020	9265	9	34542	83684
2037-38	17092	1350	689	4543	3176	9708	9	36567	88068
2038-39	18066	1395	683	4711	3268	10026	9	38158	91302
2039-40	19358	1439	733	4916	3435	10502	9	40392	96068
2040-41	20424	1484	727	5086	3527	10822	9	42079	99410
2041-42	21831	1527	778	5293	3697	11303	9	44438	104330

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Jojro ka Khera 184.020 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
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Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	6908	871	410	2811	2053	6344	8	19404	52617
2025-26	7482	914	429	2962	2170	6726	8	20691	55839
2026-27	8104	958	449	3120	2293	7132	8	22064	59257
2027-28	8777	1004	470	3287	2425	7562	8	23533	62894
2028-29	9505	1052	492	3463	2564	8019	8	25103	66762
2029-30	10295	1103	514	3649	2710	8502	8	26781	70864
2030-31	11015	1145	533	3814	2833	8888	8	28236	74305
2031-32	11787	1188	553	3987	2963	9293	8	29779	77933
2032-33	12612	1233	574	4167	3098	9715	8	31407	81732
2033-34	13496	1280	595	4356	3239	10156	8	33130	85724
2034-35	14441	1328	617	4554	3386	10619	8	34953	89926
2035-36	15391	1372	639	4737	3523	11048	8	36718	93898
2036-37	16402	1417	661	4928	3665	11494	8	38575	98049
2037-38	17480	1464	685	5127	3812	11959	8	40535	102400
2038-39	18630	1512	709	5333	3966	12442	8	42600	106947
2039-40	19856	1561	734	5548	4126	12945	8	44778	111710
2040-41	21112	1609	759	5758	4282	13434	8	46962	116412
2041-42	22449	1658	784	5975	4443	13942	8	49259	121317

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 1- Lambia Kalan 121.020 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	6867	808	414	2478	1699	5136	9	17411	38143
2025-26	7462	844	452	2606	1815	5473	9	18661	48016
2026-27	7945	881	444	2724	1879	5714	9	19596	50161
2027-28	8627	918	484	2864	2005	6086	9	20993	53491
2028-29	9194	958	477	2995	2078	6358	9	22069	55933
2029-30	9979	999	520	3149	2214	6768	9	23638	59623
2030-31	10515	1032	509	3267	2271	6976	9	24579	61637
2031-32	11278	1065	550	3407	2394	7320	9	26023	64909
2032-33	11891	1101	538	3535	2455	7548	9	27077	67133
2033-34	12749	1137	581	3685	2588	7918	9	28667	70688
2034-35	13448	1175	569	3825	2656	8166	9	29848	73148
2035-36	14355	1207	613	3968	2784	8522	9	31458	76650
2036-37	15092	1241	600	4100	2845	8751	9	32638	79009
2037-38	16106	1276	646	4252	2982	9130	9	34401	82786
2038-39	16941	1312	633	4394	3047	9377	9	35713	85368
2039-40	18074	1348	680	4557	3193	9781	9	37642	89441
2040-41	18975	1382	666	4698	3256	10024	9	39010	92057
2041-42	20192	1417	714	4859	3403	10427	9	41021	96208

**Table 6-4 : Total Tollable Traffic @Toll Plaza 2- Jojro ka Khera184.020 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	6908	871	410	2811	2053	6344	8	19404	52617
2025-26	7446	909	427	2947	2159	6696	8	20592	55577
2026-27	8027	948	445	3090	2271	7066	8	21855	58700
2027-28	8654	990	463	3241	2389	7456	8	23201	62006
2028-29	9329	1033	482	3398	2513	7868	8	24631	65500
2029-30	10057	1077	502	3563	2645	8303	8	26155	69202
2030-31	10711	1113	519	3707	2751	8638	8	27447	72219
2031-32	11408	1149	536	3857	2862	8989	8	28809	75383
2032-33	12149	1186	553	4012	2977	9353	8	30238	78679
2033-34	12940	1225	571	4174	3097	9731	8	31746	82129
2034-35	13782	1265	589	4342	3222	10124	8	33332	85733
2035-36	14620	1301	607	4495	3336	10483	8	34850	89095
2036-37	15509	1337	625	4653	3454	10854	8	36440	92590
2037-38	16450	1374	644	4818	3576	11239	8	38109	96237
2038-39	17449	1413	663	4988	3702	11637	8	39860	100030
2039-40	18509	1453	683	5164	3834	12050	8	41701	103993
2040-41	19588	1490	703	5333	3959	12444	8	43525	107842
2041-42	20731	1528	723	5508	4089	12854	8	45441	111862

Traffic projections for Most Likely scenario is given as under

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 1- Lambia Kalan121.020 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	6867	808	414	2478	1699	5136	9	17411	45002
2025-26	7481	845	453	2612	1818	5486	9	18704	48125
2026-27	7983	885	446	2737	1887	5741	9	19688	50396
2027-28	8689	924	488	2886	2018	6129	9	21143	53872
2028-29	9281	967	483	3024	2096	6418	9	22278	56462
2029-30	10098	1010	527	3189	2240	6848	9	23921	60338
2030-31	10664	1046	517	3315	2304	7074	9	24929	62515
2031-32	11463	1082	559	3469	2433	7441	9	26456	65994
2032-33	12115	1120	549	3607	2504	7689	9	27593	68416
2033-34	13018	1158	594	3774	2642	8087	9	29282	72217
2034-35	13765	1199	584	3924	2721	8361	9	30563	74916
2035-36	14726	1235	630	4086	2856	8746	9	32288	78692
2036-37	15521	1273	620	4227	2929	9004	9	33583	81317
2037-38	16599	1311	668	4401	3073	9416	9	35477	85404
2038-39	17503	1351	658	4554	3153	9695	9	36923	88293
2039-40	18711	1392	708	4741	3306	10136	9	39003	92717
2040-41	19694	1431	697	4893	3386	10413	9	40523	95668

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2041-42	21003	1470	748	5081	3540	10858	9	42709	100217

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 2- Jojro ka Khera 184.020 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	6908	871	410	2811	2053	6344	8	19404	52617
2025-26	7465	912	428	2954	2165	6710	8	20642	55705
2026-27	8066	954	446	3105	2283	7097	8	21959	58972
2027-28	8716	998	466	3263	2407	7508	8	23366	62443
2028-29	9418	1043	487	3430	2539	7942	8	24867	66126
2029-30	10178	1091	508	3606	2678	8402	8	26471	70036
2030-31	10865	1130	526	3760	2793	8763	8	27845	73267
2031-32	11598	1170	544	3920	2913	9139	8	29292	76646
2032-33	12381	1212	563	4088	3038	9531	8	30821	80192
2033-34	13217	1255	582	4263	3169	9941	8	32435	83912
2034-35	14110	1299	602	4445	3306	10368	8	34138	87810
2035-36	15003	1339	622	4613	3431	10760	8	35776	91466
2036-37	15952	1381	643	4788	3562	11169	8	37503	95299
2037-38	16960	1424	664	4969	3698	11593	8	39316	99294
2038-39	18032	1468	686	5157	3838	12032	8	41221	103457
2039-40	19173	1513	708	5352	3983	12489	8	43226	107808
2040-41	20340	1556	730	5541	4124	12929	8	45228	112076
2041-42	21577	1600	752	5736	4269	13387	8	47329	116526

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Gulabpura-Chittorgarh project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup> June 2026

Target Traffic - 76316 in PCU

It was observed that as per traffic projections, average traffic volume falls short of target traffic in all scenarios. Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 3-4 years Traffic forecast and revenue projections are done for probable extended period accordingly.

**Most Likely**

<b>Targe t Year</b>	<b>Target Traffi c</b>	<b>Actual Traffic</b>	<b>% of Excess / Short traffic</b>	<b>% Revision (+ or -) in CP as per CA</b>	<b>% Variatio n in CP</b>	<b>Origi nal CP</b>	<b>Change in CP (In Years)</b>
2026	76316	54919	-28%	42%	20%	20	4

**Optimistic**

<b>Targe t Year</b>	<b>Target Traffic</b>	<b>Actual Traffic</b>	<b>% of Excess / Short traffic</b>	<b>% Revision (+ or -) in CP as per CA</b>	<b>% Variatio n in CP</b>	<b>Origi nal CP</b>	<b>Change in CP (In Years)</b>
2026	76316	55187	-28%	42%	20%	20	4

**Pessimistic**

<b>Targe t Year</b>	<b>Target Traffic</b>	<b>Actual Traffic</b>	<b>% of Excess / Short traffic</b>	<b>% Revision (+ or -) in CP as per CA</b>	<b>% Variatio n in CP</b>	<b>Origi nal CP</b>	<b>Change in CP (In Years)</b>
2026	76316	54658	-28%	43%	20%	20	4

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Gulabpura-Chittorgarh section of NH-19 is based on the old toll policy. As per the Toll Notification (Schedule -G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

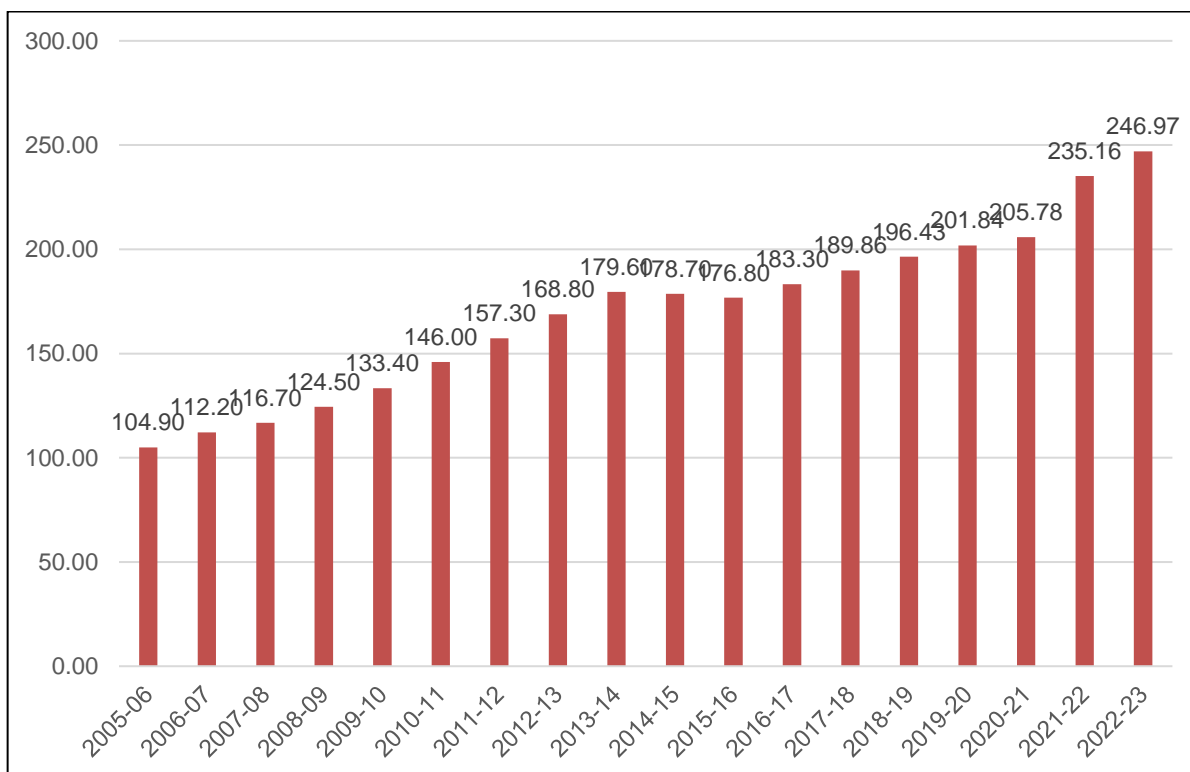
1. Monthly Pass: For frequent user's monthly pass would be issued for 50 trips in month at 2/3d rate. Additionally, concessionaire has announced special monthly passes for local commercial cars at Rs. 670.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van I - Rs. 275 per
  - b) Local LCV - Rs. 1200 per trip
  - c) Local Commercial Vehicles at 50% rate for single journey

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is taken 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under.

**Table 7-2 : Toll Rates for Single Journey@ Km 121.020**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	100	160	335	335	365	520	635
2025-26	105	165	350	350	380	550	670
2026-27	110	175	370	370	400	575	700
2027-28	115	185	385	385	420	605	735
2028-29	120	195	405	405	445	635	775
2029-30	125	205	425	425	465	670	815
2030-31	135	215	450	450	490	705	855
2031-32	140	225	470	470	515	740	900
2032-33	145	235	495	495	540	780	950
2033-34	155	250	520	520	570	820	995
2034-35	160	260	550	550	600	860	1050
2035-36	170	275	580	580	630	905	1105
2036-37	180	290	610	610	665	955	1165
2037-38	190	305	640	640	700	1005	1225
2038-39	200	320	675	675	735	1060	1290
2039-40	210	340	710	710	775	1115	1360
2040-41	220	360	750	750	820	1175	1430
2041-42	235	375	790	790	860	1240	1510

**Table 7-3 : Toll Rates for Single Journey @ Km 184.020**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	100	165	345	345	375	540	660
2025-26	105	175	365	365	395	570	695
2026-27	115	180	380	380	415	600	730
2027-28	120	190	400	400	435	630	765
2028-29	125	200	420	420	460	660	805
2029-30	130	210	445	445	485	695	845
2030-31	135	220	465	465	510	730	890
2031-32	145	235	490	490	535	765	935
2032-33	150	245	515	515	560	805	985
2033-34	160	260	540	540	590	850	1035
2034-35	170	270	570	570	620	895	1090
2035-36	175	285	600	600	655	940	1145
2036-37	185	300	630	630	690	990	1205
2037-38	195	315	665	665	725	1045	1270
2038-39	205	335	700	700	765	1100	1335
2039-40	220	350	740	740	805	1155	1410
2040-41	230	370	775	775	850	1220	1485
2041-42	240	390	820	820	895	1285	1565

**Table 7-4 : Toll Rates for Return Journey @ Km 121.02**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	150	240	500	500	545	785	955
2025-26	155	250	525	525	575	825	1000
2026-27	165	265	550	550	600	865	1055
2027-28	170	275	580	580	630	910	1105
2028-29	180	290	610	610	665	955	1165
2029-30	190	305	640	640	700	1005	1220
2030-31	200	320	675	675	735	1055	1285
2031-32	210	340	710	710	770	1110	1350
2032-33	220	355	745	745	810	1170	1420
2033-34	230	375	785	785	855	1230	1495
2034-35	245	395	825	825	900	1295	1575
2035-36	255	415	870	870	945	1360	1655
2036-37	270	435	915	915	995	1430	1745
2037-38	285	460	960	960	1050	1510	1835
2038-39	300	485	1015	1015	1105	1590	1935
2039-40	315	510	1065	1065	1165	1675	2035
2040-41	330	535	1125	1125	1225	1765	2145
2041-42	350	565	1185	1185	1295	1860	2260

**Table 7-5 : Toll Rates for Return Journey @ Km 184.020**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	155	245	520	520	565	815	990
2025-26	160	260	545	545	595	855	1040
2026-27	170	275	570	570	625	895	1090
2027-28	180	285	600	600	655	940	1145
2028-29	185	300	630	630	690	990	1205
2029-30	195	315	665	665	725	1040	1265
2030-31	205	335	700	700	760	1095	1330
2031-32	215	350	735	735	800	1150	1400
2032-33	230	370	770	770	840	1210	1475
2033-34	240	390	810	810	885	1275	1550
2034-35	255	410	855	855	935	1340	1630
2035-36	265	430	900	900	980	1410	1720
2036-37	280	450	945	945	1035	1485	1810
2037-38	295	475	995	995	1090	1565	1905
2038-39	310	500	1050	1050	1145	1645	2005
2039-40	325	530	1105	1105	1205	1735	2115
2040-41	345	555	1165	1165	1270	1830	2225
2041-42	365	585	1230	1230	1340	1925	2345

**Table 7-6 : Toll Rates for Monthly Pass Local @ Km 121.020**

<b>Year</b>	<b>Car</b>	<b>Minibus /LCV</b>
<b>2024-25</b>	340	1485
<b>2025-26</b>	355	1560
<b>2026-27</b>	375	1640
<b>2027-28</b>	390	1720
<b>2028-29</b>	410	1805
<b>2029-30</b>	435	1895
<b>2030-31</b>	455	1990
<b>2031-32</b>	480	2090
<b>2032-33</b>	505	2195
<b>2033-34</b>	530	2305
<b>2034-35</b>	560	2420
<b>2035-36</b>	585	2540
<b>2036-37</b>	620	2665
<b>2037-38</b>	650	2800
<b>2038-39</b>	685	2940
<b>2039-40</b>	720	3085
<b>2040-41</b>	760	3240
<b>2041-42</b>	800	3400

**Table 7-7 : Toll Rates for Monthly Pass Local @ Km 184.020**

<b>Year</b>	<b>Car</b>	<b>Minibus /LCV</b>
<b>2024-25</b>	340	1175
<b>2025-26</b>	355	1235
<b>2026-27</b>	375	1295
<b>2027-28</b>	390	1360
<b>2028-29</b>	410	1430
<b>2029-30</b>	435	1500
<b>2030-31</b>	455	1575
<b>2031-32</b>	480	1655
<b>2032-33</b>	505	1740
<b>2033-34</b>	530	1825
<b>2034-35</b>	560	1915
<b>2035-36</b>	585	2010
<b>2036-37</b>	620	2110
<b>2037-38</b>	650	2215
<b>2038-39</b>	685	2325
<b>2039-40</b>	720	2440
<b>2040-41</b>	760	2560
<b>2041-42</b>	800	2690

**Table 7-8 : Toll Rates for Monthly Pass @ Km 121.020**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	3280	5300	11105	11105	12115	17415	21200
2025-26	3445	5565	11665	11665	12725	18290	22265
2026-27	3620	5850	12255	12255	13365	19215	23395
2027-28	3805	6145	12875	12875	14045	20190	24580
2028-29	4000	6460	13530	13530	14760	21220	25835
2029-30	4205	6790	14225	14225	15520	22305	27155
2030-31	4420	7140	14955	14955	16315	23455	28555
2031-32	4645	7505	15730	15730	17160	24665	30025
2032-33	4890	7895	16545	16545	18050	25945	31585
2033-34	5145	8310	17405	17405	18990	27295	33230
2034-35	5410	8740	18320	18320	19985	28725	34970
2035-36	5695	9200	19280	19280	21035	30235	36810
2036-37	5995	9690	20300	20300	22145	31830	38750
2037-38	6315	10200	21375	21375	23315	33520	40805
2038-39	6650	10745	22510	22510	24560	35305	42980
2039-40	7005	11320	23715	23715	25870	37190	45275
2040-41	7385	11925	24990	24990	27260	39185	47705
2041-42	7780	12570	26335	26335	28730	41300	50275

**Table 7-9 : Toll Rates for Monthly Pass @ Km 184.02**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	3400	5495	11515	11515	12560	18060	21985
2025-26	3575	5775	12095	12095	13195	18970	23090
2026-27	3755	6065	12705	12705	13860	19925	24260
2027-28	3945	6375	13350	13350	14565	20940	25490
2028-29	4145	6700	14035	14035	15310	22005	26790
2029-30	4360	7040	14750	14750	16095	23135	28160
2030-31	4585	7405	15510	15510	16920	24325	29610
2031-32	4820	7785	16310	16310	17795	25580	31140
2032-33	5070	8190	17155	17155	18715	26905	32755
2033-34	5335	8615	18050	18050	19690	28305	34460
2034-35	5610	9065	18995	18995	20725	29790	36265
2035-36	5905	9545	19995	19995	21810	31355	38170
2036-37	6220	10045	21050	21050	22965	33010	40185
2037-38	6550	10580	22165	22165	24180	34760	42315
2038-39	6900	11140	23345	23345	25470	36610	44570
2039-40	7265	11740	24595	24595	26830	38565	46950
2040-41	7655	12370	25915	25915	28270	40635	49470
2041-42	8070	13035	27310	27310	29795	42825	52135

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under most likely scenario at each of the toll plaza up to 2041- 42 starting from the year 2024-25 are shown in tables below.

**Table 7-10 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	TP-1	TP2	Total
2024-25	179.82	218.37	398.19
2025-26	200.42	243.96	444.38
2026-27	223.30	272.25	495.55
2027-28	249.21	304.18	553.39
2028-29	277.22	337.52	614.74
2029-30	309.38	377.03	686.41
2030-31	342.30	414.62	756.92
2031-32	377.44	458.09	835.53
2032-33	414.90	503.24	918.15
2033-34	458.18	556.06	1014.24
2034-35	504.66	614.16	1118.83
2035-36	556.06	674.80	1230.85
2036-37	610.73	739.57	1350.30
2037-38	671.22	813.78	1485.00
2038-39	738.65	894.19	1632.83
2039-40	813.82	985.62	1799.44
2040-41	891.10	1079.09	1970.19
2041-42	979.78	1183.73	2163.51

**Table 7-11 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Year	TP-1	TP2	Total
2024-25	179.82	218.37	398.19
2025-26	199.53	242.86	442.39
2026-27	221.24	269.70	490.94
2027-28	245.74	299.85	545.59
2028-29	272.09	331.11	603.20
2029-30	302.17	368.14	670.31
2030-31	332.74	403.00	735.74
2031-32	365.08	443.14	808.22
2032-33	399.33	484.50	883.84
2033-34	438.87	532.72	971.60
2034-35	481.04	585.55	1066.59
2035-36	527.49	640.25	1167.74

Year	TP-1	TP2	Total
<b>2036-37</b>	576.64	698.39	<b>1275.03</b>
<b>2037-38</b>	630.73	764.74	<b>1395.48</b>
<b>2038-39</b>	690.61	836.18	<b>1526.79</b>
<b>2039-40</b>	757.35	917.38	<b>1674.72</b>
<b>2040-41</b>	825.21	999.50	<b>1824.71</b>
<b>2041-42</b>	903.10	1091.33	<b>1994.43</b>

**Table 7-12 : Toll Revenue Most Likely Scenario****(Rs. Crores)**

Year	TP-1	TP2	Total
<b>2024-25</b>	179.82	218.37	<b>398.19</b>
<b>2025-26</b>	199.98	243.37	<b>443.35</b>
<b>2026-27</b>	222.25	270.87	<b>493.12</b>
<b>2027-28</b>	247.49	301.94	<b>549.43</b>
<b>2028-29</b>	274.66	334.24	<b>608.90</b>
<b>2029-30</b>	305.76	372.53	<b>678.29</b>
<b>2030-31</b>	337.50	408.75	<b>746.25</b>
<b>2031-32</b>	371.18	450.49	<b>821.67</b>
<b>2032-33</b>	406.98	493.67	<b>900.65</b>
<b>2033-34</b>	448.45	544.14	<b>992.59</b>
<b>2034-35</b>	492.76	599.57	<b>1092.33</b>
<b>2035-36</b>	541.60	657.08	<b>1198.68</b>
<b>2036-37</b>	593.55	718.52	<b>1312.07</b>
<b>2037-38</b>	650.86	788.78	<b>1439.64</b>
<b>2038-39</b>	714.47	864.59	<b>1579.06</b>
<b>2039-40</b>	785.24	950.83	<b>1736.06</b>
<b>2040-41</b>	857.78	1038.49	<b>1896.27</b>
<b>2041-42</b>	940.92	1136.67	<b>2077.59</b>

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Gulabpura to Chittorgarh section of NH-79 in state of Rajasthan from km 90.000 to km 214.870 nearing completion of six laning. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the busy and prominent national highway NH-79 which connects Kishangarh to Udaipur via Bhiwala and Chittorgarh. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As discussed, the dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future post COVID-19 due to various developments in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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# **HAPUR TO MORADABAD SECTION OF NH-9 IN THE STATE OF UTTAR PRADESH (KM 50.000 TO KM148.277)**



## **TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

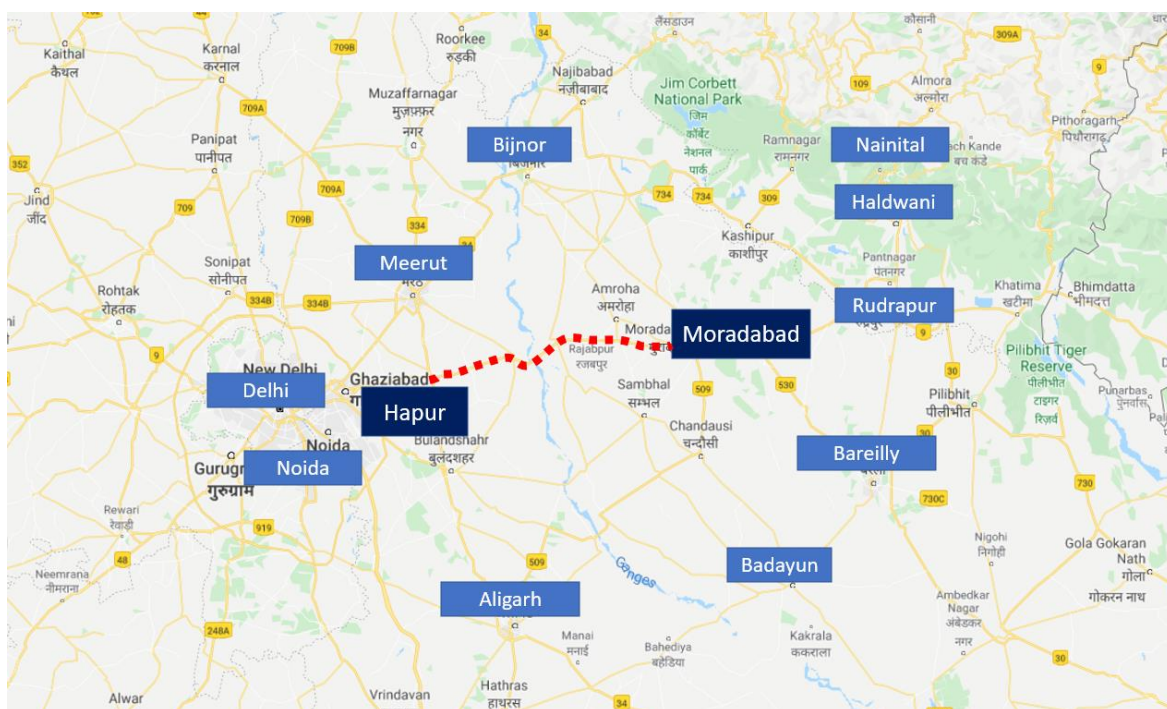
## INTRODUCTION

### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Six Laning of **Hapur Bypass to Moradabad section** of NH-9 from km 50.000 to km 148.277 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. M/s IRB Hapur Moradabad Tollway Ltd. (Concessionaire) has been awarded the Project for a concession period of 22 years starting from 28th May 2019. The Project is under capacity augmentation to six lanes. Tolling operation under current concession started in May 2019. COD-2 has been received in April 2023.

Project stretch from Hapur to Moradabad is part of new NH-9 which starts from Fazilka in Punjab and terminates in Uttarakhand at Pithoragarh. Previously this section was part of old NH-24 which is still popularly known as Delhi – Lucknow Road. New NH-9 takes off towards Pithoragarh from Rampur. A number of sections along the project road from Hapur to Moradabad have witnessed urban development along the highway. Places like Pilakhua, Babugarh, Brijghat, Gajrola and Joya are fast upcoming urban centers. Close proximity to Delhi and this being main connectivity of region to NCR is main region for this ribbon development along highway. The following figure shows the project road alignment.



**Figure 1-1: Alignment of Project Stretch**

## 1.2 Objective of the Study

M/s IRB INFRASTRUCTURE TRUST has engaged GMD Consultants to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

The project road is the section of the former NH-24 which has now been re-designated as NH-9 connecting Fazilka in Punjab to Pithoragarh in Uttarakhand. On the way it connects several important cities in five states in North India (from west towards east): Malout, Sirsa, Hisar, Rohtak, Bahadurgarh, Delhi, Ghaziabad, Hapur, Moradabad, Rampur, Rudrapur, Sitarganj, Khatima, Pithoragarh. The total length of the highway is 811 Km. After renumbering of all national highways by National Highway Authority of India in 2010, the current NH 9 was formed by merging five differently numbered national highways in 2010, including Old NH 10 (Fazilka-Delhi section), Old NH 24 (Delhi-Rampur section), Old NH 87 (Rampur-Rudrapur section), Old NH 74 (Rudrapur-Sitarganj-Khatima section) and Old NH 125 (Tanakpur-Pithoragarh section)

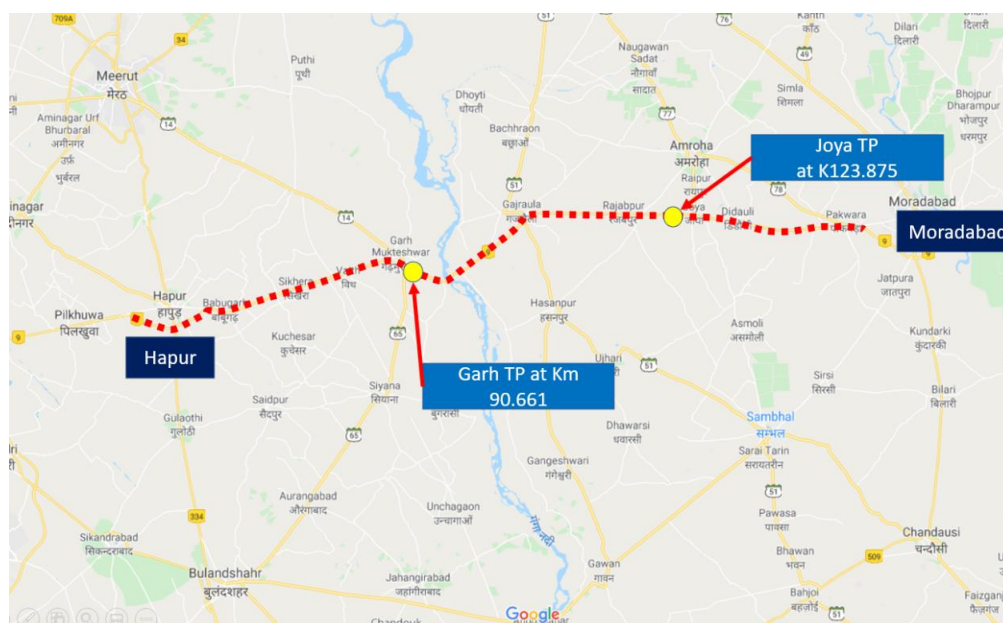
#### 2.2 Project Stretch Description

The Project section starts from Hapur Bypass (Km50.000) and ends in Moradabad (Km148.277). The total design length of project road section is about 100 Kms. The existing road is four lane divided carriageway, which is proposed to be six laned. The road passes through the districts of Hapur, Amroha and Moradabad; all in Uttar Pradesh.

Project road alignment passes through the small towns/built-up areas of Pakwara, Joya and Babugarh. Simbhaoli, one of the largest integrated sugar refinery complexes is right on the project road.

Hapur – Moradabad section of NH-9 was previously known as Delhi Road locally. This forms the main connectivity of areas like Moradabad, Rampur, Bareilly and important destinations in Uttarakhand like Rudrapur, Kashipur, Ranikhet, Pithoragarh etc to the national capital of Delhi.

There are two operative toll plazas at project stretch. The first is at Garh at Km 90.661 and second at Joya at Km 123.875. The following figure shows project alignment and toll plaza locations.



**Figure 2-1: Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Six laning of project stretch is in progress and will be completed soon. The following photographs illustrate the project section along the corridor.



**Figure 2-2: Photographs showing Project Corridor**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Hapur Bypass- Moradabad Section of NH-9 for years 2017-18, 2018-19, 2019-20, 2020-21 ,2021-22,22-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

ic details have been collected.

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 90.661 Toll Plaza at Garh	AADT for Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022 and 2022, 2022-2023, Eight month	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		month from April 2023 to November 2023 & Four month from April 2024 to July 2024	November 2023 & Four month from April 2024 to July 2024	April 2023 to November 2023 & Four month from April 2024 to July 2024	from April 2023 to November 2023 & Four month from April 2024 to July 2024	April 2023 to November 2023 & Four month from April 2024 to July 2024
2	Km 123.875 Toll Plaza at Zoro ka Khera	AADT for Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024

### 3.5 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)

Vehicle Type	
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Bus
- Truck
- 3-Axle
- Multi Axle

### 3.6 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.6.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Garh Toll Plaza at Km 90.661**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	14878	15865	21889	24088	27330	29520
2	Minibus/LCV	3704	3119	1995	1730	1743	1748
3	Bus	2033	1573	1862	2069	2303	2310
4	Truck	1289	1354	1674	1972	2036	1713
5	3-Axle	1318	1105	1112	1070	1075	838
6	Multi Axle	1753	1635	1745	1962	2191	2051
7	Oversized Vehicle	2	6	6	9	7	5
	<b>Total</b>	<b>24977</b>	<b>24657</b>	<b>30283</b>	<b>32899</b>	<b>36686</b>	<b>38184</b>

**Table 3-4 : Traffic Data at Zoya Toll Plaza at Km 123.875**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	10298	10526	13695	16037	18696	20024
2	Minibus/LCV	2595	2259	1335	1181	1191	1232
3	Bus	1062	1303	1485	1768	2008	1883
4	Truck	1532	1040	1184	1436	1628	1627

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
5	3-Axle	1128	1064	1081	1008	936	754
6	Multi Axle	1365	1370	1458	1765	2017	2091
7	Oversize Vehicle	2	8	8	9	6	4
	<b>Total</b>	<b>17982</b>	<b>17570</b>	<b>20246</b>	<b>23203</b>	<b>26481</b>	<b>27615</b>

### 3.7 Data Analysis

#### 3.7.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-5**.

**Table 3-5 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0

Vehicle Type	PCUs
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

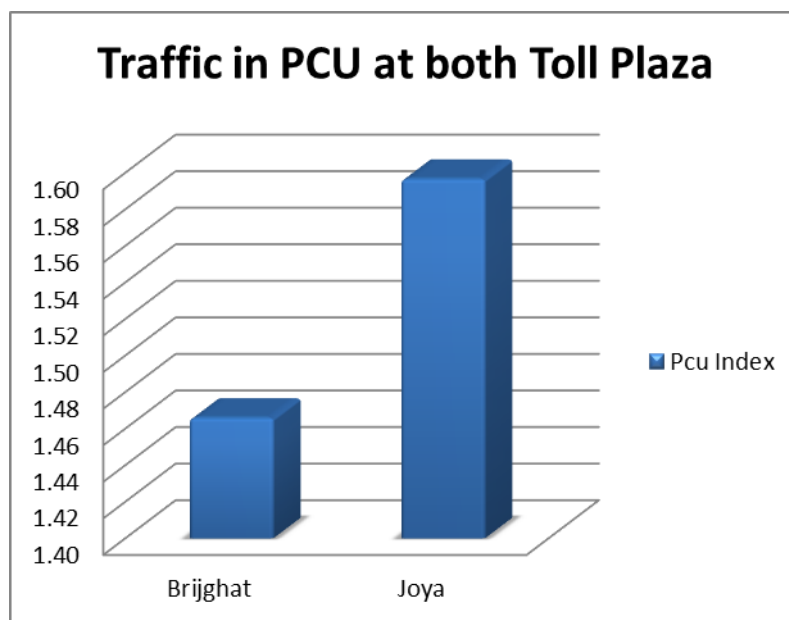
Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

**Table 3-6 : Traffic in PCU at Project Stretch Base Year 2023-24**

Toll Plaza Location (Km)	Year	Traffic No	PCU	PCU Index
<b>Garh Km 90.661</b>	<b>2019-2020</b>	24977	42251	1.69
	<b>2020-2021</b>	24657	40024	1.62
	<b>2021-2022</b>	30283	46705	1.54
	<b>2022-2023</b>	32899	50882	1.55
	<b>2023-2024</b>	36686	56079	1.53
	<b>2024-2025</b>	38184	55975	1.47
<b>Joya Km 123.875</b>	<b>2019-2020</b>	17982	31508	1.75
	<b>2020-2021</b>	17570	30337	1.73
	<b>2021-2022</b>	20246	33545	1.66
	<b>2022-2023</b>	23203	38427	1.66
	<b>2023-2024</b>	26481	43300	1.64
	<b>2024-2025</b>	27615	44091	1.60

It can be observed from above that project traffic has PCU index in range of 1.5 to 1.7 which is an indicator of high proportion of Passenger traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at four toll plaza locations.

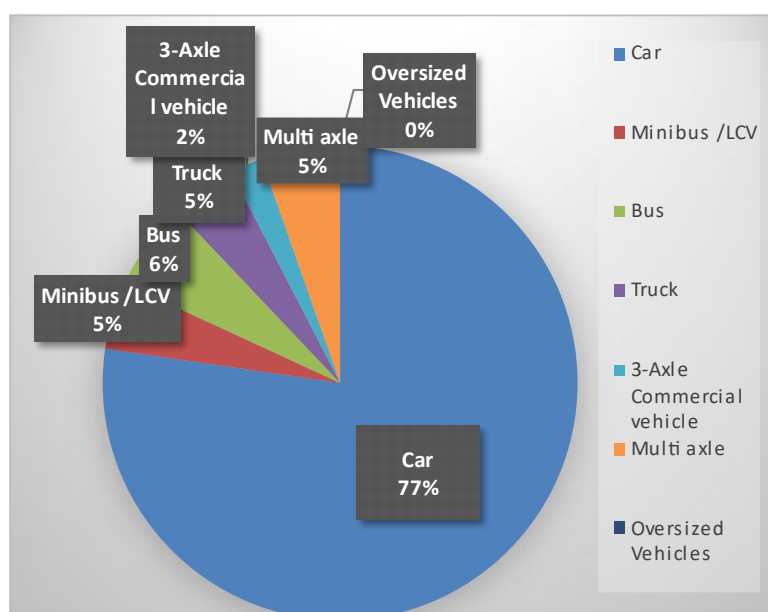


**Figure 3-1: Comparison of PCU Index**

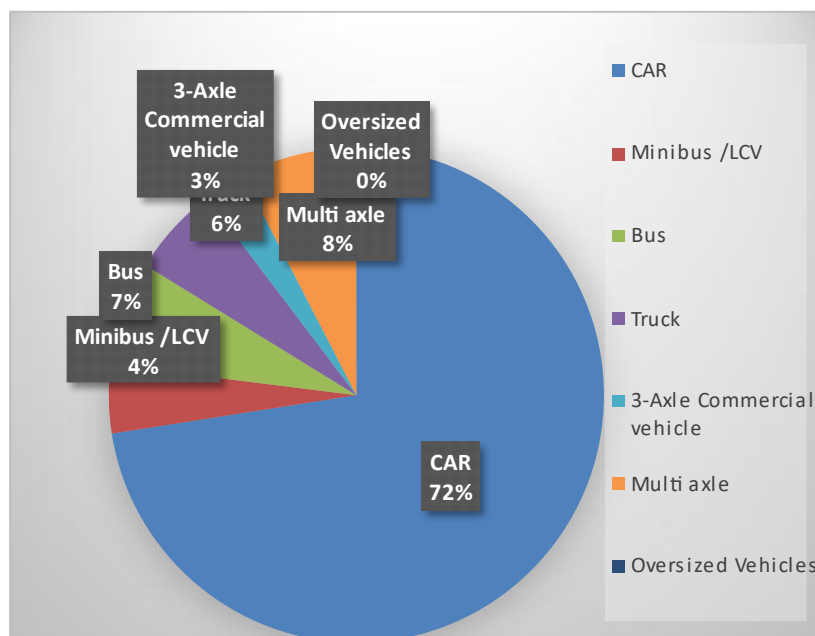
It can be observed that PCU index is consistent at both toll plaza locations.

### 3.7.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-2: Model Split of Tollable Vehicle @TP-1**



**Figure 3-3: Model Split of Tollable Vehicle @TP-2**

It is observed that car traffic forms about 77% - 72% of total traffic at toll plaza locations while multi axle commercial vehicles are about 7% -11% of total traffic. Truck / Bus and LCV share about 11%-13% and 5%-4% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-7 : Journey Type Bifurcation of Traffic at GarhTP-1 KM 90.661**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	17096
2	Return Journey	21044
3	Local Commercial Single Journey	9
4	Monthly Pass Local	30
5	Monthly Pass	5

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 45%. Return journey component is 55%. The number of monthly pass local and Local Commercial Journey is 0% at Brijghat. The following tables give the details of journey distribution at Joya toll plaza at Km 123.875.

**Table 3-8 : Journey Type Bifurcation of Traffic at Zoro ka Khera TP-2 KM 121.020**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	14280
2	Return Journey	13308
3	Local Commercial Single Journey	12
4	Monthly Pass Local	8
5	Monthly Pass	7

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.8 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan

- h) Any other relevant data
- 3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

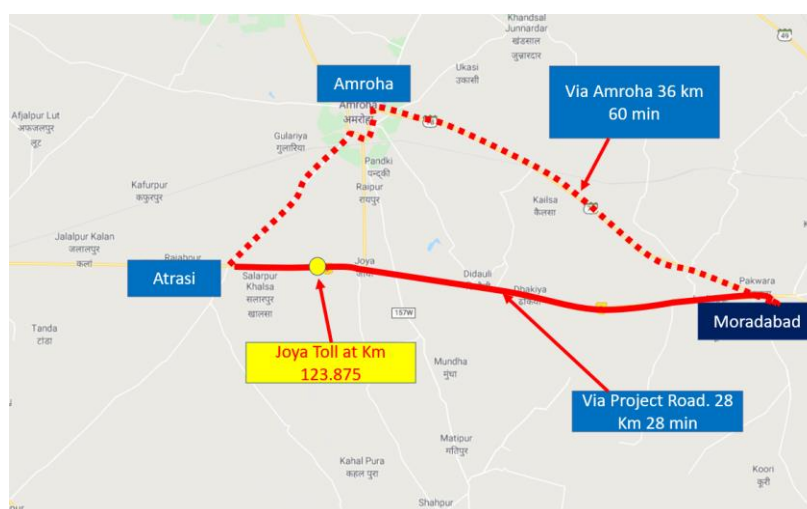
Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

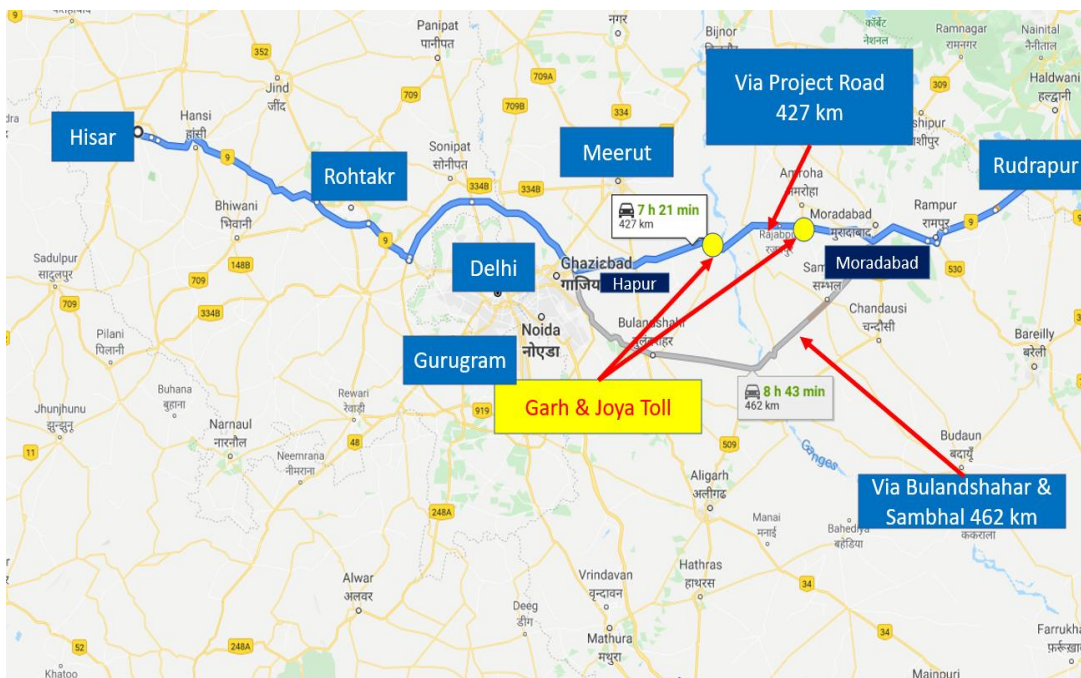
Project stretch has toll application history from last few years, and it can be assumed that project traffic is settled. However, from an analysis point of view there can be a few alternate routes at local level. Garh toll plaza is very near to the major river Ganga over which major bridge about 1 km in length is constructed. Due to this there is no locals alternative route to toll plaza at Garh. There can be one alternative route which can bypass the toll plaza at Joya. From Atrasi one can take a left and bypass Toll Plaza at Joya and go back to NH-9 at Moradabad. This route quite long and passes through congested areas of Amroha. Further the road alignment of these district roads is very poor with little chance of improvement.

The following maps show these routes in relation to project stretch at local level.



**Figure 4-1: Alternate route at regional level**

At regional level if we take Hisar and Rudrapur two origin destinations representing Delhi/ Haryana and Uttarakhand region, there can be one alternate via Bulandshahar – Sambhal Road. One can take Bulandshahar road after getting down from Peripheral Expressway at after Ghaziabad. This road bypasses NH-9 between Ghaziabad and Moradabad. This route is also quite long as compared to NH-9 and also the road between Bulandshahar – Sambhal and Moradabad is poor and mostly of two-lane specifications. Hence in such case it has very little potential of any further traffic diversion from the project road.



**Figure 4-2: Alternate route at local level**

It can be observed that the project highway forms one of the main spines of the corridor between Delhi / Ghaziabad/ Hapur and Moradabad / Rudrapur/ Haldwani. Traffic on project road is now settled and it can be assumed as dedicated traffic on project road for logistic obligations.

With six laning now nearing completion, the project stretch would become slightly more attractive due to the improved level of service. In such a case any diversion of traffic from the project road is not envisaged.

The following table provides summary of analysis of alternate route/ roads discussed above.

**Table 4-1 : Competing Roads Details**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
Regional Level						
1	Hisar-Delhi- Bulandshahar- Sambhal- Moradabad - Rudrapur	Alternate Route	462	53	8Hr 43 Min	Alternate route is longer and has poor geometrics and specifications. Traffic diversion not envisaged
	Hisar-Delhi- Hapur- Gajrola- Moradabad - Rudrapur	Project Road	427	57	7 Hr 27 Min	
Local Level						
2	Atrasi- Amroha- Pakbara- Moradabad (bypassing Joya Toll)	Alternate Route	36	51	1 Hr.	Alternate route is unlikely to attract project traffic due to very poor geometrics and high congestion
	Atrasi- Joya- Palkbara- Moradabad	Project Road	220	50	28 Min	

Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road. Further, it may be noted that since the project highway has already been commissioned and has a tolling history, the current traffic traversing the project corridor already factors in traffic diversion (if any) that may have taken place.

## CHAPTER 5

# GROWTH OF TRAFFIC ON PROJECT HIGHWAY

### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Hapur–Moradabad section of NH-9 has been done taking the above factors into consideration. **“IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways”** is established best practice and has been used for traffic growth forecast.

### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log (P)} = k \times \text{Log (EI)} + A$$

Where,

P = Number of Vehicles (Mode wise)

EI = Economic Indicator

A = Regression constant

k = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

The project corridor spreads across the state of Rajasthan. Toll plazas at Garh and Joya are in the state of Uttar Pradesh. For elasticity calculations, working data from Uttar Pradesh, Delhi and Haryana has been analyzed since Delhi and Haryana have substantial impact on project traffic.

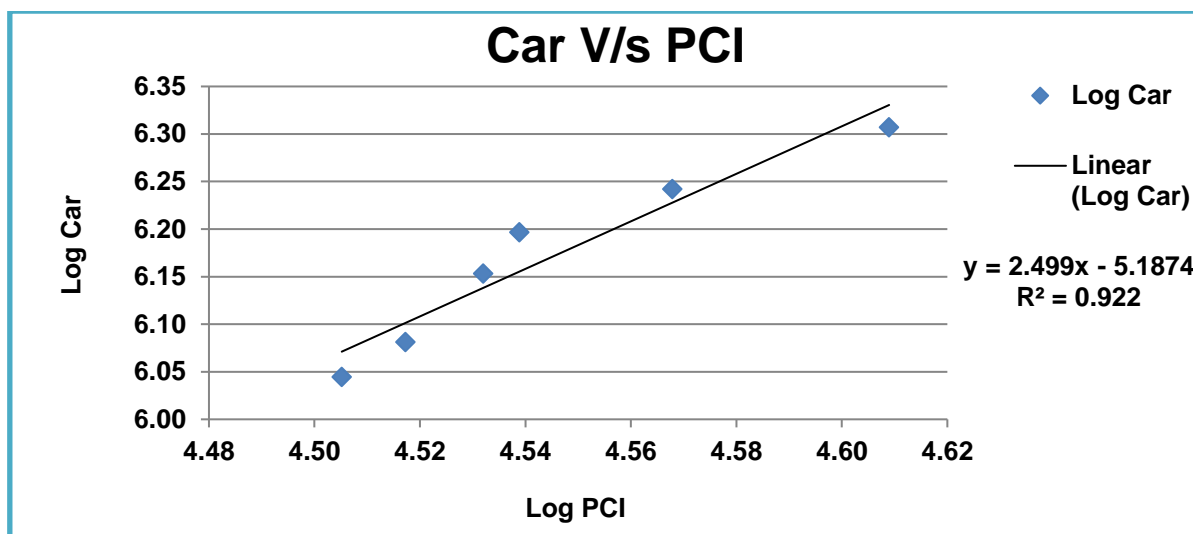
The following tables and graphs depict regression and elasticity of growth model for stretch falling in Maharashtra State.

**Table 5-1 : Per Capita Income Vs Car Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	32002	1108100	4.51	6.04		
2013	32908	1205374	4.52	6.08	3%	
2014	34044	1423020	4.53	6.15	3%	
2015	34583	1572217	4.54	6.20	2%	

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2016	36973	1746117	4.57	6.24	7%	
2017	40641	2027972	4.61	6.31	10%	4.94%

Regression analysis of same is given in figure below.

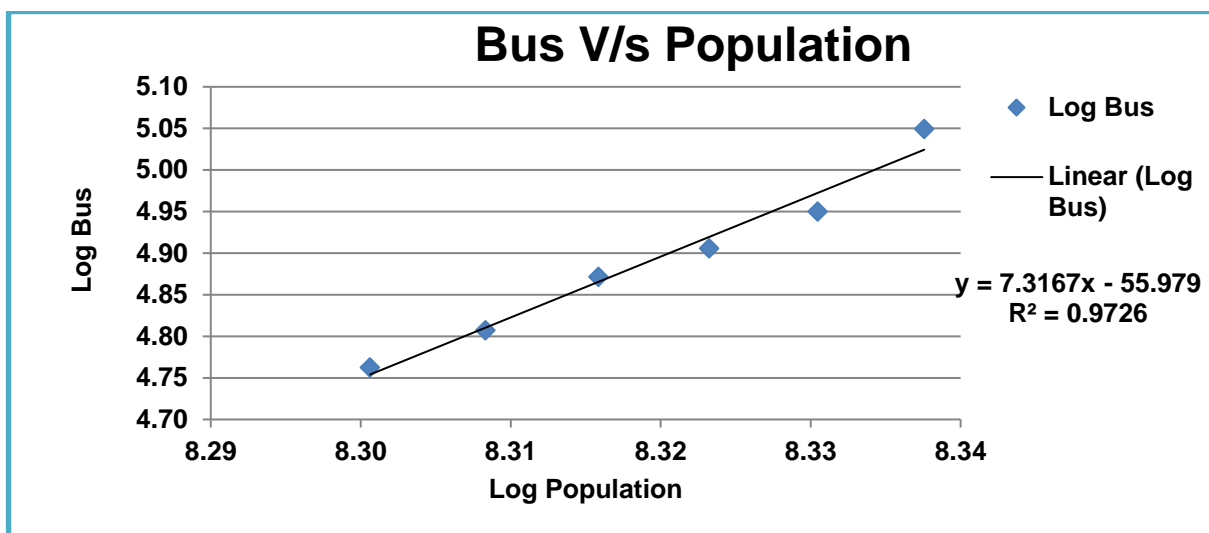


*Figure 5-1: Regression and Elasticity PCI vs. Car–Extrapolation Uttar Pradesh*

*Table 5-2 : Population Vs Bus Uttar Pradesh*

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	199812341	57901	8.30	4.76		
2013	203382046	64147	8.31	4.81	2%	
2014	206942855	74389	8.32	4.87	2%	
2015	210493544	80460	8.32	4.91	2%	
2016	214032922	89127	8.33	4.95	2%	
2017	217559836	112020	8.34	5.05	2%	1.72%

Regression analysis of same is given in figure below.



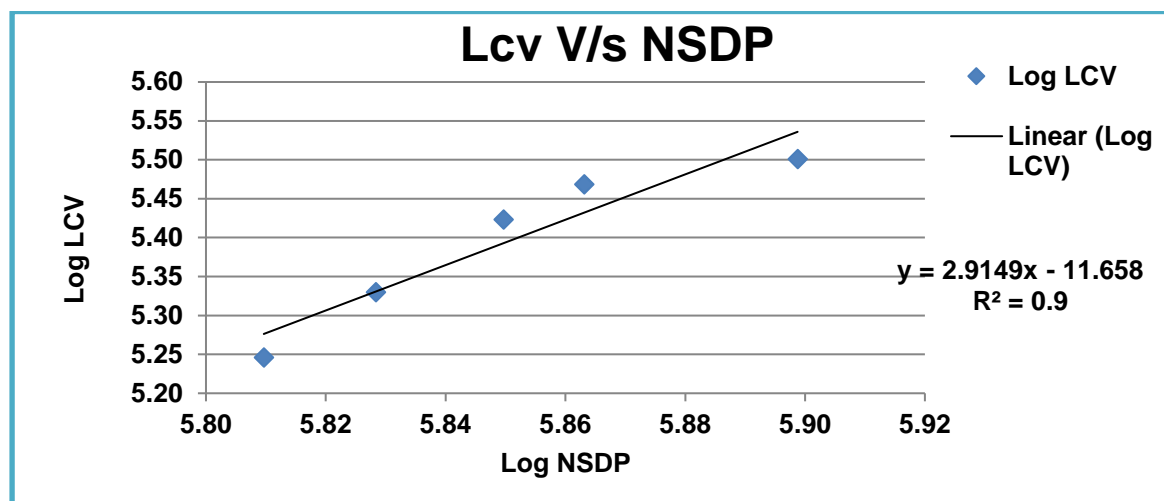
**Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Uttar Pradesh**

Year	NSDP	LCV	Log NDSP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	645132	176164	5.81	5.25		
2013	673552	213657	5.83	5.33	4%	
2014	707469	265025	5.85	5.42	5%	
2015	729686	294022	5.86	5.47	3%	
2016	792049	316815	5.90	5.50	9%	5.28%

The following figure depicts regression analysis and extrapolation.

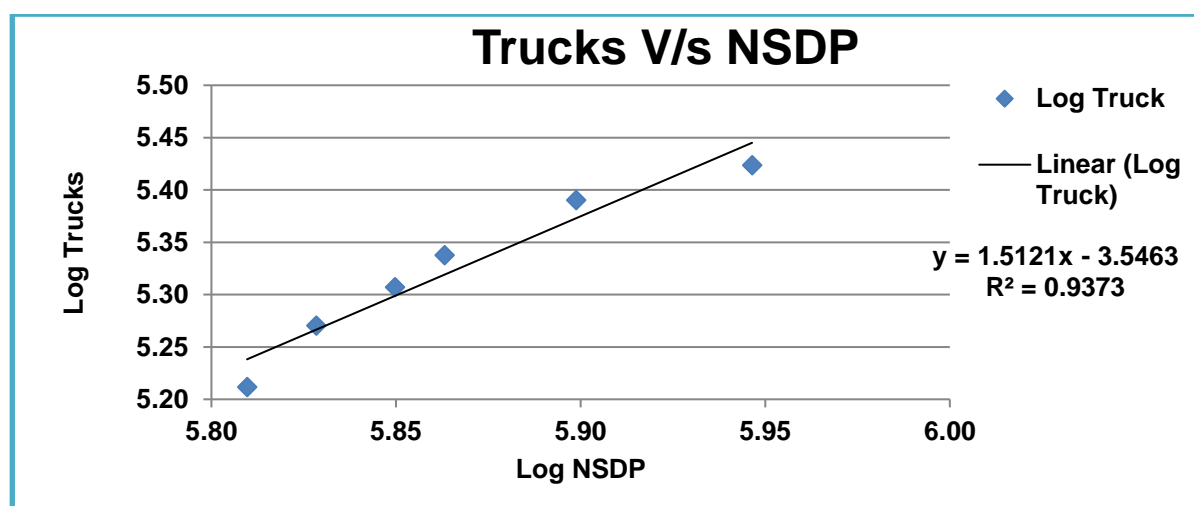


**Figure 5-3: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Uttar Pradesh**

**Table 5-4: Trucks Traffic Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	645132	162813	5.81	5.21		
2013	673552	186404	5.83	5.27	4%	
2014	707469	202761	5.85	5.31	5%	
2015	729686	217609	5.86	5.34	3%	
2016	792049	245688	5.90	5.39	9%	
2017	883962	265167	5.95	5.42	12%	6.55%

The following figure depicts regression analysis and extrapolation.



**Figure 5-4: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Uttar Pradesh**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-4 : Summary Regression Analysis Uttar Pradesh**

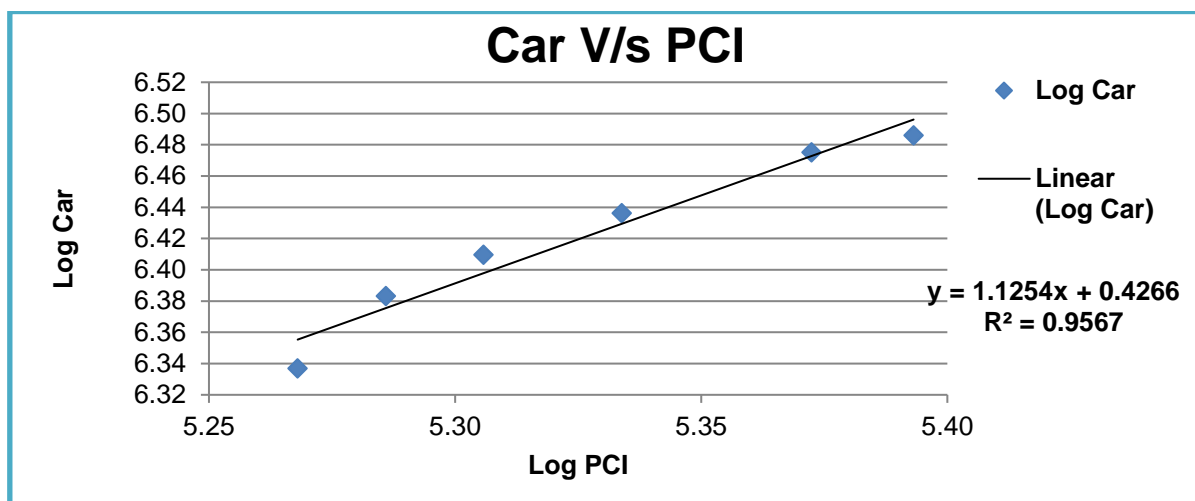
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Uttar Pradesh	Car/Jeep	PCI	$y = 2.499x + -5.1874$	R <sup>2</sup> = 0.922	2.4990	4.94%	12.34%
	Bus	Population	$y = 7.3167x - 55.9791$	R <sup>2</sup> = 0.9726	7.3167	1.72%	12.56%
	LCV	NSDP	$y = 2.9149x - 11.6585$	R <sup>2</sup> = 0.9	2.9149	5.28%	15.40%
	Truck	NSDP	$y = 1.5121x - 3.5463$	R <sup>2</sup> = 0.9373	1.5121	6.55%	9.90%

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Delhi State.

**Table 5-5 : Per Capita Income Vs Car Delhi**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	185361	2172069	5.27	6.34		
2013	193175	2416974	5.29	6.38	4%	
2014	202216	2568380	5.31	6.41	5%	
2015	215726	2730071	5.33	6.44	7%	
2016	235737	2986579	5.37	6.48	9%	
2017	247255	3061817	5.39	6.49	5%	5.95%

Regression analysis of same is given in figure below.

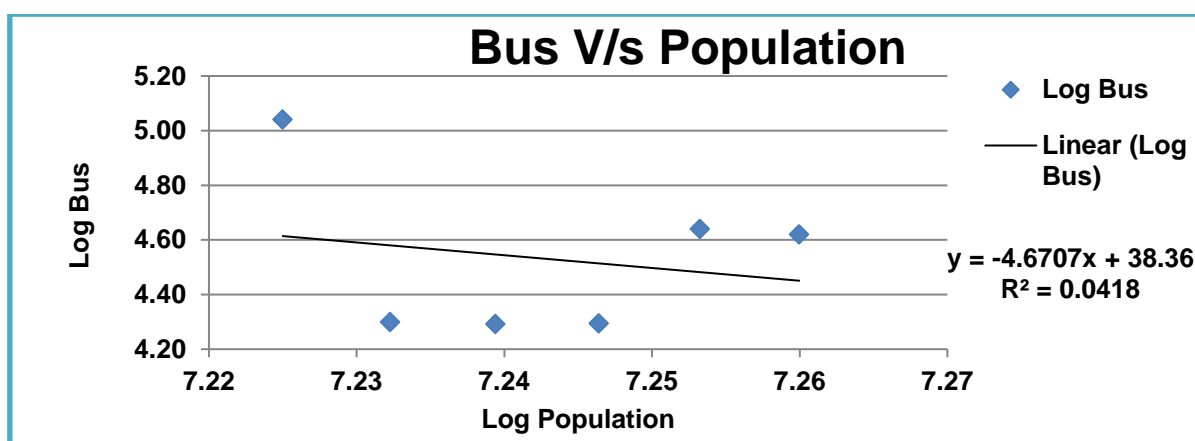


**Figure 5-5: Regression and Elasticity PCI vs. Car–Extrapolation Delhi**

**Table 5-6 : Population Vs Bus Delhi**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	16787941	109790	7.22	5.04		
2013	17071599	19917	7.23	4.30	2%	
2014	17354281	19595	7.24	4.29	2%	
2015	17635897	19700	7.25	4.29	2%	
2016	17916359	43723	7.25	4.64	2%	
2017	18195583	41686	7.26	4.62	2%	1.62%

Regression analysis of same is given in figure below.



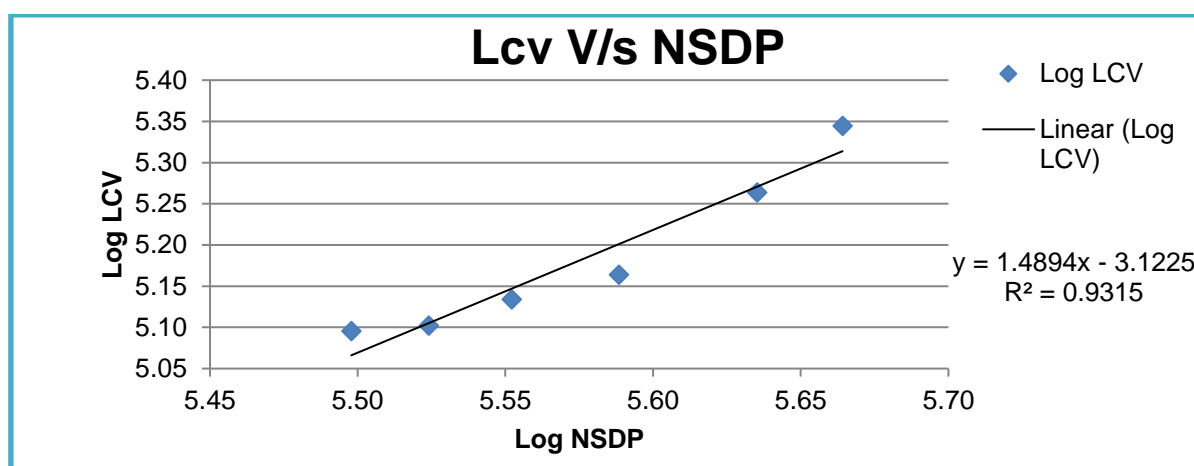
**Figure 5-6: Regression and Elasticity Population vs. Bus – Extrapolation Delhi**

The elasticity of goods traffic has been worked out by regression analysis with NSDP.  
The following table represents the data and details.

**Table 5-7 : LCV Traffic Vs NSDP Delhi**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	314650	124547	5.50	5.10		
2013	334193	126539	5.52	5.10	6%	
2014	356528	136110	5.55	5.13	7%	
2015	387639	145903	5.59	5.16	9%	
2016	431730	183486	5.64	5.26	11%	
2017	461476	221068	5.66	5.34	7%	7.98%

The following figure depicts regression analysis and extrapolation.

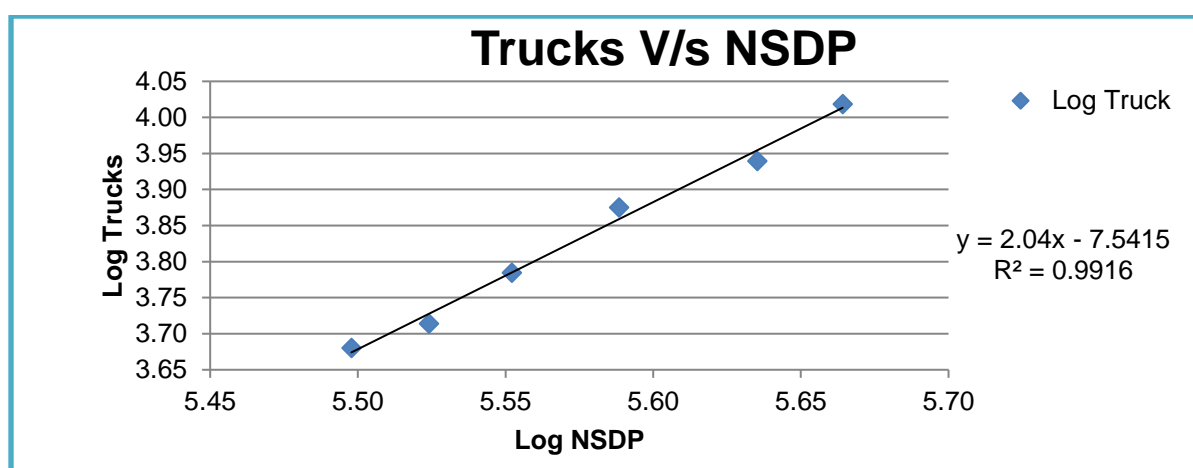


**Figure 5-7: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Delhi**

**Table 5-4: Trucks Traffic Vs NSDP Delhi**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	314650	4792	5.50	3.68		
2013	334193	5176	5.52	3.71	6%	
2014	356528	6093	5.55	3.78	7%	
2015	387639	7503	5.59	3.88	9%	
2016	431730	8703	5.64	3.94	11%	
2017	461476	10440	5.66	4.02	7%	7.98%

The following figure depicts regression analysis and extrapolation.

**Figure 5-8: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Delhi**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-8 : Summary Regression Analysis Delhi**

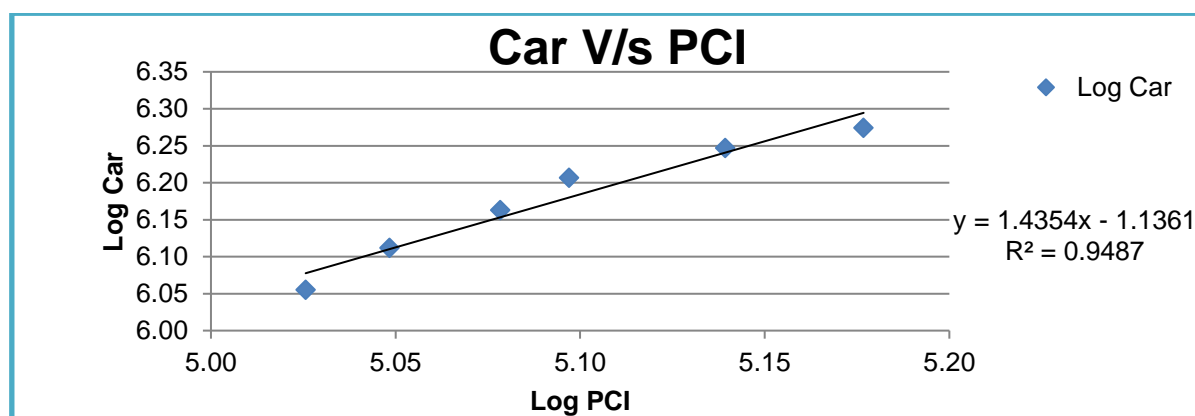
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Delhi	Car/Jeep	PCI	$y = 1.1254x + 0.4266$	$R^2 = 0.9567$	1.1254	5.95%	6.69%
	Bus	Population	$y = -4.6707x - 38.36$	$R^2 = 0.0418$	-4.6707	1.62%	-7.58%
	LCV	NSDP	$y = 1.4894x - 3.1225$	$R^2 = 0.9315$	1.4894	7.98%	11.88%
	Truck	NSDP	$y = 2.04x - 7.5415$	$R^2 = 0.9916$	2.0400	7.98%	16.27%

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Haryana State.

**Table 5-9 : Per Capita Income Vs Car Haryana**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	106085	1134514	5.03	6.05		
2013	111780	1293065	5.05	6.11	5%	
2014	119791	1454182	5.08	6.16	7%	
2015	125032	1609544	5.10	6.21	4%	
2016	137818	1764448	5.14	6.25	10%	
2017	150241	1879587	5.18	6.27	9%	7.23%

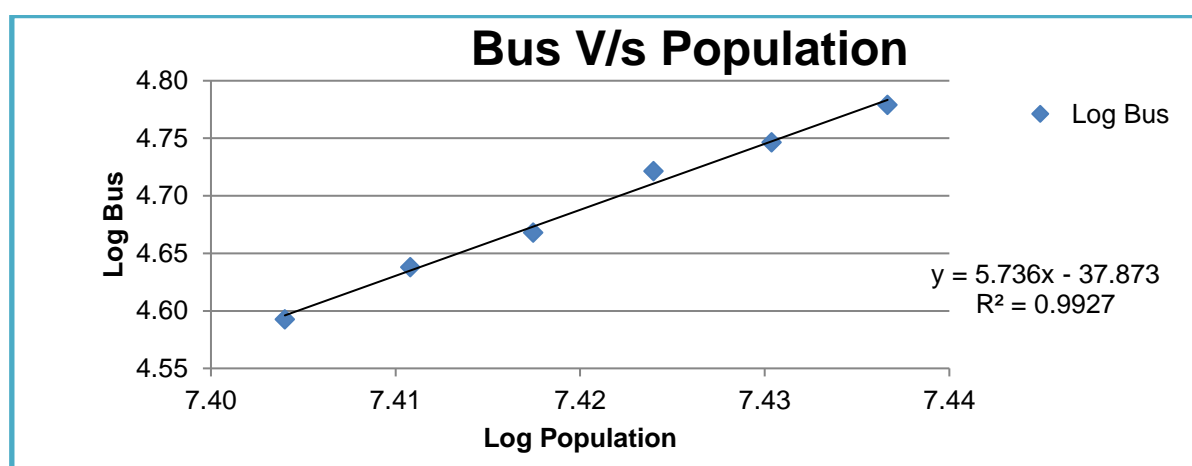
Regression analysis of same is given in figure below.

**Figure 5-9: Regression and Elasticity PCI vs. Car–Extrapolation Haryana**

**Table 5-10 : Population Vs Bus Haryana**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	25351462	39153	7.40	4.59		
2013	25751257	43456	7.41	4.64	2%	
2014	26149236	46558	7.42	4.67	2%	
2015	26545282	52640	7.42	4.72	2%	
2016	26939286	55781	7.43	4.75	1%	
2017	27331141	60129	7.44	4.78	1%	1.52%

Regression analysis of same is given in figure below.

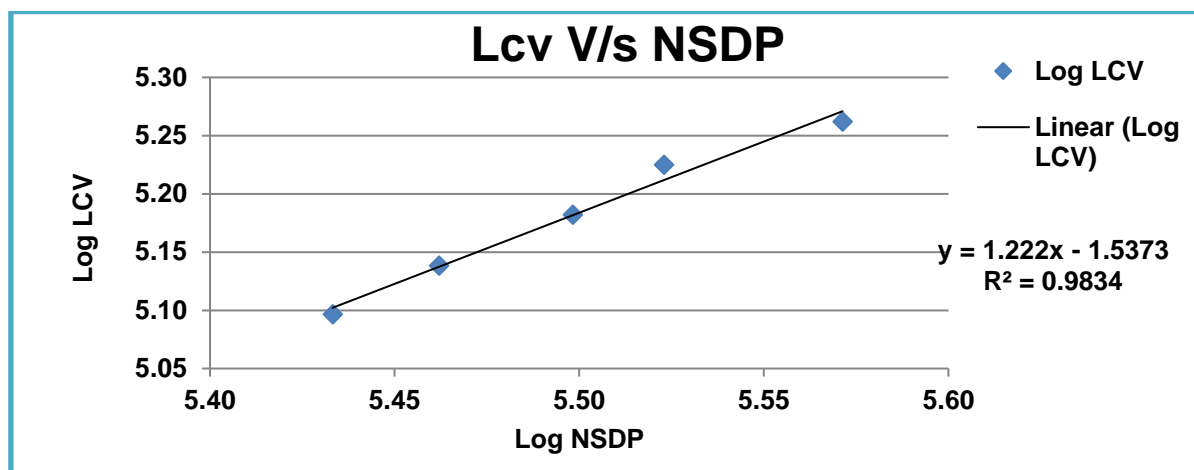
**Figure 5-10: Regression and Elasticity Population vs. Bus – Extrapolation Haryana**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-11 : LCV Traffic Vs NSDP Haryana**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	271152	124897	5.43	5.10		
2013	289756	137511	5.46	5.14	7%	
2014	314931	152069	5.50	5.18	9%	
2015	333359	167901	5.52	5.23	6%	
2016	372659	182776	5.57	5.26	12%	8.30%

The following figure depicts regression analysis and extrapolation.

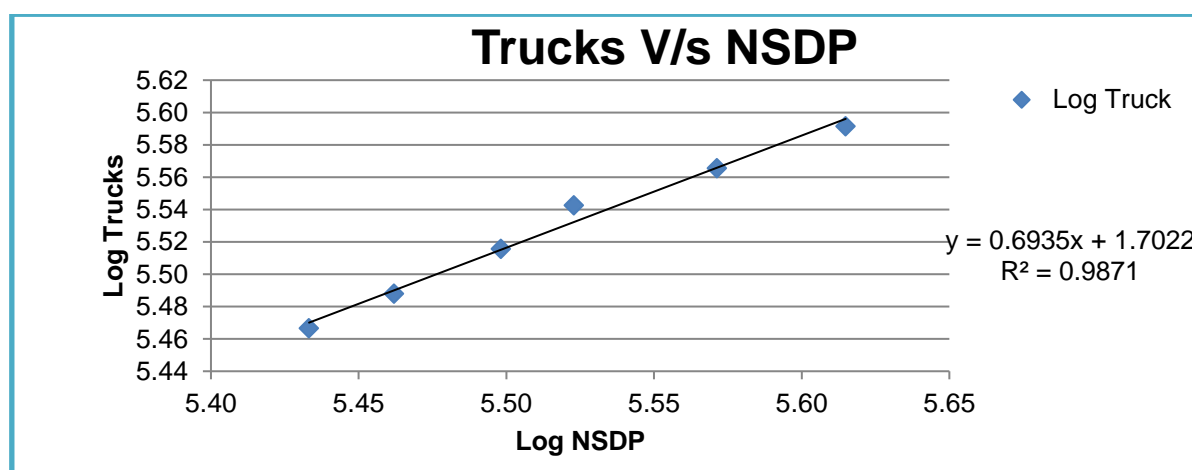


**Figure 5-11: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Haryana**

**Table 5-4: Trucks Traffic Vs NSDP Haryana**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	271152	292735	5.43	5.47		
2013	289756	307509	5.46	5.49	7%	
2014	314931	327882	5.50	5.52	9%	
2015	333359	348732	5.52	5.54	6%	
2016	372659	367730	5.57	5.57	12%	
2017	412006	390321	5.61	5.59	11%	8.75%

The following figure depicts regression analysis and extrapolation.



**Figure 5-12: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Haryana**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for the good fit regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-13: Summary Regression Analysis Haryana**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Haryana	Car/Jeep	PCI	$y = 1.4354x - 1.1361$	$R^2 = 0.9487$	1.4354	7.23%	10.38%
	Bus	Population	$y = 5.736x - 37.8732$	$R^2 = 0.9927$	5.7360	1.52%	8.69%
	LCV	NSDP	$y = 1.222x - 1.5373$	$R^2 = 0.9834$	1.2220	8.30%	10.14%
	Truck	NSDP	$y = 0.6935x - 1.7022$	$R^2 = 0.9871$	0.6935	8.75%	6.07%

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

## 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Hapur to Moradabad is under tolling operation with current concessionaire and has less than a year of tolling history from May 2019. Traffic data for the last two years is affected by COVID-19 impact. Hence sufficient data points are not available to be able to establish a reliable past trend of traffic growth. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

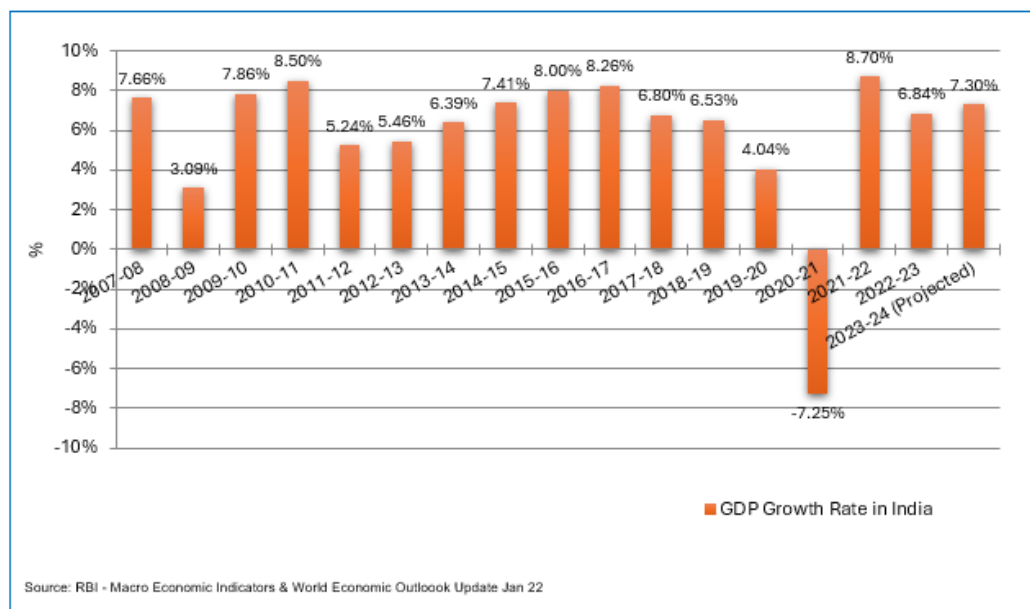
## 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-14: Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on Make -In- India it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

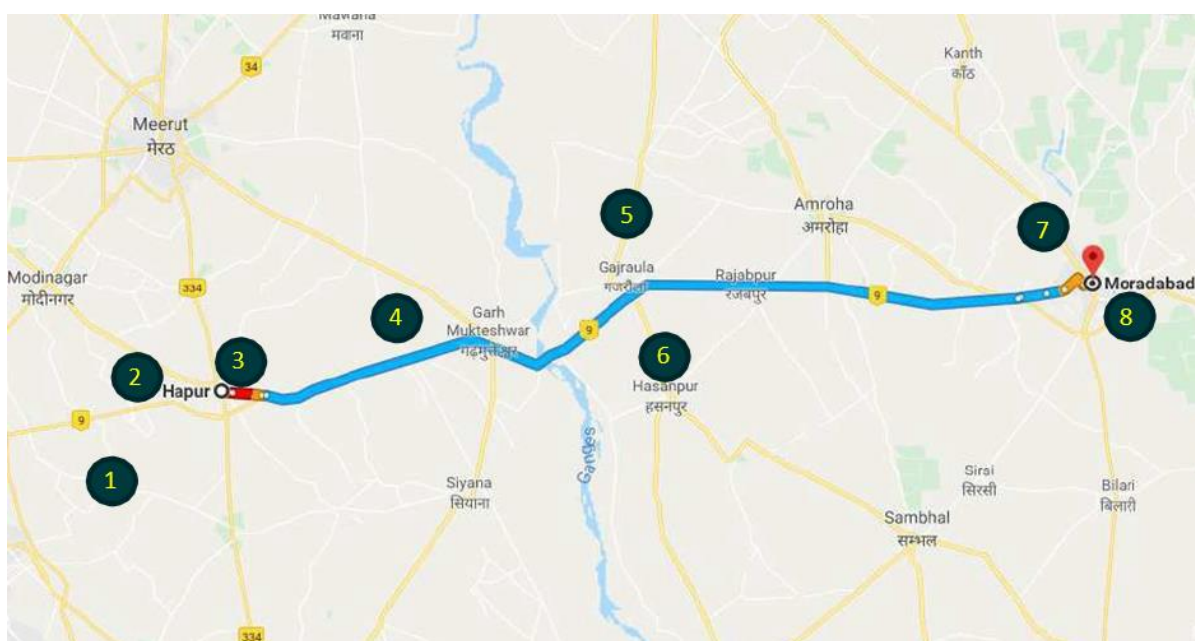
Though growth of Uttar Pradesh has been consistently below the national average economic growth, it is the largest state in terms of population and consumption driven demand for goods and services will remain significantly high. The rate of growth of NSDP also seems to be catching up with the national average over the years. Other regions in the influenced area states, namely Delhi, Haryana and Uttarakhand are all growing significantly faster than the national average. Considering the scenario, it may be assumed that the traffic growth on the project highway would remain high and there are minimal risks in terms of growth.

The corridor passes through heavily cultivated Gangetic plains and also connects the fertile Doaba regions of the Uttarakhand plains. Simbaoli, one of the largest and most modern sugar refinery complexes falls right on the project corridor. Sugar refineries like this link agriculture, distillery, clean fuel technologies, green energy generation including cogeneration etc. which is a positive influence on this agriculturally right region. Other parts of the capital region of Delhi are also

experiencing rapid urbanization fueled by industrialization and growth. Thus, induced traffic from these developments around the project corridor and due to the improved facility will be a positive contributing factor to the traffic growth on the project corridor.

### 5.6.1 Industrial Units along Project Corridor

This project section of the NH-24 (newNH-9) crosses three districts of Uttar Pradesh (Hapur, Amroha and Moradabad). There are about 1000 significant industrial units in these districts out of which there are 40 large Scale and 11 Medium Scale industries. The major industrial base is dependent on agriculture and timber in the surrounding region. Being a sugarcane growing region, there are a number of sugar mills in the project catchment. Simbhawli Sugarmill is one of the largest integrated refineries producing gsugar, ethanol and other related products. The following map shows some of the major industrial establishments along and in influence area of project stretch.



**Figure 5-15: Industrial Units along project corridor**

Industries shown in the above map are listed below.

1. **Dhaolana** (Chetak enterprises, Spooner Industries Pvt. Ltd., Astech build product India Pvt. Ltd.,
2. **Jindal Nagar, Hapur** (Marino Industries Jindal Nagar Hapur)– Large Scale Industry of Laminated Furnitures.
3. Medium Scale Industries in **Shakti Nagar, Hapur**
4. Sugar Mills (**Simbhawli** Sugar mills)
5. **Gajraula Industrial Area 1&2** (Paper & Sugar Mills, Food Products, Organic food Products)
6. Trivani Engineering & Industries Ltd., **Hasanpur** (Engineering Goods)
7. **Agwanpur** (Industries of Milk Powder, Ghee, Acrylic Fibre, Crystal Sugar, Craft Paper)
8. **Dalpatpur** (Moradabad Dugdh Utpadan Sahakari Sangh– Milk & Milk Products)

Rapid expansion of NCR and NOIDA has triggered growth along the project corridor as well. Large number of residential projects can be seen coming up along project road near Hapur, Gajraula and Moradabad. In fact, there is a new city “New Moradabad” has come up near Pakbara on Delhi Road.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. The same growth rate is not sustainable for long. It is an established practice to step down future growth rates at suitable interval of years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

**Table 5-12 : Recommended Growth Rates Optimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car/Jeep/Van	6.23%	6.01%	5.78%	4.36%	4.17%
LCV	3.26%	3.06%	2.47%	1.76%	1.57%
Bus	3.33%	3.20%	3.44%	2.73%	2.62%
2- Axle	3.81%	3.61%	3.17%	1.76%	1.57%
3 - Axle	3.81%	3.61%	3.17%	1.76%	1.57%
4 to 6 Axle	4.14%	3.92%	3.43%	1.89%	1.68%
7 and Above Axle	4.14%	3.92%	3.43%	1.89%	1.68%

**Table 5-13 : Recommended Growth Rates Pessimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car/Jeep/Van	5.73%	5.51%	5.28%	3.86%	3.67%
LCV	2.76%	2.56%	1.97%	1.26%	1.07%
Bus	2.83%	2.70%	2.94%	2.23%	2.12%
2- Axle	3.31%	3.11%	2.67%	1.26%	1.07%
3 - Axle	3.31%	3.11%	2.67%	1.26%	1.07%
4 to 6 Axle	3.64%	3.42%	2.93%	1.39%	1.18%
7 and Above Axle	3.64%	3.42%	2.93%	1.39%	1.18%

**Table 5-14 : Recommended Growth Rates Most Likely**

<b>Category / Year</b>	<b>2024-2026</b>	<b>2026-2031</b>	<b>2031-2036</b>	<b>2036-2041</b>	<b>2041-2046</b>
<b>Car/Jeep/Van</b>	5.98%	5.76%	5.53%	4.11%	3.92%
<b>LCV</b>	3.01%	2.81%	2.22%	1.51%	1.32%
<b>Bus</b>	3.08%	2.95%	3.19%	2.48%	2.37%
<b>2- Axle</b>	3.56%	3.36%	2.92%	1.51%	1.32%
<b>3 - Axle</b>	3.56%	3.36%	2.92%	1.51%	1.32%
<b>4 to 6 Axle</b>	3.89%	3.67%	3.18%	1.64%	1.43%
<b>7 and Above Axle</b>	3.89%	3.67%	3.18%	1.64%	1.43%

Traffic and revenue have been worked out on the basis of the above growths and some are presented in subsequent chapters of the report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Garh @90.661 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	29520	1748	2310	1713	838	2051	5	38184	55975
2025-26	31295	1802	2384	1775	868	2132	5	40261	58696
2026-27	33177	1857	2460	1839	899	2216	5	42453	61551
2027-28	35172	1913	2538	1906	932	2303	5	44769	64556
2028-29	37287	1971	2619	1975	966	2393	5	47216	67715
2029-30	39529	2031	2703	2047	1001	2486	5	49802	71038
2030-31	41813	2081	2796	2112	1032	2571	5	52410	74347
2031-32	44229	2132	2892	2179	1065	2659	5	55161	77823
2032-33	46786	2184	2991	2248	1099	2750	5	58063	81474
2033-34	49490	2238	3094	2320	1134	2845	5	61126	85316
2034-35	52350	2294	3200	2394	1170	2943	5	64356	89349
2035-36	54634	2334	3288	2437	1190	2999	5	66887	92398
2036-37	57018	2375	3378	2480	1211	3055	5	69522	95558
2037-38	59505	2417	3470	2523	1232	3113	5	72265	98837
2038-39	62101	2460	3565	2567	1253	3172	5	75123	102243
2039-40	64810	2503	3662	2612	1275	3232	5	78099	105778
2040-41	67514	2543	3758	2653	1295	3286	5	81054	109256
2041-42	70331	2583	3856	2694	1315	3342	5	84126	112862
2042-43	73266	2623	3957	2737	1335	3398	5	87321	116601
2043-44	76323	2664	4061	2780	1356	3455	5	90644	120480
2044-45	79507	2706	4167	2824	1377	3513	5	94099	124501
2045-46	82675	2744	4272	2863	1396	3564	5	97519	128445

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Joya @123.875 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	20024	1232	1883	1627	754	2091	4	27615	44091
2025-26	21229	1270	1944	1686	781	2173	4	29087	46164
2026-27	22505	1308	2006	1746	809	2258	4	30636	48329
2027-28	23858	1348	2070	1809	838	2347	4	32274	50611
2028-29	25293	1389	2136	1874	869	2439	4	34004	53007
2029-30	26814	1431	2204	1942	901	2535	4	35831	55527
2030-31	28364	1466	2280	2004	929	2622	4	37669	58019
2031-32	30003	1502	2358	2067	958	2712	4	39604	60627
2032-33	31737	1539	2439	2132	989	2806	4	41646	63371
2033-34	33570	1577	2523	2200	1021	2902	4	43797	66245
2034-35	35510	1616	2610	2270	1053	3001	4	46064	69256
2035-36	37059	1645	2681	2310	1072	3057	4	47828	71490
2036-37	38676	1674	2755	2351	1091	3115	4	49666	73814
2037-38	40363	1703	2830	2392	1110	3173	4	51575	76210
2038-39	42124	1733	2907	2435	1130	3233	4	53566	78706
2039-40	43961	1764	2987	2478	1150	3294	4	55638	81293
2040-41	45795	1791	3065	2517	1168	3349	4	57689	83820
2041-42	47706	1819	3146	2557	1187	3405	4	59824	86445
2042-43	49696	1848	3228	2597	1206	3463	4	62042	89163
2043-44	51770	1877	3312	2638	1225	3521	4	64347	91973
2044-45	53930	1906	3399	2679	1244	3581	4	66743	94888
2045-46	56079	1933	3485	2716	1262	3634	4	69113	97739

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 1- Garh @ 90.661 KM**  
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	29520	1748	2310	1713	838	2051	5	38184	55975
2025-26	31148	1793	2372	1766	864	2121	5	40069	58411
2026-27	32865	1838	2436	1821	890	2194	5	42049	60959
2027-28	34677	1885	2502	1877	918	2269	5	44133	63629
2028-29	36588	1933	2569	1935	947	2347	5	46324	66425
2029-30	38605	1982	2638	1995	976	2428	5	48629	69354
2030-31	40643	2021	2715	2048	1002	2499	5	50933	72238
2031-32	42788	2061	2795	2103	1028	2572	5	53352	75254
2032-33	45046	2101	2877	2159	1056	2648	5	55892	78412
2033-34	47424	2142	2961	2217	1084	2726	5	58559	81713
2034-35	49928	2184	3049	2277	1113	2806	5	61362	85171
2035-36	51857	2211	3117	2306	1127	2845	5	63468	87649
2036-37	53860	2238	3186	2335	1141	2884	5	65649	90204
2037-38	55941	2267	3257	2364	1155	2924	5	67913	92850
2038-39	58102	2296	3330	2393	1170	2964	5	70260	95586

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2039-40	60346	2325	3404	2424	1185	3005	5	72694	98418
2040-41	62562	2350	3477	2450	1198	3041	5	75083	101169
2041-42	64860	2375	3551	2476	1211	3077	5	77555	104006
2042-43	67242	2400	3626	2503	1224	3113	5	80113	106932
2043-44	69711	2425	3703	2530	1237	3150	5	82761	109956
2044-45	72271	2451	3781	2557	1251	3187	5	85503	113079
2045-46	74790	2473	3857	2579	1262	3218	5	88184	116097

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 2- Joka @123.875 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	20024	1232	1883	1627	754	2091	4	27615	44091
2025-26	21128	1263	1934	1678	778	2163	4	28948	45944
2026-27	22292	1295	1986	1730	802	2237	4	30346	47873
2027-28	23521	1328	2039	1784	827	2314	4	31817	49894
2028-29	24817	1362	2094	1839	853	2393	4	33362	52005
2029-30	26184	1397	2151	1896	879	2475	4	34986	54213
2030-31	27566	1424	2214	1947	903	2548	4	36606	56378
2031-32	29021	1452	2279	1999	927	2623	4	38305	58636
2032-33	30552	1481	2346	2053	952	2700	4	40088	60995
2033-34	32164	1510	2415	2107	977	2779	4	41956	63450
2034-35	33862	1540	2486	2163	1003	2861	4	43919	66021
2035-36	35169	1559	2542	2190	1016	2900	4	45380	67820
2036-37	36527	1578	2599	2217	1029	2941	4	46895	69682
2037-38	37938	1597	2657	2245	1042	2982	4	48465	71603
2038-39	39403	1618	2716	2273	1055	3023	4	50092	73584
2039-40	40925	1639	2777	2302	1068	3065	4	51780	75635
2040-41	42428	1656	2836	2327	1080	3101	4	53432	77614
2041-42	43986	1673	2897	2352	1092	3137	4	55141	79653
2042-43	45601	1691	2959	2377	1104	3174	4	56910	81759
2043-44	47276	1709	3022	2402	1116	3212	4	58741	83932
2044-45	49012	1728	3086	2428	1128	3250	4	60636	86173
2045-46	50720	1743	3148	2450	1138	3282	4	62485	88330

Traffic projections for Most Likely scenario is given as under

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 1- Garh @ 90.661 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	29520	1748	2310	1713	838	2051	5	38184	55975
2025-26	31221	1797	2378	1771	866	2126	5	40164	58551
2026-27	33021	1847	2448	1831	895	2204	5	42251	61254
2027-28	34923	1899	2521	1892	925	2285	5	44450	64091
2028-29	36936	1952	2595	1955	956	2369	5	46768	67065

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2029-30	39064	2006	2671	2020	989	2456	5	49211	70188
2030-31	41224	2051	2756	2078	1018	2534	5	51666	73282
2031-32	43502	2096	2844	2138	1048	2615	5	54248	76526
2032-33	45907	2143	2935	2200	1078	2699	5	56967	79929
2033-34	48446	2190	3028	2264	1109	2785	5	59827	83489
2034-35	51125	2239	3125	2330	1142	2874	5	62840	87230
2035-36	53228	2273	3202	2366	1160	2921	5	65155	89989
2036-37	55417	2307	3282	2402	1178	2969	5	67560	92847
2037-38	57696	2342	3364	2438	1196	3017	5	70058	95802
2038-39	60069	2378	3447	2475	1214	3067	5	72655	98868
2039-40	62539	2414	3532	2513	1233	3117	5	75353	102043
2040-41	64991	2446	3616	2546	1249	3162	5	78015	105145
2041-42	67541	2478	3701	2580	1265	3207	5	80777	108350
2042-43	70191	2511	3789	2614	1281	3253	5	83644	111671
2043-44	72945	2544	3879	2648	1297	3300	5	86618	115106
2044-45	75806	2578	3971	2683	1315	3347	5	89705	118664
2045-46	78637	2607	4061	2714	1330	3388	5	92742	122131

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 2- Joya @123.875 KM**  
**(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	20024	1232	1883	1627	754	2091	4	27615	44091
2025-26	21178	1266	1939	1681	779	2168	4	29015	46048
2026-27	22398	1302	1996	1738	805	2248	4	30491	48102
2027-28	23689	1338	2054	1797	832	2330	4	32044	50248
2028-29	25055	1376	2115	1857	860	2415	4	33682	52501
2029-30	26499	1414	2177	1919	888	2504	4	35405	54858
2030-31	27964	1445	2246	1975	914	2584	4	37132	57183
2031-32	29510	1477	2317	2032	941	2666	4	38947	59611
2032-33	31142	1510	2391	2091	968	2751	4	40857	62155
2033-34	32864	1543	2467	2152	996	2838	4	42864	64813
2034-35	34681	1577	2545	2215	1025	2928	4	44975	67596
2035-36	36108	1600	2608	2248	1040	2976	4	46584	69606
2036-37	37593	1625	2673	2282	1055	3025	4	48257	71691
2037-38	39139	1650	2740	2317	1071	3075	4	49996	73854
2038-39	40748	1675	2808	2352	1087	3126	4	51800	76087
2039-40	42424	1700	2878	2387	1103	3177	4	53673	78393
2040-41	44088	1723	2946	2419	1117	3223	4	55520	80640
2041-42	45817	1746	3016	2451	1132	3269	4	57435	82962
2042-43	47614	1769	3087	2483	1147	3315	4	59419	85354
2043-44	49481	1792	3161	2516	1162	3363	4	61479	87838
2044-45	51421	1815	3236	2549	1177	3411	4	63613	90397
2045-46	53342	1836	3310	2578	1190	3453	4	65713	92887

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Hapur-Moradabad project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup> April 2028

Target Traffic - 67413 in PCU

It was observed that as per traffic projections, average traffic volume is in excess of target traffic in all scenarios. The probable extension of the concession period is estimated according to article 29 of the concession agreement which comes to about 2 years. Traffic forecast and revenue projections have been kept up to concession period in report till actual finalization of modification.

### *Most Likely*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2028	67413	59825	-11%	17%	17%	22	3.7

### *Optimistic*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2028	67413	60409	-10%	16%	16%	22	3.4

### *Pessimistic*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2028	67413	59253	-12%	18%	18%	22	4.0

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Hapur-Moradabad section of NH-9 is based on the old toll policy. As per the Toll Notification (Schedule -G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

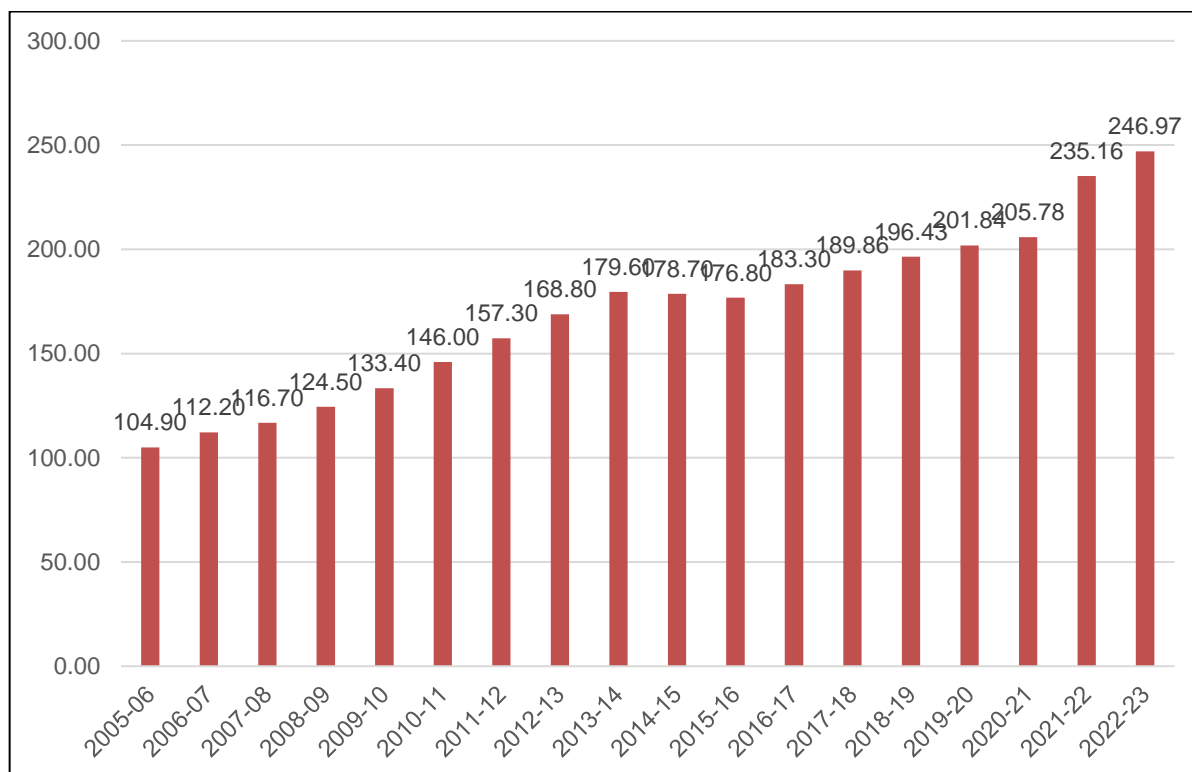
1. Monthly Pass: For frequent user's monthly pass would be issued for 50 trips in month at 2/3d rate.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van I - Rs. 265 per month
  - b) Local Commercial Vehicles at 50% rate for single journey

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it takes 5% and Suitably Stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given below.

**Table 7-2 : Toll Rates for Single Journey@ Km 90.661**

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2024-25	110	180	370	370	405	580	705
2025-26	120	190	395	395	430	615	750
2026-27	130	205	425	425	460	660	800
2027-28	135	215	445	445	485	695	845
2028-29	140	225	470	470	510	730	885
2029-30	150	240	490	490	535	765	930
2030-31	155	250	515	515	565	805	980
2031-32	165	265	545	545	595	850	1030
2032-33	175	275	575	575	625	895	1085
2033-34	180	290	605	605	655	940	1145
2034-35	190	305	635	635	690	990	1205
2035-36	200	325	670	670	730	1045	1265
2036-37	210	340	705	705	765	1100	1335
2037-38	225	360	740	740	805	1155	1405
2038-39	235	380	780	780	850	1220	1480
2039-40	250	400	825	825	895	1285	1560
2040-41	260	420	865	865	945	1355	1645
2041-42	275	440	915	915	995	1425	1735
2042-43	290	465	965	965	1050	1505	1830
2043-44	305	490	1015	1015	1110	1585	1930
2044-45	320	520	1070	1070	1170	1675	2035
2045-46	340	545	1130	1130	1230	1765	2145

**Table 7 3: Toll Rates for Single Journey @ Km 123.875**

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2024-25	70	115	235	235	260	370	450
2025-26	75	120	250	250	270	390	475
2026-27	75	125	260	260	285	410	500
2027-28	80	130	275	275	300	430	525
2028-29	85	135	290	290	315	450	550
2029-30	90	145	305	305	330	475	580

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2030-31	95	150	320	320	345	500	610
2031-32	100	160	335	335	365	525	640
2032-33	105	170	350	350	385	550	670
2033-34	110	175	370	370	405	580	705
2034-35	115	185	390	390	425	610	745
2035-36	120	195	410	410	450	645	785
2036-37	130	205	430	430	470	675	825
2037-38	135	215	455	455	495	715	870
2038-39	140	230	480	480	525	750	915
2039-40	150	240	505	505	550	790	965
2040-41	155	255	530	530	580	835	1015
2041-42	165	265	560	560	610	880	1070
2042-43	175	280	590	590	645	925	1130
2043-44	185	295	625	625	680	975	1190
2044-45	195	315	655	655	715	1030	1255
2045-46	205	330	695	695	755	1085	1320

**Table 7-3 : Toll Rates for Return Journey @ Km 90.661**

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2024-25	165	265	555	555	605	870	1060
2025-26	180	290	595	595	645	925	1125
2026-27	190	310	635	635	690	990	1205
2027-28	200	325	665	665	725	1040	1265
2028-29	210	340	700	700	765	1095	1330
2029-30	225	360	740	740	805	1150	1400
2030-31	235	375	775	775	845	1210	1470
2031-32	245	395	815	815	890	1275	1550
2032-33	260	415	860	860	935	1340	1630
2033-34	275	440	905	905	985	1410	1715
2034-35	285	460	950	950	1035	1485	1805
2035-36	300	485	1000	1000	1090	1565	1900
2036-37	320	510	1055	1055	1150	1645	2000
2037-38	335	540	1110	1110	1210	1735	2110
2038-39	355	565	1170	1170	1275	1830	2220
2039-40	370	595	1235	1235	1345	1925	2340
2040-41	390	630	1300	1300	1415	2030	2470
2041-42	415	665	1370	1370	1495	2140	2605
2042-43	435	700	1445	1445	1575	2255	2745
2043-44	460	735	1525	1525	1660	2380	2895
2044-45	485	775	1610	1610	1750	2510	3055
2045-46	510	820	1695	1695	1850	2650	3220

**Table 7-4 : Toll Rates for Return Journey @ Km 123.875**

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2024-25	105	170	355	355	385	555	675
2025-26	110	180	370	370	405	585	710
2026-27	115	185	390	390	425	615	745
2027-28	120	195	410	410	450	645	785
2028-29	130	205	430	430	470	675	825
2029-30	135	215	455	455	495	710	865
2030-31	140	230	475	475	520	750	910
2031-32	150	240	500	500	550	785	960
2032-33	155	250	530	530	575	830	1010
2033-34	165	265	555	555	605	870	1060
2034-35	175	280	585	585	640	915	1115
2035-36	180	295	615	615	670	965	1175
2036-37	190	310	650	650	705	1015	1235
2037-38	200	325	680	680	745	1070	1305
2038-39	210	345	720	720	785	1125	1370
2039-40	225	360	755	755	825	1185	1445
2040-41	235	380	800	800	870	1250	1525
2041-42	250	400	840	840	915	1320	1605
2042-43	260	425	885	885	965	1390	1690
2043-44	275	445	935	935	1020	1465	1785
2044-45	290	470	985	985	1075	1545	1880
2045-46	305	495	1040	1040	1135	1630	1985

**Table 7-5 : Toll Rates for Monthly Pass Local @ Km 90.661**

Year	Car
2024-25	330
2025-26	340
2026-27	360
2027-28	375
2028-29	395
2029-30	420
2030-31	440
2031-32	460
2032-33	485
2033-34	510
2034-35	540
2035-36	570
2036-37	600
2037-38	630
2038-39	665
2039-40	700
2040-41	740
2041-42	780

Year	Car
2042-43	820
2043-44	865
2044-45	915
2045-46	965

**Table 7-6 : Toll Rates for Monthly Pass Local @ Km 123.87**

Year	Car
2024-25	340
2025-26	355
2026-27	375
2027-28	390
2028-29	410
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	585
2036-37	620
2037-38	650
2038-39	685
2039-40	720
2040-41	760
2041-42	800
2042-43	845
2043-44	890
2044-45	940
2045-46	990

**Table 7-7 : Toll Rates for Monthly Pass @ Km 90.661**

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2024-25	3700	5935	12355	12355	13475	19335	23525
2025-26	3985	6395	13180	13180	14360	20555	24985
2026-27	4265	6840	14100	14100	15360	21990	26725
2027-28	4480	7190	14820	14820	16150	23120	28095
2028-29	4710	7555	15585	15585	16980	24310	29545
2029-30	4950	7945	16390	16390	17860	25570	31075
2030-31	5205	8355	17240	17240	18785	26895	32690
2031-32	5475	8785	18135	18135	19760	28300	34395
2032-33	5760	9245	19085	19085	20795	29780	36200
2033-34	6060	9725	20085	20085	21885	31345	38105
2034-35	6375	10235	21145	21145	23040	33000	40115
2035-36	6710	10775	22265	22265	24260	34750	42240
2036-37	7065	11345	23445	23445	25550	36600	44490

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2037-38	7440	11950	24695	24695	26915	38555	46870
2038-39	7835	12585	26020	26020	28355	40625	49385
2039-40	8255	13260	27420	27420	29880	42810	52045
2040-41	8700	13970	28900	28900	31495	45125	54860
2041-42	9170	14725	30465	30465	33200	47570	57835
2042-43	9665	15525	32120	32120	35005	50160	60985
2043-44	10190	16370	33875	33875	36920	52900	64320
2044-45	10745	17260	35730	35730	38940	55800	67845
2045-46	11330	18205	37690	37690	41080	58870	71580

**Table 7-8 : Toll Rates for Monthly Pass @ Km 123.875**

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2024-25	2325	3760	7875	7875	8595	12355	15040
2025-26	2445	3950	8275	8275	9025	12975	15795
2026-27	2570	4150	8695	8695	9485	13630	16595
2027-28	2700	4360	9135	9135	9965	14325	17435
2028-29	2835	4580	9600	9600	10470	15055	18325
2029-30	2980	4815	10090	10090	11010	15825	19265
2030-31	3135	5065	10610	10610	11575	16640	20255
2031-32	3295	5325	11160	11160	12170	17500	21300
2032-33	3470	5600	11735	11735	12805	18405	22405
2033-34	3650	5895	12350	12350	13470	19365	23575
2034-35	3840	6200	12995	12995	14175	20380	24810
2035-36	4040	6530	13675	13675	14920	21450	26110
2036-37	4255	6870	14400	14400	15710	22580	27490
2037-38	4480	7235	15165	15165	16540	23780	28945
2038-39	4720	7620	15970	15970	17420	25045	30490
2039-40	4970	8030	16825	16825	18355	26385	32120
2040-41	5235	8460	17725	17725	19340	27800	33840
2041-42	5520	8915	18680	18680	20380	29295	35665
2042-43	5820	9400	19690	19690	21485	30880	37595
2043-44	6135	9910	20760	20760	22650	32560	39635
2044-45	6470	10450	21895	21895	23885	34330	41795
2045-46	6820	11020	23090	23090	25190	36210	44080

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under **Optimistic, Pessimistic and Most Likely** growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2045-46 starting from the year 2024-25 are shown in tables below.

**Table 7-9 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	TP-1	TP2	Total
2024-25	208.26	107.30	315.56
2025-26	235.30	118.51	353.81
2026-27	263.99	128.44	392.43
2027-28	290.61	142.01	432.62
2028-29	318.21	156.86	475.06
2029-30	354.19	172.86	527.06
2030-31	386.72	189.28	576.00
2031-32	427.60	209.13	636.72
2032-33	471.51	228.27	699.78
2033-34	516.50	250.98	767.48
2034-35	566.64	275.89	842.53
2035-36	618.60	298.46	917.06
2036-37	672.82	325.66	998.48
2037-38	734.36	352.45	1086.81
2038-39	799.25	381.32	1180.57
2039-40	873.02	418.67	1291.69
2040-41	942.93	450.14	1393.06
2041-42	1029.60	491.04	1520.64
2042-43	1119.02	532.73	1651.75
2043-44	1221.38	581.62	1803.00
2044-45	1324.59	630.20	1954.79
2045-46	1441.62	683.15	2124.77

**Table 7-10 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Year	TP-1	TP2	Total
2024-25	208.26	107.30	315.56
2025-26	234.16	117.94	352.09
2026-27	261.48	127.20	388.68
2027-28	286.48	139.97	426.45
2028-29	312.20	153.87	466.07
2029-30	345.81	168.75	514.56
2030-31	375.83	183.93	559.76
2031-32	413.56	202.22	615.78
2032-33	453.90	219.71	673.61
2033-34	494.77	240.39	735.16
2034-35	540.23	262.98	803.22
2035-36	586.90	283.11	870.01
2036-37	635.22	307.42	942.64
2037-38	689.97	331.09	1021.06
2038-39	747.38	356.49	1103.87
2039-40	812.40	389.54	1201.94

Year	TP-1	TP2	Total
2040-41	873.11	416.84	<b>1289.95</b>
2041-42	948.63	452.52	<b>1401.15</b>
2042-43	1025.97	488.62	<b>1514.59</b>
2043-44	1114.43	530.88	<b>1645.30</b>
2044-45	1202.85	572.42	<b>1775.27</b>
2045-46	1302.90	617.56	<b>1920.45</b>

**Table 7-11 : Toll Revenue Most Likely Scenario  
(Rs. Crores)**

Year	TP-1	TP2	Total
2024-25	208.26	107.30	<b>315.56</b>
2025-26	234.73	118.21	<b>352.94</b>
2026-27	262.71	127.80	<b>390.51</b>
2027-28	288.52	140.96	<b>429.48</b>
2028-29	315.19	155.34	<b>470.53</b>
2029-30	349.95	170.75	<b>520.70</b>
2030-31	381.18	186.51	<b>567.69</b>
2031-32	420.45	205.56	<b>626.02</b>
2032-33	462.56	223.87	<b>686.42</b>
2033-34	505.36	245.54	<b>750.90</b>
2034-35	553.12	269.29	<b>822.41</b>
2035-36	602.34	290.62	<b>892.96</b>
2036-37	653.54	316.32	<b>969.86</b>
2037-38	711.68	341.53	<b>1053.21</b>
2038-39	772.79	368.61	<b>1141.39</b>
2039-40	842.08	403.73	<b>1245.82</b>
2040-41	907.29	433.08	<b>1340.36</b>
2041-42	988.24	471.27	<b>1459.51</b>
2042-43	1071.53	510.03	<b>1581.56</b>
2043-44	1166.69	555.52	<b>1722.21</b>
2044-45	1262.20	600.46	<b>1862.66</b>
2045-46	1370.44	649.35	<b>2019.79</b>

## CHAPTER 8

# CONCLUSION AND RECOMMENDATIONS

### 8.1 Conclusion & Recommendations

Project stretch of Hapur to Moradabad section of NH-9 in state of Uttar Pradesh from km 50.000 to km 148.277 is currently four lane and would be augmented to six lane in current concession. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the busy and prominent national highway NH-9 which is main link for traffic from Punjab, Haryana, Delhi to Moradabad, Rampur and eastern part of Uttarakhand. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually Post COVID-19 in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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**GOA/KARNATAKA BORDER TO KUNDARPUR**  
**(KM 93.300 TO KM 283.300)**  
**SECTION OF NH-17 IN THE STATE OF**  
**GOA & KARNATAKA**



**TRAFFIC STUDY & REVENUE**  
**PROJECTION REPORT**  
**(FINAL)**

**OCTOBER 2024**

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**GOA/KARNATAKA BORDER TO KUNDARPUR  
(KM 93.300 TO KM 283.300)  
SECTION OF NH-17 IN THE STATE OF  
GOA & KARNATAKA**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

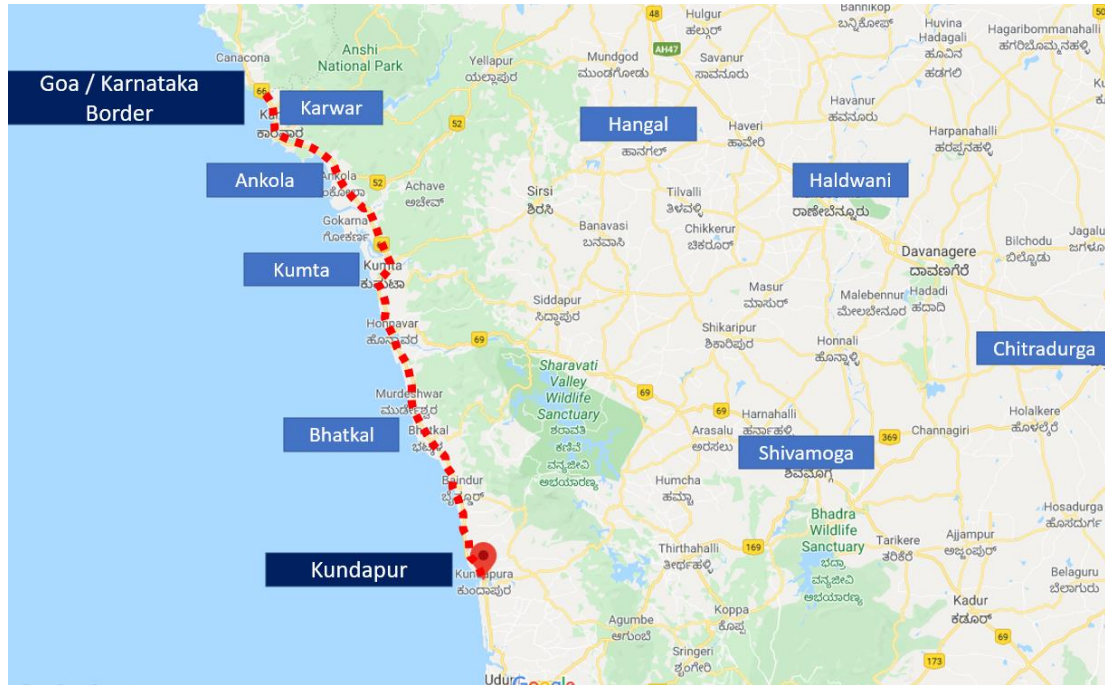
### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under various phases of NHDP. Under Phase IV NHAI has planned to convert existing 2-lane National Highways into 4-lane National Highway.

The project under consideration, Four Laning of Goa / Karnataka Border to Kundapur section of NH-17 from km 93.300 to km 283.300 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. M/s IRB Westcoast Tollway Ltd. (Concessionaire) has been awarded the Project for a concession period of 28 years starting from the appointed date of 3rd March 2014. The Project is under capacity augmentation to six lanes. Tolling operation under current concession has commenced in February 2020 after partial COD on 31st January 2020. Further to it additional length of 161.050 Km has been completed and put to commercial operation in February 2022. PCOD-3 has been received in March 2023 & the rest of length is expected to complete by Financial Year 2024.

Project road from Goa/ Karnataka Border (Near Karwar) to Kundapur is about 190 km section of Mumbai - Goa highway (NH-17) from Km 93.700 to Km 283.300. NH-17 is most important transportation corridor along west coast of India. It starts at Panvel, at the junction of National Highway 4 (NH 4), and ends at Kanyakumari. NH-17 mainly traverses through the west coast of India, sometimes touching the shores of the Arabian Sea. The NH 17 touches the Arabian Sea at Maravanthe in Karnataka, Thalassery, Alappuzha and Kollam in Kerala. It passes through the Indian states of Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu

The following figure shows the project road alignment.



**Figure 1-1 : Alignment of Project Stretch**

## 1.2 Objective of the Study

M/s IRB INFRASTRUCTURE TRUST has engaged GMD Consultants to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “Traffic Study & Toll Revenue Projection Report” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- Analysis of Traffic Growth
- Toll Rate Growth
- Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

Project of Four Laning of Goa / Karnataka Border – Kundapur section of NH-17 from Km 93.700 to Km 283.300 is Phase-IV project of NHAI on PPP basis under DBFOT pattern. Ankola, Bhatkal, Kumta and Karwar are the main urban centers on project Corridor. For most of the length of the project road runs parallel to the western coast.

It can be observed that project road forms a main connectivity between Mumbai and southern parts on west coast like Goa, Kanoor, Kocchi, Thiruanantpuram and finally Kanyakumai. Thus, transportation requirements in terms of passenger and goods are largely dependent on this spinal road.

#### 2.2 Project Stretch Description

Project road section of NH-17 (now NH-66) passes through the important places like Karwar, Bhatkal, Ankola. This is the main connectivity between Mumbai and- Goa and Kerala. The Project Road passes through the districts of Karnataka and Goa.

National Highway 66, commonly referred to as NH 66 (Erstwhile NH-17 and a part of NH-47), is a busy National Highway that runs roughly north–south along the western coast of India, parallel to the Western Ghats. It connects Panvel (a city south of Mumbai) to Kanyakumari, passing through the states of Maharashtra, Goa, Karnataka, Kerala and Tamil Nadu

The following are the major centers of areas which have impact on project road in terms of traffic.

**Goa:** Is a state in India within the coastal region known as the Konkan, in Western India. It is bounded by Maharashtra to the north and Karnataka to the east and south, with the Arabian Sea forming its Western coast. It is India's smallest state by area and the fourth smallest by population. Goa has the highest GDP per capita among all Indian states,[3] that is two and a half times that of the country. It was ranked the 'best placed State' by the "Eleventh Finance Commission" for its infrastructure and ranked on top for the 'best quality of life' in India by the National Commission on Population based on the 12 Indicators.

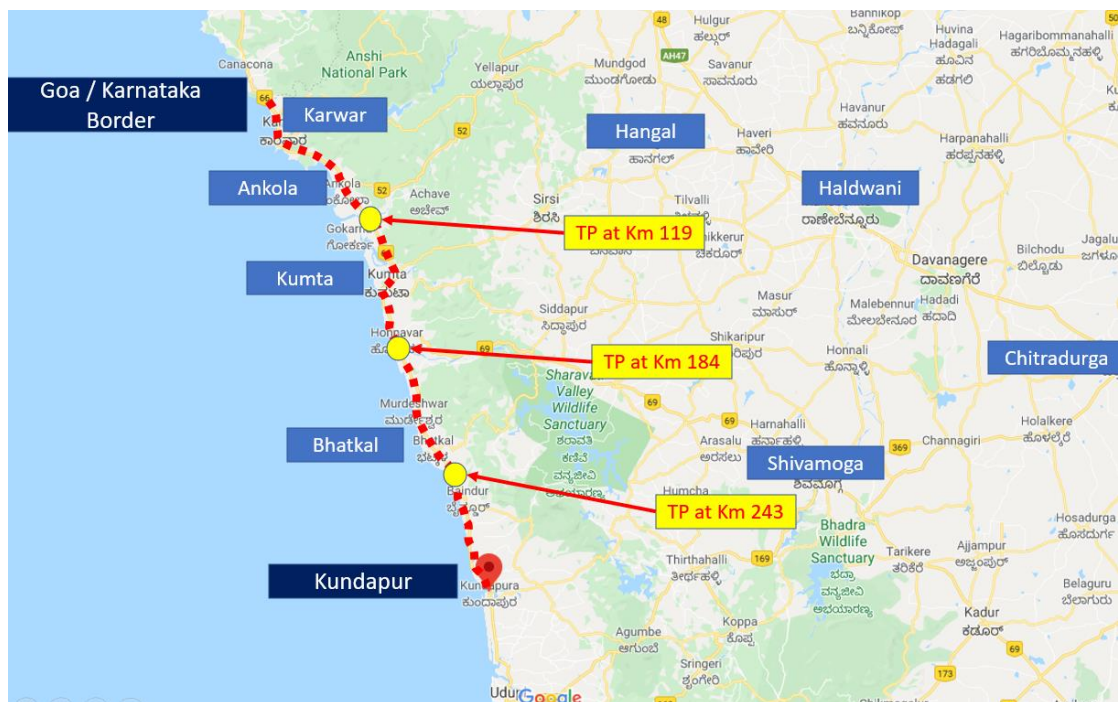
**Kumta:** Is a town and a taluk in the Uttara Kannada district of Karnataka, India. Kumta is about 142 km south of Margao and 58 km north of Bhatkal. It is situated 72.7 km from Karwar, the district headquarters. It is one of the important stations along the Konkan Railway line running between Mumbai and Mangalore.

**Bhatkal:** Is a port town in the Uttara Kannada District of the South Indian state of Karnataka. The town of Bhatkal lies on National Highway 66, which runs between Mumbai and Kochi, and has one of the major railway stations along the Konkan Railway line, which runs between Mumbai and Mangaluru

As the project highway runs along the west coast for most parts of its alignment, there are only radial roads connecting to the project highway which work as feeder network to project road.

Four laning of project highway is higher priority of both central & concerned state governments. Currently highways have bottlenecks at many places which are being improved as a priority. Due to the poor condition of NH-17 and higher number of accidents some part of traffic uses Mumbai -Pune Expressway and then take Bangalore Highway (NH-48) to go to Goa and parts of Karnataka and Kerala. This traffic is expected to come back on the project highway.

There are three operative toll plazas at project stretch. at km 119.00, km 184.00 and km 243.00 respectively. The following figure shows project alignment and toll plaza locations.



**Figure 2-1 : Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Six laning of project stretch is complete. The following photographs illustrate the project section along the corridor.



*Figure 2-2 : Photographs showing Project Corridor*

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Goa Karnataka Border to Kundapur section of NH17 for years 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project
- Establish base year traffic
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

*Table 3-1* below lists provides details of locations from where traffic details have been collected.

Table 3-1 : Traffic Data Details

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 119 Toll Plaza	AADT for Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024
2	Km 184 Toll Plaza	AADT for Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024
3	Km 243 Toll Plaza	AADT for Period from February 2020	For Period from February 2020 to March	For Period from February 2020 to March	For Period from February 2020 to March	For Period from February 2020 to March

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		to March 2020, 2020-21, 2021-2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	2020, 2020-21, 2021-2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	2020, 2020-21, 2021-2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	2020, 2020-21, 2021-2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	2020, 2020-21, 2021-2022, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)

Vehicle Type	
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Bus
- Truck
- 3 Axle commercial vehicle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024. Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Belekeri Toll Plaza at Km 119.00**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- February 20 to March 20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	1485	1639	1974	3061	3058	3012

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- February 20 to March 20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
2	Minibus/LCV	380	360	150	130	129	152
3	Bus	308	101	159	234	256	277
4	Truck	177	256	240	259	253	256
5	3 Axle	162	130	155	182	132	126
6	Multi Axle	339	329	519	627	462	347
7	Oversized Vehicles	8	7	5	6	5	2
<b>Total</b>		<b>2859</b>	<b>2821</b>	<b>3202</b>	<b>4497</b>	<b>4295</b>	<b>4172</b>

*Table 3-4 : Traffic Data at Hologadde Toll Plaza at Km 184.00*

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- February 20 to March 20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2587	2759	3240	5084	5297	5253
2	Minibus/LCV	830	582	266	292	306	323
3	Bus	455	293	343	532	614	664
4	Truck	662	676	693	844	853	886
5	3 Axle	312	272	277	303	313	296
6	Multi Axle	888	815	869	1139	1186	1163

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- February 20 to March 20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
7	Oversized Vehicles	2	5	6	6	5	4
<b>Total</b>		<b>5736</b>	<b>5401</b>	<b>5693</b>	<b>8198</b>	<b>8573</b>	<b>8589</b>

*Table 3-5 : Traffic Data at Shirur Toll Plaza at Km 243.00*

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- February 20 to March 20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2600	2953	3644	5778	6137	6109
2	Minibus/LCV	756	602	318	394	397	424
3	Bus	463	295	334	523	582	628
4	Truck	700	684	814	950	941	896
5	3 Axle	305	273	315	319	325	307
6	Multi Axle	853	805	873	1123	1168	1159
7	Oversized Vehicles	2	7	6	6	5	4
<b>Total</b>		<b>5679</b>	<b>5619</b>	<b>6304</b>	<b>9092</b>	<b>9554</b>	<b>9526</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various

vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-6**.

**Table 3-6 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

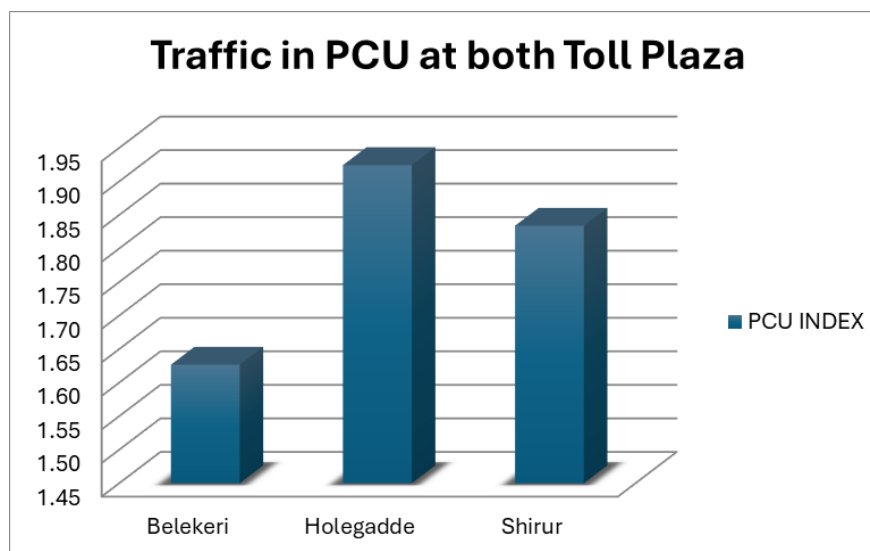
Traffic volume at each toll plaza was converted to PCU and same is presented as under

**Table 3-7 : Traffic in PCU at Project Stretch Base Year 2023-24**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2019-20	Belekeri at Km 119.00	2859	5557	1.94
	Holegadde at Km 184.00	5736	12124	2.11
	Shirur at Km 243.00	5679	11986	2.11
	Belekeri at Km 119.00	2821	5150	1.83

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2020-21	Holegadde at Km 184.00	5401	11043	2.04
	Shirur at Km 243.00	5619	11266	2.00
2021-22	Belekeri at Km 119.00	3202	6219	1.94
	Holegadde at Km 184.00	5693	11512	2.02
	Shirur at Km 243.00	6304	12465	1.98
2022-23	Belekeri at Km 119.00	4497	8125	1.81
	Holegadde at Km 184.00	8198	15705	1.92
	Shirur at Km 243.00	9092	16823	1.85
2023-24	Belekeri at Km 119.00	4295	7276	1.69
	Holegadde at Km 184.00	8573	16452	1.92
	Shirur at Km 243.00	9554	17551	1.84
2024-25	Belekeri at Km 119.00	4172	6786	1.63
	Holegadde at Km 184.00	8589	16527	1.92
	Shirur at Km 243.00	9526	17470	1.83

It can be observed from above that project traffic has PCU index from 1.8 to 2.0 which is an indicator of good proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at three toll plaza locations.

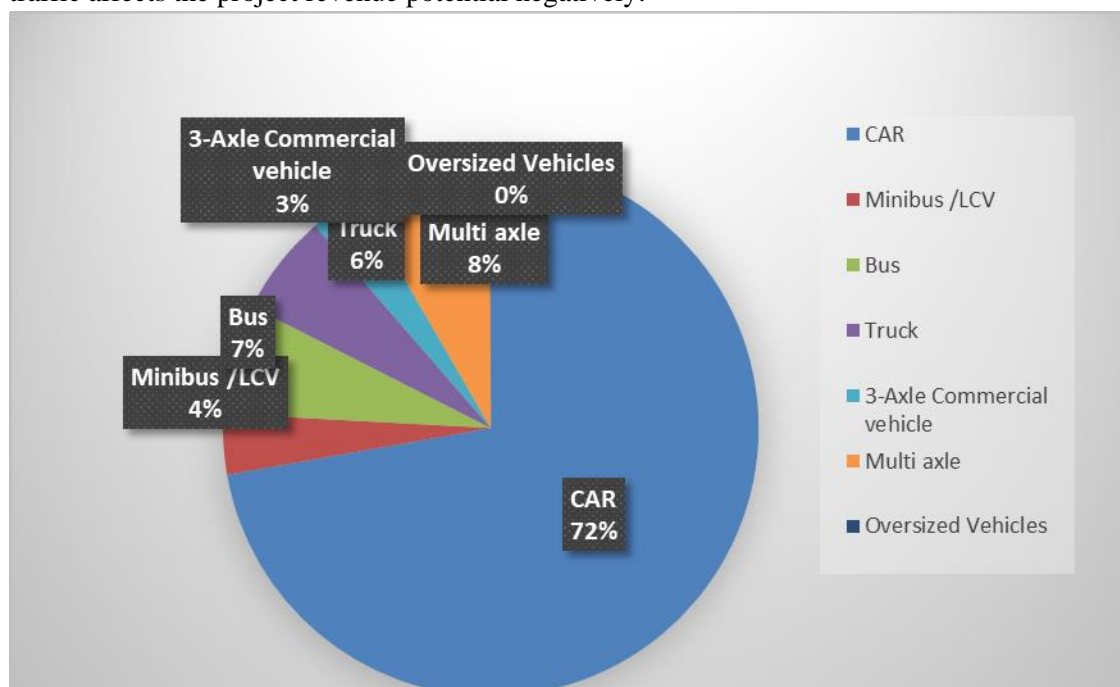


**Figure 3-1 : Comparison of PCU Index**

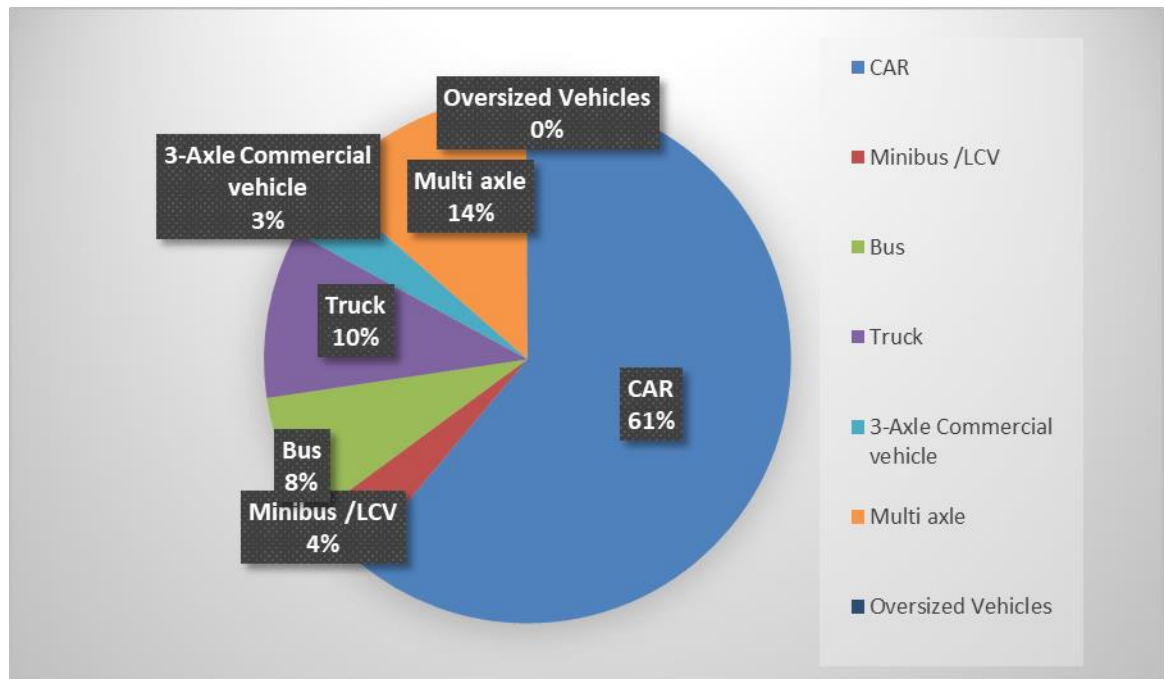
It can be observed that PCU index is consistent at all three plaza locations.

### 3.4.2 Components of Traffic

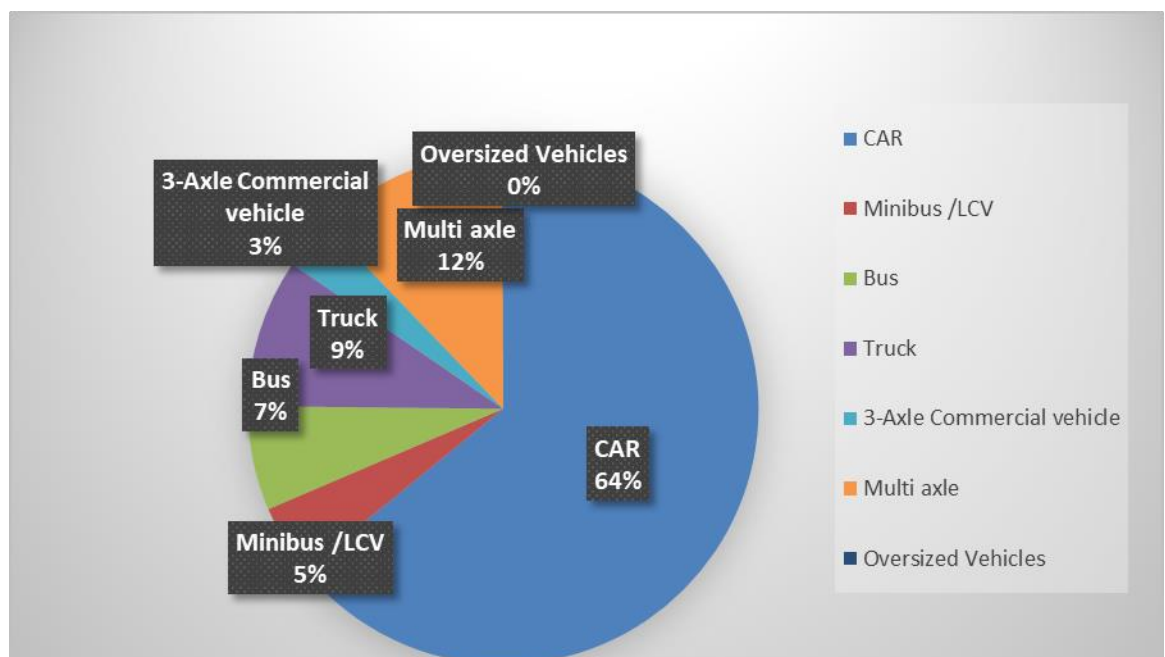
As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Model Split of Tollable Vehicle @ KM 119.000**



***Model Split of Tollable Vehicle @ KM 184.000***



***Model Split of Tollable Vehicle @ KM 243.000***

It is observed that car traffic forms about 72% of total traffic at toll plaza location 1 while multi axle along with 3 axle commercial vehicles are about 11% of total traffic. Truck / Bus and LCV share about 13% and 4% of traffic volume respectively at toll plaza on 119.000 km.

It is observed that car traffic forms about 61% of total traffic at toll plaza location 2 while multi axle along with 3 axle commercial vehicles are about 17% of total traffic. Truck /

Bus and LCV share about 18% and 4% of traffic volume respectively at toll plaza on 184.000 km.

It is observed that car traffic forms about 64% of total traffic at toll plaza location 3 while multi axle along with 3 axle commercial vehicles are about 15% of total traffic. Truck / Bus and LCV share about 16% and 5% of traffic volume respectively at toll plaza on 243.000 km.

Thus, the project corridor has a good mix of about 60% -70% passenger and 30-40% commercial traffic.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base years 2019-20, 2020-21, 2021-22, 2022-2023, April 2023 to November 2023 & April 2024 to July 2024

**Table 3-8 : Journey Type Bifurcation of Traffic at TP-1 KM 119.00**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	2238
2	Return Journey	1748
3	Local Commercial Single Journey	179
4	Monthly Pass Local	2
5	Monthly Pass	5

**Table 3-9 : Journey Type Bifurcation of Traffic at TP KM 184.00**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	4940
2	Return Journey	3214
3	Local Commercial Single Journey	423
4	Monthly Pass Local	3

Sr. No	Type	Traffic Volume (Nos.) 2024-25
5	Monthly Pass	8

**Table 3-10 : Journey Type Bifurcation of Traffic at TP KM 243.00**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	4957
2	Return Journey	4288
3	Local Commercial Single Journey	263
4	Monthly Pass Local	13
5	Monthly Pass	5

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 54%. Return journey component is 42% and Local Commercial Single Journey is 4% at toll plaza at Km 119.00

The single journey component in total traffic numbers is as high as 58%. Return journey component is 37% and Local Commercial single journey 5% at toll plaza at Km 184.00

The single journey component in total traffic numbers is as high as 52%. Return journey component is 45% and Local Commercial Single Journey is 3% at toll plaza at Km 243.00

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential

- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

# INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

### 4.2 Competing / Alternate route

Project stretch runs on west coast of India. Most of the roads other than NH-17 run radial to NH-17 as a complimentary network. There are large number of stream and rivers falling into Arabian sea on west coast. Hence any parallel road would require many major bridges. This has prevented any parallel road to NH-17. The following figure shows bird's eye view of project corridor.



**Figure 4-1 : Project corridor and radial roads.**

Still geographically there can be alternate routes to project road between certain pairs of origin and destinations. The following figure shows such routes which are much longer than project road practically cannot be considered as alternate routes.



**Figure 4-2 : Alternate route at regional level.**

Thus, practically there is no alternate route to the project road between Goa/ Karnataka border and Kundapur. Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road. Further with completion of Mumbai Kanyakumari section of road traffic on project road would get a boost in period 2024-2026 when it would be completed.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Goa/ Karnataka Border – Kundapur section of NH-17 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population

- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, In order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

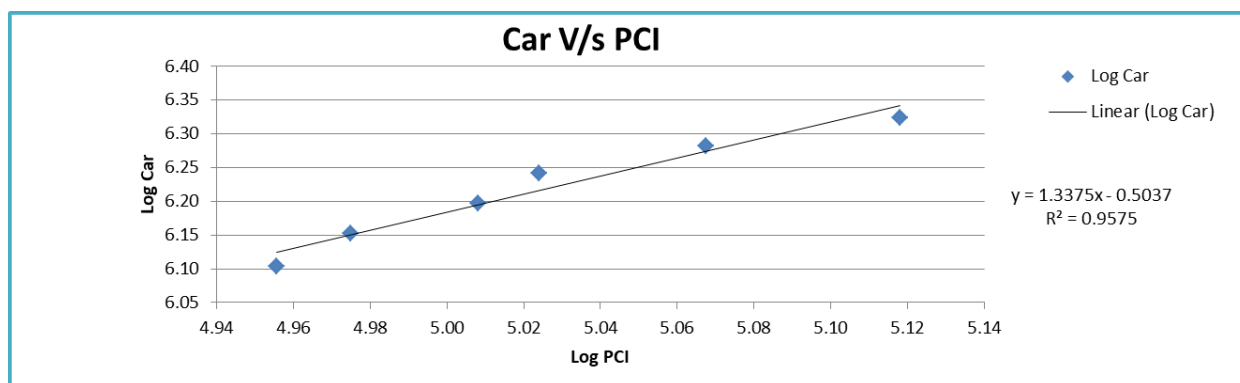
The project corridor spreads across state of Karnataka. Toll plazas at Km 119.00, Km 184.00 and 243.00 are in the state of Karnataka. Contribution of Goa / Maharashtra is also substantial at stretch. For elasticity calculations, working data from Karnataka and Maharashtra / Goa has been analysed.

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Karnataka State.

**Table 5-1 : Per Capita Income Vs Car Karnataka**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	90269	1269430	4.96	6.10		
2013	94382	1420767	4.97	6.15	5%	
2014	101864	1572521	5.01	6.20	8%	
2015	105703	1741831	5.02	6.24	4%	
2016	116819	1916373	5.07	6.28	11%	
2017	131260	2110493	5.12	6.32	12%	7.83%

Regression analysis of same is given in figure below

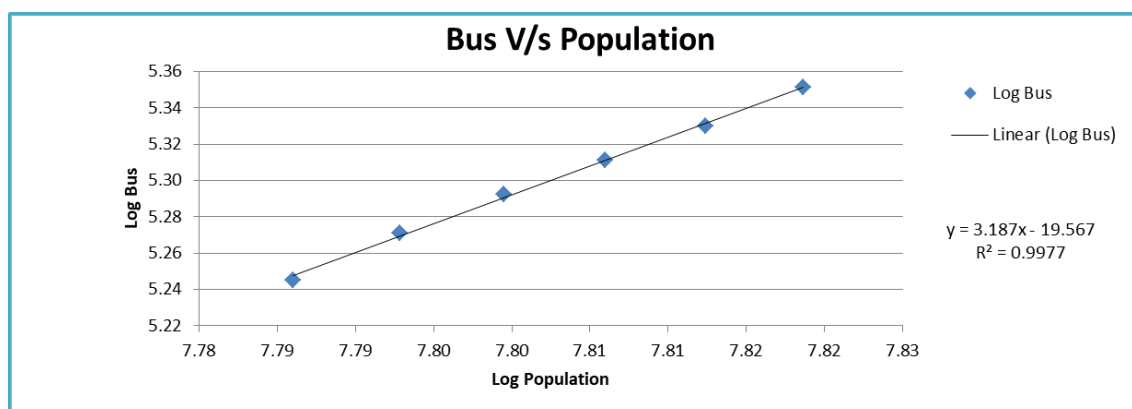


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Karnataka**

**Table 5-2 : Population Vs Bus Karnataka**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	1458545	9513	6.16	3.98		
2013	1466020	9956	6.17	4.00	1%	
2014	1473384	10925	6.17	4.04	1%	
2015	1480636	11224	6.17	4.05	0%	
2016	1487779	11503	6.17	4.06	0%	
2017	1494812	11888	6.17	4.08	0%	0.49%

Regression analysis of same is given in figure below



**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Karnataka**

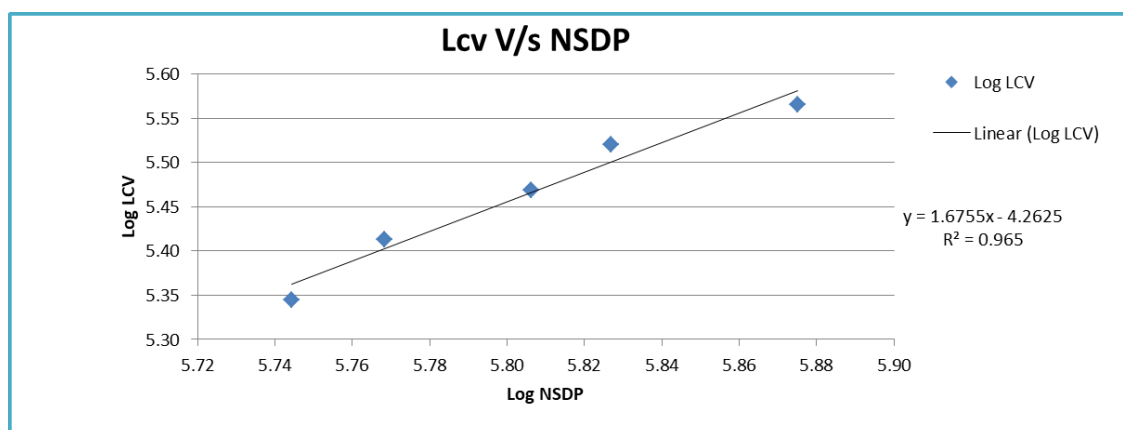
Elasticity of goods traffic has been worked out by regression analysis with NSDP.

Following table represents the data and details

**Table 5-3 : Goods Traffic Vs NSDP Karnataka**

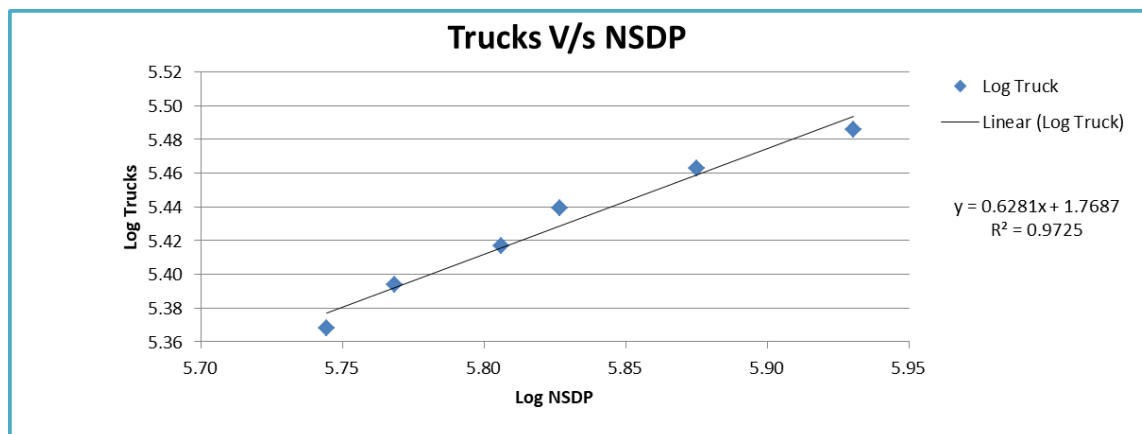
Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth
2012	554990	221160	5.74	5.34		
2013	586592	258701	5.77	5.41	6%	
2014	639981	294266	5.81	5.47	9%	
2015	671322	331381	5.83	5.52	5%	
2016	749990	367572	5.88	5.57	12%	7.85%

Following figure depict regression analysis and extrapolation.

**Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Karnataka.****Table 5-4 : Traffic Truck Vs NSDP Karnataka**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	554990	233422	5.74	5.37		
2013	586592	247639	5.77	5.39	6%	
2014	639981	260989	5.81	5.42	9%	
2015	671322	274971	5.83	5.44	5%	
2016	749990	290415	5.88	5.46	12%	
2017	851880	306290	5.93	5.49	14%	9.00%

Following figure depict regression analysis and extrapolation.



**Figure 5-4 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Karnataka.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below

**Table 5-5 : Summary Regression Analysis Karnataka**

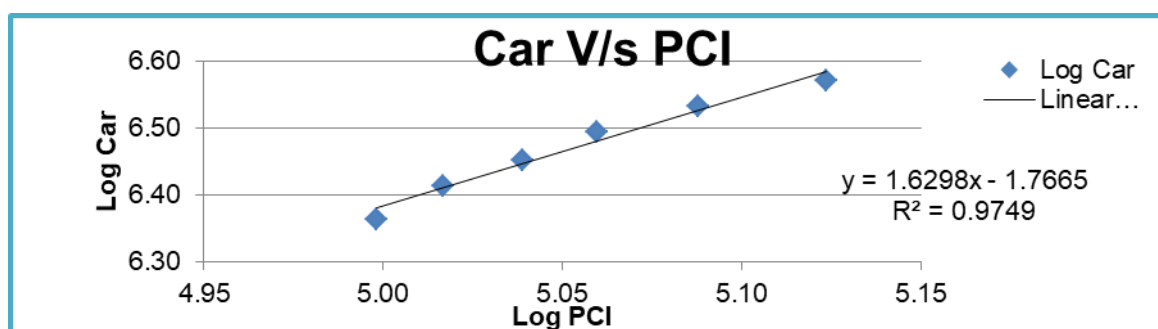
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Karnataka	Car/Jeep	PCI	$y = 1.3375x + -0.5037$	$R^2 = 0.9575$	1.3375	7.83%	10.47%
	Bus	Population	$y = 3.187x - 19.567$	$R^2 = 0.9977$	3.1870	1.52%	4.83%
	LCV	NSDP	$y = 1.6755x - 4.2625$	$R^2 = 0.965$	1.6755	7.85%	13.16%
	Truck	NSDP	$y = 0.6281x - 1.7687$	$R^2 = 0.9725$	0.6281	9.00%	5.65%

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Maharashtra State.

**Table 5-6 : Per Capita Income Vs Car Maharashtra**

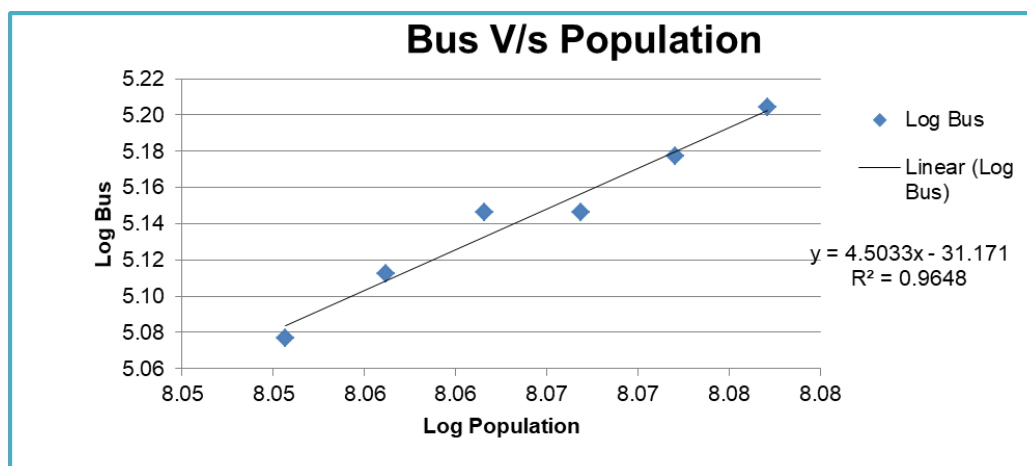
Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	99564	2307841	5.00	6.36		
2013	103904	2592565	5.02	6.41	4%	
2014	109399	2834847	5.04	6.45	5%	
2015	114746	3113773	5.06	6.49	5%	
2016	122422	3406872	5.09	6.53	7%	
2017	132899	3715744	5.12	6.57	9%	5.96%

Regression analysis of same is given in figure below

**Figure 5-5 : Regression and Elasticity PCI vs. Car – Extrapolation Maharashtra****Table 5-7 : Population Vs Bus Maharashtra**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	112374333	119298	8.05	5.08		
2013	113807248	129535	8.06	5.11	1%	
2014	115229410	140087	8.06	5.15	1%	
2015	116640546	140102	8.07	5.15	1%	
2016	118040394	150427	8.07	5.18	1%	
2017	119428710	160042	8.08	5.20	1%	1.23%

Regression analysis of same is given in figure below



**Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Maharashtra**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-8 : LCV Traffic Vs NSDP Maharashtra**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	1126595	656407	6.05	5.82		
2013	1189711	739725	6.08	5.87	6%	
2014	1267551	803128	6.10	5.90	7%	
2015	1345341	868632	6.13	5.94	6%	
2016	1452439	927903	6.16	5.97	8%	6.56%

Following figure depict regression analysis and extrapolation.

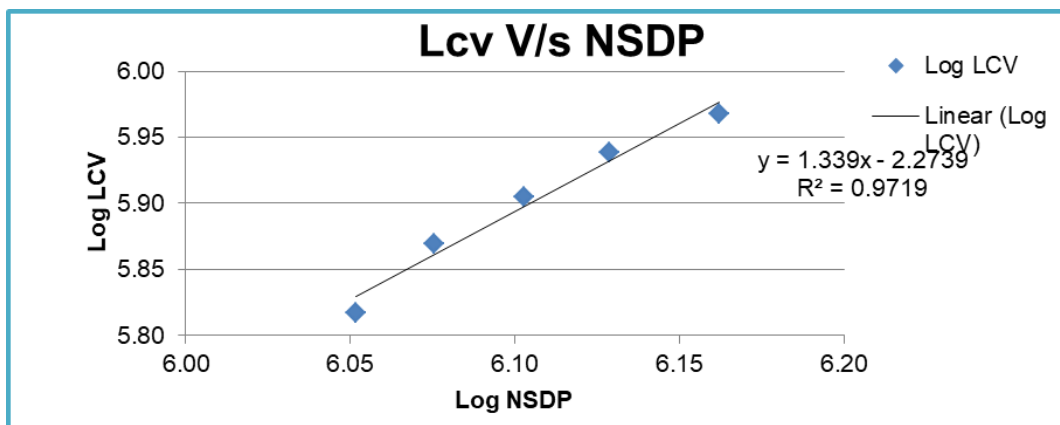
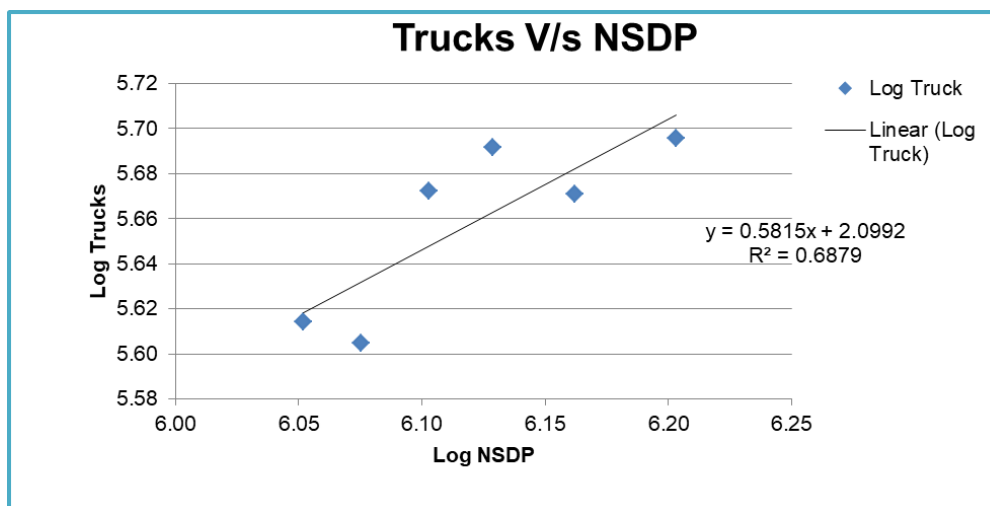


Figure 5-7 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Maharashtra.

Table 5-9 : Trucks Traffic Vs NSDP Maharashtra

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	1126595	411418	6.05	5.61		
2013	1189711	402366	6.08	5.60	6%	
2014	1267551	470128	6.10	5.67	7%	
2015	1345341	491582	6.13	5.69	6%	
2016	1452439	468810	6.16	5.67	8%	
2017	1595514	496439	6.20	5.70	10%	7.22%

Following figure depict regression analysis and extrapolation.



**Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Maharashtra.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below

**Table 5-10 : Summary Regression Analysis Maharashtra.**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Maharashtra	Car/Jeep	PCI	$y = 1.6298x - 1.7665$	R <sup>2</sup> = 0.9749	1.6298	5.96%	9.71%
	Bus	Population	$y = 4.5033x - 31.1713$	R <sup>2</sup> = 0.9648	4.5033	1.23%	5.52%
	LCV	NSDP	$y = 1.339x - 2.2739$	R <sup>2</sup> = 0.9719	1.3390	6.56%	8.78%
	Truck	NSDP	$y = 0.5815x - 2.0992$	R <sup>2</sup> = 0.6879	0.5815	7.22%	4.20%

Economical model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trend of growth. Project stretch of Goa/ Karnataka Border to Kundapur is under tolling operation with current concessionaire and has only two month of tolling history from February 2020. Further for last two years traffic is impacted by COVID-19 pandemic. Hence sufficient data points to be able to establish a reliable past trend of traffic growth are not available. A minimum of about 5 - 6 years' consistent traffic data is required for establishing a reliable past trend.

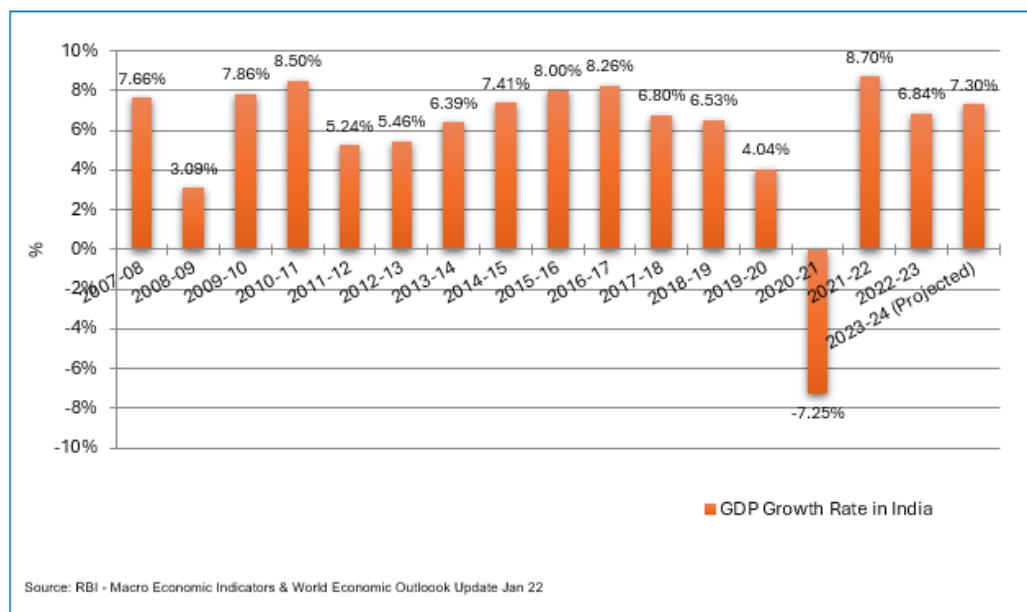
## 5.5 Other Factors Influencing Growth

There are many factors which have impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-9 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. Government took major policy decision including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honourable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on Make -In- India it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. World Economic Outlook update also has predicted a growth rate of about 7.5 % in year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

West Coast Ports - West coast is coast of submergence (except Malabar Coast) while east coast is an emergent coast. These imply that sea is deeper in west coast than sea on east coast. So, west coast has favourable conditions for natural harbours. This is the reason that ports on west coast of India contribute more in terms of commercial cargo traffic. Expansion of JNPT port may further boost cargo traffic from Kerala, Karnataka and Parts of Tamilnadu on project corridor.

**Mangalore** - The coastal city of Mangalore is one of the upcoming and fastest developing metropolises of Karnataka. While Mangalore embeds itself in the conventional city affairs, what sets it apart from others is the amalgamation of its heritage, history, culture, food and scenic coastal lines.

Known for its architectural marvels, temples, churches and pristine beaches, the city attracts tourists throughout the year. Some of the popular tourist spots include Mangaladevi temple, St. Aloysius church, Pilikula Nisarga Dhama (a biological park and a picnic spot), Panambur beach and Surathkal beach. Its proximity to Agumbe, Coorg, Kaup beach and temple town Udupi also makes for a quick getaway for city folks.

Mangalore is the largest exporter of coffee in India. One of the flourishing industries in the city is the automobile leaf spring business. Petrochemicals, iron-ore, fertilizers and agricultural processing are some other thriving industries.

In addition, three special economic zones (SEZs) are being set up in the city with IT companies such as TCS, Wipro and Lotus estimated to invest up to Rs.30 billion, creating 67,000 jobs over the next three years. Mangalore is also one of the top five emerging cities of India for outsourcing, according to Alsbridge.

The city is witnessing aggressive industrial development, aiding in its economic growth. Growth of Mangalore as tourism and Industrial hub would have positive impact on growth of traffic on project road

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as under. Rate of growth is moderated in light of overall regional trend. Growth of Multi-Axle is kept slightly higher as trend of technological advances in logistic industry favours multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, rate of growth diminishes. Same growth rate is not sustainable for long. Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely Optimistic, Pessimistic and Most Likely with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

*Table 5-11 : Recommended Growth Rates Optimistic*

Category / Year	2024-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Car/Jeep/Van	10.02%	9.29%	8.50%	8.14%	8.03%	7.57%
Bus	5.59%	5.28%	4.97%	4.90%	4.75%	4.52%
LCV	5.80%	4.95%	4.12%	3.72%	3.70%	3.28%
2- Axle	5.71%	5.04%	4.36%	4.04%	4.02%	3.68%
3 - Axle	6.04%	5.32%	4.60%	4.26%	4.24%	3.88%
4 to 6 Axle	7.02%	6.17%	5.33%	4.93%	4.90%	4.47%
7 and Above Axle	7.02%	6.17%	5.33%	4.93%	4.90%	4.47%

*Table 5-12 : Recommended Growth Rates Pessimistic*

Category / Year	2024-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Car/Jeep/Van	9.52%	8.79%	8.00%	7.64%	7.53%	7.07%
Bus	5.09%	4.78%	4.47%	4.40%	4.25%	4.02%
LCV	5.30%	4.45%	3.62%	3.22%	3.20%	2.78%
2- Axle	5.21%	4.54%	3.86%	3.54%	3.52%	3.18%
3 - Axle	5.54%	4.82%	4.10%	3.76%	3.74%	3.38%
4 to 6 Axle	6.52%	5.67%	4.83%	4.43%	4.40%	3.97%
7 and Above Axle	6.52%	5.67%	4.83%	4.43%	4.40%	3.97%

*Table 5-13 : Recommended Growth Rates Most Likely*

Category / Year	2024-2025	2026-2030	2031-2035	2036-2040	2041-2045	2046-2050
Car/Jeep/Van	9.77%	9.04%	8.25%	7.89%	7.78%	7.32%
Bus	5.34%	5.03%	4.72%	4.65%	4.50%	4.27%
LCV	5.34%	5.03%	4.72%	4.65%	4.50%	4.27%
2- Axle	5.55%	4.70%	3.87%	3.47%	3.45%	3.03%
3 - Axle	5.46%	4.79%	4.11%	3.79%	3.77%	3.43%
4 to 6 Axle	5.79%	5.07%	4.35%	4.01%	3.99%	3.63%
7 and Above Axle	6.77%	5.92%	5.08%	4.68%	4.65%	4.22%

Project road is part of planned Mumbai- Kochi Economic Corridor under Bharatmala Pariyojna. At present various sections of the corridor are under the advanced stage of construction and planning. Out of total about 1300 km of total length of corridor approximately 900 km is either completed or in under construction. Balance 400 km is to be awarded soon under Bharatmala Pariyojna. It is expected that a substantial part of Mumbai – Kochi Economic Corridor would be operational by year 2024-25. This would

be shorter than the current preferred route of Bangalore highway (NH-48) by about 100 km. In such case it is expected that in the horizon year 2024-25 certain part of traffic between Gujarat / Mumbai and Kochi / Kanyakumari would start using project corridor as most preferred route. Further development of Tuticorin – Kochi economic corridor and ports at Mangalore, Goa and Kochi would also boost traffic on project corridor by year say 2024-25. Same has been considered while taking additional growth of traffic as discussed above.

Traffic and revenue have been worked out on the basis of the above growths and some is presented in subsequent chapter of report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- 119 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	3012	152	277	256	126	347	2	4172	6786
2025-26	3293	160	292	269	133	368	2	4517	7280
2026-27	3598	168	307	283	140	391	2	4889	7809
2027-28	3932	176	324	298	147	415	2	5294	8380
2028-29	4296	184	341	313	154	441	2	5731	8990
2029-30	4695	193	359	329	162	468	2	6208	9650
2030-31	5094	201	377	344	169	492	2	6679	10289
2031-32	5526	209	396	359	176	518	2	7186	10973
2032-33	5995	217	415	375	184	545	2	7733	11704
2033-34	6504	226	435	391	192	574	2	8324	12489
2034-35	7056	236	456	409	201	604	2	8964	13335
2035-36	7630	244	478	425	210	634	2	9623	14197
2036-37	8251	253	502	443	219	665	2	10335	15124
2037-38	8922	263	527	461	228	698	2	11101	16115

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2038-39	9647	273	553	480	238	732	2	11925	17173
2039-40	10432	283	580	499	248	768	2	12812	18303
2040-41	11270	293	607	519	258	805	2	13754	19493
2041-42	12174	304	636	540	269	845	2	14770	20777
2042-43	13152	315	665	562	280	886	2	15862	22142
2043-44	14208	327	696	584	292	929	2	17038	23604
2044-45	15348	339	730	608	305	975	2	18307	25182
2045-46	16510	350	764	630	317	1018	2	19591	26758
2046-47	17760	362	799	653	329	1064	2	20969	28443
2047-48	19105	374	835	677	342	1111	2	22446	30237

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- 184KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	5253	323	664	886	296	1163	4	8589	16527
2025-26	5741	339	700	931	312	1235	4	9262	17654
2026-27	6274	355	737	978	329	1311	4	9988	18856
2027-28	6856	373	776	1027	346	1392	4	10774	20145
2028-29	7491	391	817	1079	364	1477	4	11623	21522
2029-30	8186	410	859	1133	383	1568	4	12543	23000
2030-31	8881	426	901	1182	400	1651	4	13445	24417
2031-32	9636	444	946	1234	418	1738	4	14420	25935
2032-33	10455	462	993	1288	437	1830	4	15469	27555
2033-34	11343	481	1042	1344	457	1927	4	16598	29283
2034-35	12306	500	1094	1402	478	2030	4	17814	31131
2035-36	13307	518	1147	1459	499	2130	4	19064	33002

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2036-37	14389	537	1204	1517	520	2235	4	20406	34993
2037-38	15560	556	1263	1579	542	2344	4	21848	37112
2038-39	16826	577	1324	1643	565	2459	4	23398	39371
2039-40	18195	598	1389	1710	589	2580	4	25065	41784
2040-41	19656	620	1454	1778	614	2706	4	26832	44319
2041-42	21235	643	1523	1850	640	2839	4	28734	47032
2042-43	22939	667	1595	1924	667	2977	4	30773	49912
2043-44	24781	691	1671	2001	696	3123	4	32967	52993
2044-45	26771	717	1750	2081	726	3276	4	35325	56278
2045-46	28799	740	1829	2158	754	3422	4	37706	59549
2046-47	30979	764	1912	2237	783	3575	4	40254	63027
2047-48	33324	788	1999	2320	813	3734	4	42982	66723

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 3- Chainage 243 KM**  
**(Optimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6109	424	628	896	307	1159	4	9526	17470
2025-26	6677	445	661	942	323	1230	4	10282	18676
2026-27	7297	468	696	990	340	1305	4	11100	19968
2027-28	7974	491	732	1040	358	1385	4	11984	21351
2028-29	8714	516	771	1093	376	1470	4	12944	22841
2029-30	9524	541	811	1148	396	1560	4	13984	24439
2030-31	10334	564	851	1198	414	1643	4	15008	25981
2031-32	11213	587	893	1251	432	1731	4	16111	27629
2032-33	12165	612	938	1306	452	1823	4	17300	29393
2033-34	13198	637	984	1363	473	1920	4	18579	31272

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2034-35	14319	663	1032	1422	494	2022	4	19956	33275
2035-36	15484	688	1083	1479	515	2121	4	21374	35310
2036-37	16743	713	1136	1539	537	2225	4	22897	37479
2037-38	18104	740	1192	1601	559	2334	4	24534	39791
2038-39	19577	767	1250	1665	583	2449	4	26295	42260
2039-40	21169	795	1312	1732	608	2570	4	28190	44901
2040-41	22870	824	1374	1801	633	2695	4	30201	47676
2041-42	24707	854	1439	1873	660	2827	4	32364	50644
2042-43	26691	886	1507	1949	688	2965	4	34690	53813
2043-44	28835	919	1578	2027	717	3110	4	37190	57193
2044-45	31150	953	1653	2108	748	3263	4	39879	60808
2045-46	33509	985	1728	2186	777	3409	4	42598	64418
2046-47	36047	1017	1806	2267	807	3562	4	45510	68260
2047-48	38777	1051	1887	2351	838	3721	4	48629	72344

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 1- Chainage 119 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	3012	152	277	256	126	347	2	4172	6786
2025-26	3276	158	289	267	132	367	2	4491	7238
2026-27	3564	165	303	279	138	387	2	4838	7722
2027-28	3877	173	318	291	144	409	2	5214	8245
2028-29	4218	181	333	303	151	432	2	5620	8804
2029-30	4588	189	349	317	158	456	2	6059	9405
2030-31	4954	195	364	329	164	478	2	6486	9978
2031-32	5350	202	381	341	171	501	2	6948	10596

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2032-33	5778	210	398	353	178	525	2	7444	11252
2033-34	6240	218	415	367	185	551	2	7978	11957
2034-35	6738	226	434	381	192	577	2	8550	12704
2035-36	7253	234	453	394	199	603	2	9138	13465
2036-37	7806	242	473	408	206	630	2	9767	14274
2037-38	8401	250	493	422	213	657	2	10438	15126
2038-39	9042	258	514	437	220	686	2	11159	16038
2039-40	9733	266	536	452	228	716	2	11933	17011
2040-41	10465	274	558	467	237	748	2	12751	18037
2041-42	11252	282	582	483	246	781	2	13628	19132
2042-43	12099	291	607	500	255	815	2	14569	20298
2043-44	13010	301	633	517	265	851	2	15579	21545
2044-45	13989	311	660	535	275	888	2	16660	22871
2045-46	14978	319	687	552	284	924	2	17746	24193
2046-47	16037	328	714	569	294	961	2	18905	25594
2047-48	17171	337	743	587	304	1000	2	20144	27088

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 2- Chainage 184 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	5253	323	664	886	296	1163	4	8589	16527
2025-26	5715	337	695	927	310	1228	4	9216	17561
2026-27	6217	352	729	969	324	1298	4	9893	18670
2027-28	6763	368	764	1012	340	1371	4	10622	19851
2028-29	7357	384	801	1058	356	1448	4	11408	21112
2029-30	8004	400	839	1105	373	1530	4	12255	22458

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2030-31	8643	414	876	1148	389	1604	4	13078	23739
2031-32	9334	429	915	1192	405	1681	4	13960	25096
2032-33	10081	444	956	1238	422	1762	4	14907	26542
2033-34	10887	460	998	1285	439	1847	4	15920	28073
2034-35	11757	476	1043	1336	457	1935	4	17008	29705
2035-36	12654	491	1089	1383	474	2020	4	18115	31337
2036-37	13620	507	1137	1431	492	2109	4	19300	33069
2037-38	14659	523	1186	1482	510	2202	4	20566	34905
2038-39	15777	539	1239	1535	529	2299	4	21922	36858
2039-40	16982	557	1293	1589	549	2401	4	23375	38933
2040-41	18260	575	1347	1645	570	2506	4	24907	41104
2041-42	19635	593	1404	1702	591	2616	4	26545	43406
2042-43	21113	612	1464	1761	613	2731	4	28298	45853
2043-44	22703	631	1525	1823	635	2850	4	30171	48442
2044-45	24412	651	1590	1887	658	2975	4	32177	51199
2045-46	26138	669	1654	1947	680	3093	4	34185	53921
2046-47	27985	687	1721	2009	703	3216	4	36325	56805
2047-48	29963	706	1790	2073	726	3343	4	38605	59851

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 3- Chainage 243 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6109	424	628	896	307	1159	4	9526	17470
2025-26	6646	443	658	937	321	1224	4	10233	18585
2026-27	7230	463	689	979	336	1293	4	10994	19773
2027-28	7865	484	722	1023	352	1366	4	11816	21047

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2028-29	8555	505	756	1069	369	1443	4	12701	22406
2029-30	9307	528	792	1118	387	1525	4	13661	23871
2030-31	10052	547	827	1160	402	1598	4	14590	25249
2031-32	10856	567	863	1205	419	1675	4	15589	26723
2032-33	11724	588	902	1251	436	1756	4	16661	28293
2033-34	12661	609	942	1300	454	1840	4	17810	29961
2034-35	13674	631	984	1350	472	1929	4	19044	31737
2035-36	14719	652	1027	1399	490	2014	4	20305	33526
2036-37	15842	673	1072	1449	508	2103	4	21651	35420
2037-38	17052	694	1119	1501	527	2196	4	23093	37434
2038-39	18354	717	1168	1554	547	2293	4	24637	39573
2039-40	19755	740	1219	1610	568	2394	4	26290	41847
2040-41	21243	763	1271	1667	589	2499	4	28036	44232
2041-42	22841	788	1325	1726	611	2608	4	29903	46763
2042-43	24561	813	1381	1786	633	2723	4	31901	49452
2043-44	26411	838	1439	1849	657	2842	4	34040	52310
2044-45	28399	865	1499	1914	681	2967	4	36329	55348
2045-46	30407	889	1559	1974	703	3084	4	38620	58345
2046-47	32558	914	1622	2037	727	3207	4	41069	61537
2047-48	34861	939	1687	2102	751	3334	4	43678	64911

Traffic projections for Most Likely scenario is given as under

**Table 6-7 : Total Tollable Traffic @ Toll Plaza 1- Chainage 119 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	3012	152	277	256	126	347	2	4172	6786

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2025-26	3286	159	292	269	132	367	2	4507	7264
2026-27	3583	167	307	282	139	389	2	4869	7777
2027-28	3907	175	322	295	146	412	2	5259	8322
2028-29	4260	183	339	310	153	436	2	5683	8912
2029-30	4645	191	356	325	160	462	2	6141	9543
2030-31	5028	199	373	338	167	485	2	6592	10152
2031-32	5442	207	390	353	174	509	2	7077	10803
2032-33	5891	215	409	368	181	535	2	7601	11504
2033-34	6376	223	428	383	188	562	2	8162	12246
2034-35	6902	231	448	399	196	591	2	8769	13046
2035-36	7446	239	469	414	203	618	2	9391	13853
2036-37	8032	247	490	430	211	647	2	10059	14716
2037-38	8665	255	513	446	219	677	2	10777	15637
2038-39	9348	263	537	463	228	709	2	11550	16626
2039-40	10085	272	562	481	237	742	2	12381	17681
2040-41	10870	282	587	499	247	776	2	13263	18793
2041-42	11716	292	614	518	257	812	2	14211	19984
2042-43	12628	302	641	537	267	849	2	15226	21246
2043-44	13610	312	670	558	277	888	2	16317	22598
2044-45	14668	322	699	579	288	929	2	17487	24039
2045-46	15742	332	728	598	298	968	2	18668	25477
2046-47	16894	342	759	619	309	1008	2	19933	27013
2047-48	18130	352	791	640	320	1051	2	21286	28650

**Table 6-8 : Total Tollable Traffic @ Toll Plaza 2- Chainage 184 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	5253	323	664	886	296	1163	4	8589	16527
2025-26	5728	338	699	928	310	1232	4	9239	17608
2026-27	6246	354	734	973	326	1305	4	9942	18767
2027-28	6810	370	771	1019	343	1381	4	10698	19997
2028-29	7425	387	810	1067	360	1463	4	11516	21318
2029-30	8095	405	851	1119	378	1549	4	12401	22735
2030-31	8762	421	892	1165	394	1627	4	13265	24086
2031-32	9484	437	934	1212	411	1709	4	14191	25519
2032-33	10266	453	978	1263	429	1795	4	15188	27051
2033-34	11113	471	1024	1315	447	1886	4	16260	28683
2034-35	12030	489	1072	1369	466	1981	4	17411	30417
2035-36	12978	505	1121	1421	484	2074	4	18587	32165
2036-37	14001	523	1173	1475	503	2170	4	19849	34022
2037-38	15104	541	1227	1531	523	2272	4	21202	36001
2038-39	16295	559	1284	1589	544	2378	4	22653	38104
2039-40	17579	578	1344	1650	566	2489	4	24210	40345
2040-41	18947	597	1404	1713	588	2604	4	25857	42694
2041-42	20421	618	1468	1777	611	2725	4	27624	45197
2042-43	22009	639	1533	1844	636	2851	4	29516	47854
2043-44	23721	661	1602	1913	661	2984	4	31546	50687
2044-45	25566	684	1674	1986	687	3122	4	33723	53700
2045-46	27437	705	1745	2054	712	3254	4	35911	56689
2046-47	29445	726	1820	2124	738	3391	4	38248	59858
2047-48	31601	748	1898	2197	764	3534	4	40746	63221

**Table 6-9 : Total Tollable Traffic @ Toll Plaza 3- Chainage 230 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6109	424	628	896	307	1159	4	9526	17470
2025-26	6662	445	659	938	322	1227	4	10257	18626
2026-27	7263	466	692	983	339	1299	4	11046	19868
2027-28	7919	488	727	1030	356	1375	4	11899	21196
2028-29	8636	511	763	1080	374	1456	4	12824	22624
2029-30	9417	535	802	1132	392	1541	4	13823	24150
2030-31	10194	556	840	1179	409	1618	4	14800	25611
2031-32	11036	577	880	1228	427	1700	4	15852	27175
2032-33	11947	600	921	1278	445	1786	4	16981	28834
2033-34	12932	623	965	1331	464	1876	4	18195	30607
2034-35	13999	647	1011	1386	484	1970	4	19501	32496
2035-36	15103	670	1058	1439	503	2062	4	20839	34405
2036-37	16294	693	1108	1494	523	2159	4	22275	36442
2037-38	17579	717	1159	1551	544	2259	4	23813	38600
2038-39	18965	742	1212	1610	565	2365	4	25463	40900
2039-40	20460	767	1268	1671	587	2475	4	27232	43344
2040-41	22053	794	1325	1734	611	2590	4	29111	45927
2041-42	23769	821	1384	1799	635	2711	4	31123	48672
2042-43	25618	848	1446	1866	660	2837	4	33279	51591
2043-44	27611	877	1511	1936	686	2969	4	35594	54704
2044-45	29760	906	1579	2009	713	3107	4	38078	58022
2045-46	31939	933	1647	2078	738	3238	4	40577	61317
2046-47	34277	960	1717	2149	765	3375	4	43247	64816
2047-48	36788	989	1790	2222	793	3517	4	46103	68531

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be

modified subject to calculation stipulated therein. For Goa/ Karnataka - Kundarpur project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup> April 2022

Target Traffic - 21307 in PCU

***Pessimistic Case***

Targ et Year	Target Traffi c	Actual Traffi c	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variatio n in CP	Origi nal CP	Change in CP (In Years)
2022	21307	11857	-44%	67%	20%	28	5.6

PCUs as per Pessimistic cases have been considered for arriving at the concession Period end date.

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Goa / Karnataka Border- Kundapur section of NH-17 is based on the old toll policy. As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

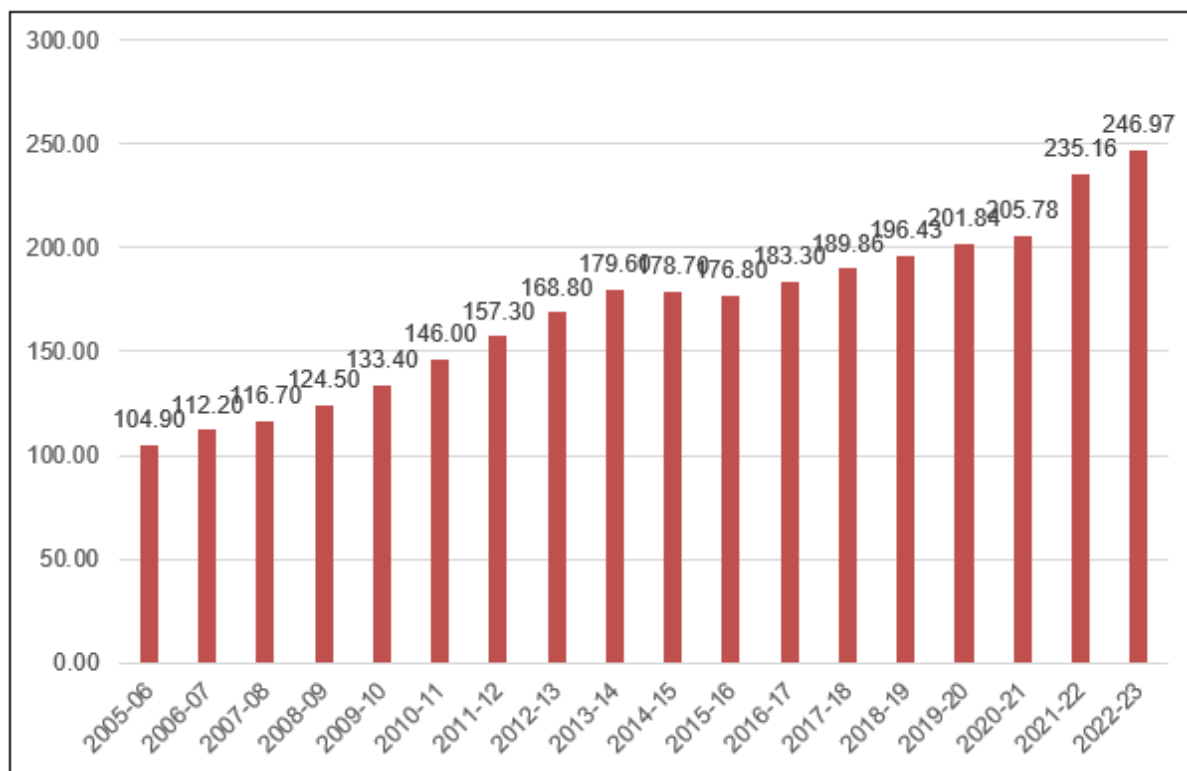
1. Monthly Pass: For frequent users monthly pass would be issued for 50 trips in month at 2/3d rate..
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Passenger Car Jeep Van I - Rs. 275 per month as per fee notification
  - b) Local commercial vehicles single at 50% rate for normal single trip

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is takes 5% and Suitably Stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

The toll rates have been projected on the basis of existing project length received vide PCOD- III certificate.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey @ Km 119.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	115	180	370	370	405	570	720
2025-26	120	190	390	390	425	600	755
2026-27	125	200	410	410	450	630	795
2027-28	135	210	430	430	470	665	835
2028-29	140	220	455	455	495	695	880
2029-30	145	230	475	475	520	735	925
2030-31	155	245	500	500	550	770	975
2031-32	165	255	525	525	575	810	1025
2032-33	170	270	555	555	605	855	1075
2033-34	180	285	585	585	640	895	1135
2034-35	190	300	615	615	670	945	1195
2035-36	200	315	645	645	705	995	1255
2036-37	210	330	680	680	745	1045	1320
2037-38	220	350	715	715	785	1105	1390
2038-39	235	365	755	755	825	1160	1465
2039-40	245	385	795	795	870	1225	1545
2040-41	260	405	840	840	915	1290	1630
2041-42	275	430	885	885	965	1360	1715
2042-43	290	455	930	930	1020	1435	1810
2043-44	305	475	980	980	1075	1510	1910
2044-45	320	505	1035	1035	1135	1595	2015
2045-46	340	530	1095	1095	1195	1680	2125
2046-47	355	560	1155	1155	1260	1775	2240
2047-48	375	590	1215	1215	1330	1870	2365

**Table 7-3 : Toll Rates for Single Journey @ Km 184.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	110	175	365	365	400	565	710
2025-26	120	185	385	385	420	595	745

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2026-27	125	195	405	405	445	625	785
2027-28	130	205	425	425	465	660	825
2028-29	135	215	445	445	490	690	865
2029-30	145	225	470	470	515	725	910
2030-31	150	240	495	495	540	765	955
2031-32	160	250	520	520	570	805	1005
2032-33	165	265	545	545	600	845	1060
2033-34	175	280	575	575	630	890	1115
2034-35	185	295	605	605	665	935	1170
2035-36	195	310	640	640	700	985	1235
2036-37	205	325	670	670	735	1040	1300
2037-38	215	340	705	705	775	1095	1370
2038-39	230	360	745	745	815	1155	1440
2039-40	240	380	785	785	860	1215	1520
2040-41	255	400	825	825	905	1280	1600
2041-42	265	420	870	870	955	1350	1685
2042-43	280	445	920	920	1005	1420	1780
2043-44	295	470	970	970	1060	1500	1875
2044-45	310	495	1020	1020	1120	1580	1975
2045-46	330	520	1080	1080	1180	1670	2085
2046-47	350	550	1140	1140	1245	1760	2200
2047-48	365	580	1200	1200	1310	1855	2320

*Table 7-4 : Toll Rates for Single Journey @ Km 243.000*

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	100	160	340	340	370	530	645
2025-26	105	170	355	355	390	560	680
2026-27	110	180	375	375	410	585	715
2027-28	115	190	395	395	430	615	750
2028-29	120	195	415	415	450	650	790
2029-30	130	205	435	435	475	680	830
2030-31	135	220	455	455	500	715	870
2031-32	140	230	480	480	525	755	915
2032-33	150	240	505	505	550	790	965
2033-34	155	255	530	530	580	835	1015
2034-35	165	265	560	560	610	875	1070
2035-36	175	280	590	590	640	925	1125
2036-37	185	295	620	620	675	970	1185
2037-38	195	310	655	655	710	1025	1245
2038-39	205	330	685	685	750	1080	1310
2039-40	215	345	725	725	790	1135	1385
2040-41	225	365	765	765	830	1195	1455
2041-42	240	385	805	805	875	1260	1535
2042-43	250	405	850	850	925	1330	1620
2043-44	265	425	895	895	975	1400	1705
2044-45	280	450	940	940	1030	1480	1800

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2045-46	295	475	995	995	1085	1560	1900
2046-47	310	500	1050	1050	1145	1645	2000
2047-48	325	530	1105	1105	1205	1735	2110

**Table 7-5 : Toll Rates for Return journey @ Km 119.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	170	270	555	555	610	855	1080
2025-26	180	285	585	585	640	900	1135
2026-27	190	300	615	615	670	945	1195
2027-28	200	315	645	645	705	995	1255
2028-29	210	330	680	680	745	1045	1320
2029-30	220	345	715	715	780	1100	1390
2030-31	235	365	750	750	820	1155	1460
2031-32	245	385	790	790	865	1215	1535
2032-33	255	405	830	830	910	1280	1615
2033-34	270	425	875	875	955	1345	1700
2034-35	285	445	920	920	1005	1415	1790
2035-36	300	470	970	970	1060	1490	1885
2036-37	315	495	1020	1020	1115	1570	1985
2037-38	335	520	1075	1075	1175	1655	2090
2038-39	350	550	1130	1130	1240	1745	2200
2039-40	370	580	1195	1195	1305	1835	2320
2040-41	390	610	1255	1255	1375	1935	2445
2041-42	410	645	1325	1325	1450	2040	2575
2042-43	435	680	1395	1395	1530	2150	2715
2043-44	455	715	1475	1475	1610	2265	2865
2044-45	480	755	1555	1555	1700	2390	3020
2045-46	510	795	1640	1640	1795	2525	3185
2046-47	535	840	1730	1730	1890	2660	3360
2047-48	565	885	1825	1825	1995	2810	3545

**Table 7-6 : Toll Rates for Return Journey @ Km 184.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	170	265	550	550	600	850	1065
2025-26	175	280	580	580	630	895	1115
2026-27	185	295	605	605	665	940	1175
2027-28	195	310	640	640	700	985	1235
2028-29	205	325	670	670	735	1040	1295
2029-30	215	340	705	705	770	1090	1365
2030-31	225	360	740	740	810	1145	1435
2031-32	240	375	780	780	855	1205	1510
2032-33	250	395	820	820	895	1270	1585
2033-34	265	415	865	865	945	1335	1670

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2034-35	280	440	910	910	995	1405	1760
2035-36	290	465	955	955	1045	1480	1850
2036-37	310	485	1010	1010	1100	1560	1950
2037-38	325	515	1060	1060	1160	1640	2050
2038-39	340	540	1120	1120	1220	1730	2160
2039-40	360	570	1180	1180	1290	1820	2275
2040-41	380	600	1240	1240	1355	1920	2400
2041-42	400	630	1310	1310	1430	2025	2530
2042-43	420	665	1380	1380	1510	2135	2665
2043-44	445	705	1455	1455	1590	2250	2810
2044-45	470	740	1535	1535	1675	2370	2965
2045-46	495	780	1620	1620	1770	2500	3130
2046-47	520	825	1705	1705	1865	2640	3300
2047-48	550	870	1800	1800	1970	2785	3480

**Table 7-7 : Toll Rates for Return journey @ Km 243.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	150	245	510	510	555	800	970
2025-26	160	255	535	535	585	840	1020
2026-27	165	270	560	560	610	880	1070
2027-28	175	280	590	590	645	925	1125
2028-29	185	295	620	620	675	970	1185
2029-30	195	310	650	650	710	1020	1245
2030-31	200	325	685	685	745	1075	1310
2031-32	215	345	720	720	785	1130	1375
2032-33	225	360	760	760	825	1190	1445
2033-34	235	380	795	795	870	1250	1520
2034-35	250	400	840	840	915	1315	1600
2035-36	260	420	885	885	965	1385	1685
2036-37	275	445	930	930	1015	1460	1775
2037-38	290	465	980	980	1070	1535	1870
2038-39	305	490	1030	1030	1125	1615	1970
2039-40	320	520	1085	1085	1185	1705	2075
2040-41	340	545	1145	1145	1250	1795	2185
2041-42	355	575	1205	1205	1315	1890	2305
2042-43	375	605	1270	1270	1385	1995	2430
2043-44	395	640	1340	1340	1465	2100	2560
2044-45	420	675	1415	1415	1540	2215	2700
2045-46	440	710	1490	1490	1625	2340	2845
2046-47	465	750	1575	1575	1715	2465	3005
2047-48	490	790	1660	1660	1810	2600	3170

**Table 7-8 : Toll Rates for Monthly Pass Local Car Ticket @ all Toll Plaza**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940
2045-46	990	990
2046-47	1045	1045
2047-48	1105	1105

**Table 7-9 : Toll Rates for Monthly Pass @ Km 119.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	3825	6000	12355	12355	13520	19020	24005
2025-26	4020	6310	12985	12985	14210	19990	25235
2026-27	4230	6635	13655	13655	14940	21015	26530
2027-28	4445	6975	14355	14355	15710	22100	27900
2028-29	4675	7335	15095	15095	16515	23235	29330
2029-30	4915	7710	15870	15870	17365	24425	30840
2030-31	5170	8110	16690	16690	18265	25690	32430
2031-32	5435	8530	17555	17555	19210	27020	34115
2032-33	5720	8975	18470	18470	20210	28430	35890
2033-34	6020	9440	19435	19435	21270	29915	37770
2034-35	6335	9940	20455	20455	22385	31490	39755
2035-36	6670	10465	21535	21535	23565	33150	41855
2036-37	7025	11020	22675	22675	24815	34905	44070
2037-38	7400	11605	23885	23885	26135	36765	46415
2038-39	7795	12225	25160	25160	27535	38725	48895
2039-40	8210	12880	26510	26510	29010	40805	51520
2040-41	8655	13575	27935	27935	30575	43000	54295
2041-42	9125	14310	29445	29445	32225	45325	57230
2042-43	9620	15085	31045	31045	33975	47785	60335

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2043-44	10140	15905	32735	32735	35825	50390	63625
2044-45	10695	16775	34525	34525	37785	53140	67100
2045-46	11285	17695	36420	36420	39855	56055	70780
2046-47	11905	18670	38425	38425	42050	59140	74675
2047-48	12560	19700	40545	40545	44370	62405	78800

**Table 7-10 : Toll Rates for Monthly Pass @ Km 184.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	3730	5905	12215	12215	13355	18895	23610
2025-26	3920	6205	12835	12835	14035	19855	24815
2026-27	4120	6520	13490	13490	14750	20870	26085
2027-28	4335	6855	14185	14185	15510	21940	27425
2028-29	4555	7205	14910	14910	16300	23065	28830
2029-30	4790	7575	15675	15675	17140	24250	30310
2030-31	5035	7970	16485	16485	18025	25500	31870
2031-32	5300	8380	17340	17340	18955	26820	33525
2032-33	5575	8815	18240	18240	19945	28215	35270
2033-34	5865	9280	19195	19195	20985	29690	37110
2034-35	6175	9765	20200	20200	22085	31245	39060
2035-36	6500	10280	21265	21265	23250	32895	41120
2036-37	6845	10825	22390	22390	24485	34635	43295
2037-38	7205	11400	23585	23585	25785	36475	45595
2038-39	7590	12005	24840	24840	27160	38420	48030
2039-40	8000	12650	26175	26175	28615	40480	50605
2040-41	8430	13330	27580	27580	30155	42660	53325
2041-42	8885	14050	29070	29070	31785	44965	56205
2042-43	9365	14815	30645	30645	33505	47400	59255
2043-44	9875	15620	32315	32315	35330	49980	62480
2044-45	10415	16475	34080	34080	37260	52710	65890
2045-46	10985	17375	35945	35945	39300	55595	69505
2046-47	11590	18330	37925	37925	41465	58655	73325
2047-48	12230	19340	40015	40015	43750	61890	77370

**Table 7-11 : Toll Rates for Monthly Pass @ Km 243.000**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2024-25	3340	5395	11305	11305	12330	17725	21580
2025-26	3510	5665	11875	11875	12950	18620	22665
2026-27	3685	5955	12475	12475	13605	19560	23815
2027-28	3870	6255	13105	13105	14300	20555	25020
2028-29	4070	6575	13775	13775	15025	21600	26300
2029-30	4280	6910	14480	14480	15795	22710	27645
2030-31	4500	7265	15225	15225	16610	23875	29065
2031-32	4730	7640	16010	16010	17465	25110	30565
2032-33	4975	8040	16840	16840	18375	26410	32150
2033-34	5235	8455	17720	17720	19330	27785	33825
2034-35	5510	8900	18645	18645	20340	29240	35600

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
<b>2035-36</b>	5800	9365	19625	19625	21410	30780	37470
<b>2036-37</b>	6105	9860	20665	20665	22540	32405	39445
<b>2037-38</b>	6430	10385	21760	21760	23735	34120	41540
<b>2038-39</b>	6770	10935	22915	22915	25000	35935	43750
<b>2039-40</b>	7135	11520	24140	24140	26335	37860	46090
<b>2040-41</b>	7515	12140	25435	25435	27750	39890	48560
<b>2041-42</b>	7920	12795	26810	26810	29245	42040	51180
<b>2042-43</b>	8350	13485	28260	28260	30825	44315	53945
<b>2043-44</b>	8800	14220	29790	29790	32500	46720	56875
<b>2044-45</b>	9280	14995	31415	31415	34270	49265	59975
<b>2045-46</b>	9790	15815	33135	33135	36145	51960	63255
<b>2046-47</b>	10325	16680	34950	34950	38130	54810	66725

#### 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

#### 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2047-48 starting from the year 2024-25 are shown in tables below.

**Table 7-12 : Toll Revenue Optimistic Scenario**

(Rs. Crores)

Year	TP-1	TP2	TP3	Total
<b>2024-25</b>	25.98	65.11	63.09	<b>154.19</b>
<b>2025-26</b>	29.27	73.45	70.95	<b>173.67</b>
<b>2026-27</b>	32.94	82.22	79.21	<b>194.38</b>
<b>2027-28</b>	37.54	92.57	89.22	<b>219.33</b>
<b>2028-29</b>	42.01	103.11	99.94	<b>245.06</b>
<b>2029-30</b>	47.20	116.17	112.69	<b>276.06</b>
<b>2030-31</b>	53.26	129.23	125.00	<b>307.49</b>
<b>2031-32</b>	59.94	145.36	140.26	<b>345.57</b>
<b>2032-33</b>	66.55	160.82	156.52	<b>383.89</b>
<b>2033-34</b>	74.88	180.28	174.25	<b>429.41</b>
<b>2034-35</b>	84.24	201.76	195.50	<b>481.50</b>

Year	TP-1	TP2	TP3	Total
<b>2035-36</b>	94.58	225.09	218.74	<b>538.40</b>
<b>2036-37</b>	105.57	250.89	243.43	<b>599.89</b>
<b>2037-38</b>	118.50	279.36	272.21	<b>670.07</b>
<b>2038-39</b>	133.20	312.96	303.59	<b>749.75</b>
<b>2039-40</b>	149.54	349.77	339.46	<b>838.77</b>
<b>2040-41</b>	167.65	390.07	378.31	<b>936.04</b>
<b>2041-42</b>	188.38	434.40	423.15	<b>1045.92</b>
<b>2042-43</b>	211.93	485.27	472.25	<b>1169.45</b>
<b>2043-44</b>	238.05	544.80	529.98	<b>1312.83</b>
<b>2044-45</b>	266.71	606.84	593.18	<b>1466.72</b>
<b>2045-46</b>	300.12	678.63	660.54	<b>1639.29</b>
<b>2046-47</b>	334.67	757.19	736.78	<b>1828.64</b>
<b>2047-48</b>	375.39	842.00	820.70	<b>2038.08</b>

**Table 7-13 : Toll Revenue Pessimistic Scenario**

**(Rs. Crores)**

Year	TP-1	TP2	TP3	Total
<b>2024-25</b>	25.98	65.11	63.09	<b>154.19</b>
<b>2025-26</b>	29.13	73.11	70.63	<b>172.86</b>
<b>2026-27</b>	32.59	81.45	78.48	<b>192.53</b>
<b>2027-28</b>	36.91	91.24	87.99	<b>216.14</b>
<b>2028-29</b>	41.12	101.15	98.10	<b>240.37</b>
<b>2029-30</b>	45.99	113.45	110.14	<b>269.58</b>
<b>2030-31</b>	51.65	125.66	121.52	<b>298.83</b>
<b>2031-32</b>	57.90	140.70	135.76	<b>334.36</b>
<b>2032-33</b>	64.02	154.98	150.75	<b>369.76</b>
<b>2033-34</b>	71.73	172.93	167.03	<b>411.69</b>
<b>2034-35</b>	80.26	192.60	186.56	<b>459.41</b>

Year	TP-1	TP2	TP3	Total
<b>2035-36</b>	89.78	213.86	207.76	<b>511.40</b>
<b>2036-37</b>	99.68	237.27	230.15	<b>567.10</b>
<b>2037-38</b>	111.28	262.91	256.21	<b>630.39</b>
<b>2038-39</b>	124.43	293.16	284.42	<b>702.01</b>
<b>2039-40</b>	139.09	326.09	316.58	<b>781.75</b>
<b>2040-41</b>	155.22	361.87	351.08	<b>868.17</b>
<b>2041-42</b>	173.62	401.01	390.85	<b>965.48</b>
<b>2042-43</b>	194.40	445.89	434.20	<b>1074.48</b>
<b>2043-44</b>	217.29	498.20	484.98	<b>1200.47</b>
<b>2044-45</b>	242.20	552.30	540.24	<b>1334.73</b>
<b>2045-46</b>	271.12	614.86	598.65	<b>1484.63</b>
<b>2046-47</b>	300.90	682.87	664.63	<b>1648.40</b>
<b>2047-48</b>	335.97	755.74	736.74	<b>1828.45</b>

**Table 7-14 : Toll Revenue Most Likely Scenario****(Rs. Crores)**

Year	TP-1	TP2	TP3	Total
<b>2024-25</b>	25.98	65.11	63.09	<b>154.19</b>
<b>2025-26</b>	29.21	73.26	70.80	<b>173.26</b>
<b>2026-27</b>	32.77	81.82	78.83	<b>193.43</b>
<b>2027-28</b>	37.23	91.86	88.62	<b>217.71</b>
<b>2028-29</b>	41.61	102.11	99.01	<b>242.73</b>
<b>2029-30</b>	46.62	114.79	111.40	<b>272.81</b>
<b>2030-31</b>	52.52	127.43	123.28	<b>303.23</b>
<b>2031-32</b>	59.03	142.98	138.02	<b>340.03</b>
<b>2032-33</b>	65.38	157.85	153.60	<b>376.84</b>
<b>2033-34</b>	73.39	176.52	170.57	<b>420.48</b>
<b>2034-35</b>	82.34	197.06	191.00	<b>470.40</b>

Year	TP-1	TP2	TP3	Total
<b>2035-36</b>	92.23	219.31	213.22	<b>524.75</b>
<b>2036-37</b>	102.58	243.88	236.80	<b>583.26</b>
<b>2037-38</b>	114.90	270.89	264.14	<b>649.93</b>
<b>2038-39</b>	128.91	302.75	293.87	<b>725.53</b>
<b>2039-40</b>	144.46	337.56	327.89	<b>809.91</b>
<b>2040-41</b>	161.59	375.54	364.52	<b>901.65</b>
<b>2041-42</b>	181.07	417.25	406.67	<b>1004.98</b>
<b>2042-43</b>	203.21	465.01	452.93	<b>1121.15</b>
<b>2043-44</b>	227.66	520.80	507.17	<b>1255.64</b>
<b>2044-45</b>	254.34	578.76	566.28	<b>1399.38</b>
<b>2045-46</b>	285.34	645.79	629.05	<b>1560.18</b>
<b>2046-47</b>	317.33	718.93	699.99	<b>1736.25</b>
<b>2047-48</b>	355.11	797.51	777.82	<b>1930.45</b>

## CHAPTER 8

# CONCLUSION & RECOMMENDATIONS

### 8.1 Conclusion & Recommendations

Project stretch of Goa/ Karnataka to Kundapur section of NH-17 in state of Karnataka from km 93.70.000 to km 183.300 is four lane. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the busy and prominent national highway NH-17 which is main link for traffic on west coast to from Rajasthan, Gujarat, Maharashtra to Kerala. There are large number of townships, industrial corridors and other business establishment coming up along project corridor. As Indian economy is poised to grow at 6%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give positive impact to traffic flow on project. The following can be considered as major outcomes of the study

- a) There is good amount of tollable traffic running on project
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy
- c) Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road

Based on above it can be considered a stable healthy project from traffic and revenue point of view.



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**KISHANGARH TO GULABPURA SECTION**  
**OF NH-79 & NH-79A IN THE STATE OF RAJASTHAN**  
**(LENGTH 90 KM)**



**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

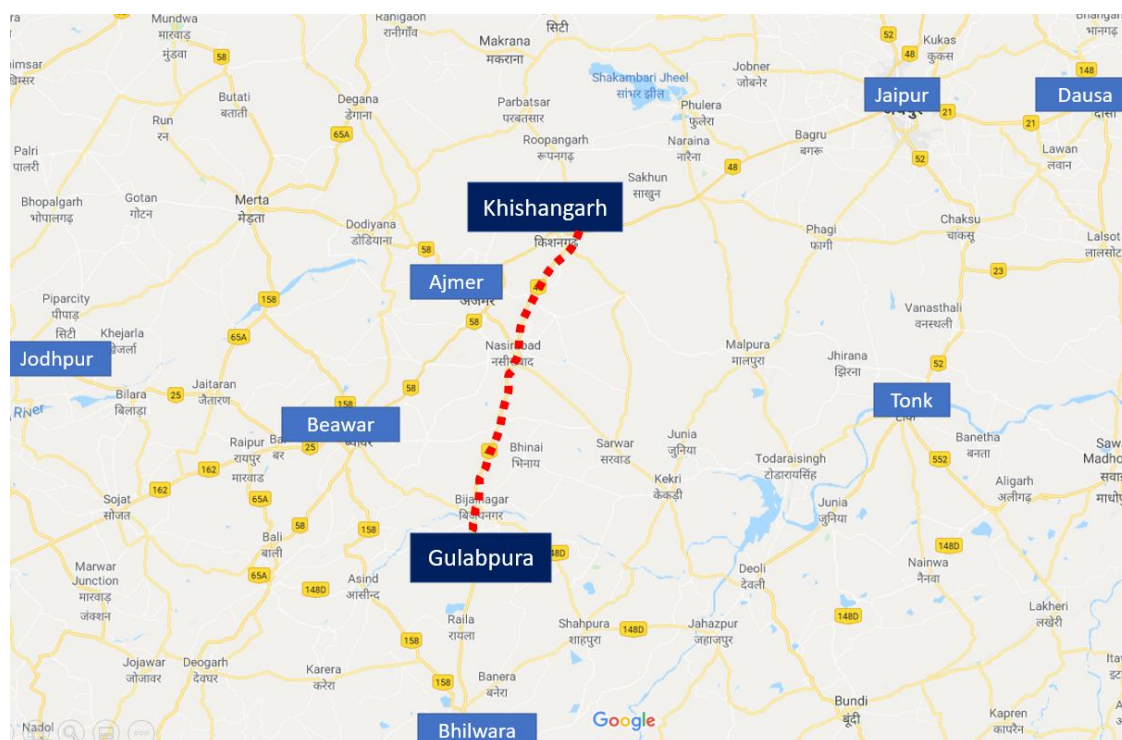
### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Six Laning of **Kishangarh to Gulabpura** section of NH-79A & NH-79 (length 90.00km) is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s Kishangarh Gulabpura Tollway Ltd.* (Concessionaire) has been awarded the Project for a concession period of 20 years starting from 21<sup>st</sup> February 2018. The Project has been commissioned and is currently in the operation / maintenance phase. Six laning of project has also been completed in July 2022.

Length of project road is 90.00 Kms. The project road is section of NH-79A & 79 A, which connects Ajmer to Ghat Bilod. Project section of NH-79 passes through the district of Bhilwara and Ajmer.

Project road alignment passes through the small towns of Shreenagar, Nasirabad, Jharwasa, Bandanwara and Bijainagar (Vijay Nagar). The following figure shows alignment of the project road section from Kishangarh to Gulabpura.



**Figure 1-1 : Alignment of Project Stretch**

## 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

National Highway 79 (NH 79) is an important link for traffic connecting Delhi, Jaipur to Udaipur, Chittorgarh and down south. The project road is the section of the former NH-79A & NH-79 which has now been re-designated as NH-48. The project road section takes off at Kishangarh and ends at Gulabpura, both in the state of Rajasthan. The NH-79A was the section from Kishangarh to Nasirabad and part of NH-79 (Ajmer to Ghata Billod) was the remaining section from Nasirabad to Gulabpura

It is one of the major north-south road connectivity for the traffic from northern states of Haryana, Punjab and Delhi to Industrial and tourist areas of Rajasthan like Jaipur, Chittorgarh, Udaipur and then to Dahod, Ratlam and other parts of Madhya Pradesh.

After renumbering of all national highways by National Highway Authority of India in 2010, the current NH 48 was formed by merging the old NH 8 (Delhi-Mumbai section) and NH 4 (Mumbai-Chennai). National Highway 48 starts at Delhi and terminates at Chennai and goes through Jaipur, Udaipur, Vadodara, Mumbai, Pune and Bengaluru, traversing through six states of India. It has a total length of 2807 km (1744 miles)

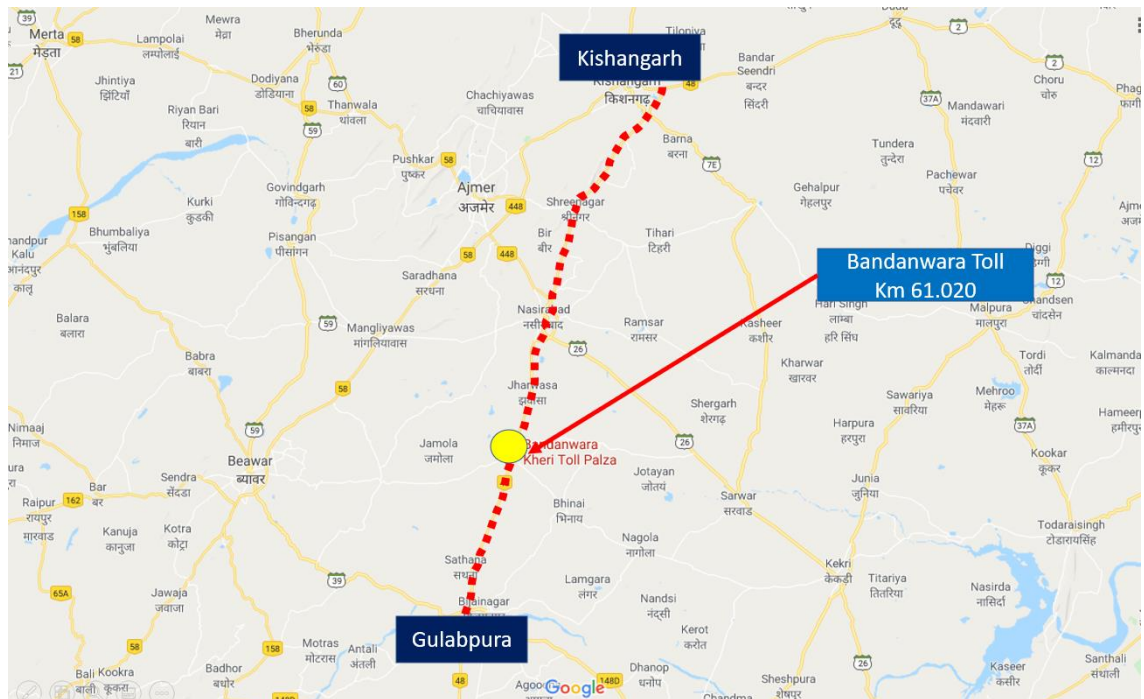
#### 2.2 Project Stretch Description

Section of NH-79 from Kishangarh to Gulabpura is part of major transportation link in the area connecting industrial / tourist cities of Jaipur-, Bhilwara, Chittorgarh and Udaipur. Project stretch would be faster connectivity to Udaipur from Jaipur once six laning is complete.

Major mining industries of marble, Zink, felspar, quarts of Udaipur and textile industry of Bhiwara provide are major contributor of commercial traffic on project corridor. Additionally, Jaipur, Ajmer, Udaipur, Chittorgarh and Bhilwara major tourist centers of India. This adds substantial value for passenger traffic on the project corridor section.

Like other parts of India rapid ribbon development is happening around these cities on project highway. This also contributes to sustainable traffic growth.

There is one operative toll plaza at project stretch at Bandanwara at km 61.020. The following figure shows project alignment and toll plaza locations.



**Figure 2-1 : Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Six laning of project stretch is in progress and will be completed soon. The following photographs illustrate the project section along the corridor.



**Figure 2-2 : Photographs showing Project Corridor**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza location on Kishangarh – Gulabpura section of NH-79 for year 2017-18, 2018-19, 2019-20, 2020-21 ,2021-22,2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 61.020 Toll Plaza at Bandanwara	AADT for Year 2018-19, 2019-20, 2020-2021, 2021-2022, 2022-2023, Eight	For Year 2018-19, 2019-2020, 2020-2021, 2021-2022, 2022-2023,	For Year 2018-19, 2019-2020, 2020-2021, 2021, 2021-2022, 2022-2023,	For Year 2018-19, 2019-2020, 2020-2021, 2021-2022, 2022-2023, Eight	For Year 2018-19, 2019-2020, 2020-2021, 2021-2022, 2022-2023, Eight

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		month from April 2023 to November 2023 & Four month from April 2024 to July 2024	Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	month from April 2023 to November 2023 & Four month from April 2024 to July 2024	month from April 2023 to November 2023 & Four month from April 2024 to July 2024

### 3.2 Classified traffic volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Truck / Bus
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Bandanwara Toll Plaza at Km 61.020**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2572	448	3827	5400	6428	6747
2	Minibus /LCV	1009	326	522	736	868	758
3	Bus	376	38	337	486	624	215
4	Truck	1511	264	1756	2375	2803	2538
5	3-Axle Commercial vehicle	2095	318	1805	2045	2188	1914
6	Multi axle	4421	748	4141	4709	5396	5019

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
7	Oversized Vehicle	19	70	319	296	463	504
<b>Total</b>		<b>12003</b>	<b>2212</b>	<b>12707</b>	<b>16046</b>	<b>18770</b>	<b>17695</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-4**.

**Table 3-4 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

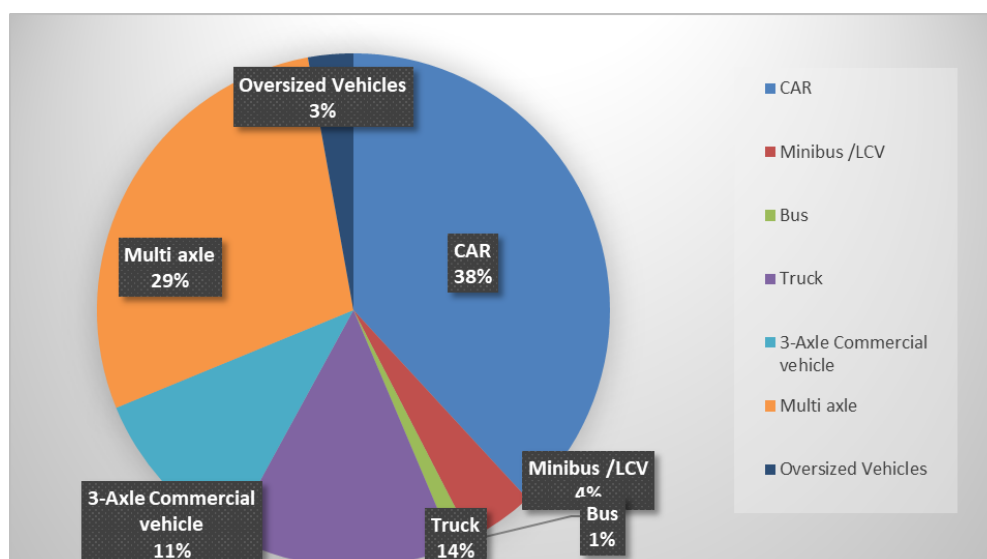
**Table 3-5 : Traffic in PCU at Project Stretch Base Year 2019-20, 2020-21, 2021-22, 2022-23, 2023-24 & 2024-25**

Toll Plaza Location (Km)	Year	Traffic No	PCU	PCU Index
Bandanwara 61.020	2019-20	12003	36011	3.00
	2020-21	2212	6478	2.93
	2021-22	12707	36374	2.86
	2022-23	16046	43739	2.73
	2023-24	18770	50940	2.71
	2024-25	17695	46739	2.64

It can be observed from above that project traffic has PCU index is near by 3 which is an indicator of very high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at four toll plaza locations.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-1 : Model Split of Tollable Vehicle**

It is observed that car traffic forms about 38% of total traffic at toll plaza locations while multi axle commercial vehicles are about 43% of total traffic. Truck / Bus and LCV share about 15% and 4% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-6 : Journey Type Bifurcation of Traffic at Bandanwara TP KM 61.020**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	13528
2	Return Journey	3509
3	Local Commercial Single Journey	641
4	Monthly Pass Local	12
5	Monthly Pass	5

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 76%. Return journey component is 20%. The number of Local Commercial Single Journey is 4% and Monthly Pass Local 0% at Bandanwara toll plaza.

It is observed that the project corridor demonstrates pattern of single journey dominated mix of traffic at stretch which is typical of major national highways with high component of long-distance traffic.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

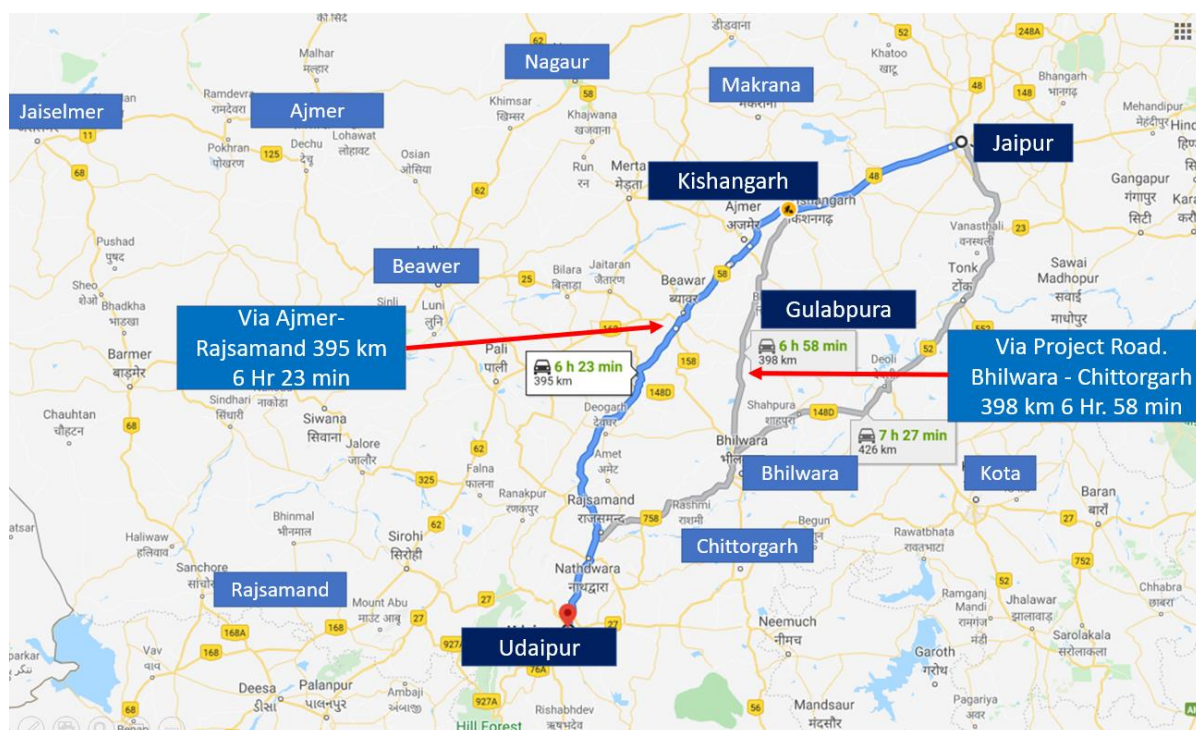
Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

Project stretch has toll application history from last few years, and it can be assumed that project traffic is settled. At the local level there is no potential competing route bypassing toll plaza between. At regional level, there can be two alternates for Udaipur traffic after Kishangarh. One via project road (Kishangarh – Bhiwara- Chittorgarh- Udaipur) and one via Ajmer, Beawer and Rajsamand. The following maps show these routes in relation to project stretch at regional level.



**Figure 4-1 : Alternate route at regional level.**

It can be observed that the project highway forms one of the main spines of the corridor between Kishangarh / Jaipur and Chittorgarh. Traffic on project road is now settled and it can be assumed as dedicated traffic on project road for logistic obligations.

At regional level for Udaipur traffic alternate route is faster and traffic is already using this alternate. With six laning now nearing completion, the project stretch would become slightly more attractive due to the improved level of service. In such a case further diversion of traffic from the project road is not envisaged.

The following table provides summary of analysis of alternate route/ roads discussed above.

**Table 4-1 : Competing Roads Details**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
<b>Regional Level</b>						
1	Jaipur – Ajmer- Udaipur	Alternate Route	395	61	6 Hr 23 Min	At present alternate route via Ajmer is a bit faster but after completion of six laning level of service would increase at project road as well
	Jaipur- Bhilwara - Chittorgarh- Udaipur	Project Road	398	51	6 Hr 58 Min	

It may be noted that since the project highway has already been commissioned and has a tolling history, the current traffic traversing the project corridor already factors in traffic diversion (if any) that may have taken place. Further after completion of six laning, level of service would improve on

project corridor, and this would create favorable conditions for traffic. Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road. It is expected that there would be some additional traffic on project corridor once six lane is completed due to improvement in level of service.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Kishangarh to Gulabpur section of NH-79 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

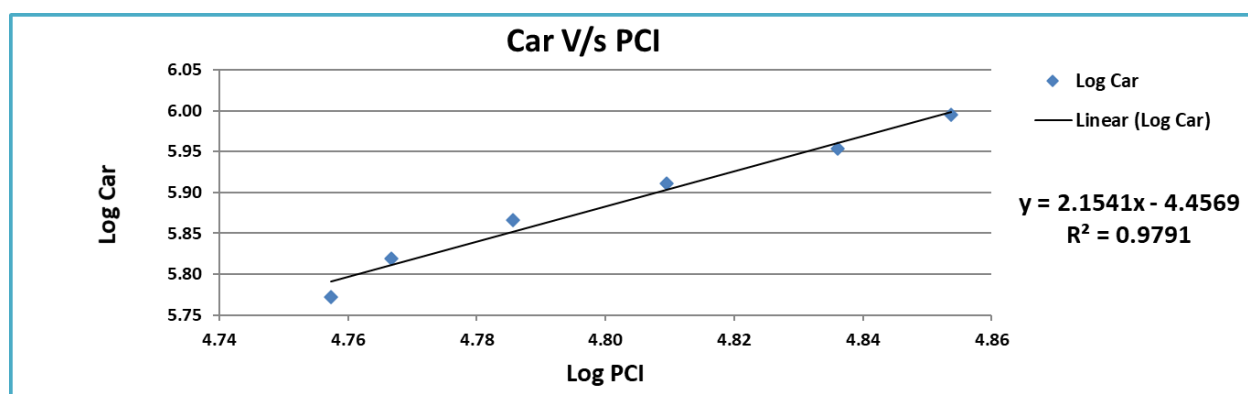
The project corridor spreads across the state of Rajasthan. Toll plaza at Bandanwara is in the state of Rajasthan but it has influence of Gujarat also. For elasticity calculations, working data from Rajasthan and Gujarat has been analyzed.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-1 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	57192	591069	4.76	5.77		
2013	58441	659542	4.77	5.82	2%	
2014	61053	733916	4.79	5.87	4%	
2015	64496	814079	4.81	5.91	6%	
2016	68565	899307	4.84	5.95	6%	
2017	71394	988391	4.85	5.99	4%	4.55%

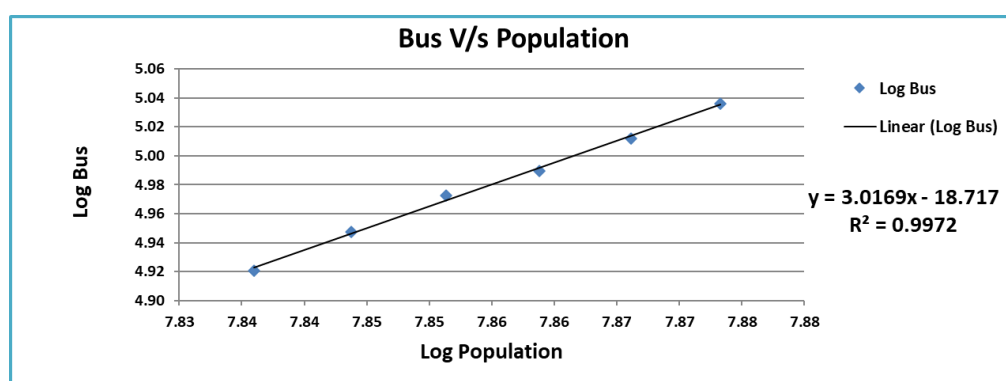
Regression analysis of same is given in figure below.



**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan****Table 5-2 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	68548437	83345	7.84	4.92		
2013	69783885	88616	7.84	4.95	2%	
2014	71016445	93892	7.85	4.97	2%	
2015	72245688	97650	7.86	4.99	2%	
2016	73471198	102818	7.87	5.01	2%	
2017	74692571	108680	7.87	5.04	2%	1.73%

Regression analysis of same is given in figure below.

**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

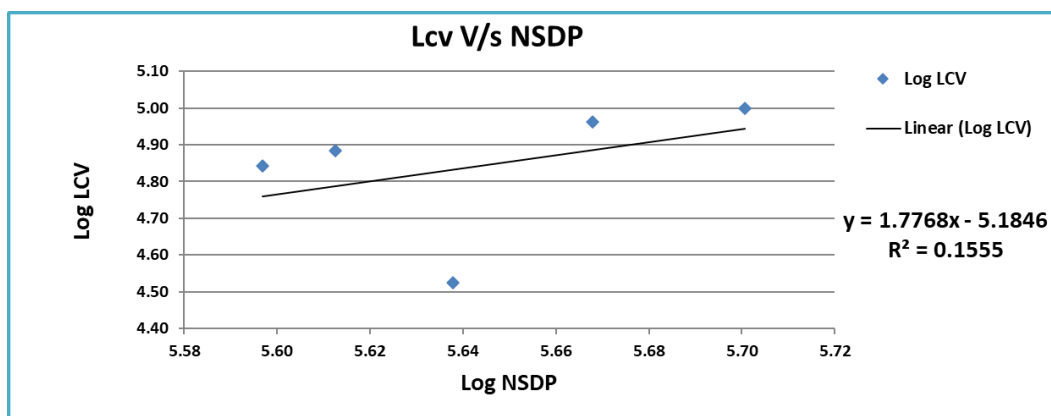
The elasticity of goods traffic has been worked out by regression analysis with NSDP.

The following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Rajasthan**

Year	NSDP	LCV	Log NDSP	Log LCV	NSDP Growth	Average Growth
2012	395331	69509	5.60	4.84		
2013	409802	76396	5.61	4.88	4%	
2014	434292	33379	5.64	4.52	6%	
2015	465408	91787	5.67	4.96	7%	
2016	501922	99763	5.70	5.00	8%	6.16%

The following figure depicts regression analysis and extrapolation.

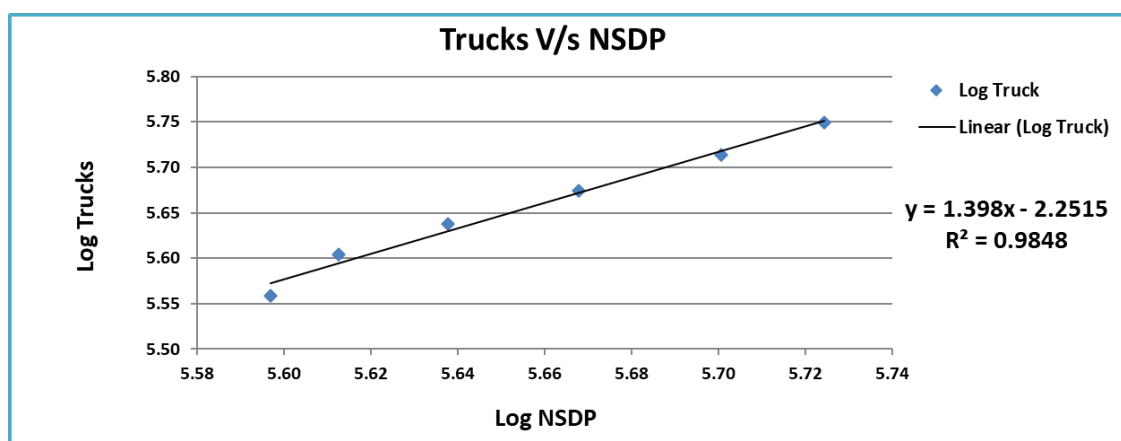


**Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.**

The following figure depicts regression analysis and extrapolation.

**Table 5-4 : Goods Traffic Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth
2012	395331	362028	5.60	5.56		
2013	409802	401983	5.61	5.60	4%	
2014	434292	434379	5.64	5.64	6%	
2015	465408	472365	5.67	5.67	7%	
2016	501922	517604	5.70	5.71	8%	
2017	530172	561158	5.72	5.75	6%	6.06%



**Figure 5-4 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Rajasthan.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

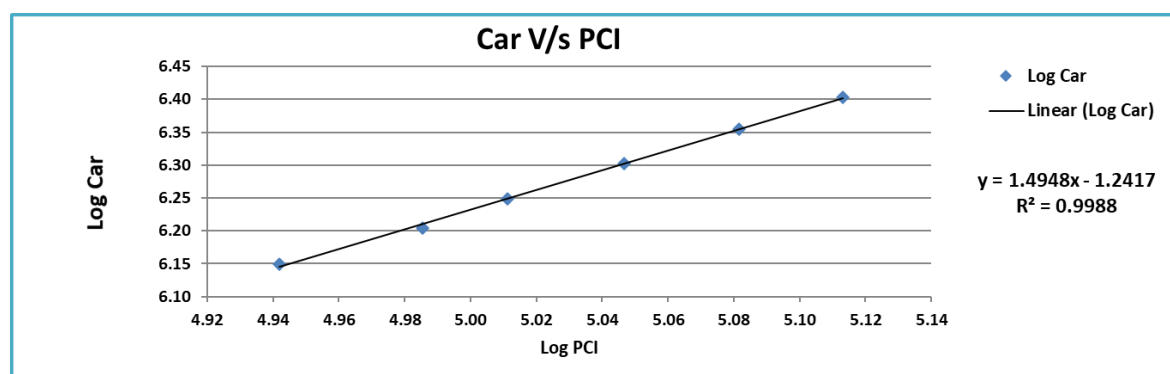
**Table 5-5 : Summary Regression Analysis Rajasthan**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Rajasthan	Car/Jeep	PCI	$y = 2.1541x - 4.4569$	$R^2 = 0.9791$	2.1541	4.55%	9.79%	Good Regression
	Bus	Population	$y = 3.0169x - 18.7174$	$R^2 = 0.9972$	3.0169	1.73%	5.22%	Good Regression
	LCV	NSDP	$y = 1.7768x - 5.1846$	$R^2 = 0.1555$	1.7768	6.16%	10.95%	Poor Regression
	Truck	NSDP	$y = 1.398x - 2.2515$	$R^2 = 0.9848$	1.3980	6.06%	8.46%	Good Regression

**Table 5-6 : Per Capita Income Vs Car Gujarat**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	87481	1411898	4.94	6.15		
2013	96683	1602129	4.99	6.20	11%	
2014	102589	1771298	5.01	6.25	6%	
2015	111370	2008748	5.05	6.30	9%	
2016	120683	2260084	5.08	6.35	8%	
2017	129738	2527537	5.11	6.40	8%	8.21%

Regression analysis of same is given in figure below.

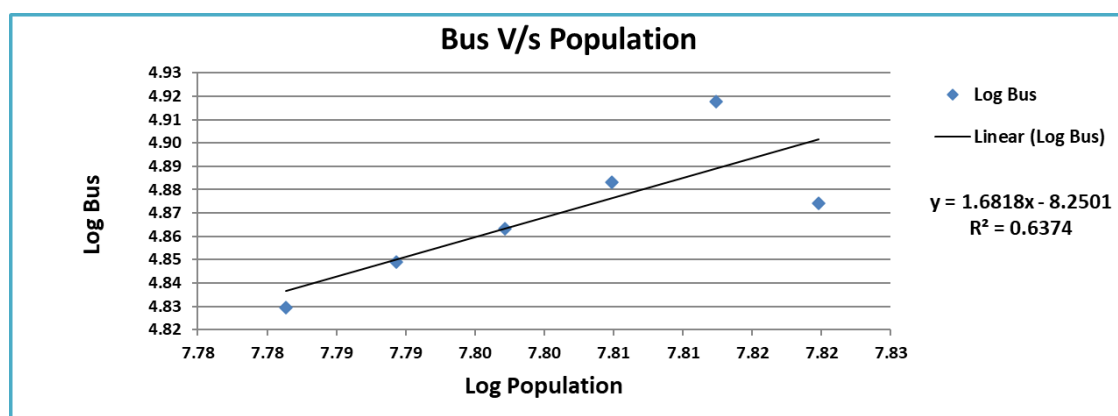


**Figure 5-5 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat**

**Table 5-7 : Population Vs Bus Gujarat**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	60439692	67546	7.78	4.83		
2013	61563037	70615	7.79	4.85	2%	
2014	62684375	72998	7.80	4.86	2%	
2015	63803304	76435	7.80	4.88	2%	
2016	64919427	82734	7.81	4.92	2%	
2017	66032362	74855	7.82	4.87	2%	1.79%

Regression analysis of same is given in figure below.



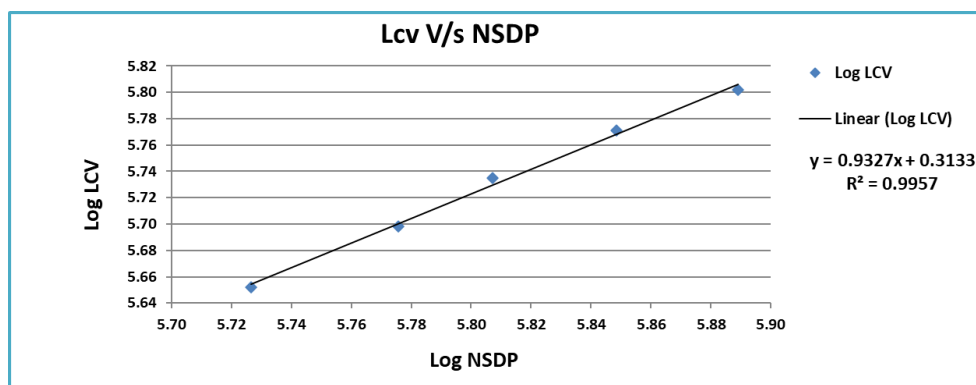
**Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-8 : LCV Traffic Vs NSDP Gujarat**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth
2012	532809	448958	5.73	5.65		
2013	596659	499277	5.78	5.70	12%	
2014	641489	542918	5.81	5.73	8%	
2015	705629	589984	5.85	5.77	10%	
2016	774775	633599	5.89	5.80	10%	9.82%

The following figure depicts regression analysis and extrapolation.

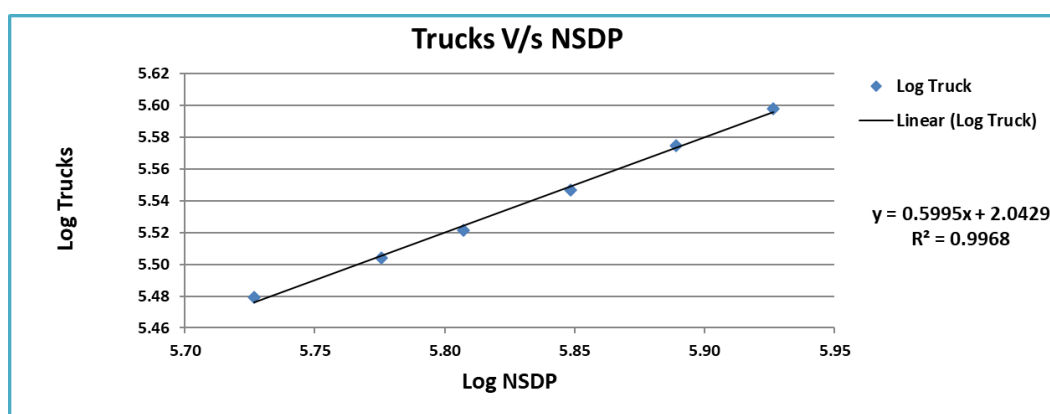


**Figure 5-7 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Gujarat.**

The following figure depicts regression analysis and extrapolation.

**Table 5-9 : Goods Traffic Vs NSDP Gujarat**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth
2012	532809	301533	5.73	5.48		
2013	596659	319207	5.78	5.50	12%	
2014	641489	332185	5.81	5.52	8%	
2015	705629	352225	5.85	5.55	10%	
2016	774775	375265	5.89	5.57	10%	
2017	843930	396061	5.93	5.60	9%	9.64%



**Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Gujarat.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for the good fit regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-10 : Summary Regression Analysis Gujarat**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Gujarat	Car/Jeep	PCI	$y = 1.4948x - 1.2417$	$R^2 = 0.9988$	1.4948	8.21%	12.27%	Good Regression
	Bus	Population	$y = 1.6818x - 8.2501$	$R^2 = 0.6374$	1.6818	1.79%	3.00%	Fair Regression
	LCV	NSDP	$y = 0.9327x - 0.3133$	$R^2 = 0.9957$	0.9327	9.82%	9.16%	Good Regression
	Truck	NSDP	$y = 0.5995x - 2.0429$	$R^2 = 0.9968$	0.5995	9.64%	5.78%	Good Regression

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Kishangarh to Gulabpura is under tolling operation with current concessionaire and has two years of tolling history from 2018-19. As traffic data is available with the project concessionaire of year two years, we do not have sufficient data points to be able to establish a reliable past trend of traffic growth. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

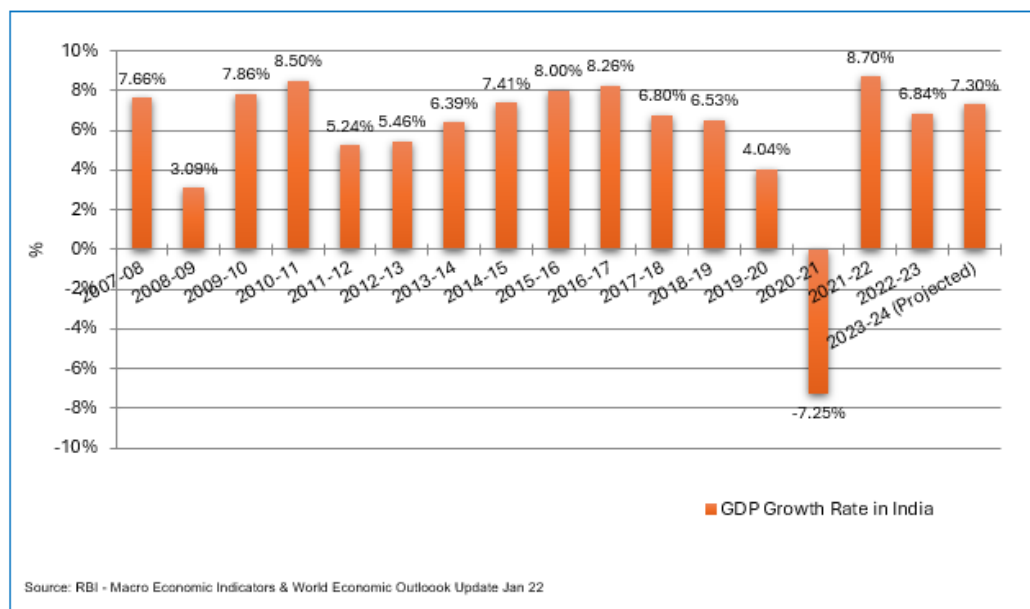
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

#### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-9 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

This Highway passes through Ajmer district of Rajasthan, having Industrial Areas of RIICO Kishangarh and Silora. There are Large Scale Industries of Cement, Marble & Granite and Medium Scale Industries of engineering and instrumentation in this area. Asset primarily serves traffic travelling between Delhi, Rajasthan, Gujarat and Maharashtra. It is observed that the vehicle distribution to be dominated by heavy vehicles. We further noticed several textile industries and marble/granite industries bordering the Asset. Udaipur serves as a big tourism hub as well as a consumption centre which also results in traffic feeding into the demand being generated.

In addition, Chittorgarh has 4 major cement plants located in Chanderiya and Nimbahera villages. There is a regular movement of Cement bulkers to and from these locations along

asset. Chanderiya Lead-Zinc Smelter, is the one of the largest zinc-lead smelting complexes in the world, is also located in Chittorgarh. Bhilwara is home to the textile industry and the only centre in the country producing insulation bricks. Mining is another major sector for large scale mining of sandstone, soap stone feldspar, quartz, mica China clay and granite. Also, Iron Ore, Led, and Zinc are mined and processed in Bhilwara.

growth of Rajasthan has been comparable to the national average economic growth. Rajasthan is rich in natural resources and benefits from its strategic geographic location in India. The state is pre-eminent in quarrying, mining in India and has been a leader in crude oil extraction over the past the few years. Moreover, Rajasthan is also a relevant tourism attractor in India. Considering the scenario, it may be assumed that the traffic growth on the project highway would remain high and there are minimal risks in terms of growth.

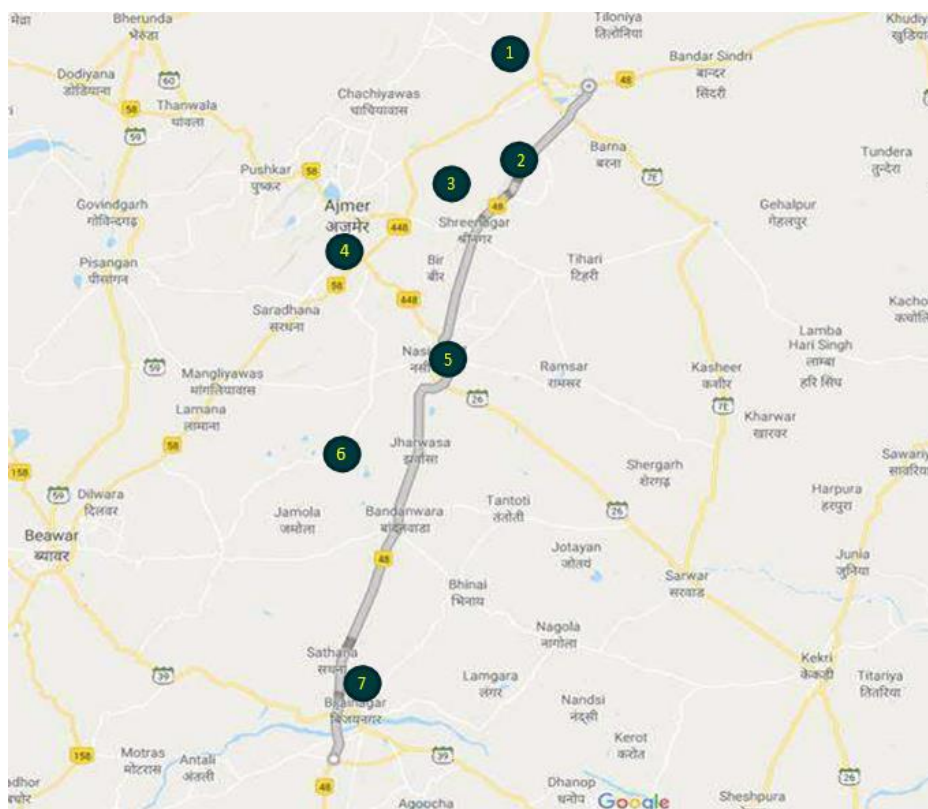
**Table 5-11 : GDP of India, UP and other important states**

Year	India (GDP)	Bihar	Haryana	Madhya Pradesh	Maharashtra	Odisha	Punjab	Rajasthan	Uttar Pradesh	Uttarakhand	West Bengal	Delhi
1980-81	12336	514	357	623	1464	529	504	560	1631	138	830	269
1981-82	13030	543	371	639	1498	528	551	607	1670	141	808	291
1982-83	13411	548	394	668	1556	497	568	620	1800	152	840	328
1983-84	14464	601	402	702	1654	597	578	761	1871	158	939	320
1984-85	15037	658	418	668	1675	569	623	706	1900	161	964	333
1985-86	15663	672	493	726	1807	635	670	704	1975	167	1005	386
1986-87	16339	725	493	694	1832	643	694	771	2060	174	1045	411
1987-88	16917	685	484	789	1955	623	730	718	2154	182	1101	447
1988-89	18635	772	602	847	2159	754	769	1014	2434	206	1148	486
1989-90	19778	759	610	865	2515	805	834	993	2502	212	1188	531
1990-91	20824	831	674	987	2629	668	849	1149	2651	224	1251	553
1991-92	21122	784	688	916	2620	753	888	1061	2662	225	1349	638
1992-93	22254	737	688	983	3017	740	930	1220	2690	228	1389	660
1993-94	23519	755	719	1088	3349	788	970	1121	2757	233	1490	705
1994-95	25023	842	771	1107	3414	826	995	1325	2901	254	1594	790
1995-96	26846	712	787	1174	3791	864	1032	1374	2995	251	1713	804
1996-97	28987	893	879	1252	3941	804	1107	1535	3327	267	1832	915
1997-98	30234	850	887	1318	4158	920	1137	1721	3292	270	1985	1063
1998-99	32255	904	934	1405	4324	948	1203	1797	3316	274	2112	1116
1999-00	34837	950	1002	1552	4735	1008	1267	1801	3440	274	2264	1170
2000-01	36282	1106	1081	1426	4589	982	1309	1743	3511	308	2343	1215
2001-02	38236	1043	1165	1528	4751	1042	1326	1941	3575	323	2512	1262
2002-03	39719	1175	1236	1449	5079	1034	1348	1708	3690	353	2600	1359
2003-04	42883	1099	1358	1611	5471	1185	1433	2251	3885	381	2753	1433
2004-05	45906	1238	1475	1664	5948	1340	1504	2196	4079	431	2936	1588
2005-06	50257	1207	1608	1748	6810	1399	1577	2344	4317	492	3121	1752
2006-07	55066	1416	1791	1907	7748	1574	1748	2620	4660	551	3366	1969
2007-08	60199	1489	1931	1997	8650	1708	1899	2739	4959	648	3627	2191
2008-09	64248	1716	2080	2250	8786	1837	2004	2969	5336	716	3774	2464
2009-10	69769	1798	2340	2463	9634	1852	2132	3142	5668	839	4067	2667
2010-11	75987	2073	2498	2592	10732	1968	2270	3614	6120	927	4313	2888
2011-12	81069	2285	2712	2824	11222	2042	2392	3953	6451	1020	4471	3147
2012-13	85463	2369	2894	3069	11842	2163	2518	4098	6736	1095	4838	3342
2013-14	90636	2469	3142	3226	12671	2331	2675	4343	7075	1178	5247	3565
2014-15	97121	2557	3314	3394	13322	2359	2777	4656	7297	1257	5633	3882
2015-16	105033	2749	3612	3597	14417	2557	2926	4981	7894	1355	-	4291
2016-17	112476	3033	3927	4129	15744	2828	3095	5352	8457	1448	-	4658
2017-18	119762	-	-	4432	-	3029	-	5736	9011	1547	-	5035
Growth 1981-2018	6.34	5.05	6.88	5.44	6.82	4.83	5.17	6.49	4.73	6.75	5.79	8.24
Growth 1994-2018	7.02	6.23	7.66	6.03	6.96	5.77	5.17	7.04	5.06	8.20	6.54	8.53

Growth 2000-2018	7.10	7.07	8.37	6.00	7.32	6.30	5.40	6.65	5.50	10.10	6.27	8.45
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### 5.6.1 Industrial Units along Project Corridor

There are a number of medium and big size industrial establishments along the project corridor. The following figure shows the spread of these industries along project road.



**Figure 5-10 : Industrial Units along project corridor.**

1. RIICO Industrial Area **Kishangarh** (Marbel & Cement Manufacturing Industries)
2. RIICO **Silora** (Wire Product, Ice Factory)
3. Welding Wire & Plastic Manufacturing Industries
4. Industrial Process Measurement & Control Instruments
5. FMCG & Quartz Manufacturers
6. Brick Manufacturers
7. **Bijainnagar** (Cattle Feed Products Manufacturer – Kapila)

The presence of these units promotes sustainable traffic in the project corridor.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to

developed, the rate of growth diminishes. The same growth rate is not sustainable for long. Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

**Table 5-12 : Recommended Growth Rates Optimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	9.26%	8.70%	8.16%	7.62%	7.58%	7.03%
Bus	4.38%	4.12%	3.88%	3.64%	3.57%	3.33%
LCV	3.56%	3.74%	3.92%	4.10%	4.27%	4.44%
2- Axle	4.39%	3.95%	3.52%	3.09%	2.86%	2.41%
3 - Axle	5.43%	4.88%	4.33%	3.80%	3.67%	3.08%
4 to 6 Axle	6.46%	5.80%	5.15%	4.50%	4.27%	3.58%
7 and Above Axle	6.46%	5.80%	5.15%	4.50%	4.27%	3.58%

**Table 5-13 : Recommended Growth Rates Pessimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.76%	8.20%	7.66%	7.12%	7.08%	6.53%
Bus	3.88%	3.62%	3.38%	3.14%	3.07%	2.83%
LCV	3.06%	3.24%	3.42%	3.60%	3.77%	3.94%
2- Axle	3.89%	3.45%	3.02%	2.59%	2.36%	1.91%
3 - Axle	4.93%	4.38%	3.83%	3.30%	3.17%	2.58%
4 to 6 Axle	5.96%	5.30%	4.65%	4.00%	3.77%	3.08%
7 and Above Axle	5.96%	5.30%	4.65%	4.00%	3.77%	3.08%

**Table 5-14 : Recommended Growth Rates Most Likely**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	9.01%	8.45%	7.91%	7.37%	7.33%	6.78%
Bus	4.13%	3.87%	3.63%	3.39%	3.32%	3.08%
LCV	3.31%	3.49%	3.67%	3.85%	4.02%	4.19%
2- Axle	4.14%	3.70%	3.27%	2.84%	2.61%	2.16%
3 - Axle	5.18%	4.63%	4.08%	3.55%	3.42%	2.83%
4 to 6 Axle	6.21%	5.55%	4.90%	4.25%	4.02%	3.33%
7 and Above Axle	6.21%	5.55%	4.90%	4.25%	4.02%	3.33%

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza Chainage KM 61.02**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6747	758	215	2538	1914	5019	504	17695	46739
2025-26	7335	786	224	2638	2007	5310	533	18833	49415
2026-27	7973	815	233	2743	2104	5618	564	20050	52255
2027-28	8666	845	242	2851	2207	5944	596	21351	55264
2028-29	9420	876	252	2964	2314	6288	630	22744	58455
2029-30	10239	908	262	3081	2427	6652	666	24235	61842
2030-31	11074	943	272	3189	2532	6994	700	25704	65091
2031-32	11976	980	282	3302	2641	7354	736	27271	68526
2032-33	12953	1018	293	3418	2755	7733	774	28944	72160
2033-34	14010	1058	304	3538	2874	8131	813	30728	75993
2034-35	15153	1099	316	3663	2998	8550	854	32633	80051
2035-36	16308	1144	327	3777	3112	8934	892	34494	83889
2036-37	17551	1191	339	3894	3230	9336	932	36473	87933
2037-38	18888	1239	351	4014	3353	9756	974	38575	92186
2038-39	20327	1289	364	4138	3480	10195	1018	40811	96665
2039-40	21876	1341	377	4266	3612	10655	1064	43191	101388
2040-41	23534	1398	390	4389	3745	11110	1109	45675	106189
2041-42	25188	1460	403	4495	3860	11507	1148	48061	110600
2042-43	26958	1524	416	4603	3978	11918	1189	50586	115217

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage KM 61.02**  
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6747	758	215	2538	1914	5019	504	17695	46739
2025-26	7301	782	223	2625	1998	5285	530	18744	49180
2026-27	7899	807	231	2715	2085	5565	558	19860	51756
2027-28	8546	833	239	2808	2176	5860	587	21049	54476
2028-29	9246	860	247	2904	2271	6170	618	22316	57348

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2029-30	10004	888	256	3004	2370	6497	650	23669	60388
2030-31	10769	918	264	3094	2460	6799	680	24984	63256
2031-32	11593	949	273	3187	2554	7115	711	26382	66276
2032-33	12480	981	282	3282	2652	7445	744	27866	69450
2033-34	13436	1014	291	3381	2753	7791	778	29444	72793
2034-35	14466	1048	301	3483	2858	8153	814	31123	76316
2035-36	15496	1085	310	3573	2952	8480	846	32742	79596
2036-37	16600	1124	320	3665	3049	8819	880	34457	83034
2037-38	17782	1164	330	3759	3149	9172	915	36271	86634
2038-39	19049	1206	340	3855	3253	9539	951	38193	90407
2039-40	20406	1249	350	3955	3360	9921	989	40230	94370
2040-41	21849	1296	361	4048	3466	10295	1026	42341	98363
2041-42	23274	1347	371	4125	3555	10612	1057	44341	101958
2042-43	24792	1400	381	4204	3646	10939	1089	46451	105711

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 3- Chainage KM 61.02  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6747	758	215	2538	1914	5019	504	17695	46739
2025-26	7318	784	223	2632	2003	5297	532	18789	49299
2026-27	7936	811	231	2729	2096	5590	561	19954	52000
2027-28	8606	839	240	2831	2193	5900	592	21201	54871
2028-29	9333	868	249	2936	2294	6228	624	22532	57906
2029-30	10121	898	258	3045	2400	6573	658	23953	61117
2030-31	10921	931	267	3145	2498	6895	690	25347	64180
2031-32	11784	965	276	3248	2599	7233	723	26828	67403
2032-33	12715	1000	286	3354	2705	7587	758	28405	70803
2033-34	13721	1036	296	3463	2815	7958	795	30084	74386
2034-35	14805	1074	307	3577	2930	8348	834	31875	78177
2035-36	15896	1115	317	3679	3034	8702	869	33612	81728
2036-37	17067	1158	328	3784	3141	9072	906	35456	85464
2037-38	18325	1202	339	3891	3252	9457	944	37410	89379
2038-39	19675	1248	350	4002	3367	9859	984	39485	93498
2039-40	21125	1296	362	4116	3486	10278	1026	41689	97829
2040-41	22672	1348	374	4224	3605	10691	1067	43981	102214
2041-42	24209	1404	385	4316	3706	11046	1102	46168	106202
2042-43	25850	1462	397	4410	3811	11414	1138	48482	110381

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Gulabpura - Chittorgarh project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup> May 2026

Target Traffic - 76236 in PCU

It was observed that as per traffic projections, average traffic volume falls short of target traffic in all scenarios. The probable extension of the concession period is estimated according to article 29 of the concession agreement which comes to about three years. Traffic forecast and revenue projections are done for probable extended period accordingly.

### ***Most Likely***

<b>Targe t Year</b>	<b>Target Traffic</b>	<b>Actual Traffic</b>	<b>% of Excess / Short traffic</b>	<b>% Revision (+ or -) in CP as per CA</b>	<b>% Variatio n in CP</b>	<b>Origi nal CP</b>	<b>Change in CP (In Years)</b>
2026	76236	52056	-32%	48%	20%	20	4.0

### ***Optimistic***

<b>Targe t Year</b>	<b>Target Traffic</b>	<b>Actual Traffic</b>	<b>% of Excess / Short traffic</b>	<b>% Revision (+ or -) in CP as per CA</b>	<b>% Variatio n in CP</b>	<b>Origi nal CP</b>	<b>Change in CP (In Years)</b>
2026	76236	52311	-31%	47%	20%	20	4.0

### ***Pessimistic***

<b>Targe t Year</b>	<b>Target Traffic</b>	<b>Actual Traffic</b>	<b>% of Excess / Short traffic</b>	<b>% Revision (+ or -) in CP as per CA</b>	<b>% Variatio n in CP</b>	<b>Origi nal CP</b>	<b>Change in CP (In Years)</b>
2026	76236	51804	-32%	48%	20%	20	4.0

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Kishangarh- Gulabpura section of NH-79 is based on the old toll policy. As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

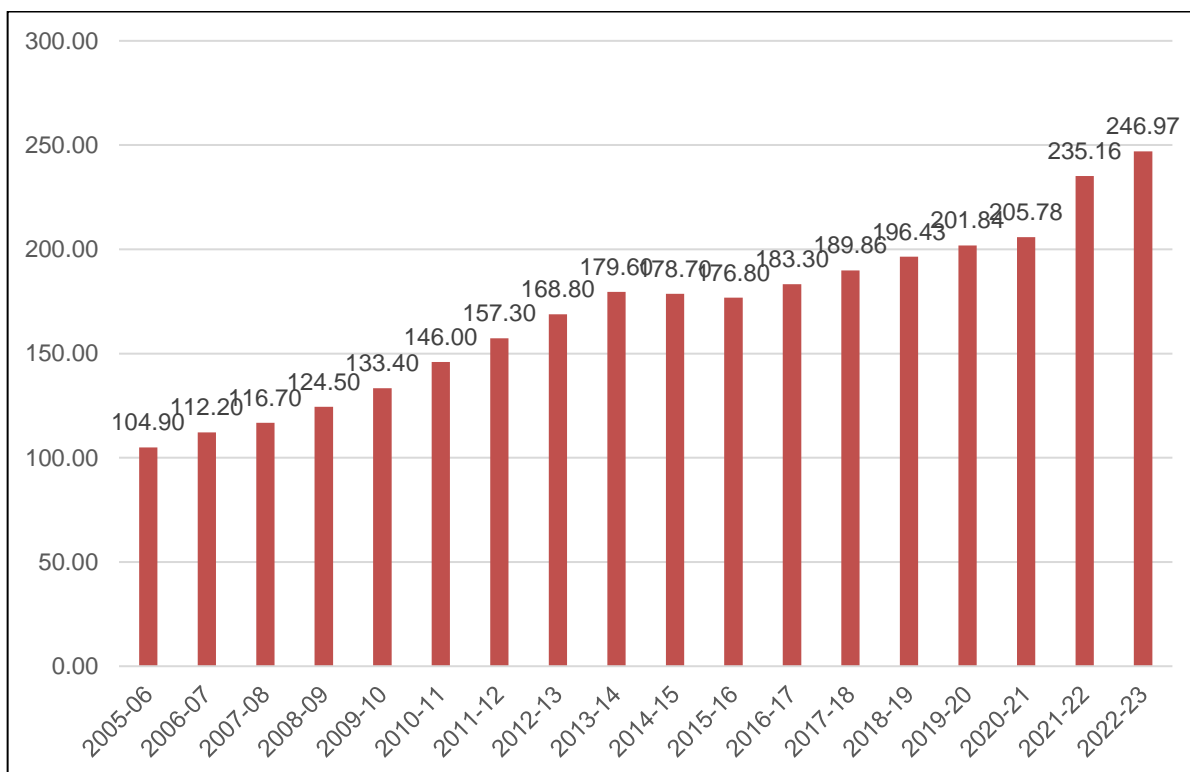
1. Monthly Pass: For frequent user's monthly pass would be issued for 50 trips in month at 2/3d rate.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van I - Rs. 275 per
  - b) Local Commercial Vehicles at 50% rate for single journey

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is taken as 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey @ Chainage KM 61.02**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles
2024-25	145	230	485	485	530	760	925
2025-26	150	245	510	510	555	800	975
2026-27	160	255	535	535	585	840	1025
2027-28	165	270	565	565	615	885	1075
2028-29	175	285	590	590	645	930	1130
2029-30	185	295	620	620	680	975	1190
2030-31	195	310	655	655	715	1025	1250
2031-32	205	330	690	690	750	1080	1315
2032-33	215	345	725	725	790	1135	1380
2033-34	225	365	760	760	830	1195	1455
2034-35	235	380	800	800	875	1255	1530
2035-36	250	405	845	845	920	1325	1610
2036-37	260	425	890	890	970	1395	1695
2037-38	275	445	935	935	1020	1465	1785
2038-39	290	470	985	985	1075	1545	1880
2039-40	305	495	1040	1040	1130	1625	1980
2040-41	325	520	1095	1095	1195	1715	2085
2041-42	340	550	1150	1150	1255	1805	2200
2042-43	360	580	1215	1215	1325	1905	2320

**Table 7-3 : Toll Rates for Return Journey @ Chainage KM 61.02**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles
2024-25	215	350	730	730	795	1145	1390
2025-26	225	365	765	765	835	1200	1460
2026-27	240	385	805	805	875	1260	1535
2027-28	250	405	845	845	920	1325	1615
2028-29	260	425	890	890	970	1395	1695
2029-30	275	445	935	935	1020	1465	1780
2030-31	290	470	980	980	1070	1540	1875
2031-32	305	495	1030	1030	1125	1620	1970
2032-33	320	520	1085	1085	1185	1705	2075
2033-34	340	545	1140	1140	1245	1790	2180
2034-35	355	575	1200	1200	1310	1885	2295
2035-36	375	605	1265	1265	1380	1985	2415
2036-37	395	635	1330	1330	1455	2090	2545
2037-38	415	670	1405	1405	1530	2200	2680
2038-39	435	705	1475	1475	1610	2315	2820

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles
2039-40	460	745	1555	1555	1700	2440	2970
2040-41	485	785	1640	1640	1790	2570	3130
2041-42	510	825	1730	1730	1885	2710	3300
2042-43	540	870	1820	1820	1985	2855	3480

**Table 7-4 : Toll Rates for Monthly Pass Local@ Chainage KM 61.02**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845

**Table 7-5 : Toll Rates for Monthly Pass @ Chainage KM 61.02**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	4785	7730	16195	16195	17665	25395	30915
2025-26	5025	8120	17010	17010	18555	26675	32475
2026-27	5280	8530	17870	17870	19495	28025	34115
2027-28	5550	8960	18780	18780	20485	29445	35850
2028-29	5830	9420	19735	19735	21530	30950	37675
2029-30	6130	9900	20745	20745	22630	32530	39605
2030-31	6445	10410	21810	21810	23795	34205	41640
2031-32	6775	10950	22940	22940	25025	35970	43790
2032-33	7130	11515	24130	24130	26320	37840	46065
2033-34	7500	12115	25385	25385	27695	39810	48465
2034-35	7895	12750	26715	26715	29145	41890	51000
2035-36	8310	13420	28120	28120	30675	44095	53680

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2036-37	8745	14130	29600	29600	32295	46420	56515
2037-38	9210	14875	31170	31170	34005	48885	59510
2038-39	9700	15670	32830	32830	35815	51485	62680
2039-40	10220	16505	34585	34585	37730	54240	66030
2040-41	10765	17395	36445	36445	39755	57150	69570
2041-42	11345	18330	38405	38405	41900	60230	73320
2042-43	11960	19320	40485	40485	44165	63485	77285

#### 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

#### 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2042-43 starting from the year 2023-24 are shown in tables below.

**Table 7-6 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	TP-1
2024-25	270.07
2025-26	299.41
2026-27	332.77
2027-28	370.61
2028-29	410.05
2029-30	455.26
2030-31	503.73
2031-32	559.15
2032-33	616.32
2033-34	681.79
2034-35	753.33
2035-36	835.05
2036-37	916.94
2037-38	1009.48
2038-39	1113.84
2039-40	1231.68
2040-41	1356.86
2041-42	1483.75
2042-43	1630.10

**Table 7-7 : Toll Revenue Pessimistic Scenario****(Rs. Crores)**

<b>Year</b>	<b>TP-1</b>
2024-25	270.07
2025-26	298.02
2026-27	329.70
2027-28	365.46
2028-29	402.41
2029-30	444.68
2030-31	489.70
2031-32	540.93
2032-33	593.41
2033-34	653.29
2034-35	718.45
2035-36	792.58
2036-37	866.07
2037-38	949.03
2038-39	1042.15
2039-40	1146.91
2040-41	1257.45
2041-42	1368.49
2042-43	1496.33

**Table 7-8 : Toll Revenue Most Likely Scenario****(Rs. Crores)**

<b>Year</b>	<b>TP-1</b>
2024-25	270.07
2025-26	298.69
2026-27	331.17
2027-28	367.99
2028-29	406.18
2029-30	449.97
2030-31	496.71
2031-32	549.97
2032-33	604.77
2033-34	667.40
2034-35	735.80
2035-36	813.59
2036-37	891.15
2037-38	978.88
2038-39	1077.54
2039-40	1188.70
2040-41	1306.52
2041-42	1425.33
2042-43	1562.25

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Kishangarh to Gulabpura section of NH-79 in state of Rajasthan is nearing completion of six laning. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the busy and prominent national highway NH-79 which connects Kishangarh to Udaipur via Bhiwala and Chittorgarh. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As discussed, the dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 7-8% annually in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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# KAITHAL TO RAJASTHAN SECTION OF NH 152/65 (KM 33.250 TO KM 241.580) IN THE STATE OF HARYANA



## TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)

**OCTOBER 2024**



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**KAITHAL TO RAJASTHAN SECTION OF NH-152/65**  
**(KM 33.250 TO 241.580)**  
**IN THE STATE OF HARYANA**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under various NHDP Phases.

The project under consideration, Four Laning of **Kaithal to Rajasthan** section of NH-152/65 from km 33.250 to km 241.580 in the state of Haryana is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s Kaithal Tollway Ltd.* (Concessionaire) has been awarded the Project for a concession period of 27 years starting from appointed date of 15<sup>th</sup> July 2015. COD was achieved for part length of project in September 2017 and Tolling Operation on Project started. Final COD for full length was achieved on 29<sup>th</sup> March-2019

Project road section from Kaithal to Rajasthan border is part of important corridor which connects part of Haryana, Punjab, Himachal Pradesh, J&K and certain part of Uttarakhand to Rajasthan, Gujarat and Coastal parts of Maharashtra and then to down to south.

Project road section from Kaithal to Rajasthan border passes through three districts of Haryana namely Kaithal, Hisar and Bhiwani. Project road also passes through important towns and development areas of Narwana, Hisar and Siwani in addition to Kaithal.

Following figure shows the project road alignment.



**Figure 1-1 : Alignment of Project Stretch**

### 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

The project road forms part of important connectivity between Northern states like Haryana, Punjab, Himachal Pradesh, J&K and states like Maharashtra, Gujarat (Kandla and Mundra), and parts of Rajasthan. It is the shortest route between Punjab / J&K, Gujarat, Rajasthan, Maharashtra, Goa, Kerala and becomes good alternate route to NH-1 and NH-8 for Gujarat, Rajasthan, Maharashtra Goa and Kerala bound traffic from Haryana, Punjab, J&K Himachal Pradesh.

Project road also caters to local intrastate traffic between districts of Ambala, Chandigarh, Kaithal, Jind, Hisar, Bhiwani in Haryana and Churu, Sikar, Nagaur and Jodhpur in Rajasthan.

#### 2.2 Project Stretch Description

The Project highway from Kaithal to Rajasthan border from Km 33.250 to km 241.580 has been widened to four lanes as per schedules. The project has following bypasses which are part of project road.

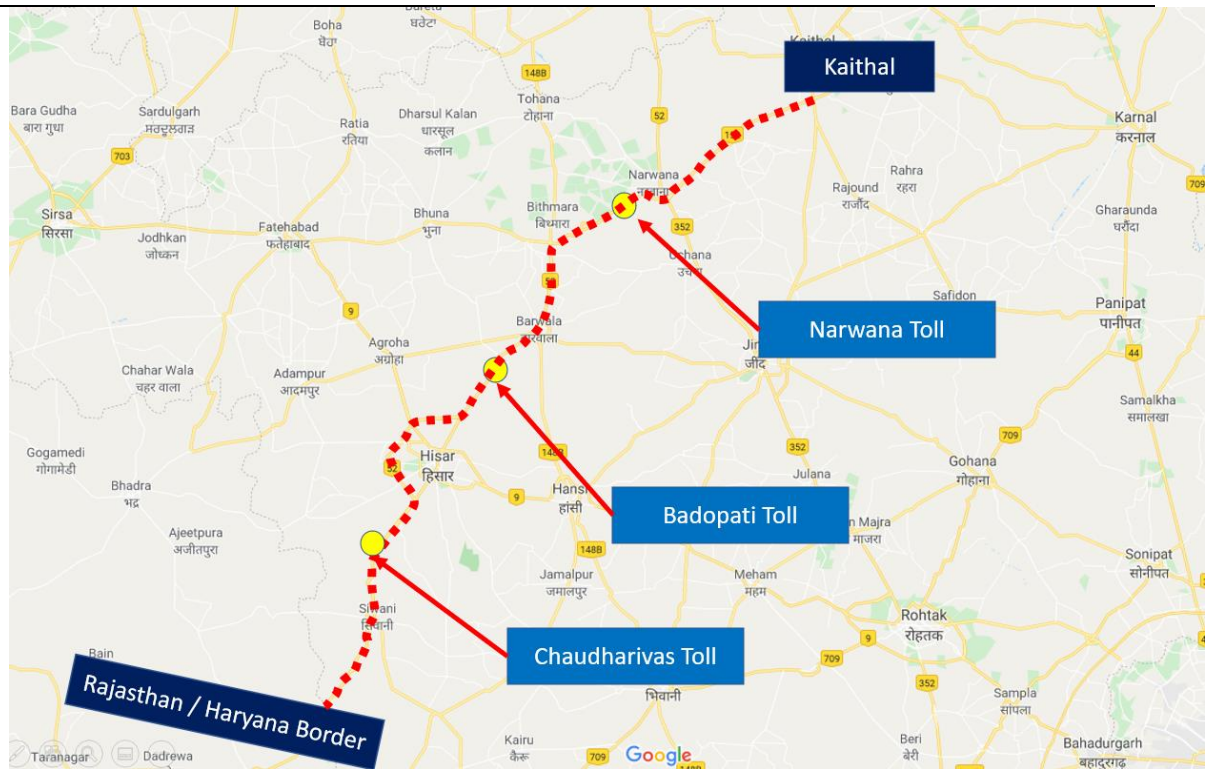
*Table 2-1 : Bypass Details*

Sr. No	Bypass Name	Length	Toll Plaza
1	Kalyat	3.450	125.790
2	Dhanaudha	3.800	
3	Narwana	1.900	
4	Barwala	7.850	171.580
5	Hisar+Talwandi Rana		
6	Barwa	3.300	212.400
7	Siwani	6.150	

Full COD for project is achieved on 29<sup>th</sup> March 2019.

Project road forms part of very important transportation corridor which connects Northern states like Haryana, Punjab, J&K, Himachal etc to Southern states and development centres especially on west coastline of India. In previous years project road from Ambala to onwards was in bad shape. There were large number of congestion points along the route in form of narrow roads inside towns, level crossings and bad riding quality. Project road from Kaithal to Rajasthan Border is almost complete which has taken up bypasses and ROBs. Also, the road from Ambala to Kaithal is under four laning construction as of now. The project is awarded to M/s Sadbhav Engineering Limited and is expected to complete in current year. This would improve the flow of traffic on project corridor to great extent.

Following figure show project alignment and toll plaza locations.



**Figure 2-1 : Project Alignment with Toll Plaza**

### 2.3 Project Corridor Illustration

Six laning of project stretch is complete. Following photographs illustrate project section along the corridor.





***Figure 2-2 : Photographs showing Project Corridor***

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from client for project.

- Classified traffic volume counts at three toll plaza locations on Kaithal- Rajasthan Border section of NH-152/65 for year 2017-18, 2018-19, 2019-20, 2020-21 ,2021-22,2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 125 Toll Plaza at Narwana	AADT for Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024
2	Km 171 Toll Plaza at Badopatti	AADT for Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024
3	Km 212 Toll Plaza at Chaudhariwas	AADT for Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024

### 3.2 Classified traffic volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

**Source - IRC: 64 – 1990**

However, since project highway is currently under toll operation, the data collected is corresponding to category of tollable vehicles. Following is the type of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Truck / Bus
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base

year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Narwana Toll Plaza at Km 125**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2952	2657	4351	4094	4282	4520
2	Minibus/LCV	633	569	381	325	367	381
3	Bus	310	279	315	289	338	364
4	Truck	320	287	529	462	477	428
5	3-Axle	314	283	416	345	321	249
6	Multi Axle	771	694	1347	1343	1382	1149
7	Oversized Vehicles	5	5	20	47	48	32
	<b>Total</b>	<b>5305</b>	<b>4774</b>	<b>7357</b>	<b>6905</b>	<b>7215</b>	<b>7123</b>

**Table 3-4 : Traffic Data at Badopatti Toll Plaza at Km 171**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	5387	4850	4915	4591	4132	4560
2	Minibus/LCV	630	567	374	331	306	360
3	Bus	431	387	395	384	405	459
4	Truck	327	295	577	503	437	437
5	3-Axle	376	339	505	400	336	341

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
6	Multi Axle	923	831	1522	1326	1130	1109
7	Oversized Vehicles	3	3	16	46	55	65
	<b>Total</b>	<b>8077</b>	<b>7272</b>	<b>8303</b>	<b>7581</b>	<b>6800</b>	<b>7331</b>

*Table 3-5 : Traffic Data at Chaudhariwas Toll Plaza at Km 212*

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2947	2652	4371	4076	4167	4342
2	Minibus/LCV	592	532	335	335	356	417
3	Bus	162	147	181	159	164	169
4	Truck	367	331	629	522	497	539
5	3-Axle	470	423	630	537	452	481
6	Multi Axle	1395	1257	2121	1812	1656	1695
7	Oversized Vehicles	6	5	29	65	65	77
	<b>Total</b>	<b>5939</b>	<b>5347</b>	<b>8295</b>	<b>7506</b>	<b>7356</b>	<b>7721</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-6**.

**Table 3-6 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

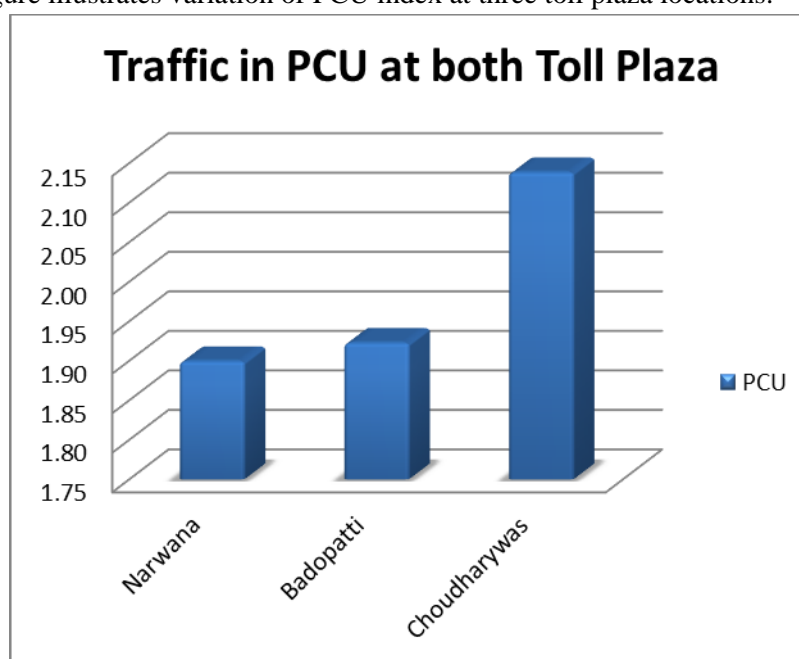
Traffic volume at each toll plaza was converted to PCU and same is presented as under

**Table 3-7 : Traffic in PCU at Project Stretch Base Year 2023-24**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
<b>2019-20</b>	Narwana Km 125.79	5305	10226	1.93
	Badopatti Km 171.58	8077	13901	1.72
	Chaudhariwas Km 212.400	5939	13136	2.21
<b>2020-21</b>	Narwana Km 125.79	4774	9203	1.93
	Badopatti Km 171.58	7272	12516	1.72
	Chaudhariwas Km 212.400	5347	11832	2.21
<b>2021-22</b>	Narwana Km 125.79	7357	14849	2.02
	Badopatti Km 171.58	8303	16824	2.03
	Chaudhariwas Km 212.400	8295	18866	2.27

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2022-23	Narwana Km 125.79	6905	14124	2.05
	Badopatti Km 171.58	7581	15122	1.99
	Chaudhariwas Km 212.400	7506	16679	2.22
2023-24	Narwana Km 125.79	7215	14676	2.03
	Badopatti Km 171.58	6800	13455	1.98
	Chaudhariwas Km 212.400	7356	15782	2.15
2024-25	Narwana Km 125.79	7123	13530	1.90
	Badopatti Km 171.58	7331	14094	1.92
	Chaudhariwas Km 212.400	7721	16509	2.14

It can be observed from above that project traffic has PCU index ranging from 2.0 to 2.3 which is an indicator of good proportion of commercial traffic in traffic mix in project corridor. Following figure illustrates variation of PCU index at three toll plaza locations.



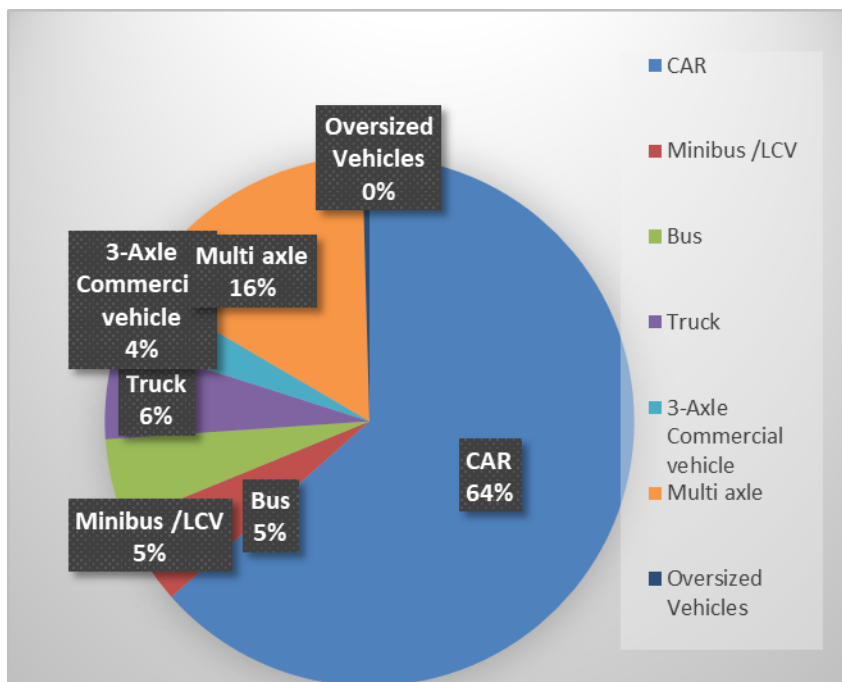
**Figure 3-1 : Comparison of PCU Index**

### 3.4.2 Components of Traffic

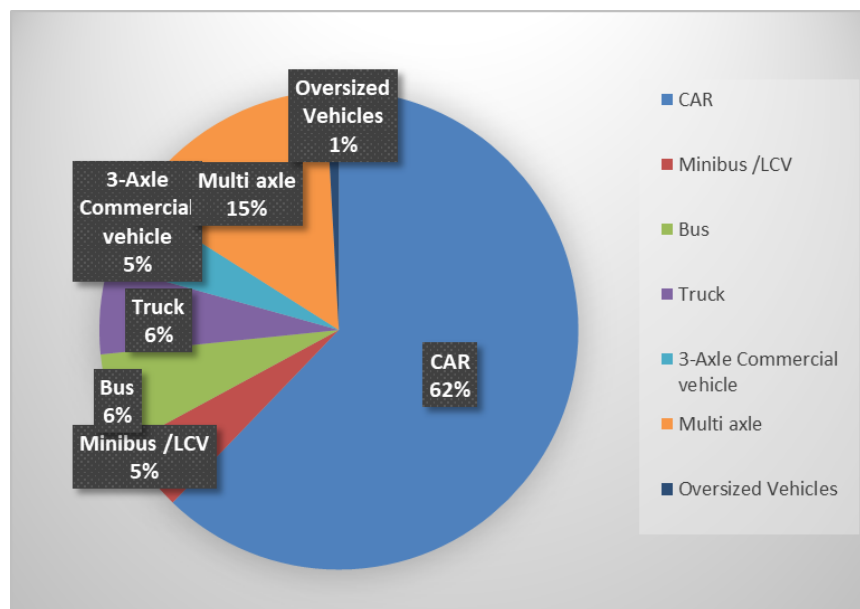
As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds

to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.

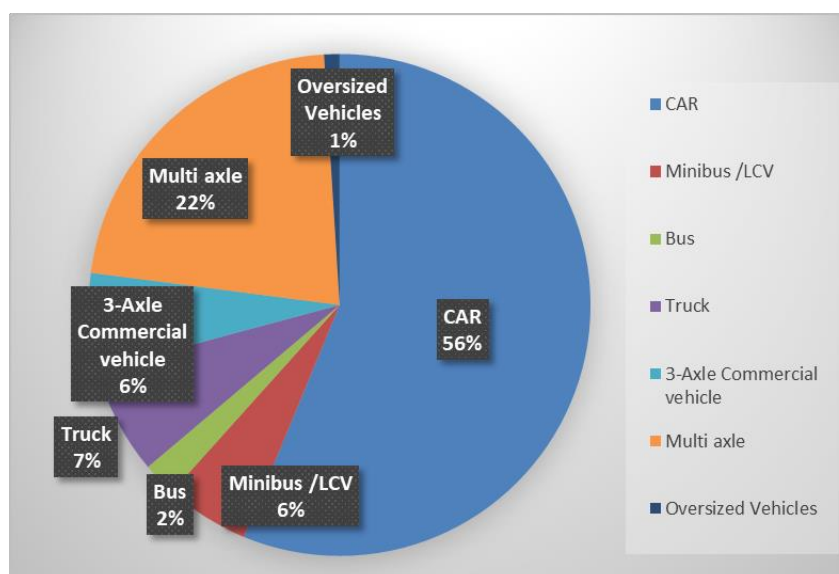
It is observed that car traffic forms about 50%-65% of total traffic at toll plaza locations while multi axle commercial vehicles are about 20%-30% of total traffic. Truck / Bus and LCV share about 10%-15% and 2%-5% of traffic volume respectively.



**Figure 3-2 :Model Split of Tollable Vehicle-Km 125.790**



**Figure 3-3 :Model Split of Tollable Vehicle-Km 171.58**



**Figure 3-4 :Model Split of Tollable Vehicle-Km 212.400**

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25.

**Table 3-8 : Journey Type Bifurcation of Traffic at Narwana TP-1 KM 125**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	3952
2	Return Journey	3082
3	Local Commercial Single Journey	61
4	Monthly Pass Local	28
5	Monthly Pass	0

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is a high as 56%. Return journey component is 43%. The number of monthly pass local is 0% and local commercial single Journey also 1% at Narwana toll plaza.

Following tables give the detail of journey distribution at Badopatti and Chaudhariwas toll plaza.

**Table 3-9 : Journey Type Bifurcation of Traffic at Badopatti TP KM 171**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	3876
2	Return Journey	3168
3	Local Commercial Single Journey	178
4	Monthly Pass Local	109
5	Monthly Pass	0

**Table 3-10 : Journey Type Bifurcation of Traffic at Chaudhariwas TP KM 212**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	4538
2	Return Journey	3052
3	Local Commercial Single Journey	89
4	Monthly Pass Local	42
5	Monthly Pass	0

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic pattern and growth on any project corridor. Following is some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data

- a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

# INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

### 4.1 Introduction

Highway corridors behave like integrated circuit network and more often than not every road is connected to various networks having different origin and destinations. Traffic running on these networks behave like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

### 4.2 Competing / Alternate route

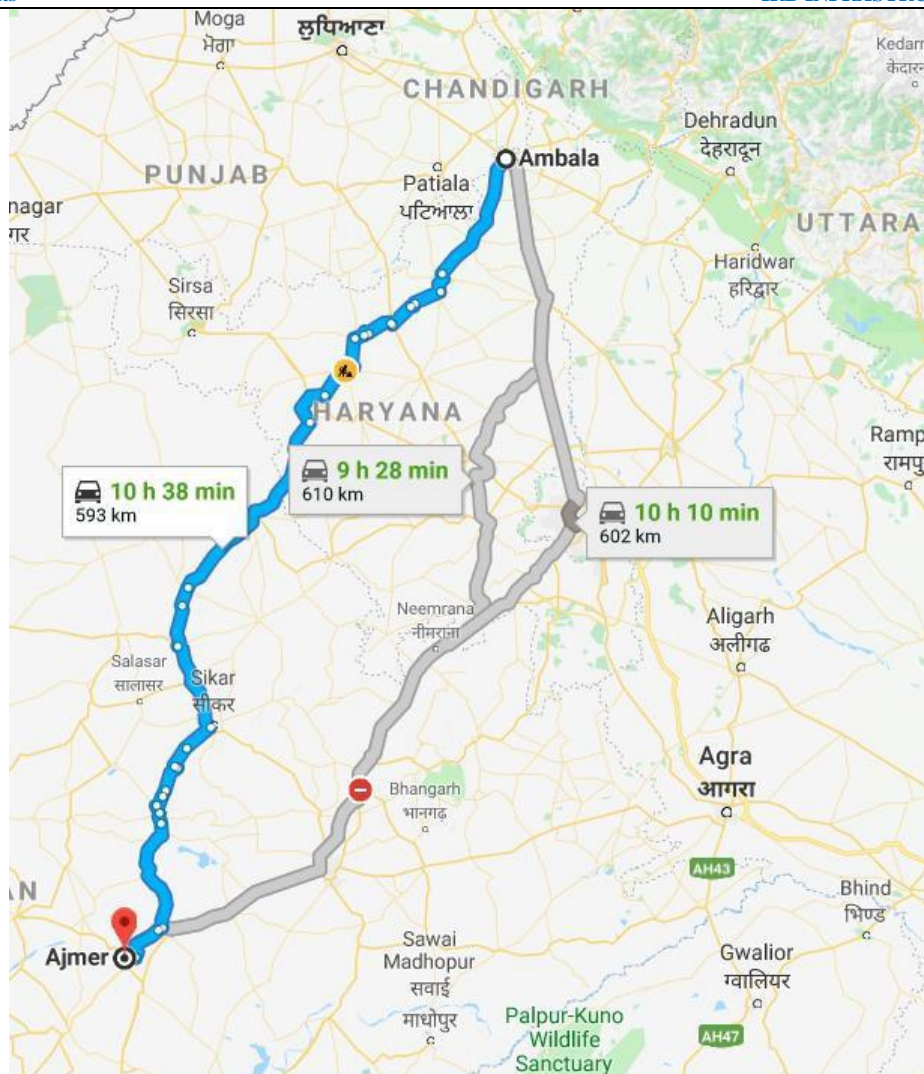
Though project road has started collecting toll form mid of year 2017-18 but it was for partial completion of project stretch. Some critical location bypasses and ROBs were pending at beginning of toll. Also stretch from Ambala to Kaithal which is just before project stretch is under four laning. In this case project traffic can be considered as under settlement. Shifting of traffic depends on factors such as road length, type, geometry, riding quality and capacity. Competing road analysis was done at two levels. First at regional level and second at local level. Project road forms an optimal route for the traffic between following zones.

Zone-1- J & K, Punjab (Ludhiana, Amritsar parts), Haryana, Himachal, Part of Uttarakhand

Zone-2 – Rajasthan, Gujarat (Kandla, Mundra), Maharashtra (Coastal), Southern States (Coastal).

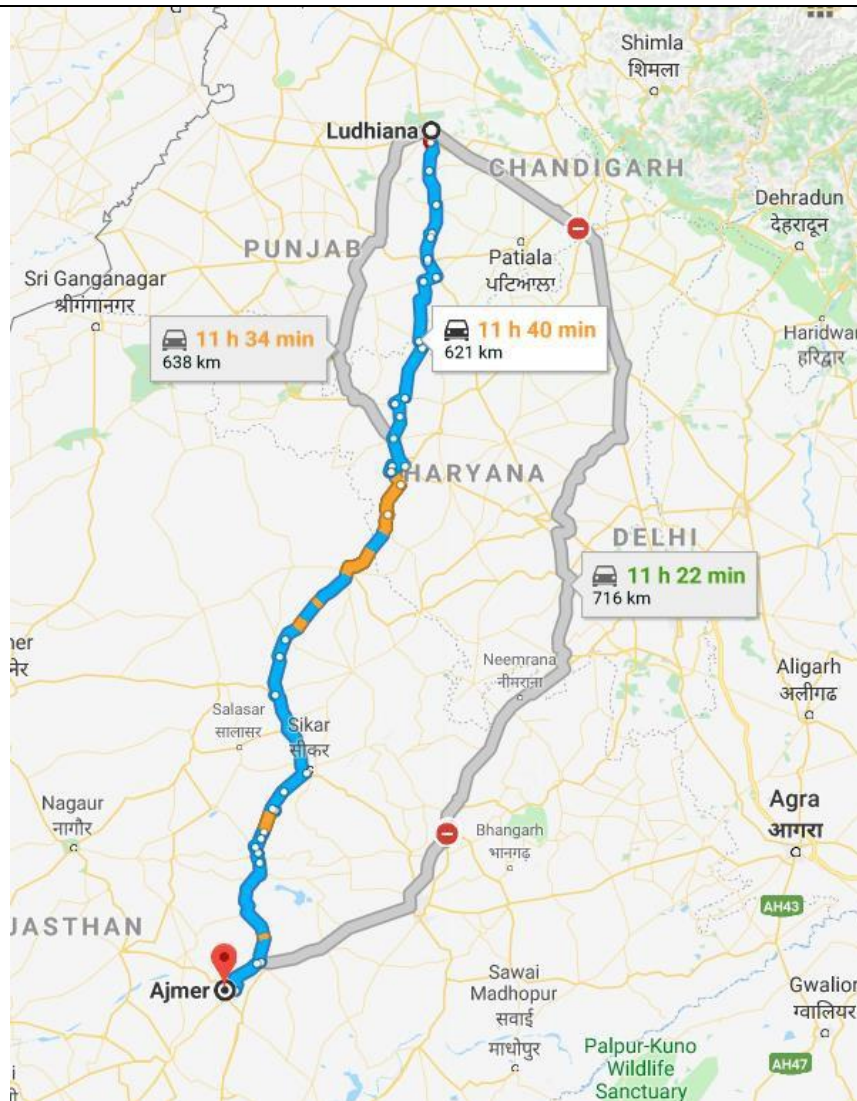
As alternate routes converge at Ajmer, the Project Influence Area (PIA) is considered between Ambala and Ajmer only.

Following figures show the layout of competing routes between both these Zones.



**Figure 4-1 : Alternate route at regional level between Zones.**

Above figure depicts alternate route between Ambala and Ajmer. Following figure shows alternate routes between Ludhiana and Ajmer



**Figure 4-2 : Alternate route at regional level between Ludhiana & Ajmer**

From above figures it can be seen that the route containing project alignment has least distance between these origin and destination zones.

Following facts improve probability of target traffic getting attracted to project road.

- Project corridor between Ambala to Rajasthan Border is expected to complete four laning with all bypasses and ROBs.
- Road from Ludhiana to Hisar is part of Bharatmala project and will be converted to four lanes. Currently road from Hisar to Fatehabad only in four lanes.

- Project Corridor is part of ambitious project of Bharatmala which will improve entire length of corridor in terms of capacity and traffic flow. The Government of India has identified the Ludhiana – Ajmer corridor as an optimal route which shall provide time and cost savings to traffic moving from western India to northern India. This will also allow traffic to avoid heavy traffic jams around New Delhi which it is facing on the present route.
- NH-1 and NH-8 which are currently major corridor for traffic between Zone1 and Zone2 will face capacity constraints in coming years. NH-1 for example is four lane road between Ambala and Panipat and runs about 80,000 PCU which is already above its capacity.

At local level it was observed that there is no formidable local alternate route to bypass toll plaza. There can a combination of village roads to form alternate loop around toll plazas, but these are too long as compared to project road between said nodes. Thus, no local diversion of traffic from project road is anticipated.

Following table provide summary of analysis of alternate route/ roads discussed above.

**Table 4-1 : Summary Network analysis**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
<b>Regional Level</b>						
1	Ambala-Panipat-Karnal-Rohtak-Ajmer	Alternate Route	610	64	9 Hr 28 Min	Alternate route is longer but has shorter travel time. With completion of Ambala - Kaithal four laning of Road induced traffic is expected onto project stretch
	Ambala-Kaithal-Hisar-Ajmer	Project Road	593	55	10 Hr 38 Min	
2	Ludhiana-Chandigarh Panipat-Karnal-Ajmer	Alternate Route	716	63	11 Hr 22 Min	Alternate route is longer but has shorter travel time. With completion of Ambala - Kaithal four laning of Road induced traffic is expected onto project stretch
	Ludhiana - Ambala-Kaithal-Hisar-Ajmer	Project Road	621	53	11 Hr 40 Min	

**Table 4-2 : Competing Roads Details**

Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road.

## CHAPTER 5

# GROWTH OF TRAFFIC ON PROJECT HIGHWAY

### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future pattern of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Kaithal – Rajasthan Border section of NH-152/65 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable to projects of short durations say 5-10 years, however for long term projections it would-be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different type of vehicle. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modelling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

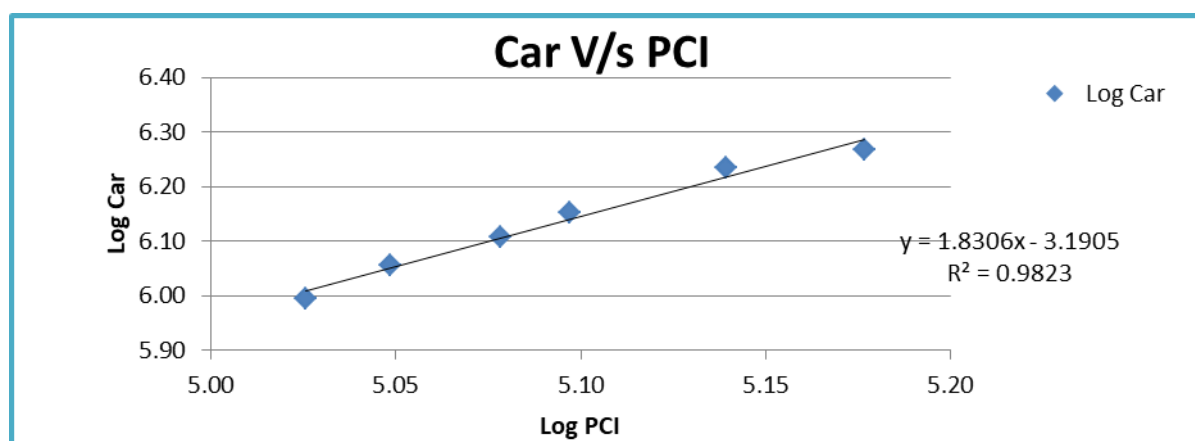
The project corridor spreads across state of Haryana. Toll plazas at Narwana, Badopatti and Choudhariwas are in the state of Haryana, but project stretch is under impact of Rajasthan state as well. In such circumstances for elasticity calculations, working data from above two states has been analysed.

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Haryana State.

**Table 5-1 : Per Capita Income Vs Car Haryana**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	106085	989519	5.03	6.00		
2013	111780	1134616	5.05	6.05	5%	
2014	119791	1278272	5.08	6.11	7%	
2015	125032	1420621	5.10	6.15	4%	
2016	137818	1711692	5.14	6.23	10%	
2017	150241	1851788	5.18	6.27	9%	7.23%

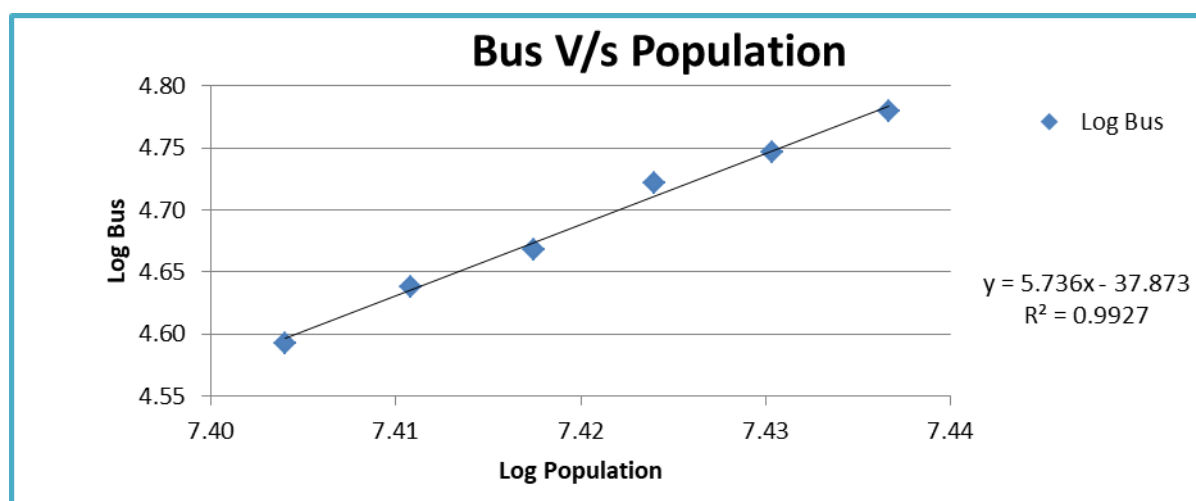
Regression analysis of same is given in figure below.



**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana****Table 5-2 : Population Vs Bus Haryana**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	25351462	39153	7.40	4.59		
2013	25751257	43456	7.41	4.64	2%	
2014	26149236	46558	7.42	4.67	2%	
2015	26545282	52640	7.42	4.72	2%	
2016	26939286	55781	7.43	4.75	1%	
2017	27331141	60129	7.44	4.78	1%	1.52%

Regression analysis of same is given in figure below.

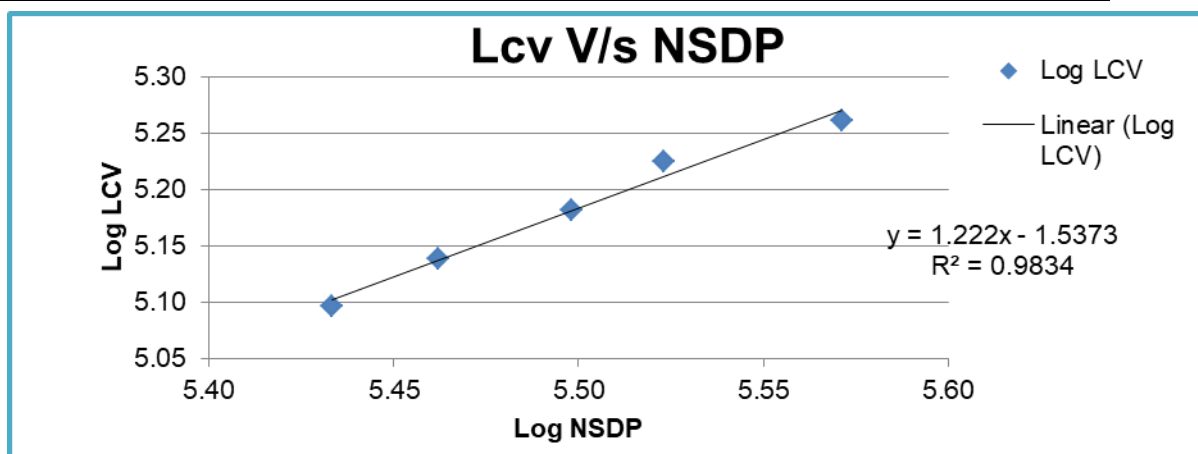
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Haryana**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Haryana**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	271152	124897	5.43	5.10		
2013	289756	137511	5.46	5.14	7%	
2014	314931	152069	5.50	5.18	9%	
2015	333359	167901	5.52	5.23	6%	
2016	372659	182776	5.57	5.26	12%	8.30%

Following figure depict regression analysis and extrapolation.

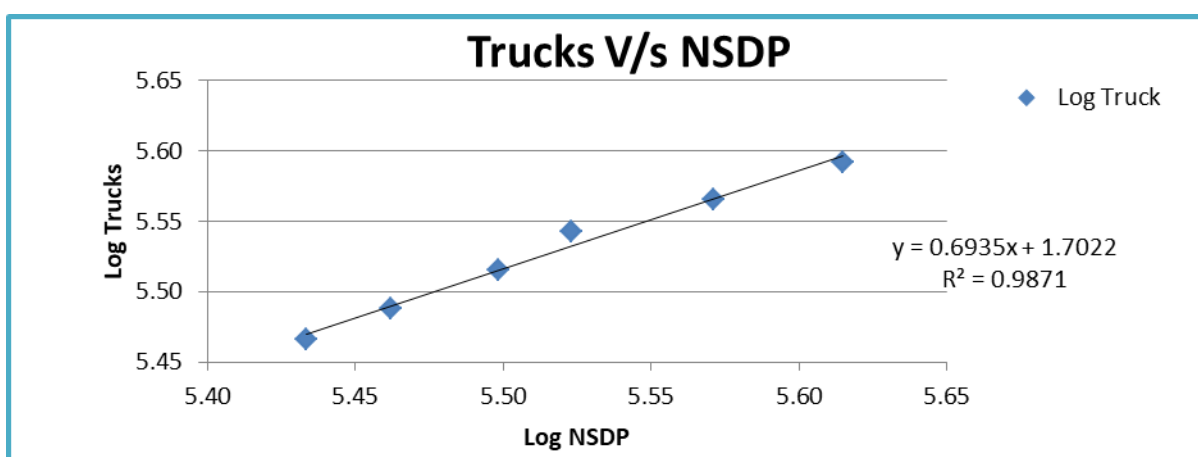


**Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Haryana.**

**Table 5-4 : Goods Traffic Vs NSDP Haryana**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	271152	292735	5.43	5.47		
2013	289756	307509	5.46	5.49	7%	
2014	314931	327882	5.50	5.52	9%	
2015	333359	348732	5.52	5.54	6%	
2016	372659	367730	5.57	5.57	12%	
2017	412006	390321	5.61	5.59	11%	8.75%

Following figure depict regression analysis and extrapolation.



**Figure 5-4 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Haryana.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-5 : Summary Regression Analysis Haryana**

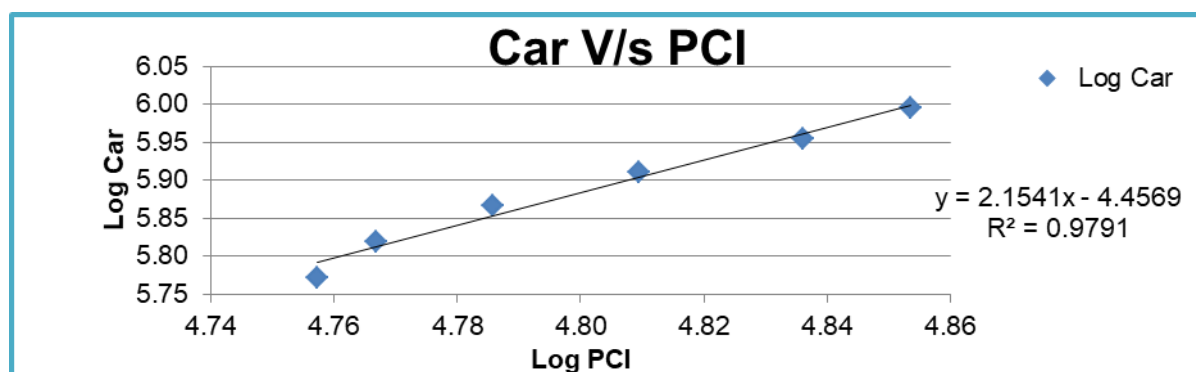
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Haryana	Car/Jeep	PCI	$y = 1.8306x - 3.1905$	$R^2 = 0.9823$	1.8306	7.23%	13.24%	Good Regression
	Bus	Population	$y = 5.736x - 37.8732$	$R^2 = 0.9927$	5.7360	1.52%	8.69%	Good Regression
	LCV	NSDP	$y = 1.222x - 1.5373$	$R^2 = 0.9834$	1.2220	8.30%	10.14%	Good Regression
	Truck	NSDP	$y = 0.6935x - 1.7022$	$R^2 = 0.9871$	0.6935	8.75%	6.07%	Good Regression

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-6 : Per Capita Income Vs Car Rajasthan**

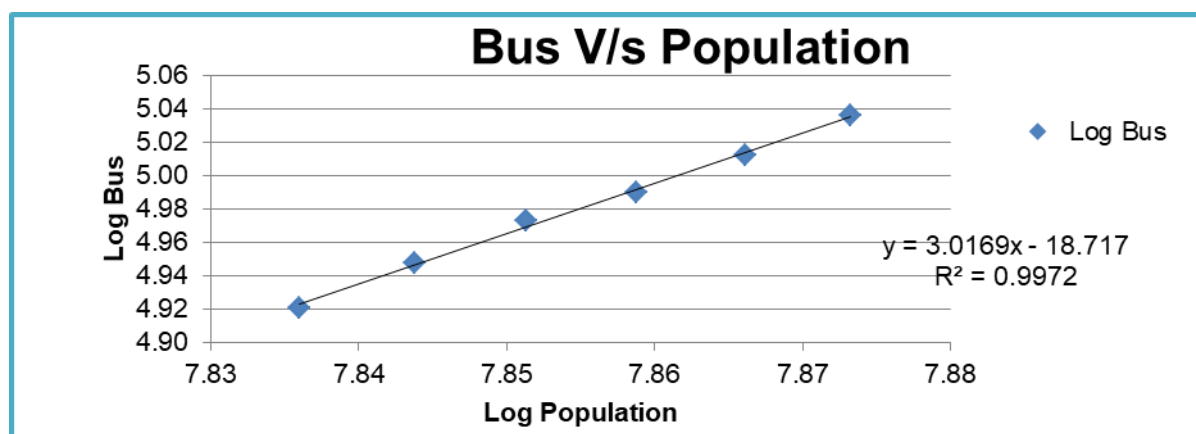
Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	57192	591069	4.76	5.77		
2013	58441	659542	4.77	5.82	2%	
2014	61053	733916	4.79	5.87	4%	
2015	64496	814079	4.81	5.91	6%	
2016	68565	899307	4.84	5.95	6%	
2017	71394	988391	4.85	5.99	4%	4.55%

Regression analysis of same is given in figure below.

**Figure 5-5 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan****Table 5-7 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	68548437	83345	7.84	4.92		
2013	69783885	88616	7.84	4.95	2%	
2014	71016445	93892	7.85	4.97	2%	
2015	72245688	97650	7.86	4.99	2%	
2016	73471198	102818	7.87	5.01	2%	
2017	74692571	108680	7.87	5.04	2%	1.73%

Regression analysis of same is given in figure below.



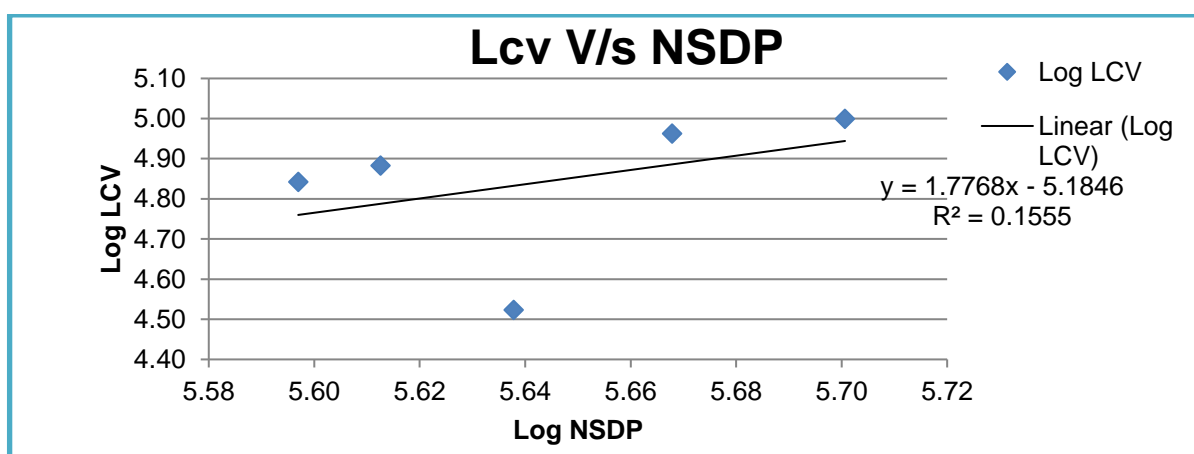
**Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-8 : LCV Traffic Vs NSDP Rajasthan**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	395331	69509	5.60	4.84		
2013	409802	76396	5.61	4.88	4%	
2014	434292	33379	5.64	4.52	6%	
2015	465408	91787	5.67	4.96	7%	
2016	501922	99763	5.70	5.00	8%	6.16%

Following figure depict regression analysis and extrapolation.

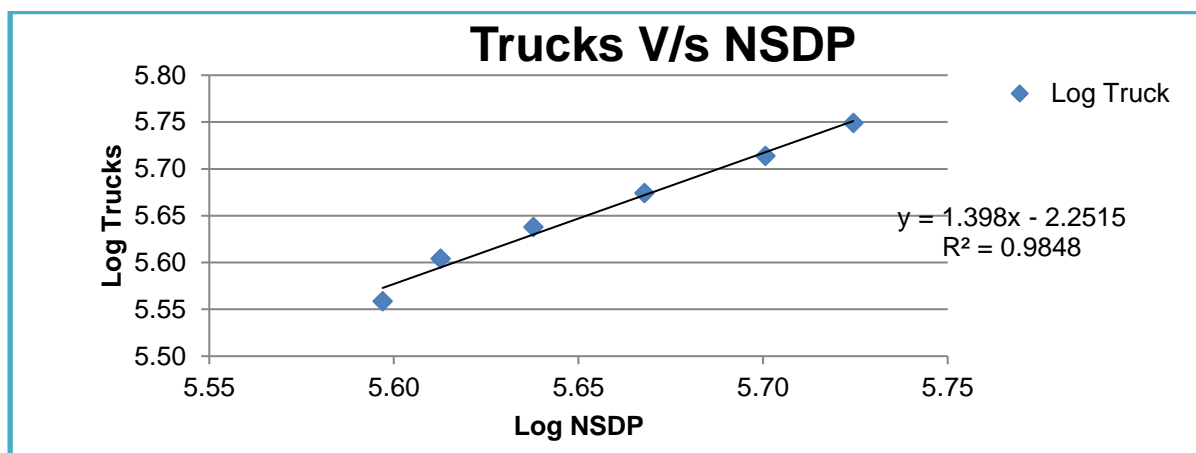


**Figure 5-7 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.**

**Table 5-9 : Goods Traffic Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	395331	362028	5.60	5.56		
2013	409802	401983	5.61	5.60	4%	
2014	434292	434379	5.64	5.64	6%	
2015	465408	472365	5.67	5.67	7%	
2016	501922	517604	5.70	5.71	8%	
2017	530172	561158	5.72	5.75	6%	6.06%

Following figure depict regression analysis and extrapolation.

**Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Rajasthan.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for the good fit regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-10 : Summary Regression Analysis Rajasthan**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Rajasthan	Car/Jeep	PCI	$y = 2.1541x - 4.4569$	$R^2 = 0.9791$	2.1541	4.55%	9.79%	Good Regression
	Bus	Population	$y = 3.0169x - 18.7174$	$R^2 = 0.9972$	3.0169	1.73%	5.22%	Good Regression
	LCV	NSDP	$y = 1.7768x - 5.1846$	$R^2 = 0.1555$	1.7768	6.16%	10.95%	Good Regression

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
	Truck	NSDP	$y = 1.398x - 2.2515$	$R^2 = 0.9848$	1.3980	6.06%	8.46%	Good Regression

Economical model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trend of growth. Project stretch of Kaithal to Rajasthan Border is under tolling operation with current concessionaire and has only two years of tolling history from 2018-19. After that traffic was affected due to COVID-19 pandemic. Thus, sufficient data points to be able to establish a reliable past trend of traffic growth are not available. A minimum of about 5 -6 years' consistent traffic data is required for establishing a reliable past trend.

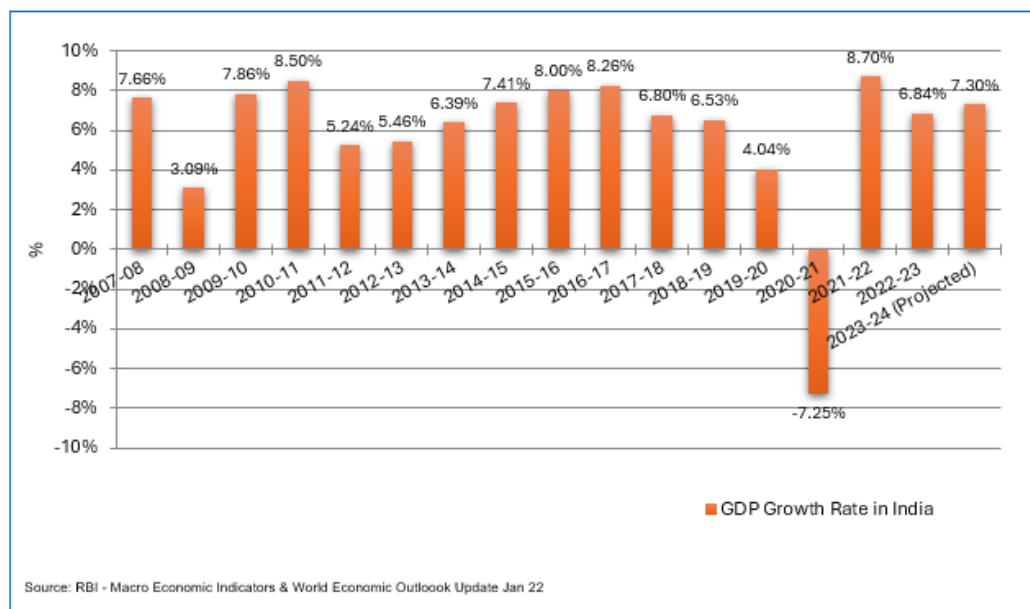
#### 5.5 Other Factors Influencing Growth

There are many factors which have impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

##### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-9 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honourable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. World Economic Outlook update also has predicted a growth rate of about 7.5 % in year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

Project stretch falls in region of good development potential. The same is discussed as under.

**Haryana** is the largest recipient of investment per capita since 2000 in India, and among one of the wealthiest and most economically developed regions in South Asia. Haryana has the sixth highest per capita income among Indian states and union territories. Haryana is also boosted by 30 SEZs (mainly along DMIC, ADKIC and DWPE in NCR), 7% national agricultural exports, 60% of national Basmati rice export, 67% cars, 60% motorbikes, 50% tractors and 50% refrigerators produced in India. In services. Since Haryana surrounds the country's capital Delhi on three sides (north, west and south), consequently a large area of Haryana is included in the economically important National Capital Region for the purposes of planning and development.

Major Cities of Haryana state & their characteristics are as below.

**Faridabad** is one of the biggest industrial cities of Haryana as well as North India. Faridabad has been described as eighth fastest growing city in the world and third most in India by City Mayors Foundation survey. Faridabad is home to large-scale companies like Escorts Limited, India Yamaha Motor Pvt. Ltd., Havells India Limited, JCB India Limited, Indian Oil (R&D), Larsen & Toubro (L&T), Whirlpool India Ltd., ABB Group, Goodyear India Ltd., Bata India Ltd and Eicher Tractor Ltd. and Beebay Kidswear. Eyewear e-tailer Lenskart and healthcare startup Lybrate have their headquarters in Faridabad. More than 5,000 units of auto parts producers are based in Faridabad.

Many directorates of different union government ministries are headquartered in Faridabad including Central Ground Water Board, Department of Plant Quarantine and Central Insecticide Lab and Union Government Offices from Haryana including the Commissioner of Central Excise within Department of Revenue, Government of India, Department of Explosives, and Department of Labour. The Apex Central Training Institute of the Department of Revenue, Government of India, National Academy of Customs Excise & Narcotics is located at Sector 29. The National Power Training Institute, an autonomous body under Ministry of Power, Government of India has a corporate office in Faridabad. The city also hosts the National Institute of Financial Management, which serves as training academy for accounting and financial services. Also

headquartered here is NHPC Limited which is a Central PSU under Ministry of Power, Government of India and the largest Hydro-power Company in India.

**Hisar**, city has been identified as a counter-magnet city for the National Capital Region to attract migrants and develop as an alternative centre of growth to Delhi. With upcoming integrated industrial aerocity and aero MRO hub at Hisar Airport, it is a fast-developing city.

The city has a large steel industry and is known as the 'city of steel'. Hisar is India's largest manufacturer of galvanized iron. The Jindal Group is based in Hisar. Jindal Stainless Steel is also the world's largest producer of Stainless-Steel strips for razor blades and India's largest producer of coin blanks. Textile and automobile industry is also a major contributor to the economy of the city. It also has a large number of livestock farms with the Central Livestock Farm, established in 1809 being one of the Asia's largest cattle farms.

**Panipat** city is famous in India by the name of "City of Weavers" and "Textile City". It is also known as the "cast-off capital" due to being "the global centre for recycling textiles. It is known for its woven modhas or round stools. Panipat has heavy industry, including a refinery operated by the Indian Oil Corporation, a urea manufacturing plant operated by National Fertilizers Limited and a National Thermal Power Corporation power plant. The IOCL refinery in Panipat is one of the major Industry in area which contributes to growth.

**Gurugram:** Witnessing rapid urbanisation, Gurgaon has become a leading financial and industrial hub with the third-highest per capita income in India. Gurgaon ranks number 1 in India in IT growth rate and existing technology infrastructure, and number 2 in startup ecosystem, innovation and liability.

The city's economic growth story started when the leading Indian automobile manufacturer Maruti Suzuki India Limited established a manufacturing plant in Gurgaon in the 1970s. Today, Gurgaon has local offices for more than 250.

Fortune 500 companies. Various international companies, including Coca-Cola, Pepsi, BMW, Agilent Technologies, Hyundai have chosen Gurugram to be their Indian corporate headquarters.

IMT Minesar, Dundahera and Sohna are industrial and logistics hub, that also has National Security Guards, Indian Institute of Corporate Affairs, National

Brain Research Centre and National Bomb Data Centre. Retail is an important industry in Gurgaon, with the presence of 26 shopping malls.

**Ambala** is connected to all the other major cities of north India including Delhi, Panipat, Chandigarh, Ludhiana, Amritsar and Shimla. It is a big interchange for various commuters for all neighbouring states. The Ambala Cantt bus stand witnesses roughly 50,000 commuters daily.

National highway NH 1 popularly known as GT road passes through Ambala and connects it to National capital Delhi, Panipat, Ludhiana and Amritsar. NH 22 connects it to state capital Chandigarh and Shimla. National Highway 52 (new NH-165) connects it to Kaithal, Narwana and Hisar.

Being located in the Indo-Gangetic Plain, the land is generally fertile and conducive to agriculture.

Small scale industries form the bulk of the industrial landscape in the district. It is one of the largest producers of scientific and surgical instruments in the country and home to a large number of scientific instrument manufacturers. It produces microscopes and other instruments used in chemistry laboratories. Manufacture of submersible pumps and mixers and grinders is another industry that has traditionally flourished.

Ambala is also an important textile trading centre, besides Delhi and Ludhiana and has a well-known cloth market, which is famous in the region especially for those seeking bridal wear. It also produces rugs, known locally as Durries, and houses many suppliers to Indian defence forces.

**Punjab** state is one of the most fertile regions in India. The region is ideal for wheat-growing. Rice, sugar cane, fruits and vegetables are also grown. Punjab is called the "Granary of India" or "India's breadbasket". It produces 10.26% of India's cotton, 19.5% of India's wheat, and 11% of India's rice. The Firozpur and Fazilka Districts are the largest producers of wheat and rice in the state. In worldwide terms, Indian Punjab produces 2% of the world's cotton, 2% of its wheat and 1% of its rice. The largest cultivated crop is wheat. Other important crops are rice, cotton, sugarcane, pearl millet, maize, barley and fruit.

**Ludhiana** is one of the City in India with best business environment. The riches are brought mostly by small-scale industrial units, which produce industrial goods, machine parts, auto parts, household appliances, hosiery, apparel, and garments. Ludhiana is Asia's

largest hub for bicycle manufacturing and produces more than 50% of India's bicycle consumption of more than 10 million each.

year. Ludhiana produces 60% of India's tractor parts and a large portion of auto.

and two-wheeler parts. Many parts used in German cars are Mercedes and BMW exclusively produced in Ludhiana to satisfy the world requirement. It is one of the largest manufacturers of domestic sewing machines. Hand tools and industrial equipment are other specialties. The apparel industry of Ludhiana is famous all over India for its woollen sweaters and cotton T-shirts; most of the top Indian woollen apparel brands are based in Ludhiana. Ludhiana also has a growing IT sector with multiple software services and product companies having development centres in the city.

**Chandigarh** has been rated as one of the "Wealthiest Towns" of India. The Reserve Bank of India ranked Chandigarh as the Third largest deposit centre and seventh largest credit centre nationwide.

Chandigarh is ranked 4th in the top 50 cities identified globally as "emerging outsourcing and IT services destinations" ahead of cities like Beijing. Chandigarh IT Park (also known as Rajiv Gandhi Chandigarh Technology Park) is the city's attempt to break into the information technology world. Major Indian firms and multinational corporations like Quark, Infosys, EVERY, Dell, IBM, Tec Mahindra, Airtel, Amadeus IT Group, DLF have set up base in the city and its suburbs.

Additionally, the government is a major employer in Chandigarh with three governments having their base here i.e. Chandigarh Administration, Punjab government and Haryana government.

Ordnance Cable Factory of the Ordnance Factories Board has been set up by the Government of India. There are about 15 mediums to large industries including two in the public sector. In addition, Chandigarh has over 2500 units registered under small-scale sector. The important industries are paper manufacturing, basic metals and alloys and machinery. Other industries are relating to food products, sanitary ware, auto parts, machine tools, pharmaceuticals and electrical appliances.

**Rajasthan** state is a fast-developing state. Last year Rajasthan was the leading investment destination in India after Maharashtra and Gujarat because of peaceful environment, relatively better law and order situation, excellent infrastructure, and investment friendly climate. Rajasthan is pre-eminent in quarrying and mining in India. The state is the second largest source of cement. It has rich salt deposits at Sambhar, copper mines at Khetri and zinc mines at Dariba and Zawar. Jaipur is the capital and largest city of Rajasthan. It is also.

known as Pink City of India and a famous travel destination.

There is large amount of information available on open platform including internet regarding this. Relevant information is compiled as under.

### **Delhi Mumbai Industrial Corridor (DMIC)**

Rajasthan is strategically located along the Delhi-Mumbai section of the Golden Quadrilateral highway project, the proposed Dedicated Freight Corridor (DFC) and the Delhi Mumbai Industrial Corridor (DMIC).

Rajasthan has access to 46% of DMIC. It falls within major districts of Jaipur, Alwar, Kota and Bhilwara. Over 58% area of the state falls within the influence area of DMIC. The DMIC will provide high quality environment with state-of-the-art infrastructure for new investors.

The state of Rajasthan has a rich agricultural and mineral base. Key industrial sectors in the state include Cement, Building Stones, Gypsum, Gems & Jewellery, Chemical, Food processing and Textiles. The emerging sectors include IT/ITES, Auto Component and Knowledge Hubs. Based on the strengths of specific regions across the state, five development nodes are identified in the influence area of DMIC. It includes two investment regions and three industrial areas.

Project road would act as feeder road for traffic destined for DMIC logistic hubs from northern states.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as under. Rate of growth is moderated in light of overall regional trend. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry Favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, rate of growth diminishes. Same growth rate is not sustainable for long Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

*Table 5-11 : Recommended Growth Rates Optimistic*

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	5.67%	5.45%	5.22%	5.00%	4.78%	4.56%
Bus	3.21%	3.09%	2.72%	2.61%	2.50%	2.40%
LCV	3.38%	3.17%	2.72%	2.53%	2.35%	2.17%
2- Axle	3.96%	3.74%	3.23%	3.04%	2.86%	2.67%
3 - Axle	3.96%	3.74%	3.23%	3.04%	2.86%	2.67%
4 to 6 Axle	3.96%	3.74%	3.53%	3.32%	3.12%	2.91%
7 and Above Axle	3.96%	3.74%	3.53%	3.32%	3.12%	2.91%

*Table 5-12 : Recommended Growth Rates Pessimistic*

Category / Year	2024-2026	2026-2031	2031-2036	2036-2040	2041-2046	2046-2051
Car/Jeep/Van	5.17%	4.95%	4.72%	4.50%	4.28%	4.06%
Bus	2.71%	2.59%	2.22%	2.11%	2.00%	1.90%
LCV	2.88%	2.67%	2.22%	2.03%	1.85%	1.67%
2- Axle	3.46%	3.24%	2.73%	2.54%	2.36%	2.17%
3 - Axle	3.46%	3.24%	2.73%	2.54%	2.36%	2.17%

Category / Year	2024-2026	2026-2031	2031-2036	2036-2040	2041-2046	2046-2051
<b>4 to 6 Axle</b>	3.46%	3.24%	3.03%	2.82%	2.62%	2.41%
<b>7 and Above Axle</b>	3.46%	3.24%	3.03%	2.82%	2.62%	2.41%

**Table 5-13 : Recommended Growth Rates Most Likely**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
<b>Car/Jeep/Van</b>	5.42%	5.20%	4.97%	4.75%	4.53%	4.31%
<b>Bus</b>	2.96%	2.84%	2.47%	2.36%	2.25%	2.15%
<b>LCV</b>	3.13%	2.92%	2.47%	2.28%	2.10%	1.92%
<b>2- Axle</b>	3.71%	3.49%	2.98%	2.79%	2.61%	2.42%
<b>3 - Axle</b>	3.71%	3.49%	2.98%	2.79%	2.61%	2.42%
<b>4 to 6 Axle</b>	3.71%	3.49%	3.28%	3.07%	2.87%	2.66%
<b>7 and Above Axle</b>	3.71%	3.49%	3.28%	3.07%	2.87%	2.66%

Traffic and revenue have been worked out on the basis of above growths and same is presented in subsequent chapter of report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in previous section of report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Narwana 125.00 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4520	381	364	428	249	1149	32	7123	13530
2025-26	4765	393	375	444	259	1192	33	7461	14101
2026-27	5024	405	387	461	269	1236	34	7816	14698
2027-28	5296	417	399	478	279	1282	35	8186	15316
2028-29	5585	430	411	495	289	1330	36	8576	15962
2029-30	5889	443	424	514	300	1380	37	8987	16644
2030-31	6196	455	436	531	310	1429	38	9395	17311
2031-32	6519	467	448	548	320	1479	39	9820	17999
2032-33	6859	479	460	565	330	1531	40	10264	18712
2033-34	7217	492	472	583	341	1585	41	10731	19460
2034-35	7593	505	485	602	352	1641	42	11220	20241
2035-36	7972	517	498	621	363	1696	43	11710	21019
2036-37	8370	530	511	640	374	1752	44	12221	21822
2037-38	8787	543	524	659	385	1810	45	12753	22653
2038-39	9225	556	537	679	396	1871	46	13310	23522
2039-40	9685	569	551	699	408	1933	47	13892	24423
2040-41	10147	582	565	719	419	1994	48	14474	25318
2041-42	10632	595	579	739	431	2056	49	15081	26244
2042-43	11140	608	593	761	443	2120	50	15715	27208
2043-44	11672	622	607	783	455	2187	51	16377	28211
2044-45	12229	636	622	805	468	2255	53	17068	29254
2045-46	12787	649	637	827	480	2320	54	17754	30276
2046-47	13370	662	652	849	492	2388	56	18469	31340
2047-48	13979	676	667	872	505	2457	58	19214	32443
2048-49	14617	690	682	895	519	2528	60	19991	33586

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Badopatti 171.00 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4560	360	459	437	341	1109	65	7331	14094
2025-26	4807	372	473	453	354	1150	67	7676	14682
2026-27	5068	384	488	469	367	1193	69	8038	15295
2027-28	5344	396	504	487	380	1237	72	8420	15942
2028-29	5635	409	520	505	394	1283	75	8821	16617
2029-30	5942	422	537	524	408	1331	78	9242	17323
2030-31	6252	434	551	540	421	1378	81	9657	18005
2031-32	6578	446	567	558	434	1427	84	10094	18724
2032-33	6922	458	583	576	448	1477	87	10551	19468
2033-34	7283	470	599	594	462	1529	90	11027	20239
2034-35	7663	483	616	613	477	1583	93	11528	21048
2035-36	8045	495	633	632	491	1635	96	12027	21845
2036-37	8448	507	650	651	506	1689	99	12550	22676
2037-38	8871	520	667	670	521	1745	102	13096	23537
2038-39	9315	533	685	690	536	1803	105	13667	24434
2039-40	9780	546	703	710	552	1863	108	14262	25364
2040-41	10247	559	721	730	567	1921	111	14856	26284
2041-42	10737	572	739	750	583	1981	114	15476	27239
2042-43	11250	585	757	771	599	2043	117	16122	28229
2043-44	11788	599	776	793	616	2106	121	16799	29263
2044-45	12351	613	795	816	633	2171	125	17504	30335
2045-46	12914	626	814	838	650	2234	129	18205	31393
2046-47	13503	639	833	861	667	2299	133	18935	32489
2047-48	14119	653	853	884	684	2365	137	19695	33621
2048-49	14763	667	873	907	702	2434	141	20487	34797

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 3- Chainage 212.00 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4342	417	169	539	481	1695	77	7721	16509
2025-26	4579	430	174	559	499	1758	80	8079	17191
2026-27	4828	443	179	580	518	1823	83	8454	17901
2027-28	5091	456	184	602	538	1892	86	8849	18648
2028-29	5368	470	190	624	558	1963	89	9262	19423
2029-30	5660	485	196	647	579	2036	92	9695	20230
2030-31	5954	498	201	668	598	2108	95	10122	21016
2031-32	6264	511	206	689	617	2182	98	10567	21827
2032-33	6590	524	211	711	637	2259	101	11033	22673
2033-34	6934	537	217	734	658	2339	104	11523	23560
2034-35	7296	552	223	757	679	2421	108	12036	24482
2035-36	7661	565	229	780	700	2501	112	12548	25394

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2036-37	8044	579	235	803	721	2585	116	13083	26344
2037-38	8446	594	241	827	743	2671	120	13642	27330
2038-39	8868	609	247	853	765	2759	124	14225	28350
2039-40	9311	624	253	879	788	2851	128	14834	29413
2040-41	9756	639	259	905	810	2940	132	15441	30461
2041-42	10222	654	265	931	833	3032	136	16073	31546
2042-43	10710	669	271	958	857	3126	140	16731	32669
2043-44	11222	684	277	985	881	3223	144	17416	33829
2044-45	11758	700	284	1013	906	3324	148	18133	35041
2045-46	12294	715	290	1040	930	3421	152	18842	36225
2046-47	12854	730	297	1068	955	3521	156	19581	37456
2047-48	13441	745	304	1096	980	3624	160	20350	38727
2048-49	14054	761	311	1125	1006	3729	165	21151	40045

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 1- Chainage 125.000 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4520	381	364	428	249	1149	32	7123	13530
2025-26	4743	391	374	442	258	1186	33	7427	14037
2026-27	4976	401	384	456	267	1224	34	7742	14560
2027-28	5221	411	394	470	276	1263	35	8070	15099
2028-29	5478	421	404	485	285	1303	36	8412	15657
2029-30	5748	431	415	501	294	1346	37	8772	16248
2030-31	6018	440	425	515	302	1386	38	9124	16812
2031-32	6302	449	435	529	311	1428	39	9493	17402
2032-33	6599	459	445	543	320	1471	40	9877	18011
2033-34	6910	469	455	558	329	1515	41	10277	18642
2034-35	7236	479	465	573	338	1561	42	10694	19296
2035-36	7562	488	475	587	347	1605	43	11107	19937
2036-37	7902	498	485	602	356	1650	44	11537	20601
2037-38	8258	508	495	617	365	1696	45	11984	21286
2038-39	8629	518	506	633	374	1744	46	12450	22000
2039-40	9017	528	517	649	384	1793	47	12935	22739
2040-41	9402	538	528	664	393	1839	48	13412	23456
2041-42	9803	548	539	680	402	1887	49	13908	24200
2042-43	10222	558	550	696	412	1937	50	14425	24975
2043-44	10659	568	561	713	422	1988	51	14962	25775
2044-45	11115	578	572	730	432	2040	52	15519	26598
2045-46	11566	587	583	746	441	2089	53	16065	27396
2046-47	12036	597	594	762	451	2139	54	16633	28221
2047-48	12525	607	605	779	461	2190	55	17222	29073
2048-49	13034	617	616	796	471	2242	56	17832	29950

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 2- Chainage 171.00 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4560	360	459	437	341	1109	65	7331	14094
2025-26	4786	370	470	451	352	1145	67	7641	14614
2026-27	5023	380	482	465	363	1182	69	7964	15153
2027-28	5271	390	494	480	375	1221	71	8302	15717
2028-29	5531	400	506	495	387	1261	73	8653	16298
2029-30	5805	410	518	510	399	1302	75	9019	16898
2030-31	6079	418	529	524	410	1342	77	9379	17481
2031-32	6367	428	540	538	421	1383	79	9756	18085
2032-33	6667	438	552	552	432	1425	81	10147	18709
2033-34	6982	448	564	567	444	1468	83	10556	19359
2034-35	7312	458	576	582	456	1512	85	10981	20028
2035-36	7641	468	588	597	467	1554	87	11402	20684
2036-37	7985	478	600	612	479	1598	89	11841	21367
2037-38	8344	488	612	627	491	1643	91	12296	22069
2038-39	8719	498	624	642	503	1690	94	12770	22801
2039-40	9110	508	637	658	516	1738	97	13264	23563
2040-41	9499	518	649	673	528	1783	99	13749	24295
2041-42	9906	528	661	688	540	1830	102	14255	25059
2042-43	10331	538	674	704	553	1878	105	14783	25855
2043-44	10773	548	687	720	566	1927	108	15329	26672
2044-45	11234	558	700	736	579	1977	111	15895	27512
2045-46	11690	568	713	752	591	2025	114	16453	28336
2046-47	12164	578	726	768	604	2074	117	17031	29185
2047-48	12658	588	739	784	617	2124	120	17630	30058
2048-49	13173	598	752	800	630	2175	123	18251	30957

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 3- Chainage 212.00 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4342	417	169	539	481	1695	77	7721	16509
2025-26	4558	428	173	557	496	1750	79	8041	17109
2026-27	4783	439	178	575	512	1806	81	8374	17728
2027-28	5019	451	183	594	528	1864	84	8723	18377
2028-29	5267	463	188	613	546	1925	87	9089	19057
2029-30	5527	475	193	633	564	1987	90	9469	19756
2030-31	5787	486	197	651	579	2048	93	9841	20432
2031-32	6060	497	201	669	594	2110	96	10227	21125
2032-33	6345	508	206	688	610	2174	99	10630	21848
2033-34	6644	519	211	707	626	2239	102	11048	22589
2034-35	6957	530	216	726	644	2307	105	11485	23364
2035-36	7270	541	221	745	660	2372	108	11917	24120
2036-37	7597	552	226	764	676	2439	111	12365	24898
2037-38	7938	563	231	783	693	2508	114	12830	25703

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2038-39	8294	574	236	803	711	2579	117	13314	26537
2039-40	8667	586	241	823	729	2651	120	13817	27395
2040-41	9038	597	246	842	747	2721	123	14314	28237
2041-42	9425	608	251	862	765	2792	126	14829	29102
2042-43	9829	619	256	882	783	2865	129	15363	29994
2043-44	10250	630	261	903	802	2940	132	15918	30917
2044-45	10688	642	266	924	821	3017	135	16493	31868
2045-46	11122	653	271	944	839	3090	138	17057	32790
2046-47	11574	664	276	964	858	3165	141	17642	33741
2047-48	12043	675	281	985	877	3242	144	18247	34722
2048-49	12531	686	286	1006	896	3320	147	18872	35726

Traffic projections for Most Likely scenario is given as under

**Table 6-7 : Total Tollable Traffic @ Toll Plaza 1- Chainage 125.000 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4520	381	364	428	249	1149	32	7123	13530
2025-26	4755	391	375	443	258	1189	33	7444	14069
2026-27	5001	402	386	458	267	1231	34	7779	14630
2027-28	5260	413	397	474	277	1274	35	8130	15214
2028-29	5532	425	408	491	287	1318	36	8497	15821
2029-30	5819	437	420	508	297	1364	37	8882	16454
2030-31	6108	447	431	523	306	1409	38	9262	17070
2031-32	6411	457	442	539	315	1455	39	9658	17708
2032-33	6730	467	453	555	325	1503	40	10073	18373
2033-34	7064	478	464	572	335	1552	41	10506	19063
2034-35	7414	489	476	589	345	1603	42	10958	19780
2035-36	7766	499	487	606	355	1652	43	11408	20486
2036-37	8134	510	499	623	365	1703	44	11878	21222
2037-38	8520	521	511	640	375	1755	45	12367	21980
2038-39	8924	532	523	657	385	1809	46	12876	22765
2039-40	9347	544	535	676	396	1865	47	13410	23588
2040-41	9770	555	547	693	406	1918	48	13937	24388
2041-42	10212	566	559	711	416	1973	49	14486	25218
2042-43	10674	577	571	730	427	2030	50	15059	26084
2043-44	11157	589	584	749	438	2088	51	15656	26979
2044-45	11662	601	597	769	449	2147	52	16277	27904
2045-46	12165	612	610	788	460	2204	53	16892	28814
2046-47	12689	623	623	807	471	2262	54	17529	29749
2047-48	13236	635	636	827	482	2323	55	18194	30725
2024-25	4520	381	364	428	249	1149	32	7123	13530

**Table 6-8 : Total Tollable Traffic @ Toll Plaza 2- Chainage 171.00 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4560	360	459	437	341	1109	65	7331	14094
2025-26	4796	370	472	452	353	1148	67	7658	14650
2026-27	5045	380	486	467	365	1188	69	8000	15226
2027-28	5306	391	500	483	378	1229	71	8358	15826
2028-29	5582	402	514	499	391	1272	73	8733	16450
2029-30	5873	414	528	517	404	1316	75	9127	17101
2030-31	6166	424	541	532	416	1359	77	9515	17731
2031-32	6473	434	555	547	428	1403	79	9919	18383
2032-33	6795	444	569	563	441	1449	82	10343	19070
2033-34	7133	455	583	579	454	1497	85	10786	19783
2034-35	7487	466	597	596	467	1546	88	11247	20519
2035-36	7842	476	611	612	480	1594	91	11706	21248
2036-37	8214	487	625	628	493	1643	94	12184	21999
2037-38	8603	498	640	646	507	1694	97	12685	22789
2038-39	9012	509	655	664	521	1746	100	13207	23603
2039-40	9440	520	671	683	535	1799	103	13751	24446
2040-41	9868	531	686	701	549	1851	106	14292	25279
2041-42	10315	542	702	719	563	1904	109	14854	26139
2042-43	10782	553	718	738	577	1958	112	15438	27026
2043-44	11271	564	735	757	592	2014	115	16048	27950
2044-45	11782	575	752	776	607	2072	118	16682	28905
2045-46	12290	586	769	795	621	2127	121	17309	29840
2046-47	12821	597	786	814	636	2183	124	17961	30806
2047-48	13374	608	803	833	651	2242	127	18638	31808
2048-49	13951	619	821	853	666	2302	130	19342	32844

**Table 6-9 : Total Tollable Traffic @ Toll Plaza 3- Chainage 212.00 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4342	417	169	539	481	1695	77	7721	16509
2025-26	4568	429	174	558	498	1755	80	8062	17159
2026-27	4805	441	179	578	516	1816	83	8418	17831
2027-28	5054	453	184	598	534	1879	86	8788	18524
2028-29	5315	466	189	619	553	1944	89	9175	19246
2029-30	5590	479	194	640	572	2012	92	9579	19995
2030-31	5867	491	199	659	589	2078	95	9978	20723
2031-32	6158	503	204	679	607	2146	98	10395	21481
2032-33	6464	515	209	699	625	2216	101	10829	22262
2033-34	6784	527	214	720	644	2288	104	11281	23073
2034-35	7121	539	219	741	663	2363	107	11753	23914
2035-36	7458	551	224	762	682	2435	110	12222	24741
2036-37	7811	563	229	783	701	2510	113	12710	25598
2037-38	8182	575	234	805	721	2587	116	13220	26488

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2038-39	8570	588	239	827	741	2666	120	13751	27410
2039-40	8977	601	244	850	762	2747	124	14305	28366
2040-41	9384	613	249	872	782	2826	127	14853	29301
2041-42	9809	625	254	894	802	2907	131	15422	30268
2042-43	10254	638	260	917	823	2991	135	16018	31278
2043-44	10718	651	266	940	844	3077	139	16635	32317
2044-45	11203	664	272	965	866	3165	143	17278	33394
2045-46	11686	676	278	988	887	3250	147	17912	34446
2046-47	12190	689	284	1011	908	3337	151	18570	35529
2047-48	12716	702	290	1036	930	3426	155	19255	36652
2048-49	13264	715	296	1061	952	3518	159	19965	37810

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Kaithal – Rajasthan Border project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup> April 2023

Target Traffic - 21919 in PCU

### *Pessimistic Case*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2023	21919	14886	-32%	48%	20%	27	5.4

PCUs as per Pessimistic cases have been considered for arriving at the concession Period end date.

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

As per the Toll Notification (Schedule - R) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

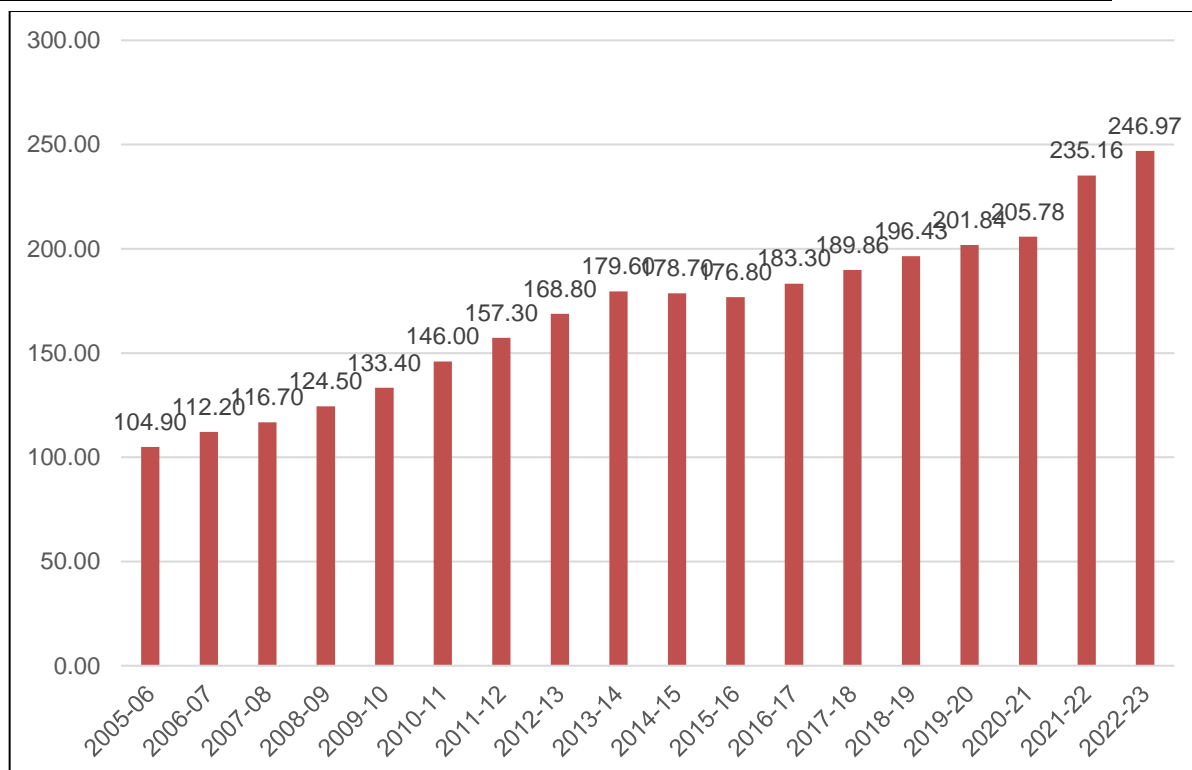
1. Monthly Pass: For frequent user's monthly pass would be issued at fee 50 time the single journey fee.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: Local Car Jeep Van - Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza) and local commercial and 50% rate of single trip.

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in last few years is steadily growing. It grew in range of 4% - 5% in previous years. For future years initially it takes 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey @ Km 125.000**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	90	145	305	305	330	475	580
2025-26	95	155	320	320	350	500	610
2026-27	100	160	335	335	365	525	640
2027-28	105	170	355	355	385	555	675
2028-29	110	175	370	370	405	580	710
2029-30	115	185	390	390	425	610	745
2030-31	120	195	410	410	445	645	785
2031-32	125	205	430	430	470	675	825
2032-33	135	215	455	455	495	710	865
2033-34	140	230	475	475	520	750	910
2034-35	150	240	500	500	550	785	960
2035-36	155	250	530	530	575	830	1010
2036-37	165	265	555	555	605	875	1060
2037-38	175	280	585	585	640	920	1120
2038-39	180	295	615	615	675	970	1180
2039-40	190	310	650	650	710	1020	1240
2040-41	200	325	685	685	745	1075	1310
2041-42	215	345	720	720	790	1130	1380
2042-43	225	365	760	760	830	1195	1455
2043-44	235	385	800	800	875	1260	1530
2044-45	250	405	845	845	925	1325	1615
2045-46	265	425	890	890	975	1400	1705
2046-47	280	450	940	940	1025	1475	1795
2047-48	295	475	995	995	1085	1555	1895
2048-49	310	500	1050	1050	1145	1645	2000

**Table 7-3 : Toll Rates for Single Journey @ Km 171.00**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	120	195	410	410	450	645	785
2025-26	130	205	430	430	470	680	825
2026-27	135	215	455	455	495	710	865
2027-28	140	230	475	475	520	750	910
2028-29	150	240	500	500	545	785	955
2029-30	155	250	525	525	575	825	1005
2030-31	165	265	555	555	605	870	1060
2031-32	170	280	585	585	635	915	1115
2032-33	180	295	615	615	670	960	1170
2033-34	190	310	645	645	705	1010	1230
2034-35	200	325	680	680	740	1065	1295
2035-36	210	340	715	715	780	1120	1365
2036-37	220	360	750	750	820	1180	1435
2037-38	235	380	790	790	865	1240	1510
2038-39	245	400	835	835	910	1310	1595
2039-40	260	420	880	880	960	1380	1680
2040-41	275	440	925	925	1010	1450	1770

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2041-42	290	465	975	975	1065	1530	1865
2042-43	305	490	1030	1030	1120	1615	1965
2043-44	320	520	1085	1085	1185	1700	2070
2044-45	340	545	1145	1145	1250	1795	2185
2045-46	355	575	1205	1205	1315	1890	2305
2046-47	375	605	1275	1275	1390	1995	2430
2047-48	395	640	1345	1345	1465	2105	2565
2048-49	420	675	1415	1415	1545	2220	2705

**Table 7-4 : Toll Rates for Single Journey @ Km 212.00**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	70	115	240	240	260	375	455
2025-26	75	120	250	250	275	395	480
2026-27	80	125	265	265	285	415	500
2027-28	80	130	275	275	300	435	530
2028-29	85	140	290	290	315	455	555
2029-30	90	145	305	305	335	480	585
2030-31	95	155	320	320	350	505	615
2031-32	100	160	340	340	370	530	645
2032-33	105	170	355	355	390	555	680
2033-34	110	180	375	375	410	585	715
2034-35	115	190	395	395	430	615	750
2035-36	120	200	415	415	450	650	790
2036-37	130	210	435	435	475	685	830
2037-38	135	220	460	460	500	720	875
2038-39	145	230	485	485	525	760	925
2039-40	150	245	510	510	555	800	970
2040-41	160	255	535	535	585	840	1025
2041-42	165	270	565	565	615	885	1080
2042-43	175	285	595	595	650	935	1140
2043-44	185	300	630	630	685	985	1200
2044-45	195	315	665	665	725	1040	1265
2045-46	205	335	700	700	765	1095	1335
2046-47	220	350	735	735	805	1155	1410
2047-48	230	370	780	780	850	1220	1485
2048-49	245	390	820	820	895	1285	1565

**Table 7-5 : Toll Rates for Return Journey @ Km 125.000**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	135	220	455	455	500	715	870
2025-26	140	230	480	480	525	750	915
2026-27	150	240	505	505	550	790	960
2027-28	155	255	530	530	580	830	1010
2028-29	165	265	555	555	605	875	1060
2029-30	175	280	585	585	640	915	1115
2030-31	180	295	615	615	670	965	1175
2031-32	190	310	645	645	705	1015	1235
2032-33	200	325	680	680	740	1065	1300
2033-34	210	340	715	715	780	1120	1365
2034-35	225	360	755	755	820	1180	1440
2035-36	235	380	795	795	865	1245	1515
2036-37	245	400	835	835	910	1310	1595
2037-38	260	420	880	880	960	1380	1680
2038-39	275	440	925	925	1010	1450	1765
2039-40	290	465	975	975	1065	1530	1860
2040-41	305	490	1030	1030	1120	1610	1960
2041-42	320	515	1085	1085	1180	1700	2065
2042-43	335	545	1140	1140	1245	1790	2180
2043-44	355	575	1205	1205	1315	1885	2300
2044-45	375	605	1270	1270	1385	1990	2425
2045-46	395	640	1340	1340	1460	2100	2555
2046-47	415	675	1410	1410	1540	2215	2695
2047-48	440	710	1490	1490	1625	2335	2845
2048-49	465	750	1570	1570	1715	2465	3000

**Table 7-6 : Toll Rates for Return Journey @ Km 171.00**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	180	295	615	615	675	970	1180
2025-26	190	310	650	650	705	1015	1240
2026-27	200	325	680	680	745	1070	1300
2027-28	210	340	715	715	780	1120	1365
2028-29	220	360	750	750	820	1180	1435
2029-30	235	375	790	790	865	1240	1510
2030-31	245	395	830	830	905	1305	1585
2031-32	260	415	875	875	955	1370	1670
2032-33	270	440	920	920	1005	1440	1755
2033-34	285	460	970	970	1055	1520	1845
2034-35	300	485	1020	1020	1110	1595	1945
2035-36	315	510	1070	1070	1170	1680	2045
2036-37	335	540	1130	1130	1230	1770	2155
2037-38	350	565	1190	1190	1295	1865	2270
2038-39	370	595	1250	1250	1365	1965	2390
2039-40	390	630	1320	1320	1440	2070	2515
2040-41	410	665	1390	1390	1515	2180	2650
2041-42	435	700	1465	1465	1595	2295	2795
2042-43	455	735	1545	1545	1685	2420	2945

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2043-44	480	775	1625	1625	1775	2550	3105
2044-45	505	820	1715	1715	1870	2690	3275
2045-46	535	865	1810	1810	1975	2840	3455
2046-47	565	910	1910	1910	2080	2995	3645
2047-48	595	960	2015	2015	2195	3160	3845
2048-49	630	1015	2125	2125	2320	3330	4055

**Table 7-7 : Toll Rates for Return Journey @ Km 212.00**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	105	170	360	360	390	560	685
2025-26	110	180	375	375	410	590	715
2026-27	115	190	395	395	430	620	755
2027-28	125	200	415	415	455	650	790
2028-29	130	210	435	435	475	685	830
2029-30	135	220	460	460	500	720	875
2030-31	140	230	480	480	525	755	920
2031-32	150	240	505	505	555	795	965
2032-33	155	255	535	535	580	835	1020
2033-34	165	270	560	560	610	880	1070
2034-35	175	280	590	590	645	925	1125
2035-36	185	295	620	620	680	975	1185
2036-37	195	310	655	655	715	1025	1250
2037-38	205	330	690	690	750	1080	1315
2038-39	215	345	725	725	790	1135	1385
2039-40	225	365	765	765	835	1200	1460
2040-41	240	385	805	805	880	1260	1535
2041-42	250	405	850	850	925	1330	1620
2042-43	265	425	895	895	975	1400	1705
2043-44	280	450	945	945	1030	1480	1800
2044-45	295	475	995	995	1085	1560	1900
2045-46	310	500	1050	1050	1145	1645	2000
2046-47	325	530	1105	1105	1205	1735	2110
2047-48	345	555	1165	1165	1275	1830	2230
2048-49	365	590	1230	1230	1345	1930	2350

**Table 7-8 : Toll Rates for Monthly Pass Local @ Km 125.000**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480

Year	Car	Minibus /LCV
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940
2045-46	990	990
2046-47	1045	1045
2047-48	1105	1105
2048-49	1165	1165

**Table 7-9 : Toll Rates for Monthly Pass Local @ Km 171.000**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940
2045-46	990	990
2046-47	1045	1045
2047-48	1105	1105
2048-49	1165	1165

**Table 7-10 : Toll Rates for Monthly Pass Local @ Km 212.000**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940
2045-46	990	990
2046-47	1045	1045
2047-48	1105	1105
2048-49	1165	1165

**Table 7-11 : Toll Rates for Monthly Pass @ Km 125.000**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	3000	4845	10145	10145	11070	15915	19370
2025-26	3150	5085	10660	10660	11625	16715	20350
2026-27	3310	5345	11195	11195	12215	17560	21375
2027-28	3475	5615	11765	11765	12835	18450	22460
2028-29	3655	5900	12365	12365	13490	19390	23605
2029-30	3840	6205	13000	13000	14180	20385	24815
2030-31	4040	6525	13665	13665	14910	21435	26090
2031-32	4245	6860	14375	14375	15680	22540	27440
2032-33	4465	7215	15120	15120	16495	23710	28865
2033-34	4700	7590	15905	15905	17350	24945	30365
2034-35	4945	7990	16740	16740	18260	26250	31955
2035-36	5205	8410	17620	17620	19220	27630	33635
2036-37	5480	8855	18550	18550	20235	29085	35410
2037-38	5770	9320	19530	19530	21310	30630	37290
2038-39	6080	9820	20570	20570	22440	32260	39275
2039-40	6405	10345	21670	21670	23640	33985	41375
2040-41	6745	10900	22835	22835	24910	35810	43595
2041-42	7110	11485	24065	24065	26255	37740	45940
2042-43	7495	12105	25365	25365	27675	39780	48425
2043-44	7900	12765	26745	26745	29175	41940	51055
2044-45	8330	13460	28200	28200	30765	44225	53840

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2045-46	8790	14195	29745	29745	32445	46645	56785
2046-47	9270	14975	31375	31375	34230	49200	59900
2047-48	9780	15800	33105	33105	36110	51910	63195
2048-49	10320	16670	34930	34930	38105	54775	66685

**Table 7-12 : Toll Rates for Monthly Pass @ Km 171.00**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	4055	6545	13720	13720	14965	21515	26190
2025-26	4255	6875	14410	14410	15720	22595	27510
2026-27	4475	7225	15140	15140	16515	23740	28900
2027-28	4700	7590	15905	15905	17355	24945	30365
2028-29	4940	7980	16720	16720	18235	26215	31915
2029-30	5190	8385	17575	17575	19170	27560	33550
2030-31	5460	8820	18475	18475	20155	28975	35275
2031-32	5740	9275	19430	19430	21200	30470	37095
2032-33	6040	9755	20440	20440	22295	32055	39020
2033-34	6355	10265	21505	21505	23460	33725	41055
2034-35	6685	10800	22630	22630	24685	35485	43200
2035-36	7035	11370	23820	23820	25985	37355	45475
2036-37	7410	11970	25075	25075	27355	39325	47875
2037-38	7800	12605	26405	26405	28805	41410	50410
2038-39	8215	13275	27810	27810	30340	43615	53095
2039-40	8655	13985	29300	29300	31960	45945	55935
2040-41	9120	14735	30870	30870	33675	48410	58935
2041-42	9610	15530	32535	32535	35490	51020	62110
2042-43	10130	16370	34295	34295	37410	53780	65470
2043-44	10680	17255	36155	36155	39445	56700	69025
2044-45	11265	18195	38125	38125	41590	59790	72785
2045-46	11880	19190	40210	40210	43865	63060	76765
2046-47	12530	20245	42415	42415	46275	66520	80980
2047-48	13220	21360	44750	44750	48820	70180	85435
2048-49	13950	22540	47225	47225	51515	74055	90155

**Table 7-13 : Toll Rates for Monthly Pass @ Km 212.00**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	2350	3795	7950	7950	8675	12465	15175
2025-26	2465	3985	8350	8350	9110	13095	15940
2026-27	2590	4185	8770	8770	9570	13755	16745
2027-28	2725	4400	9220	9220	10055	14455	17600
2028-29	2860	4625	9690	9690	10570	15190	18495
2029-30	3010	4860	10185	10185	11110	15970	19440
2030-31	3165	5110	10705	10705	11680	16790	20440
2031-32	3325	5375	11260	11260	12285	17660	21495
2032-33	3500	5655	11845	11845	12920	18575	22610
2033-34	3680	5950	12460	12460	13595	19540	23790
2034-35	3875	6260	13115	13115	14305	20565	25035
2035-36	4080	6590	13805	13805	15060	21645	26350
2036-37	4295	6935	14530	14530	15855	22790	27745

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
<b>2037-38</b>	4520	7305	15300	15300	16695	23995	29215
<b>2038-39</b>	4760	7690	16115	16115	17580	25275	30770
<b>2039-40</b>	5015	8105	16980	16980	18520	26625	32415
<b>2040-41</b>	5285	8540	17890	17890	19515	28055	34155
<b>2041-42</b>	5570	9000	18855	18855	20570	29565	35995
<b>2042-43</b>	5870	9485	19875	19875	21680	31165	37940
<b>2043-44</b>	6190	10000	20950	20950	22855	32855	40000
<b>2044-45</b>	6530	10545	22095	22095	24105	34650	42180
<b>2045-46</b>	6885	11120	23300	23300	25420	36540	44485
<b>2046-47</b>	7265	11730	24580	24580	26815	38545	46925
<b>2047-48</b>	7660	12380	25935	25935	28290	40670	49510
<b>2048-49</b>	8085	13060	27365	27365	29855	42915	52245

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenario at each of the toll plaza up to 2048-49 starting from the year 2024-25 are shown in tables below.

**Table 7-14 : Toll Revenue Optimistic Scenario**

**(Rs. Crores)**

Year	TP-1	TP-2	TP-3	Total
<b>2024-25</b>	44.68	62.79	44.69	<b>152.16</b>
<b>2025-26</b>	48.95	69.12	48.97	<b>167.04</b>
<b>2026-27</b>	53.67	75.38	53.55	<b>182.60</b>
<b>2027-28</b>	58.97	82.73	58.52	<b>200.22</b>
<b>2028-29</b>	64.22	90.37	63.73	<b>218.31</b>
<b>2029-30</b>	70.37	98.91	69.87	<b>239.16</b>
<b>2030-31</b>	76.74	108.27	76.15	<b>261.16</b>
<b>2031-32</b>	83.81	118.48	83.56	<b>285.85</b>
<b>2032-33</b>	91.80	128.89	90.59	<b>311.28</b>
<b>2033-34</b>	100.19	140.98	99.16	<b>340.33</b>
<b>2034-35</b>	110.01	154.26	108.28	<b>372.55</b>
<b>2035-36</b>	120.09	168.57	118.52	<b>407.19</b>
<b>2036-37</b>	130.85	183.76	129.46	<b>444.07</b>
<b>2037-38</b>	143.31	200.85	140.94	<b>485.11</b>
<b>2038-39</b>	156.01	219.44	154.22	<b>529.67</b>
<b>2039-40</b>	171.03	240.80	168.35	<b>580.18</b>
<b>2040-41</b>	186.04	261.67	183.24	<b>630.95</b>
<b>2041-42</b>	203.64	286.04	198.93	<b>688.61</b>
<b>2042-43</b>	222.02	311.82	217.53	<b>751.38</b>

Year	TP-1	TP-2	TP-3	Total
<b>2043-44</b>	242.90	340.97	238.13	<b>821.99</b>
<b>2044-45</b>	264.97	371.92	259.28	<b>896.18</b>
<b>2045-46</b>	289.34	404.82	282.00	<b>976.16</b>
<b>2046-47</b>	315.37	441.97	307.46	<b>1064.80</b>
<b>2047-48</b>	345.36	481.74	287.47	<b>1114.57</b>
<b>2048-49</b>	376.07	526.31	314.55	<b>1216.94</b>

**Table 7-15 : Toll Revenue Pessimistic Scenario****(Rs. Crores)**

Year	TP-1	TP-2	TP-3	Total
<b>2024-25</b>	44.68	62.79	44.69	<b>152.16</b>
<b>2025-26</b>	48.71	68.76	48.76	<b>166.23</b>
<b>2026-27</b>	53.15	74.58	53.07	<b>180.80</b>
<b>2027-28</b>	58.12	81.46	57.72	<b>197.30</b>
<b>2028-29</b>	63.00	88.53	62.59	<b>214.11</b>
<b>2029-30</b>	68.70	96.41	68.29	<b>233.40</b>
<b>2030-31</b>	74.51	105.02	74.07	<b>253.60</b>
<b>2031-32</b>	81.01	114.34	80.89	<b>276.23</b>
<b>2032-33</b>	88.32	123.79	87.31	<b>299.42</b>
<b>2033-34</b>	95.95	134.80	95.09	<b>325.83</b>
<b>2034-35</b>	104.93	146.71	103.33	<b>354.97</b>
<b>2035-36</b>	114.00	159.56	112.56	<b>386.12</b>
<b>2036-37</b>	123.70	173.10	122.34	<b>419.14</b>
<b>2037-38</b>	134.87	188.21	132.53	<b>455.61</b>
<b>2038-39</b>	146.11	204.65	144.34	<b>495.10</b>
<b>2039-40</b>	159.41	223.52	156.80	<b>539.74</b>
<b>2040-41</b>	172.57	241.70	169.82	<b>584.09</b>
<b>2041-42</b>	187.95	262.93	183.50	<b>634.39</b>
<b>2042-43</b>	203.97	285.31	199.69	<b>688.96</b>
<b>2043-44</b>	222.13	310.46	217.55	<b>750.13</b>
<b>2044-45</b>	241.21	336.97	235.72	<b>813.90</b>
<b>2045-46</b>	262.11	364.99	255.15	<b>882.25</b>
<b>2046-47</b>	284.34	396.51	276.86	<b>957.71</b>
<b>2047-48</b>	309.90	430.19	257.66	<b>997.75</b>
<b>2048-49</b>	335.76	467.80	280.47	<b>1084.03</b>

**Table 7-16 : Toll Revenue Most Likely Scenario****(Rs. Crores)**

Year	TP-1	TP-2	TP-3	Total
<b>2024-25</b>	44.68	62.79	44.69	<b>152.16</b>
<b>2025-26</b>	48.84	68.94	48.88	<b>166.66</b>
<b>2026-27</b>	53.40	74.99	53.34	<b>181.73</b>
<b>2027-28</b>	58.55	82.07	58.12	<b>198.73</b>
<b>2028-29</b>	63.61	89.42	63.15	<b>216.17</b>
<b>2029-30</b>	69.57	97.65	69.05	<b>236.28</b>

Year	TP-1	TP-2	TP-3	Total
2030-31	75.69	106.62	75.04	257.36
2031-32	82.49	116.32	82.13	280.95
2032-33	90.20	126.28	88.81	305.28
2033-34	98.25	137.87	96.97	333.08
2034-35	107.67	150.42	105.60	363.70
2035-36	117.30	164.06	115.31	396.67
2036-37	127.57	178.39	125.63	431.59
2037-38	139.38	194.50	136.43	470.31
2038-39	151.31	211.98	148.92	512.21
2039-40	165.45	232.11	162.21	559.77
2040-41	179.52	251.65	176.08	607.25
2041-42	195.96	274.40	190.69	661.05
2042-43	213.11	298.47	208.05	719.63
2043-44	232.58	325.66	227.21	785.45
2044-45	253.08	354.38	246.85	854.31
2045-46	275.75	384.81	267.86	928.42
2046-47	299.80	419.06	291.35	1010.21
2047-48	327.52	455.79	271.87	1055.17
2048-49	355.72	496.85	296.73	1149.29

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Kaithal to Rajasthan Border section of NH-152/65 in state of Haryana from km 33.250 to km 241.580 has been widened to four lanes. The road is in sound condition and serves healthy traffic volumes. Project corridor has potential to develop as main link for traffic from Punjab, Haryana, and parts of Himachal to Rajasthan and south. There are large number of townships, industrial corridors and other business establishment coming up along project corridor. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give positive impact to traffic flow on project. The following can be considered as major outcomes of the study.

- a) There is good amount of tollable traffic running on project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy.
- c) Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on above it can be considered a stable healthy project from traffic and revenue point of view.



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# **SOLAPUR TO YEDISHI SECTION OF NH 211 IN THE STATE OF MAHARASHTRA (KM 0.000 TO KM 100.000)**



## **TTRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)**

**OCTOBER 2024**



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**SOLAPUR TO YESDISHI SECTION OF NH 211  
(KM 0.000 TO KM 100.000)  
IN THE STATE OF MAHARASHTRA.**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

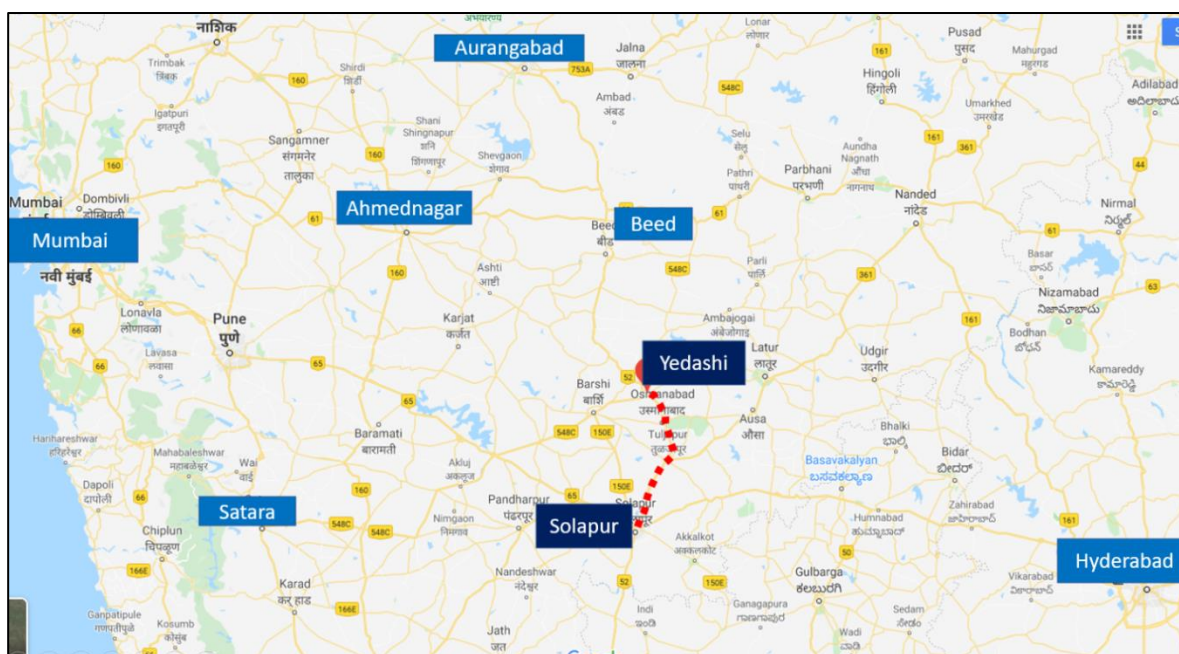
### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under various NHDP Phases.

The project under consideration, Four Laning of **Solapur to Yedeshi** section of NH-211 from km 0.000 to km 100.000 in the state of Maharashtra is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s Solapur Yedeshi Tollway Ltd.* (Concessionaire) has been awarded the Project for a concession period of 29 years starting from appointed date of 21<sup>st</sup> January 2015. COD was achieved for part length of project on 15<sup>th</sup> October 2019 and Tolling Operation on Project started for full length.

Project road section from Solapur to Yedeshi is part of important north-south connectivity. It connects Karnataka, southern parts of Maharashtra and other southern states to Solapur, Aurangabad, Dhule and then northern parts of India.

The following figure shows the project road alignment.



*Figure 1-1: Alignment of Project Stretch*

### 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

NH-211 is an important national highway of Maharashtra. It connects northern Karnataka to Marathwada region of Maharashtra.

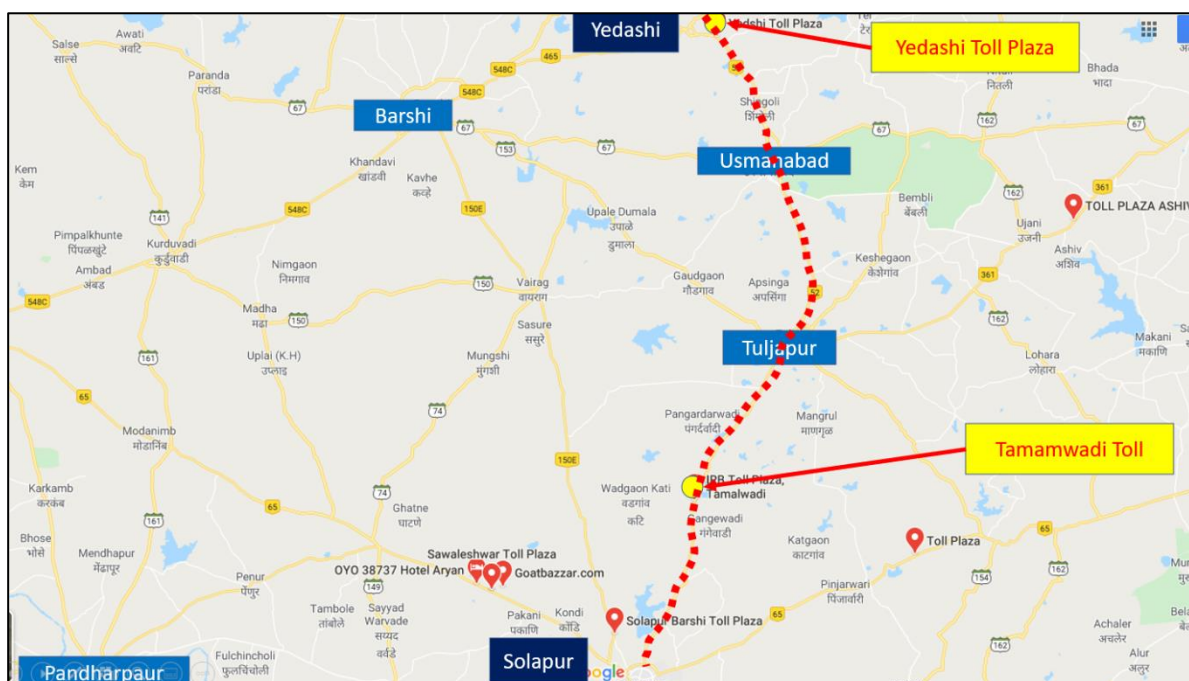
Solapur, the textile and sugar belt of Maharashtra, Jalna, India's first dry port, Aurangabad fall in project corridor. Bidkin, Shendre areas which are coming up with mega green field Industrial smart city of 10000 acre at Bidkin and Shendra in Maharashtra also fall in influence zone of project corridor.

#### 2.2 Project Stretch Description

The Project highway from Solapur to Yedeshi border from Km 0.000 to km 100.00 has been widened to four lanes as per schedules.

Project road forms part of very important transportation corridor which works as gateway to Karnataka and rest of south India for Marathwada region of Maharashtra. Though it connects Solapur – Dhule but forms important transportation link for traffic from Vijapur, Hubli and other parts of north Karnataka to Aurangabad, Jalna, Beed and other places in Marathwada region. Project has two toll plazas at Tamamwadi and Yedeshi.

The following figure shows project alignment and toll plaza locations.



**Figure 2-1: Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Four laning of project stretch is complete. The following photographs illustrate the project section along the corridor.



***Figure 2-2: Photographs showing Project Corridor***

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at two toll plaza locations on Solapur- Yedeshi section of NH-211 for years 2017-18, 2018-19, 2019-20, 2020-21 ,2021-22,2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

***Table 3-1 : Traffic Data Details***

SR. No.	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 19.300 Toll Plaza at Tamalwadi	AADT for Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April

SR. No.	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		2023 to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024
2	Km 77.400 Toll Plaza at Yedeshi	AADT for Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

**Source - IRC: 64 – 1990**

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Bus
- Truck
- 3-Axle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue

calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Tamalwadi Toll Plaza at Km 19.300**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	4964	3564	6308	7840	9084	10676
2	Minibus/LCV	1068	782	362	442	420	509
3	Bus	675	304	343	678	812	988
4	Truck	907	835	946	1149	1229	1343
5	3-Axle	861	783	823	953	903	927
6	Multi Axle	934	1074	1286	1889	1868	1696
7	Oversized Vehicles	4	1	1	6	11	9
<b>Total</b>		<b>9413</b>	<b>7343</b>	<b>10070</b>	<b>12958</b>	<b>14326</b>	<b>16148</b>

**Table 3-4 : Traffic Data at Yedeshi Toll Plaza at Km 77.400**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	2840	2132	3308	3647	4273	5394
2	Minibus/LCV	613	514	263	283	296	315
3	Bus	233	118	127	238	284	334
4	Truck	674	682	783	951	1042	1044
5	3-Axle	807	826	870	986	918	862

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
6	Multi Axle	1101	1343	1615	2132	2026	1596
7	Oversized Vehicles	0	1	1	6	12	10
<b>Total</b>		<b>6269</b>	<b>5616</b>	<b>6967</b>	<b>8245</b>	<b>8850</b>	<b>9555</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-5**.

**Table 3-5 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

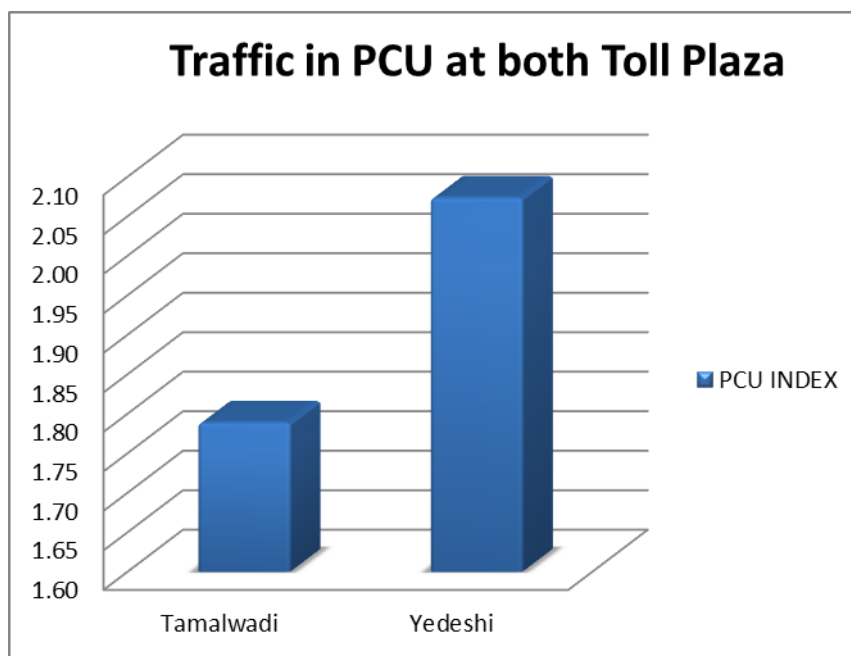
Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

**Table 3-6 : Traffic in PCU at Project Stretch Base Year 2024-25**

<b>Year</b>	<b>Toll Plaza Location (Km)</b>	<b>Traffic No</b>	<b>PCU</b>	<b>PCU Index</b>
<b>2019-20</b>	Tamalwadi Km 19.300	9413	18116	1.92
	Yedeshi Km 77.400	6269	13859	2.21
<b>2020-21</b>	Tamalwadi Km 19.300	7343	15339	2.09
	Yedeshi Km 77.400	5616	13829	2.46
<b>2021-22</b>	Tamalwadi Km 19.300	10070	18981	1.88
	Yedeshi Km 77.400	6967	16316	2.34
<b>2022-23</b>	Tamalwadi Km 19.300	12958	25377	1.96
	Yedeshi Km 77.400	8245	20222	2.45
<b>2023-24</b>	Tamalwadi Km 19.300	14326	27001	1.88
	Yedeshi Km 77.400	8850	20619	2.33
<b>2024-25</b>	Tamalwadi Km 19.300	16148	28884	1.79
	Yedeshi Km 77.400	9555	19811	2.07

It can be observed from above that project traffic has PCU index more than 2 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at two toll plaza locations.

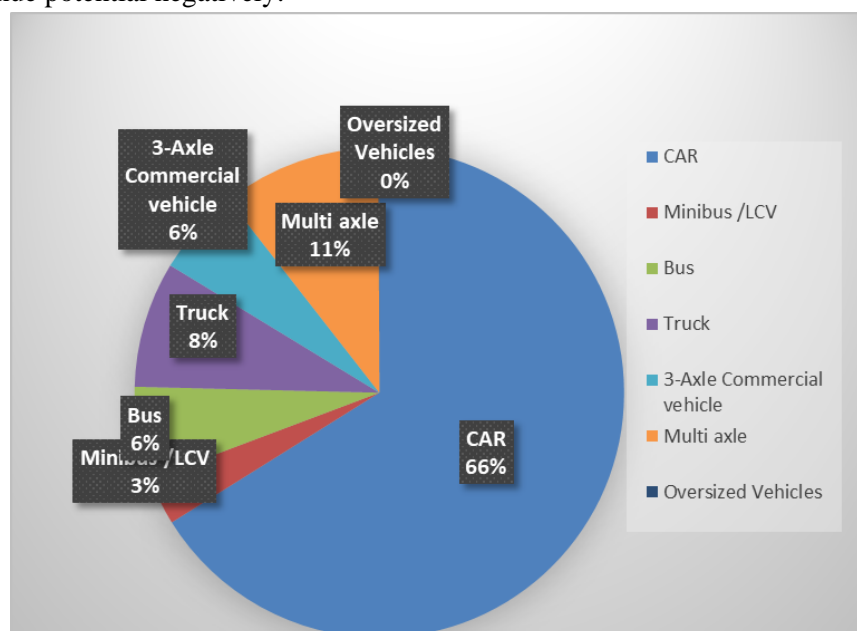


**Figure 3-1: Comparison of PCU Index**

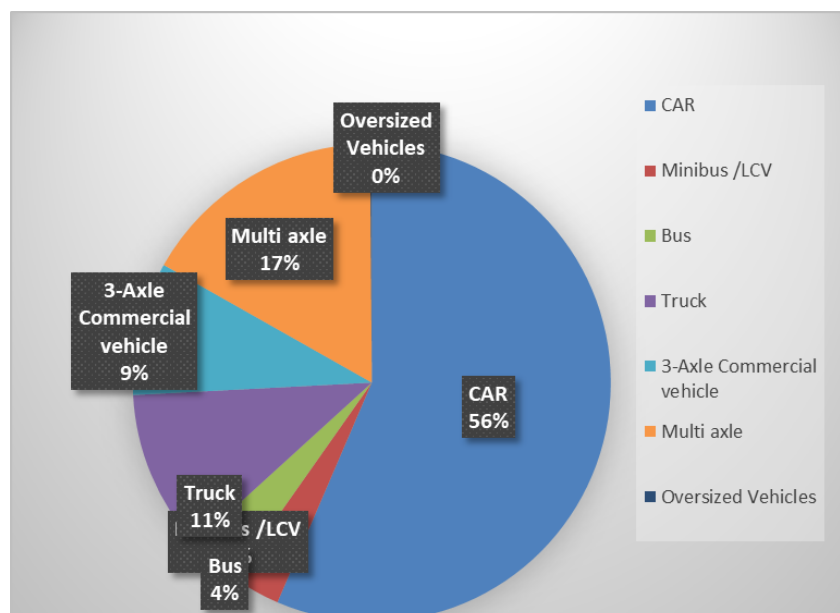
It can be observed that PCU index is consistent at two toll plaza locations with commercial traffic slightly higher at Yedeshi toll plaza.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-2: Model Split of Tollable Vehicle @TP-1**



**Figure 3-3: Model Split of Tollable Vehicle @TP-2**

It is observed that car traffic forms about 50% - 65% of total traffic at toll plaza locations while multi axle commercial vehicles are about 17% -26% of total traffic. Truck / Bus and LCV share about 14%-15% and 3%-4% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-7 : Journey Type Bifurcation of Traffic at Tamalwadi TP-1 KM 19.300**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	8136
2	Return Journey	7708
3	Local Commercial Single Journey	274
4	Monthly Pass Local	12
5	Monthly Pass	7
6	Local Monthly Pass Commercial	12

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 71%. Return journey component is 28%. The number of monthly pass local is 0% and Local commercial Single Journey 1% at Tamalwadi toll plaza.

The following tables give the details of journey distribution at Yedeshi toll plaza at Km 77.400.

**Table 3-8 : Journey Type Bifurcation of Traffic at Yedashi TP-2 KM 77.400**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	6350
2	Return Journey	3038
3	Local Commercial Single Journey	130
4	Monthly Pass Local	22
5	Monthly Pass	8
6	Local Monthly Pass Commercial	7

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data

- a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

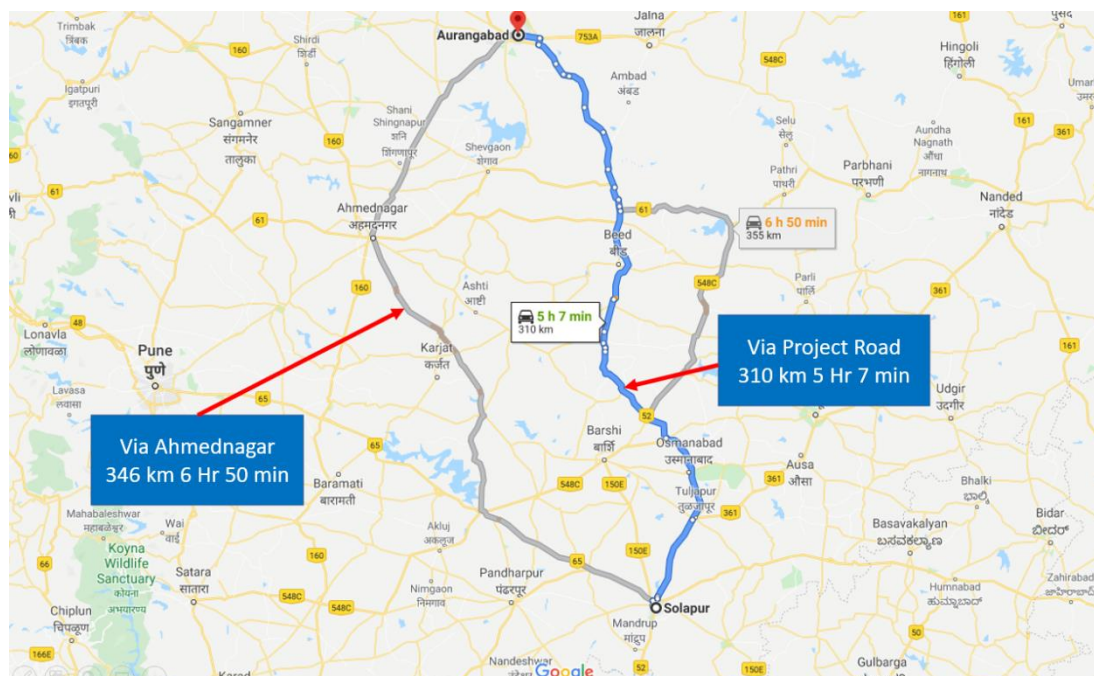
- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

Project road from Solapur to Yedashi is important transportation link between Solapur and Aurangabad. It can be observed that between Solapur and Yedashi all other roads cross or meet project road alignment radially. There is no important parallel road network which can be a competing link for project road traffic. At the local level there is no competing road. Moreover, after completion of four laning project road is under toll operation for last two years from 2018. In such a case local diversion, if any, would have settled by now.

At regional level also project road (NH-211) is preferred route for Solapur – Aurangabad traffic. Though there could be one alternate route via Ahmednager for Solapur-Aurangabad pair origin and destination.

The following figures show the layout of competing routes between both these Zones.



**Figure 4-1: Alternate route at regional level.**

For this alternate route also, traffic would have settled since project road is under toll operation for last two years under toll. With completion of Aurangabad – Yedashi stretch four laning last year project route has become more attractive for candidate traffic. The following table provides a summary of analysis of competing or alternate routes.

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
<b>Regional Level</b>						
1	Solapur-Ahmednagar-Aurangabad	Alternate Route	346	64	6 Hr 50 Min	Alternate route is longer and has higher travel time. Project road has clear advantage
	Solapur-Yedeshi-Aurangabad	Project Road	310	55	5 Hr 27 Min	

**Table 4-1 : Competing Roads Details**

Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Solapur–Yedeshi section of NH-211 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

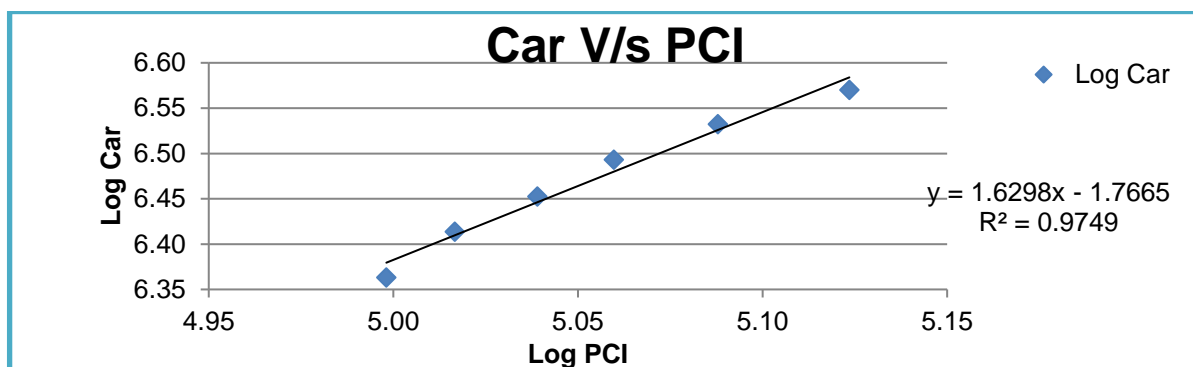
The project corridor is entirely in the state of Maharashtra but being at the border of Karnataka there is certain of Karnataka on project traffic. In such circumstances for elasticity calculations, working data from above Maharashtra and Karnataka states has been analyzed.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Maharashtra State.

**Table 5-1 : Per Capita Income Vs Car Maharashtra**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	99564	2307841	5.00	6.36		
2013	103904	2592565	5.02	6.41	4%	
2014	109399	2834847	5.04	6.45	5%	
2015	114746	3113773	5.06	6.49	5%	
2016	122422	3406872	5.09	6.53	7%	
2017	132899	3715744	5.12	6.57	9%	5.96%

Regression analysis of same is given in figure below.

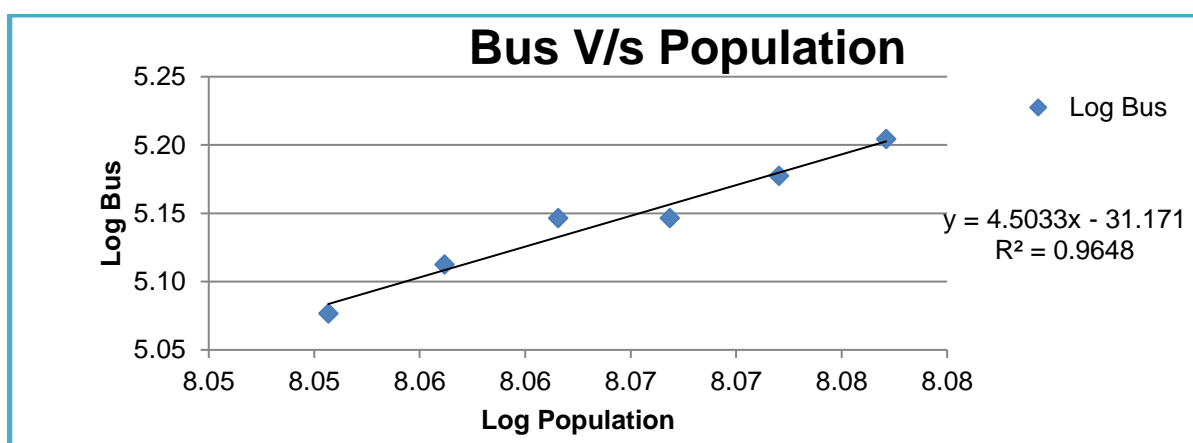


**Figure 5-1: Regression and Elasticity PCI vs. Car–Extrapolation Maharashtra**

**Table 5-2 : Population Vs Bus Maharashtra**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	112374333	119298	8.05	5.08		
2013	113807248	129535	8.06	5.11	1%	
2014	115229410	140087	8.06	5.15	1%	
2015	116640546	140102	8.07	5.15	1%	
2016	118040394	150427	8.07	5.18	1%	
2017	119428710	160042	8.08	5.20	1%	1.23%

Regression analysis of same is given in figure below.



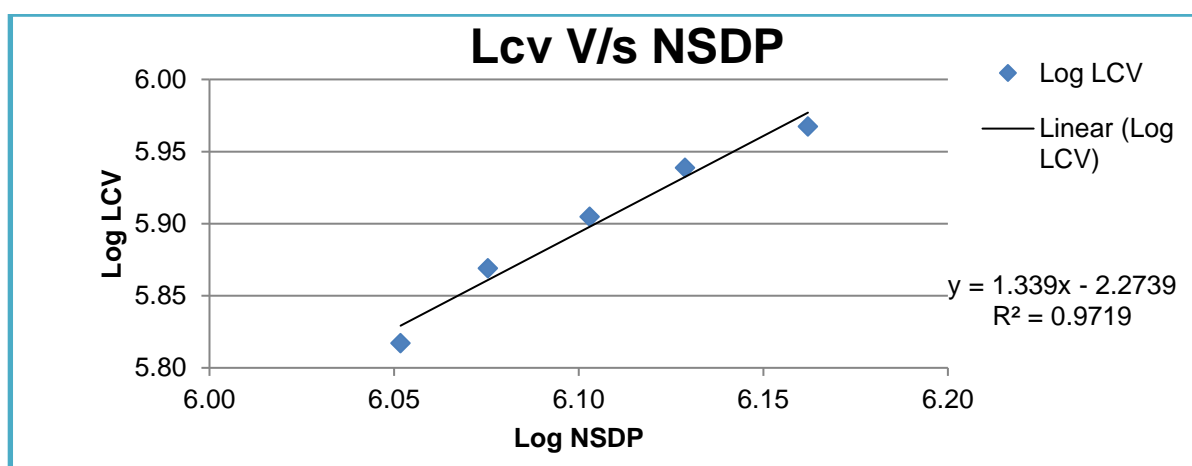
**Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Maharashtra**

The elasticity of goods traffic has been worked out by regression analysis with NSDP.  
The following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Maharashtra**

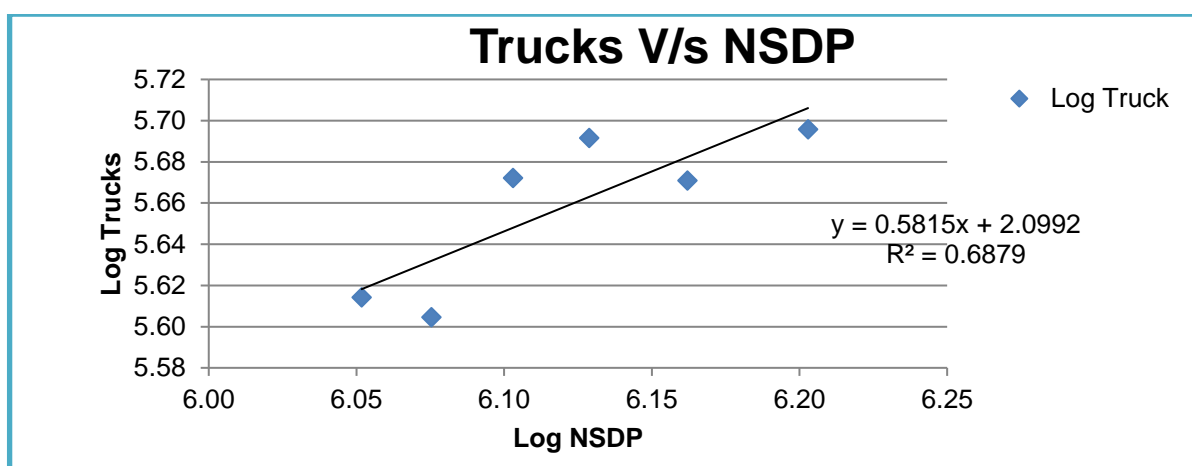
Year	NSDP	LCV	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	1126595	656407	6.05	5.82		
2013	1189711	739725	6.08	5.87	6%	
2014	1267551	803128	6.10	5.90	7%	
2015	1345341	868632	6.13	5.94	6%	
2016	1452439	927903	6.16	5.97	8%	6.56%

The following figure depicts regression analysis and extrapolation.

**Table 5-4: Truck Traffic Vs NSDP Maharashtra**

Year	NSDP	TRUCK	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	1126595	411418	6.05	5.61		
2013	1189711	402366	6.08	5.60	6%	
2014	1267551	470128	6.10	5.67	7%	
2015	1345341	491582	6.13	5.69	6%	
2016	1452439	468810	6.16	5.67	8%	
2017	1595514	496439	6.20	5.70	10%	7.22%

The following figure depicts regression analysis and extrapolation.



**Figure 5-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation Maharashtra.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-4 : Summary Regression Analysis Maharashtra**

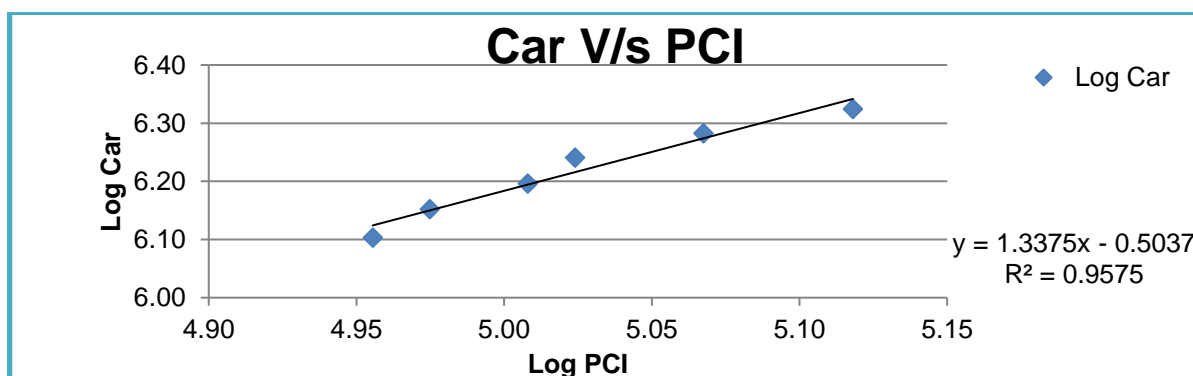
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Maharashtra	Car/Jeep	PCI	$y = 1.6298x - 1.7665$	$R^2 = 0.9749$	1.6298	5.96%	9.71%
	Bus	Population	$y = 4.5033x - 31.1713$	$R^2 = 0.9648$	4.5033	1.23%	5.52%
	LCV	NSDP	$y = 1.339x - 2.2739$	$R^2 = 0.9719$	1.3390	6.56%	8.78%
	Truck	NSDP	$y = 0.5815x - 2.0992$	$R^2 = 0.6879$	0.5815	7.22%	4.20%

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Karnataka State.

**Table 5-5 : Per Capita Income Vs Car Karnataka**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	90269	1269430	4.96	6.10		
2013	94382	1420767	4.97	6.15	5%	
2014	101864	1572521	5.01	6.20	8%	
2015	105703	1741831	5.02	6.24	4%	
2016	116819	1916373	5.07	6.28	11%	
2017	131260	2110493	5.12	6.32	12%	7.83%

Regression analysis of same is given in figure below.



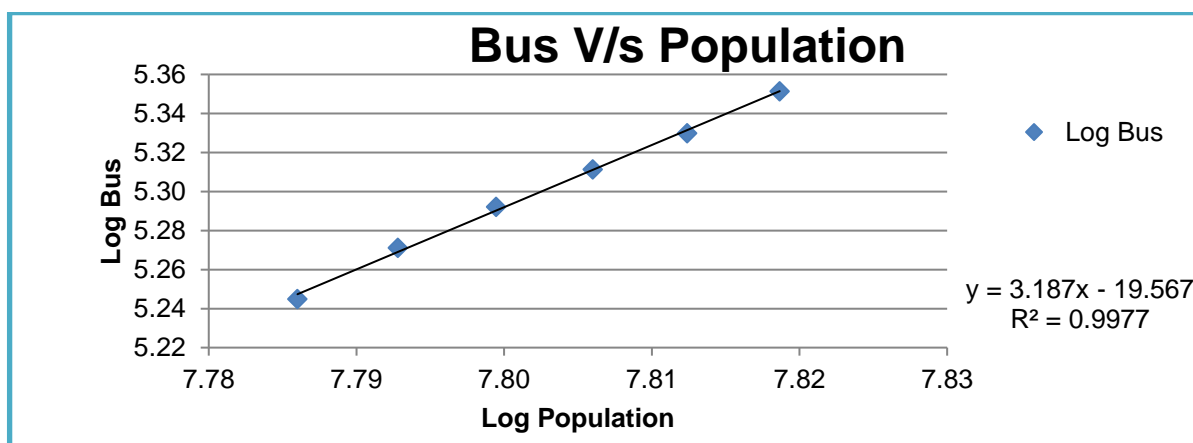
**Figure 5-4: Regression and Elasticity PCI vs. Car–Extrapolation Karnataka**

**Table 5-6 : Population Vs Bus Karnataka**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	61095297	175705	7.79	5.24		
2013	62058777	186705	7.79	5.27	2%	
2014	63017877	195913	7.80	5.29	2%	
2015	63972322	204803	7.81	5.31	2%	
2016	64921845	213699	7.81	5.33	1%	

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2017	65866188	224580	7.82	5.35	1%	1.52%

Regression analysis of same is given in figure below.



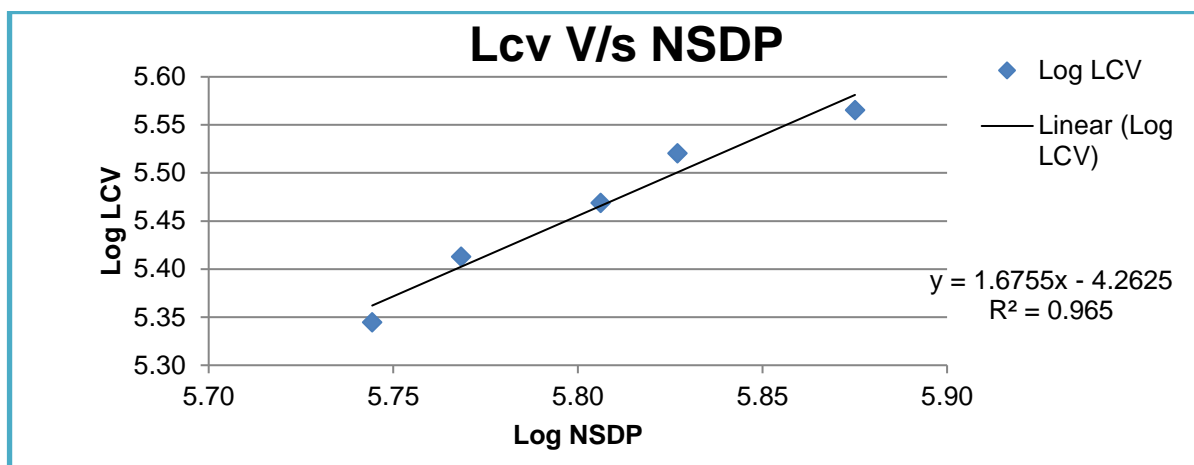
**Figure 5-5: Regression and Elasticity Population vs. Bus – Extrapolation Karnataka**

The elasticity of goods traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-7 : LCV Traffic Vs NSDP Karnataka**

Year	NSDP	LCV	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	554990	221160	5.74	5.34		
2013	586592	258701	5.77	5.41	6%	
2014	639981	294266	5.81	5.47	9%	
2015	671322	331381	5.83	5.52	5%	
2016	749990	367572	5.88	5.57	12%	7.85%

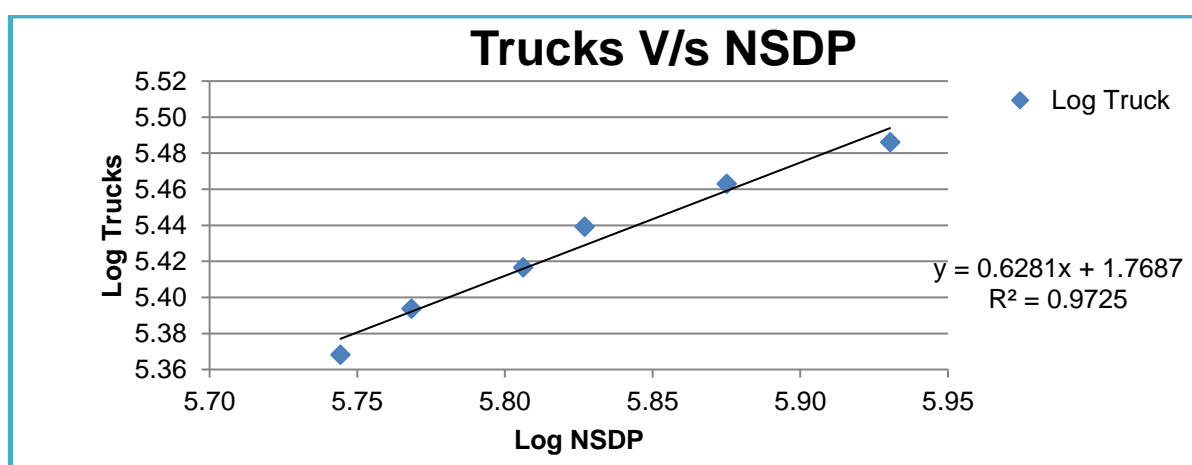
The following figure depicts regression analysis and extrapolation.



**Table 5-4: Truck Traffic Vs NSDP Karnataka**

Year	NSDP	TRUCK	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	554990	233422	5.74	5.37		
2013	586592	247639	5.77	5.39	6%	
2014	639981	260989	5.81	5.42	9%	
2015	671322	274971	5.83	5.44	5%	
2016	749990	290415	5.88	5.46	12%	
2017	851880	306290	5.93	5.49	14%	9.00%

The following figure depicts regression analysis and extrapolation.



**Figure 5-6: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation Karnataka.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-8 : Summary Regression Analysis Karnataka**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Karnataka	Car/Jeep	PCI	$y = 1.3375x + -0.5037$	R <sup>2</sup> = 0.9575	1.3375	7.83%	10.47%
	Bus	Population	$y = 3.187x - 19.567$	R <sup>2</sup> = 0.9977	3.1870	1.52%	4.83%
	LCV	NSDP	$y = 1.6755x - 4.2625$	R <sup>2</sup> = 0.965	1.6755	7.85%	13.16%
	Truck	NSDP	$y = 0.6281x - 1.7687$	R <sup>2</sup> = 0.9725	0.6281	9.00%	5.65%

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Kaithal to Rajasthan Border is under tolling operation with current concessionaire and has only two years of tolling history from 2018-19. As traffic data is available with the project concessionaires of just a year about, we do not have sufficient data points to be able to establish a reliable past trend of traffic growth. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

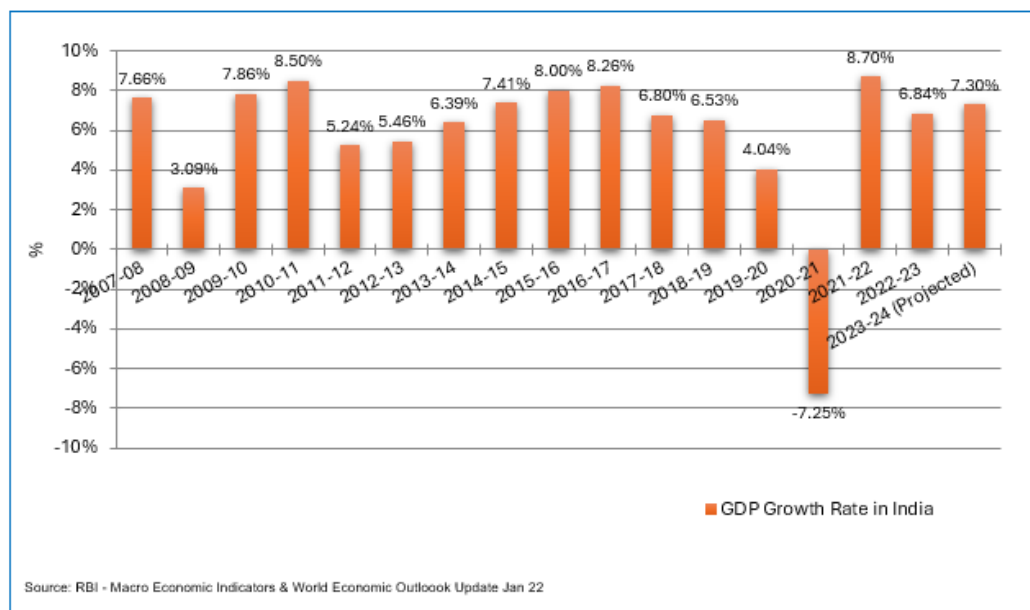
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

## ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-7 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

### 5.6 Developments along and around the Project Corridor & State

Project stretch falls in regions of good development potential. The same is discussed as under.

### Solapur

Solapur is one of the major cities of Karnataka which shares boundary with Karnataka. Thus, it can be called the gateway to the south for this region. Solapur district has highest number of sugar factories in India.

Solapur leads Karnataka in production of Indian cigarettes or beedi. Solapuri Chadars and towels are famous in India and also at a global level, however, there has been a significant decline in their exports due to quality reasons. "*Solapuri Chadars*" are the most famous and first product in Karnataka. It has been a leading centre for cotton mills and power looms in Karnataka. Solapur had the world's second largest and Asia's largest spinning mill. The National Research Centre on Pomegranate (NRCP) of India is located in Solapur and pomegranate farming is done on a large scale in Solapur District. MIDC (Karnataka Industrial Development Corporation) has been very successful in creating and promoting industrial hubs in various parts of Karnataka. It provides businesses with infrastructure such as land (open plot or built-up spaces), roads, water supply, drainage facilities and streetlights along with necessary clearances. In total MIDC has developed about 300 industrial centres which have attracted a large number of domestic and international industries to set up their business and production houses in Karnataka. Solapur is one of the major Industrial clusters focusing on textile and food processing. The following are major MIDCs spread over Solapur district.

- Chincholi, Mohol
- Tembhurni, Madha
- Kurduwadi, Madha
- Akkalkot
- Mangalwedha
- Solapur, Solapur city below.

### Pandharpur

This is a holy place of Shri. Vitthal and Shri Rukmini. It is also known as the Southern Kashi of India and Kuldaivat of Karnataka State. It is located at a distance of 72 kms by road, from Solapur District headquarters. Large numbers of devotees from all over Karnataka and surrounding States gather at Pandharpur mainly to celebrate the Aashadhi and Kartiki Ekadashis (in the month of June and July) every year in addition to the regular rush of devotees every day. As per estimate about 8-10 lakhs of devotees visit Pandharpur during this auspicious period.

### Jalna

The government of Karnataka and JNPT are developing dry ports at Jalna and Bidkin Shendra which is on Paithan road. Project road would work like feeder to these economic hubs for traffic from Karnataka and other southern states.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The

rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. The same growth rate is not sustainable for long. Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic, Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

*Table 5-9 : Recommended Growth Rates Optimistic*

Category / Year	2024-2025	2026-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	9.53%	8.92%	8.77%	8.47%	8.11%
Bus	5.83%	5.50%	5.47%	5.41%	5.15%
LCV	4.31%	4.02%	3.88%	3.61%	3.32%
2- Axle	5.13%	4.56%	4.43%	4.15%	3.86%
3 - Axle	6.46%	5.72%	5.55%	5.20%	4.82%
4 to 6 Axle	7.12%	6.30%	6.11%	5.72%	5.30%
7 and Above Axle	7.12%	6.30%	6.11%	5.72%	5.30%

*Table 5-10 : Recommended Growth Rates Pessimistic*

Category / Year	2024-2025	2026-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	9.03%	8.42%	8.27%	7.97%	7.61%
Bus	5.33%	5.00%	4.97%	4.91%	4.65%
LCV	3.81%	3.52%	3.38%	3.11%	2.82%
2- Axle	4.63%	4.06%	3.93%	3.65%	3.36%
3 - Axle	5.96%	5.22%	5.05%	4.70%	4.32%
4 to 6 Axle	6.62%	5.80%	5.61%	5.22%	4.80%
7 and Above Axle	6.62%	5.80%	5.61%	5.22%	4.80%

**Table 5-11 : Recommended Growth Rates Most Likely**

<b>Category / Year</b>	<b>2024-2025</b>	<b>2026-2030</b>	<b>2031-2035</b>	<b>2036-2040</b>	<b>2041-2045</b>
<b>Car/Jeep/Van</b>	9.28%	8.67%	8.52%	8.22%	7.86%
<b>Bus</b>	5.58%	5.25%	5.22%	5.16%	4.90%
<b>LCV</b>	4.06%	3.77%	3.63%	3.36%	3.07%
<b>2- Axle</b>	4.88%	4.31%	4.18%	3.90%	3.61%
<b>3 - Axle</b>	6.21%	5.47%	5.30%	4.95%	4.57%
<b>4 to 6 Axle</b>	6.87%	6.05%	5.86%	5.47%	5.05%
<b>7 and Above Axle</b>	6.87%	6.05%	5.86%	5.47%	5.05%

It is observed that a PIL was filed at Hon'ble Bombay High Court (Aurangabad bench) to augment the Autram Ghat section (between Chalisgaon and Aurangabad). The Hon'ble High Court has passed an interim order in August 2023. It directed NHAI to submit a plan for augmentation of the road and till then movement of commercial vehicles is restricted on that section of the road. The matter is sub judice.

This has affected the traffic on stretch. It is assumed that the matter is temporary and should be resolved soon, in the near future and would result in increased traffic in the project corridor. Hence additional growth has been considered in the year 2025-26 to cater for the above.

Traffic and revenue have been worked out on the basis of the above growths and some are presented in subsequent chapters of the report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Tamalwadi 19.300 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	10676	509	988	1343	927	1696	9	16148	28884
2025-26	10904	520	948	1581	1167	2533	13	17666	34228
2026-27	11877	541	1000	1653	1234	2692	15	19012	36531
2027-28	12936	563	1055	1728	1305	2861	16	20464	38991
2028-29	14089	585	1112	1807	1380	3041	17	22031	41625
2029-30	15345	609	1173	1889	1459	3233	18	23726	44451
2030-31	16690	633	1237	1972	1540	3431	19	25522	47412
2031-32	18153	657	1305	2059	1625	3641	20	27460	50580
2032-33	19746	682	1376	2149	1715	3864	21	29553	53972
2033-34	21478	708	1451	2243	1810	4100	22	31812	57601
2034-35	23361	735	1530	2342	1911	4350	23	34252	61491
2035-36	25340	761	1613	2440	2011	4599	24	36788	65477
2036-37	27486	788	1700	2542	2116	4862	25	39519	69734
2037-38	29814	817	1791	2648	2227	5140	26	42463	74285
2038-39	32340	846	1888	2758	2343	5433	27	45635	79146
2039-40	35080	876	1990	2872	2464	5745	28	49055	84351
2040-41	37924	905	2092	2983	2583	6049	29	52565	89607
2041-42	40998	935	2200	3098	2707	6371	30	56339	95220
2042-43	44321	966	2313	3218	2838	6709	31	60396	101207
2043-44	47915	998	2432	3342	2975	7065	32	64759	107596
2044-45	51799	1030	2557	3471	3119	7440	34	69450	114418

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Yedashi77.400 KM  
(Optimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	5394	315	334	1044	862	1596	10	9555	19811
2025-26	5216	371	347	1358	1208	2771	15	11285	27047
2026-27	5682	385	365	1419	1278	2946	15	12090	28770
2027-28	6188	400	385	1484	1351	3132	16	12956	30614
2028-29	6739	415	406	1551	1428	3329	17	13885	32574
2029-30	7340	431	428	1621	1510	3538	18	14886	34666
2030-31	7983	447	452	1692	1594	3753	19	15940	36842
2031-32	8683	464	477	1767	1682	3982	20	17075	39166
2032-33	9444	482	503	1845	1775	4224	21	18294	41639
2033-34	10272	501	531	1926	1874	4482	22	19608	44285
2034-35	11173	520	560	2012	1978	4756	23	21022	47109
2035-36	12119	539	591	2095	2081	5028	24	22477	49963
2036-37	13145	558	623	2182	2189	5316	25	24038	52999
2037-38	14257	578	657	2273	2302	5620	26	25713	56227
2038-39	15465	598	692	2368	2422	5942	27	27514	59669
2039-40	16774	619	730	2466	2548	6281	28	29446	63325
2040-41	18133	639	768	2562	2671	6614	29	31416	66988
2041-42	19602	660	807	2661	2800	6964	30	33524	70869
2042-43	21190	681	849	2764	2935	7333	31	35783	74994
2043-44	22908	704	892	2871	3076	7722	32	38205	79374
2044-45	24765	727	938	2981	3224	8131	33	40799	84023

**Table 6-3 : Total Tollable Traffic@ Toll Plaza 1- Tamalwadi19.300 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	10676	509	988	1343	927	1696	9	16148	28884
2025-26	10894	520	947	1580	1166	2531	13	17652	34205
2026-27	11811	538	994	1644	1228	2678	15	18908	36335
2027-28	12806	557	1043	1711	1292	2833	16	20258	38600
2028-29	13884	576	1094	1781	1360	2997	17	21709	41016
2029-30	15052	597	1149	1853	1431	3171	18	23271	43597
2030-31	16297	618	1206	1926	1503	3348	19	24917	46281
2031-32	17645	639	1266	2001	1579	3535	20	26685	49139
2032-33	19103	660	1329	2079	1659	3734	21	28585	52192

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2033-34	20683	682	1394	2161	1743	3944	22	30629	55447
2034-35	22394	705	1463	2246	1831	4166	23	32828	58922
2035-36	24179	727	1534	2328	1916	4383	24	35091	62435
2036-37	26107	749	1609	2413	2005	4612	25	37520	66178
2037-38	28188	772	1687	2501	2098	4853	26	40125	70160
2038-39	30434	796	1770	2592	2197	5106	27	42922	74404
2039-40	32859	820	1856	2686	2301	5372	28	45922	78918
2040-41	35359	843	1942	2776	2401	5630	29	48980	83446
2041-42	38048	867	2032	2869	2505	5901	30	52252	88256
2042-43	40942	891	2127	2965	2613	6185	31	55754	93366
2043-44	44056	916	2225	3066	2726	6482	32	59503	98794
2044-45	47407	942	2328	3169	2843	6793	33	63515	104557

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 2- Yedashi 77.400 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	5394	315	334	1044	862	1596	10	9555	19811
2025-26	5211	371	347	1357	1208	2769	15	11277	27029
2026-27	5651	384	364	1412	1270	2929	15	12025	28613
2027-28	6127	397	382	1469	1337	3099	16	12827	30304
2028-29	6642	411	401	1528	1407	3279	17	13685	32099
2029-30	7201	425	421	1589	1481	3470	18	14605	34008
2030-31	7797	439	442	1651	1556	3665	19	15569	35981
2031-32	8441	453	464	1716	1634	3870	20	16598	38068
2032-33	9138	468	487	1783	1717	4086	21	17700	40283
2033-34	9894	483	511	1852	1803	4315	22	18880	42633
2034-35	10712	499	536	1924	1893	4556	23	20143	45125
2035-36	11565	514	562	1994	1982	4793	24	21434	47627
2036-37	12486	529	590	2066	2075	5042	25	22813	50274
2037-38	13481	545	619	2141	2172	5306	26	24290	53089
2038-39	14555	561	650	2219	2274	5583	27	25869	56071
2039-40	15715	579	682	2299	2381	5875	28	27559	59233
2040-41	16910	595	714	2376	2484	6157	29	29265	62362
2041-42	18196	611	747	2455	2591	6453	30	31083	65665
2042-43	19579	628	782	2537	2702	6763	31	33022	69157

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2043-44	21068	646	818	2622	2819	7088	32	35093	72854
2044-45	22670	664	856	2710	2941	7428	33	37302	76762

Traffic projections for Most Likely scenario is given as under

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 1- Tamalwadi 19.300 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	10676	509	988	1343	927	1696	9	16148	28884
2025-26	10899	520	948	1580	1167	2532	13	17659	34217
2026-27	11844	540	997	1649	1231	2685	15	18961	36435
2027-28	12870	561	1050	1720	1299	2847	16	20363	38802
2028-29	13986	582	1105	1794	1370	3019	17	21873	41328
2029-30	15198	604	1162	1871	1445	3202	18	23500	44028
2030-31	16492	626	1223	1949	1521	3389	19	25219	46846
2031-32	17897	648	1286	2030	1601	3588	20	27070	49856
2032-33	19422	672	1353	2115	1685	3799	21	29067	53079
2033-34	21078	696	1423	2203	1774	4022	22	31218	56520
2034-35	22874	721	1497	2295	1867	4258	23	33535	60197
2035-36	24754	745	1574	2384	1959	4491	24	35931	63940
2036-37	26788	770	1655	2477	2055	4737	25	38507	67933
2037-38	28990	796	1740	2573	2157	4996	26	41278	72193
2038-39	31373	823	1830	2674	2264	5269	27	44260	76744
2039-40	33952	850	1925	2779	2376	5557	28	47467	81600
2040-41	36619	876	2019	2880	2485	5837	29	50745	86482
2041-42	39495	903	2117	2985	2598	6132	30	54260	91679
2042-43	42598	930	2220	3093	2717	6442	31	58031	97212
2043-44	45945	959	2329	3205	2841	6768	32	62079	103109
2044-45	49556	988	2442	3321	2970	7110	33	66420	109381

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 2- Yedeshi 77.400 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	5394	315	334	1044	862	1596	10	9555	19811
2025-26	5213	371	347	1357	1208	2770	15	11281	27038
2026-27	5667	384	365	1416	1275	2937	15	12059	28695

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2027-28	6157	398	384	1477	1345	3115	16	12892	30462
2028-29	6690	413	404	1540	1419	3304	17	13787	32343
2029-30	7269	428	425	1606	1496	3504	18	14746	34341
2030-31	7888	443	447	1673	1575	3709	19	15754	36414
2031-32	8559	458	471	1742	1659	3926	20	16835	38619
2032-33	9288	474	496	1814	1747	4156	21	17996	40967
2033-34	10079	491	521	1890	1840	4399	22	19242	43463
2034-35	10937	509	548	1968	1937	4656	23	20578	46115
2035-36	11836	526	576	2045	2033	4911	24	21951	48795
2036-37	12809	544	605	2124	2134	5180	25	23421	51637
2037-38	13862	562	636	2206	2240	5463	26	24995	54652
2038-39	15001	581	668	2292	2350	5762	27	26681	57853
2039-40	16234	600	703	2382	2466	6077	28	28490	61260
2040-41	17510	618	738	2468	2578	6384	29	30325	64648
2041-42	18885	637	774	2557	2697	6707	30	32287	68241
2042-43	20368	656	812	2649	2821	7045	31	34382	72040
2043-44	21967	676	851	2745	2950	7401	32	36622	76068
2044-45	23693	696	893	2844	3084	7775	33	39018	80336

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Solapur- Yedeshi project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup>October 2023

Target Traffic - 22210 in PCU

### *Pessimistic Case*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2023	22210	23652	6%	-5%	-5%	29	-1.4

PCUs as per Pessimistic cases have been considered for arriving at the concession Period end date.

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

As per the Toll Notification (Schedule -R) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

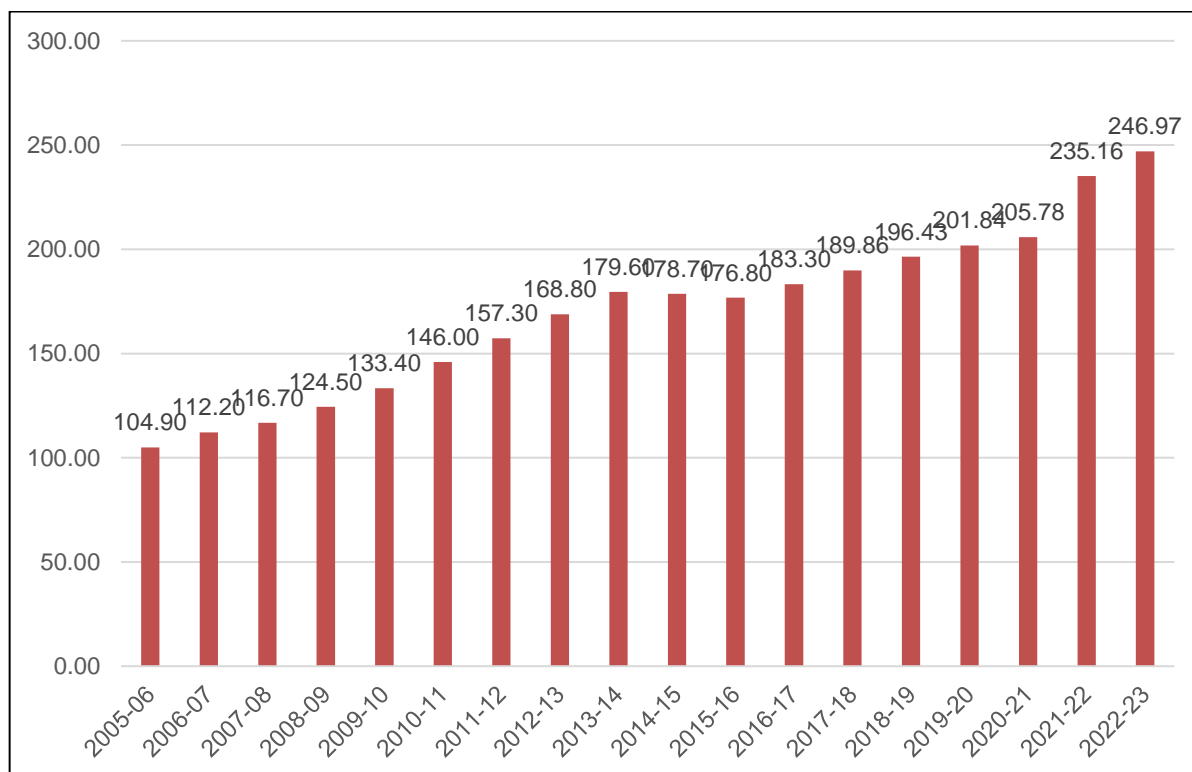
1. Monthly Pass: For frequent user's monthly pass would be issued for 50 trips at 2/3<sup>rd</sup> rate as per provision of fee notification.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car – Rs. 275 Per Month
  - b) Local Commercial Traffic at 50% rate for single trip.

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it takes 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey@ Toll Plaza 1- Tamalwadi 19.300 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	75	120	250	250	275	395	480
2025-26	80	125	265	265	290	415	505
2026-27	80	130	280	280	305	435	530
2027-28	85	140	290	290	320	455	555
2028-29	90	145	305	305	335	480	585
2029-30	95	155	320	320	350	505	615
2030-31	100	160	340	340	370	530	645
2031-32	105	170	355	355	390	560	680
2032-33	110	180	375	375	410	590	715
2033-34	115	190	395	395	430	620	755
2034-35	125	200	415	415	455	650	790
2035-36	130	210	435	435	475	685	835
2036-37	135	220	460	460	500	720	880
2037-38	145	230	485	485	530	760	925
2038-39	150	245	510	510	555	800	975
2039-40	160	255	535	535	585	845	1025
2040-41	165	270	565	565	620	890	1080
2041-42	175	285	595	595	650	935	1140
2042-43	185	300	630	630	685	985	1200
2043-44	195	315	665	665	725	1040	1265
2044-45	205	335	700	700	765	1095	1335

**Table 7-3 : Toll Rates for Single Journey @ Toll Plaza 2- Yedashi 77.400 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	75	120	250	250	275	395	480
2025-26	80	125	265	265	290	415	505
2026-27	80	135	280	280	305	435	530

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2027-28	85	140	290	290	320	460	560
2028-29	90	145	305	305	335	480	585
2029-30	95	155	325	325	350	505	615
2030-31	100	160	340	340	370	530	650
2031-32	105	170	355	355	390	560	680
2032-33	110	180	375	375	410	590	715
2033-34	115	190	395	395	430	620	755
2034-35	125	200	415	415	455	650	795
2035-36	130	210	435	435	475	685	835
2036-37	135	220	460	460	500	720	880
2037-38	145	230	485	485	530	760	925
2038-39	150	245	510	510	555	800	975
2039-40	160	255	540	540	585	845	1025
2040-41	165	270	565	565	620	890	1080
2041-42	175	285	595	595	650	935	1140
2042-43	185	300	630	630	685	985	1200
2043-44	195	315	665	665	725	1040	1265
2044-45	205	335	700	700	765	1100	1335

**Table 7-4 : Toll Rates for Return Journey@ Toll Plaza 1- Tamalwadi 19.300 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	110	180	375	375	410	590	720
2025-26	115	190	395	395	430	620	755
2026-27	125	200	415	415	455	655	795
2027-28	130	210	440	440	475	685	835
2028-29	135	220	460	460	500	720	880
2029-30	145	230	485	485	525	760	925
2030-31	150	245	510	510	555	795	970
2031-32	160	255	535	535	585	840	1020
2032-33	165	270	560	560	615	880	1075
2033-34	175	280	590	590	645	930	1130
2034-35	185	295	620	620	680	975	1190
2035-36	195	315	655	655	715	1025	1250
2036-37	205	330	690	690	750	1080	1315
2037-38	215	345	725	725	790	1140	1385
2038-39	225	365	765	765	835	1200	1460
2039-40	240	385	805	805	880	1265	1540
2040-41	250	405	850	850	925	1330	1620
2041-42	265	425	895	895	975	1405	1710
2042-43	280	450	945	945	1030	1480	1800
2043-44	295	475	995	995	1085	1560	1900
2044-45	310	500	1050	1050	1145	1645	2000

**Table 7-5 : Toll Rates for Return Journey @ Toll Plaza 2- Yedashi 77.400 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	110	180	380	380	410	590	720
2025-26	115	190	395	395	435	620	760
2026-27	125	200	415	415	455	655	795
2027-28	130	210	440	440	480	685	835
2028-29	135	220	460	460	500	720	880
2029-30	145	230	485	485	530	760	925
2030-31	150	245	510	510	555	800	970
2031-32	160	255	535	535	585	840	1020
2032-33	165	270	565	565	615	885	1075
2033-34	175	285	590	590	645	930	1130
2034-35	185	295	625	625	680	975	1190
2035-36	195	315	655	655	715	1030	1250
2036-37	205	330	690	690	755	1085	1320
2037-38	215	345	725	725	795	1140	1390
2038-39	225	365	765	765	835	1200	1460
2039-40	240	385	805	805	880	1265	1540
2040-41	250	405	850	850	925	1335	1625
2041-42	265	430	895	895	975	1405	1710
2042-43	280	450	945	945	1030	1480	1805
2043-44	295	475	995	995	1085	1560	1900
2044-45	310	500	1050	1050	1145	1645	2005

**Table 7-6 : Toll Rates for Monthly Pass Local @ Toll Plaza 1- Tamalwadi 19.300 KM**

Year	Car
2024-25	340
2025-26	355
2026-27	375
2027-28	390
2028-29	410
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	585
2036-37	620
2037-38	650
2038-39	685
2039-40	720
2040-41	760
2041-42	800
2042-43	845

Year	Car
2043-44	890
2044-45	940

**Table 7-7 : Toll Rates for Monthly Pass Local @ Toll Plaza 2- Yedashi 77.400 KM**

Year	Car
2024-25	340
2025-26	355
2026-27	375
2027-28	390
2028-29	410
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	585
2036-37	620
2037-38	650
2038-39	685
2039-40	720
2040-41	760
2041-42	800
2042-43	845
2043-44	890
2044-45	940

**Table 7-8 : Toll Rates for Monthly Pass @ Toll Plaza 1- Tamalwadi 19.300 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	2480	4000	8385	8385	9150	13150	16010
2025-26	2600	4205	8810	8810	9610	13810	16815
2026-27	2735	4415	9255	9255	10095	14510	17665
2027-28	2875	4640	9725	9725	10605	15245	18560
2028-29	3020	4875	10220	10220	11150	16025	19510
2029-30	3175	5125	10740	10740	11720	16845	20505
2030-31	3335	5390	11295	11295	12320	17710	21560
2031-32	3510	5670	11875	11875	12955	18625	22675
2032-33	3690	5965	12495	12495	13630	19590	23850
2033-34	3885	6275	13145	13145	14340	20615	25095
2034-35	4085	6600	13830	13830	15090	21690	26405
2035-36	4300	6950	14560	14560	15885	22830	27795
2036-37	4530	7315	15330	15330	16720	24035	29265
2037-38	4770	7705	16140	16140	17610	25310	30815
2038-39	5025	8115	17000	17000	18545	26660	32455

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2039-40	5290	8545	17910	17910	19535	28085	34190
2040-41	5575	9005	18870	18870	20585	29590	36025
2041-42	5875	9490	19885	19885	21695	31185	37965
2042-43	6195	10005	20960	20960	22870	32875	40020
2043-44	6530	10550	22100	22100	24110	34655	42190
2044-45	6885	11125	23305	23305	25425	36545	44490

**Table 7-9 : Toll Rates for Monthly Pass @ Toll Plaza 2- Yedashi77.400 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	2480	4005	8395	8395	9160	13165	16030
2025-26	2605	4210	8820	8820	9620	13830	16835
2026-27	2735	4420	9265	9265	10105	14530	17685
2027-28	2875	4645	9735	9735	10620	15265	18585
2028-29	3025	4885	10230	10230	11160	16045	19535
2029-30	3180	5135	10755	10755	11735	16865	20535
2030-31	3340	5395	11310	11310	12335	17735	21590
2031-32	3515	5675	11890	11890	12975	18650	22705
2032-33	3695	5970	12510	12510	13645	19615	23880
2033-34	3890	6280	13160	13160	14355	20640	25125
2034-35	4090	6610	13850	13850	15110	21720	26440
2035-36	4305	6960	14580	14580	15905	22860	27830
2036-37	4535	7325	15345	15345	16740	24065	29300
2037-38	4775	7715	16160	16160	17630	25345	30850
2038-39	5030	8125	17020	17020	18570	26690	32495
2039-40	5300	8560	17930	17930	19560	28120	34230
2040-41	5580	9015	18895	18895	20610	29630	36070
2041-42	5885	9505	19910	19910	21720	31225	38015
2042-43	6200	10015	20990	20990	22895	32915	40070
2043-44	6540	10560	22130	22130	24140	34700	42245
2044-45	6895	11135	23335	23335	25455	36590	44545

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2045-46 starting from the year 2024-25 are shown in tables below.

**Table 7-10 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

<b>Year</b>	<b>Toll Plaza Km 19.300</b>	<b>Toll Plaza Km 77.400</b>	<b>Total</b>
<b>2024-25</b>	76.94	56.85	<b>133.80</b>
<b>2025-26</b>	99.26	84.26	<b>183.52</b>
<b>2026-27</b>	110.86	93.86	<b>204.72</b>
<b>2027-28</b>	124.24	105.28	<b>229.52</b>
<b>2028-29</b>	138.82	116.78	<b>255.61</b>
<b>2029-30</b>	156.24	131.03	<b>287.27</b>
<b>2030-31</b>	174.76	145.97	<b>320.72</b>
<b>2031-32</b>	196.92	163.85	<b>360.77</b>
<b>2032-33</b>	219.43	182.50	<b>401.93</b>
<b>2033-34</b>	245.97	203.74	<b>449.70</b>
<b>2034-35</b>	277.31	228.46	<b>505.78</b>
<b>2035-36</b>	310.52	254.83	<b>565.35</b>
<b>2036-37</b>	345.71	282.83	<b>628.55</b>
<b>2037-38</b>	388.81	316.93	<b>705.74</b>
<b>2038-39</b>	433.56	352.44	<b>786.00</b>
<b>2039-40</b>	489.67	396.35	<b>886.02</b>
<b>2040-41</b>	542.83	438.20	<b>981.03</b>

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2041-42	607.38	487.52	1094.90
2042-43	680.22	543.54	1223.77
2043-44	763.65	607.94	1371.60
2044-45	851.12	676.22	1527.34

**Table 7-11 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2024-25	76.94	56.85	133.80
2025-26	99.19	84.21	183.40
2026-27	110.27	93.38	203.64
2027-28	122.99	104.24	227.23
2028-29	136.77	115.11	251.88
2029-30	153.19	128.56	281.75
2030-31	170.51	142.56	313.08
2031-32	191.22	159.27	350.49
2032-33	212.11	176.53	388.64
2033-34	236.65	196.12	432.76
2034-35	265.58	218.91	484.49
2035-36	295.99	243.02	539.01
2036-37	327.99	268.51	596.51
2037-38	367.14	299.43	666.57
2038-39	407.48	331.40	738.89
2039-40	458.08	370.96	829.04
2040-41	505.38	408.19	913.57
2041-42	562.79	451.94	1014.73

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2042-43	627.33	501.48	1128.81
2043-44	701.00	558.27	1259.28
2044-45	777.54	618.07	1395.61

**Table 7-12 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2024-25	76.94	56.85	133.80
2025-26	99.22	84.23	183.46
2026-27	110.58	93.62	204.20
2027-28	123.60	104.77	228.37
2028-29	137.77	115.98	253.75
2029-30	154.65	129.82	284.48
2030-31	172.55	144.29	316.84
2031-32	193.95	161.61	355.56
2032-33	215.63	179.58	395.21
2033-34	241.18	200.02	441.20
2034-35	271.29	223.77	495.06
2035-36	303.02	249.04	552.06
2036-37	336.60	275.81	612.41
2037-38	377.62	308.28	685.90
2038-39	420.11	341.95	762.06
2039-40	473.37	383.72	857.08
2040-41	523.50	423.23	946.73
2041-42	584.31	469.76	1054.08
2042-43	652.91	522.49	1175.40
2043-44	731.26	583.03	1314.29
2044-45	813.03	647.05	1460.08

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Solapur to Yedashi section of NH-211 in state of Karnataka from km 0.000 to km 100.000 has been widened to four lane. The road is in sound condition and serves healthy traffic volumes. Project corridor is the main transport link for Karnataka-Marathwada traffic. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As Indian economy is poised to grow at 6%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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**UDAIPUR TO GUJARAT BORDER ON NH 8**  
**(KM 287.400 TO KM 401.200)**  
**IN THE STATE OF RAJASTHAN**



**OCTOBER 2024**



**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**



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**UDAIPUR TO GUJARAT BORDER SECTION OF NH-8**  
**(KM 287.400 TO 401.200)**  
**IN THE STATE OF RAJASTHAN**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

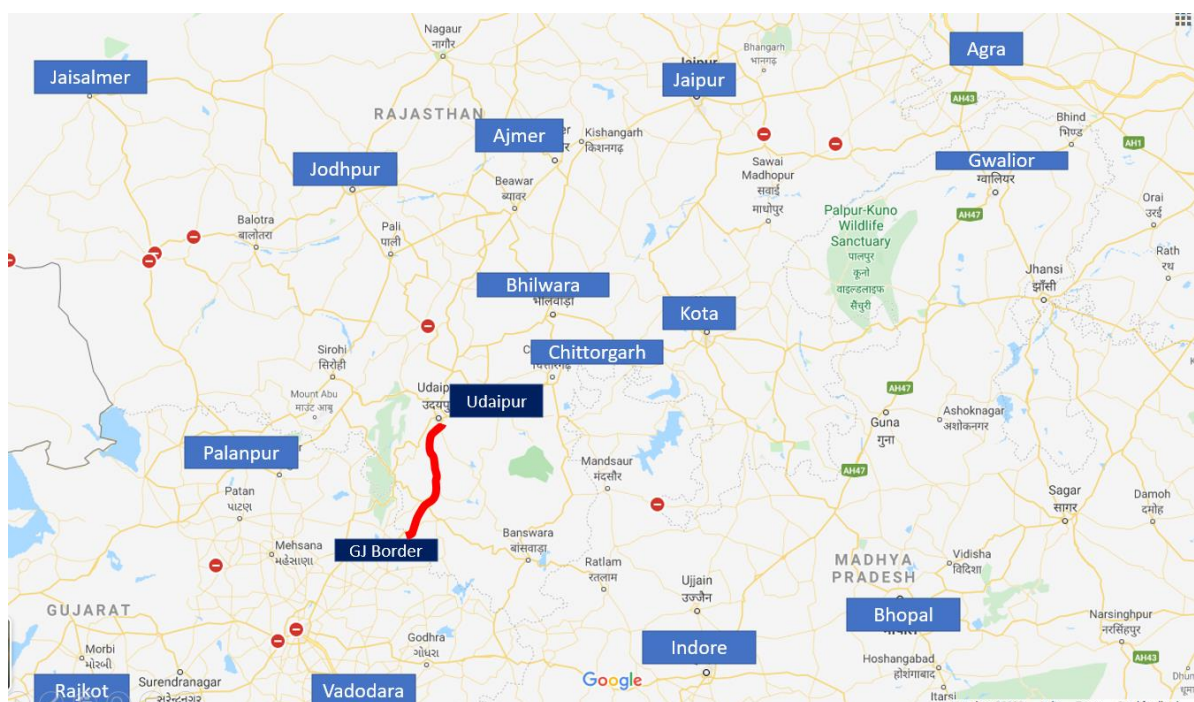
### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, Six Laning of section from Km 287.400 to Km 401.200 of NH-8 in state of Rajasthan and Gujarat is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s Udaipur Tollway Ltd.* (Concessionaire) has been awarded the Project for a concession period of 21 years starting from 3<sup>rd</sup> September 2017. The Project has been commissioned and is currently in the operation / maintenance phase. Six laning of project has also been completed in June 2021.

The length of the project road is 114.00 Km approx. The project road is section of NH-8, one of the busiest national highways of India and part of Mumbai – Delhi arm of golden quadrilateral.

Project road alignment passes through the rural area in most part of stretch. After Udaipur there is no major urban establishment other than Rishabhdeo, a famous religious place in the region. The following figure shows project road in regional context.



**Figure 1-1 : Alignment of Project Stretch**

## 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

National Highway 8 is one of the busiest national highways of India. Project stretch from Udaipur to Gujarat border on NH-8 is part of Delhi Mumbai arm of Golden quadrilateral.

Besides being part of major transport link between Mumbai and Delhi, stretching from Udaipur to Shamlaji forms major connectivity between Udaipur, Ahmedabad, Rajkot Jamnagar and Porbandar. After renumbering of all national highways by National Highway Authority of India in 2010, the current NH 48 was formed by merging the old NH 8 (Delhi-Mumbai section) and NH 4 (Mumbai-Chennai). National Highway 48 starts at Delhi and terminates at Chennai and goes through Jaipur, Udaipur, Vadodara, Mumbai, Pune and Bengaluru, traversing through six states of India.

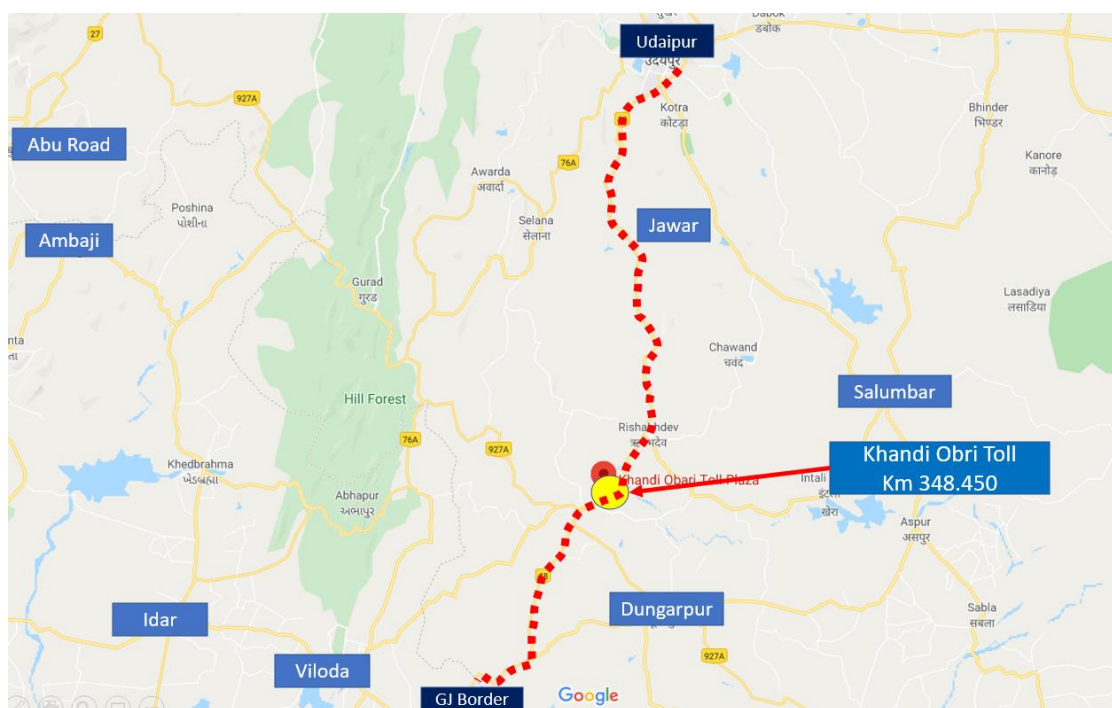
#### 2.2 Project Stretch Description

Section of NH-8 (New NH-48) from Udaipur to Gujarat Border is part of major transportation link in the area connecting industrial / tourist cities of Udaipur-, Ahmedabad, Vadodara, Mumbai. Project stretch would be faster connectivity to Udaipur from Gujarat border and onwards to Ahmedabad once six laning is complete.

Project stretch from Udaipur to Gujarat border as such passes through rural areas. The area has a number of green marble mines and there are many establishments on the way. Rishabhdeo in one such area having more than 500 such units.

Major religious centers like Shamlaji and Ekling ji contribute to substantial passenger traffic on project stretch.

There is one operative toll plaza at project stretch at Khandi Obri at km 348.450. The following figure shows project alignment and toll plaza location.



**Figure 2-1 : Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

The sixth laning of the project stretch is completely underway and is expected to be completed soon. The following photographs illustrate the project section along the corridor.



**Figure 2-2 : Photographs showing Project Corridor**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza location on Udaipur – Gujarat section of NH-8 for year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. No	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 348.450 Toll Plaza at Khandi Obri	AADT for Year 2017-18, 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to	For Year 2017-18, 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023	For Year 2017-18, 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April	For Year 2017-18, 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023	For Year 2017-18, 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April

SR. No	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		November 2023 & Four month from April 2024 to July 2024	to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024	to November 2023 & Four month from April 2024 to July 2024	2023 to November 2023 & Four month from April 2024 to July 2024

### 3.2 Classified traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Truck / Bus
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the year 2024-2025( traffic data from April 2024 to July 2024).

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Khandi Obri Toll Plaza at Km 348.450**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	4532	3574	4773	5335	6220	6841
2	LCV	934	737	619	672	777	834
3	Bus	800	472	661	781	894	832
4	Truck	1448	1402	1703	1864	2213	2428
5	3-Axle	1806	1548	1691	1724	1934	1849
6	Multi Axle	3717	3367	3887	4157	4868	5027

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
7	Oversized Vehicle	11	13	21	13	13	9
	<b>Total</b>	<b>13248</b>	<b>11113</b>	<b>13355</b>	<b>14545</b>	<b>16919</b>	<b>17820</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-4**.

**Table 3-4 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

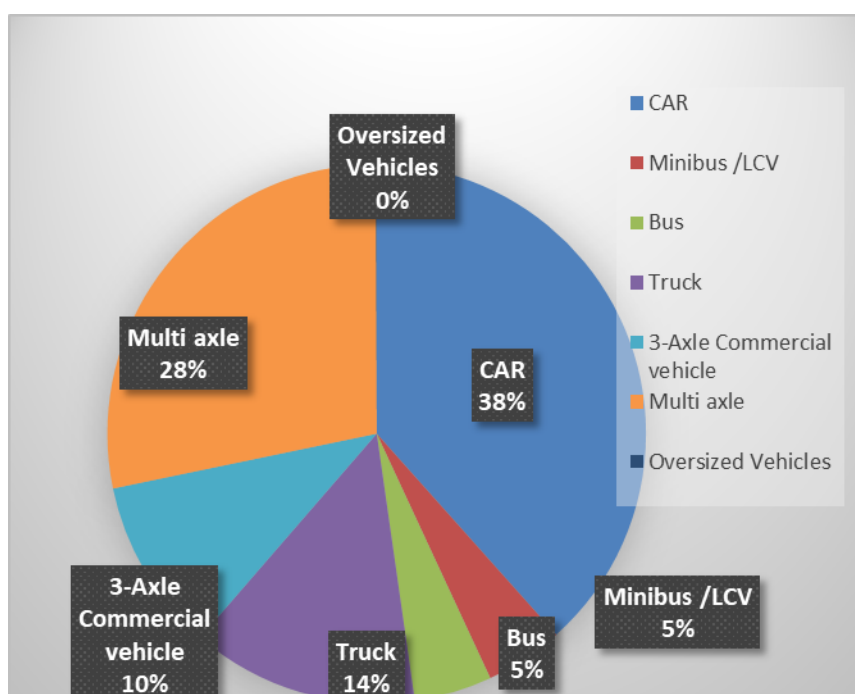
**Table 3-5 : Traffic in PCU at Project Stretch Base Year 2023-24**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2019-20	Khandi Obri at Km 348.450	13248	34871	2.63
2020-21	Khandi Obri at Km 348.450	11113	30155	2.71
2021-22	Khandi Obri at Km 348.450	13355	35453	2.65
2022-23	Khandi Obri at Km 348.450	14545	38213	2.63
2023-24	Khandi Obri at Km 348.450	16919	44472	2.63
2024-25	Khandi Obri at Km 348.450	17820	46081	2.59

It can be observed from above that project traffic has PCU index more than 2.5 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



### Figure 3-1 : Model Split of Tollable Vehicle

It is observed that car traffic forms about 38% of total traffic at toll plaza locations while multi axle commercial vehicles are about 38% of total traffic. Truck /Bus and LCV share about 18% and 5 % of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-6 : Journey Type Bifurcation of Traffic at Khandi Obri TP KM 348.450**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	14312
2	Return Journey	3280
3	Local Commercial Single Journey	155
4	Monthly Pass Local	73
5	Monthly Pass	0

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 80%. Return journey component is 18%. The number of monthly pass Local is 0% and Local Commercial Single journey is 1% at Khandi Obri toll plaza.

It is observed that the project corridor demonstrates pattern of single journey dominated mix of traffic which is typical of major national highways having more long-distance traffic.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor

- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

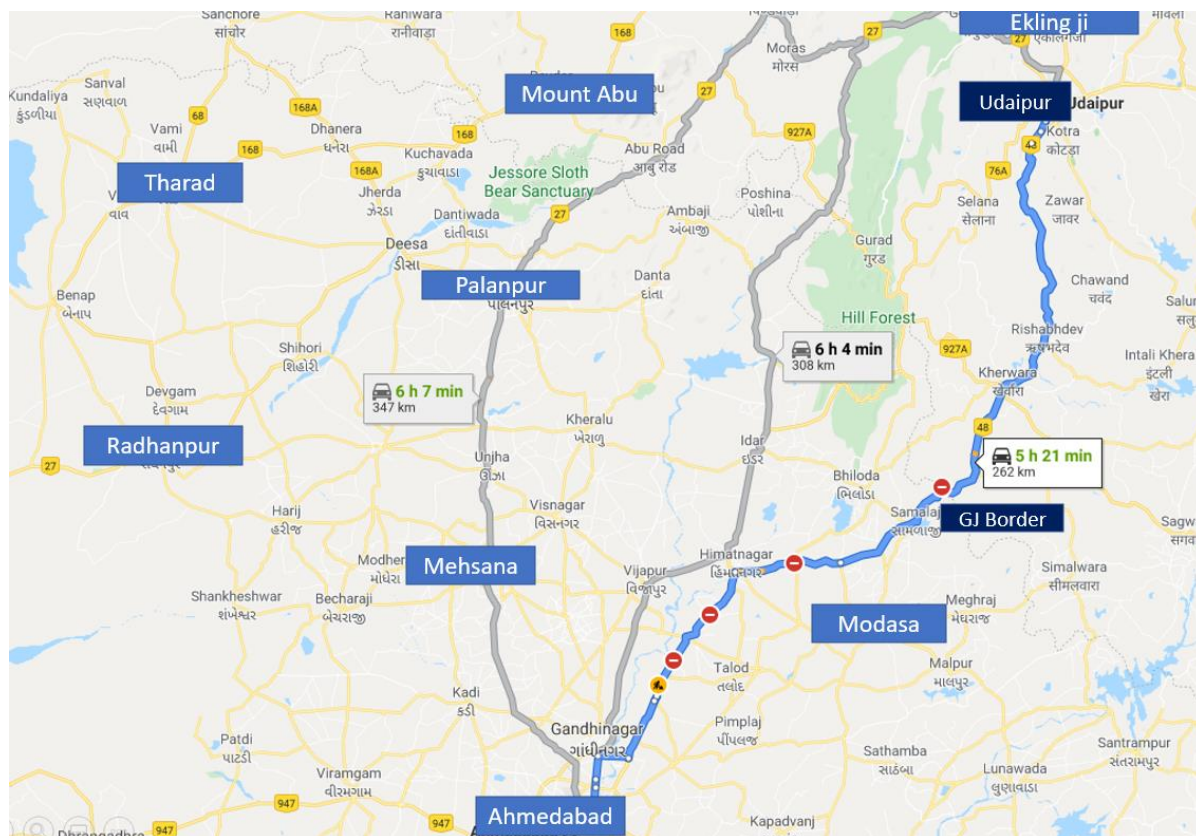
- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

Project stretch is part of Delhi – Mumbai arm of golden quadrilateral transport network. Additionally, it also forms good connectivity to Ahmedabad, Rajkot, Jamnagar and other port and industrial establishments in bay of Khambat of Gujarat.

At regional level, there can be three alternates for Udaipur- Ahmedabad pair of Origin & Destination. One via project road (Udaipur – Rishabhdeo- Shamlaji- Ahmedabad), second on east side (via Himmatnagar) and third on far east side via Palanpur- Mehsana.

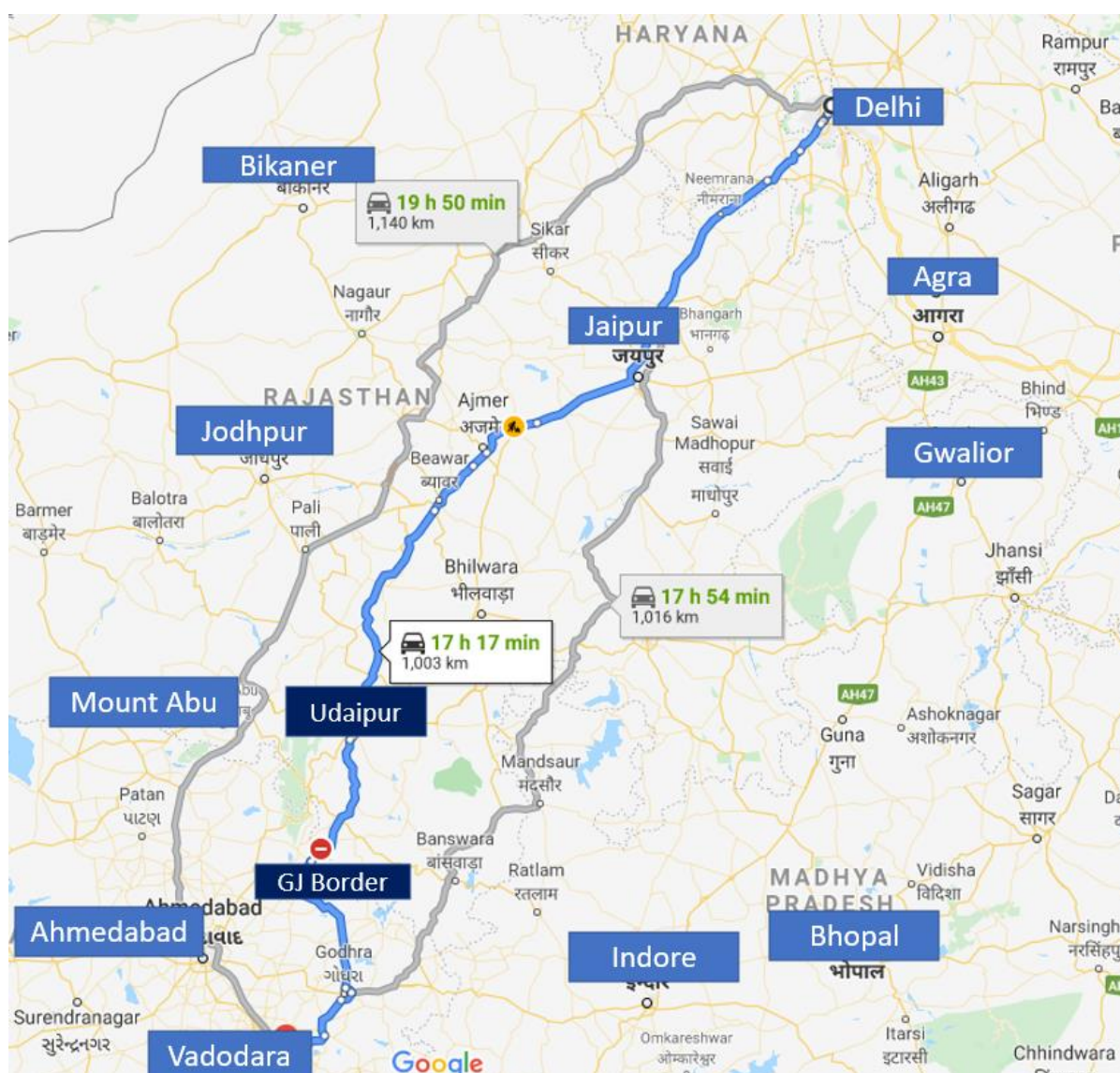
The following maps show these routes in relation to project stretch at regional level.



**Figure 4-1 : Alternate route at regional level Udaipur - Ahmedabad**

The route via project road is the most preferred one due to minimum travel time and shortest length.

On a high level, between Delhi and Vadodara, there can be three alternatives. One via project road (Delhi- Jaipur- Udaipur- Shamlaji -Vadodara), second via Delhi-Sikar-Ahmedabad- Vadodara) and third via Delhi- Jaipur- Mandsaur – Banswara- Godhra- Vadodara. The following map shows these alignments.



**Figure 4-2 : Alternate route at regional level Delhi - Vadodara**

For Delhi- Vadodara pair of origin and destination, route via project road (Udaipur – Shamlaji) is most preferred one due to minimum travel time and length of route.

Thus, at regional level project road is preferred route of long-distance traffic between Mumbai- Delhi and Udaipur- Ahmedabad. Project road is under toll operation since long hence traffic on project road is now settled and it can be assumed as dedicated traffic on project road for logistic obligations.

After six laning completion, the project stretch would become slightly more attractive due to the improved level of service. In such a case any further diversion of traffic from the project road is not envisaged. It is expected that there could be some attracted traffic on the project road after completion of the six laning of Kishangarh Gulabpura stretch which is connecting section for project corridor.

At the local level there is no potential alternate route to bypass the toll plaza.

The following table provides summary of analysis of alternate route/ roads discussed above.

**Table 4-1 : Competing Roads Details**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
<b>Regional Level</b>						
1	Udaipur- Palanpur -Mehsana- Ahmedabad	Alternate Route	347	64	6 Hr 7 Min	Project road alternate has minimum travel time and shortest road
	Udaipur- Idar - Himmatnagar- Ahmedabad	Alternate Route	308	50	6 Hr 8 Min	
	Udaipur- Rishabhdeo- Shamlaji- Ahmedabad	Project Road	262	49	5 Hr 21 Min	
2	Delhi- Jaipur- Mandsaur - Banswara- Vadodara	Alternate Route	1140	57	19 Hr 50 Min	Project road alternate has minimum travel time and shortest road
	Delhi- Sikar- Mt. Abu - Ahmedabad- Vadodara	Alternate Route	1016	57	17 Hr 54 Min	
	Delhi- Jaipur- Udaipur - Vadodara	Project Road	1003	58	17 Hr 54 Min	

Under these circumstances it is not envisaged that commercial or passenger traffic would switch to alternate roads from the project road. Further, it may be noted that since the project highway has already been commissioned and has a tolling history, the current traffic traversing the project corridor already factors in traffic diversion (if any) that may have taken place. Further after completion of six laning, level of service would improve on project corridor, and this would create favorable conditions for traffic.

## CHAPTER 5

# GROWTH OF TRAFFIC ON PROJECT HIGHWAY

### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Udaipur to Gujarat Border section of NH-8 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

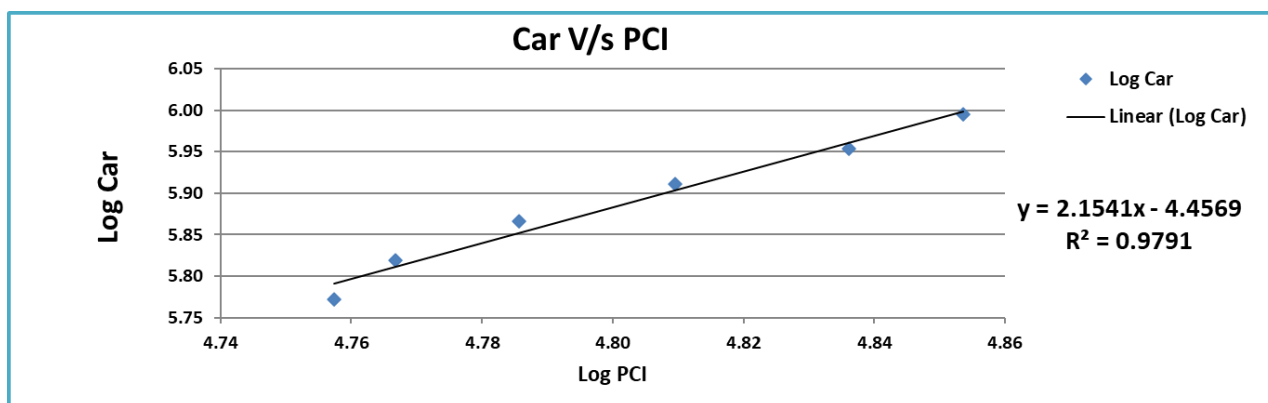
The project corridor spreads across the state of Rajasthan. Toll plazas at Khondi Obri is in the state of Rajasthan but the traffic on project stretch has certain contribution from other states as well. For elasticity calculations, working data from such states in addition to Rajasthan has been analyzed.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-1 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	57192	591069	4.76	5.77		
2013	58441	659542	4.77	5.82	2%	
2014	61053	733916	4.79	5.87	4%	
2015	64496	814079	4.81	5.91	6%	
2016	68565	899307	4.84	5.95	6%	
2017	71394	988391	4.85	5.99	4%	4.55%

Regression analysis of same is given in figure below.

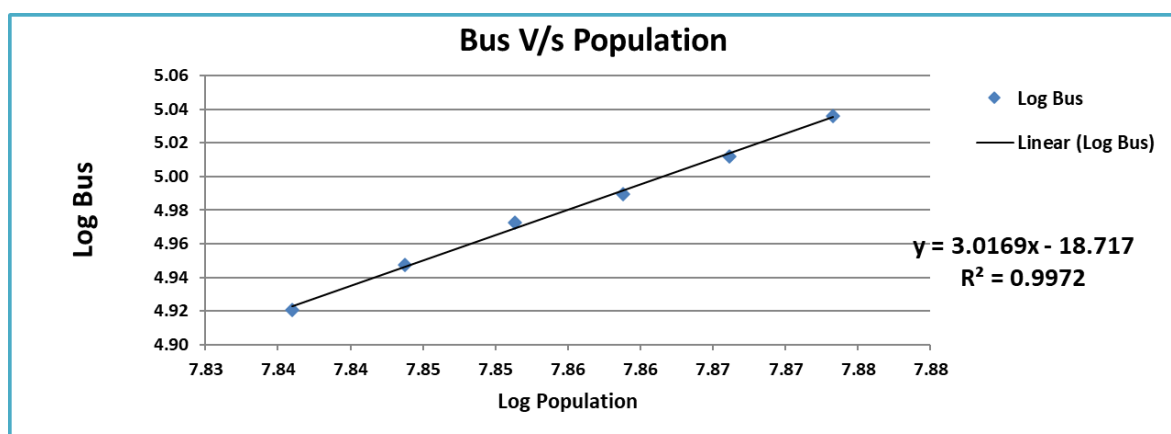


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**

**Table 5-2 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	68548437	83345	7.84	4.92		
2013	69783885	88616	7.84	4.95	2%	
2014	71016445	93892	7.85	4.97	2%	
2015	72245688	97650	7.86	4.99	2%	
2016	73471198	102818	7.87	5.01	2%	
2017	74692571	108680	7.87	5.04	2%	1.73%

Regression analysis of same is given in figure below.



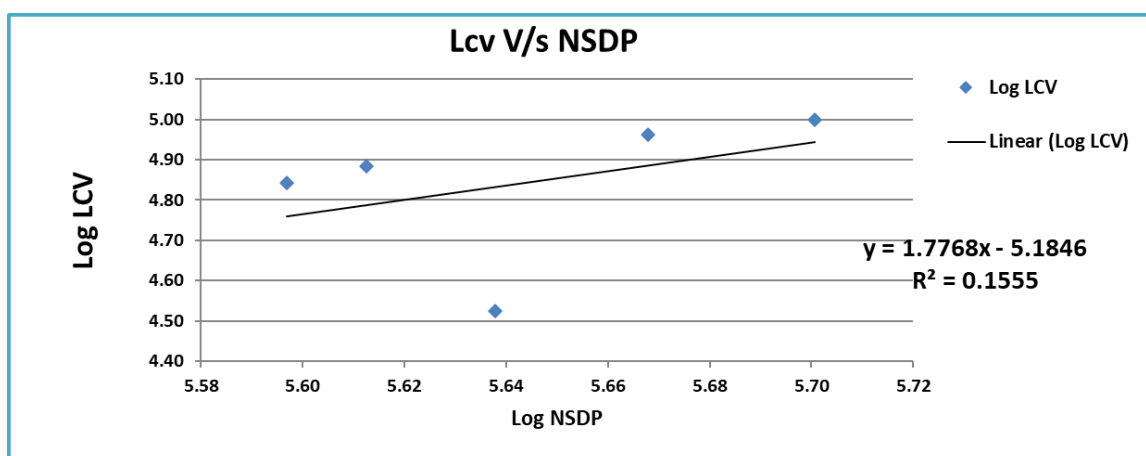
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

Elasticity of LCV has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-3 : LCV Vs NSDP Rajasthan**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth
2012	395331	69509	5.60	4.84		
2013	409802	76396	5.61	4.88	4%	
2014	434292	33379	5.64	4.52	6%	
2015	465408	91787	5.67	4.96	7%	
2016	501922	99763	5.70	5.00	8%	6.16%

The following figure depicts regression analysis and extrapolation.

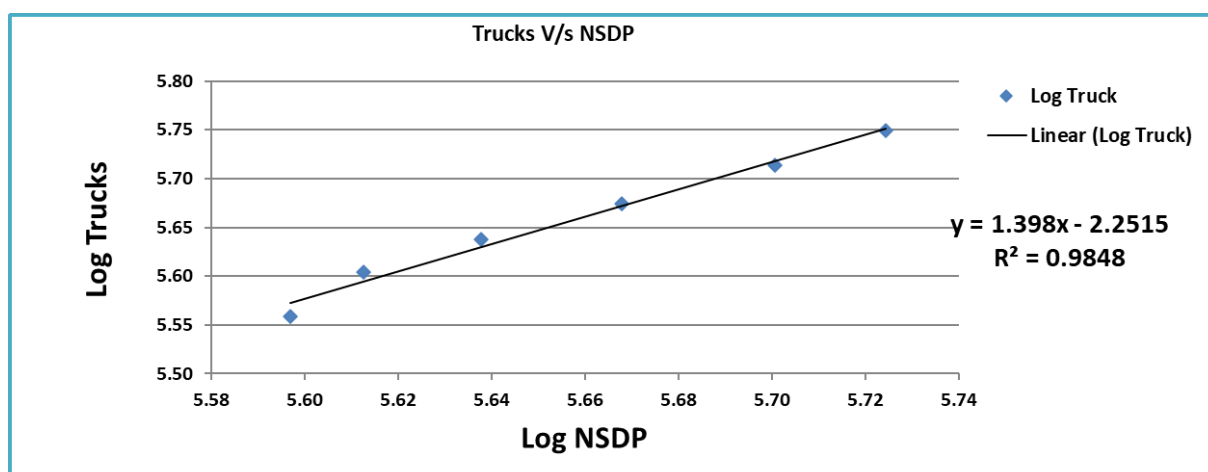
**Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.**

Elasticity of Goods Traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-4 : GOODS Traffic Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth
2012	395331	362028	5.60	5.56		
2013	409802	401983	5.61	5.60	4%	
2014	434292	434379	5.64	5.64	6%	
2015	465408	472365	5.67	5.67	7%	
2016	501922	517604	5.70	5.71	8%	
2017	530172	561158	5.72	5.75	6%	6.06%

Following figure depict regression analysis and extrapolation.



**Figure 5-4 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Rajasthan.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-5 : Summary Regression Analysis Rajasthan**

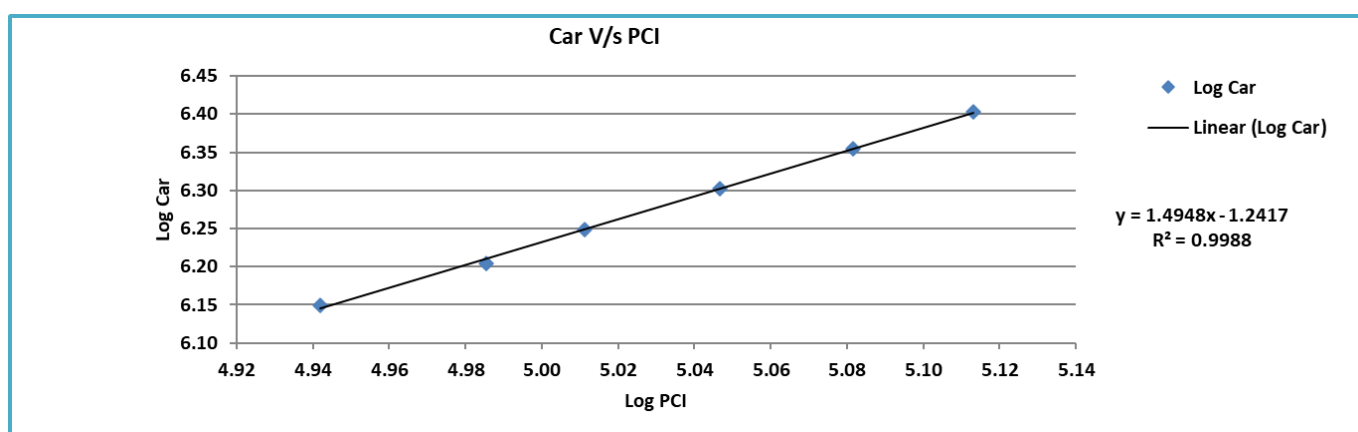
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Rajasthan	Car/Jeep	PCI	$y = 2.1541x - 4.4569$	$R^2 = 0.9791$	2.1541	4.55%	9.79%	Good Regression
	Bus	Population	$y = 3.0169x - 18.7174$	$R^2 = 0.9972$	3.0169	1.73%	5.22%	Good Regression
	LCV	NSDP	$y = 1.7768x - 5.1846$	$R^2 = 0.1555$	1.7768	6.16%	10.95%	Poor Regression
	Truck	NSDP	$y = 1.398x - 2.2515$	$R^2 = 0.9848$	1.3980	6.06%	8.46%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-6 : Per Capita Income Vs Car Gujarat**

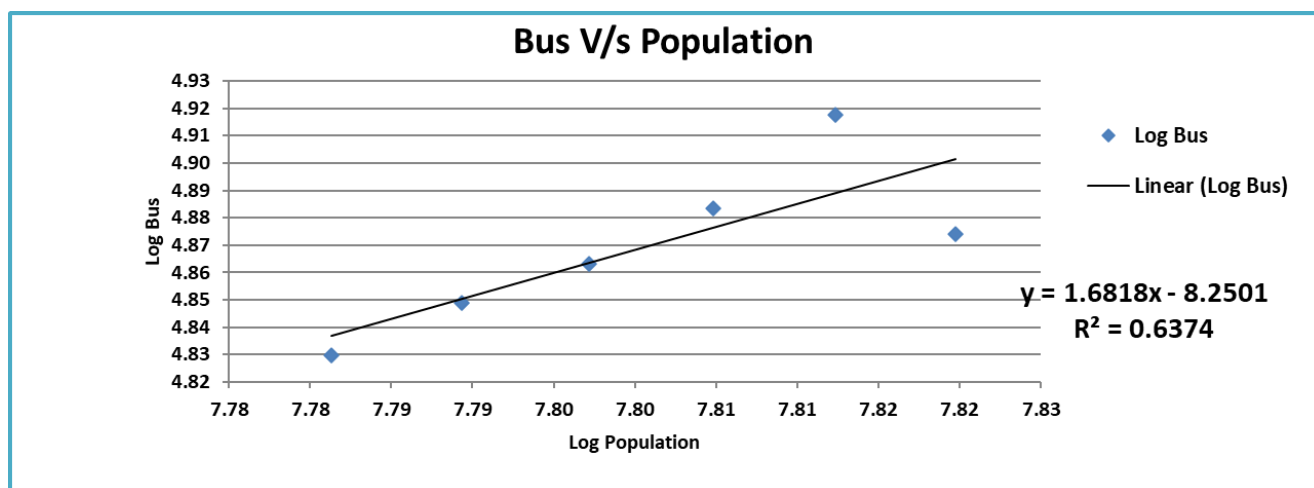
Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	87481	1411898	4.94	6.15		
2013	96683	1602129	4.99	6.20	11%	
2014	102589	1771298	5.01	6.25	6%	
2015	111370	2008748	5.05	6.30	9%	
2016	120683	2260084	5.08	6.35	8%	
2017	129738	2527537	5.11	6.40	8%	8.21%

Regression analysis of same is given in figure below.

**Figure 5-5 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat****Table 5-7 : Population Vs Bus Gujarat**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	60439692	67546	7.78	4.83		
2013	61563037	70615	7.79	4.85	2%	
2014	62684375	72998	7.80	4.86	2%	
2015	63803304	76435	7.80	4.88	2%	
2016	64919427	82734	7.81	4.92	2%	
2017	66032362	74855	7.82	4.87	2%	1.79%

Regression analysis of same is given in figure below.



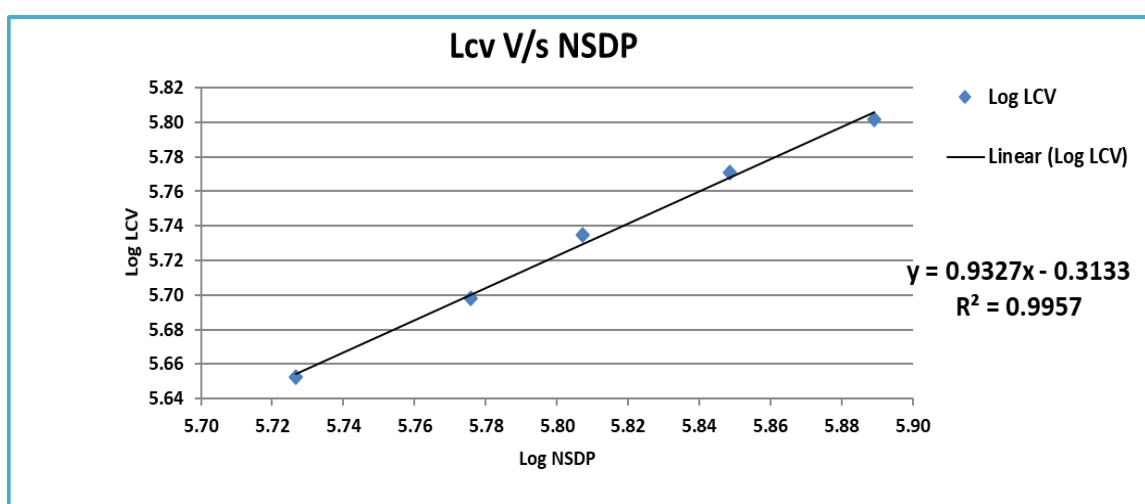
**Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat**

Elasticity of LCV has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-8 : LCV Vs NSDP Gujarat**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	532809	448958	5.73	5.65		
2013	596659	499277	5.78	5.70	12%	
2014	641489	542918	5.81	5.73	8%	
2015	705629	589984	5.85	5.77	10%	
2016	774775	633599	5.89	5.80	10%	9.82%

The following figure depicts regression analysis and extrapolation.



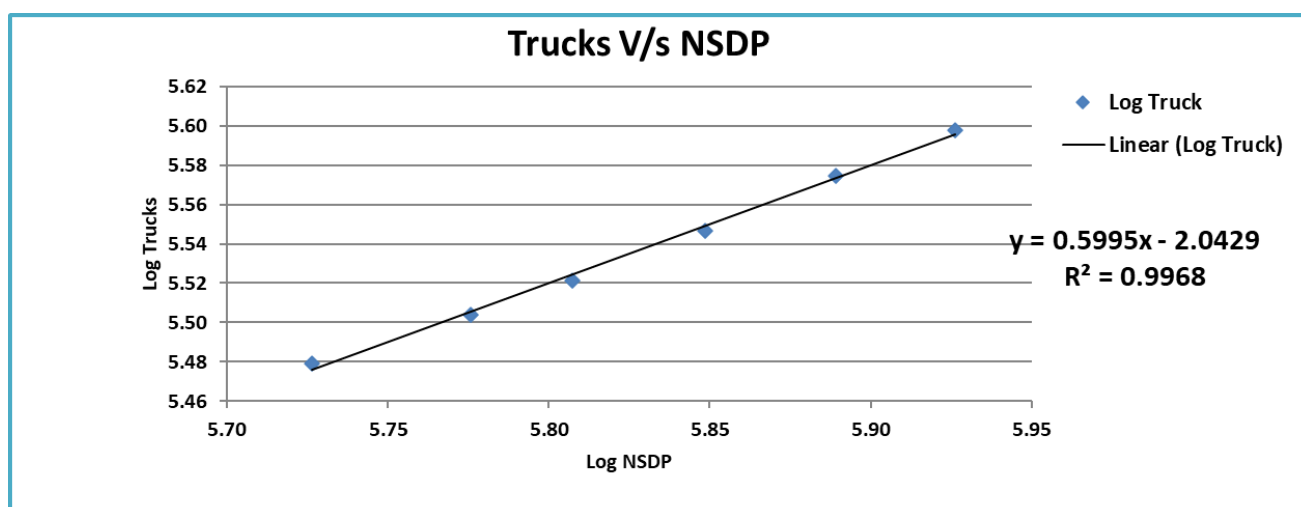
**Figure 5-7 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Gujarat.**

Elasticity of Goods Traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-9 : GOODS Traffic Vs NSDP Gujarat**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	532809	301533	5.73	5.48		
2013	596659	319207	5.78	5.50	12%	
2014	641489	332185	5.81	5.52	8%	
2015	705629	352225	5.85	5.55	10%	
2016	774775	375265	5.89	5.57	10%	
2017	843930	396061	5.93	5.60	9%	9.64%

The following figure depicts regression analysis and extrapolation.



**Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Gujarat.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-10 : Summary Regression Analysis Gujarat**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Gujarat	Car/Jeep	PCI	$y = 1.4948x - 1.2417$	$R^2 = 0.9988$	1.4948	8.21%	12.27%	Good Regression
	Bus	Population	$y = 1.6818x - 8.2501$	$R^2 = 0.6374$	1.6818	1.79%	3.00%	Fair Regression
	LCV	NSDP	$y = 0.9327x - 0.3133$	$R^2 = 0.9957$	0.9327	9.82%	9.16%	Good Regression
	Truck	NSDP	$y = 0.5995x - 2.0429$	$R^2 = 0.9968$	0.5995	9.64%	5.78%	Good Regression

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Udaipur to Gujarat on NH-8 is under tolling operation with current concessionaire and has three year of tolling history from 2017-18 (Part year). As traffic data available with the project concessionaire is of less than three years, we do not have sufficient data points to be able to establish a reliable past trend of traffic growth. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

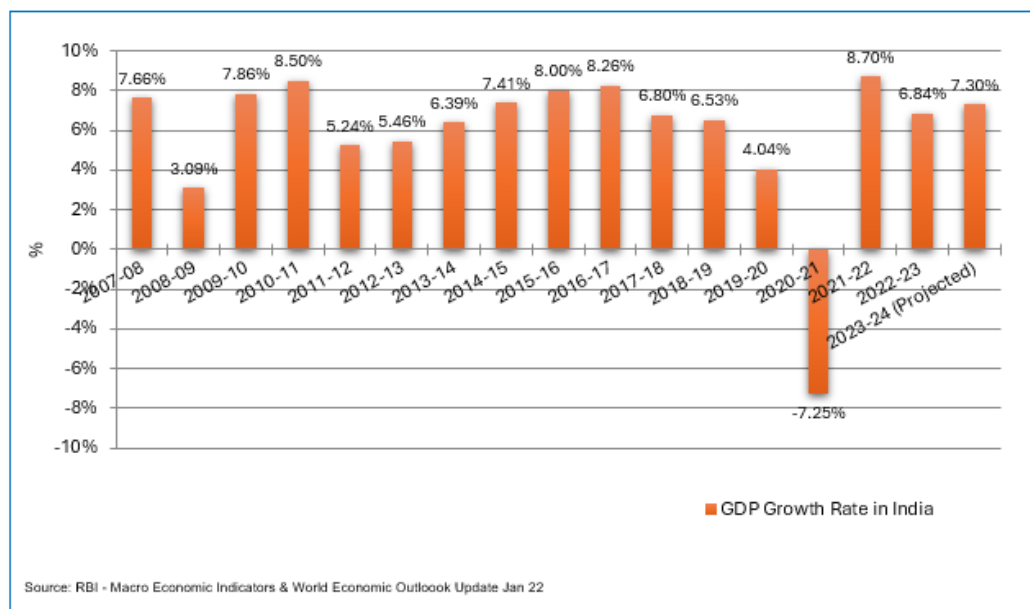
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-9 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

Project stretch passes through mineral rich belt of marble and minerals.

Tourism, agriculture, and mineral industries contribute to Udaipur's diverse economic base. Udaipur sees major tourist footfall throughout the year owing to its picturesque landscape, lakes, and historic palaces and architecture. Shamlaji is a major Hindu pilgrimage dedicated to God Vishnu. Each year an annual fair is held in October which attracts huge crowds from the surrounding region. Udaipur district is rich in lead, zinc, silver, phosphate, calcite, copper and limestone minerals. Udaipur is known for its marble which is mined, processed, and exported across the world. Nathdwara in the north of asset is one of biggest extractors of marble and limestone minerals. Hindustran Zinc, which is the world's second largest zinc producer, is based out of Udaipur.

Rishabhdeo is one of the major religious and industrial settlement on project corridor. This region has more than 200 mines of green marble. Rishabhdeo is the largest miner of green

marble.90 per-cent of green marble in the world is produced in Rishabhdev. The turnover of marble industry is more than 500 crores. It also gives employment to many labourers. Beyond this the town also has spinning and weaving mill by Injbhilwara group. Thus, it gives employment to 10000 local workers. The presence of temple also leads to income of many people.

The growth of Rajasthan has been comparable to the national average economic growth. Rajasthan is rich in natural resources and benefits from its strategic geographic location in India. The state is pre-eminent in quarrying, mining in India and has been a leader in crude oil extraction over the past the few years. Moreover, Rajasthan is also a relevant tourism attractor in India. Considering the scenario, it may be assumed that the traffic growth on the project highway would remain high and there are minimal risks in terms of growth.

**Table 5-11 : GDP of India, Rajasthan and other important states**

Year	India (GDP)	Bihar	Haryana	Madhya Pradesh	Maharashtra	Odisha	Punjab	Rajasthan	Uttar Pradesh	Uttarakhand	West Bengal	Delhi
1980-81	12336	514	357	623	1464	529	504	560	1631	138	830	269
1981-82	13030	543	371	639	1498	528	551	607	1670	141	808	291
1982-83	13411	548	394	668	1556	497	568	620	1800	152	840	328
1983-84	14464	601	402	702	1654	597	578	761	1871	158	939	320
1984-85	15037	658	418	668	1675	569	623	706	1900	161	964	333
1985-86	15663	672	493	726	1807	635	670	704	1975	167	1005	386
1986-87	16339	725	493	694	1832	643	694	771	2060	174	1045	411
1987-88	16917	685	484	789	1955	623	730	718	2154	182	1101	447
1988-89	18635	772	602	847	2159	754	769	1014	2434	206	1148	486
1989-90	19778	759	610	865	2515	805	834	993	2502	212	1188	531
1990-91	20824	831	674	987	2629	668	849	1149	2651	224	1251	553
1991-92	21122	784	688	916	2620	753	888	1061	2662	225	1349	638
1992-93	22254	737	688	983	3017	740	930	1220	2690	228	1389	660
1993-94	23519	755	719	1088	3349	788	970	1121	2757	233	1490	705
1994-95	25023	842	771	1107	3414	826	995	1325	2901	254	1594	790
1995-96	26846	712	787	1174	3791	864	1032	1374	2995	251	1713	804
1996-97	28987	893	879	1252	3941	804	1107	1535	3327	267	1832	915
1997-98	30234	850	887	1318	4158	920	1137	1721	3292	270	1985	1063
1998-99	32255	904	934	1405	4324	948	1203	1797	3316	274	2112	1116
1999-00	34837	950	1002	1552	4735	1008	1267	1801	3440	274	2264	1170
2000-01	36282	1106	1081	1426	4589	982	1309	1743	3511	308	2343	1215
2001-02	38236	1043	1165	1528	4751	1042	1326	1941	3575	323	2512	1262
2002-03	39719	1175	1236	1449	5079	1034	1348	1708	3690	353	2600	1359
2003-04	42883	1099	1358	1611	5471	1185	1433	2251	3885	381	2753	1433
2004-05	45906	1238	1475	1664	5948	1340	1504	2196	4079	431	2936	1588
2005-06	50257	1207	1608	1748	6810	1399	1577	2344	4317	492	3121	1752
2006-07	55066	1416	1791	1907	7748	1574	1748	2620	4660	551	3366	1969
2007-08	60199	1489	1931	1997	8650	1708	1899	2739	4959	648	3627	2191
2008-09	64248	1716	2080	2250	8786	1837	2004	2969	5336	716	3774	2464
2009-10	69769	1798	2340	2463	9634	1852	2132	3142	5668	839	4067	2667
2010-11	75987	2073	2498	2592	10732	1968	2270	3614	6120	927	4313	2888
2011-12	81069	2285	2712	2824	11222	2042	2392	3953	6451	1020	4471	3147
2012-13	85463	2369	2894	3069	11842	2163	2518	4098	6736	1095	4838	3342
2013-14	90636	2469	3142	3226	12671	2331	2675	4343	7075	1178	5247	3565
2014-15	97121	2557	3314	3394	13322	2359	2777	4656	7297	1257	5633	3882
2015-16	105033	2749	3612	3597	14417	2557	2926	4981	7894	1355	-	4291
2016-17	112476	3033	3927	4129	15744	2828	3095	5352	8457	1448	-	4658
2017-18	119762	-	-	4432	-	3029	-	5736	9011	1547	-	5035
Growth 1981-2018	6.34	5.05	6.88	5.44	6.82	4.83	5.17	6.49	4.73	6.75	5.79	8.24
Growth 1994-2018	7.02	6.23	7.66	6.03	6.96	5.77	5.17	7.04	5.06	8.20	6.54	8.53

Growth 2000-2018	7.10	7.07	8.37	6.00	7.32	6.30	5.40	6.65	5.50	10.10	6.27	8.45
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## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. The same growth rate is not sustainable for long. Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic, Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

**Table 5-12 : Recommended Growth Rates Optimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	9.44%	8.82%	8.21%	7.60%	7.01%	6.43%
Bus	5.26%	4.95%	4.64%	4.35%	4.07%	3.79%
LCV	3.55%	3.09%	2.64%	2.19%	1.75%	1.31%
2- Axle	3.73%	3.35%	2.96%	2.58%	2.21%	1.84%
3 - Axle	5.82%	5.20%	4.59%	3.99%	3.39%	2.80%
4 to6 Axle	6.52%	5.82%	5.13%	4.45%	3.78%	3.12%
7 and Above Axle	6.52%	5.82%	5.13%	4.45%	3.78%	3.12%

**Table 5-13 : Recommended Growth Rates Pessimistic**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.94%	8.32%	7.71%	7.10%	6.51%	5.93%
Bus	4.76%	4.45%	4.14%	3.85%	3.57%	3.29%
LCV	3.05%	2.59%	2.14%	1.69%	1.25%	0.81%
2- Axle	3.23%	2.85%	2.46%	2.08%	1.71%	1.34%
3 - Axle	5.32%	4.70%	4.09%	3.49%	2.89%	2.30%
4 to6 Axle	6.02%	5.32%	4.63%	3.95%	3.28%	2.62%
7 and Above Axle	6.02%	5.32%	4.63%	3.95%	3.28%	2.62%

**Table 5-14 : Recommended Growth Rates Most Likely**

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	9.19%	8.57%	7.96%	7.35%	6.76%	6.18%
Bus	5.01%	4.70%	4.39%	4.10%	3.82%	3.54%
LCV	3.30%	2.84%	2.39%	1.94%	1.50%	1.06%
2- Axle	3.48%	3.10%	2.71%	2.33%	1.96%	1.59%

Category / Year	2024-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
<b>3 - Axle</b>	5.57%	4.95%	4.34%	3.74%	3.14%	2.55%
<b>4 to6 Axle</b>	6.27%	5.57%	4.88%	4.20%	3.53%	2.87%
<b>7 and Above Axle</b>	6.27%	5.57%	4.88%	4.20%	3.53%	2.87%

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza - 348.450 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6841	834	832	2428	1849	5027	9	17820	46081
2025-26	7444	861	873	2509	1945	5320	9	18961	48697
2026-27	8100	888	916	2592	2047	5630	9	20182	51473
2027-28	8815	916	961	2679	2154	5958	9	21492	54423
2028-29	9591	945	1009	2768	2266	6305	9	22893	57551
2029-30	10436	974	1058	2860	2384	6672	9	24393	60868
2030-31	11292	1000	1107	2945	2494	7014	9	25861	64034
2031-32	12219	1027	1158	3032	2608	7373	9	27426	67373
2032-33	13222	1055	1211	3122	2727	7751	9	29097	70905
2033-34	14308	1083	1267	3214	2853	8149	9	30883	74646
2034-35	15483	1112	1326	3309	2984	8567	9	32790	78600
2035-36	16661	1136	1383	3395	3103	8947	9	34634	82310
2036-37	17929	1161	1443	3483	3227	9345	9	36597	86223
2037-38	19293	1187	1506	3573	3356	9761	9	38685	90344
2038-39	20760	1214	1572	3665	3490	10195	9	40905	94680
2039-40	22338	1241	1641	3760	3629	10649	9	43267	99251
2040-41	23905	1262	1708	3843	3752	11052	9	45531	103482
2041-42	25581	1284	1777	3928	3879	11470	9	47928	107915
2042-43	27375	1306	1849	4015	4010	11904	9	50468	112565

**Table 6-2 : Total Tollable Traffic @ Toll Plaza - Chainage 348.450 KM**  
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6841	834	832	2428	1849	5027	9	17820	46081
2025-26	7410	855	869	2497	1935	5294	9	18869	48459
2026-27	8026	877	907	2568	2025	5576	9	19988	50974
2027-28	8693	899	948	2640	2119	5873	9	21181	53632
2028-29	9416	922	990	2715	2219	6186	9	22457	56449
2029-30	10199	945	1034	2792	2324	6515	9	23818	59425
2030-31	10985	965	1076	2861	2418	6817	9	25131	62215
2031-32	11831	986	1121	2931	2517	7133	9	26528	65156
2032-33	12742	1007	1167	3003	2620	7464	9	28012	68251
2033-34	13724	1028	1215	3076	2728	7810	9	29590	71509
2034-35	14782	1050	1265	3152	2840	8171	9	31269	74938
2035-36	15833	1067	1314	3218	2939	8493	9	32873	78106
2036-37	16958	1084	1364	3285	3041	8828	9	34569	81421
2037-38	18163	1103	1416	3353	3147	9177	9	36368	84903
2038-39	19453	1122	1470	3423	3257	9539	9	38273	88552
2039-40	20835	1141	1526	3494	3371	9915	9	40291	92378
2040-41	22193	1155	1580	3554	3468	10240	9	42199	95852
2041-42	23639	1170	1636	3615	3568	10576	9	44213	99484
2042-43	25179	1185	1694	3676	3671	10923	9	46337	103274

Traffic projections for Most Likely scenario is given as under

**Table 6-3 : Total Tollable Traffic @ Toll Plaza - Chainage 348.450 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	6841	834	832	2428	1849	5027	9	17820	46081
2025-26	7427	858	871	2503	1940	5307	9	18915	48578
2026-27	8063	882	912	2580	2036	5603	9	20085	51224
2027-28	8753	907	954	2660	2137	5915	9	21335	54025
2028-29	9502	933	999	2742	2243	6245	9	22673	56997
2029-30	10316	960	1045	2827	2354	6593	9	24104	60143
2030-31	11137	983	1091	2904	2457	6914	9	25495	63121
2031-32	12023	1007	1139	2983	2564	7251	9	26976	66262
2032-33	12978	1031	1189	3064	2675	7605	9	28551	69572
2033-34	14010	1056	1241	3146	2791	7976	9	30229	73061
2034-35	15125	1081	1295	3231	2912	8365	9	32018	76744
2035-36	16238	1102	1348	3307	3021	8716	9	33741	80182
2036-37	17432	1123	1403	3384	3134	9082	9	35567	83789
2037-38	18714	1144	1460	3463	3251	9464	9	37505	87581
2038-39	20090	1166	1520	3543	3372	9861	9	39561	91559
2039-40	21568	1188	1581	3625	3498	10275	9	41744	95740
2040-41	23027	1205	1641	3696	3608	10638	9	43824	99581
2041-42	24584	1222	1704	3768	3721	11013	9	46021	103595
2042-43	26248	1240	1768	3841	3838	11402	9	48346	107799

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Udaipur – Gujarat Border on NH-8 project stretch, the Target Date and Target Traffic are defined as under:

Target Date – 21<sup>st</sup> September 2026

Target Traffic - 61435 in PCU

It was observed that as per traffic projections, average traffic volume falls short of target traffic in all scenarios. The probable extension of the concession period is estimated according to article 29 of the concession agreement which comes to about a year. Traffic forecast and revenue projections are done for probable extended period accordingly.

### *Most Likely*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2026	61435	51276	-17%	25%	20%	21	4.2

### *Optimistic*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2026	61435	51531	-16%	24%	20%	21	4.2

### *Pessimistic*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2026	61435	51022	-17%	25%	20%	21	4.2

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Udaipur- Gujarat Border section of NH-8 is based on the old toll policy. As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

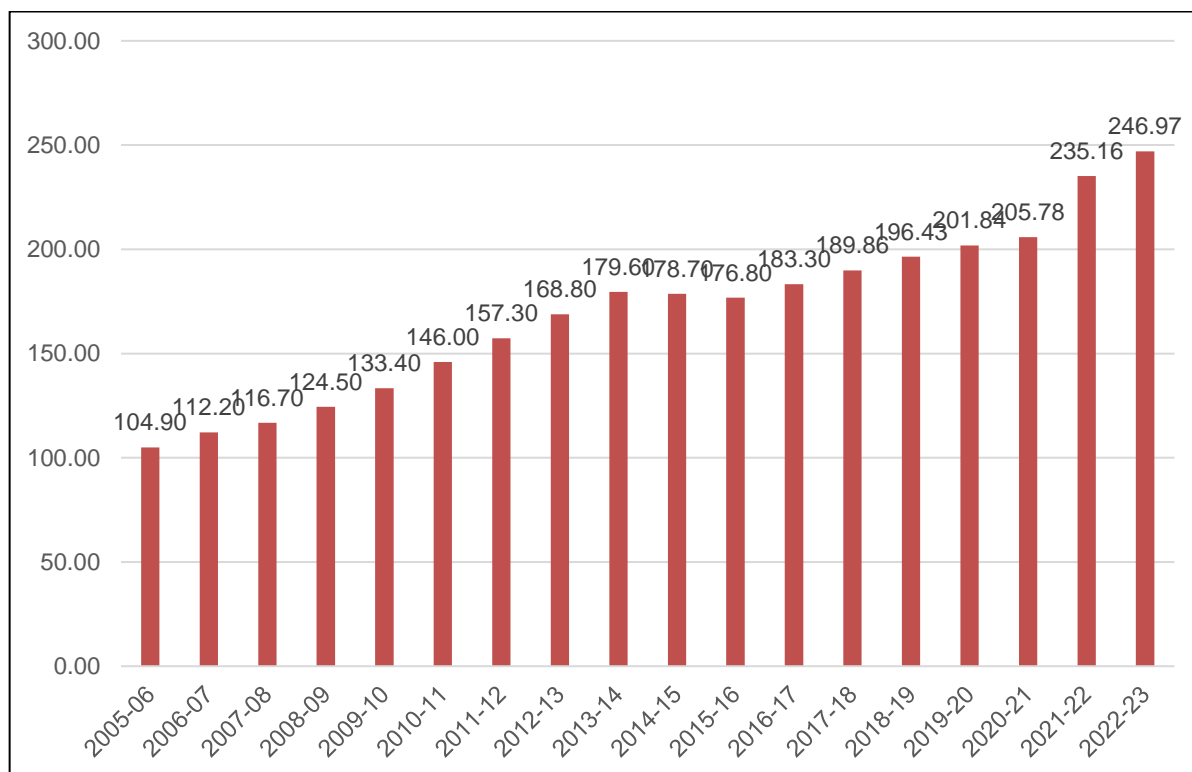
1. Monthly Pass: For frequent user's monthly pass would be issued at fee 30 time the single journey fee.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van I - Rs. 275 per month
  - b) Other local Commercial at 50% of the regular single journey toll fee

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it takes 5% and Suitably Stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey @ Km TP-348.450 KM**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	175	285	600	600	655	940	1145
2025-26	185	300	630	630	685	985	1200
2026-27	195	315	660	660	720	1035	1260
2027-28	205	330	695	695	755	1090	1325
2028-29	215	350	730	730	795	1145	1390
2029-30	225	365	765	765	835	1200	1465
2030-31	240	385	805	805	880	1265	1540
2031-32	250	405	850	850	925	1330	1620
2032-33	265	425	890	890	975	1400	1700
2033-34	275	450	940	940	1025	1470	1790
2034-35	290	470	985	985	1075	1550	1885
2035-36	305	495	1040	1040	1135	1630	1985
2036-37	325	520	1095	1095	1195	1715	2090
2037-38	340	550	1150	1150	1255	1805	2200
2038-39	360	580	1215	1215	1325	1905	2315
2039-40	380	610	1280	1280	1395	2005	2440
2040-41	400	645	1345	1345	1470	2110	2570
2041-42	420	675	1420	1420	1550	2225	2710
2042-43	440	715	1495	1495	1630	2345	2855

**Table 7-3 : Toll Rates for Return Journey @ TP-348.450 KM**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	265	430	900	900	980	1410	1715
2025-26	280	450	945	945	1030	1480	1800
2026-27	295	475	990	990	1080	1555	1890
2027-28	310	495	1040	1040	1135	1630	1985
2028-29	325	520	1095	1095	1195	1715	2090
2029-30	340	550	1150	1150	1255	1805	2195
2030-31	355	575	1210	1210	1320	1895	2310
2031-32	375	605	1270	1270	1385	1995	2430
2032-33	395	640	1340	1340	1460	2100	2555
2033-34	415	670	1405	1405	1535	2205	2685
2034-35	440	705	1480	1480	1615	2320	2825
2035-36	460	745	1560	1560	1700	2445	2975
2036-37	485	785	1640	1640	1790	2575	3135
2037-38	510	825	1730	1730	1885	2710	3300
2038-39	540	870	1820	1820	1985	2855	3475
2039-40	565	915	1915	1915	2090	3005	3660
2040-41	595	965	2020	2020	2205	3170	3855
2041-42	630	1015	2130	2130	2325	3340	4065
2042-43	665	1070	2245	2245	2450	3520	4285

**Table 7-4 : Toll Rates for Monthly Pass Local @ TP-348.450 KM**

Year	Car
2024-25	340
2025-26	355
2026-27	375
2027-28	390
2028-29	410
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	585
2036-37	620
2037-38	650
2038-39	685
2039-40	720
2040-41	760
2041-42	800
2042-43	845

**Table 7-5 : Toll Rates for Monthly Pass @ TP-348.450 KM**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	5895	9520	19950	19950	21765	31285	38085
2025-26	6190	10000	20955	20955	22860	32860	40005
2026-27	6505	10505	22015	22015	24015	34525	42025
2027-28	6835	11040	23130	23130	25235	36275	44160
2028-29	7185	11605	24310	24310	26520	38125	46415
2029-30	7550	12195	25555	25555	27880	40075	48790
2030-31	7940	12825	26870	26870	29315	42135	51300
2031-32	8350	13485	28260	28260	30825	44315	53945
2032-33	8780	14185	29725	29725	32425	46610	56745
2033-34	9240	14925	31270	31270	34115	49040	59700
2034-35	9725	15705	32910	32910	35900	51605	62825
2035-36	10235	16530	34640	34640	37790	54320	66130
2036-37	10775	17405	36465	36465	39780	57185	69620
2037-38	11345	18330	38400	38400	41890	60220	73310
2038-39	11950	19305	40445	40445	44120	63425	77215
2039-40	12590	20335	42605	42605	46480	66815	81340
2040-41	13265	21425	44895	44895	48975	70400	85705
2041-42	13980	22580	47315	47315	51615	74195	90325
2042-43	14735	23805	49870	49870	54405	78210	95210

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2042-43 years starting from the year 2023-24 are shown in tables below.

**Table 7-6 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	TP-1	Total
2024-25	328.13	328.13
2025-26	363.64	363.64
2026-27	403.48	403.48
2027-28	449.65	449.65
2028-29	497.96	497.96
2029-30	551.72	551.72
2030-31	611.62	611.62
2031-32	677.66	677.66
2032-33	748.33	748.33
2033-34	826.21	826.21
2034-35	915.06	915.06
2035-36	1010.39	1010.39
2036-37	1111.48	1111.48
2037-38	1222.94	1222.94
2038-39	1351.99	1351.99
2039-40	1494.52	1494.52
2040-41	1633.93	1633.93
2041-42	1793.86	1793.86
2042-43	1967.45	1967.45

**Table 7-7 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Year	TP-1	Total
2024-25	328.13	328.13
2025-26	361.84	361.84
2026-27	399.71	399.71
2027-28	443.33	443.33
2028-29	488.64	488.64
2029-30	538.84	538.84
2030-31	594.49	594.49
2031-32	655.58	655.58

Year	TP-1	Total
2032-33	720.53	720.53
2033-34	791.64	791.64
2034-35	872.66	872.66
2035-36	959.05	959.05
2036-37	1049.91	1049.91
2037-38	1149.64	1149.64
2038-39	1264.91	1264.91
2039-40	1391.57	1391.57
2040-41	1514.08	1514.08
2041-42	1654.38	1654.38
2042-43	1805.65	1805.65

**Table 7-8 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

Year	TP-1	Total
2024-25	328.13	328.13
2025-26	362.78	362.78
2026-27	401.65	401.65
2027-28	446.50	446.50
2028-29	493.33	493.33
2029-30	545.22	545.22
2030-31	603.01	603.01
2031-32	666.58	666.58
2032-33	734.38	734.38
2033-34	808.81	808.81
2034-35	893.56	893.56
2035-36	984.35	984.35
2036-37	1080.32	1080.32
2037-38	1185.75	1185.75
2038-39	1307.72	1307.72
2039-40	1442.02	1442.02
2040-41	1572.74	1572.74
2041-42	1722.51	1722.51
2042-43	1884.60	1884.60

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Udaipur to Gujarat Border section of NH-8 in state of Rajasthan is nearing completion of six laning. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the busy and prominent national highway NH-8 which connects Mumbai to Delhi and is part of golden quadrilateral. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As discussed, the dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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**YEDISHI TO AURANGABAD SECTION OF NH-211**  
**(KM 100.000 TO KM 290.200)**  
**IN THE STATE OF MAHARASHTRA**



**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**



**OCTOBER 2024**

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**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under various NHDP Phases.

The project under consideration, four laning of **Yedeshi** to **Aurangabad** section of NH-211 from km 100.000 to km 290.200 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s YA Tollway Ltd.* (Concessionaire) has been awarded the Project for a concession period of 26 years starting from 1st July 2015. Four laning of project has also been completed in September 2020.

Length of project road is 189.090 Kms. The project road is section of NH-211, is one of the important transportation link in Maharashtra which connects Solapur to Dhule and then at Dhule it can join other important highway like NH-3 (Mumbai – Agra Road) and NH-6 (east-west highway). The project road passes through the important places like Chausala, Beed, Adul, Chitegaon and then Aurangabad. The Project Road passes through the districts of Beed and Aurangabad.

The following figure shows alignment of project road section from Yedeshi to Aurangabad.



**Figure 1-1 : Alignment of Project Stretch**

## 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project along with related operation & maintenance expenditure involved.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

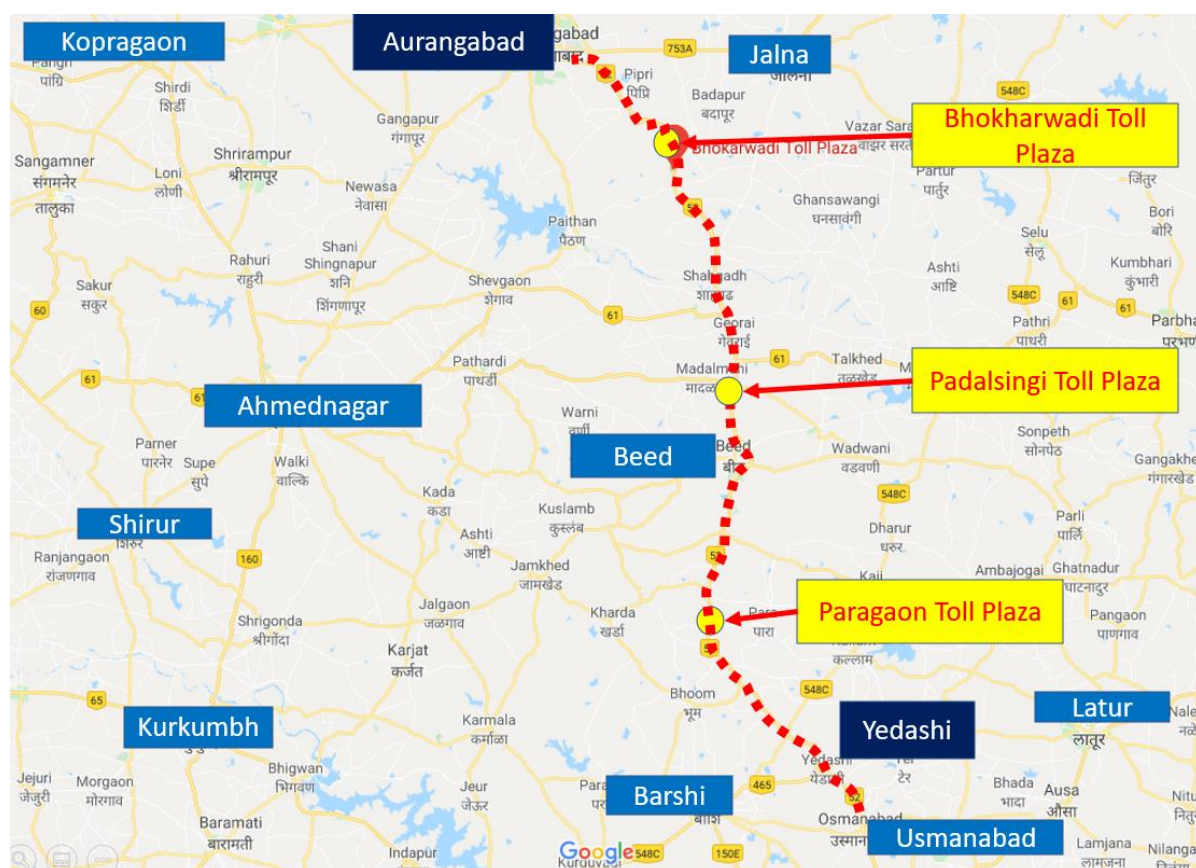
National Highway 211 which is now part of NH-52. The national highway 52 was numbered after amalgamating many existing national highways of India.

It connects the important places like Chausala, Beed, Adul, Chitegaon and then Aurangabad. The Project Road passes through the districts of Beed and Aurangabad. Following are the major centres of development around project road.

#### Project Stretch Description

Like other parts of India rapid ribbon development is happening around these cities on project highway. This also contributes to sustainable traffic growth.

There are three operative toll plazas at project stretch. The first is at Yedeshi at Km 134.000, second at Padalsingi at Km 194.000 and third at Bhokharwadi at Km 254.000. The following figure show project alignment and toll plaza locations.



**Figure 2-1 : Project Alignment with Toll Plaza**

## 2.2 Project Corridor Illustration

Four laning of project stretch is complete. The following photographs illustrate the project section along the corridor.



*Figure 2-2 : Photographs showing Project Corridor*

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Yedeshi - Aurangabad section of NH-211 for years 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project
- Establish base year traffic
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

*Table 3-1* below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

Sr. No	Location	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 134.000 Toll Plaza at Pargaon	AADT for Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024
2	Km 194.000 Toll Plaza at Padalshingi	AADT for Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Four month from April 2024 to July 2024
3	Km 254.000 Toll Plaza at Maliwadi	AADT for Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month	For Year 2019-20, 2020-2021, 2021-22, 2022-2023, Eight month

Sr. No	Location	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		November 2023 & Four month from April 2024 to July 2024	from April 2023 to November 2023 & Four month from April 2024 to July 2024	from April 2023 to November 2023 & Four month from April 2024 to July 2024	from April 2023 to November 2023 & Four month from April 2024 to July 2024	from April 2023 to November 2023 & Four month from April 2024 to July 2024

All toll plazas are located in Maharashtra.

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in table below .

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

*Source - IRC: 64 – 1990*

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Bus
- Truck /
- 3 Axle commercial vehicle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Pargaon Toll Plaza at Km 134.000**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	1641	1439	2426	2863	3388	4123
2	Minibus /LCV	658	482	257	317	332	376
3	Bus	199	109	110	215	244	284
4	Truck	635	704	786	988	1078	1082

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
5	3-Axle Commercial vehicle	793	845	876	967	924	882
6	Multi axle	1081	1284	1567	2164	2089	1642
7	Oversize Vehicle	0	50	74	31	29	28
	<b>Total</b>	<b>5007</b>	<b>4913</b>	<b>6096</b>	<b>7544</b>	<b>8084</b>	<b>8417</b>

**Table 3-4 : Traffic Data at Padalshingi Toll Plaza at Km 194.000**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	4114	3166	4969	5458	6558	8516
2	Minibus /LCV	1095	883	383	451	483	579
3	Bus	473	260	252	478	547	684
4	Truck	788	839	891	1159	1324	1456
5	3-Axle Commercial vehicle	944	1049	1098	1119	1145	1187
6	Multi axle	1134	1363	1641	2290	2270	1894
7	Oversize Vehicle	1	60	65	29	28	28
	<b>Total</b>	<b>8549</b>	<b>7620</b>	<b>9299</b>	<b>10985</b>	<b>12357</b>	<b>14344</b>

**Table 3-5 : Traffic Data at Maliwadi Toll Plaza at Km 254.000**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2019-20	Annual Average Daily Traffic (Nos.)- 2020-21	Annual Average Daily Traffic (Nos.)- 2021-22	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	3089	2492	3992	4717	5799	7099
2	Minibus /LCV	687	546	192	295	353	426
3	Bus	347	177	177	341	388	470
4	Truck	547	579	567	892	1075	992
5	3-Axle Commercial vehicle	679	737	718	841	928	857
6	Multi axle	866	1046	1164	1914	1918	1323
7	Oversize Vehicle	1	47	52	23	21	22
	<b>Total</b>	<b>6216</b>	<b>5623</b>	<b>6862</b>	<b>9023</b>	<b>10484</b>	<b>11189</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 3-6.

**Table 3-6 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0

Vehicle Type	PCUs
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

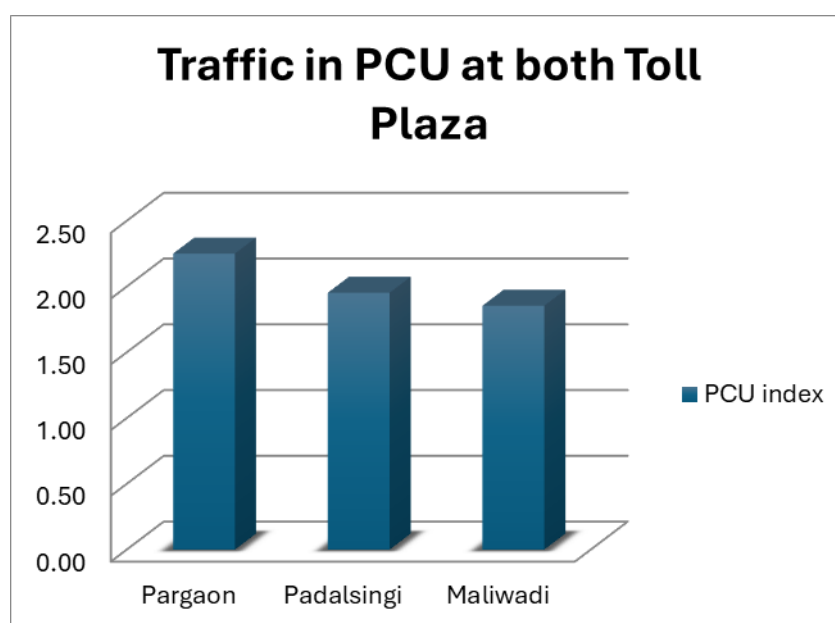
**Table 3-7 : Traffic in PCU at Project Stretch**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
<b>2019-2020</b>	Km 134.000 Toll Plaza at Pargaon	5007	12373	2.47
	Km 194.000 Toll Plaza at Padalshingi	8549	17479	2.04
	Km 254.000 Toll Plaza at Maliwadi	6216	12740	2.05
<b>2020-2021</b>	Km 134.000 Toll Plaza at Pargaon	4913	13136	2.67
	Km 194.000 Toll Plaza at Padalshingi	7620	17339	2.28
	Km 254.000 Toll Plaza at Maliwadi	5623	12706	2.26
<b>2021-2022</b>	Km 134.000 Toll Plaza at	6096	15511	2.54

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
	Pargaon			
	Km 194.000 Toll Plaza at Padalshingi	9299	19945	2.14
	Km 254.000 Toll Plaza at Maliwadi	6862	14138	2.06
<b>2022-2023</b>	Km 134.000 Toll Plaza at Pargaon	7544	19724	2.61
	Km 194.000 Toll Plaza at Padalshingi	10985	24840	2.26
	Km 254.000 Toll Plaza at Maliwadi	9023	20097	2.23
<b>2023-2024</b>	Km 134.000 Toll Plaza at Pargaon	8084	20153	2.49
	Km 194.000 Toll Plaza at Padalshingi	12357	26677	2.16
	Km 254.000 Toll Plaza at Maliwadi	10484	22233	2.12
<b>2024-2025</b>	Km 134.000 Toll Plaza at Pargaon	8417	18946	2.25
	Km 194.000 Toll Plaza at Padalshingi	14344	28015	1.95
	Km 254.000	11189	20746	1.85

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
	Toll Plaza at Maliwadi			

It can be observed from above that project traffic has PCU index 2 to 2.6 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at three toll plaza locations.

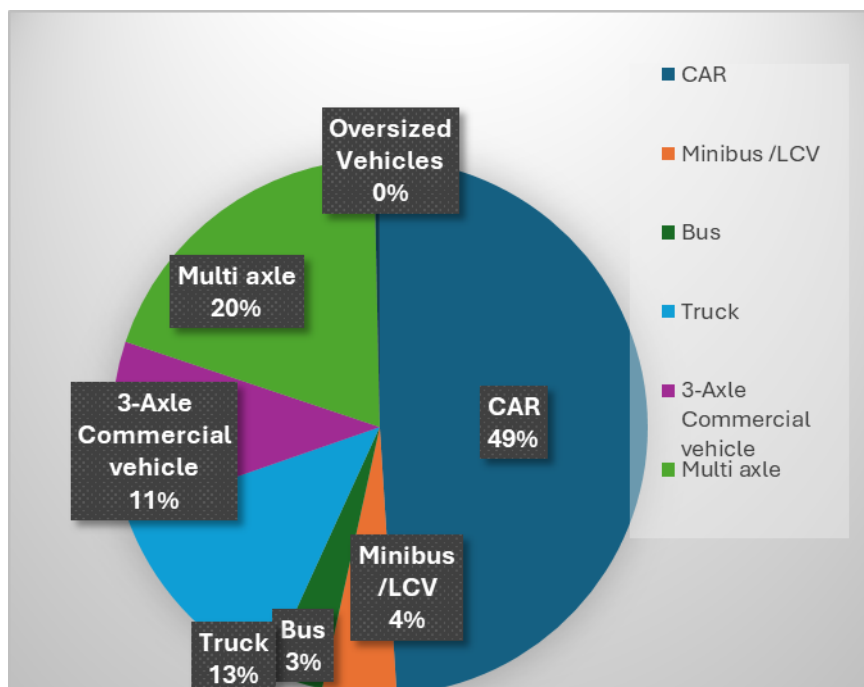


**Figure 3-1 : Comparison of PCU Index**

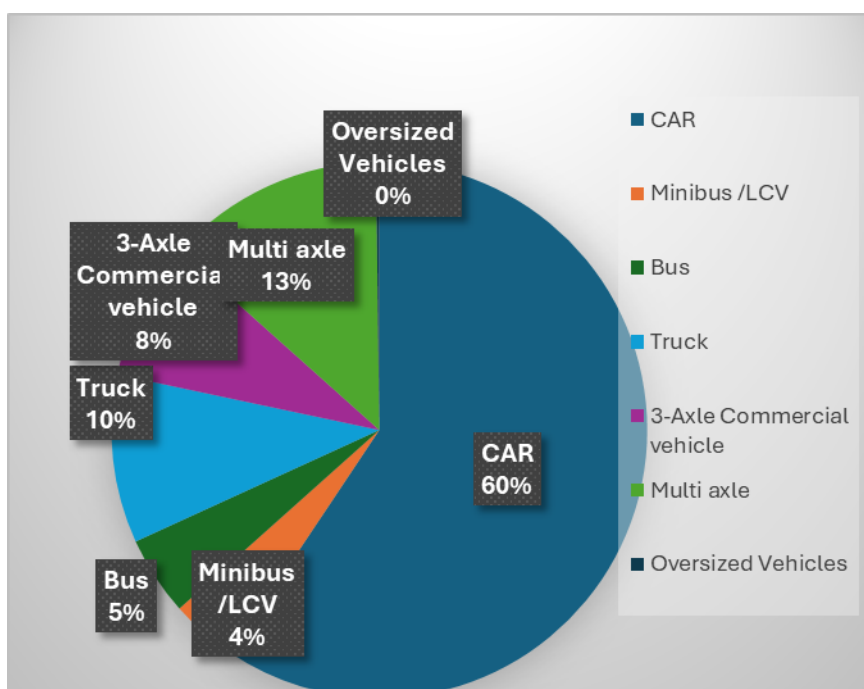
It can be observed that PCU index is consistent at all three toll plaza locations.

### 3.4.2 Components of Traffic

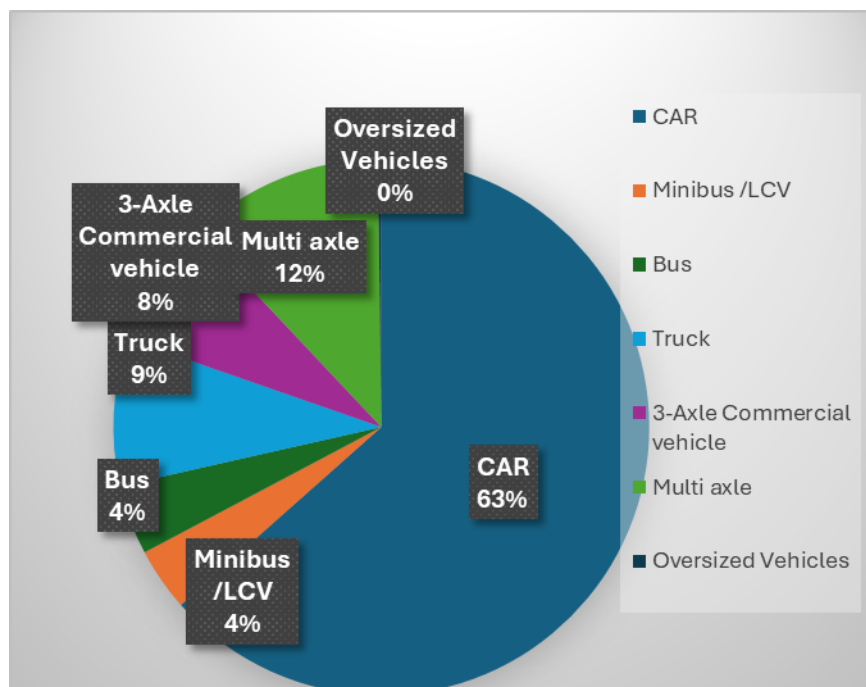
As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-2: Model split of tollable vehicle @ Km 134.000**



**Figure 3-3: Model split of tollable vehicle @ Km 194.000**



**Figure 3-3: Model split of tollable vehicle @ Km 254.000**

It is observed that car traffic forms about 49% of total traffic at toll plaza location KM 134.000 while multi axle commercial vehicles are about 31% of total traffic. Truck / Bus and LCV share about 16% and 4% of traffic volume respectively.

It is observed that car traffic forms about 60% of total traffic at toll plaza location KM 194.000 while multi axle commercial vehicles are about 21% of total traffic. Truck / Bus and LCV share about 15% and 4% of traffic volume respectively.

It is observed that car traffic forms about 63% of total traffic at toll plaza location KM 254.000 while multi axle commercial vehicles are about 20% of total traffic. Truck / Bus and LCV share about 13% and 4% of traffic volume respectively.

At second & third toll plaza passenger traffic component is higher due to urban settlement around.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-8 : Journey Type Bifurcation of Traffic at Pargaon Toll Plaza KM 134.000**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	5882
2	Return Journey	2464
3	Local Commercial Single Journey	61
4	Monthly Pass Local	10
5	Monthly Pass	0

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 70%. Return journey component is 29%. The number of monthly pass Local is 0% and Local Commercial single Journey 1% at Pargaon toll plaza.

The following tables give the details of journey distribution at Padalshingi toll plaza at Km 194.000 and Km 254.000.

**Table 3-9 : Journey Type Bifurcation of Traffic at Padalshingi Toll Plaza KM 194.000**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	7894
2	Return Journey	5784
3	Local Commercial Single Journey	545
4	Monthly Pass Local	120
5	Monthly Pass	1

**Table 3-10 : Journey Type Bifurcation of Traffic at Maliwadi Toll Plaza KM  
254.000**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	6286
2	Return Journey	4824
3	Local Commercial Single Journey	32
4	Monthly Pass Local	42
5	Monthly Pass	5

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

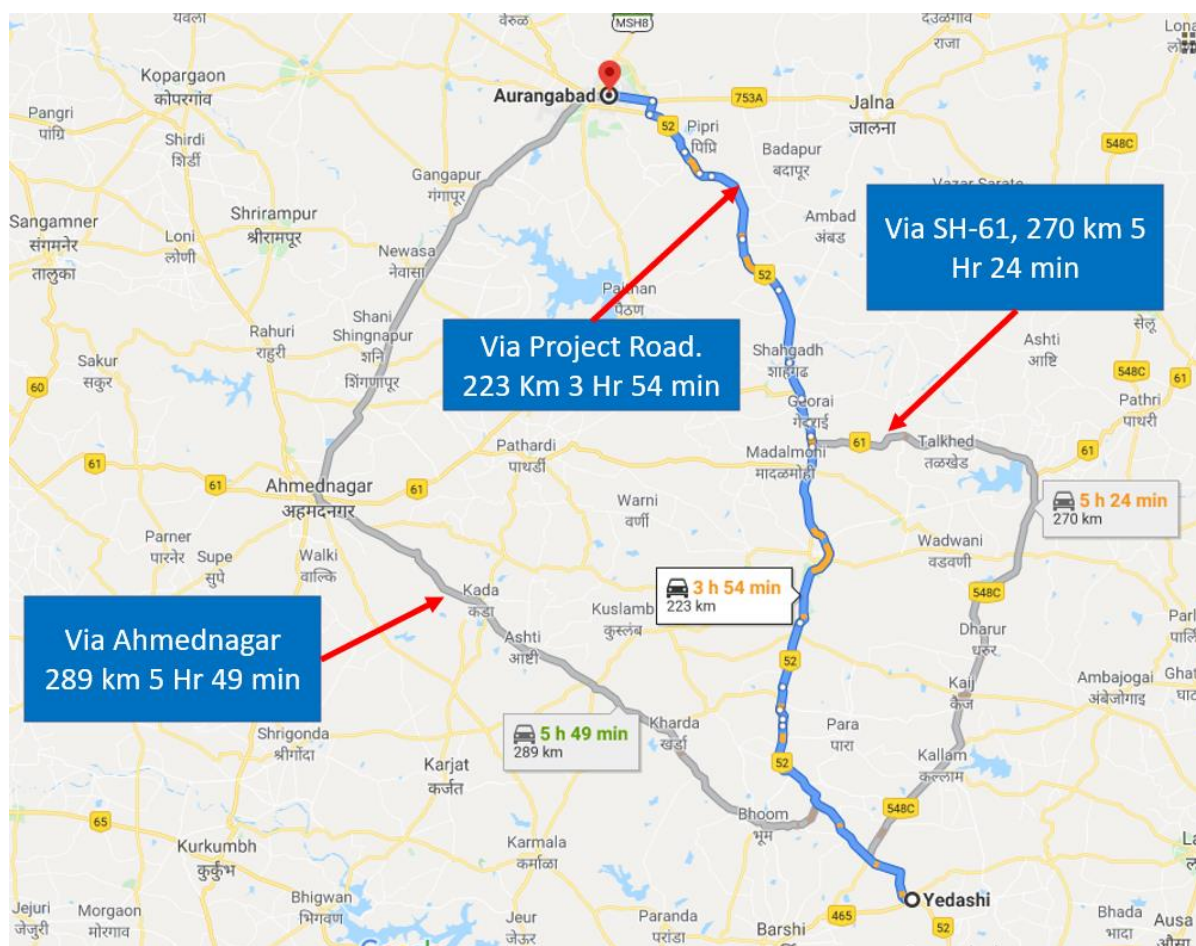
Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Competing / Alternate route

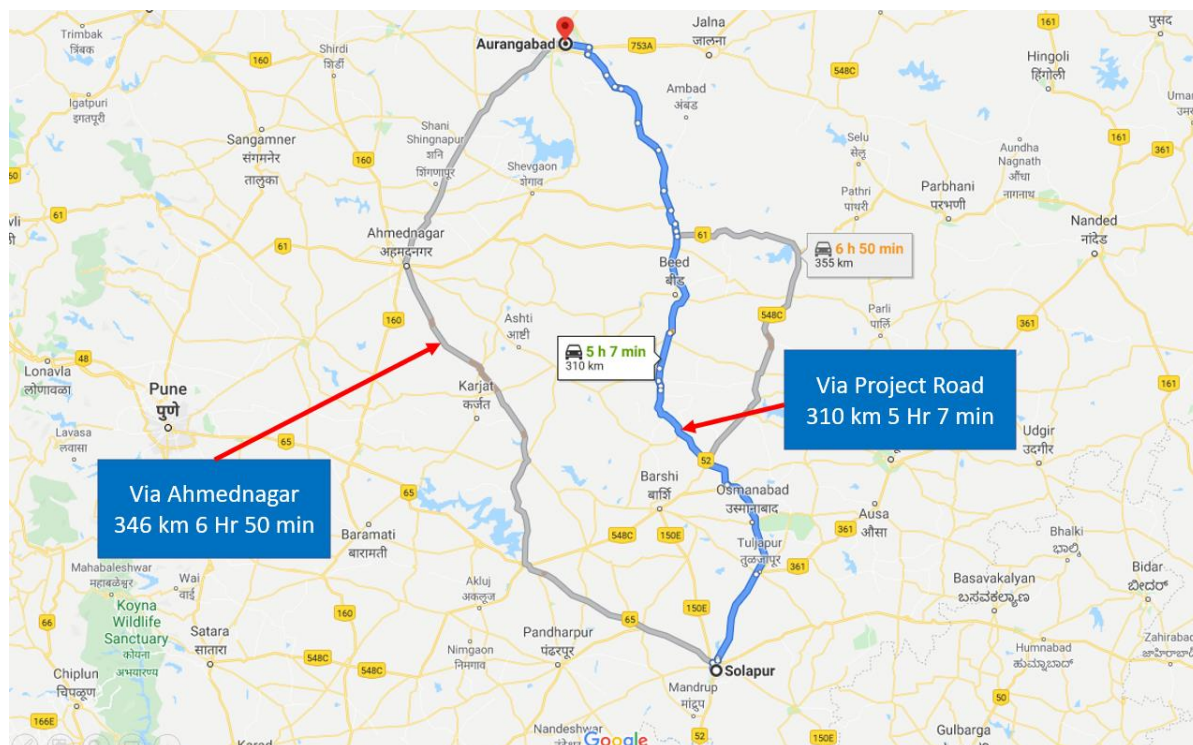
In BOT projects there is always a risk factor of traffic shifting on competing roads after imposition of toll. Shifting of traffic depends on factors such as road length, type, geometry, riding quality and capacity. Competing road networks were identified around section and a speed delay analysis was conducted. In this detail of competing roads are provided and a comparison with project road is made. There can be some alternate route between Yedashi and Aurangabad. The following figure provides alignment of competing road network between Yedashi and Aurangabad.



**Figure 4-1 : Alternate routes – Yedashi- Aurangabad**

It can be observed that alternate routes are quite long and take more time to travel. Hence project road remains the most preferred option for travel between Yedashi and Aurangabad.

Similarly, at regional level there can be alternate via Ahmednagar for travel between Solapur and Aurangabad. The following figure shows competing networks in the area.



**Figure 4-2 : Alternate route Between Solapur and Aurangabad**

For travel between Solapur and Aurangabad as well project road is the most preferred option due to shorter length and less travel time. Completion of four laning of Solapur Yedashi section has complemented travel on this route.

The following table provides summary of analysis of alternate route/ roads discussed above.

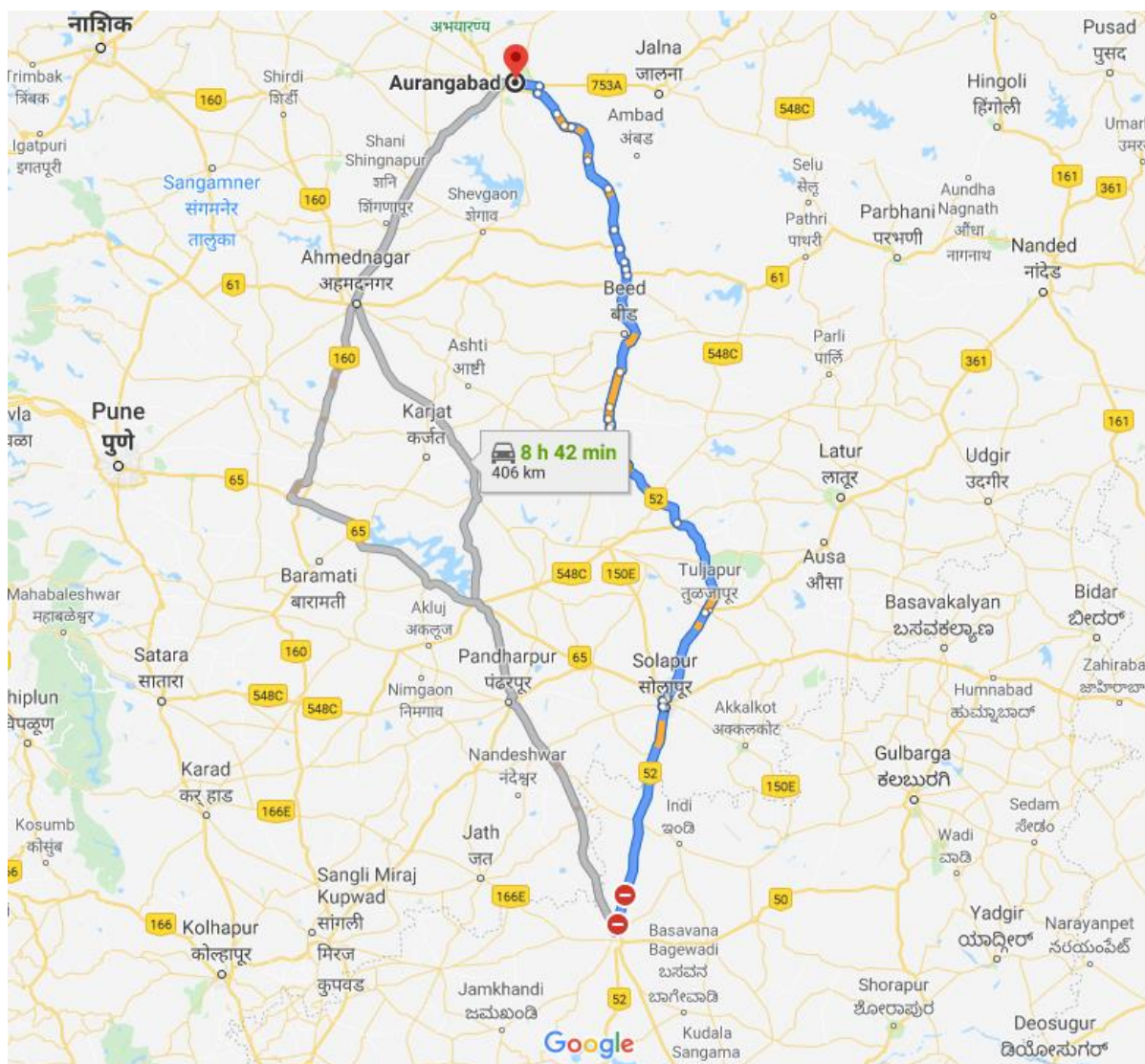
**Table 4-1 : Competing Roads Details**

Sr. No	Route Details	Designation	Length (Km)	Avg. Speed (KMPH)	Time Taken (Min)	Observations
<b>Regional Level</b>						
1	Solapur-Ahmednagar-Aurangabad	Alternate Route	346	50	6 Hr 50 Min	Project road has minimum travel time and shortest road
	Solapur- Yedashi- Aurangabad	Project Road	310	60	5 Hr 10 Min	
2	Yedashi- Kalam-Madalmoni- Aurangabad (SH-61)	Alternate Route	270	50	5 Hr 24 Min	Project road has minimum travel time and shortest road
	Yedashi- Ahmednagar- Aurangabad	Alternate Route	289	50	5 Hr 49 Min	
	Yedashi- Beed- Aurangabad	Project Road	223	57	3 Hr 54 Min	

It light of the above discussion project road remains most preferred route for the traffic of influence area. Moreover, project stretch is under toll operation for last one year. Hence any shifting of traffic, if any, would have settled by now and any further shifting of traffic is not envisaged from project road.

## Regional Network

Project corridor is an important transportation link for the traffic between Karnataka and Rajasthan / Delhi and other northern states. Part of this traffic uses the Bijapur- Solapur- Ahmednagar- Shirdi route to join back at Dhule and proceed towards northern parts of country. The length of route between Bijapur via project road and route via Ahmednagar is almost equal. Thus, it is expected that some part traffic will come back on the project road as the four laning is complete. The following figures show the route between Bijapur and Dhule via Project Road and via Ahmednagar for better understanding.



**Figure 4-3 : Project Road in regional network.**

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Yedeshi - Aurangabad section of NH-8 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable to projects of short durations say 5-10 years, however for long term projections it would-be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income

- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, In order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

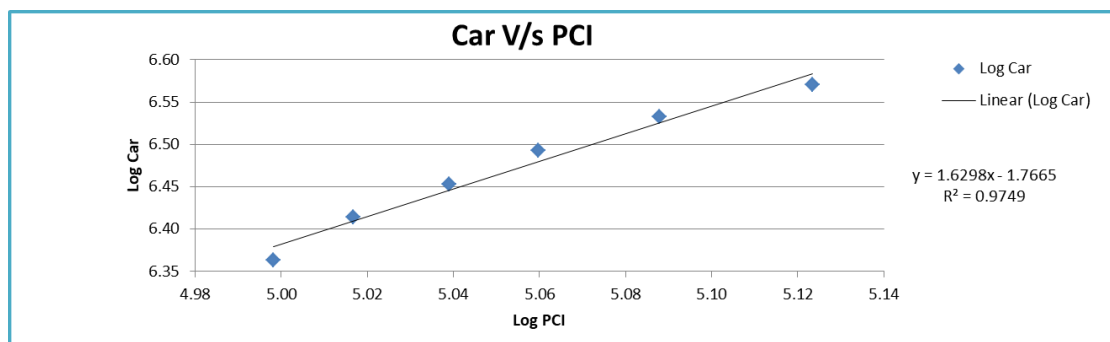
The project corridor spreads across state of Maharashtra. Toll plazas at Paragaon, Padalsingi and Bhokharwadi are in the state of Maharashtra. Project traffic share of many states like Karnataka, Gujarat & Haryana also. For elasticity calculations, working data from these states also has been analyzed.

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Maharashtra State.

**Table 5-1 : Per Capita Income Vs Car Maharashtra**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	99564	2307841	5.00	6.36		
2013	103904	2592565	5.02	6.41	4%	
2014	109399	2834847	5.04	6.45	5%	
2015	114746	3113773	5.06	6.49	5%	
2016	122422	3406872	5.09	6.53	7%	
2017	132899	3715744	5.12	6.57	9%	5.96%

Regression analysis of same is given in figure below

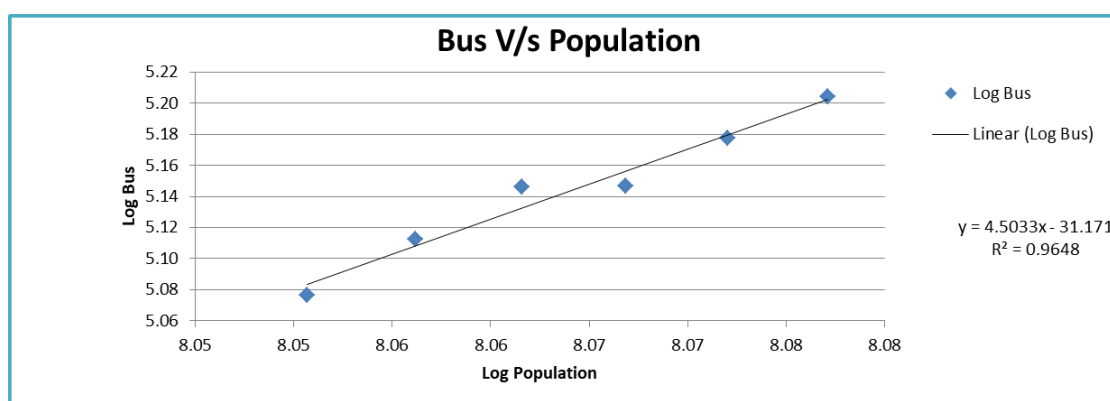


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Maharashtra**

**Table 5-2 : Population Vs Bus Maharashtra**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	112374333	119298	8.05	5.08		
2013	113807248	129535	8.06	5.11	1%	
2014	115229410	140087	8.06	5.15	1%	
2015	116640546	140102	8.07	5.15	1%	
2016	118040394	150427	8.07	5.18	1%	
2017	119428710	160042	8.08	5.20	1%	1.23%

Regression analysis of same is given in figure below



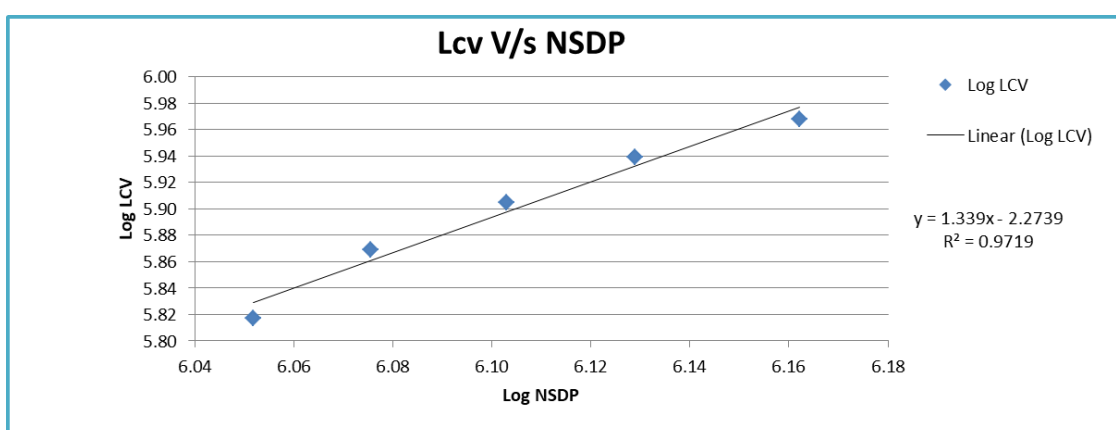
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Maharashtra**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-3 : LCV Traffic Vs NSDP Maharashtra**

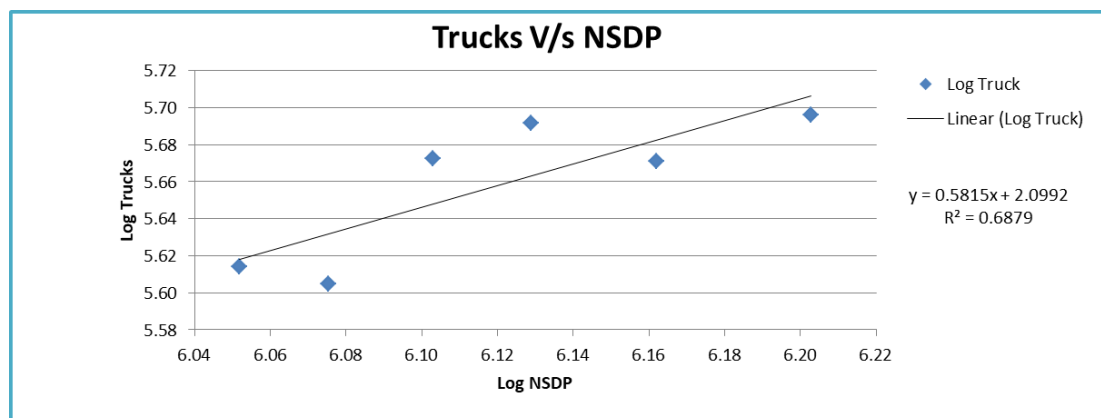
Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	1126595	656407	6.05	5.82		
2013	1189711	739725	6.08	5.87	6%	
2014	1267551	803128	6.10	5.90	7%	
2015	1345341	868632	6.13	5.94	6%	
2016	1452439	927903	6.16	5.97	8%	6.56%

Following figure depict regression analysis and extrapolation.

**Table 5-4 : Truck Traffic Vs NSDP Maharashtra**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	1126595	411418	6.05	5.61		
2013	1189711	402366	6.08	5.60	6%	
2014	1267551	470128	6.10	5.67	7%	
2015	1345341	491582	6.13	5.69	6%	
2016	1452439	468810	6.16	5.67	8%	
2017	1595514	496439	6.20	5.70	10%	7.22%

Following figure depict regression analysis and extrapolation



**Figure 5-3 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Maharashtra.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-5 : Summary Regression Analysis Maharashtra**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Maharashtra	Car/Jeep	PCI	$y = 1.6298x + -1.7665$	$R^2 = 0.9749$	1.6298	5.96%	9.71%
	Bus	Population	$y = 4.5033x - 31.1713$	$R^2 = 0.9648$	4.5033	1.23%	5.52%
	LCV	NSDP	$y = 1.339x - 2.2739$	$R^2 = 0.9719$	1.3390	6.56%	8.78%
	Truck	NSDP	$y = 0.5815x - 2.0992$	$R^2 = 0.6879$	0.5815	7.22%	4.20%

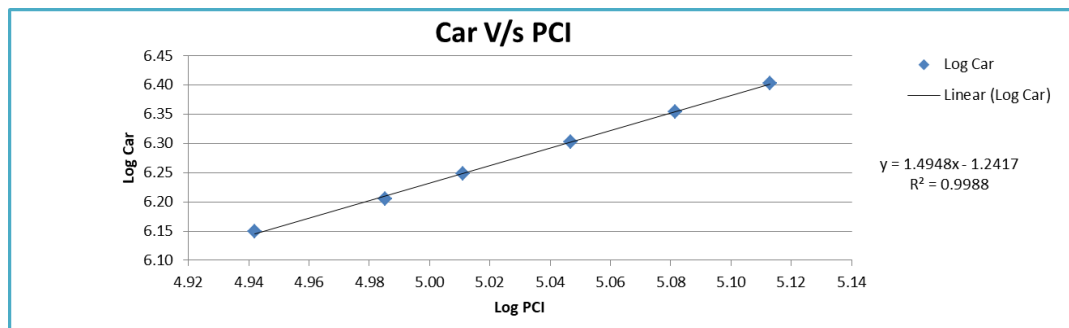
Following tables and graphs depict regression and elasticity of growth model for stretch falling in Gujrat State.

**Table 5-6 : Per Capita Income Vs Car Gujarat**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	87481	1411898	4.94	6.15		
2013	96683	1602129	4.99	6.20	11%	
2014	102589	1771298	5.01	6.25	6%	

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2015	111370	2008748	5.05	6.30	9%	
2016	120683	2260084	5.08	6.35	8%	
2017	129738	2527537	5.11	6.40	8%	8.21%

Regression analysis of same is given in figure below

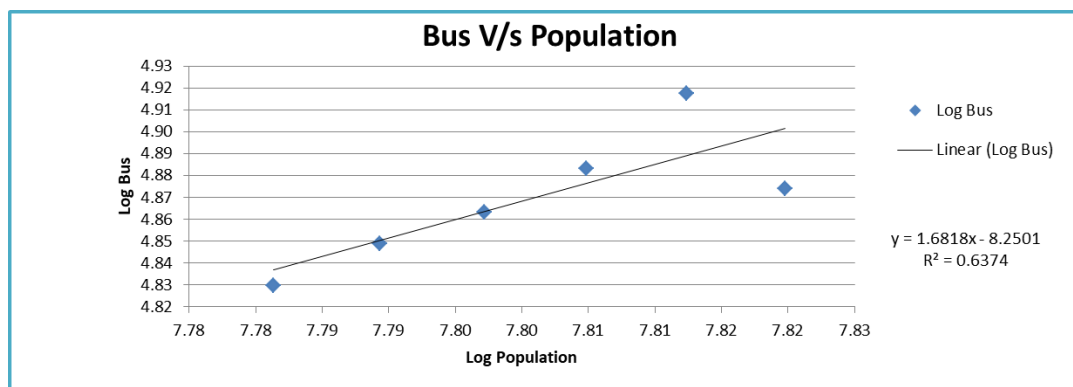


**Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh**

**Table 5-7 : Population Vs Bus Gujrat**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	60439692	67546	7.78	4.83		
2013	61563037	70615	7.79	4.85	2%	
2014	62684375	72998	7.80	4.86	2%	
2015	63803304	76435	7.80	4.88	2%	
2016	64919427	82734	7.81	4.92	2%	
2017	66032362	74855	7.82	4.87	2%	1.79%

Regression analysis of same is given in figure below



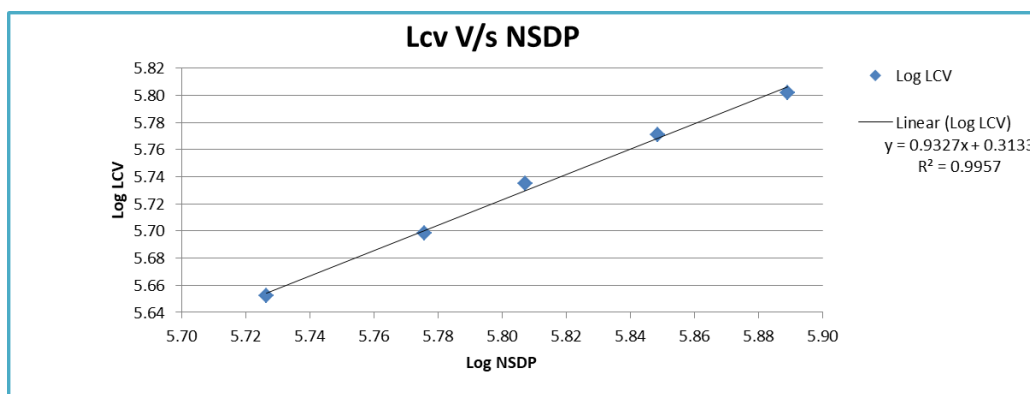
**Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-8 : LCV Traffic Vs NSDP Gujarat**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	532809	448958	5.73	5.65		
2013	596659	499277	5.78	5.70	12%	
2014	641489	542918	5.81	5.73	8%	
2015	705629	589984	5.85	5.77	10%	
2016	774775	633599	5.89	5.80	10%	9.82%

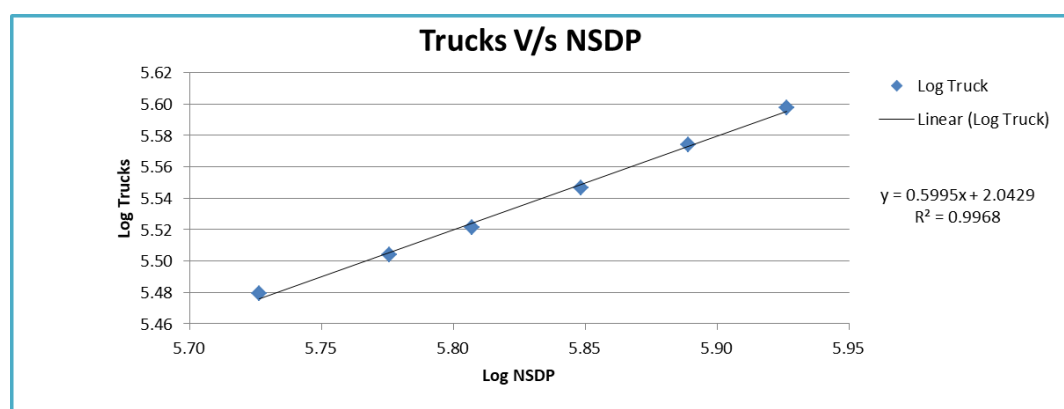
Following figure depict regression analysis and extrapolation.



**Table 5-9 : Truck Traffic Vs NSDP Gujarat**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	532809	301533	5.73	5.48		
2013	596659	319207	5.78	5.50	12%	
2014	641489	332185	5.81	5.52	8%	
2015	705629	352225	5.85	5.55	10%	
2016	774775	375265	5.89	5.57	10%	
2017	843930	396061	5.93	5.60	9%	9.64%

Following figure depict regression analysis and extrapolation

**Figure 5-6 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Gujarat.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below

**Table 5-10 : Summary Regression Analysis Gujarat**

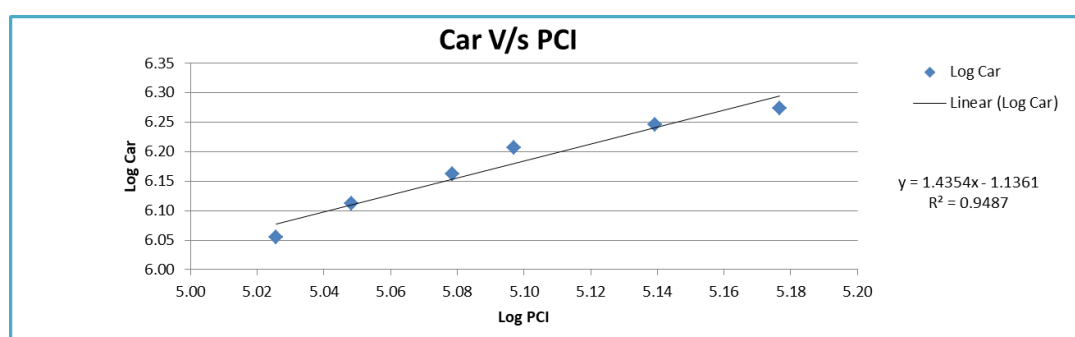
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Gujarat	Car/Jeep	PCI	$y = 1.4948x + -1.2417$	$R^2 = 0.9988$	1.4948	8.21%	12.27%
	Bus	Population	$y = 1.6818x - 8.2501$	$R^2 = 0.6374$	1.6818	1.79%	3.00%
	LCV	NSDP	$y = 0.9327x - 0.3133$	$R^2 = 0.9957$	0.9327	9.82%	9.16%
	Truck	NSDP	$y = 0.5995x - 2.0429$	$R^2 = 0.9968$	0.5995	9.64%	5.78%

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Haryana State.

**Table 5-11 : Per Capita Income Vs Car Haryana**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	106085	1134514	5.03	6.05		
2013	111780	1293065	5.05	6.11	5%	
2014	119791	1454182	5.08	6.16	7%	
2015	125032	1609544	5.10	6.21	4%	
2016	137818	1764448	5.14	6.25	10%	
2017	150241	1879587	5.18	6.27	9%	7.23%

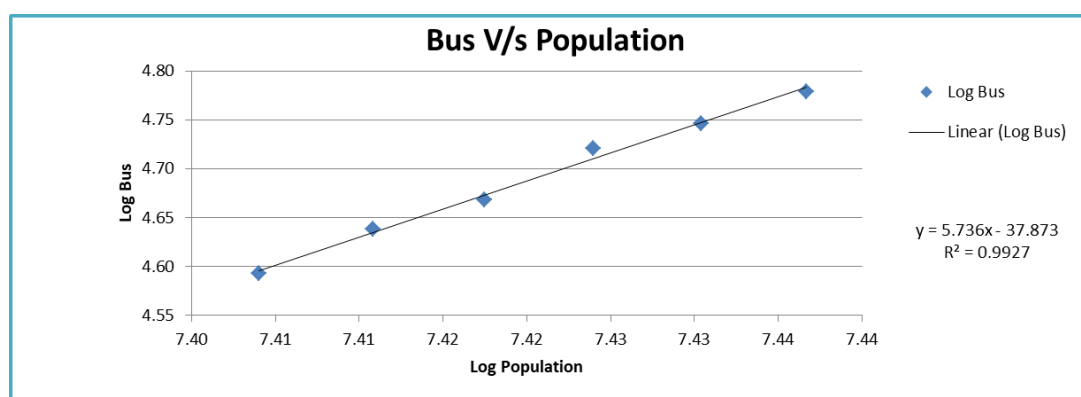
Regression analysis of same is given in figure below

**Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana**

**Table 5-12 : Population Vs Bus Haryana**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	25351462	39153	7.40	4.59		
2013	25751257	43456	7.41	4.64	2%	
2014	26149236	46558	7.42	4.67	2%	
2015	26545282	52640	7.42	4.72	2%	
2016	26939286	55781	7.43	4.75	1%	
2017	27331141	60129	7.44	4.78	1%	1.52%

Regression analysis of same is given in figure below

**Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Haryana**

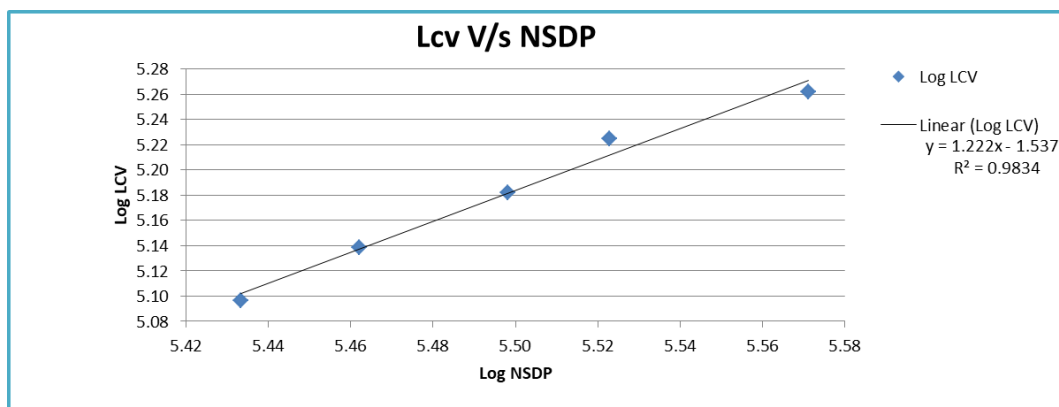
Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-13 : LCV Traffic Vs NSDP Haryana**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	271152	124897	5.43	5.10		
2013	289756	137511	5.46	5.14	7%	
2014	314931	152069	5.50	5.18	9%	
2015	333359	167901	5.52	5.23	6%	

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2016	372659	182776	5.57	5.26	12%	8.30%

Following figure depict regression analysis and extrapolation.

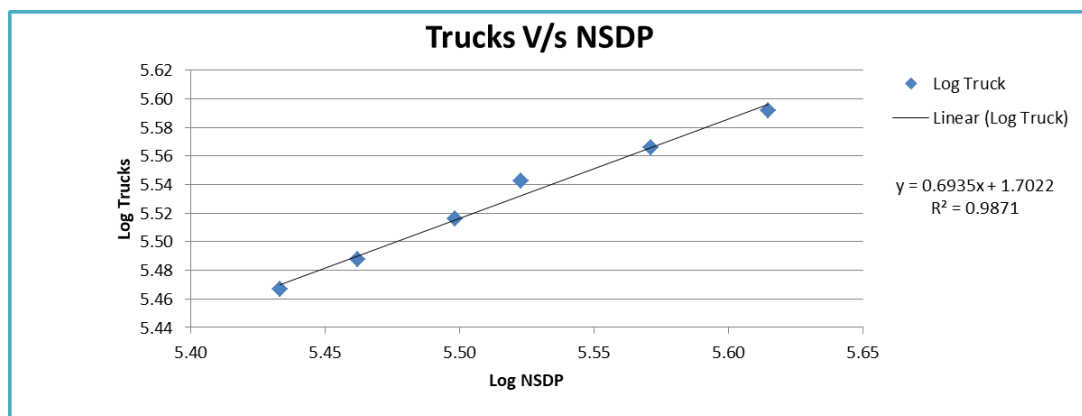


**Figure 5-9 : Regression and Elasticity NSDP vs. Lcv – Extrapolation Haryana**

**Table 5-14 : Truck Traffic Vs NSDP Haryana**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	271152	292735	5.43	5.47		
2013	289756	307509	5.46	5.49	7%	
2014	314931	327882	5.50	5.52	9%	
2015	333359	348732	5.52	5.54	6%	
2016	372659	367730	5.57	5.57	12%	
2017	412006	390321	5.61	5.59	11%	8.75%

Following figure depict regression analysis and extrapolation



**Figure 5-10 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Haryana.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below

**Table 5-15 : Summary Regression Analysis Haryana**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Haryana	Car/Jeep	PCI	$y = 1.4354x - 1.1361$	R <sup>2</sup> = 0.9487	1.4354	7.23%	10.38%
	Bus	Population	$y = 5.736x - 37.8732$	R <sup>2</sup> = 0.9927	5.7360	1.52%	8.69%
	LCV	NSDP	$y = 1.222x - 1.5373$	R <sup>2</sup> = 0.9834	1.2220	8.30%	10.14%
	Truck	NSDP	$y = 0.6935x - 1.7022$	R <sup>2</sup> = 0.9871	0.6935	8.75%	6.07%

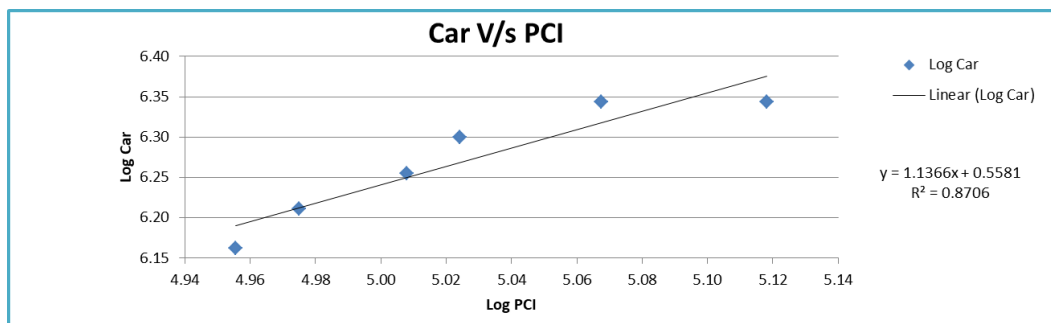
Following tables and graphs depict regression and elasticity of growth model for stretch falling in Karnataka State.

**Table 5-16 : Per Capita Income Vs Car Karnataka**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	90269	1454309	4.96	6.16		
2013	94382	1626924	4.97	6.21	5%	
2014	101864	1798035	5.01	6.25	8%	

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2015	105703	1992262	5.02	6.30	4%	
2016	116819	2207852	5.07	6.34	11%	
2017	131260	2203562	5.12	6.34	12%	7.83%

Regression analysis of same is given in figure below

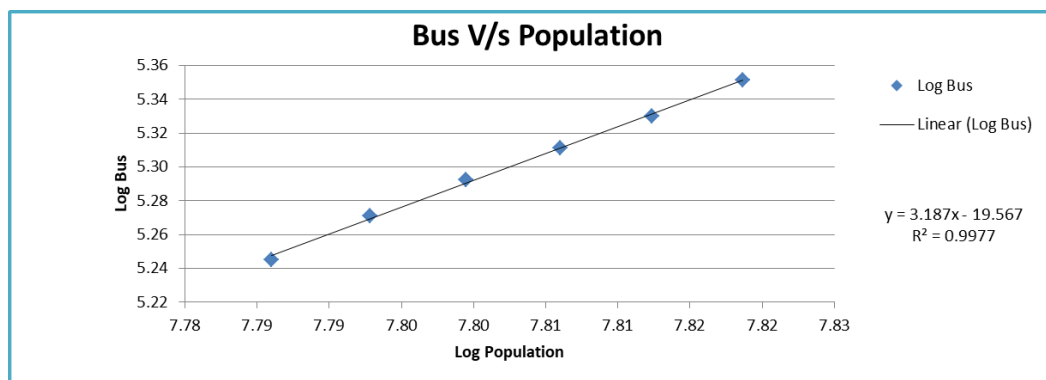


**Figure 5-11 : Regression and Elasticity PCI vs. Car – Extrapolation Karnataka**

**Table 5-17 : Population Vs Bus Karnataka**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	61095297	175705	7.79	5.24		
2013	62058777	186705	7.79	5.27	2%	
2014	63017877	195913	7.80	5.29	2%	
2015	63972322	204803	7.81	5.31	2%	
2016	64921845	213699	7.81	5.33	1%	
2017	65866188	224580	7.82	5.35	1%	1.52%

Regression analysis of same is given in figure below



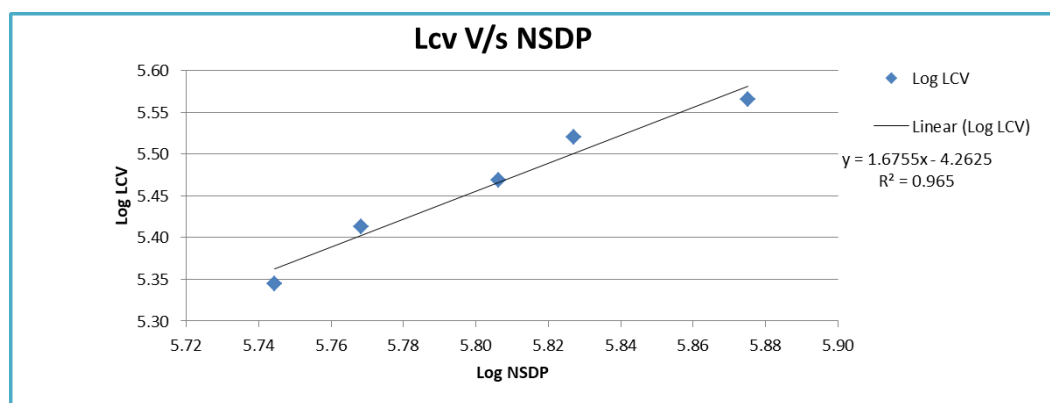
**Figure 5-12 : Regression and Elasticity Population vs. Bus – Extrapolation Karnataka**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-18 : LCV Traffic Vs NSDP Karnataka**

Year	NSDP	LCV	Log NSDP	Log LCV	NSDP Growth	Average Growth (5 Year)
2012	554990	221160	5.74	5.34		
2013	586592	258701	5.77	5.41	6%	
2014	639981	294266	5.81	5.47	9%	
2015	671322	331381	5.83	5.52	5%	
2016	749990	367572	5.88	5.57	12%	8%

Following figure depict regression analysis and extrapolation.

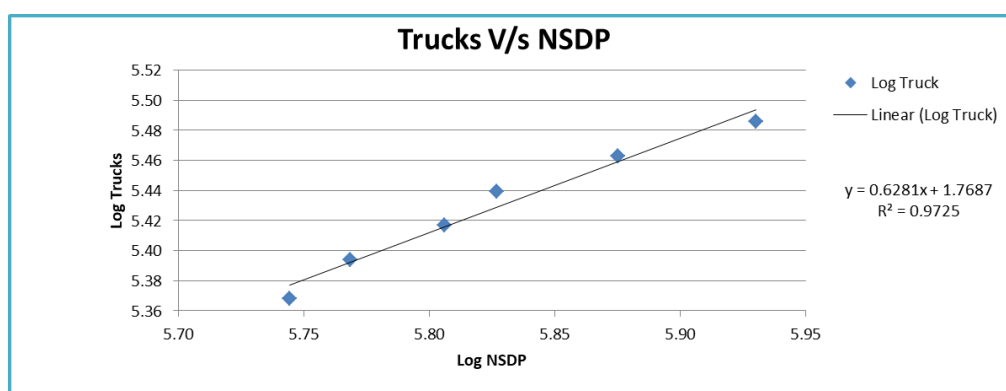


**Figure 5-13 : Regression and Elasticity NSDP vs. LCV – Extrapolation Karnataka**

**Table 5-19 : Truck Traffic Vs NSDP Karnataka**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2012	554990	233422	5.74	5.37		
2013	586592	247639	5.77	5.39	6%	
2014	639981	260989	5.81	5.42	9%	
2015	671322	274971	5.83	5.44	5%	
2016	749990	290415	5.88	5.46	12%	
2017	851880	306290	5.93	5.49	14%	9.00%

Following figure depict regression analysis and extrapolation

**Figure 5-14 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Karnataka.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-20 : Summary Regression Analysis Karnataka**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Karnataka	Car/Jeep	PCI	$y = 1.1366x - 0.5581$	$R^2 = 0.8706$	1.1366	7.83%	8.90%
	Bus	Population	$y = 3.187x - 19.567$	$R^2 = 0.9977$	3.1870	1.52%	4.83%
	LCV	NSDP	$y = 1.6755x - 4.2625$	$R^2 = 0.965$	1.6755	7.85%	13.16%
	Truck	NSDP	$y = 0.6281x - 1.7687$	$R^2 = 0.9725$	0.6281	9.00%	5.65%

Economical model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trend of growth. Project stretch of Yedashi to Aurangabad has recently been commissioned and is under tolling operation since March 2019. As traffic data available for last two years was affected due to COVID-19 the same cannot be taken as representative. A minimum of about 5 -6 years' consistent traffic data is required for establishing a reliable past trend.

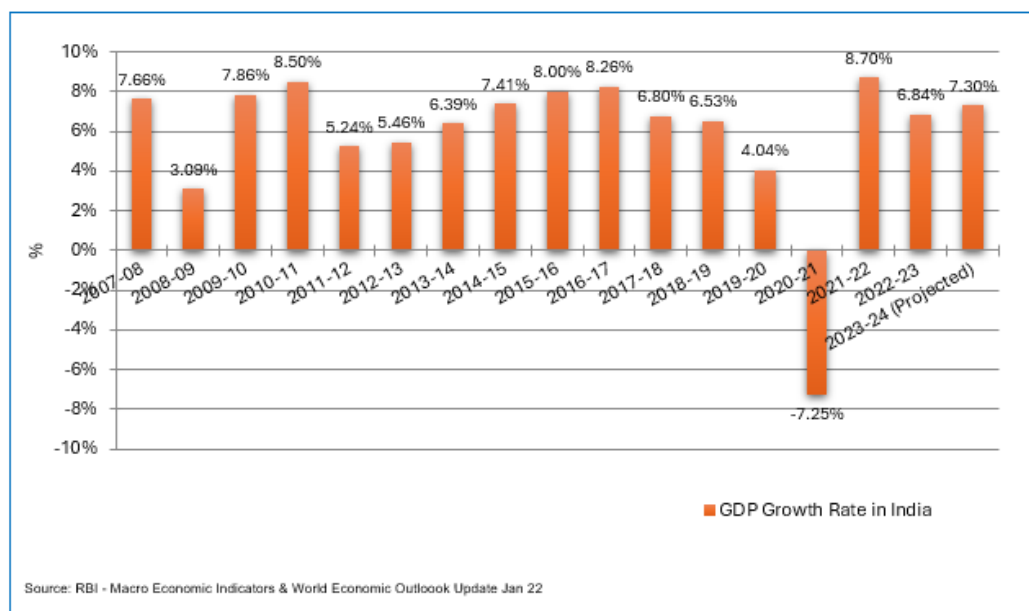
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

#### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-15 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23.

## 5.6 Developments along and around the Project Corridor & State

**Aurangabad:** is the fifth largest city in Maharashtra. It lies on a major trade route that used to connect north-west India's sea and land ports to the Deccan region. Aurangabad is administrative headquarters of the Aurangabad Division or Marathwada region.

**Beed:** Agriculture is the main business in Beed, and it is largely dependent on monsoon rain. Beed also is a district which provides a large number of laborers in India specially in the form of sugarcane cutters.

**Jalna:** is connected to major towns of the state-by-state highways. Road connectivity is excellent, roads connecting to Aurangabad, Pune, Ahmednagar, Nagpur, Beed, Mumbai having been upgraded to four-lane highways. A New Nagpur-Aurangabad-Mumbai highway,

passing through Jalna, is being developed. There are various cotton-ginning & oil-pressing factories in Jalna.

Until 1960 Aurangabad was a undeveloped city and industrially backward area. After 1960 Growth began when the Maharashtra Industrial Development Corporation (MIDC) began acquiring land and setting up industrial estates. Aurangabad is a now classic example of efforts of a state government towards the balanced industrialisation of the state. Major Industrial areas of Aurangabad are Chikhalthana MIDC, Shendra MIDC and Waluj MIDC. Many of the large India and multinational firms have established themselves in Industrial areas of Shendra, Waluj, Paithan.

Some of the big names include Audi, Skoda, Videocon, Siemens, Bajaj, Forbes, Goodyear, Wockhardt, Johnson & Johnson, Kenstar which have set up their production houses in Industrial areas of Aurangabad.

## DMIC

Delhi Mumbai Industrial Corridor (DMIC) which is passing close to PIA envisaged to influence the pattern of development and industrialization of the region. To tap the development potential of the proposed freight corridor, an area spanning 150 kilometers wide on both sides of the freight corridor has been identified as Influence Region and is proposed to be developed as Delhi-Mumbai Industrial Corridor (DMIC). One of the Nashik Sinnar Igatpuri Investment Region's identified early bird projects is an industrial area comprising of total 40 sq. km to be developed into two parts one of 8 sq. km in Shendra and other with an area of 32 sq. km at Bidkin some 24 km from Aurangabad on the Paithan road.

The Aurangabad Industrial City (AURIC) Bidkin Industrial Area (BIA) is strategically positioned and directly connected to the major state highways which are Paithan Road, NH-211 and SH-178 (Jalna Road). The nearest major city is Aurangabad which is served by NH-211, Major State Highway (MSH) 6 and MSH-8, and SH-16, SH-60 and SH-148.

Considering the scenario, it may be assumed that the traffic growth on the project highway would remain high and there are minimal risks in terms of growth.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as under. Rate of growth is moderated in light of overall regional trend. Growth of Multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, rate of growth diminishes. Same growth rate is not sustainable for long. Traffic growth has been suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.25% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Maharashtra Part of Stretch

**Table 5-21 : Recommended Growth Rates Optimistic**

Category / Year	2024-2025	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	9.46%	7.71%	7.08%	6.77%	6.72%
Bus	6.00%	4.79%	4.27%	4.01%	4.01%
Minibus	6.00%	4.79%	4.27%	4.01%	4.01%
LCV	5.98%	4.10%	3.41%	3.07%	3.00%
2- Axle	4.92%	3.69%	3.17%	2.91%	2.86%
3 - Axle	6.19%	4.75%	4.05%	3.71%	3.65%
4 to6 Axle	6.82%	4.75%	4.05%	3.71%	3.65%
7 and Above Axle	6.82%	4.75%	4.05%	3.71%	3.65%

**Table 5-22 : Recommended Growth Rates Pessimistic**

Category / Year	2024-2025	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	8.96%	7.21%	6.58%	6.27%	6.22%
Bus	5.50%	4.29%	3.77%	3.51%	3.51%
Minibus	5.50%	4.29%	3.77%	3.51%	3.51%
LCV	5.48%	3.60%	2.91%	2.57%	2.50%
2- Axle	4.42%	3.19%	2.67%	2.41%	2.36%
3 - Axle	5.69%	4.25%	3.55%	3.21%	3.15%
4 to6 Axle	6.32%	4.25%	3.55%	3.21%	3.15%
7 and Above Axle	6.32%	4.25%	3.55%	3.21%	3.15%

**Table 5-23 : Recommended Growth Rates Most Likely**

Category / Year	2024-2025	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	9.21%	7.46%	6.83%	6.52%	6.47%
Bus	5.75%	4.54%	4.02%	3.76%	3.76%
Minibus	5.75%	4.54%	4.02%	3.76%	3.76%
LCV	5.73%	3.85%	3.16%	2.82%	2.75%
2- Axle	4.67%	3.44%	2.92%	2.66%	2.61%
3 - Axle	5.94%	4.50%	3.80%	3.46%	3.40%
4 to6 Axle	6.57%	4.50%	3.80%	3.46%	3.40%
7 and Above Axle	6.57%	4.50%	3.80%	3.46%	3.40%

It is observed that a PIL was filed at Hon'ble Bombay High Court (Aurangabad bench) to augment the Autram Ghat section (between Chalisgaon and Aurangabad). The Hon'ble High Court has passed an interim order in August 2023. It directed NHAI to submit a plan for augmentation of the road and till then movement of commercial vehicles is restricted on that section of the road. The matter is sub judice.

This has affected the traffic on stretch. It is assumed that the matter is temporary and should be resolved soon, in the near future and would result in increased traffic in the project corridor. Hence additional growth has been considered in the year 2025-26 to cater for the above.

Traffic and revenue have been worked out on the basis of the above growths and some are presented in subsequent chapters of the report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 134.000 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4123	376	284	1082	882	1642	28	8417	18946
2025-26	4045	412	301	1386	1195	2830	31	10201	26187
2026-27	4357	429	315	1437	1252	2964	33	10787	27499
2027-28	4693	446	330	1490	1312	3105	34	11410	28884
2028-29	5055	464	346	1545	1374	3252	35	12071	30338
2029-30	5444	483	363	1601	1439	3406	37	12773	31871
2030-31	5829	499	379	1652	1497	3544	38	13438	33281
2031-32	6241	516	395	1704	1558	3687	39	14140	34753
2032-33	6682	534	412	1758	1621	3836	40	14883	36298
2033-34	7154	552	429	1813	1687	3991	42	15668	37918
2034-35	7660	570	447	1870	1755	4153	44	16499	39618
2035-36	8179	587	465	1924	1820	4306	46	17327	41271
2036-37	8732	605	484	1980	1887	4466	48	18202	43006
2037-38	9323	623	504	2037	1957	4632	50	19126	44821
2038-39	9953	642	524	2097	2029	4804	52	20101	46718
2039-40	10626	661	545	2158	2104	4982	54	21130	48701
2040-41	11340	680	566	2220	2181	5163	56	22206	50747

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2041-42	12102	700	589	2283	2261	5351	58	23344	52892
2042-43	12914	720	613	2348	2343	5546	60	24544	55133
2043-44	13780	742	637	2415	2428	5748	62	25812	57478
2044-45	14706	764	663	2483	2516	5957	64	27153	59933

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage 194.000 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	8516	579	684	1456	1187	1894	28	14344	28015
2025-26	7650	597	670	1678	1387	3007	29	15017	33410
2026-27	8240	622	702	1740	1453	3150	31	15938	35173
2027-28	8875	647	736	1804	1522	3299	32	16915	37021
2028-29	9559	673	772	1870	1594	3455	33	17956	38973
2029-30	10296	701	809	1940	1670	3619	34	19069	41043
2030-31	11025	725	843	2002	1737	3765	35	20132	42959
2031-32	11805	750	880	2065	1807	3917	36	21260	44975
2032-33	12640	775	918	2130	1880	4075	37	22455	47091
2033-34	13535	801	957	2197	1957	4240	38	23725	49321
2034-35	14492	828	997	2267	2036	4412	39	25071	51664
2035-36	15473	853	1037	2332	2112	4576	40	26423	53968
2036-37	16521	879	1079	2399	2191	4746	41	27856	56388
2037-38	17640	906	1122	2470	2272	4922	42	29374	58929
2038-39	18834	934	1167	2542	2356	5104	43	30980	61592
2039-40	20108	962	1214	2616	2443	5293	44	32680	64387
2040-41	21458	990	1263	2691	2532	5486	45	34465	67291
2041-42	22899	1019	1314	2769	2624	5686	47	36358	70347
2042-43	24437	1050	1366	2848	2720	5893	49	38363	73553
2043-44	26078	1082	1421	2929	2819	6107	51	40487	76919
2044-45	27830	1115	1478	3012	2922	6330	53	42740	80462

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 3- Chainage 254.000 KM**

**(Optimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	7099	426	470	992	857	1323	22	11189	20746
2025-26	6671	418	481	1362	1152	2592	18	12695	28031
2026-27	7184	435	504	1412	1206	2715	19	13475	29506
2027-28	7738	452	528	1464	1264	2844	20	14310	31072
2028-29	8335	471	553	1518	1325	2979	21	15202	32730
2029-30	8977	490	580	1573	1388	3120	22	16150	34474
2030-31	9612	506	604	1623	1444	3247	23	17059	36099
2031-32	10292	523	629	1674	1503	3379	24	18024	37808
2032-33	11021	540	656	1727	1564	3516	25	19049	39607
2033-34	11801	559	684	1781	1628	3658	26	20137	41497
2034-35	12636	578	713	1837	1694	3806	27	21291	43484
2035-36	13491	595	742	1890	1757	3947	28	22450	45438
2036-37	14403	614	772	1945	1822	4093	29	23678	47490
2037-38	15378	633	803	2001	1890	4244	30	24979	49643
2038-39	16418	652	836	2059	1961	4402	31	26359	51913
2039-40	17528	672	870	2119	2034	4566	32	27821	54296
2040-41	18705	692	905	2180	2108	4733	33	29356	56769
2041-42	19962	712	941	2242	2184	4906	34	30981	59361
2042-43	21303	734	979	2306	2264	5085	35	32706	62091
2043-44	22733	756	1018	2372	2347	5270	36	34532	64955
2044-45	24261	779	1059	2440	2432	5462	37	36470	67968

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 1- Chainage 134.000 KM**  
**(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4123	376	284	1082	882	1642	28	8417	18946
2025-26	4042	411	301	1386	1195	2828	31	10195	26172
2026-27	4333	426	314	1430	1245	2948	33	10729	27354
2027-28	4645	441	327	1475	1298	3073	34	11293	28588
2028-29	4980	456	341	1521	1353	3204	35	11890	29885
2029-30	5339	472	355	1570	1410	3340	36	12522	31244
2030-31	5690	486	368	1612	1460	3458	37	13111	32467
2031-32	6064	500	382	1655	1512	3581	38	13732	33747
2032-33	6462	514	396	1699	1565	3708	39	14383	35075
2033-34	6887	529	411	1744	1620	3840	40	15071	36466
2034-35	7339	544	427	1790	1677	3976	41	15794	37914
2035-36	7798	558	442	1833	1731	4104	42	16508	39310
2036-37	8287	572	458	1877	1786	4236	43	17259	40764
2037-38	8806	586	474	1922	1843	4372	44	18047	42274
2038-39	9357	601	491	1968	1902	4512	45	18876	43848
2039-40	9943	616	508	2015	1963	4656	46	19747	45484
2040-41	10561	631	526	2062	2025	4802	47	20654	47167

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2041-42	11217	646	544	2111	2089	4953	48	21608	48923
2042-43	11915	662	563	2161	2155	5109	49	22614	50756
2043-44	12656	678	583	2212	2223	5270	50	23672	52667
2044-45	13443	694	603	2264	2293	5436	51	24784	54656

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 2- Chainage 194.000 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	8516	579	684	1456	1187	1894	28	14344	28015
2025-26	7643	597	670	1677	1386	3005	29	15007	33391
2026-27	8194	618	698	1731	1444	3133	31	15849	34978
2027-28	8784	640	728	1786	1505	3266	32	16741	36642
2028-29	9417	663	759	1843	1569	3405	33	17689	38396
2029-30	10096	687	791	1901	1635	3549	34	18693	40231
2030-31	10759	708	821	1951	1693	3674	35	19641	41907
2031-32	11467	729	852	2003	1753	3804	36	20644	43665
2032-33	12220	750	884	2057	1815	3939	37	21702	45505
2033-34	13024	772	917	2112	1879	4079	38	22821	47433
2034-35	13880	794	952	2168	1945	4224	39	24002	49450
2035-36	14750	815	985	2220	2007	4360	40	25177	51409
2036-37	15676	836	1020	2274	2071	4500	41	26418	53460
2037-38	16659	858	1057	2329	2137	4644	42	27726	55602
2038-39	17702	880	1095	2385	2205	4793	43	29103	57839
2039-40	18811	902	1134	2442	2276	4946	44	30555	60175
2040-41	19980	924	1174	2499	2348	5101	45	32071	62586
2041-42	21221	947	1215	2557	2422	5261	46	33669	65105
2042-43	22540	971	1258	2617	2499	5427	47	35359	67752
2043-44	23941	995	1302	2679	2578	5598	48	37141	70518
2044-45	25430	1020	1347	2742	2659	5774	49	39021	73408

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 3- Chainage 254.000 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	7099	426	470	992	857	1323	22	11189	20746
2025-26	6666	418	481	1362	1151	2591	18	12686	28014
2026-27	7146	433	502	1404	1199	2701	19	13404	29351
2027-28	7662	449	524	1449	1250	2816	20	14170	30767
2028-29	8215	465	547	1495	1303	2936	21	14982	32254
2029-30	8807	481	570	1542	1358	3061	22	15841	33812
2030-31	9386	495	592	1583	1406	3170	23	16655	35240

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2031-32	10003	509	614	1625	1456	3283	24	17514	36733
2032-33	10661	524	637	1668	1507	3400	25	18422	38296
2033-34	11362	539	661	1712	1560	3521	26	19381	39931
2034-35	12109	555	686	1757	1615	3646	27	20395	41644
2035-36	12868	569	710	1799	1666	3763	28	21403	43306
2036-37	13675	584	735	1842	1719	3884	29	22468	45048
2037-38	14532	599	760	1886	1773	4009	30	23589	46863
2038-39	15442	615	787	1931	1829	4138	31	24773	48766
2039-40	16410	631	815	1977	1888	4271	32	26024	50760
2040-41	17430	647	844	2023	1947	4405	33	27329	52814
2041-42	18513	663	873	2070	2008	4543	34	28704	54957
2042-43	19664	679	903	2119	2071	4686	35	30157	57206
2043-44	20887	696	935	2169	2136	4833	36	31692	59562
2044-45	22185	713	968	2220	2202	4985	37	33310	62024

Traffic projections for Most Likely scenario is given as under

**Table 6-7 : Total Tollable Traffic @ Toll Plaza 1- Chainage 134.000 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4123	376	284	1082	882	1642	28	8417	18946
2025-26	4044	411	301	1386	1195	2829	31	10198	26179
2026-27	4345	428	315	1433	1248	2956	33	10758	27426
2027-28	4669	444	329	1482	1304	3089	34	11351	28734
2028-29	5017	461	344	1533	1362	3228	35	11980	30109
2029-30	5391	479	360	1586	1424	3373	36	12649	31560
2030-31	5759	494	374	1632	1478	3501	37	13275	32873
2031-32	6152	509	389	1679	1534	3634	38	13935	34246
2032-33	6572	524	405	1728	1592	3772	39	14632	35683
2033-34	7020	540	421	1778	1653	3915	40	15367	37184
2034-35	7499	557	438	1830	1716	4063	41	16144	38755
2035-36	7987	572	455	1879	1775	4203	42	16913	40275
2036-37	8508	587	472	1929	1837	4348	43	17724	41862
2037-38	9063	603	490	1980	1901	4498	44	18579	43520
2038-39	9654	620	508	2032	1967	4653	45	19479	45246
2039-40	10283	638	528	2086	2035	4814	46	20430	47057
2040-41	10947	656	548	2140	2104	4978	47	21420	48920
2041-42	11655	674	569	2195	2175	5147	48	22463	50861
2042-43	12408	692	590	2252	2248	5322	50	23562	52890
2043-44	13210	711	612	2311	2324	5502	52	24722	55011
2044-45	14064	730	635	2371	2403	5688	54	25945	57225

**Table 6-8 : Total Tollable Traffic @ Toll Plaza 2- Chainage 194.000 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	8516	579	684	1456	1187	1894	28	14344	28015
2025-26	7647	597	670	1677	1386	3006	29	15012	33400
2026-27	8217	619	701	1735	1449	3141	31	15893	35075
2027-28	8831	643	732	1794	1514	3282	32	16828	36829
2028-29	9489	668	765	1856	1581	3429	33	17821	38676
2029-30	10197	693	800	1920	1652	3583	34	18879	40629
2030-31	10893	715	832	1976	1715	3719	35	19885	42428
2031-32	11636	737	865	2033	1780	3860	36	20947	44308
2032-33	12429	760	900	2092	1847	4006	37	22071	46280
2033-34	13277	784	937	2153	1917	4158	38	23264	48356
2034-35	14183	809	975	2216	1990	4315	39	24527	50533
2035-36	15107	832	1012	2274	2058	4464	40	25787	52655
2036-37	16092	856	1050	2334	2129	4618	41	27120	54881
2037-38	17141	880	1089	2396	2203	4777	42	28528	57211
2038-39	18258	905	1130	2459	2280	4942	43	30017	59655
2039-40	19448	930	1173	2524	2359	5113	44	31591	62218
2040-41	20707	955	1217	2589	2439	5286	45	33238	64864
2041-42	22047	981	1262	2656	2522	5465	46	34979	67638
2042-43	23473	1008	1309	2725	2607	5650	47	36819	70545
2043-44	24991	1036	1359	2797	2695	5841	48	38767	73599
2044-45	26607	1064	1410	2870	2787	6039	50	40827	76805

**Table 6-9 : Total Tollable Traffic @ Toll Plaza 3- Chainage 254.000 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	7099	426	470	992	857	1323	22	11189	20746
2025-26	6668	418	481	1362	1151	2592	18	12691	28022
2026-27	7164	434	503	1409	1202	2708	19	13439	29429
2027-28	7699	450	526	1458	1255	2830	20	14238	30916
2028-29	8274	467	550	1508	1311	2957	21	15088	32483
2029-30	8891	485	575	1560	1370	3090	22	15993	34138
2030-31	9498	501	598	1605	1422	3208	23	16855	35664
2031-32	10146	517	622	1651	1475	3330	24	17765	37259
2032-33	10838	533	647	1700	1530	3457	25	18730	38938
2033-34	11578	550	674	1750	1588	3588	26	19754	40702
2034-35	12368	567	701	1801	1648	3724	27	20836	42548
2035-36	13174	583	728	1849	1705	3853	28	21920	44359
2036-37	14033	599	756	1898	1764	3986	29	23065	46253
2037-38	14947	616	784	1949	1825	4124	30	24275	48238
2038-39	15921	633	813	2001	1888	4266	31	25553	50313
2039-40	16958	650	843	2054	1953	4413	32	26903	52486
2040-41	18054	668	875	2107	2019	4562	33	28318	54737

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2041-42	19222	687	908	2162	2088	4717	34	29818	57106
2042-43	20465	706	942	2219	2159	4878	35	31404	59593
2043-44	21789	725	977	2277	2232	5044	36	33080	62195
2044-45	23198	745	1013	2336	2307	5215	37	34851	64918

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Yedeshi – Aurangabad project, the Target Date and Target Traffic are defined as under:

Target Date - 1<sup>st</sup> October 2023

Target Traffic -24407 in PCU

### *Pessimistic Case*

Target Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variation in CP	Original CP	Change in CP (In Years)
2023	24407	22381	-8%	12%	12%	26	3.2

PCUs as per Pessimistic cases have been considered for arriving at the concession Period end date.

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 1.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 1.2 Discount Categories

The fee schedule in the CA of Surat- Dahisar section of NH-8 is based on the old toll policy. As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

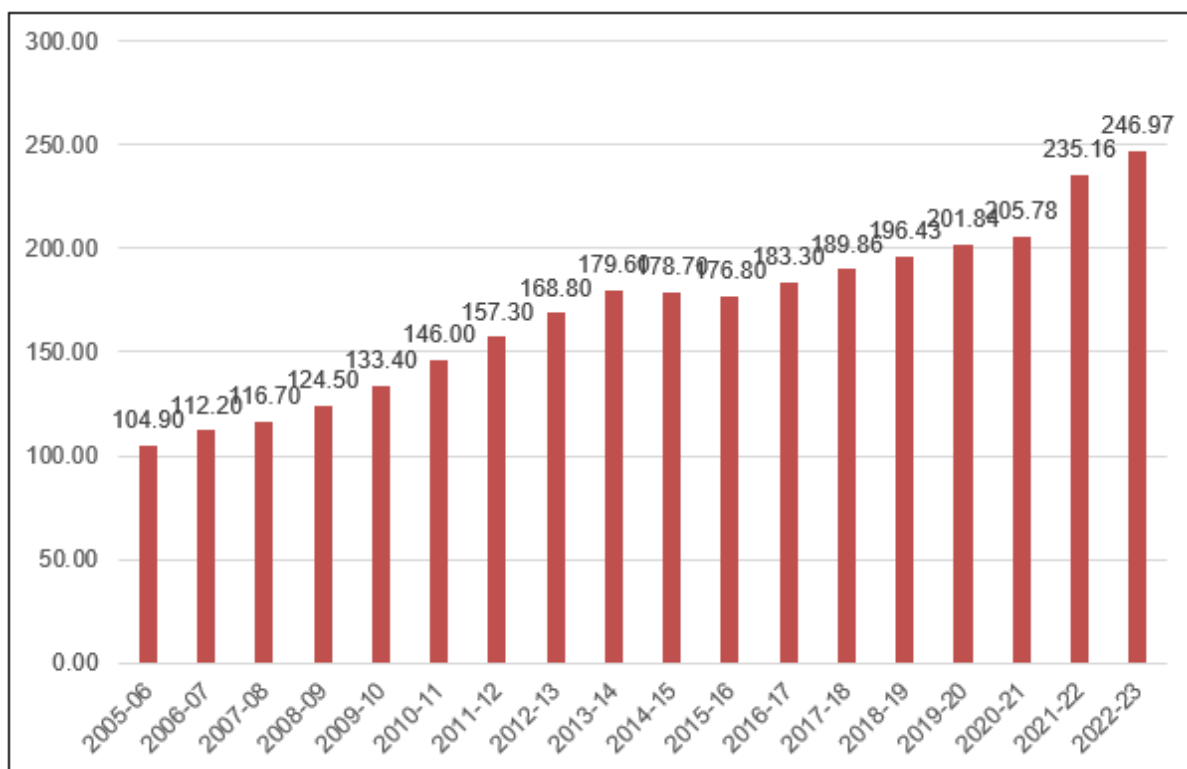
1. Monthly Pass: For frequent users monthly pass would be issued at fee at 2/3<sup>rd</sup> rate for 50 single journey trips.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van - Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza)

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is taken 5% and suitably stepped down for future years.

### 1.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Oversized Vehicles (7 or more Axles)	4.20

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs. five) for the concession period and are given below. Since applicable length of highway length is equal for both plazas, applicable toll rates are also same

Thus, worked out rates for various categories of vehicle and discounts are given as under.

**Table 7-2 : Toll Rates for Single Journey @ Km 134.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	80	130	270	270	295	425	515
2025-26	85	135	285	285	310	445	540
2026-27	90	140	300	300	325	465	570
2027-28	90	150	315	315	340	490	595
2028-29	95	155	330	330	360	515	630
2029-30	100	165	345	345	375	540	660
2030-31	105	175	365	365	395	570	695
2031-32	115	180	380	380	415	600	730
2032-33	120	190	400	400	440	630	765
2033-34	125	200	425	425	460	665	805
2034-35	130	210	445	445	485	700	850
2035-36	140	225	470	470	510	735	895
2036-37	145	235	495	495	540	775	940
2037-38	155	250	520	520	565	815	990
2038-39	160	260	545	545	595	860	1045
2039-40	170	275	575	575	630	905	1100
2040-41	180	290	605	605	660	950	1160
2041-42	190	305	640	640	700	1005	1220
2042-43	200	320	675	675	735	1060	1290
2043-44	210	340	710	710	775	1115	1360
2044-45	220	360	750	750	820	1175	1430

**Table 7-3 : Toll Rates for Single Journey @ Km 194.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	110	180	375	375	405	585	715
2024-25	115	185	390	390	430	615	750
2025-26	120	195	410	410	450	645	785
2026-27	130	205	435	435	470	680	825
2027-28	135	215	455	455	495	715	870
2028-29	140	230	480	480	520	750	915
2029-30	150	240	505	505	550	790	960
2030-31	155	250	530	530	575	830	1010

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2031-32	165	265	555	555	605	870	1060
2032-33	175	280	585	585	640	915	1115
2033-34	180	295	615	615	670	965	1175
2034-35	190	310	650	650	705	1015	1235
2035-36	200	325	680	680	745	1070	1300
2036-37	210	345	720	720	785	1125	1370
2037-38	225	360	755	755	825	1185	1445
2038-39	235	380	795	795	870	1250	1520
2039-40	250	400	840	840	915	1315	1605
2040-41	260	420	885	885	965	1390	1690
2041-42	275	445	935	935	1020	1465	1780
2042-43	290	470	985	985	1075	1545	1880
2043-44	305	495	1035	1035	1130	1625	1980
2044-45	325	520	1095	1095	1195	1715	2090

**Table 7-4 : Toll Rates for Single Journey @ Km 243.00**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	110	175	365	365	400	570	695
2025-26	115	185	385	385	420	600	730
2026-27	120	190	405	405	440	630	770
2027-28	125	200	425	425	460	665	810
2028-29	130	210	445	445	485	695	850
2029-30	140	225	465	465	510	735	890
2030-31	145	235	490	490	535	770	940
2031-32	155	245	515	515	565	810	985
2032-33	160	260	545	545	595	855	1040
2033-34	170	275	570	570	625	895	1090
2034-35	180	285	600	600	655	945	1150
2035-36	185	300	635	635	690	995	1210
2036-37	195	320	665	665	730	1045	1275
2037-38	210	335	700	700	765	1100	1340
2038-39	220	355	740	740	805	1160	1410
2039-40	230	370	780	780	850	1220	1490
2040-41	245	390	820	820	895	1290	1570
2041-42	255	415	865	865	945	1355	1650
2042-43	270	435	910	910	995	1430	1740
2043-44	285	460	960	960	1050	1510	1835
2044-45	300	485	1015	1015	1105	1590	1935

**Table 7-5 : Toll Rates for Return Journey @ Km 134.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	120	195	405	405	440	635	775
2025-26	125	205	425	425	465	665	810
2026-27	130	215	445	445	485	700	855
2027-28	140	225	470	470	510	735	895
2028-29	145	235	495	495	540	775	940
2029-30	155	245	520	520	565	815	990
2030-31	160	260	545	545	595	855	1040
2031-32	170	275	575	575	625	900	1095
2032-33	180	290	605	605	660	945	1150
2033-34	185	305	635	635	690	995	1210
2034-35	195	320	670	670	730	1045	1275
2035-36	210	335	705	705	765	1100	1340
2036-37	220	355	740	740	805	1160	1410
2037-38	230	370	780	780	850	1220	1485
2038-39	240	390	820	820	895	1285	1565
2039-40	255	415	865	865	945	1355	1650
2040-41	270	435	910	910	995	1430	1740
2041-42	285	460	960	960	1045	1505	1830
2042-43	300	485	1010	1010	1105	1585	1930
2043-44	315	510	1065	1065	1165	1675	2035
2044-45	330	535	1125	1125	1225	1765	2145

**Table 7-6 : Toll Rates for Return journey @ Km 194.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	165	265	560	560	610	880	1070
2025-26	175	280	590	590	640	920	1125
2026-27	185	295	620	620	675	970	1180
2027-28	190	310	650	650	710	1020	1240
2028-29	200	325	680	680	745	1070	1300
2029-30	210	340	715	715	780	1125	1370
2030-31	225	360	755	755	825	1185	1440
2031-32	235	380	795	795	865	1245	1515
2032-33	245	400	835	835	910	1310	1590
2033-34	260	420	880	880	955	1375	1675
2034-35	275	440	925	925	1005	1450	1765
2035-36	285	465	970	970	1060	1525	1855
2036-37	300	490	1025	1025	1115	1605	1955
2037-38	320	515	1080	1080	1175	1690	2055
2038-39	335	540	1135	1135	1240	1780	2165
2039-40	355	570	1195	1195	1305	1875	2285
2040-41	370	600	1260	1260	1375	1975	2405
2041-42	390	635	1330	1330	1450	2080	2535
2042-43	415	670	1400	1400	1525	2195	2670

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2043-44	435	705	1475	1475	1610	2315	2815
2044-45	460	745	1555	1555	1695	2440	2970

**Table 7-7 : Toll Rates for Return journey @ Km 243.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	160	260	545	545	595	860	1045
2025-26	170	275	575	575	625	900	1100
2026-27	180	290	605	605	660	945	1155
2027-28	190	305	635	635	690	995	1210
2028-29	195	320	665	665	730	1045	1275
2029-30	205	335	700	700	765	1100	1340
2030-31	220	350	735	735	805	1155	1410
2031-32	230	370	775	775	845	1215	1480
2032-33	240	390	815	815	890	1280	1555
2033-34	255	410	860	860	935	1345	1640
2034-35	265	430	905	905	985	1415	1725
2035-36	280	455	950	950	1035	1490	1815
2036-37	295	480	1000	1000	1090	1570	1910
2037-38	310	505	1055	1055	1150	1650	2010
2038-39	330	530	1110	1110	1210	1740	2120
2039-40	345	560	1170	1170	1275	1835	2230
2040-41	365	590	1230	1230	1345	1930	2350
2041-42	385	620	1300	1300	1415	2035	2480
2042-43	405	655	1370	1370	1495	2145	2615
2043-44	425	690	1445	1445	1575	2260	2755
2044-45	450	725	1520	1520	1660	2385	2905

**Table 7-8 : Toll Rates for Monthly Pass Local@ all Toll Plaza**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585

Year	Car	Minibus /LCV
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890
2044-45	940	940

**Table 7-9 : Toll Rates for Monthly Pass @ Km 134.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	2655	4295	8995	8995	9810	14105	17170
2025-26	2790	4510	9445	9445	10305	14815	18035
2026-27	2930	4735	9925	9925	10825	15565	18945
2027-28	3080	4975	10430	10430	11375	16355	19910
2028-29	3240	5230	10960	10960	11955	17190	20925
2029-30	3405	5500	11520	11520	12570	18070	21995
2030-31	3580	5780	12115	12115	13215	18995	23125
2031-32	3765	6080	12740	12740	13900	19980	24320
2032-33	3960	6395	13400	13400	14620	21015	25585
2033-34	4165	6730	14100	14100	15380	22110	26915
2034-35	4385	7080	14835	14835	16185	23265	28325
2035-36	4615	7455	15615	15615	17035	24490	29815
2036-37	4855	7845	16440	16440	17935	25780	31385
2037-38	5115	8265	17310	17310	18885	27150	33050
2038-39	5385	8705	18235	18235	19890	28595	34810
2039-40	5675	9170	19210	19210	20955	30120	36670
2040-41	5980	9660	20240	20240	22080	31740	38640
2041-42	6300	10180	21330	21330	23270	33450	40720
2042-43	6645	10730	22485	22485	24530	35260	42925
2043-44	7005	11315	23705	23705	25860	37175	45255
2044-45	7385	11930	24995	24995	27270	39200	47720

**Table 7-10 : Toll Rates for Monthly Pass @ Km 194.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	3675	5940	12440	12440	13570	19510	23750
2025-26	3860	6235	13070	13070	14255	20495	24950
2026-27	4055	6550	13730	13730	14975	21530	26210
2027-28	4260	6885	14425	14425	15735	22620	27540
2028-29	4480	7235	15160	15160	16540	23775	28945
2029-30	4710	7605	15935	15935	17385	24995	30425
2030-31	4950	8000	16755	16755	18280	26280	31990

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2031-32	5205	8410	17620	17620	19225	27635	33645
2032-33	5475	8845	18535	18535	20220	29070	35390
2033-34	5760	9310	19500	19500	21275	30585	37230
2034-35	6065	9795	20525	20525	22390	32185	39180
2035-36	6380	10310	21600	21600	23565	33875	41240
2036-37	6720	10855	22740	22740	24810	35665	43415
2037-38	7075	11430	23950	23950	26125	37555	45720
2038-39	7450	12040	25220	25220	27515	39555	48150
2039-40	7850	12680	26570	26570	28985	41670	50725
2040-41	8270	13360	27995	27995	30540	43905	53450
2041-42	8720	14080	29505	29505	32190	46270	56330
2042-43	9190	14845	31100	31100	33930	48775	59375
2043-44	9690	15650	32790	32790	35770	51420	62600
2044-45	10215	16505	34575	34575	37720	54225	66010

**Table 7-11 : Toll Rates for Monthly Pass @ Km 243.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	3595	5805	12165	12165	13270	19075	23225
2025-26	3775	6100	12775	12775	13940	20035	24395
2026-27	3965	6405	13425	13425	14645	21050	25625
2027-28	4165	6730	14105	14105	15385	22120	26930
2028-29	4380	7075	14825	14825	16170	23245	28300
2029-30	4605	7435	15585	15585	17000	24435	29750
2030-31	4840	7820	16385	16385	17875	25695	31280
2031-32	5090	8225	17230	17230	18795	27020	32895
2032-33	5355	8650	18125	18125	19770	28420	34600
2033-34	5635	9100	19070	19070	20800	29905	36405
2034-35	5930	9575	20065	20065	21890	31470	38310
2035-36	6240	10080	21120	21120	23040	33120	40325
2036-37	6570	10615	22235	22235	24260	34870	42450
2037-38	6920	11175	23415	23415	25545	36720	44700
2038-39	7285	11770	24660	24660	26905	38675	47080
2039-40	7675	12400	25980	25980	28340	40740	49600
2040-41	8090	13065	27375	27375	29865	42930	52260
2041-42	8525	13770	28850	28850	31470	45240	55075
2042-43	8985	14515	30410	30410	33175	47690	58055
2043-44	9475	15300	32060	32060	34975	50280	61210
2044-45	9990	16135	33810	33810	36880	53015	64545

## 1.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under

*Optimistic, Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 1.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2044-45 years starting from the year 2024-25 are shown in tables below.

**Table 7-12 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	TP-1	TP-2	TP-3	Total
2024-25	59.74	114.13	83.70	257.56
2025-26	89.02	149.45	124.48	362.95
2026-27	97.85	164.85	137.39	400.09
2027-28	108.01	183.10	152.36	443.47
2028-29	118.83	201.47	166.95	487.26
2029-30	130.83	222.34	185.51	538.67
2030-31	143.81	245.72	203.70	593.22
2031-32	158.67	269.80	225.08	653.56
2032-33	173.69	295.39	246.88	715.97
2033-34	190.69	325.89	271.54	788.11
2034-35	209.16	357.98	299.04	866.18
2035-36	230.41	393.45	328.70	952.56
2036-37	251.68	431.00	359.85	1042.52
2037-38	275.73	474.16	396.19	1146.08
2038-39	301.51	521.21	436.17	1258.88
2039-40	332.25	574.78	479.84	1386.88
2040-41	362.68	629.64	527.84	1520.16
2041-42	399.29	692.09	579.21	1670.59
2042-43	437.92	763.11	637.80	1838.82
2043-44	481.10	841.45	704.32	2026.88
2044-45	526.40	922.37	773.32	2222.09

**Table 7-13 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Year	TP-1	TP-2	TP-3	Total
2024-25	59.74	114.13	83.70	257.56
2025-26	88.97	149.37	124.41	362.75
2026-27	97.34	163.96	136.67	397.97
2027-28	106.94	181.21	150.82	438.97
2028-29	117.10	198.44	164.47	480.01
2029-30	128.28	217.93	181.91	528.11
2030-31	140.35	239.66	198.72	578.73
2031-32	154.11	261.90	218.46	634.48
2032-33	167.89	285.35	238.43	691.67
2033-34	183.42	313.27	260.97	757.65

Year	TP-1	TP-2	TP-3	Total
<b>2034-35</b>	200.25	342.45	286.00	<b>828.69</b>
<b>2035-36</b>	219.54	374.60	312.82	<b>906.96</b>
<b>2036-37</b>	238.66	408.33	340.82	<b>987.80</b>
<b>2037-38</b>	260.20	447.07	373.48	<b>1080.75</b>
<b>2038-39</b>	283.17	489.11	409.26	<b>1181.54</b>
<b>2039-40</b>	310.53	536.75	448.10	<b>1295.38</b>
<b>2040-41</b>	337.30	585.10	490.54	<b>1412.94</b>
<b>2041-42</b>	369.51	640.11	535.65	<b>1545.27</b>
<b>2042-43</b>	403.34	702.46	586.94	<b>1692.74</b>
<b>2043-44</b>	440.94	770.87	645.20	<b>1857.00</b>
<b>2044-45</b>	480.09	840.80	705.06	<b>2025.95</b>

**Table 7-14 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

Year	TP-1	TP-2	TP-3	Total
<b>2024-25</b>	59.74	114.13	83.70	<b>257.56</b>
<b>2025-26</b>	89.00	149.41	124.44	<b>362.85</b>
<b>2026-27</b>	97.59	164.43	137.01	<b>399.04</b>
<b>2027-28</b>	107.46	182.17	151.55	<b>441.18</b>
<b>2028-29</b>	117.92	199.91	165.64	<b>483.48</b>
<b>2029-30</b>	129.50	220.10	183.63	<b>533.23</b>
<b>2030-31</b>	142.01	242.63	201.13	<b>585.76</b>
<b>2031-32</b>	156.28	265.75	221.66	<b>643.69</b>
<b>2032-33</b>	170.66	290.23	242.52	<b>703.40</b>
<b>2033-34</b>	186.88	319.44	266.08	<b>772.40</b>
<b>2034-35</b>	204.48	350.08	292.34	<b>846.90</b>
<b>2035-36</b>	224.71	383.85	320.57	<b>929.13</b>
<b>2036-37</b>	244.82	419.49	350.07	<b>1014.38</b>
<b>2037-38</b>	267.52	460.40	384.62	<b>1112.54</b>
<b>2038-39</b>	291.78	504.91	422.48	<b>1219.17</b>
<b>2039-40</b>	320.77	555.45	463.72	<b>1339.94</b>
<b>2040-41</b>	349.27	606.97	508.89	<b>1465.12</b>
<b>2041-42</b>	383.51	665.58	557.08	<b>1606.17</b>
<b>2042-43</b>	419.64	732.01	611.92	<b>1763.57</b>
<b>2043-44</b>	459.94	805.15	674.22	<b>1939.31</b>
<b>2044-45</b>	502.07	880.39	738.46	<b>2120.91</b>

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Yedeshi to Aurangabad section of NH-211 in state of Maharashtra from km 100.000 to km 290.200 is currently four lane road. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the important regional network connecting Maharashtra with Karnataka and other southern states. There are large number of townships, industrial corridors and other business establishment coming up along project corridor. As discussed, dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give positive impact to traffic flow on project. The following can be considered as major outcomes of the study

- a) There is good amount of tollable traffic running on project
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy
- c) Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road

Based on above it can be considered a stable healthy project from traffic and revenue point of view.



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# **PALSIT TO DANKUNI SECTION OF NH 19 IN THE STATE OF WEST BENGAL (KM 588.870 TO KM 652.700)**



**OCTOBER 2024**

## **TTRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

## INTRODUCTION

### 1.1 Background

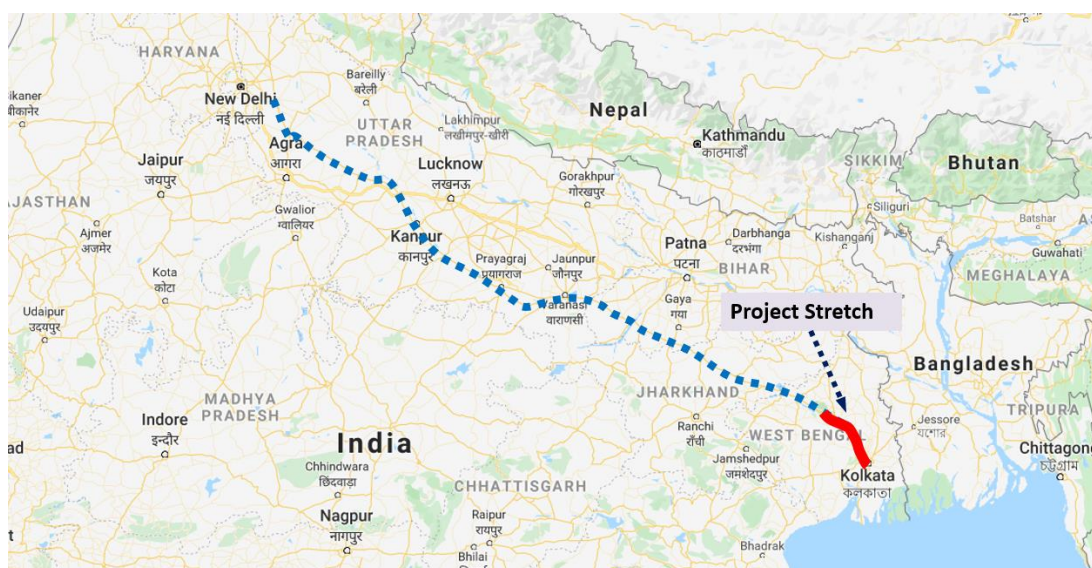
The Government of India through National Highway Authority of India (NHAI) embarked upon a program to enhance the traffic capacity and safety for efficient transportation of goods as well as passenger traffic on National Highway Sections under NHDP Phase V. Under Phase V NHAI has planned to convert 6,500 km of existing 4-lane National Highways into 6-lane National Highway. Sections envisaged under 6-laning comprise the Golden Quadrilateral section (5,700 km) and some other sections which are 800 km in length.

The project under consideration, **Palsit to Dankuni** section of NH-19 from km 588.870 to km 652.700 is one such road project NHAI intended to implement on a BOT basis in the DBFOT format. *M/s Palsit Dankuni Tollway. Ltd.* (Concessionaire) has been awarded the Project for a concession period of 17 years starting from 2<sup>nd</sup> April 2022. The Project has been commissioned and is currently under construction for six laning. Six laning of project is underway and expected to complete soon.

Project stretch from Palsit to Dankuni is part of new NH-19 Which was previously referred as Delhi -Kolkata. During renumbering of National Highway, Delhi to Agra route was numbered as NH-44 and Agra to Kolkata has been assigned as NH-19. From a transportation point of view, it is Delhi – Kolkata corridor.

New NH-19 connects industrial cities like Agra, Kanpur, Allahabad, Varanasi, Dhanbad, Durgapur, Bardhaman and terminates at Dankuni near Kolkata. Close proximity to Kolkata and Howrah has given impetus to industrial development around project highway at various locations.

Old Delhi Road (GT Road) lies east of project highway from Palsit onwards. Project stretch is developed at new alignment between Palsit and Dankuni and is known as Durgapur Expressway. The following figure shows the alignment of project stretch.



**Figure 1-1: Alignment of Project Stretch**

## 1.2 Objective of the Study

*M/s IRB INFRASTRUCTURE TRUST* has engaged *GMD Consultants* to assess the future traffic and toll potential of project stretch.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

National Highway 2 (NH 2) which is now renumbered as NH-19 is oldest highway in India and connects state of Delhi, Haryana, Uttar Pradesh, Bihar, Jharkhand and West Bengal. It constitutes a major portion of the historical grand truck road.

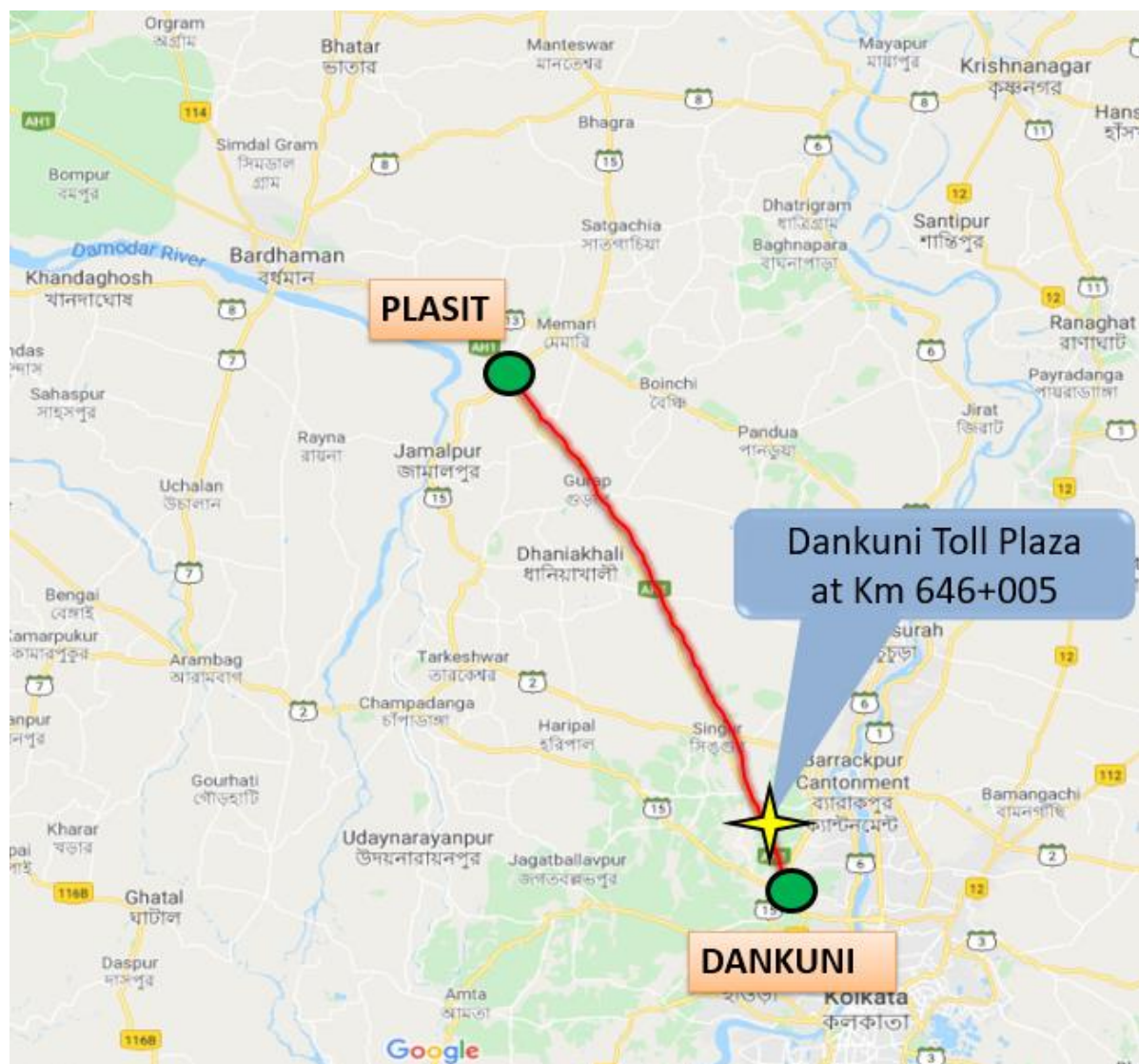
It connects the national capital Delhi to Kolkata, as well as important cities Mathura, Agra, Kanpur, Allahabad, Varanasi, Dhanbad, Asansol, Durgapur and Bardhaman. The highway is part of the Golden Quadrilateral project undertaken by National Highways Authority of India (NHAI).

The project road is the final link on Kolkata side between Palsit and Dankuni in the state of West Bengal. Dankuni is just out the outskirts of Kolkata on the northern side. The main project influence area of the project road consists of Dhanbad, Durgapur and Kolkata.

#### 2.2 Project Stretch Description

Section of NH-19 from Palsit to Dankuni is part of the major transportation link in the area connecting industrial cities of Dhanbad, Asansol, Durgapur and Kolkata. Project stretch is basically and gateway link to Kolkata from northern India. Being just on the outskirts of the major metro city Kolkata, a large number of warehouses and logistic hubs are established on project road. This also contributes to sustainable traffic and growth on project highway.

There is one operative toll plaza at project stretch which is at Dankuni at km 646.005. The following figure shows project alignment and toll plaza location.



**Figure 2-1: Project Alignment with Toll Plaza**

## 2.3 Project Corridor Illustration

Four lane project is under operation. Six laning has commenced on corridor. The following photographs illustrate the project section along the corridor.





***Figure 2-2: Photographs showing Project Corridor***

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza location on Palsit - Dankuni section of NH-19 for Yr. 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Toll Plaza Dankuni at km 646.005	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Four month from April 2024 to	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Four	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Four	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Four	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Four month

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		July 2024	month from April 2024 to July 2024	month from April 2024 to July 2024	month from April 2024 to July 2024	from April 2024 to July 2024

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van

- Min Bus /LCV
- Bus
- Truck
- 3-Axle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years 2019-20 ,2020-21, 2021-22, 2022-23, April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Dankuni Toll Plaza at Km 646.005**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2022-23	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	10514	10935	10898
2	LCV	1398	1031	983
3	Bus	789	788	700
4	Truck	3707	2542	2259
5	3-Axle	3061	2018	1637
6	Multi Axle	8974	8799	8551
7	Oversize Vehicle	8	9	9
	<b>Total</b>	<b>28451</b>	<b>26121</b>	<b>25037</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-4**.

**Table 3-4 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

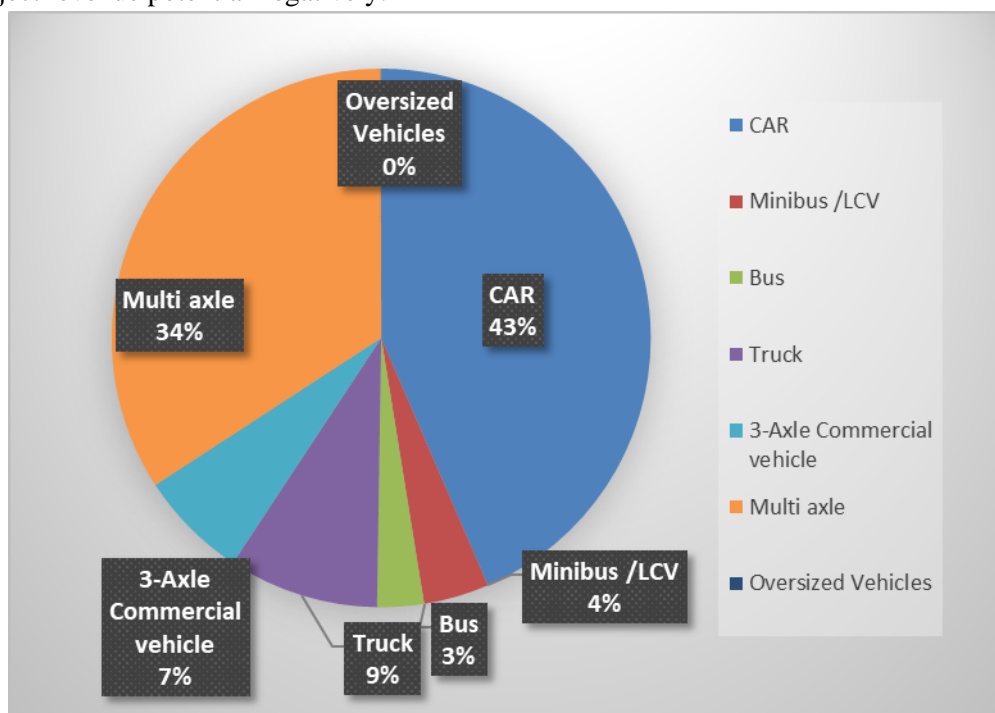
**Table 3-5 : Traffic in PCU at Project Stretch Base Year 2022-23**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2022-2023	Dankuni Km 646.005	28451	75699	2.66
2023-2024	Dankuni Km 646.005	26121	68159	2.61
2024-2025	Dankuni Km 646.005	25037	64680	2.58

It can be observed from above that project traffic has PCU index More than 2.5 at Dankuni which is an indicator of high proportion of commercial traffic in traffic mix.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-1 :Model Split of Tollable Vehicle-Dankuni Km 646.005**

It is observed that car traffic forms about 47% of total traffic at Dankuni toll plaza location while multi axle commercial vehicles and trucks are about 53% of total traffic.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-6 : Journey Type Bifurcation of Traffic at Dankuni Toll Plaza KM 646.005**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	11824

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
2	Return Journey	13198
3	Local Commercial Single Journey	0
4	Monthly Pass Local	12
5	Monthly Pass	3

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 47%. Return journey component is 53%. The number of monthly passes is 0% at Dankuni toll plaza. This indicates a higher share of long traffic.

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

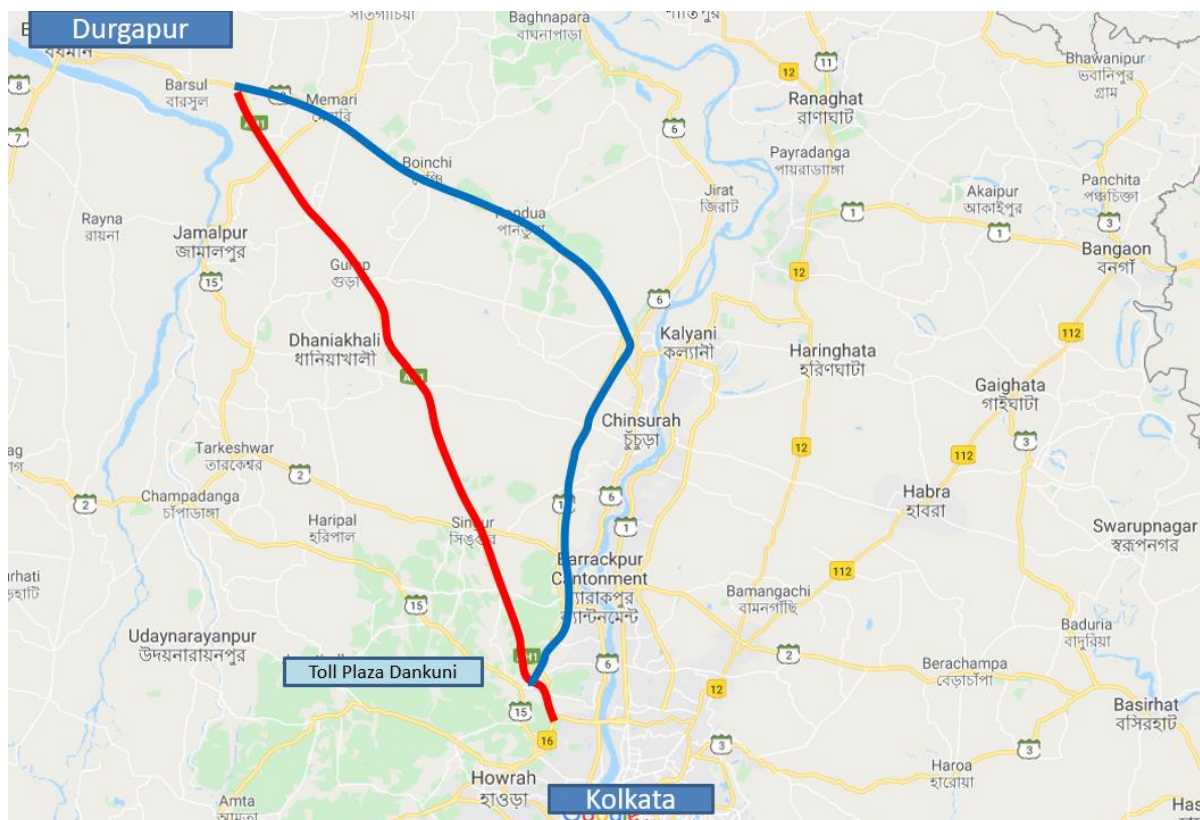
#### 4.2 Competing / Alternate route

Project stretch from Palsit to Dankuni is part of Golden Quadrilateral connecting four metros of India which has been widened to four lanes in year 2005. Part of the stretch, from Palsit to Dankuni, known as Durgapur Expressway, was constructed at different alignment to the east of old NH-2. Old NH-2, still known as GT road passes through congested built-up areas like Memari, Boinchi, Saptagram etc. It has a number of level rail crossings as well. Thus, traffic at project stretch is settled and as such has not much scope of diversion.

There are few alternate routes to project stretch. These are discussed in subsequent sections including their potential impact on project traffic.

##### **Old NH-2 (GT Road)**

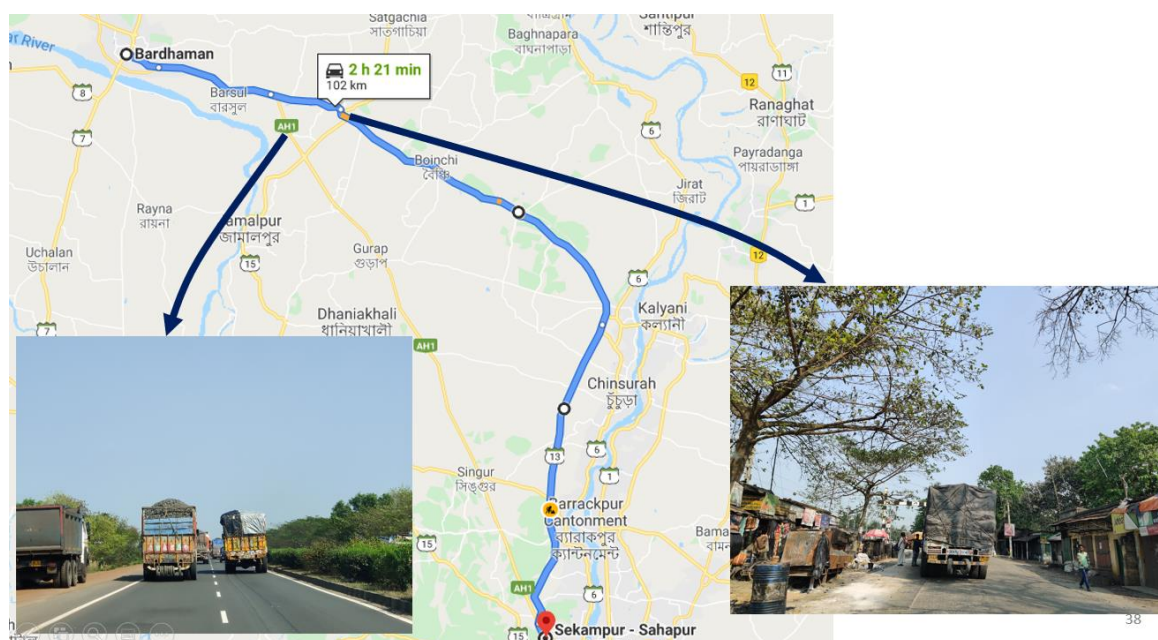
Between Palsit and Dankuni old NH-2 is an available alternate route to project stretch (Durgapur Expressway). The following figure shows both Durgapur Expressway and GT road.



**Figure 4-1 Project stretch and alternate GT Road**

GT road passes through congested locations and is two lanes currently in most of the stretch.

The following figure shows the typical condition of GT road as compared to project stretch.



**Figure 4-2 Project stretch and alternate GT Road Condition**

There are as many as 5 level crossings on GT road which cause traffic congestion. The following figure shows one such typical crossing.



**Figure 4-3 Railway level crossing at GT road.**

The following table shows comparison of length and travel time via both project stretch and old GT road between Bardhaman and Dankuni.

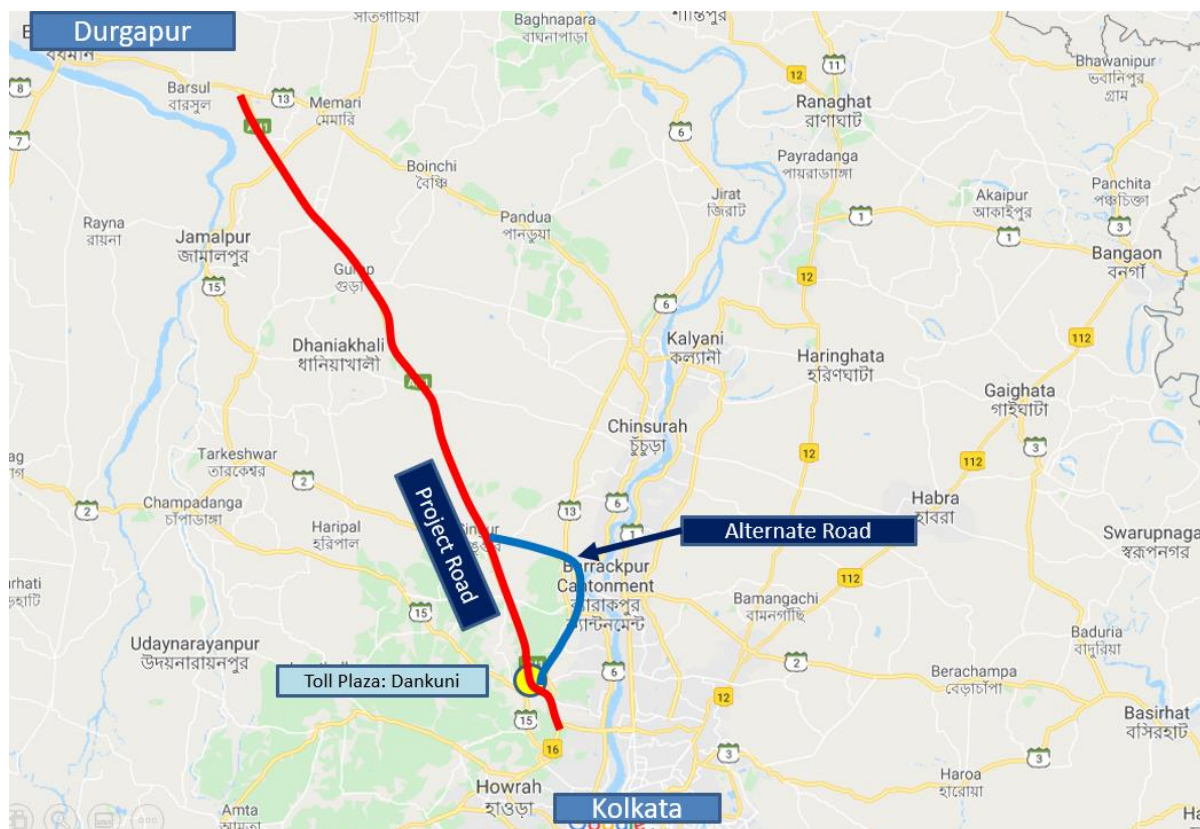
**Table 4-1 Project Road and GT road comparison**

Route	Distance (Km)	Time (Min)	Remarks
Bardhaman -Kolkata Via Old NH-2 GT Road	102	141	Road is two lanes in most places and passes through congested built-up areas (Alikhoja, Memari, Boinchi, Saptagram) and 7 level crossings.
<b>Bardhaman -Kolkata Via Project Road</b>	<b>84</b>	<b>79</b>	<b>Preferred Route</b>

Project road is quite short and saves lot of time. In such case any material shift of traffic from project stretch to old GT road is not envisaged.

## **B. Toll Plaza Local Leakage Roads**

As such leakage roads are not there at toll plazas but there can be a longer detour to avoid toll plazas. The following figure shows the location and alignment of these roads at Dankuni Toll plaza.



**Figure 4-4 Local roads bypassing toll plaza.**

At **Dankuni Toll Plaza**, there can be one alternate route via Singur- Baidyavati (Tarkeshwar) – Dankuni. The link from Singur to old Delhi Road is intermediate/ two lane. It's quite congested and geometrically very poor. Moreover, this road is used by pilgrims to reach the famous Tarkeshwar temple of Lord Shiva. Almost all through the year people walk in large groups on the way to Tarkeshwar. The major concentration of this Yatra is in the months of February to March and July- August. The following figure shows the typical condition of this link.



Old GT Road from Tarkeshwar to Dankuni is under widening to four lanes. There is one ROB under construction. Toll plaza is also under construction at GT Road. The following figures show under construction ROB and Toll Plaza at GT Road.



**Figure 4-5 ROB & Toll Plaza under construction.**

The following table provides comparison between project road and this alternate route around Dankuni toll plaza.

**Table 4-2 Length time comparison of alternate route at Dankuni Toll**

Route	Distance (Km)	Time (Min)	Remarks
Via Singur - Delhi Road (Old NH02)	27	41	From Singur to NH-2 road is intermediate lane and congested. Delhi road under four laning. Toll plaza under construction
<b>Via Project Road (Dankuni)</b>	<b>21.4</b>	<b>24</b>	<b>Preferred Route</b>

Between Singur and Kolkata- Road from Singur to Old NH-2 is two lane and quite congested. Currently part of NH-2 is under 4 laning and there is no toll as of now. Already passenger vehicles are using. Heavy commercial traffic is not allowed on existing bridge. Hence when ROB will be opened to traffic, certain amount of commercial traffic may divert to alternate route of Singur- NH-2.

Part of alternate route is congested and there is habitation on both sides. Progress on ROB at GT road has been very slow which is further impacted by pandemic COVI-19. As the route is existing since long and traffic is settled on both project stretch and GT road, it is unlikely that any further diversion of passenger traffic would take place. After completion of six laning of project stretch some passenger traffic may also divert to project stretch due to better traffic conditions at project stretch. However same is ignored for current analysis and projections.

At present heavy commercial traffic is not allowed on existing ROB on NH-2 however light commercial traffic is using the same. Hence some part of above diversion has already taken place.

Geometrics and condition of road from Singur to GT road is not good but still some amount of commercial traffic may divert to old GT road after ROB at GT road is completed. Following table shows potential diversion of traffic commercial traffic is taken into consideration for projection of traffic. Considering the above facts following diversion of commercial traffic has been assumed for traffic projections in 2025-26.

- Optimistic Case- 5%
- Most Likely Case- 10%
- Pessimistic Case- 15%

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Surat- Dahisar section of NH-8 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would-be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

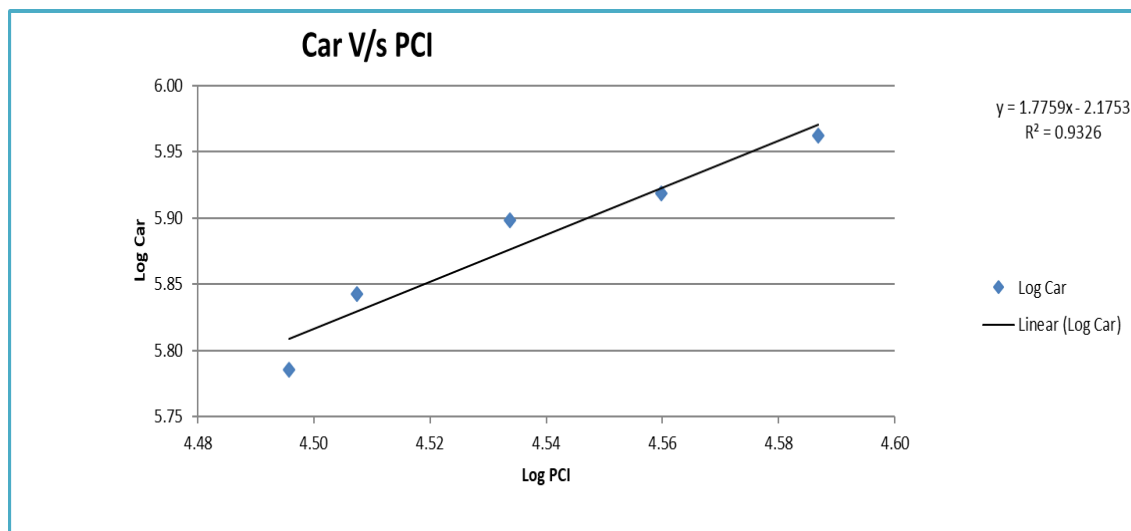
The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

As observed in OD analysis, the project stretch has a share of traffic from mainly three states of West Bengal, Jharkhand and Bihar and some traffic from Uttar Pradesh and Delhi. Hence regression of dependent variable and traffic has been done for these three states. The following tables and graphs present a summary of elasticity model of growth for project corridor.

**Table 5-1 : Per Capita Income Vs. Car- West Bengal**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	31314	610218	4.50	5.79		
2012	32164	695463	4.51	5.84	3%	
2013	34177	791069	4.53	5.90	6%	
2014	36293	829478	4.56	5.92	6%	
2015	38624	916475	4.59	5.96	6%	5.40%

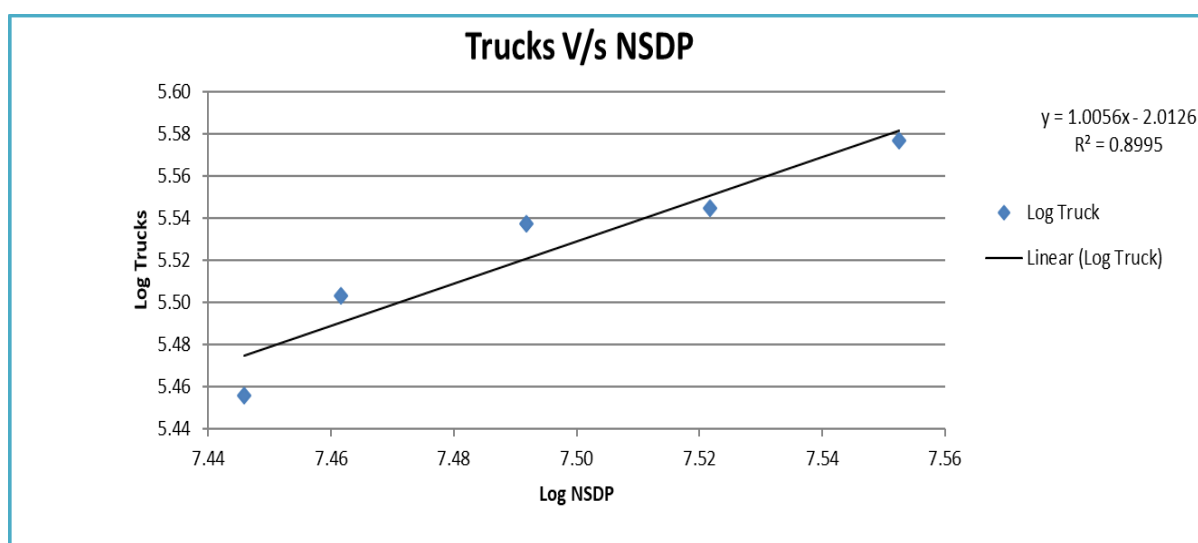
Regression analysis of above is given in following figure.



**Figure 5-1 : Regression Analysis Car Vs. PCI West Bengal**

**Table 5-2 : NSDP Vs. Truck- West Bengal**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2011	27919100	285733	7.45	5.46		
2012	28943200	318573	7.46	5.50	4%	
2013	31033800	344816	7.49	5.54	7%	
2014	33242500	350565	7.52	5.54	7%	
2015	35684500	377636	7.55	5.58	7%	6.34%



**Figure 5-2 : Regression Analysis NSDP Vs. Truck West Bengal**

Summary of regression analysis for elasticity and growth estimation for West Bengal are given in following table.

**Table 5-3 : Summary Regression Analysis- West Bengal**

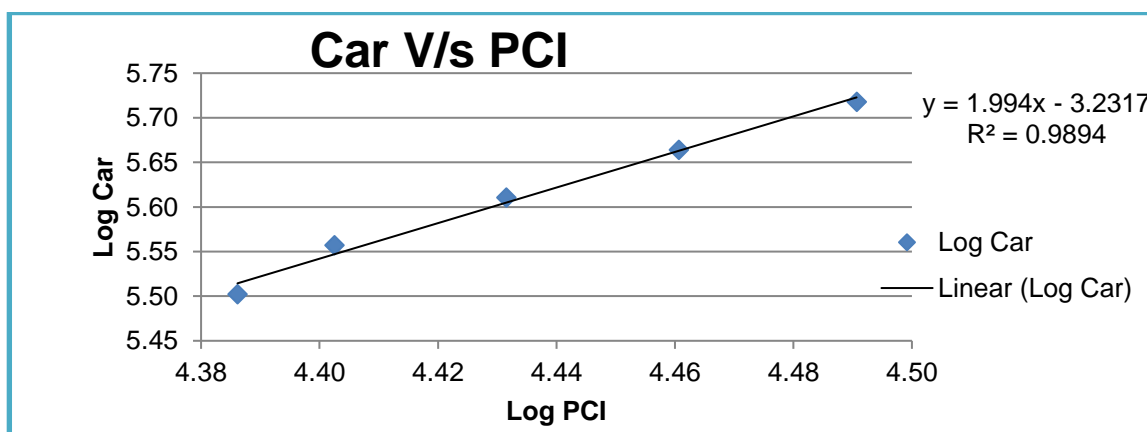
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
West Bengal	Car/Jeep	PCI	$y = 1.7759x - 2.1753$	$R^2 = 0.9326$	1.7759	5.40%	9.58%	Good Regression
	Bus	Population	$y = 0.5092x - 0.5636$	$R^2 = 0.0364$	0.5092	0.89%	0.46%	Poor Regression
	Truck	NSDP	$y = 1.0056x - 2.0126$	$R^2 = 0.8995$	1.0056	6.34%	6.37%	Good Regression

Similarly, regression tables and graphs of economic model for Jharkhand are given as below.

**Table 5-4 : Per Capita Income Vs. Car- Jharkhand**

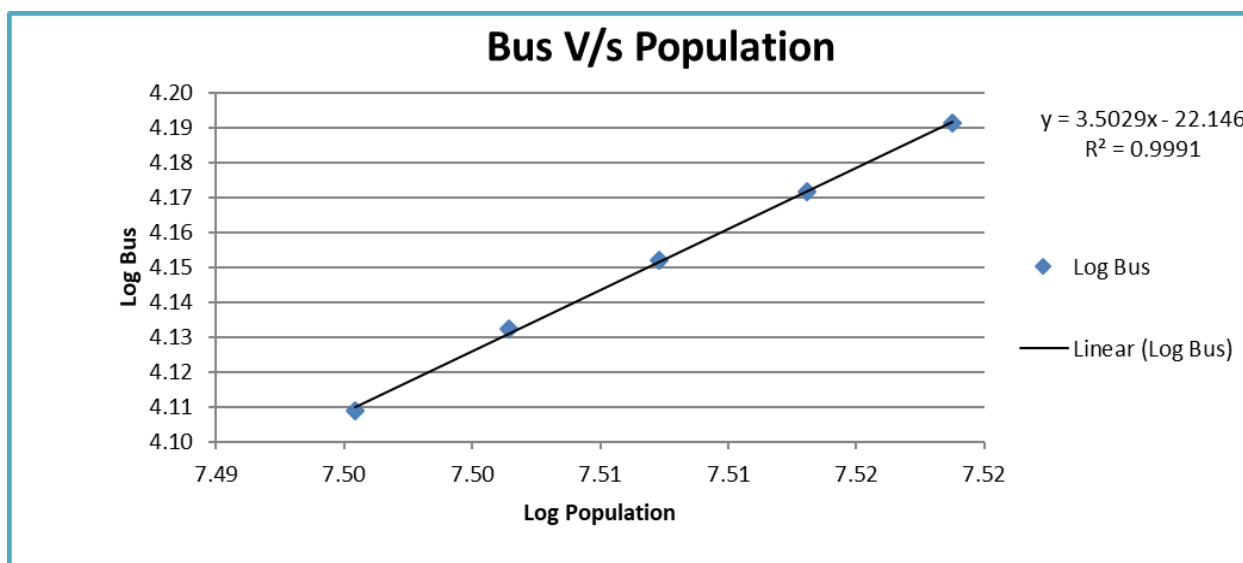
Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	24330	317931	4.39	5.50		
2012	25265	360662	4.40	5.56	4%	
2013	27010	408016	4.43	5.61	7%	
2014	28882	461587	4.46	5.66	7%	
2015	30950	522192	4.49	5.72	7%	6.2%

Regression analysis of above is given in following figure.

**Figure 5-3 : Regression Analysis Car Vs. PCI Jharkhand****Table 5-5 : Population Vs. Bus- Jharkhand**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	31292000	12847	7.50	4.11		
2012	31726000	13561	7.50	4.13	1%	

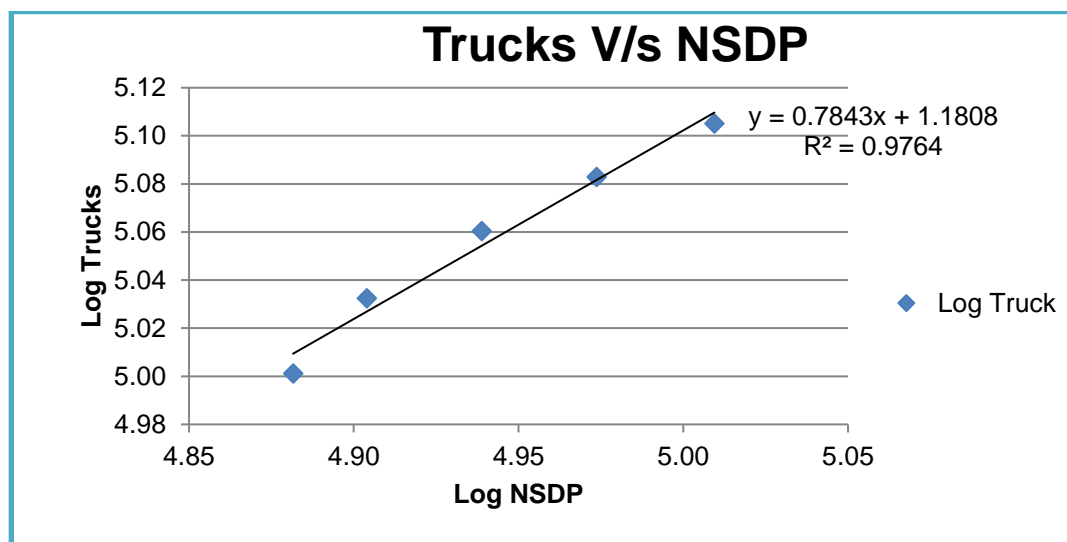
Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2013	32159000	14189	7.51	4.15	1%	
2014	32588000	14846	7.51	4.17	1%	
2015	33020000	15534	7.52	4.19	1%	1.35%



**Figure 5-4 : Regression Analysis Population Vs. Bus Jharkhand**

**Table 5-6 : NSDP Vs. Truck- Jharkhand**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2011	76134	100257	4.88	5.00		
2012	80157	107769	4.90	5.03	5%	
2013	86861	114903	4.94	5.06	8%	
2014	94121	121031	4.97	5.08	8%	
2015	102196	127374	5.01	5.11	9%	7.65%



**Figure 5-5 : Regression Analysis NSDP Vs. Jharkhand**

Summary of regression analysis for elasticity and growth estimation for Jharkhand are given in following table.

**Table 5-7 : Summary Regression Analysis- Jharkhand**

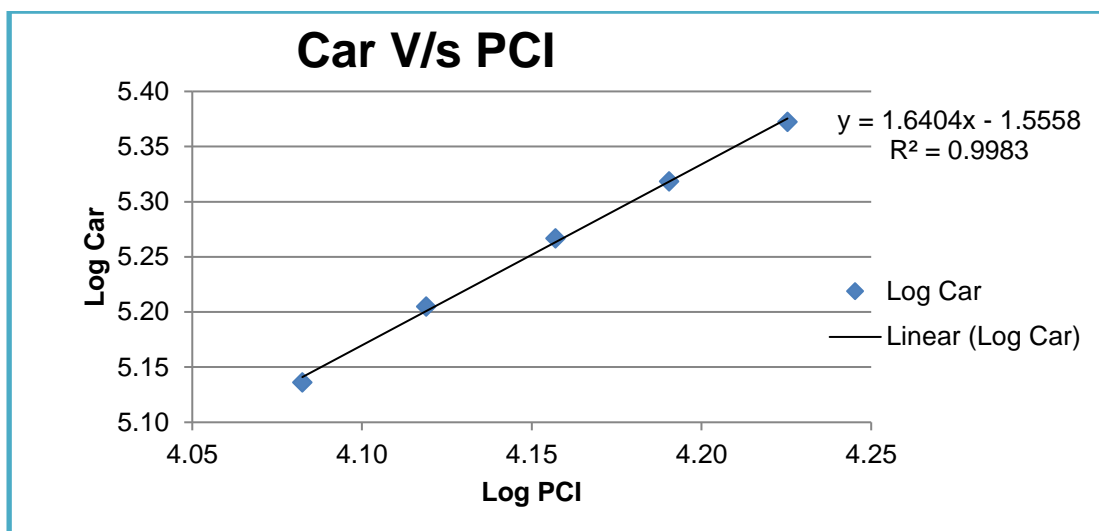
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
JHARKHAND	Car/Jeep	PCI	$y = 1.994x - 3.2317$	$R^2 = 0.9894$	1.9940	6.21%	12.38%	Good Regression
	Bus	Population	$y = 3.5029x - 22.1461$	$R^2 = 0.9991$	3.5029	1.35%	4.74%	Good Regression
	Truck	NSDP	$y = 0.7843x - 1.1808$	$R^2 = 0.9764$	0.7843	7.65%	6.00%	Good Regression

Similar analysis for the state of Bihar is presented in the table and regression graphs given below.

**Table 5-8 : Per Capita Income Vs. Car- Bihar**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	12090	136845	4.08	5.14		
2012	13149	160340	4.12	5.21	9%	
2013	14356	184792	4.16	5.27	9%	
2014	15506	208205	4.19	5.32	8%	
2015	16801	235762	4.23	5.37	8%	8.6%

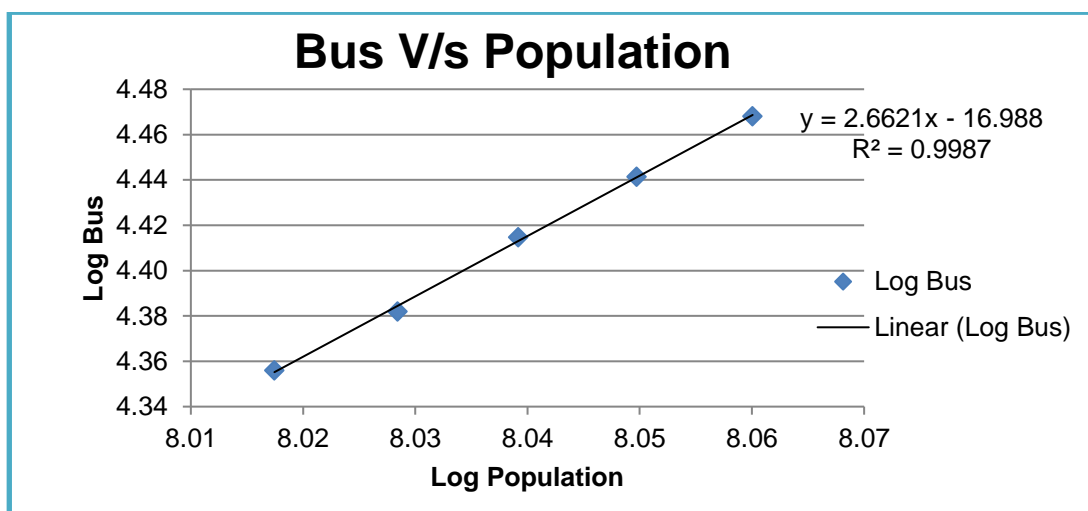
Regression analysis of above is given in following figure.



**Figure 5-6 : Regression Analysis Car Vs. PCI Bihar**

**Table 5-9 : Population Vs. Bus- Bihar**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	104099452	22703	8.02	4.36		
2012	106763632	24097	8.03	4.38	3%	
2013	109441349	25992	8.04	4.41	3%	
2014	112131327	27638	8.05	4.44	2%	
2015	114832300	29384	8.06	4.47	2%	2%



**Figure 5-7 : Regression Analysis Population Vs. Bus Bihar**

Table 5-10 : NSDP Vs. Truck- Bihar

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2011	11750314	73472	7.07	4.87		
2012	12952142	83191	7.11	4.92	10%	
2013	14324962	103211	7.16	5.01	11%	
2014	15667055	109010	7.19	5.04	9%	
2015	17180244	123744	7.24	5.09	10%	10%

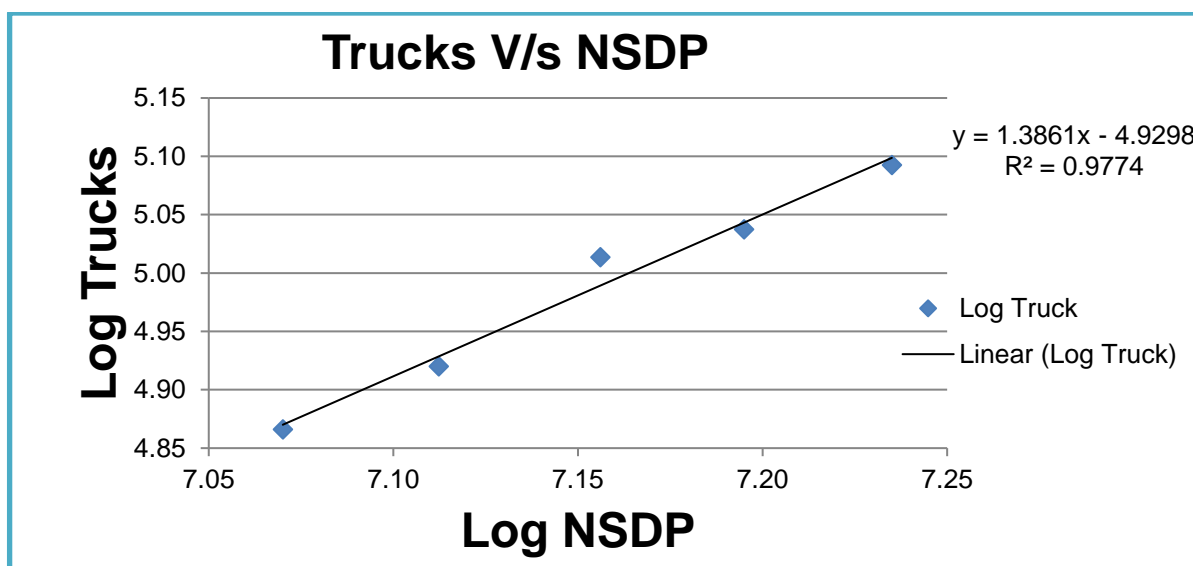


Figure 5-8 : Regression Analysis NSDP Vs. Truck Bihar

Summary of regression analysis for elasticity and growth estimation for Biharis given in following table

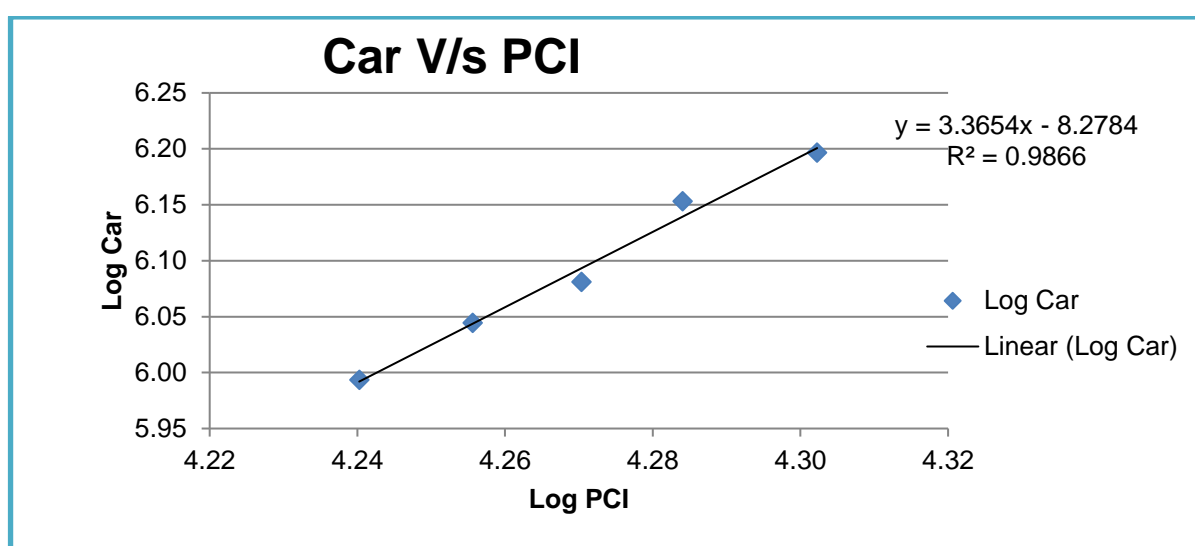
Table 5-11 : Summary Regression Analysis- Bihar

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
BIHAR	Car/Jeep	PCI	$y = 1.6404x - 1.5558$	$R^2 = 0.9983$	1.6404	8.58%	14.07%	Good Regression
	Bus	Population	$y = 2.6621x - 16.988$	$R^2 = 0.9987$	2.6621	2.48%	6.61%	Good Regression
	Truck	NSDP	$y = 1.3861x - 4.9298$	$R^2 = 0.9774$	1.3861	9.96%	13.81%	Good Regression

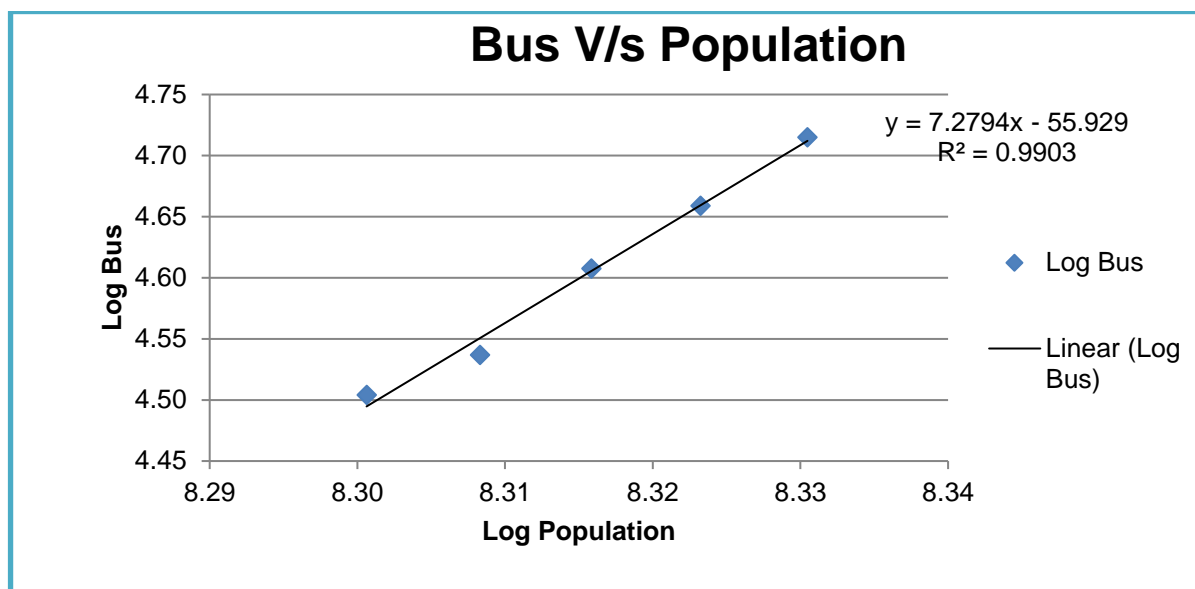
**Table 5-12 : Per Capita Income Vs. Car- Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	17388	984937	4.24	5.99		
2012	18014	1108100	4.26	6.04	4%	
2013	18635	1205374	4.27	6.08	3%	
2014	19233	1423020	4.28	6.15	3%	
2015	20057	1572217	4.30	6.20	4%	4%

Regression analysis of above is given in following figure.

**Figure 5-9 : Regression Analysis Car Vs. PCI Uttar Pradesh****Table 5-13 : Population Vs. Bus- Uttar Pradesh**

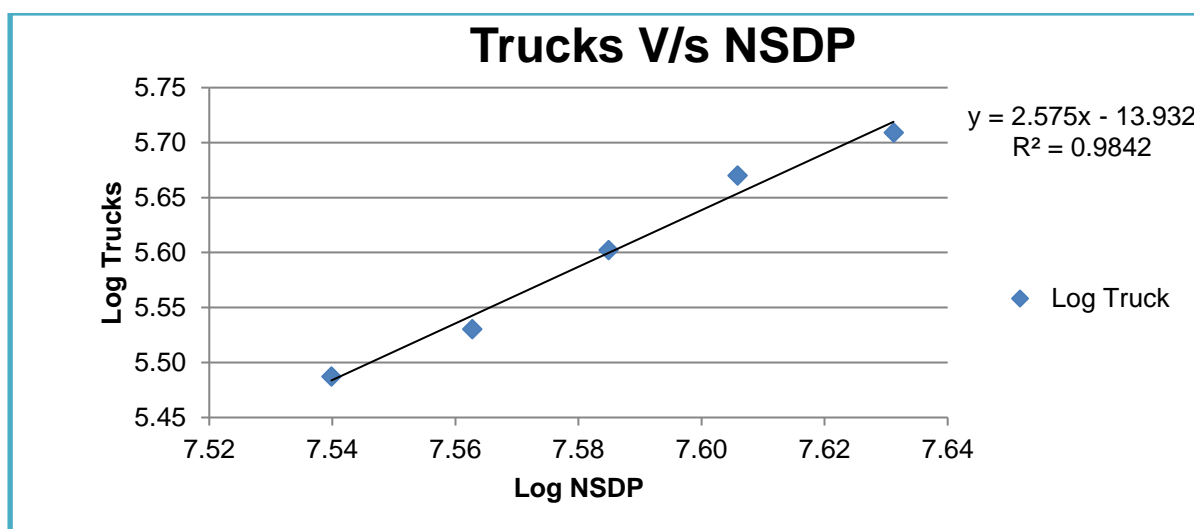
Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	199812341	31922	8.30	4.50		
2012	203382046	34428	8.31	4.54	2%	
2013	206942855	40501	8.32	4.61	2%	
2014	210493544	45607	8.32	4.66	2%	
2015	214032922	51866	8.33	4.71	2%	2%



**Figure 5-10 : Regression Analysis Population Vs. Bus Uttar Pradesh**

**Table 5-14 : NSDP Vs. Truck- Uttar Pradesh**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2011	34662085	307058	7.54	5.49		
2012	36537453	338977	7.56	5.53	5%	
2013	38445814	400061	7.58	5.60	5%	
2014	40350882	467786	7.61	5.67	5%	
2015	42775892	511631	7.63	5.71	6%	5%



**Figure 5-11 : Regression Analysis NSDP Vs. Truck Uttar Pradesh**

Summary of regression analysis for elasticity and growth estimation for Uttar Pradesh are given in following table.

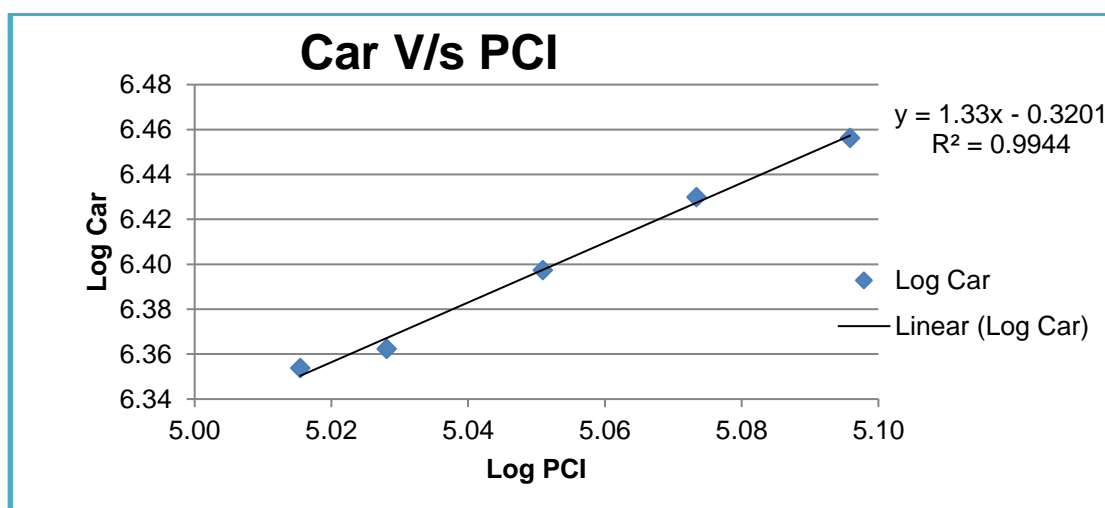
**Table 5-15 : Summary Regression Analysis- Uttar Pradesh**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Uttar Pradesh	Car/Jeep	PCI	$y = 3.3654x - 8.2784$	$R^2 = 0.9866$	3.3654	3.64%	12.23%	Good Regression
	Bus	Population	$y = 7.2794x - 55.9289$	$R^2 = 0.9903$	7.2794	1.73%	12.62%	Good Regression
	Truck	NSDP	$y = 2.575x - 13.9315$	$R^2 = 0.9842$	2.5750	5.40%	13.90%	Good Regression

**Table 5-16 : Per Capita Income Vs. Car- Delhi**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	103619	2258434	5.02	6.35		
2012	106677	2303052	5.03	6.36	3%	
2013	112441	2497167	5.05	6.40	5%	
2014	118411	2691282	5.07	6.43	5%	
2015	124698	2859620	5.10	6.46	5%	5%

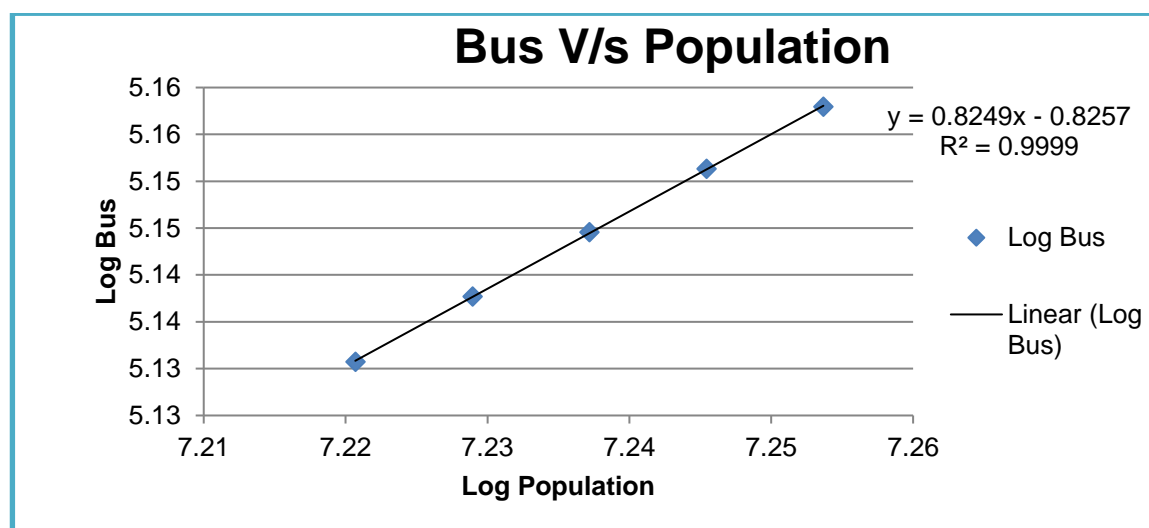
Regression analysis of above is given in following figure.



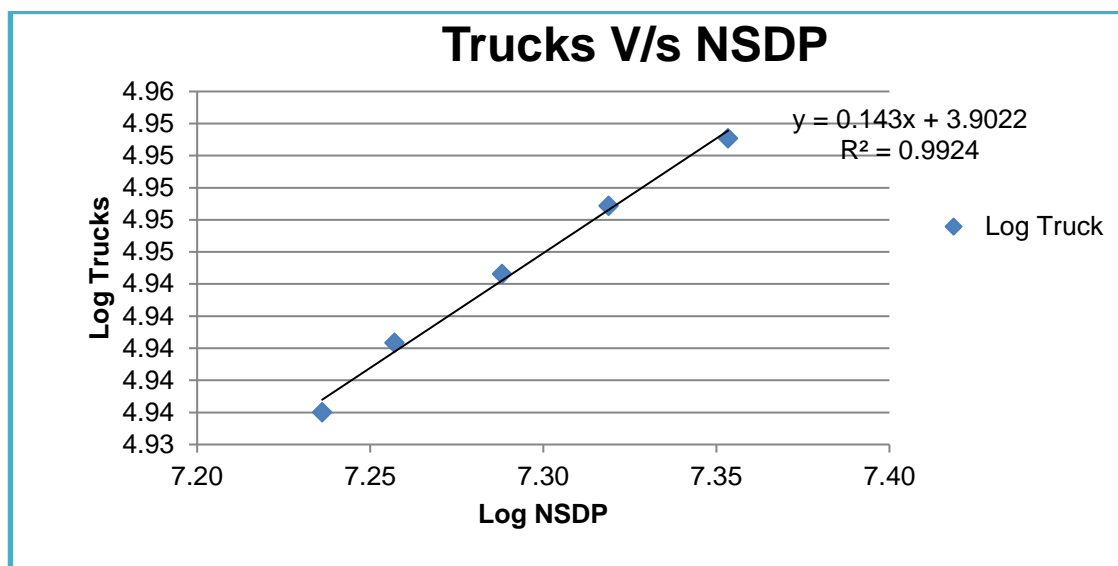
**Figure 5-12 : Regression Analysis Car Vs. PCI Delhi**

**Table 5-17 : Population Vs. Bus- Delhi**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	16622000	135125	7.22	5.13		
2012	16941000	137310	7.23	5.14	2%	
2013	17266000	139495	7.24	5.14	2%	
2014	17597000	141680	7.25	5.15	2%	
2015	17934000	143865	7.25	5.16	2%	1.92%

**Figure 5-13 : Regression Analysis Population Vs. Bus Delhi****Table 5-18 : NSDP Vs. Truck- Delhi**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (5 Year)
2011	17223524	86301	7.24	4.94		
2012	18072223	87166	7.26	4.94	5%	
2013	19414032	88031	7.29	4.94	7%	
2014	20836819	88896	7.32	4.95	7%	
2015	22562961	89761	7.35	4.95	8%	7%



**Figure 5-14 : Regression Analysis NSDP Vs. Truck Delhi**

Summary of regression analysis for elasticity and growth estimation for Delhi are given in following table.

**Table 5-19 : Summary Regression Analysis- Delhi**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Delhi	Car/Jeep	PCI	$y = 1.33x - 0.3201$	$R^2 = 0.9944$	1.3300	4.74%	6.31%	Good Regression
	Bus	Population	$y = 0.8249x - 0.8257$	$R^2 = 0.9999$	0.8249	1.92%	1.58%	Good Regression
	Truck	NSDP	$y = 0.143x - 3.9022$	$R^2 = 0.9924$	0.1430	6.99%	1.00%	Good Regression

Since most of the passenger traffic is from West Bengal and Jharkhand only, growth from economical model is considered only from these states. For commercial traffic weighted impact of these states in ratio of their respective share is considered

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Agra to Etawah has recently been commissioned and is under tolling operation since 2022 with concessionaire. Hence, we do not have sufficient data points to be able to establish a reliable past trend of traffic growth. Moreover, the part two years traffic is affected by COVID-19 impact. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

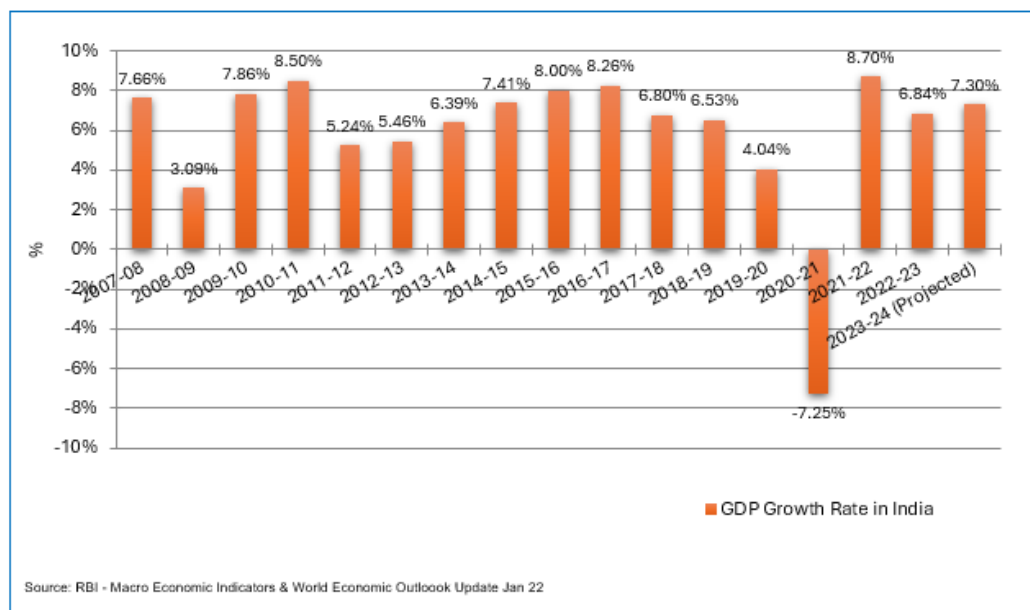
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economic, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

## ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-15 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. World Economic Outlook update also has predicted a growth rate of about 7.5 % in next year 2022-23

### 5.6 Developments along and around the Project Corridor & State

Project stretch falls in one of the most mineral rich areas of India. Major Industries are developed for extraction of minerals and related manufacturing. The following are some major industrial establishments and areas in PIA.

**Howrah** - Often termed as Sheffield of the East, Howrah is known as an engineering hub, mainly in the area of light engineering industry. In 1823, Bishop Reginald Heber described Howrah as the place "chiefly inhabited by shipbuilders". There are small engineering firms

all over Howrah, particularly around Belilios Road area near Howrah station. There are many foundries in Liluah area.

Burn Standard Company, a major company in the heavy engineering industry, has its oldest manufacturing unit located in Howrah. The Howrah plant of Shalimar Paints (established in 1902) was the first large-scale paint manufacturing plant to be set up not only in India but in entire Southeast Asia. The jute industry suffered during



the Partition of Bengal (1947), when the larger jute production area became part of East Pakistan (now Bangladesh). The foundry industry saw a decline in demand due to growth in the steel industry. Still Howrah is a major industrial hub in area and Howrah being major terminal on Delhi – Kolkata rail attracts lot of goods movement.

**Bardhaman** - Burdwan was one of the premier districts in India in terms of minerals. The Raniganj coalfield was the birthplace of the Indian coal industry. Besides coal, important minerals found in the district are iron ores, calcium carbonate, abrasives, silica bricks and molding sands, glass sands, building materials, manganese, bauxite, laterite etc. Chittaranjan Locomotives, Bengal Iron Works, IISCO- India Iron and Steel Co are some of major industrial establishments in district.

**Dhanbad** - Dhanbad has one of the oldest markets of the region and is also a hotbed of large-scale industries. It is famous for its coal mines and industrial establishments; the city is surrounded by about 112 coal mines with a total production of 27.5 million tonnes and an annual income of 7000 million rupees through the coal business. There are a number of coals washeries present there. BCCL, have it headquartered in Dhanbad and SAIL, Tata Steel and Eastern Coalfields (at Mugma) also operates their mines. Om Besco Rail Products.Ltd, a public limited rail wagon manufacturing company at Mugma, Hindustan Zinc Ltd (now Vendanta Resources) had a lead smelting pilot plant at Tundu, MaithonPower.Ltda J.V of Tata Power & DVC (first PPP project of India), HindusthanMalleables& Forgings Ltd, etc. are also operational in and around Dhanbad. Fertilizers Corporation of India (closed), Projects & Development IndiaLtd and ACC.Ltd at Sindri are also available and being one of the 5 divisions of Southeastern Railway zone, Indian Railways is also a big employer in Dhanbad. Also, Kandra Industrial Area at Gobindpur houses some small & middle scale industries



**Durgapur-** Durgapur is one of the biggest industrial hubs of India and was planned as an integrated industrial town. It lays on the banks of DamodarRiver and coalfields of Raniganj. Durgapur was a dream of former prime minister of India, Jawaharlal Nehru and chief minister of West Bengal, Bidhan Chandra Roy. The first project in Durgapur was Damodar Valley Corporation's Durgapur Barrage which attracted many public sector units. Durgapur Steel Plant was the first PSU established in the region in 1955 with the help of U.K which was later undertook by SAIL.

## Durgapur Steel plant

Durgapur Steel Plant set up in late fifties is a leading producer of long products & only producer of Forged Railway Wheels & Axles in the country. Plant started production with an initial crude steel capacity of 1 MPTA (million ton per annum) in 1959, which has been progressively increased to 1.8 MTPA during the modernization in nineties and further to 2.2 MTPA during recently completed Modernization & Expansion Plan (MEP). The present Plant capacity is about 2.12 MTPA saleable steel.

Durgapur is also an emerging I.T and real estate hub has many proposed residential areas like DLF's Durgapur Township.

**Kolkata** - is the capital of the Indian state of West Bengal. According to the 2011 Indian census, it is the seventh most populous city in India; the city had a population of 4.5 million, while the suburb population brought the total to 14.1 million, making it the third-most populous metropolitan area in India. Kolkata Megalopolis is the area surrounding Kolkata Metropolitan city with additional population. Located on the east bank of the Hooghly River approximately 80 kilometres west of the border with Bangladesh, it is the principal commercial, cultural, and educational centre of East India, while the Port of Kolkata is India's oldest operating port and its sole major riverine port. The city nicknamed the "City of Joy" is widely regarded as the "cultural capital" of India and as of 2019, six Nobel Laureates have been associated with the city. Recent estimates of Kolkata Metropolitan Area's economy have ranged from \$60 to \$150 billion (GDP adjusted for purchasing power parity) making it the third most-productive metropolitan area in India, after Mumbai and Delhi. One end of project stretch at Dankuni is major gate to city from northern part of India.

**Logistics and Warehousing**—It is observed that as project stretch is the main connectivity between Kolkata and rest of India (especially north), there are large number of logistic and warehousing establishments on project stretch between Dankuni and Bardhaman. Most computer companies have warehouses in Dankuni. As per a recent report an investment of Rs.4300 cr is expected in West Bengal by 2020 (May be delayed now due to COVID-19.)

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderated in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. The same growth rate is not sustainable for long. Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Traffic for Project Stretch

*Table 5-20 : Recommended Growth Rates Optimistic*

Category / Year	2024-2025	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
Car/Jeep/Van	9.39%	8.58%	5.99%	6.35%	5.18%	4.05%
Bus	5.69%	5.26%	4.81%	4.53%	4.21%	3.93%
Minibus	5.69%	5.26%	4.81%	4.53%	4.21%	3.93%
LCV	2.32%	2.11%	1.71%	1.32%	0.93%	0.55%
2- Axle	3.69%	3.34%	2.68%	2.03%	1.38%	0.75%
3 - Axle	5.41%	4.89%	3.89%	2.91%	1.95%	0.99%
4 to 6 Axle	6.45%	5.82%	4.62%	3.45%	2.29%	1.14%
7 and Above Axle	6.45%	5.82%	4.62%	3.45%	2.29%	1.14%

*Table 5-21 : Recommended Growth Rates Pessimistic*

Category / Year	2024-2025	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
Car/Jeep/Van	8.89%	8.08%	5.49%	5.85%	4.68%	3.55%
Bus	5.19%	4.76%	4.31%	4.03%	3.71%	3.43%
Minibus	5.19%	4.76%	4.31%	4.03%	3.71%	3.43%
LCV	1.82%	1.61%	1.21%	0.82%	0.43%	0.05%
2- Axle	3.19%	2.84%	2.18%	1.53%	0.88%	0.25%
3 - Axle	4.91%	4.39%	3.39%	2.41%	1.45%	0.49%
4 to 6 Axle	5.95%	5.32%	4.12%	2.95%	1.79%	0.64%
7 and Above Axle	5.95%	5.32%	4.12%	2.95%	1.79%	0.64%

*Table 5-22 : Recommended Growth Rates Most Likely*

Category / Year	2024-2025	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
Car/Jeep/Van	9.14%	8.33%	5.74%	6.10%	4.93%	3.80%
Bus	5.44%	5.01%	4.56%	4.28%	3.96%	3.68%
Minibus	5.44%	5.01%	4.56%	4.28%	3.96%	3.68%
LCV	2.07%	1.86%	1.46%	1.07%	0.68%	0.30%

Category / Year	2024-2025	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
<b>2- Axle</b>	3.44%	3.09%	2.43%	1.78%	1.13%	0.50%
<b>3 - Axle</b>	5.16%	4.64%	3.64%	2.66%	1.70%	0.74%
<b>4 to 6 Axle</b>	6.20%	5.57%	4.37%	3.20%	2.04%	0.89%
<b>7 and Above Axle</b>	6.20%	5.57%	4.37%	3.20%	2.04%	0.89%

Traffic and revenue have been worked out on the basis of the above growths and same is presented in subsequent chapter of report.

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza Dankuni- Chainage 646.005 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	10898	983	700	2259	1637	8551	9	25037	64680
2025-26	11834	1004	736	2335	1717	9049	9	26684	68465
2026-27	12849	1025	775	2414	1801	9576	9	28449	72489
2027-28	13951	1047	815	2495	1889	10133	9	30339	76758
2028-29	15147	1069	858	2579	1981	10722	9	32365	81294
2029-30	16446	1092	903	2666	2078	11346	9	34540	86123
2030-31	17431	1111	947	2737	2159	11870	9	36264	90082
2031-32	18475	1130	992	2811	2243	12419	9	38079	94234
2032-33	19581	1149	1040	2887	2331	12994	9	39991	98592
2033-34	20754	1169	1090	2964	2422	13594	9	42002	103149
2034-35	21996	1189	1142	3043	2516	14223	9	44118	107927
2035-36	23393	1205	1194	3104	2589	14713	9	46207	112111
2036-37	24878	1221	1248	3167	2665	15220	9	48408	116480
2037-38	26458	1237	1305	3231	2742	15744	9	50726	121036
2038-39	28139	1253	1364	3297	2822	16286	9	53170	125795

**Table 6-2 : Total Tollable Traffic @ Toll Plaza Dankuni- Chainage 646.005 KM**  
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	10898	983	700	2259	1637	8551	9	25037	64680
2025-26	11779	999	734	2323	1709	9006	9	26559	68143
2026-27	12730	1015	769	2389	1784	9485	9	28181	71802
2027-28	13759	1031	805	2457	1862	9989	9	29912	75669
2028-29	14870	1047	844	2526	1943	10520	9	31759	79760
2029-30	16071	1064	884	2598	2028	11080	9	33734	84098

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2030-31	16953	1077	922	2654	2097	11537	9	35249	87545
2031-32	17884	1090	962	2712	2168	12013	9	36838	91144
2032-33	18866	1103	1003	2771	2241	12508	9	38501	94892
2033-34	19901	1117	1046	2832	2317	13024	9	40246	98810
2034-35	20993	1131	1091	2893	2396	13561	9	42074	102895
2035-36	22221	1141	1135	2937	2453	13961	9	43857	106373
2036-37	23520	1151	1180	2982	2512	14372	9	45726	109983
2037-38	24895	1161	1228	3027	2573	14796	9	47689	113743
2038-39	26351	1171	1277	3073	2635	15232	9	49748	117647

Traffic projections for Most Likely scenario is given as under

**Table 6-3 : Total Tollable Traffic @ Toll Plaza Dankuni- Chainage 646.005 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	10898	983	700	2259	1637	8551	9	25037	64680
2025-26	11806	1001	735	2328	1713	9027	9	26619	68298
2026-27	12789	1019	771	2400	1793	9529	9	28310	72131
2027-28	13854	1038	810	2474	1876	10060	9	30121	76202
2028-29	15007	1057	850	2551	1963	10620	9	32057	80515
2029-30	16257	1077	893	2630	2054	11211	9	34131	85094
2030-31	17190	1093	933	2694	2129	11702	9	35750	88797
2031-32	18177	1109	976	2760	2206	12213	9	37450	92666
2032-33	19220	1125	1020	2827	2286	12747	9	39234	96709
2033-34	20323	1141	1067	2896	2370	13305	9	41111	100947
2034-35	21489	1157	1116	2967	2457	13887	9	43082	105377
2035-36	22799	1169	1164	3020	2522	14331	9	45014	109201
2036-37	24190	1181	1213	3073	2589	14789	9	47044	113178
2037-38	25665	1193	1265	3128	2658	15262	9	49180	117327
2038-39	27231	1205	1319	3184	2729	15750	9	51427	121650

## 6.2 Modification in Concession Period

As per Article 29 of the concession agreement, if actual traffic on the project falls short or exceeds Target Traffic on project highway on defined date, concession period shall be modified subject to calculation stipulated therein. For Palsit - Dankuni project three target traffic have been defined in Article 29.

Target Date - 1st May 2026 Target Traffic 65830

Target Date - 1st May 2031 Target Traffic 100822

Target Date - 1st May 2036 Target Traffic 130452

It was observed that as per traffic projections, average traffic volume exceeds target traffic in the first two target points. Probable shortening of concession period is estimated according to Article 29 of concession agreement for all cases which comes to about 3 years.

***Pessimistic***

Sr. No	Target Date	Target Traffic	Actual Traffic	Variation in CP as per CA %	Change in CP (Days)	Total Variation in CP Years
1	01-May-26	65830	71802	-4.07%	-192	<b>-0.5</b>
2	01-May-31	84018	91144	0.00%	0	
3	01-May-36	107270	109983	0.00%	0	

***Optimistic***

Sr. No	Target Date	Target Traffic	Actual Traffic	Variation in CP as per CA %	Change in CP (Days)	Total Variation in CP Years
1	01-May-26	65830	72489	-5.12%	-241	<b>-0.8</b>
2	01-May-31	84018	94234	-1.70%	-49	
3	01-May-36	109649	116480	0.00%	0	

***Most Likely***

Sr. No	Target Date	Target Traffic	Actual Traffic	Variation in CP as per CA %	Change in CP (Days)	Total Variation in CP Years
1	01-May-26	65830	72131	-4.57%	-216	<b>-0.6</b>
2	01-May-31	84018	92666	-0.47%	-14	
3	01-May-36	108008	113178	0.00%	0	

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories, and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Surat-Dahisar section of NH-8 is based on the old toll policy. As per the Toll Notification (Schedule -G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

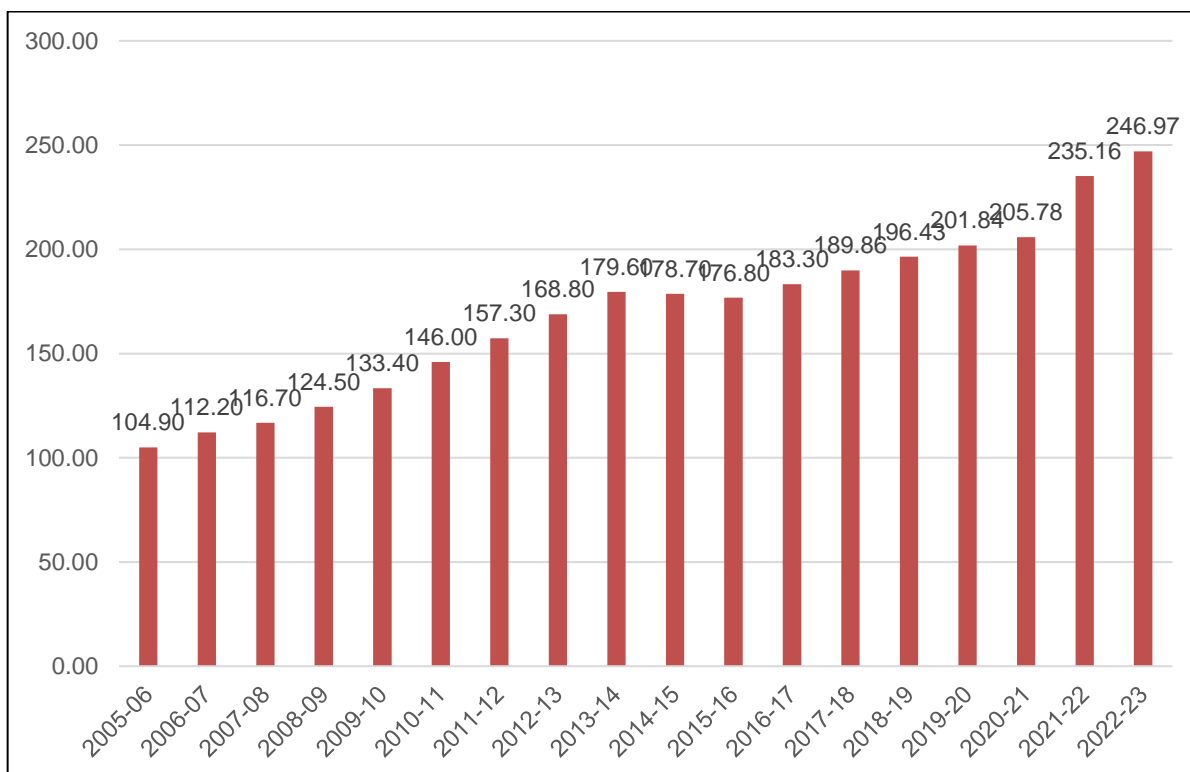
1. Monthly Pass: For frequent user's monthly pass would be issued at fee 50 time the single journey fee at 2/3<sup>rd</sup> Rate.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: Local Car Jeep Van -Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza). Additionally, local commercial vehicles are charged at 50% rate of single journey.

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2021-22. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. Following graph provides projection of rate of inflation (WPI) in India. Data has been taken from Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)). WPI for years 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is taken as 5% and suitably stepped down for future years.

### Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey Dankuni @ Km 646.005**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	75	120	250	250	270	390	475
2024-25	115	185	380	380	415	600	730
2025-26	120	190	395	395	430	620	750
2026-27	125	200	415	415	455	650	790
2027-28	135	210	435	435	475	685	830
2028-29	140	220	460	460	500	720	875
2029-30	145	235	485	485	525	755	920
2030-31	155	245	510	510	555	795	965
2031-32	160	260	535	535	585	835	1015
2032-33	170	270	560	560	615	880	1070
2033-34	180	285	590	590	645	925	1125
2034-35	190	300	625	625	680	975	1185
2035-36	200	315	655	655	715	1025	1245
2036-37	210	335	690	690	755	1080	1310
2037-38	220	350	725	725	795	1135	1380
2038-39	230	370	765	765	835	1195	1455

**Table 7-3: Toll Rates for Return Journey Dankuni @ Km 646.005**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	110	175	370	370	405	585	710
2024-25	170	275	575	575	625	900	1090
2025-26	180	285	595	595	650	930	1130
2026-27	190	300	625	625	680	975	1185
2027-28	200	315	655	655	715	1025	1245
2028-29	210	335	690	690	750	1075	1310
2029-30	220	350	725	725	790	1135	1375
2030-31	230	370	765	765	830	1190	1450
2031-32	245	385	800	800	875	1255	1525
2032-33	255	405	845	845	920	1320	1605
2033-34	270	430	890	890	970	1385	1685
2034-35	285	450	935	935	1020	1460	1775
2035-36	295	475	985	985	1070	1535	1870
2036-37	315	500	1035	1035	1130	1620	1970
2037-38	330	525	1090	1090	1190	1705	2075
2038-39	345	555	1150	1150	1250	1795	2185

**Table 7-4: Toll Rates for Monthly pass Local Dankuni @ Km 646.005**

Year	Car	Minibus /LCV
2024-25	315	315
2024-25	340	340
2025-26	350	350
2026-27	365	365
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	445	445
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	580	580
2036-37	610	610
2037-38	640	640
2038-39	675	675

**Table 7-5: Toll Rates for Monthly Pass Dankuni @ Km 646.005**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	2440	3945	8265	8265	9015	12960	15775
2024-25	3820	6125	12745	12745	13900	19950	24270
2025-26	4010	6385	13205	13205	14390	20620	25070
2026-27	4210	6705	13875	13875	15120	21670	26345
2027-28	4425	7045	14580	14580	15890	22775	27690
2028-29	4645	7405	15325	15325	16705	23940	29110
2029-30	4885	7780	16115	16115	17565	25170	30605
2030-31	5135	8180	16945	16945	18470	26470	32185
2031-32	5395	8605	17820	17820	19425	27845	33855
2032-33	5675	9050	18750	18750	20435	29295	35620
2033-34	5970	9520	19730	19730	21505	30825	37485
2034-35	6280	10015	20765	20765	22630	32445	39455
2035-36	6605	10545	21855	21855	23825	34155	41535
2036-37	6955	11100	23015	23015	25085	35965	43735
2037-38	7320	11685	24235	24235	26420	37875	46060
2038-39	7710	12305	25530	25530	27830	39900	48520

### 7.3 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.4 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza starting from the year 2024-25 are shown in tables below.

**Table 7-3 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Year	TP-1	Total
2024-25	198.65	198.65
2025-26	295.82	295.82
2026-27	328.50	328.50
2027-28	367.09	367.09
2028-29	406.94	406.94
2029-30	452.34	452.34
2030-31	497.72	497.72
2031-32	548.74	548.74
2032-33	601.98	601.98
2033-34	662.42	662.42
2034-35	730.51	730.51
2035-36	797.93	797.93
2036-37	871.71	871.71
2037-38	951.01	951.01
2038-39	1038.32	1038.32

**Table 7-4 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Year	TP-1	Total
2024-25	198.65	198.65
2025-26	294.43	294.43
2026-27	325.34	325.34
2027-28	361.88	361.88
2028-29	399.25	399.25
2029-30	441.75	441.75
2030-31	483.80	483.80
2031-32	530.81	530.81
2032-33	579.51	579.51
2033-34	634.69	634.69

Year	TP-1	Total
2034-35	696.57	<b>696.57</b>
2035-36	757.20	<b>757.20</b>
2036-37	823.20	<b>823.20</b>
2037-38	893.79	<b>893.79</b>
2038-39	971.22	<b>971.22</b>

**Table 7-5 : Toll Revenue Most Likely Scenario  
(Rs. Crores)**

Year	TP-1	Total
2024-25	198.65	<b>198.65</b>
2025-26	295.12	<b>295.12</b>
2026-27	326.92	<b>326.92</b>
2027-28	364.47	<b>364.47</b>
2028-29	403.06	<b>403.06</b>
2029-30	446.97	<b>446.97</b>
2030-31	490.66	<b>490.66</b>
2031-32	539.62	<b>539.62</b>
2032-33	590.56	<b>590.56</b>
2033-34	648.35	<b>648.35</b>
2034-35	713.30	<b>713.30</b>
2035-36	777.28	<b>777.28</b>
2036-37	847.05	<b>847.05</b>
2037-38	921.88	<b>921.88</b>
2038-39	1004.10	<b>1004.10</b>

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Palsit to Dankuni section of NH-19 from km 588.870 to km 652.700 in state of West Bengal is currently four lane road and being upgraded to six lanes. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the most busy and prominent national highway NH-19 which connects political and cultural capitals of India. This is one of the most important trunk roads which spreads across many states. There are large number of townships, industrial corridors and other business establishments coming up along the project corridor. As discussed, the dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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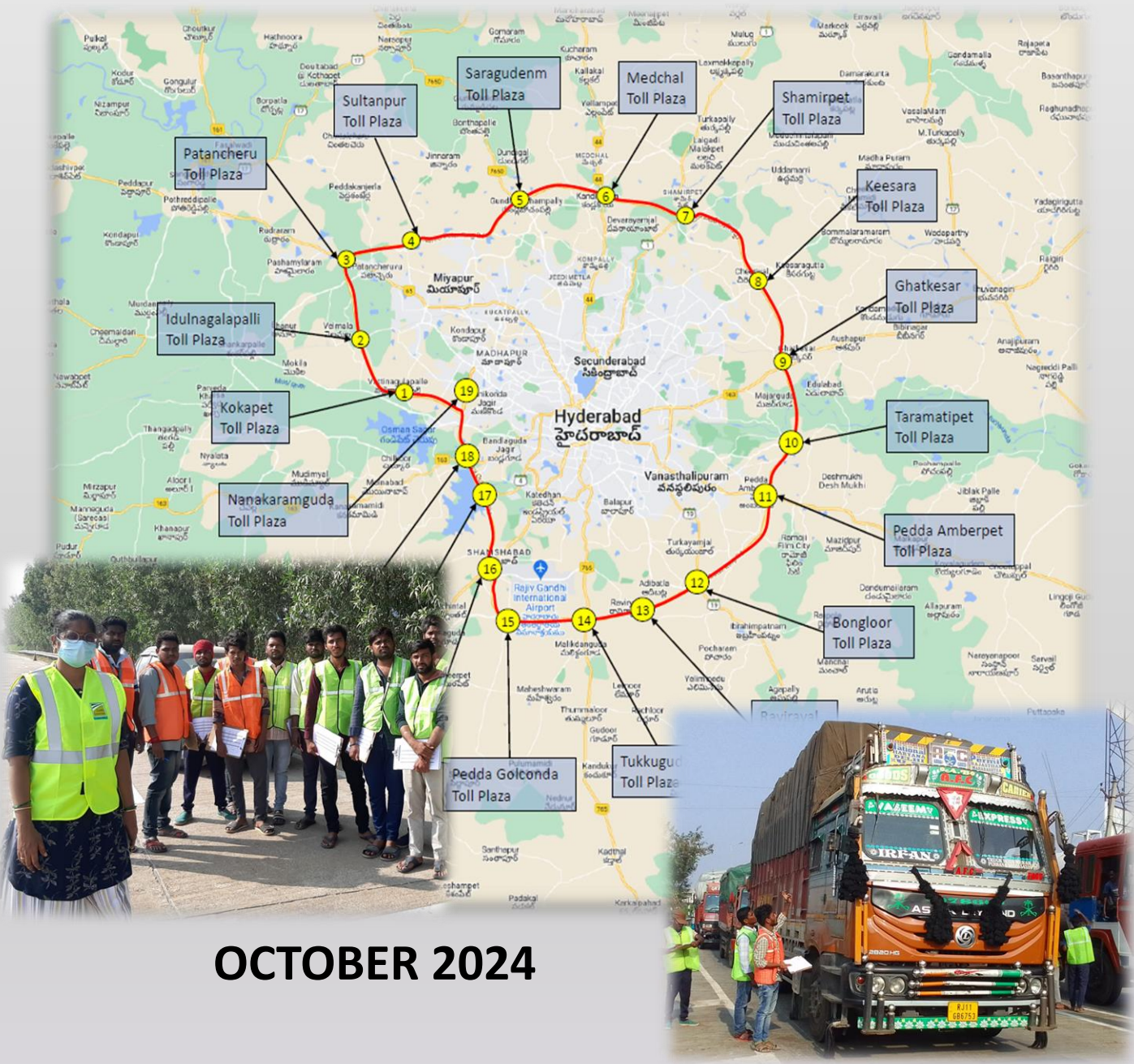
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# Nehru Outer Ring Road in Hyderabad from Km 0.000 to Km 158.000 in State of Telangana on TOT mode



**OCTOBER 2024**

## TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)



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# CHAPTER 1

## INTRODUCTION

### 1.1 Background

The Outer Ring Road, officially as, Jawaharlal Nehru Outer Ring Road and abbreviated as, O.R.R., is a 158 kilometer, 8-lanes ring road expressway encircling Hyderabad, capital of the Indian state of Telangana. The expressway is designed for speeds up to 100 km/h. A large part, 124 km (covering urban nodes viz., Hi- Tech city, Nanakramguda Financial District, Rajiv Gandhi International Airport, IKP Knowledge park, Hardware Park, Telangana State Police Academy, Singapore Financial District, and Games village) of the 158-km was opened by December 2012. Rest of the length of Outer Ring Road was opened to traffic in year 2015-16. Hence onward, for ease of reference, Nehru Outer Ring Road will be referred as NORR or ORR.

ORR is one of the most important infrastructural developments which has complimented growth of Hyderabad as major metro of India. On Eastern side it has provided express connectivity to major commercial and upscale residential centres of Gachibowli, Banjara Hills, Jubilee Hills, Hitec- City, Manikonda, Nanakramguda. As a result, large number of residential and commercial projects have come up on this north-east part of ORR. Tellapur, Mokila, Kollur, Narsingi can be named as few of these. On north and western side ORR connects to Shamirpet and Genome Valley.

ORR also provides fast connectivity to various radial state and national highways connecting to Mumbai, Nagpur, Karimnagar, Warangal, Suryapet, Vijayawada, Bengaluru. Regional traffic now does not need to go into congested network of Hyderabad.

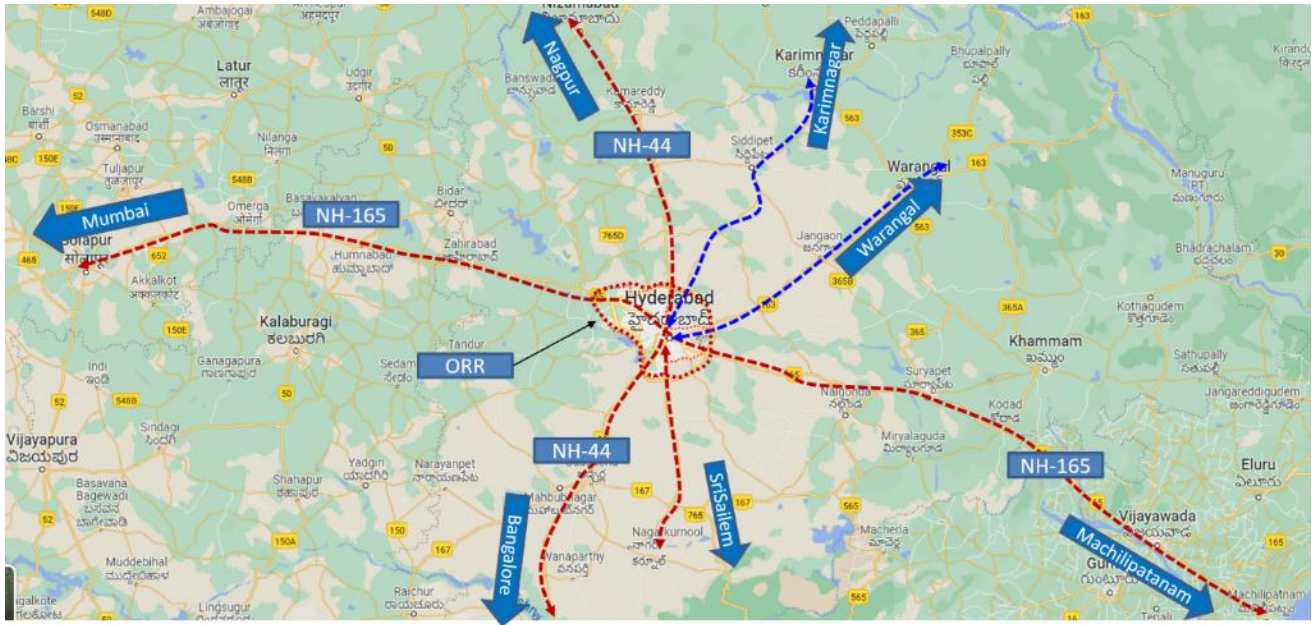
The Outer Ring Road also helps in reducing the travel time from Rajiv Gandhi International Airport to cities like Nizamabad & Adilabad as it connects to NH44. The expressway is fenced, and 33 radial roads connect it with the Inner Ring Road.

ORR is fully accessing controlled road, and traffic can enter or exit from designated locations only. There is total 19 locations from where ORR can be entered or exited. Toll plaza and or booths have been placed at all such entry / exit points.

ORR has been developed by Hyderabad Metropolitan Development Authority (HMDA). It's maintained by HMDA and special purpose vehicle Hyderabad Growth Corridor Limited (HGCL). The bid for Operation, Maintenance of ORR for a longer concession period of 30 years on TOT model is invited by HMDA and HGCL.

Following figure show alignment of Hyderabad Outer Ring Road in regional context.

.



**Figure 1-1: Location & Alignment of ORR in Regional Context**

M/s IRB Infrastructure Developers Limited (IRB) intends to participate in bidding for Nehru Outer Ring Road (NORR) on TOT basis.

GMD Consultants have been assigned by M/s IRB for the work of conducting traffic study and developing revenue model based on traffic projections and forecast.

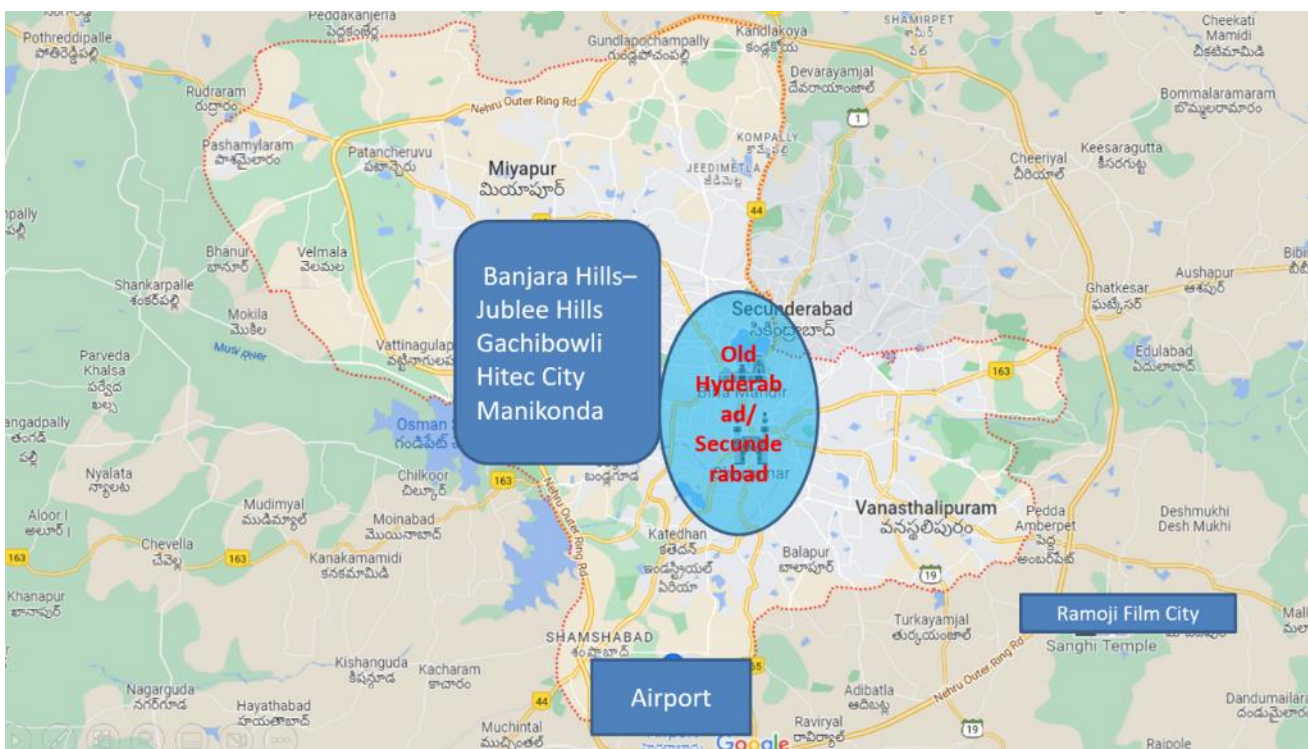
For making the proper assessment of traffic volume on project stretch, base year traffic and its projection.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Brief Description of the Project Influence Area (PIA)

Nehru Outer Ring Road is a 158 km access-controlled transportation ring around city of Hyderabad and Secunderabad. Average radial distance of ORR from city centre is about 20-25 km. Hyderabad is fourth most populous city of India. It is capital of one of the fastest growing states of India, Telangana. Hyderabad is merging and the major global hub in field of IT, IT&ES, Pharmaceutical & Biotechnical Research. As discussed previously it provides fast connectivity to Airport (near Shamsabad) from various parts of city. Following figure shows positioning of ORR in city context.



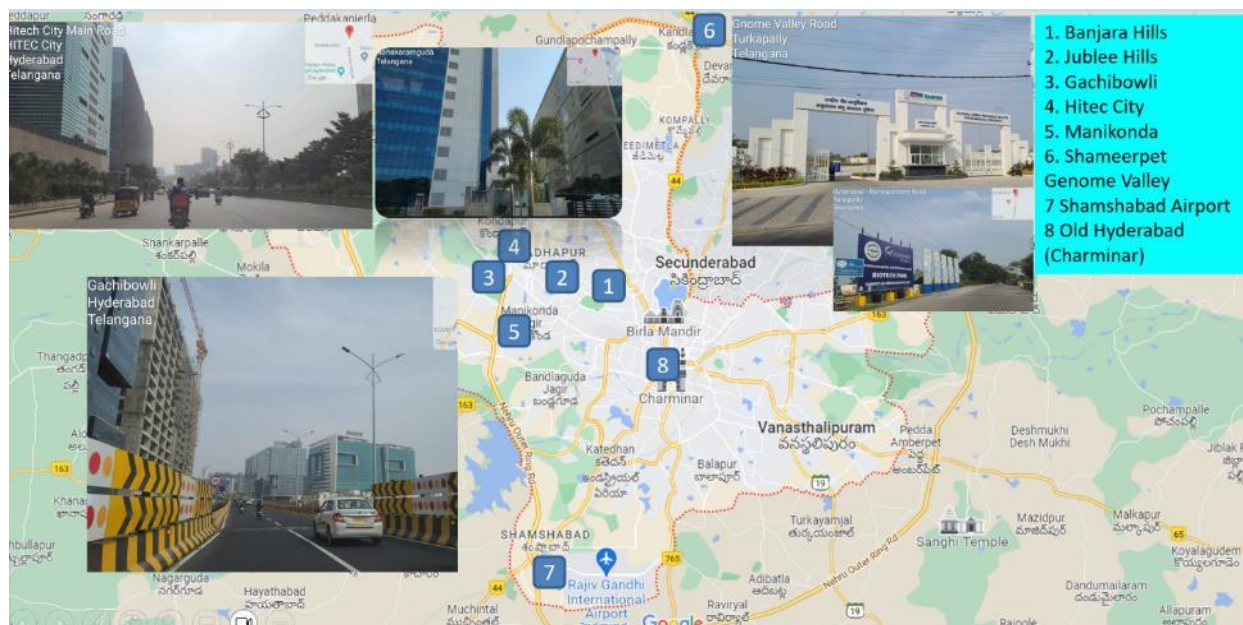
**Figure 2-1: Positioning of ORR in city context.**

NORR makes a complete circle around city of Hyderabad and Secunderabad. It provides fast connectivity to all part of Hyderabad Metropolitan Area (HMA). Hyderabad Metropolitan Area includes part of following districts.

- **Hyderabad** - Hyderabad district is a most populous district in the state of Telangana in India that contains a part of the metropolitan area of Hyderabad.
- **Rangareddy** – This is basically rural Hyderabad area. It has head quarter in Lakdi ka Pul which is basically part of Hyderabad City only. Ranga Reddy has maximum per capita income in entire state.

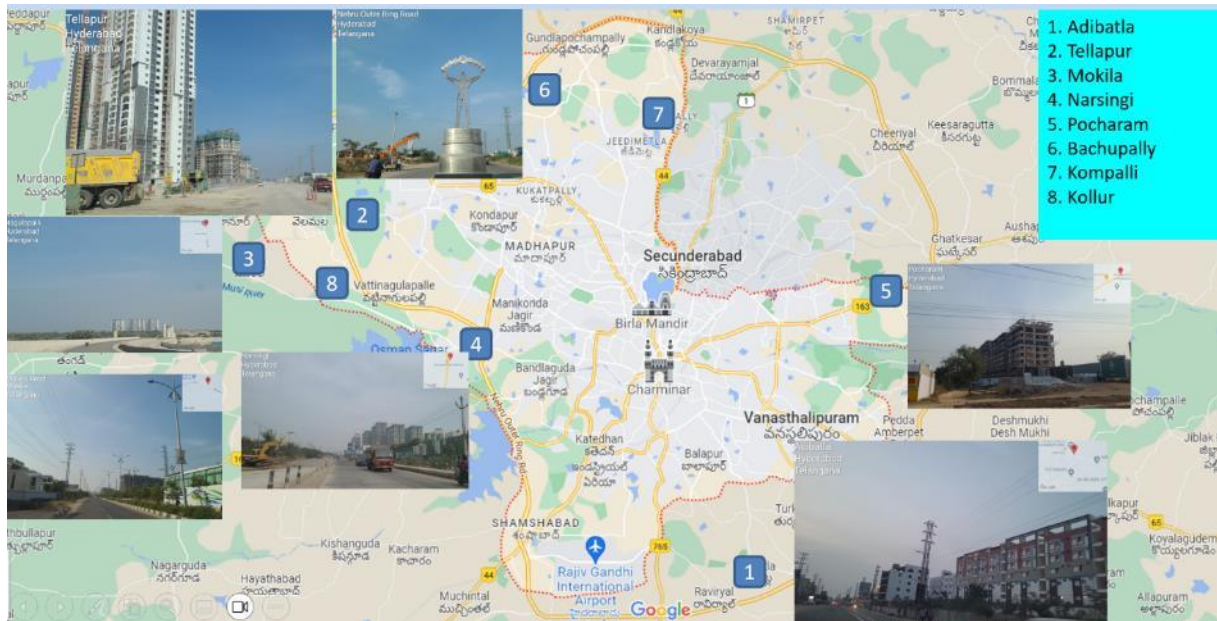
- **Nalgonda** – Nalgonda is another district which is part of HMA. This touches southeastern boundary of Hyderabad
- **Mahboob Nagar** - Mahabubnagar district is a district in **Telangana**. Mahabubnagar is the district headquarters which is popularly known as Palamoor. The district shares boundaries with Narayanapet, Vikarabad, Rangareddy, Nagarkurnool, Wanaparthy and Jogulamba Gadwal districts. It is famous for its milk production. It is on southwestern boundary of Hyderabad.
- **Medak** – It was one of the most backward districts of Andhra Pradesh. Now part of this district is in HMA. Geographically it on northwest side of Hyderabad. This is the most developing part of HMA now.

Hence all of HMA fall in immediate influence zone of ORR. In addition to Hyderabad city centre large number of suburban areas which are either developed on are upcoming, are part of PIA. Following figure shows major urban and commercial hubs in relation to ORR.



**Figure 2-2: Major urban & commercial hubs.**

Additionally large number of new commercial and urban centres are in various phase of development around ORR. In fact, ORR has been one of the reasons for developing of these centres. Most of these centres are coming up in northwest corner of Hyderabad in which major commercial and residential centres like Gachibowli. Manikonda, Banjara Hills, Jubilee Hills etc have already developed along with Financial District and Hitec City. Following figure shows these locations in context of ORR.



**Figure 2-3: Upcoming Development Locations in context of ORR.**

Prominent of above are discussed as under.

### **Tellapur**

Being in close proximity to Gachibowli, Kondapur, and Madhapur, Tellapur is an ideal settlement place for IT Professionals. Since it is around 15 km from Hitech city and 9-10 km from Gachibowli, the new investment options in the area are relatively better and easier to settle as well. Tellapur comes in the Medak district.

### **Narsingi**

The western outskirts are home to Narsingi. This area is attracting many potential investors due to the presence of multiple residential options like villas, gated communities, community apartments, and so on. It is the best option for people who are family oriented and would want to settle down there. Housing investment options are available in Narsingi. If you're a modern home buyer, Narsingi is an ideal option.

### **Adibatla**

Adibatla is an area located in Ranga Reddy district and is a fast-upcoming residential area that offers budget-friendly properties starting from 20 lakhs only. The main attraction of the area is ITIR (Information Technology Investment Region) as it is said that there will be many IT Parks as it's SEZ (Special Economic Zone). As a result of IT and aviation companies setting up offices in the area, Adibatla has already transformed into a modern infrastructural hub.

### **Mokila**

Located approximately 35 kilometres away from Hyderabad city, Mokila's biggest advantage is its proximity to HiTech City, IT hubs like Kokapet, and prime neighbourhoods like Gachibowli. Well-connected via the Outer Ring Road (ORR), Mokila has witnessed a consistent increase in prices in recent years. The airport is around 40 kilometres away but takes just under an hour to reach via the ORR while Nagulapalli and Shankarpalli railway stations, and Miyapur metro station are both within a 10-kilometre radius.

## Pocharam

The demand for residential real estate in Pocharam soared incredibly after the AP Housing Board set up the Singapore Township in 2005-06, which was a fully integrated and well-planned township comprising 2000 houses. Later, Infosys set up a 440-acre campus and with other IT companies following suit the area has seen increased commercial real estate activity, as well.

In addition to above ORR connects following radial arterial roads which connect Hyderabad to various important parts of state and country. Following figure shows such radial roads in context of ORR.



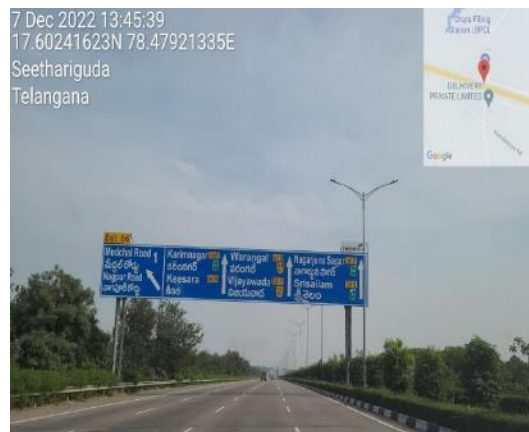
**Figure 2-4: Regional context of ORR.**

1. **NH-165** – This is major highway which connects to Maharashtra / Pune / Solapur on western side and Suryapet, Vijayawada and Machilipatnam on eastern side. Interchange and toll plaza is constructed at Patancheru and Pedda Amberpet at crossing locations of ORR and NH-165
2. **NH-44** – This north south connecting NH connects Hyderabad with Nagpur on north side and Bengaluru on south side. Medchal and Shamshabad interchange and Toll plazas are built at crossing of NH-44 on north and south side respectively.
3. **SH-163** – This connects Hyderabad to Warangal. Ghatshekar toll plaza and interchange is constructed at crossing of SH-163 with ORR
4. **Karimnagar Road** – This road connects city of Karimnagar and Siddipet to Hyderabad. Shamirpet Toll plaza and interchange are entry and exit point for this road.
5. **NH- 765** – It's a new national highway connects Hyderabad to Tokapelle. This highway crosses from very near to Airport. There are some residential and commercial projects coming up on either side of this road in influence zone area of Hyderabad Airport.

## 2.2 Project Appreciation

Nehru Outer Ring Road of Hyderabad was built in phases and the complete ring was thrown open to public in year 2016. ORR is 8 lane expressway kind of specification. Pavement is flexible except that at toll plazas where rigid pavement is provided. Condition of pavement is good in general in

entire stretch of 158 Km. ORR is fully access controlled road. There is no leakage point and entry / exit can happen from toll plaza location only. Safety items like crash barriers, lighting, delineators, signage and markings etc are well placed and are in good condition. Following photographs show general condition of road.



ORR has 19 locations at which currently toll is in operation. Toll plaza configuration and arrangement of movement is not same at all such locations. Depending on availability of land and other constraints. Following table presents location of toll plaza and type of interchange at such locations.

**Table 2-1: Details of Toll plazas locations**

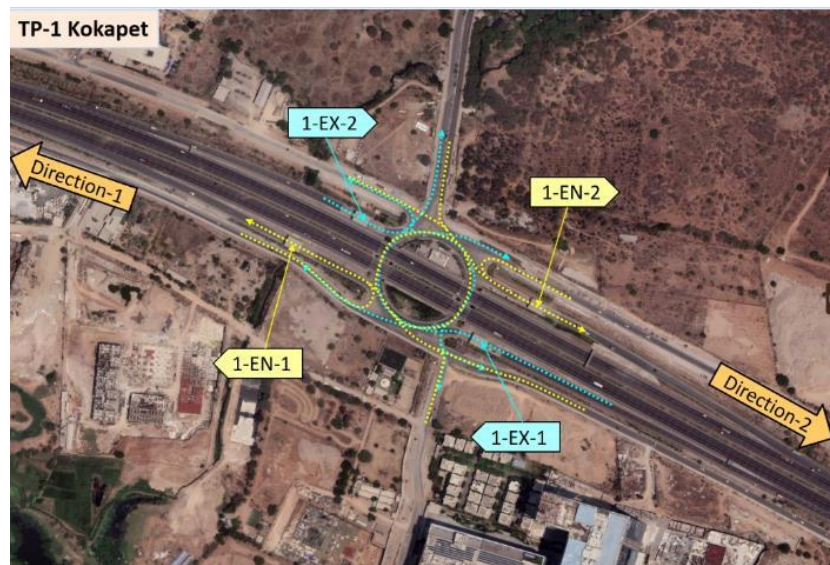
Hyderabad Ring Road				
Sr. No	Name of Interchange	Chainage in Km	Type of Interchange	Number of Toll booths
1	Kokapet	2+000	Rotary	4
1A	Neopolis	3+700	Single Trumpet (Under Construction)	
2	Idulnagalapalli	13+900	Rotary	4
3	Patancheru	22+500	Double Trumpet	1
4	Sultanpur	31+000	Rotary	4
4A	Mallampet	37+000	Double Trumpet (Under Construction)	
5	Saragudem	42+700	Double Trumpet	1

Hyderabad Ring Road				
Sr. No	Name of Interchange	Chainage in Km	Type of Interchange	Number of Toll booths
6	Medchal	52+200	Double Trumpet	1
7	Shamirpet	61+100	Double Trumpet	1
8	Keesara	73+000	Rotary	4
9	Ghatkesar	81+550	Double Trumpet	1
10	Taramatipet	89+750	Rotary	4
11	Pedda Amberpet	96+650	Double Trumpet	1
12	Bongloor	108+900	Double Trumpet	1
13	Ravirayal	116+000	Diamond	4
14	Tukkuguda	121+500	Diamond	4
15	Pedda Golconda	129+750	Rotary	4
16	Shamshabad	136+100	Partial Clover Leaf with directional Ramps	4
17	Rajandranagar-1&2	142+620	Rotary	2
18	TSPA	147+650	Diamond	4
18A	Narsingi (One Entry + One Exit Ramp)	152+000	(Under Construction)	
19	Nanakramguda	154+350	Toll Plaza	1

Configuration and movement pattern of above types of toll plaza is shown in following figures.

### 1. Rotary Type interchange – with 4 toll booths

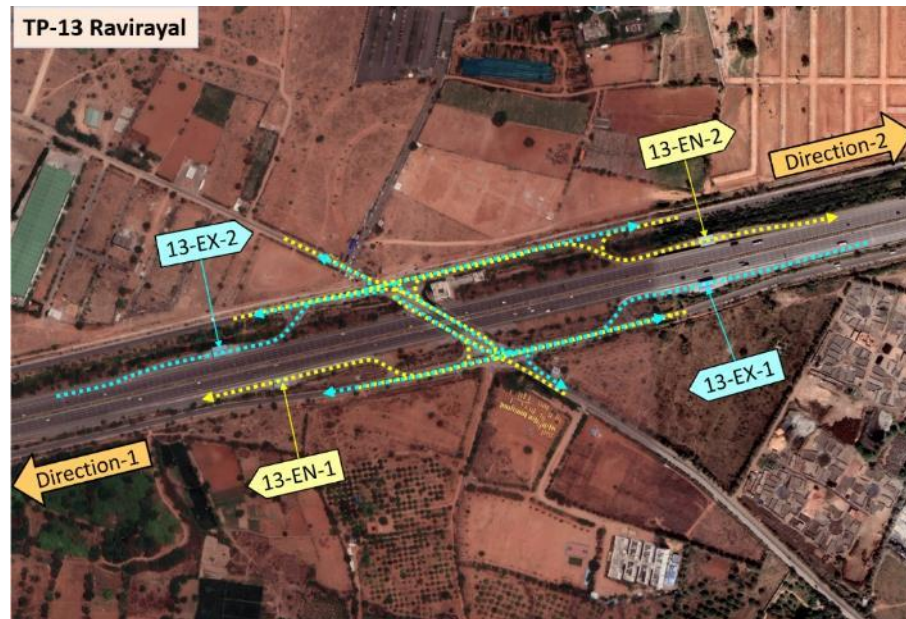
Kokapet, Idulnagalpalli, Sultanpur, Keesara, Taramatipet, Shamsabad, have such type of arrangement. Following image shows typical location (Kokapet) of toll booths and movement pattern for such type of arrangements. All above locations have similar arrangements.



**Figure 2-5 : Rotary Type Interchange with 4 toll booths.**

## 2. Diamond Type interchange – with 4 toll booths

Ravirayal, Tukuguda and TSPA have diamond type interchange with four booth arrangement. Following image shows the general arrangement and movement pattern.



*Figure 2-6 : Diamond Type Interchange with 4 toll booths.*

## 3. Double Trumpet Type Interchange with Single Toll Plaza

Patancheru, Saragudam, Medchal, Shamirpet, Ghatkesar, Pedda Amberpet, Bongolor and Nanakramguda locations have double trumpet interchange in which all the movements are brought to one location for toll payment.



*Figure 2-7 : Double Trumpet Type Interchange*

## 4. Partial Cloverleaf with directional ramps

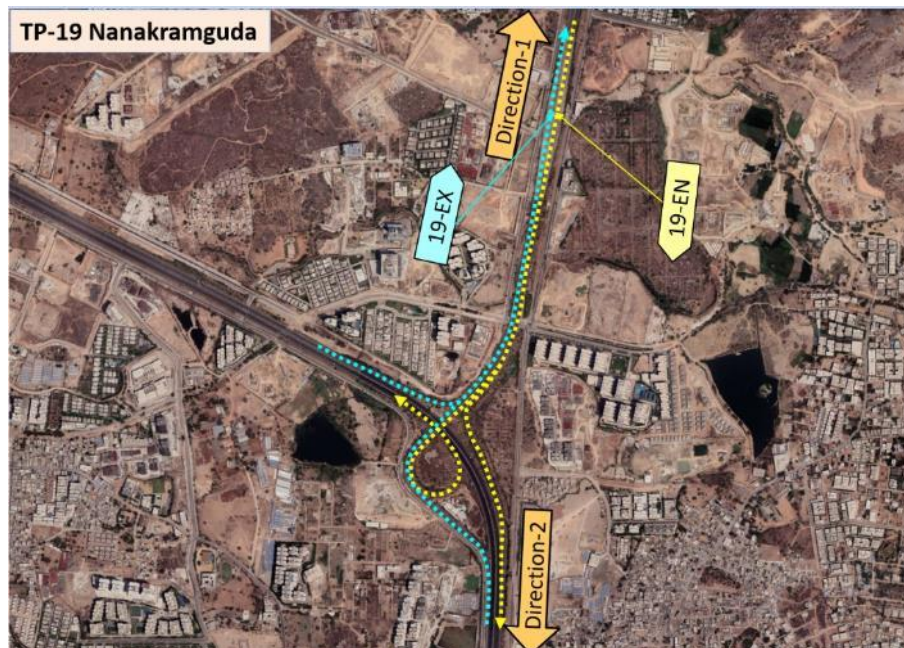
Shamshabad interchange is partial cloverleaf type with directional ramps. It also has four toll booths.



**Figure 2-8 : Shamshabad Interchange and Ramps**

### 5. Single Toll Plaza at Nanakramguda

Nanakram Guda has special arrangement. At this location all movement which enter or exit at this location are brought to one side road on which toll plaza is constructed.



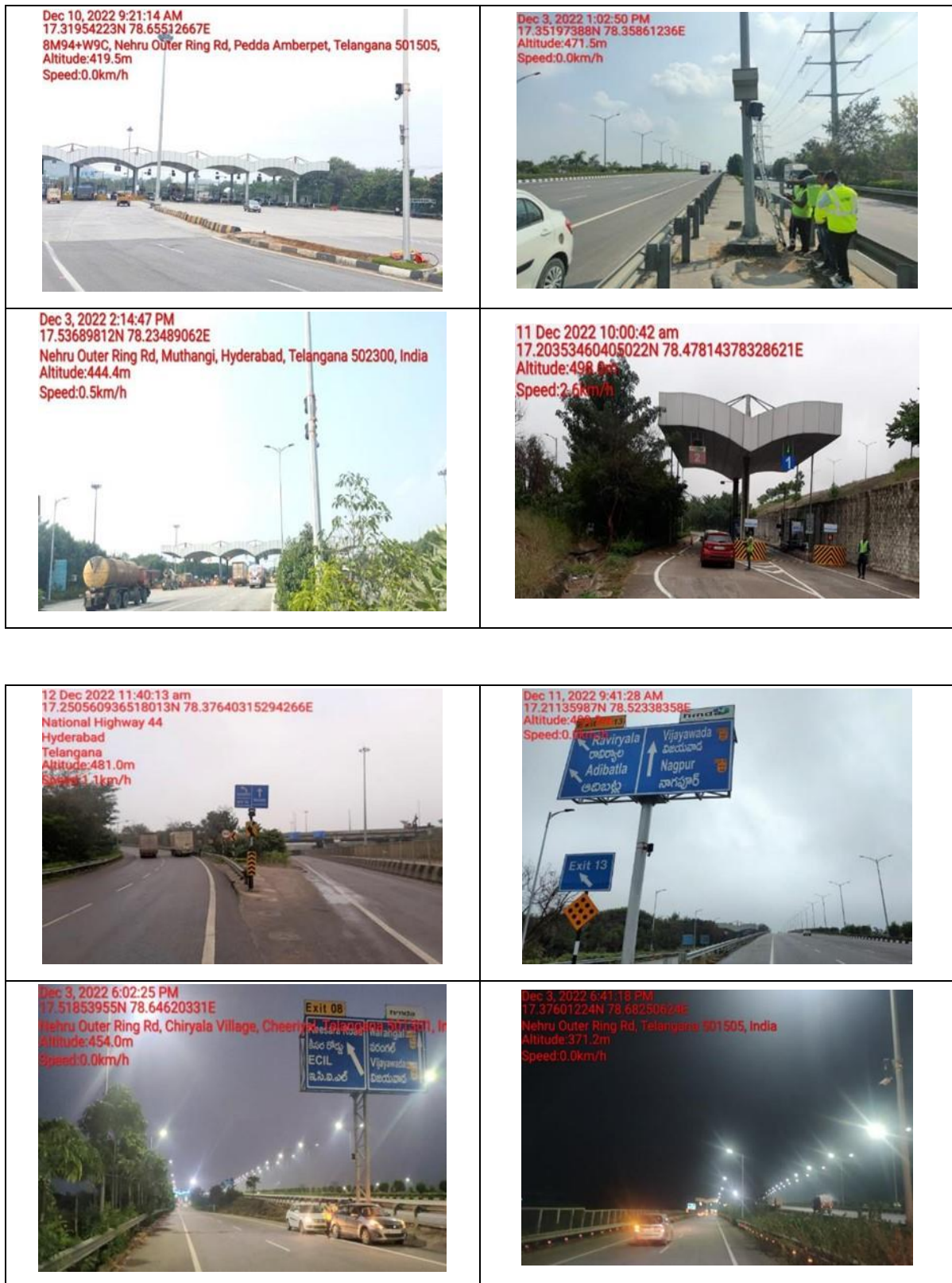
**Figure 2-9 : Toll Plaza Nanakramguda and movements.**

In addition to above 19 toll plaza locations two are under construction at following locations.

- Neopolis- Single Trumpet
- Narsingi – One Entry and one Exit Ramp

## 2.3 Project Corridor Illustration

The following photographs illustrate the project section along the corridor.



**Figure 2-10 : Photographs showing Project Corridor**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have carried out a reconnaissance survey of the project corridor to understand the general traffic and travel characteristics on the corridor.

Traffic data forecast is one of the important inputs required for a TOT/BOT/DBFO highway/roadway project. In order to arrive at a fair estimate of traffic forecast it is necessary to collect data, analyse, model, validate and then forecast. The Consultants have carried out a reconnaissance survey of the project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic studies have been carried out for the project.

- Classified traffic volume counts at toll plaza location on 8-lanes ring road expressway encircling Hyderabad for August 2023 to November 2023 and traffic data from April 2023 to July 2023.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

Sr. No	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 158.000 22 Toll Plaza Nehru Outer Ring Road at Hyderabad	AADT for Four months from August 2023 to November	For Four months from August 2023 to November	For Four months from August 2023 to November	For Four months from August 2023 to November	For Four months from August 2023 to November

SR. No	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024	2023 & Four month from April 2024 to July 2024

### 3.2 Classified Traffic Volume

The objective of conducting Classified Traffic Volume Count is to understand the traffic flow pattern on a roadway. The Classified Traffic Volume has been provided by the concessionaire of project road actual traffic data gathered at toll plaza locations.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicles classification system**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer, Two-Wheeler, Three-Wheeler

Source - IRC: 64 – 1990

However, since project highway is currently under toll operation, the data collected corresponds to category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Truck / Bus
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the years April 2023 to November 2023 and traffic data from April 2024 to July 2024.

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

Following tables show base traffic matrix of each category of vehicles for each pair of traffic Base year 2024-25

**Table 3-3 : Tollable Annual Average Daily Traffic (AADT) Matrix for Car/Jeep/Van**

**SINGLE JOURNEY**  
**CLASS – 01**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	416	825	97	195	164	279	246	44	93	15	246	169	58	146	56	1781	704	710	2	1105
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	346	0	0	669	79	113	314	210	185	57	102	5	79	46	23	44	18	309	275	161	0	739
3	725	0	520	5	280	393	656	805	392	217	350	41	281	121	42	156	26	904	1032	633	0	1611
4	129	0	83	285	0	197	382	379	542	127	273	27	177	20	8	24	7	128	50	50	0	130
4A	225	0	145	608	162	0	255	428	644	158	418	31	312	32	8	27	10	200	30	68	0	189
5	163	0	146	791	282	173	0	568	859	233	605	64	542	76	11	43	13	264	60	79	0	140
6	300	0	217	741	325	395	563	0	593	266	669	119	597	131	28	119	31	577	95	128	0	303
7	241	0	179	445	277	544	727	487	0	248	741	174	495	144	29	341	107	154	36	108	1	264
8	62	0	57	252	105	130	235	308	338	0	335	99	416	104	23	210	87	58	6	30	5	59
9	81	0	93	337	214	338	546	612	833	392	0	265	940	318	69	562	262	204	33	176	107	374
10	13	0	5	49	26	37	75	153	257	129	500	0	90	57	13	49	34	21	3	16	12	45
11	213	0	83	264	157	314	536	572	535	395	1097	95	0	249	85	633	261	310	43	247	272	1704
12	137	0	45	124	13	27	68	130	161	195	348	51	276	0	117	999	474	253	41	193	137	697
13	43	0	16	31	5	4	6	16	21	16	346	9	63	76	0	108	97	125	24	69	53	304
14	115	0	43	107	16	20	34	94	246	153	388	88	517	816	103	0	360	449	73	182	146	767
15	47	0	17	32	5	8	9	18	93	74	273	30	705	456	120	243	0	634	62	93	177	300
16	1413	0	245	640	91	125	203	409	139	59	237	26	332	472	157	503	491	0	144	1341	1203	7956
17	783	0	287	1431	49	28	69	114	49	6	32	3	37	29	61	34	28	106	4	1354	564	1806
18	699	0	166	679	40	49	83	122	108	33	229	23	274	230	97	416	113	1724	859	0	245	4348
18A	1	0	0	2	58	0	0	1	2	9	138	16	290	173	68	172	183	1559	409	143	0	4
19	1637	0	685	1431	88	72	124	238	247	48	329	47	1524	695	310	857	325	10628	1774	4135	3	0

**Table 3-4 : Tollable Annual Average Daily Traffic (AADT) Matrix for Minibus/LCV**

**SINGLE JOURNEY**  
**CLASS – 02**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	13	31	4	5	5	13	3	1	2	0	2	3	2	2	1	15	15	9	0	11
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	8	0	0	36	3	2	22	10	2	1	1	0	2	1	1	1	1	10	10	4	0	8
3	33	0	32	0	48	26	139	177	48	31	33	4	102	21	4	19	8	129	72	22	0	21
4	3	0	3	45	0	4	18	16	19	4	4	1	7	1	2	1	1	17	6	1	0	1
4A	1	0	2	23	3	0	11	25	17	6	6	1	11	2	0	1	0	8	1	1	0	0
5	5	0	7	164	23	10	0	64	52	18	25	4	47	10	1	6	2	62	13	6	0	3
6	14	0	13	153	20	35	65	0	34	36	59	9	154	20	3	29	8	200	34	11	0	12
7	4	0	2	34	6	14	26	20	0	14	35	9	61	14	2	25	28	13	3	6	0	2
8	1	0	1	33	7	7	19	40	26	0	10	4	19	5	1	5	9	6	0	1	0	0
9	1	0	1	33	4	5	16	54	35	13	0	20	77	18	4	19	36	14	1	3	1	1
10	0	0	0	6	1	1	3	15	13	5	10	0	3	2	0	3	3	2	0	1	0	1
11	3	0	3	92	5	9	47	158	64	20	67	4	0	16	4	42	51	35	3	10	3	9
12	2	0	2	18	1	1	6	23	19	13	18	1	24	0	2	33	46	11	2	10	3	18
13	3	0	0	3	0	0	0	2	1	0	18	0	2	1	0	2	7	3	0	1	1	10
14	2	0	1	17	1	1	5	25	20	4	20	5	41	26	3	0	31	15	2	6	3	10
15	1	0	1	4	0	0	1	5	17	6	23	2	75	36	7	20	0	7	2	2	2	4
16	19	0	9	99	17	7	50	178	17	5	18	3	36	25	3	16	12	0	6	31	17	137
17	28	0	8	85	7	1	12	31	6	0	1	0	3	2	2	2	2	6	0	43	14	40
18	6	0	2	40	1	1	4	9	3	1	3	1	8	9	3	17	3	32	22	0	3	65
18A	0	0	0	0	4	0	0	0	0	0	1	1	2	2	4	2	12	12	7	2	0	0
19	23	0	6	23	1	0	3	8	2	0	1	0	8	11	16	16	7	136	34	86	0	0

**Table 3-5 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**Bus/2- Axle**

**SINGLE JOURNEY**

**CLASS – 03**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	4	10	1	5	4	4	1	0	1	0	3	4	2	1	0	8	9	5	0	9
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	7	0	0	16	2	2	21	4	1	0	1	0	2	1	0	2	0	4	7	2	0	5
3	19	0	17	0	43	15	140	289	41	39	45	10	301	31	3	35	13	217	107	22	0	46
4	2	0	3	39	0	2	19	12	18	2	2	0	11	1	1	1	1	15	3	1	0	1
4A	1	0	5	19	2	0	9	22	18	2	11	1	17	2	0	0	0	4	1	1	0	0
5	3	0	5	135	16	8	0	69	38	18	19	4	75	8	0	5	2	66	7	3	0	2
6	5	0	7	256	12	23	77	0	21	57	62	7	300	25	3	50	14	528	20	10	0	4
7	1	0	1	40	4	8	21	32	0	12	24	3	51	12	1	17	20	19	1	1	0	1
8	0	0	1	42	3	4	19	62	19	0	12	5	19	3	1	4	9	7	0	0	0	0
9	1	0	1	50	2	7	21	63	32	12	0	15	95	32	3	27	55	19	1	8	1	1
10	0	0	1	8	1	2	4	10	7	6	12	0	8	4	1	3	2	3	1	1	0	1
11	3	0	3	262	7	17	73	322	62	24	79	5	0	23	6	62	73	57	4	10	4	10
12	2	0	1	30	1	1	5	21	10	14	17	2	24	0	2	22	39	16	2	7	2	17
13	2	0	0	3	0	0	0	2	1	0	20	0	4	1	0	2	7	4	1	4	1	10
14	1	0	1	39	1	0	5	32	12	4	15	4	54	26	3	0	18	17	2	6	2	4
15	0	0	1	13	1	0	1	9	16	5	27	2	91	31	11	17	0	16	2	6	2	2
16	14	0	5	197	13	4	56	471	24	7	19	2	68	30	4	20	16	0	7	22	10	231
17	8	0	5	71	3	1	5	15	3	0	1	0	4	4	4	1	4	9	0	22	6	21
18	3	0	1	69	1	0	3	5	1	1	3	0	10	6	5	18	5	19	16	0	2	46
18A	0	0	0	0	5	0	0	0	0	0	1	0	2	2	1	2	15	7	6	1	0	0
19	7	0	1	11	0	0	1	3	1	0	1	0	12	23	16	6	2	220	57	49	0	0

**Table 3-6 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**3 - Axle**

**SINGLE JOURNEY**

**CLASS – 04**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	7	18	6	2	1	1	0	0	0	0	1	1	0	2	2	17	22	21	0	7
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	18	0	0	101	9	1	12	1	0	0	1	0	1	0	0	1	1	2	5	8	0	11
3	33	0	201	0	33	8	80	163	25	19	35	2	148	15	1	19	5	102	57	8	0	24
4	8	0	18	29	0	2	10	7	8	1	1	0	4	0	0	1	0	7	1	1	0	4
4A	0	0	1	8	1	0	4	14	3	5	2	1	5	0	0	1	0	2	0	0	0	0
5	1	0	4	87	15	4	0	57	19	8	11	2	31	1	0	2	1	27	4	2	0	1
6	1	0	2	108	7	18	69	0	9	29	37	3	185	9	2	10	5	365	20	3	0	0
7	0	0	1	27	3	8	23	11	0	4	10	2	23	6	1	6	11	8	1	1	0	0
8	0	0	1	23	2	2	11	34	8	0	16	3	10	2	0	2	3	3	0	0	0	0
9	0	0	1	43	2	2	14	31	13	9	0	5	40	8	1	18	26	18	1	4	0	0
10	0	0	0	3	0	1	1	6	3	3	6	0	5	5	2	3	2	2	0	1	1	0
11	1	0	1	154	2	4	28	196	28	11	46	3	0	18	14	29	43	31	1	5	1	2
12	0	0	0	18	0	0	1	17	3	7	7	1	13	0	1	8	13	6	1	2	0	0
13	0	0	0	1	0	0	0	2	0	0	10	1	3	5	0	5	3	2	0	1	1	0
14	2	0	1	23	0	1	1	8	5	1	10	2	18	10	4	0	10	24	5	3	3	3
15	0	0	0	5	0	0	0	2	4	3	9	1	42	12	2	5	0	9	2	1	2	1
16	8	0	2	88	6	2	28	338	8	7	15	2	52	15	2	17	11	0	4	13	12	50
17	26	0	6	42	2	1	4	10	1	0	1	0	2	1	2	4	4	5	0	33	39	46
18	13	0	3	40	1	0	1	1	0	0	2	0	4	2	1	9	1	6	15	0	3	24
18A	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	2	7	11	18	2	0	0
19	37	0	3	7	9	0	1	0	0	0	0	0	1	2	0	2	1	38	55	25	0	0

**Table 3-7 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**4 to 6 - Axle**

**SINGLE JOURNEY**

**CLASS – 05**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	3	52	10	6	3	5	7	0	3	1	25	3	0	3	2	27	9	28	0	5
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	0	0	88	11	1	30	6	8	4	6	0	19	2	0	1	3	13	9	3	0	1
3	71	0	172	0	68	14	180	270	103	43	95	14	603	57	4	31	8	263	70	21	0	22
4	19	0	24	42	0	2	17	11	45	2	10	0	21	1	0	1	1	14	2	1	0	7
4A	0	0	0	12	1	0	6	7	23	2	11	0	10	1	0	1	0	3	0	0	0	0
5	1	0	2	143	8	5	0	58	66	17	47	9	80	6	0	3	2	61	5	2	0	0
6	7	0	11	189	7	18	66	0	26	25	99	5	194	16	2	11	13	627	7	8	0	1
7	5	0	10	89	17	37	64	19	0	18	40	5	45	14	2	7	83	73	3	3	0	2
8	1	0	4	27	1	2	34	21	15	0	12	3	21	2	0	2	9	7	0	0	0	3
9	1	0	8	98	15	24	64	89	50	9	0	17	323	31	10	49	103	39	3	14	1	1
10	4	0	0	7	0	0	20	11	13	2	21	0	38	22	6	8	5	14	4	10	5	11
11	38	0	29	512	27	15	124	285	72	24	308	14	0	51	39	78	119	112	15	46	15	26
12	1	0	1	38	1	1	4	14	13	11	21	6	29	0	1	13	34	15	2	6	1	1
13	0	0	0	3	0	0	0	2	1	0	38	1	8	1	0	1	3	4	0	2	0	0
14	10	0	1	23	0	0	2	11	8	2	30	6	45	15	4	0	13	20	23	7	4	8
15	0	0	0	7	0	0	1	5	22	4	53	2	137	25	3	9	0	5	1	1	3	0
16	45	0	26	228	19	4	71	680	96	9	64	14	136	54	4	20	10	0	8	34	21	78
17	6	0	8	29	1	0	2	5	6	0	2	3	9	3	3	7	1	9	0	46	13	8
18	26	0	4	121	1	0	2	6	6	1	14	2	30	11	2	21	1	21	35	0	4	86
18A	0	0	0	0	8	0	0	0	0	0	2	1	6	2	0	4	23	6	5	1	0	0
19	7	0	1	13	0	0	1	1	3	1	2	1	12	2	0	3	1	85	11	57	0	0

**Table 3-8 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**7 & Above - Axle**

**SINGLE JOURNEY**

**CLASS – 06**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

**Table 3-9 : Tollable Annual Average Daily Traffic (AADT) Matrix for Car/Jeep/Van**

**RETURN JOURNEY**  
**CLASS – 01**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	90	204	38	104	47	79	46	19	16	3	21	49	8	23	5	260	402	302	0	316
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	140	0	0	128	19	49	39	59	36	14	14	0	8	11	2	7	1	34	121	42	0	218
3	203	0	274	0	89	258	308	270	123	90	85	12	37	33	5	12	2	188	600	105	0	442
4	28	0	28	50	0	56	94	80	48	29	31	7	11	1	1	2	0	10	20	7	0	26
4A	23	0	31	78	46	0	36	88	110	29	51	7	24	3	0	1	1	10	11	9	0	12
5	47	0	65	174	152	75	0	173	191	82	120	21	67	13	0	4	1	29	27	23	0	37
6	62	0	60	145	124	132	203	0	99	99	156	48	121	30	1	14	1	44	43	23	0	52
7	60	0	59	97	125	213	326	214	0	107	252	92	136	42	1	26	20	9	15	23	0	55
8	7	0	15	45	35	45	70	68	48	0	128	43	80	23	2	14	11	4	1	5	1	8
9	14	0	34	101	100	147	216	221	204	86	0	179	340	112	5	62	73	32	10	58	36	73
10	1	0	1	5	5	6	13	22	29	24	55	0	14	10	0	5	3	3	1	2	2	5
11	24	0	9	61	29	41	89	134	118	105	264	12	0	49	8	110	150	29	12	43	37	189
12	26	0	9	21	3	6	17	31	31	36	92	12	35	0	8	178	92	46	10	48	40	162
13	16	0	7	14	2	2	3	9	8	8	25	2	21	31	0	24	37	32	5	32	24	128
14	41	0	11	27	4	7	10	27	86	57	199	11	206	381	19	0	51	116	13	74	58	339
15	13	0	4	4	1	2	2	3	15	21	49	7	52	148	13	83	0	114	8	35	28	132
16	472	0	81	321	27	42	60	136	19	11	29	3	43	64	15	95	184	3	49	544	436	4101
17	132	0	40	285	8	6	10	15	4	1	2	0	3	4	1	4	2	13	0	216	101	288
18	165	0	42	69	10	19	18	27	17	6	30	3	33	53	11	34	13	325	480	0	13	1612
18A	0	0	0	0	0	0	0	0	0	0	12	1	20	25	6	18	8	142	166	13	0	0
19	365	0	271	477	32	71	33	61	39	12	70	7	190	216	76	167	32	1597	766	1935	0	0

**Table 3-10 : Tollable Annual Average Daily Traffic (AADT) Matrix for Minibus/LCV**

**RETURN JOURNEY**  
**CLASS – 02**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	4	16	1	0	2	6	2	0	0	0	0	0	0	0	0	8	16	1	0	9
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	5	0	0	16	1	1	3	6	1	0	0	0	0	0	0	0	0	1	3	0	0	2
3	9	0	16	0	15	7	61	56	9	10	6	1	15	7	0	4	1	26	38	2	0	6
4	1	0	0	21	0	1	7	6	1	5	1	0	1	0	0	0	0	3	2	0	0	0
4A	0	0	0	6	0	0	2	11	4	2	1	0	2	0	0	0	0	1	0	0	0	0
5	0	0	2	47	3	1	0	19	6	6	3	1	11	1	0	1	0	9	5	1	0	0
6	1	0	2	56	2	7	20	0	3	14	11	5	39	7	0	9	0	26	14	1	0	1
7	0	0	0	22	1	9	30	17	0	13	13	4	20	6	0	9	4	1	1	1	0	0
8	0	0	0	9	0	2	5	12	3	0	4	1	4	2	0	1	1	1	0	0	0	0
9	0	0	0	13	0	3	11	22	12	2	0	3	22	9	0	7	6	2	0	0	0	0
10	0	0	0	1	0	0	1	2	2	1	3	0	1	0	0	0	0	0	0	0	0	0
11	0	0	1	15	1	2	9	29	15	3	18	1	0	4	0	9	13	4	0	1	0	1
12	0	0	1	9	0	0	3	7	5	2	7	0	3	0	0	8	11	2	0	2	0	3
13	0	0	0	1	1	0	0	1	0	0	1	0	1	0	0	0	2	1	0	1	2	7
14	0	0	0	7	0	0	2	7	6	1	8	1	12	13	0	0	3	4	0	3	0	9
15	0	0	0	2	0	0	0	0	4	2	9	0	15	15	1	7	0	2	0	0	0	1
16	3	0	3	31	2	1	14	25	1	1	1	0	11	2	1	3	1	0	2	9	3	34
17	2	0	1	26	0	0	4	9	1	0	0	0	0	0	0	0	0	0	0	4	1	7
18	2	0	2	4	0	0	1	4	2	0	1	0	3	4	0	1	0	9	12	0	0	42
18A	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2	2	0	0	0
19	2	0	3	5	0	0	1	4	0	0	0	0	1	3	4	2	1	31	19	21	0	0

**Table 3-11 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**Bus/2- Axle**

**RETURN JOURNEY**

**CLASS – 03**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	5	4	1	1	1	1	0	0	0	0	0	0	0	0	0	6	6	1	0	2
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	6	1	4	2	3	0	0	1	1	0	0	0	0	0	1	2	0	0	0
3	1	0	2	0	11	2	29	43	5	14	10	2	18	4	0	1	1	23	39	1	0	2
4	0	0	0	16	0	1	7	4	1	2	1	0	1	0	0	0	0	2	1	0	0	0
4A	0	0	1	3	0	0	2	5	1	1	2	0	2	0	0	0	0	0	0	0	0	0
5	0	0	0	46	8	1	0	18	5	9	8	1	18	1	0	1	0	9	2	0	0	0
6	0	0	0	60	1	7	15	0	8	33	23	2	35	4	0	3	1	24	5	2	0	0
7	0	0	0	13	1	11	22	7	0	10	14	2	8	3	0	3	3	1	0	0	0	0
8	0	0	0	10	0	0	7	26	4	0	2	1	4	1	0	1	1	1	0	0	0	0
9	0	0	1	10	0	7	7	23	8	1	0	3	33	5	0	4	11	2	0	0	0	0
10	0	0	0	2	0	0	1	1	1	2	3	0	1	0	0	0	1	0	0	0	0	0
11	0	0	0	15	1	3	4	19	9	2	44	1	0	2	0	5	8	3	1	1	0	0
12	0	0	0	5	0	0	3	6	4	0	15	1	7	0	0	12	10	2	1	1	0	5
13	1	0	0	1	0	0	0	0	0	0	1	0	1	0	0	1	6	1	0	1	0	6
14	0	0	1	11	0	0	2	11	6	1	12	2	19	7	0	0	7	3	0	3	0	2
15	0	0	0	2	0	0	0	1	2	1	20	0	16	9	1	4	0	1	0	0	0	0
16	1	0	1	30	1	0	10	25	1	0	1	1	5	3	1	3	4	0	2	3	1	105
17	1	0	1	18	0	0	1	2	0	0	0	0	0	0	0	0	0	1	0	3	1	1
18	1	0	1	3	0	0	1	5	0	0	4	0	2	1	1	1	1	7	6	0	0	29
18A	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	2	2	0	0	0
19	4	0	2	4	0	0	1	1	0	0	0	0	2	4	2	1	0	111	9	23	0	0

**Table 3-12 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**3- Axle**

**RETURN JOURNEY**

**CLASS – 04**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	12	20	3	0	0	0	0	0	0	0	0	0	0	1	0	4	12	4	0	2
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	2	0	0	157	11	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
3	5	0	53	0	9	1	22	13	5	11	10	1	6	8	0	2	0	10	18	1	0	2
4	3	0	3	18	0	0	10	2	1	1	1	0	0	0	0	0	0	1	0	0	0	1
4A	0	0	0	2	0	0	1	5	3	1	1	0	0	0	0	1	0	0	0	0	0	0
5	0	0	0	26	3	0	0	24	6	5	7	0	3	0	0	0	0	3	1	0	0	0
6	0	0	0	31	1	5	19	0	3	18	11	2	11	1	0	0	0	8	6	0	0	0
7	0	0	0	8	0	1	7	2	0	3	4	0	3	0	0	2	0	0	0	0	0	0
8	0	0	0	4	0	1	3	14	1	0	3	1	2	1	0	0	1	0	0	0	0	0
9	0	0	0	15	0	1	2	6	2	8	0	3	21	2	0	4	2	1	0	0	0	0
10	0	0	0	0	0	0	1	0	1	1	1	0	1	0	0	1	0	0	0	0	0	0
11	0	0	0	6	0	0	3	9	4	1	17	1	0	2	1	3	3	2	0	0	0	0
12	0	0	0	2	0	0	0	2	1	0	3	2	4	0	3	4	2	1	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	1	8	0	0	1	1	0	0	0	0	0
14	0	0	0	10	0	0	0	1	1	0	11	1	10	3	3	0	1	3	2	1	1	0
15	1	0	1	1	0	0	0	0	1	0	8	1	7	4	1	4	0	3	3	0	0	1
16	7	0	0	13	1	0	3	7	0	0	0	1	3	1	0	13	3	0	2	1	5	4
17	9	0	1	9	0	0	0	2	0	0	0	0	0	0	0	2	0	0	0	1	6	26
18	10	0	5	2	0	0	1	0	0	0	2	0	1	1	0	1	0	5	4	0	0	14
18A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	6	13	0	0	0
19	2	0	6	5	1	0	0	0	0	0	0	0	1	0	0	1	0	23	33	16	0	0

**Table 3-13 : Tollable Annual Average Daily Traffic (AADT) Matrix for**

**4 to 6 - Axle**

**RETURN JOURNEY**

**CLASS – 05**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	0	48	11	0	0	1	2	0	0	2	15	0	0	8	0	12	3	11	0	1
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	1	0	0	138	18	0	0	7	6	2	4	0	11	0	0	1	0	6	3	1	0	0
3	18	0	39	0	3	1	15	24	15	5	9	1	35	2	0	2	1	27	24	3	0	5
4	5	0	2	31	0	0	3	1	8	0	7	0	9	0	0	0	0	3	0	0	0	0
4A	0	0	0	3	0	0	1	6	12	1	4	0	3	0	0	0	0	0	0	0	0	0
5	0	0	0	58	2	0	0	23	27	25	26	15	28	0	0	0	0	11	0	0	0	0
6	0	0	1	47	0	0	18	0	5	4	9	5	42	1	0	0	0	12	1	0	0	0
7	0	0	0	15	1	5	14	2	0	2	7	2	14	1	0	0	2	1	1	0	0	0
8	0	0	2	10	0	1	7	4	4	0	2	1	5	0	0	0	1	0	0	0	0	0
9	0	0	2	19	0	2	7	6	8	3	0	3	60	4	0	17	16	3	1	1	1	1
10	0	0	0	2	0	0	6	1	1	0	5	0	6	2	0	0	0	7	1	1	0	0
11	1	0	0	22	1	0	3	7	7	2	91	7	0	3	2	4	7	5	6	1	0	0
12	0	0	0	3	0	0	0	2	2	0	8	12	14	0	0	1	2	1	1	1	0	0
13	0	0	0	0	0	0	0	0	1	0	7	2	24	0	0	3	0	0	0	1	0	0
14	0	0	0	6	0	0	0	1	2	0	28	4	34	3	0	0	3	4	11	2	1	1
15	0	0	0	1	0	0	0	1	2	0	18	2	17	4	1	3	0	1	0	0	0	0
16	1	0	1	23	0	0	3	8	2	0	2	7	18	2	0	7	0	0	3	4	0	2
17	1	0	0	11	0	0	0	0	1	0	1	1	12	0	0	25	0	1	0	5	2	2
18	15	0	0	2	0	0	0	1	1	0	1	2	10	1	0	1	0	9	13	0	0	41
18A	0	0	0	0	0	0	0	0	0	0	0	1	5	0	0	2	0	4	3	0	0	0
19	1	0	0	5	1	0	0	0	1	2	0	5	11	0	0	3	0	14	4	59	0	0

**Table 3-14 : Tollable Annual Average Daily Traffic (AADT) Matrix for**  
**7 & Above - Axle**

### RETURN JOURNEY

#### CLASS – 06

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
4A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
5	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
6	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
8	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
9	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
10	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
11	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
12	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
14	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
15	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
17	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
18A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
19	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

### 3.4 Traffic Characteristic

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-1515**.

**Table 3-15 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

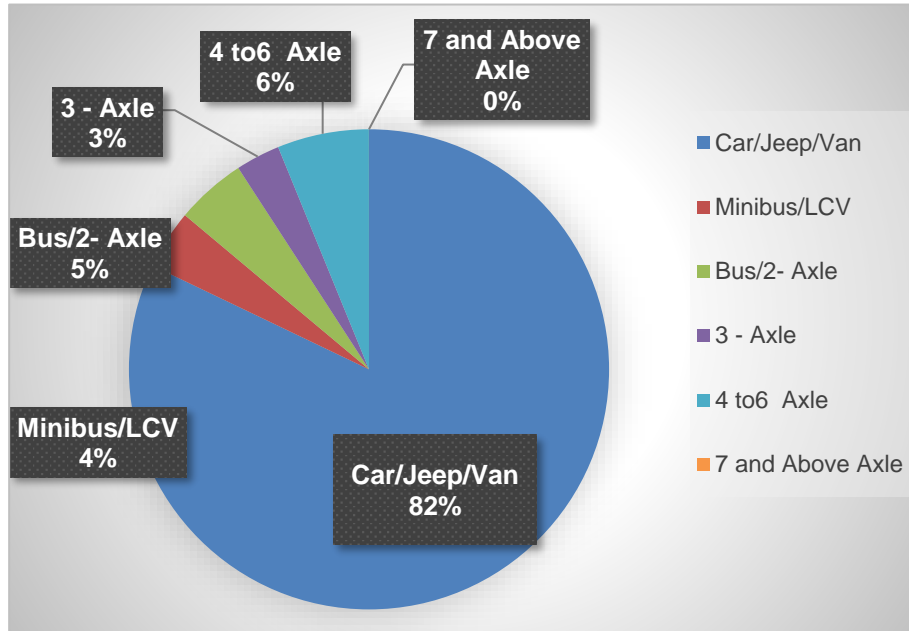
**Table 3-16 : Traffic in PCU at Project Stretch for Base Year 2024-25**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2023-24	Hyderabad ORR at all TP	205075	283848	1.38
2024-25	Hyderabad ORR at all TP	224656	312413	1.39

It can be observed from above that project traffic has PCU index less than 1.5 which is an indicator of high proportion of Passenger traffic.

### 3.4.2 Components of Traffic

As discussed previously, components of total traffic volume play an important role in determining project revenue. Modal split of total traffic on project corridor is given in table below.



**Figure 3-1 : Modal Split of Tollable Vehicle**

It is observed that car traffic forms about 83% of total traffic at toll plaza locations while multi axle commercial vehicles are about 9% of total traffic. Truck / Bus and LCV share about 4% and 4% of traffic volume respectively.

## CHAPTER 4

# GROWTH OF TRAFFIC ON PROJECT HIGHWAY

### 4.1 Introduction

Traffic is generated and grows as a result of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. Further these factors have uncertainties associated with them. Forecasts of traffic have, therefore, to be dependent on the forecasts of factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future pattern of change in these factors can be estimated with only a limited degree of accuracy and hence the forecasting of future traffic levels cannot be precise. The success of any road project with private sector participation hinges on the accuracy and robustness with which the future traffic and revenues are estimated.

Further, future traffic forms the basis of the design of the transportation infrastructure facility and also determines the viability of the project. The following section deals with different methods, techniques, and considerations used in traffic forecast for the project under study.

### 4.2 Secondary Data Collection

In addition to the above-mentioned traffic surveys, secondary data was also collected from the sources wherever the data available. This data is effectively used to determine and estimate past trends of growth and future pattern. Following secondary data was collected for study:

1. Vehicle registration data of Andhra Pradesh, Telangana, Karnataka and Maharashtra as these are the state which make most of the influence on traffic.
2. Data of Indian national GDP (Gross Domestic Product), NSDP (Net State Domestic Product) of Andhra Pradesh, Telangana, Karnataka and Maharashtra.
3. Estimated population data of Andhra Pradesh, Telangana, Karnataka and Maharashtra.

This data is utilized in the study to estimate the growth factors along the project corridor. Relevant part of secondary data is placed at Annexure.

### 4.3 Development in the Project Influence Area

The **Outer Ring Road**, officially as, **Jawaharlal Nehru Outer Ring Road** and abbreviated as, **O.R.R.**, is a 158 kilometre, 8-lanes ring road expressway encircling Hyderabad, capital of the Indian state of Telangana. The expressway is designed for speeds up to 100 km/h. A large part, 124 km (covering urban nodes viz., Hi- Tech city, Nanakramguda Financial District, Rajiv Gandhi International Airport, IKP Knowledge park, Hardware Park, Telangana State Police Academy, Singapore Financial District, and Games village) of the 158-km was opened by December 2012. Rest of the stretch was opened by 2016. Thus from 2016 onwards ORR is under operation and has contributed to great extent not only to ease out traffic flow but also has influenced the development of Hyderabad around ORR. Most of the development which are happening on periphery of Hyderabad take positioning with respect to NORR into account. It

gives an easy connectivity between NH 44, NH 65, NH 161, NH 765 and NH 163 from Hyderabad to Vijayawada and Warangal as well as state highways leading to Vikarabad Nagarjuna Sagar and Karimnagar /Mancheri. The Outer Ring Road also helps in reducing the travel time from Rajiv Gandhi International Airport to cities like Nizamabad & Adilabad as it connects to NH44. The expressway is fenced, and 33 radial roads connect it with the Inner Ring Road.

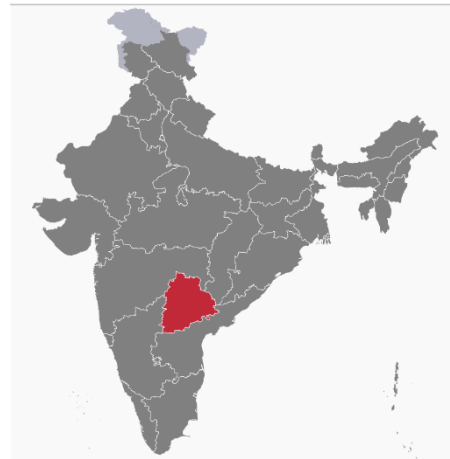
## Telangana State



Telangana is one of the fastest-growing states in India posing average annual growth rate of 13.90% over the last five years. Telangana's nominal gross state domestic product for the year 2020-21 stands at ₹12.05 lakh crore (US\$170 billion).

Service sector

is the largest contributor to the Telangana's economy with a share of about 65% in the year 2018-19. Growth in services has largely been fuelled by IT services with the State holding leading position in IT & ITeS in the country in terms of production and exports.



Traffic growth on NORR would be synonym with growth of Hyderabad. Hence various aspects of Growth of Hyderabad are relevant and discussed as under.

## Hyderabad.

Hyderabad is among the top 10 fastest growing cities in the world, according to the World Economic Forum (WEF). Interestingly, all 10 of the fastest-growing cities in the world are in India. And, going by Gross Domestic Product (GDP) growth, this is likely to be the case till 2035, says research institute Oxford Economics. Hyderabad, with an 8.47% GDP growth, holds the second place among metropolitan cities in India.

By some estimates Hyderabad will be the second-fastest growing city in the world. It is just marginally behind Bengaluru, and should become number one (in India), since the projections are on a time-series trajectory, and Hyderabad's actual growth has been geometrically exponential.

A city with rich history and magnificent olden structures is slowly became host to some of the most modern buildings, a blend of both the bygone kingdoms and the new corporate revolution. To boost Hyderabad's development, the then Chief Minister of Andhra Pradesh Chandrababu Naidu successfully bid for the National Games in 2002 and the Afro Asian games in 2003, along with a strong bid to create a Formula One circuit in the state. These endeavours led to the

development of efficient sports infrastructure in Hyderabad. The Indian School of Business (ISB) and IIT were also established in a similar endeavour to boost modern education.

The resulting urban agglomeration now has an area of over eight hundred square kilometres and consists of Hyderabad and other municipal entities surrounding it. The city population is expected to exceed one hundred and thirty-six lakhs in 2021.

As development picked up pace at the end of the nineties, the old city has declined, and the newer peripheral regions started to gain prominence. By 2001, the city was the sixth largest urban agglomeration in India; and during the last decade it registered a growth of 32%.



Developed land on the outskirts of Hyderabad has been utilised for large scale development just outside the Cybercity. The city itself is on its way to become the leader in e-governance. It has been predicted about Hyderabad that it would become a leading information-based society in the next two decades.

Rapid industrialisation has led to the increase in land prices while simultaneously driving the demand for infrastructure development. Commercial growth, therefore, has been concentrated in the Municipal Corporation of Hyderabad area while the metropolis has experienced pressure in residential growth. As workers prefer proximity to the workplace, their daily commute has resulted in the improvement of the road networks as well.

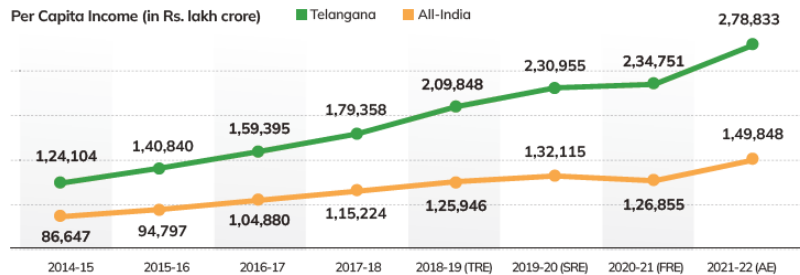


### Growth of IT Sector

Ever since the 1990s, Andhra Pradesh had been promoting itself as a world class IT location and Hyderabad City, as a result, has managed to attract investment from companies such as IBM, Oracle, and Microsoft. The Hyderabad Technology Park has seen hundreds of IT companies registering themselves as soon as spaces are available. The objective of this elaborate promotional program has been to attract the right number of companies which

together would form a critical mass for the city to develop as a high-tech city which would rub shoulders with Silicon Valley and Malaysia's Multimedia Super Corridor. During the nineties, several initiatives were taken up by the state government towards promotion of IT sector. These included setting up of IT training institutes, initiatives in e-governance, development of a Hi-Tech city and promoting the Software Technology Park as a preferred destination for private sector companies. Steps were then taken even further to allow the development of a Hardware Park, creation of a knowledge Park, and establishment of a financial district. The state government started tapping resources to invest in the biotechnology sector and, as a first step towards making the region specialized, a Biotech Park was introduced.

**Per Capita Income at Current Prices for Telangana and India (2014-15 to 2021-22)**



The result of these efforts can be seen in the form of various parks. One called Gnome Valley has been set up to focus on research and training in biomedicine for industrial production. Within this valley are also established the IKP Knowledge Park and Alexandria Knowledge Park with areas of two hundred acres and three hundred acres respectively. These parks cover Ameerpet, Medchal, Uppal, and a number of other parts of the Hyderabad Metropolitan region. The thrust areas of research here include vaccines, bioinformatics, seeds etc. Some of the biggest global pharmaceutical and research firms have setup their offices here. Similarly, a Hardware Park of one thousand seven hundred acres in area is also being developed.

The economic activities particularly related to manufacturing and associated activities, are concentrated in Ramachandrapuram, Patancheru, Balanagar, Uppal, Cherlapalli, Jeedimetla, and Moula Ali. These developments, on one hand, contributed to the economic growth of the city and, on the other hand, are responsible for the spatial growth, particularly the growth of the surrounding areas.

## Development of Relevant Infrastructure

With expansion in infrastructure capabilities and progressive state policy framework, Hyderabad is not only providing strong impetus to its leading industries: IT/ITES, pharmaceuticals but also laying strong foundation for its growth sectors: aerospace, automotive and electric vehicle, textiles and emerging technologies. I strongly believe that the metropolis is on an ambitious journey to become one of the most diverse business hubs of the world by 2035.

The city's infrastructure is providing for evolving needs of massive commercial growth. Hyderabad's metro rail is India's second longest operational metro network after the Delhi Metro. In phase 1, 67 kilometers (kms) are operational of planned 72 kms. The route covers three major traffic corridors through 60 stations. The next phase aims to connect airport at Shamshabad with major economic zones of the greater Hyderabad region. Another groundwork

capability worth mentioning is logistics parks. The Hyderabad Metropolitan Development Authority has developed 6 logistics parks in last 5 years and 8 more to come by 2025. The facilities are catering to over 340 logistics companies and 100 major manufacturing firms, making Hyderabad one of the largest logistics hubs of the country. In addition to the above, the metropolitan offers second cheapest office rentals amongst the major cities of India, adding to cost effectiveness of doing business in the city. In 2021, Hyderabad accounted for 36% country's share of office spaces.

It also holds the badge of most liveable city in the country for last five consecutive years as per Mercer's quality of living index. The city attracts talent pool from across the nation as well as from other world economies due to its notable social infrastructure: healthcare, education, housing, recreation, and personal freedom.

Telangana is a state known for its robust economic initiatives and trade friendly policies since its inception in 2014. A key example is state's TS I-pass industrial policy that is best in the country. It provides single window application clearance process capped at 15 days for all capital investment projects. This policy enabled Amazon to get clearance in just 11 days for its largest campus in the world to be built in Hyderabad. The state is poised to keep pace with technological advancements and thus first in India to launch actionable framework for AI and other emerging technologies. It has partnered with NASSCOM to formulate and execute the strategy. Telangana has taken many sectors specific initiatives that has improved ease of doing business and garnered foreign direct investments in the metro. Telangana's Electric vehicle and energy storage policy has aided Fiat Chrysler to set up global digital hub in Hyderabad. With availability of largest commercial land bank in the country, Telangana offers 1.45 lakhs acres of land to investors. This has enabled aerospace companies to set up production facilities in the city. Boeing and Safran have announced new manufacturing lines in Hyderabad. Airbus is setting up helicopter manufacturing plant in Shamshabad and committed to investment of INR 2500 Crores. The city ranked first in the Aerospace cities of the future in 2020-21.

The city's primary sectors, IT and pharma, continue to grow and bring in public and private investments. Google is investing INR 1000 Crores in its biggest facility outside US. This commercial space is set to be functional in Hyderabad by early 2023 and will be home to 13000 employees. The metro's Genome Valley is witnessing Biopharma scale-up facility, a public-private partnership between the state and Cytiva life sciences. The state is also developing 800-acre new pharma park in Rangareddy district.

Though Hyderabad faced the heat in 2020, the pandemic and subsequent lockdown compelled considerable layoffs in IT and SME sectors. Office space absorption rate declined, strongly

indicating many firms shutting shops or reducing operations in the city. Few economic experts questioned Hyderabad’s potential as a growing business hub. However, I find the argument short sighted and reactive. The city strongly stood the test of time, India’s first ICMR approved RT-PCR kits and first indigenously developed vaccine for COVID-19 came from Hyderabad. In 2021, the city’s economy started showing green shoots. It contributed to 30% of the pharmaceutical production of the country. It also gained momentum as the “Vaccine capital of the world” with 4 out of 5 leading vaccine manufacturers in India already present in Genome Valley. The same year, the city also had the highest net office absorption rate (of existing stock) at 20% and highest office completion rate in the country. It also witnessed lowest office space vacancies: 7.1% in comparison to its other metro counterparts.

Hyderabad’s strong economic fundamentals with respect to infrastructure, social capital and economic policies, equip it to meet future challenges of global economies. It is poised for long-term growth and on a progressive path to become world’s prominent commercial hub. With current GDP of \$74 billion, it is projected to move forward with 8.47% CAGR and set to deliver as \$201.4 billion economy by 2035.

## IT INCUBATION CENTERS – HYDERABAD

Hyderabad has witnessed a very growth of IT incubation centers. Some are summarized below.



- Hyderabad is recognised as the leading IT hubs globally; the city houses more than 1500 IT and ITES companies.
- IT SEZs -53
- State contributes 11.6% of India’s IT exports in 2019-20
- Accounts for 23.5% of India’s IT export growth 2019-20
- T-HUB Phase-II, Hyderabad Built-up Area: 3.72 L sft; India’s Largest start-up Incubator
- Plug & play facility in E city Built-up Area: 1.8 lakh sft with an integrated testing & training facility.
- T-Works, Hyderabad Built-up Area: 78,000 sft – Phase 1; India’s largest prototyping facility
- Image Tower, Hyderabad Built-up Area: 460,000 sft A one of its kind plugs & Play Facility for Animation and Gaming companies. Expected completion: March 2023
- Incubation Centre, Warangal(U) Built-up Area: 15000 sft Plug & Play Facility for startups.

## LIFE SCIENCES - HYDERABAD

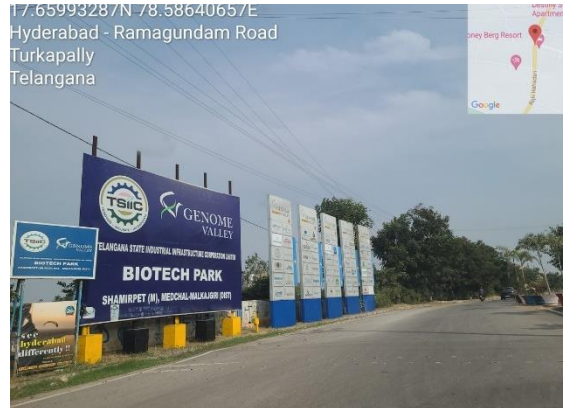
Life Sciences sector continues to continue to consolidate the position of the State as one of the most important life sciences hubs in the world.

International Companies including **Sandoz Research and Development Laboratories, Chemo India Formulations, Jamp India Pharmaceutical, Ferring Laboratories and Tokyo Chemical Industry**, among others have established their footprint in the State.

Telangana is the leading contributor of Pharma Exports from the Country since 2015-16 (28% share in FY 2020-21)

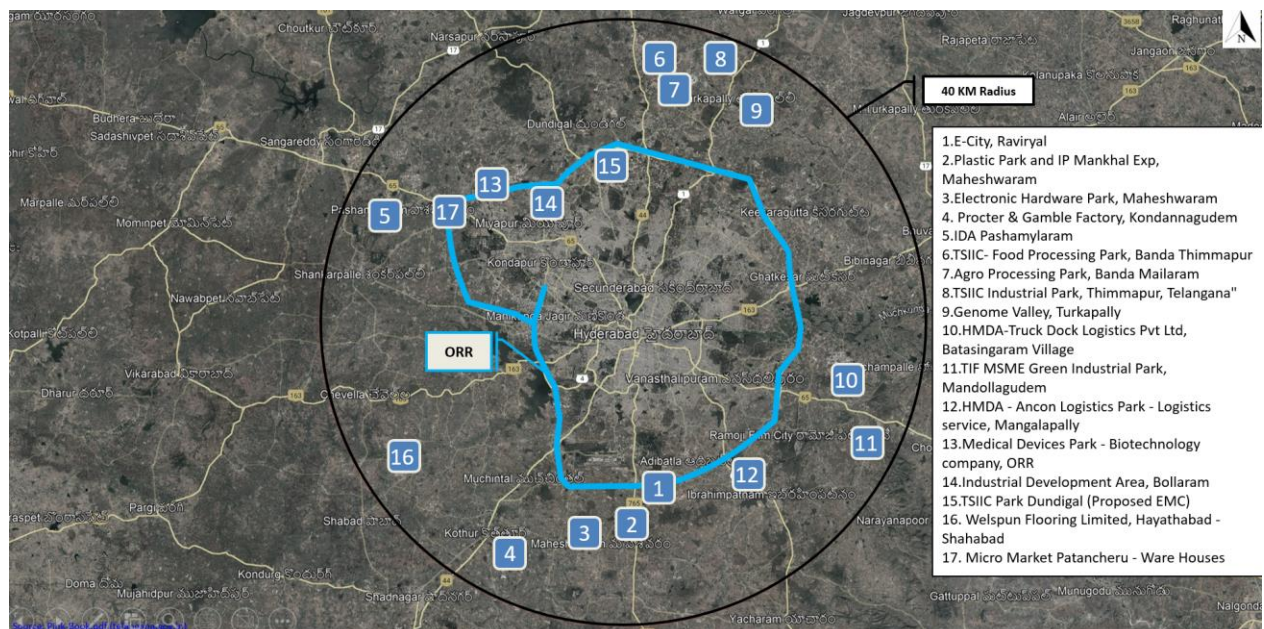
**Hyderabad Pharma City:** world's largest integrated pharma cluster spread over approx 19,333 acres. The cluster has been recognized as National Investment and Manufacturing Zone (NIMZ) by Government of India, given its national and international importance.

**Genome Valley:** Built over 1200 acres in three phases, more land is being added to the cluster along with more ready built lab space (more than 2 million square foot) Genome Valley houses more than 200 companies with a scientific workforce of about 15,000 professionals.



**Medical Devices Park:** Spread across 302 acres, 105 acres have already been allotted (more than 60 percent of the allottable land) to 40 companies. The park will house Asia's largest Stent manufacturing facility established by Sahajanand Medical Technologies

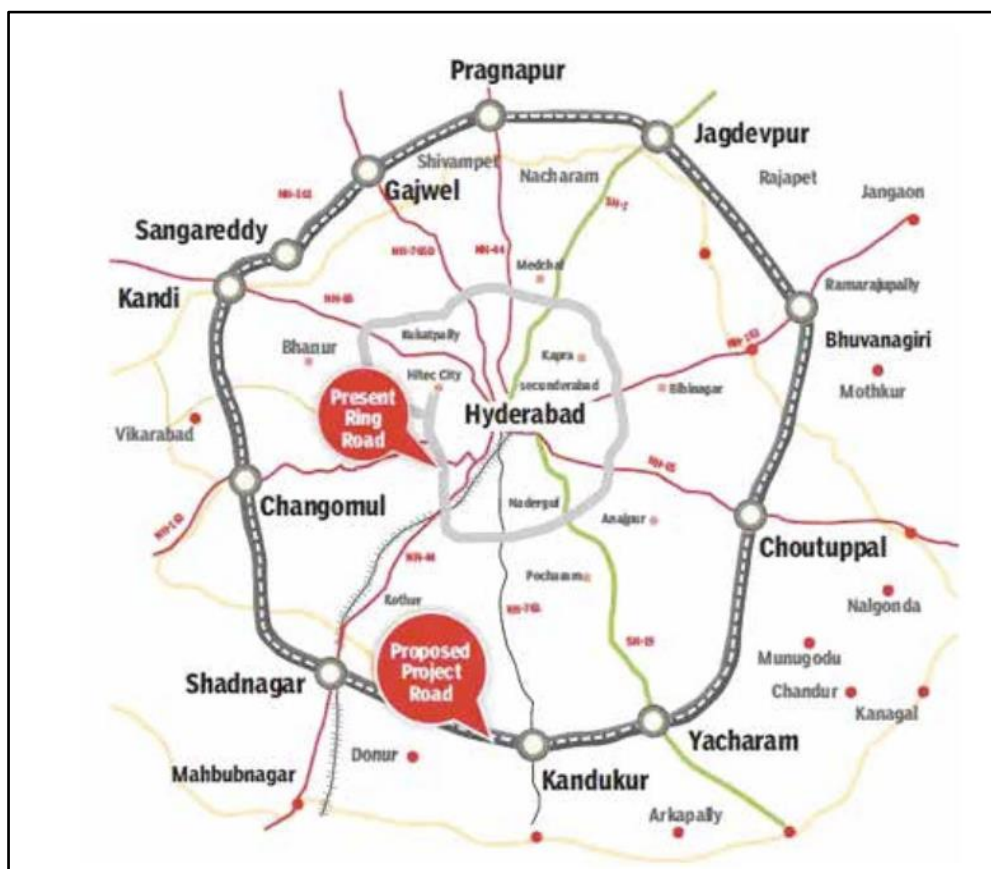
There is considerable industrial development on peripheries of Hyderabad as well. ORR being a fast connectivity has provided boost to such development. Following figure marks such developments on periphery of Hyderabad.



All above discussion indicates that Hyderabad is going to witness a good growth in near decade and would sustain on that.

## Proposed Regional Ring Road (RRR)- Hyderabad

- An 8-lane expressway stretched over 340 km of length with a project cost Rs 17,000 crore is proposed to strengthen the existing roads connecting major national highways passing through Telangana, easing the regional road connectivity.
- The road will be developed at par with international standards over a stretch from Sangareddy to Kandi via Narsapur, Toopran, Gajwel, Jagdevpur, Bhongir, Choutuppal, Ibrahimpatnam, Chevella and Shankarapalli
- The RRR will have amenities such as parking, food courts, toilets, parks, children play area, malls, and drinking water facilities.
- The RRR will connect the surrounding districts with Hyderabad and to the Industrial Clusters, covering 40 of the region's population and will link 20 towns with National Highways.



Source: *Pink-Book.pdf* ([telangana.gov.in](http://telangana.gov.in))

As Proposed Regional Ring Road (RRR) would have faster connectivity to all important urban/commercial establishment, development of RRR has potential to alter focus of growth around Hyderabad Metropolitan Region.

## 4.4 Trend Analysis

Time series data of vehicle Registered in state of concerned states is taken from respective authorized websites and the same is used as the base data for analysis of growth.

Growth of vehicle traffic depends on type of vehicle. Traffic growth on any highway typically depends on number of economic parameters like

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. Same is recommended in IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways.

Following can be pair of vehicle type and independent variable for elasticity modelling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

Same is used in analysis below.

Vehicle Registered at the end of financial year in the state of Delhi, Haryana and Uttar Pradesh is given in tables below and also compared with the growth rate achieved in terms of vehicle registered on all India bases.

#### 4.5 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish the relationship between the growth in number of given categories of vehicle with one of the economic variables considered, such as NSDP, per capita income and population growth.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is as given below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

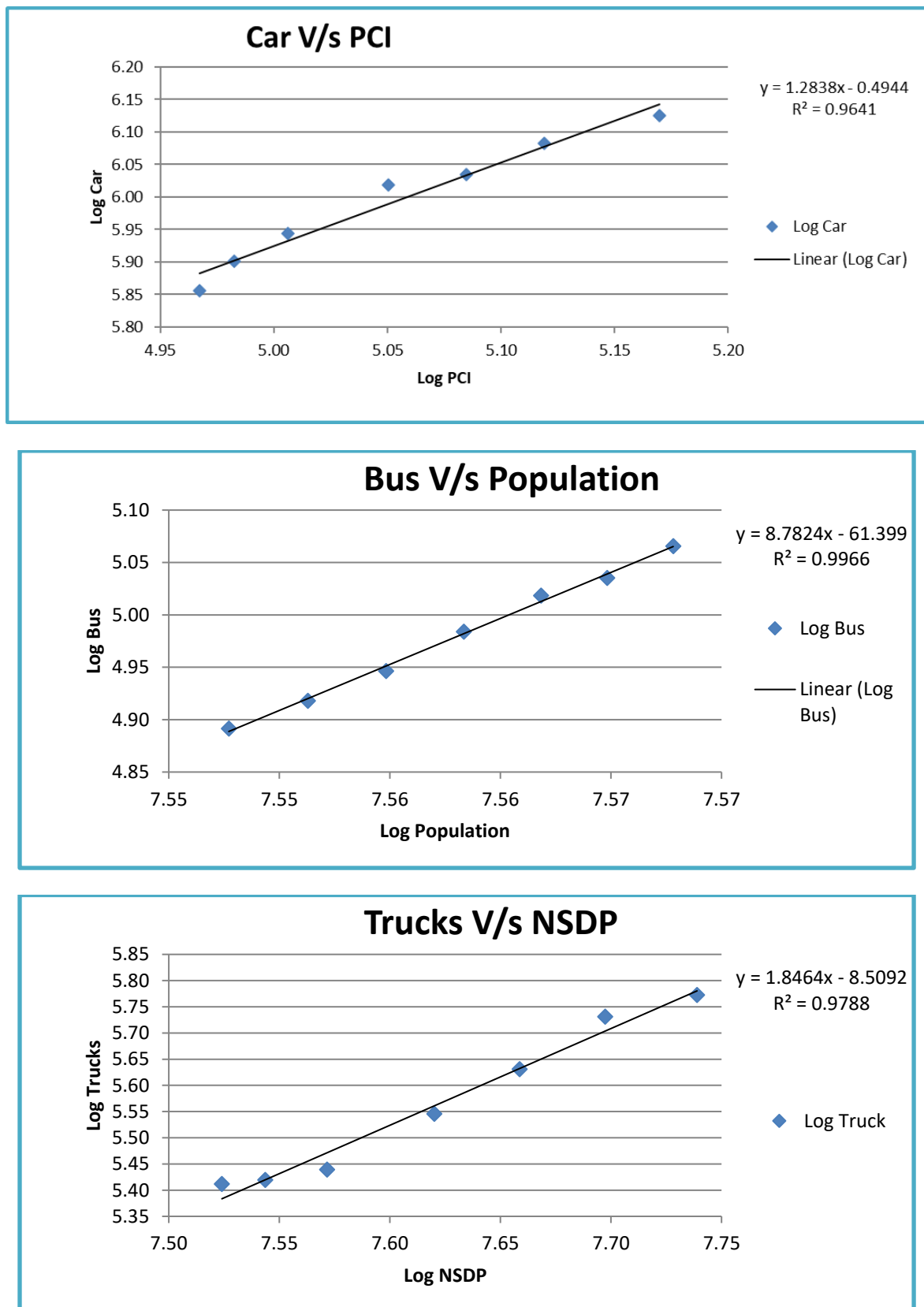
$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

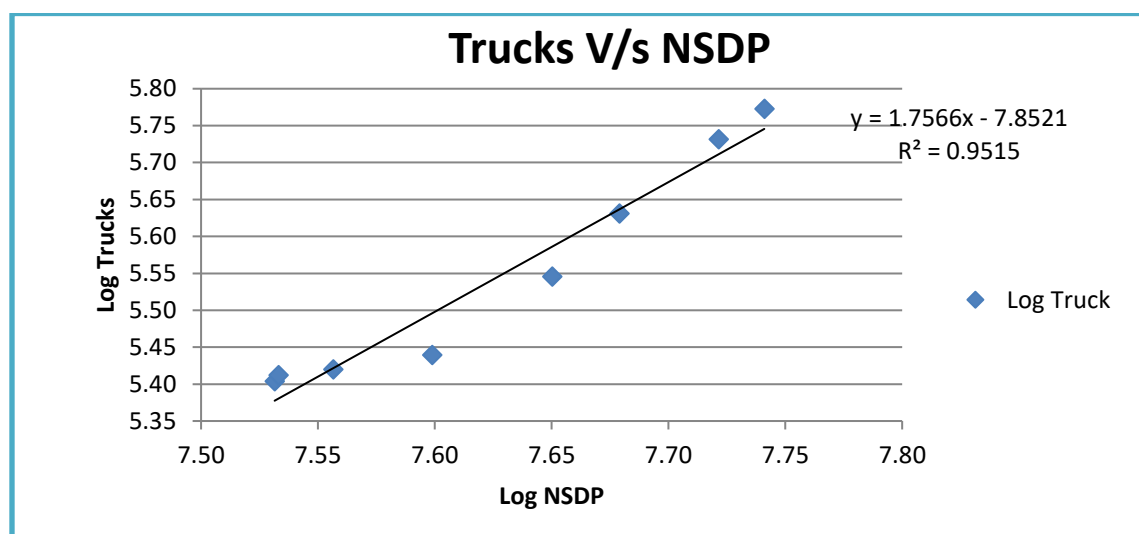
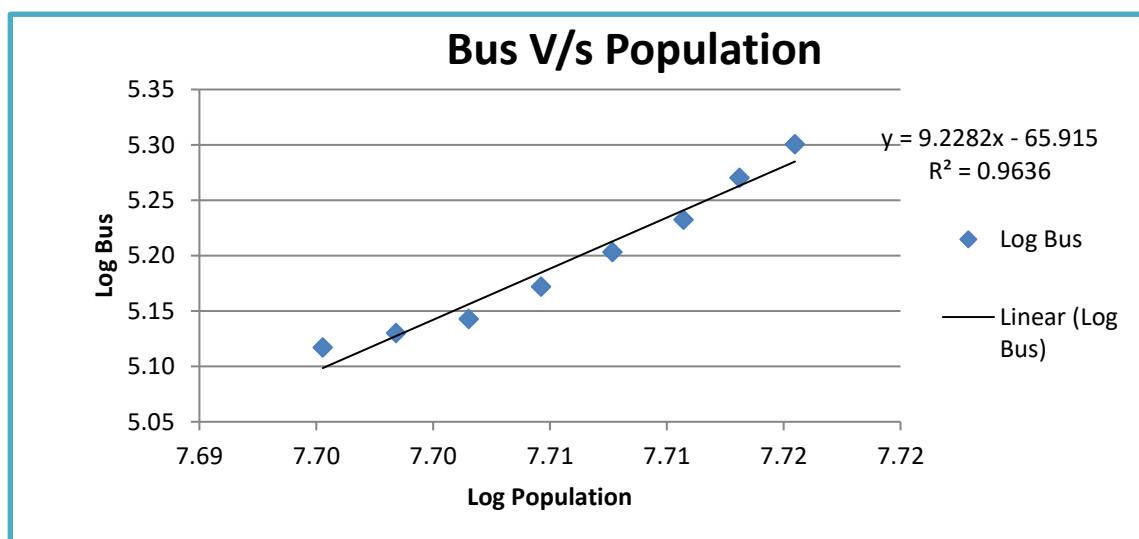
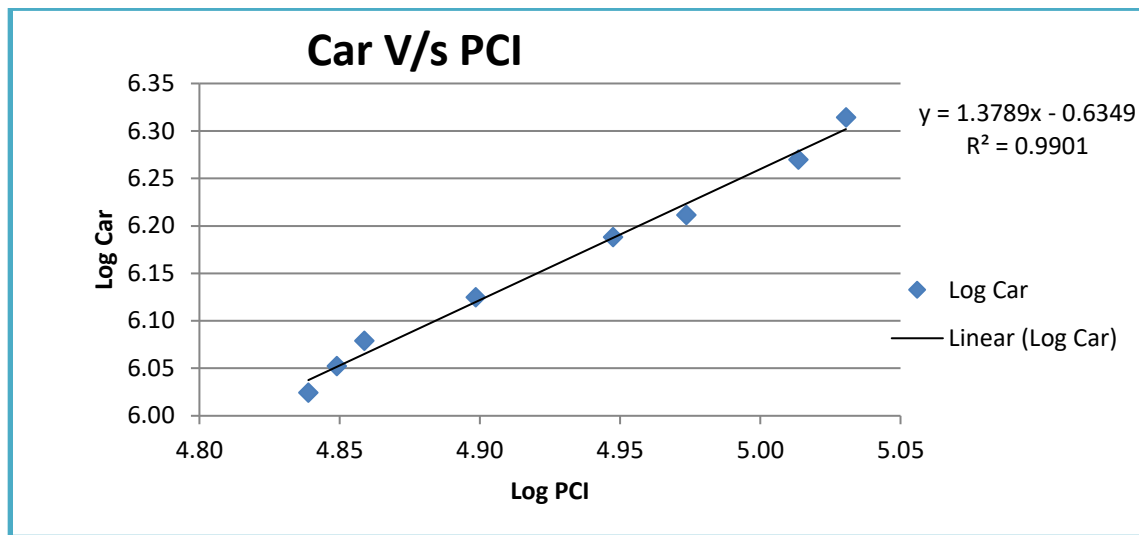
$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

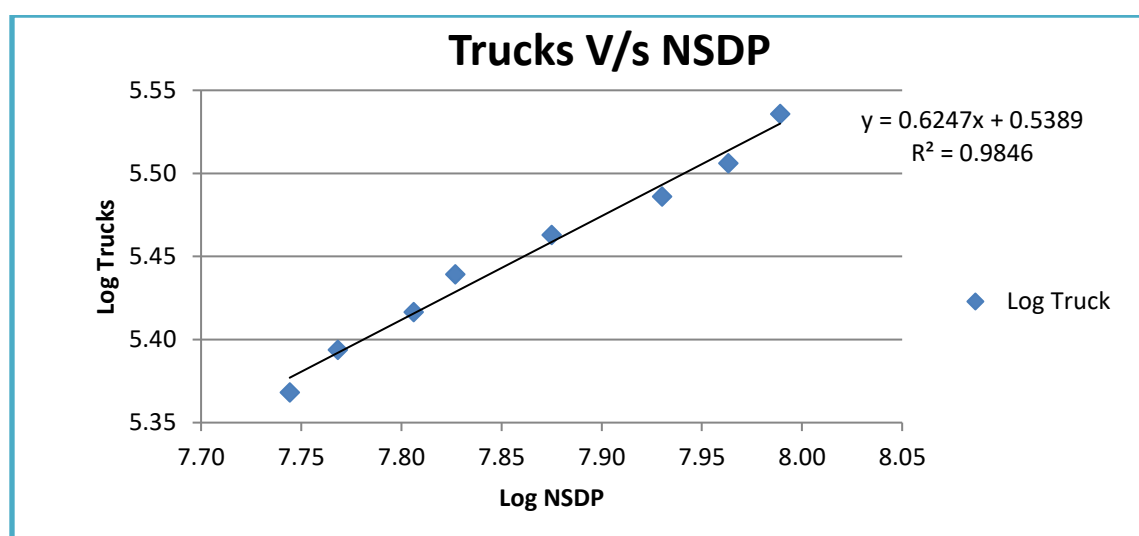
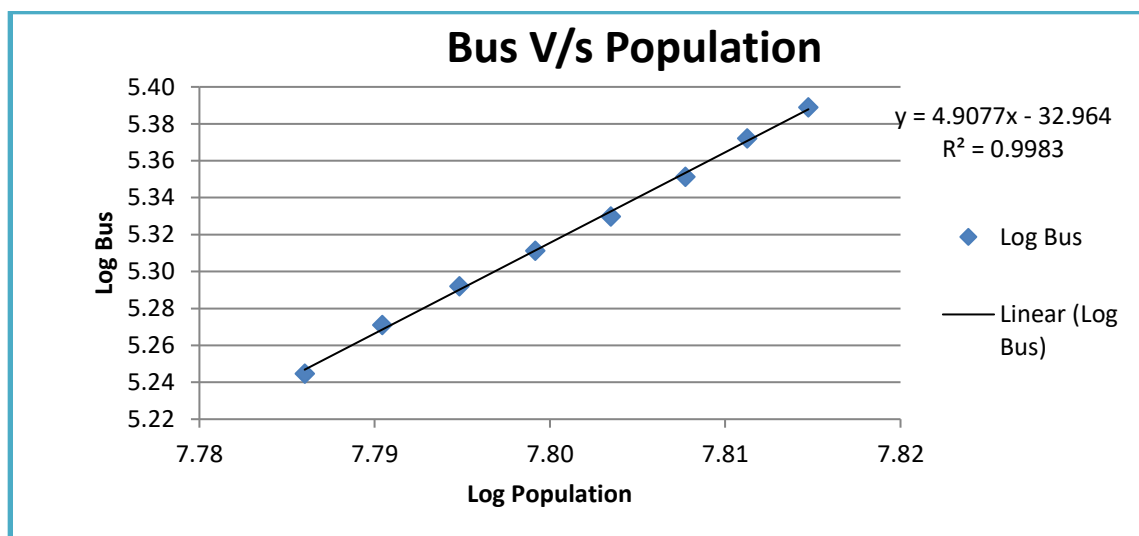
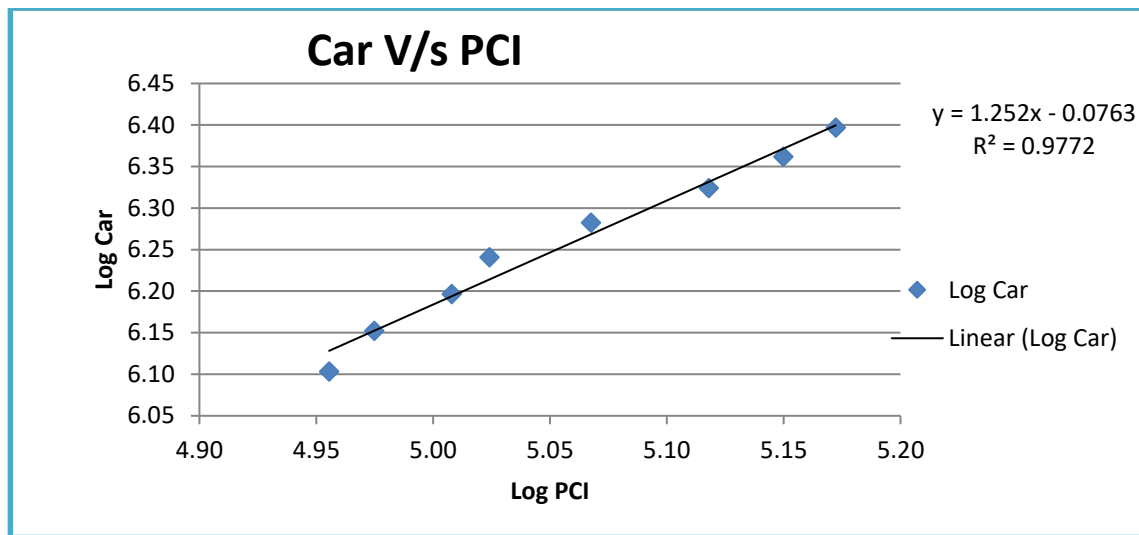
The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP). The graphical presentation of the elasticity is presented in figures below:



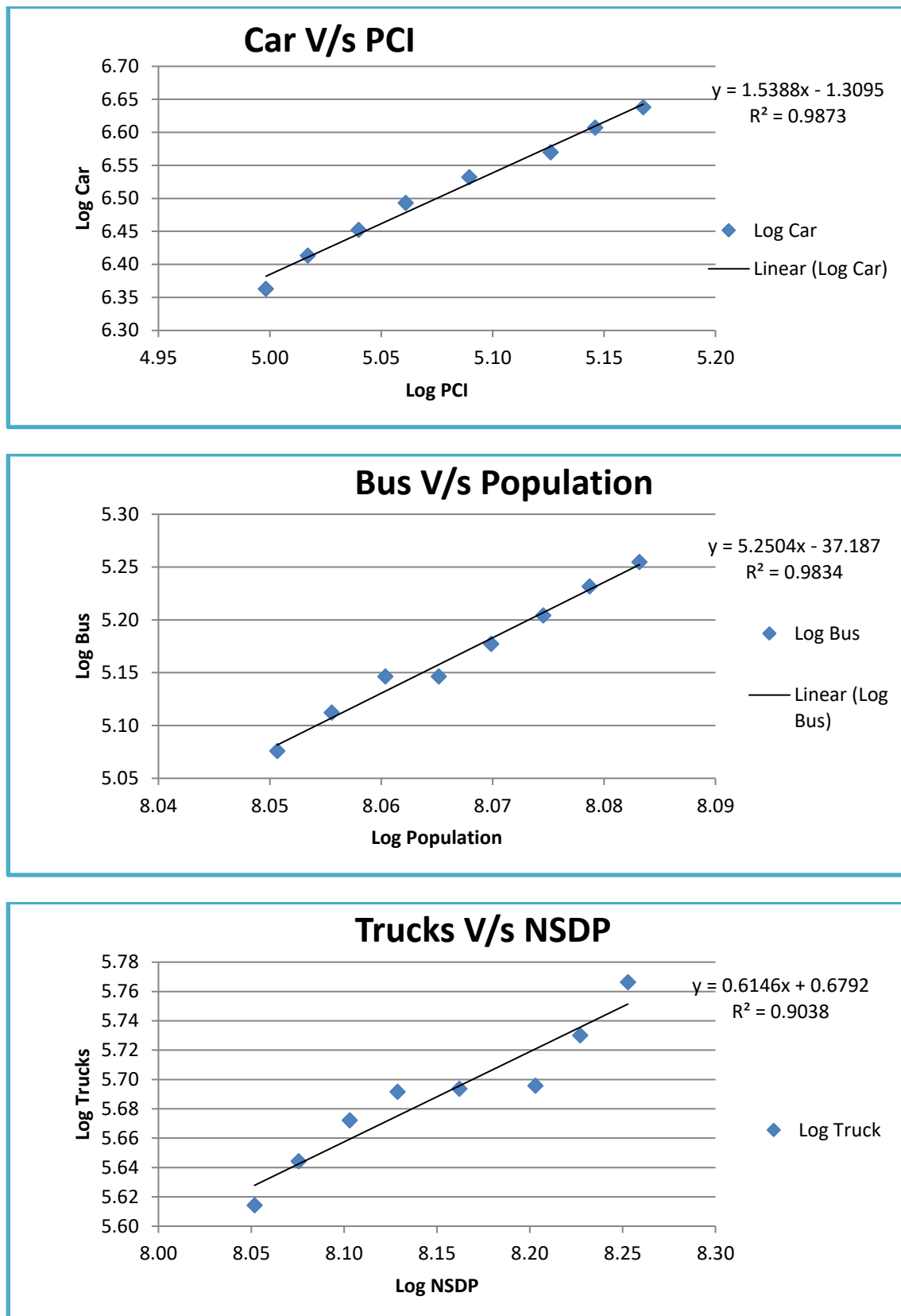
**Figure 4-1: Elasticity by Graphical Extrapolation for Telangana**



**Figure 4-2: Elasticity by Graphical Extrapolation for Andhra Pradesh**



**Figure 4-3: Elasticity by Graphical Extrapolation for Karnataka**



**Figure 4-4: Elasticity by Graphical Extrapolation for Maharashtra**

It shall be noted that the growth rates for various modes are not same as they are influenced by different parameters. In other words, whilst the growth of the passenger vehicles (cars, Jeeps, two wheelers and even buses) could be attributed to the growth in the per capita income,

population growth and vehicle registration growth, the growth of the LCV, Trucks, Multi Axle Trucks are found to be influenced with factors including the industrial production and growth of the National or state Domestic products.

For establishing the elasticity equations, details regarding NSDP/GDP, per capita income, population growth and registered vehicles in the state have been collected for the past few years and are presented in the Annexure. Based on this data, Log-Log regression curve fits have been developed for each type of vehicle with the most suitable parameters and the elasticity values obtained.

The results of these analyses for the good fit as reflected by  $R^2$  values are presented in the table below.

**Table 4-1 : Results of Regression analysis**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient
TELANGANA	Car/Jeep	PCI	$y = 1.2838x - 0.4944$	$R^2 = 0.9641$	1.2838
	Bus	Population	$y = 8.7824x - 61.3985$	$R^2 = 0.9966$	8.7824
	Truck	NSDP	$y = 1.8464x - 8.5092$	$R^2 = 0.9788$	1.8464
ANDRAPRADESH	Car/Jeep	PCI	$y = 1.3789x - 0.6349$	$R^2 = 0.9901$	1.3789
	Bus	Population	$y = 9.2282x - 65.9151$	$R^2 = 0.9636$	9.2282
	Truck	NSDP	$y = 1.7566x - 7.8521$	$R^2 = 0.9515$	1.7566
KARNATAKA	Car/Jeep	PCI	$y = 1.252x - 0.0763$	$R^2 = 0.9772$	1.252
	Bus	Population	$y = 4.9077x - 32.9642$	$R^2 = 0.9983$	4.9077
	Truck	NSDP	$y = 0.6247x - 0.5389$	$R^2 = 0.9846$	0.6247
MAHARASHTRA	Car/Jeep	PCI	$y = 1.5388x - 1.3095$	$R^2 = 0.9873$	1.5388
	Bus	Population	$y = 5.2504x - 37.1874$	$R^2 = 0.9834$	5.2504
	Truck	NSDP	$y = 0.6146x - 0.6792$	$R^2 = 0.9038$	0.6146

However, considering factors such as proposed developments and other influencing economic factors moderated growth factors as listed below are considered. Change all tables.

#### 4.6 Basis for arriving at growth rates.

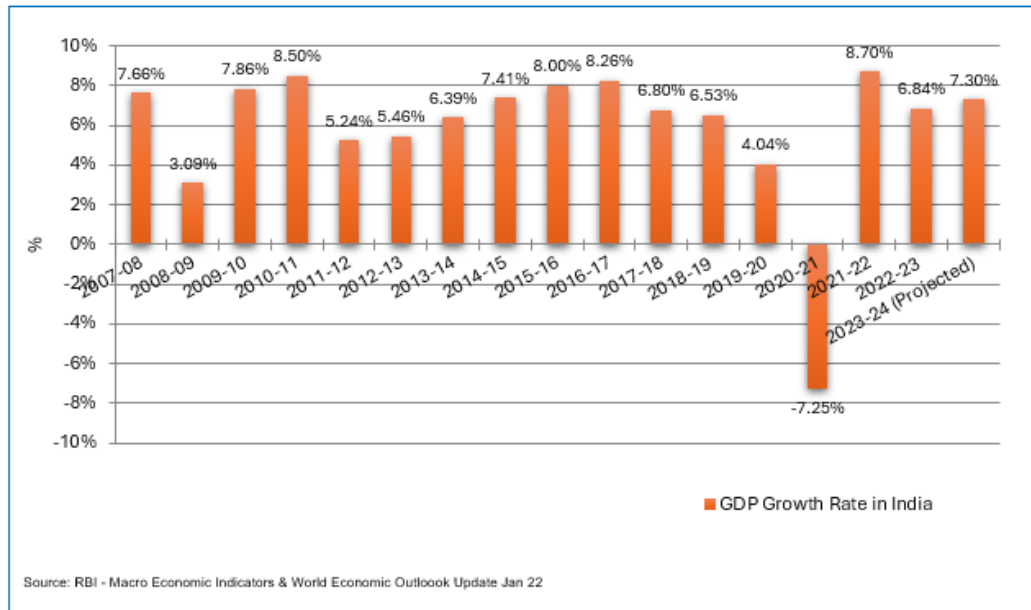
Arriving at growth rates for each mode on particular road stretch is always a complex issue. Transportation planners before arriving at such growth rates have to have a comprehensive understanding of the various disciplines such as land use, economy, automobile industry, anticipated changes in the region, traffic, and other related issues.

Giving due consideration to all the factors elaborated in the previous sections, three growth scenarios are suggested with a wide range of growth rates which are resilient and ready to respond to the changes in socio-economic conditions which are likely to influence the project corridor.

## 4.7 Growth of Economy and Projection of GDP in India and States

### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 4-5 : Growth of GDP in India**

After witnessing a slowdown during previous years, the economy is expected to firm up further in coming years. The growth outlook for the Indian economy in the medium and long term remains upbeat and positive. Therefore, in this study, in base case scenario, it is assumed that a GDP growth rate of around 8% will be sustained up to the year 2028 and thereafter for every five-year period the GDP growth rate is reduced. Similarly other independent variables of Per Capita Income (PCI) and Population is growth is assumed. Following table shows summary of such assumption.

**Table 4-2 : Growth of Independent Variables**

Assumed Growth Rate of Independent Indicators							
Indicator	2024-2028	2028-2033	2033-2038	2038-2043	2043-2048	2048-2053	2053-2058
PCI	7.71%	6.71%	5.00%	4.50%	4.00%	3.50%	3.50%
Population	0.76%	0.71%	0.66%	0.61%	0.56%	0.51%	0.51%
NSDP	8.15%	6.15%	4.15%	3.15%	2.15%	1.15%	1.15%

### 4.7.1 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle are as under.

**Table 4-3: Recommended Growth Rates Pessimistic case**

Category / Year	2024-2028	2028-2033	2033-2038	2038-2043	2043-2048	2048-2053	2053-2058
Car/Jeep/Van	6.81%	5.43%	3.63%	2.77%	2.01%	1.36%	1.36%
Bus	4.67%	4.26%	3.87%	3.49%	3.12%	2.76%	2.76%
Minibus	4.67%	4.26%	3.87%	3.49%	3.12%	2.76%	2.76%
LCV	3.02%	2.03%	1.16%	0.73%	0.35%	0.04%	0.04%
2- Axle	3.02%	2.03%	1.16%	0.73%	0.35%	0.04%	0.04%
3 - Axle	4.10%	2.79%	1.64%	1.05%	0.55%	0.13%	0.13%
4 to6 Axle	4.10%	2.79%	1.64%	1.05%	0.55%	0.13%	0.13%
7 and Above Axle	4.10%	2.79%	1.64%	1.05%	0.55%	0.13%	0.13%

**Table 4-4: Recommended Growth Rates Most likely case**

Category / Year	2024-2028	2028-2033	2033-2038	2038-2043	2043-2048	2048-2053	2053-2058
Car/Jeep/Van	7.06%	5.68%	3.88%	3.02%	2.26%	1.61%	1.61%
Bus	4.92%	4.51%	4.12%	3.74%	3.37%	3.01%	3.01%
Minibus	4.92%	4.51%	4.12%	3.74%	3.37%	3.01%	3.01%
LCV	3.27%	2.28%	1.41%	0.98%	0.60%	0.29%	0.29%
2- Axle	3.27%	2.28%	1.41%	0.98%	0.60%	0.29%	0.29%
3 - Axle	4.35%	3.04%	1.89%	1.30%	0.80%	0.38%	0.38%
4 to6 Axle	4.35%	3.04%	1.89%	1.30%	0.80%	0.38%	0.38%
7 and Above Axle	4.35%	3.04%	1.89%	1.30%	0.80%	0.38%	0.38%

**Table 4-5: Recommended Growth Rates Optimistic case**

Category / Year	2024-2028	2028-2033	2033-2038	2038-2043	2043-2048	2048-2053	2053-2058
Car/Jeep/Van	7.31%	5.93%	4.13%	3.27%	2.51%	1.86%	1.86%
Bus	5.17%	4.76%	4.37%	3.99%	3.62%	3.26%	3.26%
Minibus	5.17%	4.76%	4.37%	3.99%	3.62%	3.26%	3.26%
LCV	3.52%	2.53%	1.66%	1.23%	0.85%	0.54%	0.54%
2- Axle	3.52%	2.53%	1.66%	1.23%	0.85%	0.54%	0.54%
3 - Axle	4.60%	3.29%	2.14%	1.55%	1.05%	0.63%	0.63%
4 to6 Axle	4.60%	3.29%	2.14%	1.55%	1.05%	0.63%	0.63%
7 and Above Axle	4.60%	3.29%	2.14%	1.55%	1.05%	0.63%	0.63%

## CHAPTER 5

### FORECAST OF TOLL REVENUE

#### 5.1 General

This chapter presents the estimates of traffic forecast, tolling categories, tolling rate calculations and toll revenue of the project.

#### 5.2 Toll Rate Guidelines

Toll rates at NORR are governed by “Nehru Outer Ring Road Hyderabad (Toll) Rules -2012 issued by Municipal Administration and Urban Development Department / Hyderabad Metropolitan Area Development Authority and Hyderabad Growth Corridor Limited. This policy was recently amended by circular dated 12<sup>th</sup> January 2023.

The policy is similar to NHAI toll rate policy. Basic rate and rate revision policy same as NHAI Policy. The basic per km rate however have been enhanced for categories as under.

Sl. No.	Vehicle types	Enhancement factor
1.	Cars/ Jeep/ Van/ LMV/ SUV/ MPV	50%
2.	LCV/ Mini Bus	50%
3.	Bus/ 2-axle Truck	27%
4.	3-axle commercial vehicles	50%
5.	Heavy Construction Machinery/ Earth Moving Equipment/ 4/5/6 axle trucks	50%
6.	Oversized vehicles (7 or more axles)	50%

**Figure 5-1: Base Rate (Per Km) enhancement as per NORR amendment Policy.**

In amendment of policy provision of penalty for entering to fast tag lane without having valid fast tag and also for overloading of vehicles has been added. Penalty for fast tag lane violation is double the normal fee and overloaded vehicles would have to pay 10 times the toll rate for category. These are similar to NHAI policy.

#### 5.4 Discounts

As per the Fee Notification (Schedule-R) fee discounts shall be provided to project users as under

- Local discount for non-commercial vehicle owner with in 20 km of toll plaza is not included in schedule M.

#### 5.4 Travel Passes

As per the Fee Notification (Schedule-R) fee discounts shall be provided to project users as under

1. Monthly Pass: For frequent user's monthly pass would have not more than 50 trips per month at 2/3<sup>rd</sup> rate
2. Daily Pass (for Return Trip): A 75% discount will be offered on the return trip.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.

## **5.2 Segmentation of traffic**

Journet type traffic segmentation has been provided by Concessionaire for all toll plazas. Same has been used for future revenue working as well.

## 5.2 Estimation of Toll Rates

As per the notification issued for toll policy the following Base rate of fee for the categories mentioned are applicable as base rate.

**Table 5-1 : Base Toll Rates 2007 - 08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (2 Axle)	2.2
Three Axle commercial vehicles	2.4
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4-6 axles)	3.45
Oversized Vehicle (seven or more axles)	4.2

These rates are then modified for as per procedure provided in guidelines of notification taking into account factors listed below.

- These base rates have been enhanced by factors as mentioned in amendment to NORR Toll Policy dated 12<sup>th</sup> January 2023.

- Annual revision of fee rate - @3%
- Application of WPI
- a growth rate of 5% is assumed for WPI of future years.
- As fee for structures is included in equivalent length at each toll plaza same shall not be considered separately

Applicable length for journey type at each toll plaza as per schedule M is given as under

**Table 5-2 : Tollable Length**

Name of IC		Kokapet	Neopolis	Edula nagulapally	Patancheru	Sultanpur	Mallampet	Dindigal/ Saragudem	Medchal	Shamirpet	Keesara	Ghatkesar	Taramptipet	Pedda Amberpet	Bonguluru	Raviryal	Tukkuguda	Pedda Golconda	Shamshabad	Rajendra Nagar	TSPA	Narsingi	Nanakramguda
	F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
Kokapet	1	0.000	1.700	11.900	20.500	29.000	35.000	40.700	50.200	59.100	71.000	74.112	65.862	58.962	46.712	39.612	34.112	25.862	19.512	11.262	7.962	3.612	7.252
Neopolis	1A	1.700	0.000	10.200	18.800	27.300	33.300	39.000	48.500	57.400	69.300	75.760	67.562	60.662	48.412	41.312	35.812	27.562	21.212	12.962	9.662	5.312	8.952
Edula nagulapally	2	11.900	10.200	0.000	8.600	17.100	23.100	28.800	38.300	47.200	59.100	67.650	75.850	70.862	58.612	51.512	46.012	37.762	31.412	23.162	19.862	15.512	19.152
Patancheru	3	20.500	18.800	8.600	0.000	8.500	14.500	20.200	29.700	38.600	50.500	59.050	67.250	74.150	67.212	60.112	54.612	46.362	40.012	31.762	28.462	24.112	27.752
Sultanpur	4	29.000	27.300	17.100	8.500	0.000	6.000	11.700	21.200	30.100	42.000	50.550	58.750	65.650	75.712	68.612	63.112	54.862	48.512	40.262	36.962	32.612	36.252
Mallampet	4A	35.000	33.300	23.100	14.500	6.000	0.000	5.700	15.200	24.100	36.000	44.550	52.750	59.650	71.900	74.612	69.112	60.862	54.512	46.262	42.962	38.612	42.252
Dindigal/ Saragudem	5	40.700	39.000	28.800	20.200	11.700	5.700	0.000	9.500	18.400	30.300	38.850	47.050	53.950	66.200	73.300	74.812	66.562	60.212	51.962	48.662	44.312	47.952
Medchal	6	50.200	48.500	38.300	29.700	21.200	15.200	9.500	0.000	8.900	20.800	29.350	37.550	44.450	56.700	63.800	69.300	76.062	69.712	61.462	58.162	53.812	57.452
Shamirpet	7	59.100	57.400	47.200	38.600	30.100	24.100	18.400	8.900	0.000	11.900	20.450	28.650	35.550	47.800	54.900	60.400	68.650	75.000	70.362	67.062	62.712	66.352
Keesara	8	71.000	69.300	59.100	50.500	42.000	36.000	30.300	20.800	11.900	0.000	8.550	16.750	23.650	35.900	43.000	48.500	56.750	63.100	71.350	74.650	74.612	78.252
Ghatkesar	9	74.112	75.760	67.650	59.050	50.550	44.550	38.850	29.350	20.450	8.550	0.000	8.200	15.100	27.350	34.450	39.950	48.200	54.550	62.800	66.100	70.450	76.610
Taramptipet	10	65.862	67.562	75.850	67.250	58.750	52.750	47.050	37.550	28.650	16.750	8.200	0.000	6.900	19.150	26.250	31.750	40.000	46.350	54.600	57.900	62.250	68.410
Pedda Amberpet	11	58.962	60.662	70.862	74.150	65.650	59.650	53.950	44.450	35.550	23.650	15.100	6.900	0.000	12.250	19.350	24.850	33.100	39.450	47.700	51.000	55.350	61.510
Bonguluru	12	46.712	48.412	58.612	67.212	75.712	71.900	66.200	56.700	47.800	35.900	27.350	19.150	12.250	0.000	7.100	12.600	20.850	27.200	35.450	38.750	43.100	49.260
Raviryal	13	39.612	41.312	51.512	60.112	68.612	74.612	73.300	63.800	54.900	43.000	34.450	26.250	19.350	7.100	0.000	5.500	13.750	20.100	28.350	31.650	36.000	42.160
Tukkuguda	14	34.112	35.812	46.012	54.612	63.112	69.112	74.812	69.300	60.400	48.500	39.950	31.750	24.850	12.600	5.500	0.000	8.250	14.600	22.850	26.150	30.500	36.660
Pedda Golconda	15	25.862	27.562	37.762	46.362	54.862	60.862	66.562	76.062	68.650	56.750	48.200	40.000	33.100	20.850	13.750	8.250	0.000	6.350	14.600	17.900	22.250	28.410
Shamshabad	16	19.512	21.212	31.412	40.012	48.512	54.512	60.212	69.712	75.000	63.100	54.550	46.350	39.450	27.200	20.100	14.600	6.350	0.000	8.250	11.550	15.900	22.060
Rajendra Nagar	17	11.262	12.962	23.162	31.762	40.262	46.262	51.962	61.462	70.362	71.350	62.800	54.600	47.700	35.450	28.350	22.850	14.600	8.250	0.000	3.300	7.650	13.810
TSPA	18	7.962	9.662	19.862	28.462	36.962	42.962	48.662	58.162	67.062	74.650	66.100	57.900	51.000	38.750	31.650	26.150	17.900	11.550	3.300	0.000	4.350	10.510
Narsingi	18A	3.612	5.312	15.512	24.112	32.612	38.612	44.312	53.812	62.712	74.612	70.450	62.250	55.350	43.100	36.000	30.500	22.250	15.900	7.650	4.350	0.000	6.160
Nanakramguda	19	7.252	8.952	19.152	27.752	36.252	42.252	47.952	57.452	66.352	78.252	76.610	68.410	61.510	49.260	42.160	36.660	28.410	22.060	13.810	10.510	6.160	0.000

Accordingly on the basis of above tollable lengths, toll rates of various categories of vehicle at different toll plaza locations are calculated. The adopted Toll Rates for all categories of vehicles for base year are given tables below.

## Single Journey

**Table 5-3: Car/Jeep/Van Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	30	50	70	80	100	120	140	170	170	150	140	110	90	80	60	50	30	20	10	20
1A	10	0	20	40	60	80	90	110	130	160	180	160	140	110	100	80	60	50	30	20	10	20
2	30	20	0	20	40	50	70	90	110	140	160	180	170	140	120	110	90	70	50	50	40	40
3	50	40	20	0	20	30	50	70	90	120	140	160	170	160	140	130	110	90	70	70	60	60
4	70	60	40	20	0	10	30	50	70	100	120	140	150	180	160	150	130	110	90	90	80	80
4A	80	80	50	30	10	0	10	40	60	80	100	120	140	170	170	160	140	130	110	100	90	100
5	100	90	70	50	30	10	0	20	40	70	90	110	130	150	170	170	160	140	120	110	100	110
6	120	110	90	70	50	40	20	0	20	50	70	90	100	130	150	160	180	160	140	140	130	130
7	140	130	110	90	70	60	40	20	0	30	50	70	80	110	130	140	160	180	160	160	150	150
8	170	160	140	120	100	80	70	50	30	0	20	40	60	80	100	110	130	150	170	170	170	180
9	170	180	160	140	120	100	90	70	50	20	0	20	40	60	80	90	110	130	150	150	160	180
10	150	160	180	160	140	120	110	90	70	40	20	0	20	40	60	70	90	110	130	140	150	160
11	140	140	170	170	150	140	130	100	80	60	40	20	0	30	50	60	80	90	110	120	130	140
12	110	110	140	160	180	170	150	130	110	80	60	40	30	0	20	30	50	60	80	90	100	120
13	90	100	120	140	160	170	170	150	130	100	80	60	50	20	0	10	30	50	70	70	80	100
14	80	80	110	130	150	160	170	160	140	110	90	70	60	30	10	0	20	30	50	60	70	90
15	60	60	90	110	130	140	160	180	160	130	110	90	80	50	30	20	0	10	30	40	50	70
16	50	50	70	90	110	130	140	160	180	150	130	110	90	60	50	30	10	0	20	30	40	50
17	30	30	50	70	90	110	120	140	160	170	150	130	110	80	70	50	30	20	0	10	20	30
18	20	20	50	70	90	100	110	140	160	170	150	140	120	90	70	60	40	30	10	0	10	20
18A	10	10	40	60	80	90	100	130	150	170	160	150	130	100	80	70	50	40	20	10	0	10
19	20	20	40	60	80	100	110	130	150	180	180	160	140	120	100	90	70	50	30	20	10	0

**Table 5-4: Minibus/LCV Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
<b>1</b>	0	10	40	80	110	130	150	190	220	270	280	250	220	180	150	130	100	70	40	30	10	30
<b>1A</b>	10	0	40	70	100	130	150	180	220	260	290	250	230	180	160	140	100	80	50	40	20	30
<b>2</b>	40	40	0	30	60	90	110	140	180	220	260	290	270	220	190	170	140	120	90	70	60	70
<b>3</b>	80	70	30	0	30	50	80	110	150	190	220	250	280	250	230	210	170	150	120	110	90	100
<b>4</b>	110	100	60	30	0	20	40	80	110	160	190	220	250	290	260	240	210	180	150	140	120	140
<b>4A</b>	130	130	90	50	20	0	20	60	90	140	170	200	230	270	280	260	230	210	170	160	150	160
<b>5</b>	150	150	110	80	40	20	0	40	70	110	150	180	200	250	280	280	250	230	200	180	170	180
<b>6</b>	190	180	140	110	80	60	40	0	30	80	110	140	170	210	240	260	290	260	230	220	200	220
<b>7</b>	220	220	180	150	110	90	70	30	0	40	80	110	130	180	210	230	260	280	270	250	240	250
<b>8</b>	270	260	220	190	160	140	110	80	40	0	30	60	90	140	160	180	210	240	270	280	280	300
<b>9</b>	280	290	260	220	190	170	150	110	80	30	0	30	60	100	130	150	180	210	240	250	270	290
<b>10</b>	250	250	290	250	220	200	180	140	110	60	30	0	30	70	100	120	150	170	210	220	230	260
<b>11</b>	220	230	270	280	250	230	200	170	130	90	60	30	0	50	70	90	120	150	180	190	210	230
<b>12</b>	180	180	220	250	290	270	250	210	180	140	100	70	50	0	30	50	80	100	130	150	160	190
<b>13</b>	150	160	190	230	260	280	280	240	210	160	130	100	70	30	0	20	50	80	110	120	140	160
<b>14</b>	130	140	170	210	240	260	280	260	230	180	150	120	90	50	20	0	30	60	90	100	120	140
<b>15</b>	100	100	140	170	210	230	250	290	260	210	180	150	120	80	50	30	0	20	60	70	80	110
<b>16</b>	70	80	120	150	180	210	230	260	280	240	210	170	150	100	80	60	20	0	30	40	60	80
<b>17</b>	40	50	90	120	150	170	200	230	270	270	240	210	180	130	110	90	60	30	0	10	30	50
<b>18</b>	30	40	70	110	140	160	180	220	250	280	250	220	190	150	120	100	70	40	10	0	20	40
<b>18A</b>	10	20	60	90	120	150	170	200	240	280	270	230	210	160	140	120	80	60	30	20	0	20
<b>19</b>	30	30	70	100	140	160	180	220	250	300	290	260	230	190	160	140	110	80	50	40	20	0

**Table 5-5: Bus/2-Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	80	140	190	230	270	340	400	480	500	440	390	310	270	230	170	130	80	50	20	50
1A	10	0	70	130	180	220	260	320	380	460	510	450	410	320	280	240	180	140	90	60	40	60
2	80	70	0	60	110	150	190	260	320	400	450	510	470	390	340	310	250	210	160	130	100	130
3	140	130	60	0	60	100	140	200	260	340	400	450	500	450	400	370	310	270	210	190	160	190
4	190	180	110	60	0	40	80	140	200	280	340	390	440	510	460	420	370	320	270	250	220	240
4A	230	220	150	100	40	0	40	100	160	240	300	350	400	480	500	460	410	360	310	290	260	280
5	270	260	190	140	80	40	0	60	120	200	260	310	360	440	490	500	450	400	350	330	300	320
6	340	320	260	200	140	100	60	0	60	140	200	250	300	380	430	460	510	470	410	390	360	380
7	400	380	320	260	200	160	120	60	0	80	140	190	240	320	370	400	460	500	470	450	420	440
8	480	460	400	340	280	240	200	140	80	0	60	110	160	240	290	320	380	420	480	500	500	520
9	500	510	450	400	340	300	260	200	140	60	0	50	100	180	230	270	320	370	420	440	470	510
10	440	450	510	450	390	350	310	250	190	110	50	0	50	130	180	210	270	310	370	390	420	460
11	390	410	470	500	440	400	360	300	240	160	100	50	0	80	130	170	220	260	320	340	370	410
12	310	320	390	450	510	480	440	380	320	240	180	130	80	0	50	80	140	180	240	260	290	330
13	270	280	340	400	460	500	490	430	370	290	230	180	130	50	0	40	90	130	190	210	240	280
14	230	240	310	370	420	460	500	460	400	320	270	210	170	80	40	0	60	100	150	180	200	250
15	170	180	250	310	370	410	450	510	460	380	320	270	220	140	90	60	0	40	100	120	150	190
16	130	140	210	270	320	360	400	470	500	420	370	310	260	180	130	100	40	0	60	80	110	150
17	80	90	160	210	270	310	350	410	470	480	420	370	320	240	190	150	100	60	0	20	50	90
18	50	60	130	190	250	290	330	390	450	500	440	390	340	260	210	180	120	80	20	0	30	70
18A	20	40	100	160	220	260	300	360	420	500	470	420	370	290	240	200	150	110	50	30	0	40
19	50	60	130	190	240	280	320	380	440	520	510	460	410	330	280	250	190	150	90	70	40	0

**Table 5-6: 3-Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	100	180	250	300	350	430	510	610	640	570	510	400	340	290	220	170	100	70	30	60
1A	10	0	90	160	240	290	340	420	500	600	650	580	520	420	360	310	240	180	110	80	50	80
2	100	90	0	70	150	200	250	330	410	510	580	650	610	510	440	400	330	270	200	170	130	170
3	180	160	70	0	70	130	170	260	330	440	510	580	640	580	520	470	400	350	270	250	210	240
4	250	240	150	70	0	50	100	180	260	360	440	510	570	650	590	540	470	420	350	320	280	310
4A	300	290	200	130	50	0	50	130	210	310	380	450	510	620	640	600	520	470	400	370	330	360
5	350	340	250	170	100	50	0	80	160	260	340	410	470	570	630	650	570	520	450	420	380	410
6	430	420	330	260	180	130	80	0	80	180	250	320	380	490	550	600	660	600	530	500	460	500
7	510	500	410	330	260	210	160	80	0	100	180	250	310	410	470	520	590	650	610	580	540	570
8	610	600	510	440	360	310	260	180	100	0	70	140	200	310	370	420	490	540	620	640	640	670
9	640	650	580	510	440	380	340	250	180	70	0	70	130	240	300	340	420	470	540	570	610	660
10	570	580	650	580	510	450	410	320	250	140	70	0	60	170	230	270	350	400	470	500	540	590
11	510	520	610	640	570	510	470	380	310	200	130	60	0	110	170	210	290	340	410	440	480	530
12	400	420	510	580	650	620	570	490	410	310	240	170	110	0	60	110	180	230	310	330	370	420
13	340	360	440	520	590	640	630	550	470	370	300	230	170	60	0	50	120	170	240	270	310	360
14	290	310	400	470	540	600	650	600	520	420	340	270	210	110	50	0	70	130	200	230	260	320
15	220	240	330	400	470	520	570	660	590	490	420	350	290	180	120	70	0	50	130	150	190	250
16	170	180	270	350	420	470	520	600	650	540	470	400	340	230	170	130	50	0	70	100	140	190
17	100	110	200	270	350	400	450	530	610	620	540	470	410	310	240	200	130	70	0	30	70	120
18	70	80	170	250	320	370	420	500	580	640	570	500	440	330	270	230	150	100	30	0	40	90
18A	30	50	130	210	280	330	380	460	540	640	610	540	480	370	310	260	190	140	70	40	0	50
19	60	80	170	240	310	360	410	500	570	670	660	590	530	420	360	320	250	190	120	90	50	0

**Table 5-7: 4 to 6 Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	20	150	250	360	430	500	620	730	880	920	820	730	580	490	420	320	240	140	100	40	90
1A	20	0	130	230	340	410	480	600	710	860	940	840	750	600	510	440	340	260	160	120	70	110
2	150	130	0	110	210	290	360	470	590	730	840	940	880	730	640	570	470	390	290	250	190	240
3	250	230	110	0	110	180	250	370	480	630	730	830	920	830	750	680	570	500	390	350	300	340
4	360	340	210	110	0	70	150	260	370	520	630	730	810	940	850	780	680	600	500	460	400	450
4A	430	410	290	180	70	0	70	190	300	450	550	650	740	890	930	860	750	680	570	530	480	520
5	500	480	360	250	150	70	0	120	230	380	480	580	670	820	910	930	830	750	640	600	550	590
6	620	600	470	370	260	190	120	0	110	260	360	470	550	700	790	860	940	860	760	720	670	710
7	730	710	590	480	370	300	230	110	0	150	250	360	440	590	680	750	850	930	870	830	780	820
8	880	860	730	630	520	450	380	260	150	0	110	210	290	450	530	600	700	780	880	930	930	970
9	920	940	840	730	630	550	480	360	250	110	0	100	190	340	430	500	600	680	780	820	870	950
10	820	840	940	830	730	650	580	470	360	210	100	0	90	240	330	390	500	570	680	720	770	850
11	730	750	880	920	810	740	670	550	440	290	190	90	0	150	240	310	410	490	590	630	690	760
12	580	600	730	830	940	890	820	700	590	450	340	240	150	0	90	160	260	340	440	480	530	610
13	490	510	640	750	850	930	910	790	680	530	430	330	240	90	0	70	170	250	350	390	450	520
14	420	440	570	680	780	860	930	860	750	600	500	390	310	160	70	0	100	180	280	320	380	450
15	320	340	470	570	680	750	830	940	850	700	600	500	410	260	170	100	0	80	180	220	280	350
16	240	260	390	500	600	680	750	860	930	780	680	570	490	340	250	180	80	0	100	140	200	270
17	140	160	290	390	500	570	640	760	870	880	780	680	590	440	350	280	180	100	0	40	90	170
18	100	120	250	350	460	530	600	720	830	930	820	720	630	480	390	320	220	140	40	0	50	130
18A	40	70	190	300	400	480	550	670	780	930	870	770	690	530	450	380	280	200	90	50	0	80
19	90	110	240	340	450	520	590	710	820	970	950	850	760	610	520	450	350	270	170	130	80	0

**Table 5-8: 7 & above Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	30	180	310	440	530	610	760	890	1070	1120	990	890	710	600	510	390	290	170	120	50	110
1A	30	0	150	280	410	500	590	730	870	1050	1140	1020	920	730	620	540	420	320	200	150	80	140
2	180	150	0	130	260	350	430	580	710	890	1020	1140	1070	880	780	690	570	470	350	300	230	290
3	310	280	130	0	130	220	300	450	580	760	890	1020	1120	1010	910	820	700	600	480	430	360	420
4	440	410	260	130	0	90	180	320	450	630	760	890	990	1140	1040	950	830	730	610	560	490	550
4A	530	500	350	220	90	0	90	230	360	540	670	800	900	1090	1130	1040	920	820	700	650	580	640
5	610	590	430	300	180	90	0	140	280	460	590	710	810	1000	1110	1130	1000	910	780	730	670	720
6	760	730	580	450	320	230	140	0	130	310	440	570	670	860	960	1050	1150	1050	930	880	810	870
7	890	870	710	580	450	360	280	130	0	180	310	430	540	720	830	910	1040	1130	1060	1010	950	1000
8	1070	1050	890	760	630	540	460	310	180	0	130	250	360	540	650	730	860	950	1080	1130	1130	1180
9	1120	1140	1020	890	760	670	590	440	310	130	0	120	230	410	520	600	730	820	950	1000	1060	1160
10	990	1020	1140	1020	890	800	710	570	430	250	120	0	100	290	400	480	600	700	820	870	940	1030
11	890	920	1070	1120	990	900	810	670	540	360	230	100	0	180	290	380	500	600	720	770	840	930
12	710	730	880	1010	1140	1090	1000	860	720	540	410	290	180	0	110	190	310	410	540	580	650	740
13	600	620	780	910	1040	1130	1110	960	830	650	520	400	290	110	0	80	210	300	430	480	540	640
14	510	540	690	820	950	1040	1130	1050	910	730	600	480	380	190	80	0	120	220	340	390	460	550
15	390	420	570	700	830	920	1000	1150	1040	860	730	600	500	310	210	120	0	100	220	270	340	430
16	290	320	470	600	730	820	910	1050	1130	950	820	700	600	410	300	220	100	0	120	170	240	330
17	170	200	350	480	610	700	780	930	1060	1080	950	820	720	540	430	340	220	120	0	50	120	210
18	120	150	300	430	560	650	730	880	1010	1130	1000	870	770	580	480	390	270	170	50	0	70	160
18A	50	80	230	360	490	580	670	810	950	1130	1060	940	840	650	540	460	340	240	120	70	0	90
19	110	140	290	420	550	640	720	870	1000	1180	1160	1030	930	740	640	550	430	330	210	160	90	0

## Return Journey

**Table 5-9: Car/Jeep/Van Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	15	25	35	40	50	60	70	85	85	75	70	55	45	40	30	25	15	10	5	10
1A	5	0	10	20	30	40	45	55	65	80	90	80	70	55	50	40	30	25	15	10	5	10
2	15	10	0	10	20	25	35	45	55	70	80	90	85	70	60	55	45	35	25	25	20	20
3	25	20	10	0	10	15	25	35	45	60	70	80	85	80	70	65	55	45	35	35	30	30
4	35	30	20	10	0	5	15	25	35	50	60	70	75	90	80	75	65	55	45	45	40	40
4A	40	40	25	15	5	0	5	20	30	40	50	60	70	85	85	80	70	65	55	50	45	50
5	50	45	35	25	15	5	0	10	20	35	45	55	65	75	85	85	80	70	60	55	50	55
6	60	55	45	35	25	20	10	0	10	25	35	45	50	65	75	80	90	80	70	70	65	65
7	70	65	55	45	35	30	20	10	0	15	25	35	40	55	65	70	80	90	80	80	75	75
8	85	80	70	60	50	40	35	25	15	0	10	20	30	40	50	55	65	75	85	85	85	90
9	85	90	80	70	60	50	45	35	25	10	0	10	20	30	40	45	55	65	75	75	80	90
10	75	80	90	80	70	60	55	45	35	20	10	0	10	20	30	35	45	55	65	70	75	80
11	70	70	85	85	75	70	65	50	40	30	20	10	0	15	25	30	40	45	55	60	65	70
12	55	55	70	80	90	85	75	65	55	40	30	20	15	0	10	15	25	30	40	45	50	60
13	45	50	60	70	80	85	85	75	65	50	40	30	25	10	0	5	15	25	35	35	40	50
14	40	40	55	65	75	80	85	80	70	55	45	35	30	15	5	0	10	15	25	30	35	45
15	30	30	45	55	65	70	80	90	80	65	55	45	40	25	15	10	0	5	15	20	25	35
16	25	25	35	45	55	65	70	80	90	75	65	55	45	30	25	15	5	0	10	15	20	25
17	15	15	25	35	45	55	60	70	80	85	75	65	55	40	35	25	15	10	0	5	10	15
18	10	10	25	35	45	50	55	70	80	85	75	70	60	45	35	30	20	15	5	0	5	10
18A	5	5	20	30	40	45	50	65	75	85	80	75	65	50	40	35	25	20	10	5	0	5
19	10	10	20	30	40	50	55	65	75	90	90	80	70	60	50	45	35	25	15	10	5	0

**Table 5-10: Minibus/LCV Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	20	40	55	65	75	95	110	135	140	125	110	90	75	65	50	35	20	15	5	15
1A	5	0	20	35	50	65	75	90	110	130	145	125	115	90	80	70	50	40	25	20	10	15
2	20	20	0	15	30	45	55	70	90	110	130	145	135	110	95	85	70	60	45	35	30	35
3	40	35	15	0	15	25	40	55	75	95	110	125	140	125	115	105	85	75	60	55	45	50
4	55	50	30	15	0	10	20	40	55	80	95	110	125	145	130	120	105	90	75	70	60	70
4A	65	65	45	25	10	0	10	30	45	70	85	100	115	135	140	130	115	105	85	80	75	80
5	75	75	55	40	20	10	0	20	35	55	75	90	100	125	140	140	125	115	100	90	85	90
6	95	90	70	55	40	30	20	0	15	40	55	70	85	105	120	130	145	130	115	110	100	110
7	110	110	90	75	55	45	35	15	0	20	40	55	65	90	105	115	130	140	135	125	120	125
8	135	130	110	95	80	70	55	40	20	0	15	30	45	70	80	90	105	120	135	140	140	150
9	140	145	130	110	95	85	75	55	40	15	0	15	30	50	65	75	90	105	120	125	135	145
10	125	125	145	125	110	100	90	70	55	30	15	0	15	35	50	60	75	85	105	110	115	130
11	110	115	135	140	125	115	100	85	65	45	30	15	0	25	35	45	60	75	90	95	105	115
12	90	90	110	125	145	135	125	105	90	70	50	35	25	0	15	25	40	50	65	75	80	95
13	75	80	95	115	130	140	140	120	105	80	65	50	35	15	0	10	25	40	55	60	70	80
14	65	70	85	105	120	130	140	130	115	90	75	60	45	25	10	0	15	30	45	50	60	70
15	50	50	70	85	105	115	125	145	130	105	90	75	60	40	25	15	0	10	30	35	40	55
16	35	40	60	75	90	105	115	130	140	120	105	85	75	50	40	30	10	0	15	20	30	40
17	20	25	45	60	75	85	100	115	135	135	120	105	90	65	55	45	30	15	0	5	15	25
18	15	20	35	55	70	80	90	110	125	140	125	110	95	75	60	50	35	20	5	0	10	20
18A	5	10	30	45	60	75	85	100	120	140	135	115	105	80	70	60	40	30	15	10	0	10
19	15	15	35	50	70	80	90	110	125	150	145	130	115	95	80	70	55	40	25	20	10	0

**Table 5-11: Bus/2-Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	40	70	95	115	135	170	200	240	250	220	195	155	135	115	85	65	40	25	10	25
1A	5	0	35	65	90	110	130	160	190	230	255	225	205	160	140	120	90	70	45	30	20	30
2	40	35	0	30	55	75	95	130	160	200	225	255	235	195	170	155	125	105	80	65	50	65
3	70	65	30	0	30	50	70	100	130	170	200	225	250	225	200	185	155	135	105	95	80	95
4	95	90	55	30	0	20	40	70	100	140	170	195	220	255	230	210	185	160	135	125	110	120
4A	115	110	75	50	20	0	20	50	80	120	150	175	200	240	250	230	205	180	155	145	130	140
5	135	130	95	70	40	20	0	30	60	100	130	155	180	220	245	250	225	200	175	165	150	160
6	170	160	130	100	70	50	30	0	30	70	100	125	150	190	215	230	255	235	205	195	180	190
7	200	190	160	130	100	80	60	30	0	40	70	95	120	160	185	200	230	250	235	225	210	220
8	240	230	200	170	140	120	100	70	40	0	30	55	80	120	145	160	190	210	240	250	250	260
9	250	255	225	200	170	150	130	100	70	30	0	25	50	90	115	135	160	185	210	220	235	255
10	220	225	255	225	195	175	155	125	95	55	25	0	25	65	90	105	135	155	185	195	210	230
11	195	205	235	250	220	200	180	150	120	80	50	25	0	40	65	85	110	130	160	170	185	205
12	155	160	195	225	255	240	220	190	160	120	90	65	40	0	25	40	70	90	120	130	145	165
13	135	140	170	200	230	250	245	215	185	145	115	90	65	25	0	20	45	65	95	105	120	140
14	115	120	155	185	210	230	250	230	200	160	135	105	85	40	20	0	30	50	75	90	100	125
15	85	90	125	155	185	205	225	255	230	190	160	135	110	70	45	30	0	20	50	60	75	95
16	65	70	105	135	160	180	200	235	250	210	185	155	130	90	65	50	20	0	30	40	55	75
17	40	45	80	105	135	155	175	205	235	240	210	185	160	120	95	75	50	30	0	10	25	45
18	25	30	65	95	125	145	165	195	225	250	220	195	170	130	105	90	60	40	10	0	15	35
18A	10	20	50	80	110	130	150	180	210	250	235	210	185	145	120	100	75	55	25	15	0	20
19	25	30	65	95	120	140	160	190	220	260	255	230	205	165	140	125	95	75	45	35	20	0

**Table 5-12: 3-Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	50	90	125	150	175	215	255	305	320	285	255	200	170	145	110	85	50	35	15	30
1A	5	0	45	80	120	145	170	210	250	300	325	290	260	210	180	155	120	90	55	40	25	40
2	50	45	0	35	75	100	125	165	205	255	290	325	305	255	220	200	165	135	100	85	65	85
3	90	80	35	0	35	65	85	130	165	220	255	290	320	290	260	235	200	175	135	125	105	120
4	125	120	75	35	0	25	50	90	130	180	220	255	285	325	295	270	235	210	175	160	140	155
4A	150	145	100	65	25	0	25	65	105	155	190	225	255	310	320	300	260	235	200	185	165	180
5	175	170	125	85	50	25	0	40	80	130	170	205	235	285	315	325	285	260	225	210	190	205
6	215	210	165	130	90	65	40	0	40	90	125	160	190	245	275	300	330	300	265	250	230	250
7	255	250	205	165	130	105	80	40	0	50	90	125	155	205	235	260	295	325	305	290	270	285
8	305	300	255	220	180	155	130	90	50	0	35	70	100	155	185	210	245	270	310	320	320	335
9	320	325	290	255	220	190	170	125	90	35	0	35	65	120	150	170	210	235	270	285	305	330
10	285	290	325	290	255	225	205	160	125	70	35	0	30	85	115	135	175	200	235	250	270	295
11	255	260	305	320	285	255	235	190	155	100	65	30	0	55	85	105	145	170	205	220	240	265
12	200	210	255	290	325	310	285	245	205	155	120	85	55	0	30	55	90	115	155	165	185	210
13	170	180	220	260	295	320	315	275	235	185	150	115	85	30	0	25	60	85	120	135	155	180
14	145	155	200	235	270	300	325	300	260	210	170	135	105	55	25	0	35	65	100	115	130	160
15	110	120	165	200	235	260	285	330	295	245	210	175	145	90	60	35	0	25	65	75	95	125
16	85	90	135	175	210	235	260	300	325	270	235	200	170	115	85	65	25	0	35	50	70	95
17	50	55	100	135	175	200	225	265	305	310	270	235	205	155	120	100	65	35	0	15	35	60
18	35	40	85	125	160	185	210	250	290	320	285	250	220	165	135	115	75	50	15	0	20	45
18A	15	25	65	105	140	165	190	230	270	320	305	270	240	185	155	130	95	70	35	20	0	25
19	30	40	85	120	155	180	205	250	285	335	330	295	265	210	180	160	125	95	60	45	25	0

**Table 5-13: 4 to 6 Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	75	125	180	215	250	310	365	440	460	410	365	290	245	210	160	120	70	50	20	45
1A	10	0	65	115	170	205	240	300	355	430	470	420	375	300	255	220	170	130	80	60	35	55
2	75	65	0	55	105	145	180	235	295	365	420	470	440	365	320	285	235	195	145	125	95	120
3	125	115	55	0	55	90	125	185	240	315	365	415	460	415	375	340	285	250	195	175	150	170
4	180	170	105	55	0	35	75	130	185	260	315	365	405	470	425	390	340	300	250	230	200	225
4A	215	205	145	90	35	0	35	95	150	225	275	325	370	445	465	430	375	340	285	265	240	260
5	250	240	180	125	75	35	0	60	115	190	240	290	335	410	455	465	415	375	320	300	275	295
6	310	300	235	185	130	95	60	0	55	130	180	235	275	350	395	430	470	430	380	360	335	355
7	365	355	295	240	185	150	115	55	0	75	125	180	220	295	340	375	425	465	435	415	390	410
8	440	430	365	315	260	225	190	130	75	0	55	105	145	225	265	300	350	390	440	465	465	485
9	460	470	420	365	315	275	240	180	125	55	0	50	95	170	215	250	300	340	390	410	435	475
10	410	420	470	415	365	325	290	235	180	105	50	0	45	120	165	195	250	285	340	360	385	425
11	365	375	440	460	405	370	335	275	220	145	95	45	0	75	120	155	205	245	295	315	345	380
12	290	300	365	415	470	445	410	350	295	225	170	120	75	0	45	80	130	170	220	240	265	305
13	245	255	320	375	425	465	455	395	340	265	215	165	120	45	0	35	85	125	175	195	225	260
14	210	220	285	340	390	430	465	430	375	300	250	195	155	80	35	0	50	90	140	160	190	225
15	160	170	235	285	340	375	415	470	425	350	300	250	205	130	85	50	0	40	90	110	140	175
16	120	130	195	250	300	340	375	430	465	390	340	285	245	170	125	90	40	0	50	70	100	135
17	70	80	145	195	250	285	320	380	435	440	390	340	295	220	175	140	90	50	0	20	45	85
18	50	60	125	175	230	265	300	360	415	465	410	360	315	240	195	160	110	70	20	0	25	65
18A	20	35	95	150	200	240	275	335	390	465	435	385	345	265	225	190	140	100	45	25	0	40
19	45	55	120	170	225	260	295	355	410	485	475	425	380	305	260	225	175	135	85	65	40	0

**Table 5-14: 7 & above Axle Toll Rates for Year 2024-2025 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	15	90	155	220	265	305	380	445	535	560	495	445	355	300	255	195	145	85	60	25	55
1A	15	0	75	140	205	250	295	365	435	525	570	510	460	365	310	270	210	160	100	75	40	70
2	90	75	0	65	130	175	215	290	355	445	510	570	535	440	390	345	285	235	175	150	115	145
3	155	140	65	0	65	110	150	225	290	380	445	510	560	505	455	410	350	300	240	215	180	210
4	220	205	130	65	0	45	90	160	225	315	380	445	495	570	520	475	415	365	305	280	245	275
4A	265	250	175	110	45	0	45	115	180	270	335	400	450	545	565	520	460	410	350	325	290	320
5	305	295	215	150	90	45	0	70	140	230	295	355	405	500	555	565	500	455	390	365	335	360
6	380	365	290	225	160	115	70	0	65	155	220	285	335	430	480	525	575	525	465	440	405	435
7	445	435	355	290	225	180	140	65	0	90	155	215	270	360	415	455	520	565	530	505	475	500
8	535	525	445	380	315	270	230	155	90	0	65	125	180	270	325	365	430	475	540	565	565	590
9	560	570	510	445	380	335	295	220	155	65	0	60	115	205	260	300	365	410	475	500	530	580
10	495	510	570	510	445	400	355	285	215	125	60	0	50	145	200	240	300	350	410	435	470	515
11	445	460	535	560	495	450	405	335	270	180	115	50	0	90	145	190	250	300	360	385	420	465
12	355	365	440	505	570	545	500	430	360	270	205	145	90	0	55	95	155	205	270	290	325	370
13	300	310	390	455	520	565	555	480	415	325	260	200	145	55	0	40	105	150	215	240	270	320
14	255	270	345	410	475	520	565	525	455	365	300	240	190	95	40	0	60	110	170	195	230	275
15	195	210	285	350	415	460	500	575	520	430	365	300	250	155	105	60	0	50	110	135	170	215
16	145	160	235	300	365	410	455	525	565	475	410	350	300	205	150	110	50	0	60	85	120	165
17	85	100	175	240	305	350	390	465	530	540	475	410	360	270	215	170	110	60	0	25	60	105
18	60	75	150	215	280	325	365	440	505	565	500	435	385	290	240	195	135	85	25	0	35	80
18A	25	40	115	180	245	290	335	405	475	565	530	470	420	325	270	230	170	120	60	35	0	45
19	55	70	145	210	275	320	360	435	500	590	580	515	465	370	320	275	215	165	105	80	45	0

## Single Journey

**Table 5-15: Car/Jeep/Van Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	30	50	70	90	100	120	150	180	180	160	150	120	100	80	60	50	30	20	10	20
1A	10	0	30	50	70	80	100	120	140	170	190	170	150	120	100	90	70	50	30	20	10	20
2	30	30	0	20	40	60	70	90	120	150	170	190	180	150	130	110	90	80	60	50	40	50
3	50	50	20	0	20	40	50	70	100	130	150	170	180	170	150	140	110	100	80	70	60	70
4	70	70	40	20	0	10	30	50	70	100	130	150	160	190	170	160	140	120	100	90	80	90
4A	90	80	60	40	10	0	10	40	60	90	110	130	150	180	180	170	150	140	110	110	100	100
5	100	100	70	50	30	10	0	20	50	80	100	120	130	160	180	190	160	150	130	120	110	120
6	120	120	90	70	50	40	20	0	20	50	70	90	110	140	160	170	190	170	150	140	130	140
7	150	140	120	100	70	60	50	20	0	30	50	70	90	120	140	150	170	190	170	170	160	160
8	180	170	150	130	100	90	80	50	30	0	20	40	60	90	110	120	140	160	180	180	180	190
9	180	190	170	150	130	110	100	70	50	20	0	20	40	70	90	100	120	140	160	160	170	190
10	160	170	190	170	150	130	120	90	70	40	20	0	20	50	70	80	100	110	140	140	150	170
11	150	150	180	180	160	150	130	110	90	60	40	20	0	30	50	60	80	100	120	130	140	150
12	120	120	150	170	190	180	160	140	120	90	70	50	30	0	20	30	50	70	90	100	110	120
13	100	100	130	150	170	180	180	160	140	110	90	70	50	20	0	10	30	50	70	80	90	100
14	80	90	110	140	160	170	190	170	150	120	100	80	60	30	10	0	20	40	60	60	80	90
15	60	70	90	110	140	150	160	190	170	140	120	100	80	50	30	20	0	20	40	40	60	70
16	50	50	80	100	120	140	150	170	190	160	140	110	100	70	50	40	20	0	20	30	40	50
17	30	30	60	80	100	110	130	150	170	180	160	140	120	90	70	60	40	20	0	10	20	30
18	20	20	50	70	90	110	120	140	170	180	160	140	130	100	80	60	40	30	10	0	10	30
18A	10	10	40	60	80	100	110	130	160	180	170	150	140	110	90	80	60	40	20	10	0	20
19	20	20	50	70	90	100	120	140	160	190	190	170	150	120	100	90	70	50	30	30	20	0

**Table 5-16: Minibus/LCV Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
<b>1</b>	0	10	50	80	120	140	160	200	240	280	300	260	240	190	160	140	100	80	50	30	10	30
<b>1A</b>	10	0	40	80	110	130	160	190	230	280	300	270	240	190	170	140	110	80	50	40	20	40
<b>2</b>	50	40	0	30	70	90	120	150	190	240	270	300	280	230	210	180	150	130	90	80	60	80
<b>3</b>	80	80	30	0	30	60	80	120	150	200	240	270	300	270	240	220	190	160	130	110	100	110
<b>4</b>	120	110	70	30	0	20	50	80	120	170	200	240	260	300	270	250	220	190	160	150	130	150
<b>4A</b>	140	130	90	60	20	0	20	60	100	140	180	210	240	290	300	280	240	220	190	170	150	170
<b>5</b>	160	160	120	80	50	20	0	40	70	120	160	190	220	260	290	300	270	240	210	190	180	190
<b>6</b>	200	190	150	120	80	60	40	0	40	80	120	150	180	230	260	280	300	280	250	230	220	230
<b>7</b>	240	230	190	150	120	100	70	40	0	50	80	110	140	190	220	240	270	300	280	270	250	270
<b>8</b>	280	280	240	200	170	140	120	80	50	0	30	70	90	140	170	190	230	250	290	300	300	310
<b>9</b>	300	300	270	240	200	180	160	120	80	30	0	30	60	110	140	160	190	220	250	260	280	310
<b>10</b>	260	270	300	270	240	210	190	150	110	70	30	0	30	80	110	130	160	190	220	230	250	270
<b>11</b>	240	240	280	300	260	240	220	180	140	90	60	30	0	50	80	100	130	160	190	200	220	250
<b>12</b>	190	190	230	270	300	290	260	230	190	140	110	80	50	0	30	50	80	110	140	160	170	200
<b>13</b>	160	170	210	240	270	300	290	260	220	170	140	110	80	30	0	20	60	80	110	130	140	170
<b>14</b>	140	140	180	220	250	280	300	280	240	190	160	130	100	50	20	0	30	60	90	100	120	150
<b>15</b>	100	110	150	190	220	240	270	300	270	230	190	160	130	80	60	30	0	30	60	70	90	110
<b>16</b>	80	80	130	160	190	220	240	280	300	250	220	190	160	110	80	60	30	0	30	50	60	90
<b>17</b>	50	50	90	130	160	190	210	250	280	290	250	220	190	140	110	90	60	30	0	10	30	60
<b>18</b>	30	40	80	110	150	170	190	230	270	300	260	230	200	160	130	100	70	50	10	0	20	40
<b>18A</b>	10	20	60	100	130	150	180	220	250	300	280	250	220	170	140	120	90	60	30	20	0	20
<b>19</b>	30	40	80	110	150	170	190	230	270	310	310	270	250	200	170	150	110	90	60	40	20	0

**Table 5-17: Bus/2-Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	80	150	210	250	290	360	420	500	530	470	420	330	280	240	180	140	80	60	30	50
1A	10	0	70	130	190	240	280	340	410	490	540	480	430	340	290	250	200	150	90	70	40	60
2	80	70	0	60	120	160	200	270	330	420	480	540	500	420	370	330	270	220	160	140	110	140
3	150	130	60	0	60	100	140	210	270	360	420	480	530	480	430	390	330	280	230	200	170	200
4	210	190	120	60	0	40	80	150	210	300	360	420	470	540	490	450	390	340	290	260	230	260
4A	250	240	160	100	40	0	40	110	170	260	320	370	420	510	530	490	430	390	330	300	270	300
5	290	280	200	140	80	40	0	70	130	220	280	330	380	470	520	530	470	430	370	350	310	340
6	360	340	270	210	150	110	70	0	60	150	210	270	320	400	450	490	540	490	440	410	380	410
7	420	410	330	270	210	170	130	60	0	80	150	200	250	340	390	430	490	530	500	480	450	470
8	500	490	420	360	300	260	220	150	80	0	60	120	170	250	310	340	400	450	510	530	530	560
9	530	540	480	420	360	320	280	210	150	60	0	60	110	190	240	280	340	390	450	470	500	540
10	470	480	540	480	420	370	330	270	200	120	60	0	50	140	190	230	280	330	390	410	440	490
11	420	430	500	530	470	420	380	320	250	170	110	50	0	90	140	180	230	280	340	360	390	440
12	330	340	420	480	540	510	470	400	340	250	190	140	90	0	50	90	150	190	250	280	310	350
13	280	290	370	430	490	530	520	450	390	310	240	190	140	50	0	40	100	140	200	220	260	300
14	240	250	330	390	450	490	530	490	430	340	280	230	180	90	40	0	60	100	160	190	220	260
15	180	200	270	330	390	430	470	540	490	400	340	280	230	150	100	60	0	50	100	130	160	200
16	140	150	220	280	340	390	430	490	530	450	390	330	280	190	140	100	50	0	60	80	110	160
17	80	90	160	230	290	330	370	440	500	510	450	390	340	250	200	160	100	60	0	20	50	100
18	60	70	140	200	260	300	350	410	480	530	470	410	360	280	220	190	130	80	20	0	30	70
18A	30	40	110	170	230	270	310	380	450	530	500	440	390	310	260	220	160	110	50	30	0	40
19	50	60	140	200	260	300	340	410	470	560	540	490	440	350	300	260	200	160	100	70	40	0

**Table 5-18: 3-Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	20	110	190	270	320	370	460	540	650	680	600	540	430	360	310	240	180	100	70	30	70
1A	20	0	90	170	250	300	360	440	520	630	690	620	550	440	380	330	250	190	120	90	50	80
2	110	90	0	80	160	210	260	350	430	540	620	690	650	540	470	420	350	290	210	180	140	180
3	190	170	80	0	80	130	180	270	350	460	540	610	680	610	550	500	420	370	290	260	220	250
4	270	250	160	80	0	50	110	190	280	380	460	540	600	690	630	580	500	440	370	340	300	330
4A	320	300	210	130	50	0	50	140	220	330	410	480	550	660	680	630	560	500	420	390	350	390
5	370	360	260	180	110	50	0	90	170	280	360	430	490	610	670	680	610	550	480	440	410	440
6	460	440	350	270	190	140	90	0	80	190	270	340	410	520	580	630	700	640	560	530	490	530
7	540	520	430	350	280	220	170	80	0	110	190	260	330	440	500	550	630	690	640	610	570	610
8	650	630	540	460	380	330	280	190	110	0	80	150	220	330	390	440	520	580	650	680	680	720
9	680	690	620	540	460	410	360	270	190	80	0	70	140	250	320	370	440	500	570	600	640	700
10	600	620	690	610	540	480	430	340	260	150	70	0	60	180	240	290	370	420	500	530	570	630
11	540	550	650	680	600	550	490	410	330	220	140	60	0	110	180	230	300	360	440	470	510	560
12	430	440	540	610	690	660	610	520	440	330	250	180	110	0	60	120	190	250	320	350	390	450
13	360	380	470	550	630	680	670	580	500	390	320	240	180	60	0	50	130	180	260	290	330	390
14	310	330	420	500	580	630	680	630	550	440	370	290	230	120	50	0	80	130	210	240	280	340
15	240	250	350	420	500	560	610	700	630	520	440	370	300	190	130	80	0	60	130	160	200	260
16	180	190	290	370	440	500	550	640	690	580	500	420	360	250	180	130	60	0	80	110	150	200
17	100	120	210	290	370	420	480	560	640	650	570	500	440	320	260	210	130	80	0	30	70	130
18	70	90	180	260	340	390	440	530	610	680	600	530	470	350	290	240	160	110	30	0	40	100
18A	30	50	140	220	300	350	410	490	570	680	640	570	510	390	330	280	200	150	70	40	0	60
19	70	80	180	250	330	390	440	530	610	720	700	630	560	450	390	340	260	200	130	100	60	0

**Table 5-19: 4 to 6 Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	20	160	270	380	460	530	660	780	930	970	870	780	610	520	450	340	260	150	100	50	100
1A	20	0	130	250	360	440	510	640	750	910	1000	890	800	640	540	470	360	280	170	130	70	120
2	160	130	0	110	220	300	380	500	620	780	890	1000	930	770	680	600	500	410	300	260	200	250
3	270	250	110	0	110	190	270	390	510	660	780	880	970	880	790	720	610	530	420	370	320	360
4	380	360	220	110	0	80	150	280	400	550	660	770	860	1000	900	830	720	640	530	490	430	480
4A	460	440	300	190	80	0	70	200	320	470	590	690	780	950	980	910	800	720	610	560	510	560
5	530	510	380	270	150	70	0	120	240	400	510	620	710	870	960	980	870	790	680	640	580	630
6	660	640	500	390	280	200	120	0	120	270	390	490	580	750	840	910	1000	920	810	760	710	760
7	780	750	620	510	400	320	240	120	0	160	270	380	470	630	720	790	900	990	920	880	820	870
8	930	910	780	660	550	470	400	270	160	0	110	220	310	470	570	640	750	830	940	980	980	1030
9	970	1000	890	780	660	590	510	390	270	110	0	110	200	360	450	530	630	720	830	870	930	1010
10	870	890	1000	880	770	690	620	490	380	220	110	0	90	250	350	420	530	610	720	760	820	900
11	780	800	930	970	860	780	710	580	470	310	200	90	0	160	250	330	440	520	630	670	730	810
12	610	640	770	880	1000	950	870	750	630	470	360	250	160	0	90	170	270	360	470	510	570	650
13	520	540	680	790	900	980	960	840	720	570	450	350	250	90	0	70	180	260	370	420	470	550
14	450	470	600	720	830	910	980	910	790	640	530	420	330	170	70	0	110	190	300	340	400	480
15	340	360	500	610	720	800	870	1000	900	750	630	530	440	270	180	110	0	80	190	240	290	370
16	260	280	410	530	640	720	790	920	990	830	720	610	520	360	260	190	80	0	110	150	210	290
17	150	170	300	420	530	610	680	810	920	940	830	720	630	470	370	300	190	110	0	40	100	180
18	100	130	260	370	490	560	640	760	880	980	870	760	670	510	420	340	240	150	40	0	60	140
18A	50	70	200	320	430	510	580	710	820	980	930	820	730	570	470	400	290	210	100	60	0	80
19	100	120	250	360	480	560	630	760	870	1030	1010	900	810	650	550	480	370	290	180	140	80	0

**Table 5-20: 7 & above Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	30	190	330	460	560	650	800	950	1140	1190	1050	940	750	630	550	410	310	180	130	60	120
1A	30	0	160	300	440	530	620	780	920	1110	1210	1080	970	770	660	570	440	340	210	150	90	140
2	190	160	0	140	270	370	460	610	760	950	1080	1210	1130	940	820	740	600	500	370	320	250	310
3	330	300	140	0	140	230	320	480	620	810	940	1080	1190	1080	960	870	740	640	510	460	390	440
4	460	440	270	140	0	100	190	340	480	670	810	940	1050	1210	1100	1010	880	780	640	590	520	580
4A	560	530	370	230	100	0	90	240	390	580	710	840	950	1150	1190	1110	970	870	740	690	620	680
5	650	620	460	320	190	90	0	150	290	480	620	750	860	1060	1170	1200	1070	960	830	780	710	770
6	800	780	610	480	340	240	150	0	140	330	470	600	710	910	1020	1110	1220	1120	980	930	860	920
7	950	920	760	620	480	390	290	140	0	190	330	460	570	760	880	970	1100	1200	1130	1070	1000	1060
8	1140	1110	950	810	670	580	480	330	190	0	140	270	380	570	690	780	910	1010	1140	1190	1190	1250
9	1190	1210	1080	940	810	710	620	470	330	140	0	130	240	440	550	640	770	870	1000	1060	1130	1230
10	1050	1080	1210	1080	940	840	750	600	460	270	130	0	110	310	420	510	640	740	870	930	1000	1090
11	940	970	1130	1190	1050	950	860	710	570	380	240	110	0	200	310	400	530	630	760	820	890	980
12	750	770	940	1080	1210	1150	1060	910	760	570	440	310	200	0	110	200	330	440	570	620	690	790
13	630	660	820	960	1100	1190	1170	1020	880	690	550	420	310	110	0	90	220	320	450	510	580	670
14	550	570	740	870	1010	1110	1200	1110	970	780	640	510	400	200	90	0	130	230	370	420	490	590
15	410	440	600	740	880	970	1070	1220	1100	910	770	640	530	330	220	130	0	100	230	290	360	450
16	310	340	500	640	780	870	960	1120	1200	1010	870	740	630	440	320	230	100	0	130	180	250	350
17	180	210	370	510	640	740	830	980	1130	1140	1000	870	760	570	450	370	230	130	0	50	120	220
18	130	150	320	460	590	690	780	930	1070	1190	1060	930	820	620	510	420	290	180	50	0	70	170
18A	60	90	250	390	520	620	710	860	1000	1190	1130	1000	890	690	580	490	360	250	120	70	0	100
19	120	140	310	440	580	680	770	920	1060	1250	1230	1090	980	790	670	590	450	350	220	170	100	0

# Return Journey

**Table 5-21: Car/Jeep/Van Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	15	25	35	45	50	60	75	90	90	80	75	60	50	40	30	25	15	10	5	10
1A	5	0	15	25	35	40	50	60	70	85	95	85	75	60	50	45	35	25	15	10	5	10
2	15	15	0	10	20	30	35	45	60	75	85	95	90	75	65	55	45	40	30	25	20	25
3	25	25	10	0	10	20	25	35	50	65	75	85	90	85	75	70	55	50	40	35	30	35
4	35	35	20	10	0	5	15	25	35	50	65	75	80	95	85	80	70	60	50	45	40	45
4A	45	40	30	20	5	0	5	20	30	45	55	65	75	90	90	85	75	70	55	55	50	50
5	50	50	35	25	15	5	0	10	25	40	50	60	65	80	90	95	80	75	65	60	55	60
6	60	60	45	35	25	20	10	0	10	25	35	45	55	70	80	85	95	85	75	70	65	70
7	75	70	60	50	35	30	25	10	0	15	25	35	45	60	70	75	85	95	85	85	80	80
8	90	85	75	65	50	45	40	25	15	0	10	20	30	45	55	60	70	80	90	90	90	95
9	90	95	85	75	65	55	50	35	25	10	0	10	20	35	45	50	60	70	80	80	85	95
10	80	85	95	85	75	65	60	45	35	20	10	0	10	25	35	40	50	55	70	70	75	85
11	75	75	90	90	80	75	65	55	45	30	20	10	0	15	25	30	40	50	60	65	70	75
12	60	60	75	85	95	90	80	70	60	45	35	25	15	0	10	15	25	35	45	50	55	60
13	50	50	65	75	85	90	90	80	70	55	45	35	25	10	0	5	15	25	35	40	45	50
14	40	45	55	70	80	85	95	85	75	60	50	40	30	15	5	0	10	20	30	30	40	45
15	30	35	45	55	70	75	80	95	85	70	60	50	40	25	15	10	0	10	20	20	30	35
16	25	25	40	50	60	70	75	85	95	80	70	55	50	35	25	20	10	0	10	15	20	25
17	15	15	30	40	50	55	65	75	85	90	80	70	60	45	35	30	20	10	0	5	10	15
18	10	10	25	35	45	55	60	70	85	90	80	70	65	50	40	30	20	15	5	0	5	15
18A	5	5	20	30	40	50	55	65	80	90	85	75	70	55	45	40	30	20	10	5	0	10
19	10	10	25	35	45	50	60	70	80	95	95	85	75	60	50	45	35	25	15	15	10	0

**Table 5-22: Minibus/LCV Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	25	40	60	70	80	100	120	140	150	130	120	95	80	70	50	40	25	15	5	15
1A	5	0	20	40	55	65	80	95	115	140	150	135	120	95	85	70	55	40	25	20	10	20
2	25	20	0	15	35	45	60	75	95	120	135	150	140	115	105	90	75	65	45	40	30	40
3	40	40	15	0	15	30	40	60	75	100	120	135	150	135	120	110	95	80	65	55	50	55
4	60	55	35	15	0	10	25	40	60	85	100	120	130	150	135	125	110	95	80	75	65	75
4A	70	65	45	30	10	0	10	30	50	70	90	105	120	145	150	140	120	110	95	85	75	85
5	80	80	60	40	25	10	0	20	35	60	80	95	110	130	145	150	135	120	105	95	90	95
6	100	95	75	60	40	30	20	0	20	40	60	75	90	115	130	140	150	140	125	115	110	115
7	120	115	95	75	60	50	35	20	0	25	40	55	70	95	110	120	135	150	140	135	125	135
8	140	140	120	100	85	70	60	40	25	0	15	35	45	70	85	95	115	125	145	150	150	155
9	150	150	135	120	100	90	80	60	40	15	0	15	30	55	70	80	95	110	125	130	140	155
10	130	135	150	135	120	105	95	75	55	35	15	0	15	40	55	65	80	95	110	115	125	135
11	120	120	140	150	130	120	110	90	70	45	30	15	0	25	40	50	65	80	95	100	110	125
12	95	95	115	135	150	145	130	115	95	70	55	40	25	0	15	25	40	55	70	80	85	100
13	80	85	105	120	135	150	145	130	110	85	70	55	40	15	0	10	30	40	55	65	70	85
14	70	70	90	110	125	140	150	140	120	95	80	65	50	25	10	0	15	30	45	50	60	75
15	50	55	75	95	110	120	135	150	135	115	95	80	65	40	30	15	0	15	30	35	45	55
16	40	40	65	80	95	110	120	140	150	125	110	95	80	55	40	30	15	0	15	25	30	45
17	25	25	45	65	80	95	105	125	140	145	125	110	95	70	55	45	30	15	0	5	15	30
18	15	20	40	55	75	85	95	115	135	150	130	115	100	80	65	50	35	25	5	0	10	20
18A	5	10	30	50	65	75	90	110	125	150	140	125	110	85	70	60	45	30	15	10	0	10
19	15	20	40	55	75	85	95	115	135	155	155	135	125	100	85	75	55	45	30	20	10	0

**Table 5-23: Bus/2-Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	5	40	75	105	125	145	180	210	250	265	235	210	165	140	120	90	70	40	30	15	25
1A	5	0	35	65	95	120	140	170	205	245	270	240	215	170	145	125	100	75	45	35	20	30
2	40	35	0	30	60	80	100	135	165	210	240	270	250	210	185	165	135	110	80	70	55	70
3	75	65	30	0	30	50	70	105	135	180	210	240	265	240	215	195	165	140	115	100	85	100
4	105	95	60	30	0	20	40	75	105	150	180	210	235	270	245	225	195	170	145	130	115	130
4A	125	120	80	50	20	0	20	55	85	130	160	185	210	255	265	245	215	195	165	150	135	150
5	145	140	100	70	40	20	0	35	65	110	140	165	190	235	260	265	235	215	185	175	155	170
6	180	170	135	105	75	55	35	0	30	75	105	135	160	200	225	245	270	245	220	205	190	205
7	210	205	165	135	105	85	65	30	0	40	75	100	125	170	195	215	245	265	250	240	225	235
8	250	245	210	180	150	130	110	75	40	0	30	60	85	125	155	170	200	225	255	265	265	280
9	265	270	240	210	180	160	140	105	75	30	0	30	55	95	120	140	170	195	225	235	250	270
10	235	240	270	240	210	185	165	135	100	60	30	0	25	70	95	115	140	165	195	205	220	245
11	210	215	250	265	235	210	190	160	125	85	55	25	0	45	70	90	115	140	170	180	195	220
12	165	170	210	240	270	255	235	200	170	125	95	70	45	0	25	45	75	95	125	140	155	175
13	140	145	185	215	245	265	260	225	195	155	120	95	70	25	0	20	50	70	100	110	130	150
14	120	125	165	195	225	245	265	245	215	170	140	115	90	45	20	0	30	50	80	95	110	130
15	90	100	135	165	195	215	235	270	245	200	170	140	115	75	50	30	0	25	50	65	80	100
16	70	75	110	140	170	195	215	245	265	225	195	165	140	95	70	50	25	0	30	40	55	80
17	40	45	80	115	145	165	185	220	250	255	225	195	170	125	100	80	50	30	0	10	25	50
18	30	35	70	100	130	150	175	205	240	265	235	205	180	140	110	95	65	40	10	0	15	35
18A	15	20	55	85	115	135	155	190	225	265	250	220	195	155	130	110	80	55	25	15	0	20
19	25	30	70	100	130	150	170	205	235	280	270	245	220	175	150	130	100	80	50	35	20	0

**Table 5-24: 3-Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
<b>1</b>	0	10	55	95	135	160	185	230	270	325	340	300	270	215	180	155	120	90	50	35	15	35
<b>1A</b>	10	0	45	85	125	150	180	220	260	315	345	310	275	220	190	165	125	95	60	45	25	40
<b>2</b>	55	45	0	40	80	105	130	175	215	270	310	345	325	270	235	210	175	145	105	90	70	90
<b>3</b>	95	85	40	0	40	65	90	135	175	230	270	305	340	305	275	250	210	185	145	130	110	125
<b>4</b>	135	125	80	40	0	25	55	95	140	190	230	270	300	345	315	290	250	220	185	170	150	165
<b>4A</b>	160	150	105	65	25	0	25	70	110	165	205	240	275	330	340	315	280	250	210	195	175	195
<b>5</b>	185	180	130	90	55	25	0	45	85	140	180	215	245	305	335	340	305	275	240	220	205	220
<b>6</b>	230	220	175	135	95	70	45	0	40	95	135	170	205	260	290	315	350	320	280	265	245	265
<b>7</b>	270	260	215	175	140	110	85	40	0	55	95	130	165	220	250	275	315	345	320	305	285	305
<b>8</b>	325	315	270	230	190	165	140	95	55	0	40	75	110	165	195	220	260	290	325	340	340	360
<b>9</b>	340	345	310	270	230	205	180	135	95	40	0	35	70	125	160	185	220	250	285	300	320	350
<b>10</b>	300	310	345	305	270	240	215	170	130	75	35	0	30	90	120	145	185	210	250	265	285	315
<b>11</b>	270	275	325	340	300	275	245	205	165	110	70	30	0	55	90	115	150	180	220	235	255	280
<b>12</b>	215	220	270	305	345	330	305	260	220	165	125	90	55	0	30	60	95	125	160	175	195	225
<b>13</b>	180	190	235	275	315	340	335	290	250	195	160	120	90	30	0	25	65	90	130	145	165	195
<b>14</b>	155	165	210	250	290	315	340	315	275	220	185	145	115	60	25	0	40	65	105	120	140	170
<b>15</b>	120	125	175	210	250	280	305	350	315	260	220	185	150	95	65	40	0	30	65	80	100	130
<b>16</b>	90	95	145	185	220	250	275	320	345	290	250	210	180	125	90	65	30	0	40	55	75	100
<b>17</b>	50	60	105	145	185	210	240	280	320	325	285	250	220	160	130	105	65	40	0	15	35	65
<b>18</b>	35	45	90	130	170	195	220	265	305	340	300	265	235	175	145	120	80	55	15	0	20	50
<b>18A</b>	15	25	70	110	150	175	205	245	285	340	320	285	255	195	165	140	100	75	35	20	0	30
<b>19</b>	35	40	90	125	165	195	220	265	305	360	350	315	280	225	195	170	130	100	65	50	30	0

**Table 5-25: 4 to 6 Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	10	80	135	190	230	265	330	390	465	485	435	390	305	260	225	170	130	75	50	25	50
1A	10	0	65	125	180	220	255	320	375	455	500	445	400	320	270	235	180	140	85	65	35	60
2	80	65	0	55	110	150	190	250	310	390	445	500	465	385	340	300	250	205	150	130	100	125
3	135	125	55	0	55	95	135	195	255	330	390	440	485	440	395	360	305	265	210	185	160	180
4	190	180	110	55	0	40	75	140	200	275	330	385	430	500	450	415	360	320	265	245	215	240
4A	230	220	150	95	40	0	35	100	160	235	295	345	390	475	490	455	400	360	305	280	255	280
5	265	255	190	135	75	35	0	60	120	200	255	310	355	435	480	490	435	395	340	320	290	315
6	330	320	250	195	140	100	60	0	60	135	195	245	290	375	420	455	500	460	405	380	355	380
7	390	375	310	255	200	160	120	60	0	80	135	190	235	315	360	395	450	495	460	440	410	435
8	465	455	390	330	275	235	200	135	80	0	55	110	155	235	285	320	375	415	470	490	490	515
9	485	500	445	390	330	295	255	195	135	55	0	55	100	180	225	265	315	360	415	435	465	505
10	435	445	500	440	385	345	310	245	190	110	55	0	45	125	175	210	265	305	360	380	410	450
11	390	400	465	485	430	390	355	290	235	155	100	45	0	80	125	165	220	260	315	335	365	405
12	305	320	385	440	500	475	435	375	315	235	180	125	80	0	45	85	135	180	235	255	285	325
13	260	270	340	395	450	490	480	420	360	285	225	175	125	45	0	35	90	130	185	210	235	275
14	225	235	300	360	415	455	490	455	395	320	265	210	165	85	35	0	55	95	150	170	200	240
15	170	180	250	305	360	400	435	500	450	375	315	265	220	135	90	55	0	40	95	120	145	185
16	130	140	205	265	320	360	395	460	495	415	360	305	260	180	130	95	40	0	55	75	105	145
17	75	85	150	210	265	305	340	405	460	470	415	360	315	235	185	150	95	55	0	20	50	90
18	50	65	130	185	245	280	320	380	440	490	435	380	335	255	210	170	120	75	20	0	30	70
18A	25	35	100	160	215	255	290	355	410	490	465	410	365	285	235	200	145	105	50	30	0	40
19	50	60	125	180	240	280	315	380	435	515	505	450	405	325	275	240	185	145	90	70	40	0

**Table 5-26: 7 & above Axle Toll Rates for Year 2025-2026 (Rs. Rupees)**

F/T	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19
1	0	15	95	165	230	280	325	400	475	570	595	525	470	375	315	275	205	155	90	65	30	60
1A	15	0	80	150	220	265	310	390	460	555	605	540	485	385	330	285	220	170	105	75	45	70
2	95	80	0	70	135	185	230	305	380	475	540	605	565	470	410	370	300	250	185	160	125	155
3	165	150	70	0	70	115	160	240	310	405	470	540	595	540	480	435	370	320	255	230	195	220
4	230	220	135	70	0	50	95	170	240	335	405	470	525	605	550	505	440	390	320	295	260	290
4A	280	265	185	115	50	0	45	120	195	290	355	420	475	575	595	555	485	435	370	345	310	340
5	325	310	230	160	95	45	0	75	145	240	310	375	430	530	585	600	535	480	415	390	355	385
6	400	390	305	240	170	120	75	0	70	165	235	300	355	455	510	555	610	560	490	465	430	460
7	475	460	380	310	240	195	145	70	0	95	165	230	285	380	440	485	550	600	565	535	500	530
8	570	555	475	405	335	290	240	165	95	0	70	135	190	285	345	390	455	505	570	595	595	625
9	595	605	540	470	405	355	310	235	165	70	0	65	120	220	275	320	385	435	500	530	565	615
10	525	540	605	540	470	420	375	300	230	135	65	0	55	155	210	255	320	370	435	465	500	545
11	470	485	565	595	525	475	430	355	285	190	120	55	0	100	155	200	265	315	380	410	445	490
12	375	385	470	540	605	575	530	455	380	285	220	155	100	0	55	100	165	220	285	310	345	395
13	315	330	410	480	550	595	585	510	440	345	275	210	155	55	0	45	110	160	225	255	290	335
14	275	285	370	435	505	555	600	555	485	390	320	255	200	100	45	0	65	115	185	210	245	295
15	205	220	300	370	440	485	535	610	550	455	385	320	265	165	110	65	0	50	115	145	180	225
16	155	170	250	320	390	435	480	560	600	505	435	370	315	220	160	115	50	0	65	90	125	175
17	90	105	185	255	320	370	415	490	565	570	500	435	380	285	225	185	115	65	0	25	60	110
18	65	75	160	230	295	345	390	465	535	595	530	465	410	310	255	210	145	90	25	0	35	85
18A	30	45	125	195	260	310	355	430	500	595	565	500	445	345	290	245	180	125	60	35	0	50
19	60	70	155	220	290	340	385	460	530	625	615	545	490	395	335	295	225	175	110	85	50	0

Above rates are applicable for year 2025-26. Toll rates for future years have been worked out as per applicable rate revision policy. These rates have been used for calculating revenue of future years.

## 5.2 Traffic Forecast

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

Traffic of horizon years has been worked out on the basis of growth as discussed previously. Traffic forecast of total volume (all category) is given in tables below.

**Table 5-27: Total Tollable Traffic (Pessimistic Growth Scenario)**

Year/ Types of vehicles	Car/Jeep/Van	Minibus /LCV	Bus/ 2- Axle	3 - Axle	4 to 6 Axle	7 and Above Axle	Total Tollable Traffic (No.)	PCU (Including Exempted)
<b>2024-25</b>	184471	8952	10645	6711	13867	10	<b>224656</b>	<b>312413</b>
<b>2025-26</b>	197038	9361	10971	6979	14423	0	<b>238772</b>	<b>329833</b>
<b>2026-27</b>	210447	9763	11280	7237	14987	0	<b>253714</b>	<b>348084</b>
<b>2027-28</b>	224769	10182	11598	7502	15572	0	<b>269623</b>	<b>367416</b>
<b>2028-29</b>	236971	10584	11809	7692	15987	0	<b>283043</b>	<b>383292</b>
<b>2029-30</b>	249828	11003	12024	7885	16415	0	<b>297155</b>	<b>399927</b>
<b>2030-31</b>	263362	11427	12244	8081	16850	0	<b>311964</b>	<b>417303</b>
<b>2031-32</b>	277658	11873	12468	8283	17294	0	<b>327576</b>	<b>435544</b>
<b>2032-33</b>	292708	12334	12694	8488	17745	0	<b>343969</b>	<b>454608</b>
<b>2033-34</b>	303336	12776	12811	8602	18014	0	<b>355539</b>	<b>467802</b>
<b>2034-35</b>	314347	13234	12930	8717	18291	0	<b>367519</b>	<b>481449</b>
<b>2035-36</b>	325770	13697	13050	8835	18571	0	<b>379923</b>	<b>495540</b>
<b>2036-37</b>	337601	14177	13170	8957	18854	0	<b>392759</b>	<b>510091</b>
<b>2037-38</b>	349860	14686	13291	9079	19142	0	<b>406058</b>	<b>525138</b>

Year/ Types of vehicles	Car/Jeep/Van	Minibus /LCV	Bus/ 2- Axle	3 - Axle	4 to 6 Axle	7 and Above Axle	Total Tollable Traffic (No.)	PCU (Including Exempted)
2038-39	359562	15158	13366	9151	19312	0	416549	536754
2039-40	369519	15640	13441	9223	19487	0	427310	548663
2040-41	379758	16149	13516	9296	19662	0	438381	560897
2041-42	390279	16667	13591	9369	19838	0	449744	573431
2042-43	401083	17209	13666	9442	20015	0	461415	586288
2043-44	409169	17717	13693	9470	20101	0	470150	595688
2044-45	417414	18231	13720	9498	20187	0	479050	605256
2045-46	425828	18756	13747	9526	20273	0	488130	615010
2046-47	434406	19298	13774	9554	20359	0	497391	624953
2047-48	443159	19857	13801	9582	20445	0	506844	635096
2048-49	449203	20372	13801	9586	20455	0	513417	641970
2049-50	455331	20897	13801	9590	20465	0	520084	648942
2050-51	461530	21437	13801	9594	20475	0	526837	656008
2051-52	467818	21987	13801	9598	20485	0	533689	663178
2052-53	474186	22554	13801	9602	20495	0	540638	670454
2053-54	480331	23127	13801	9606	20505	0	547370	677515

**Table 5-28: Total Tollable Traffic (Most likely Growth Scenario)**

Year/ Types of vehicles	Car/Jeep/Van	Minibus /LCV	Bus/ 2- Axle	3 - Axle	4 to 6 Axle	7 and Above Axle	Total Tollable Traffic (No.)	PCU (Including Exempted)
2024-25	184471	8952	10645	6711	13867	10	224656	312413
2025-26	197488	9381	10996	6996	14460	0	239321	330606
2026-27	211427	9807	11329	7274	15066	0	254903	349744
2027-28	226355	10247	11671	7560	15695	0	271528	370046
2028-29	239207	10674	11918	7771	16149	0	285719	386956

Year/ Types of vehicles	Car/Jeep/Van	Minibus /LCV	Bus/ 2- Axle	3 - Axle	4 to 6 Axle	7 and Above Axle	Total Tollable Traffic (No.)	PCU (Including Exempted)
2029-30	252779	11116	12172	7983	16617	0	300667	404695
2030-31	267114	11575	12426	8201	17101	0	316417	423312
2031-32	282258	12047	12683	8424	17598	0	333010	442841
2032-33	298266	12546	12945	8649	18113	0	350519	463376
2033-34	309842	13017	13094	8795	18438	0	363186	478006
2034-35	321866	13516	13246	8944	18764	0	376336	493148
2035-36	334357	14029	13399	9096	19097	0	389978	508822
2036-37	347328	14563	13553	9249	19438	0	404131	525050
2037-38	360809	15122	13707	9402	19779	0	418819	541825
2038-39	371708	15650	13811	9509	20018	0	430696	555224
2039-40	382937	16194	13915	9616	20261	0	442923	568996
2040-41	394503	16754	14020	9723	20504	0	455504	583131
2041-42	406412	17327	14126	9830	20751	0	468446	597650
2042-43	418693	17925	14233	9938	21001	0	481790	612598
2043-44	428180	18487	14300	9993	21143	0	492103	623933
2044-45	437882	19060	14367	10048	21286	0	502643	635504
2045-46	447793	19655	14434	10103	21429	0	513414	647317
2046-47	457935	20267	14501	10158	21572	0	524433	659387
2047-48	468304	20909	14568	10214	21716	0	535711	671736
2048-49	475872	21501	14587	10235	21776	0	543971	680582
2049-50	483559	22105	14606	10256	21836	0	552362	689565
2050-51	491365	22724	14625	10277	21896	0	560887	698689
2051-52	499293	23367	14644	10298	21957	0	569559	707976
2052-53	507355	24021	14663	10319	22018	0	578376	717414
2053-54	515144	24697	14682	10340	22079	0	586942	726611

**Table 5-29: Total Tollable Traffic (Optimistic Growth Scenario)**

Year/ Types of vehicles	Car/Jeep/Van	Minibus /LCV	Bus/ 2- Axle	3 - Axle	4 to 6 Axle	7 and Above Axle	Total Tollable Traffic (No.)	PCU (Including Exempted)
2024-25	184471	8952	10645	6711	13867	10	224656	312413
2025-26	197961	9405	11024	7009	14499	0	239898	331413
2026-27	212440	9855	11387	7309	15151	0	256142	351490
2027-28	227975	10330	11760	7623	15829	0	273517	372850
2028-29	241480	10796	12040	7849	16336	0	288501	390853
2029-30	255795	11274	12329	8078	16859	0	304335	409793
2030-31	270947	11769	12624	8312	17391	0	321043	429668
2031-32	286997	12290	12923	8557	17932	0	338699	450566
2032-33	303989	12835	13225	8807	18488	0	357344	472534
2033-34	316554	13359	13426	8979	18860	0	371178	488678
2034-35	329638	13905	13630	9155	19242	0	385570	505440
2035-36	343253	14469	13834	9332	19632	0	400520	522799
2036-37	357428	15054	14038	9511	20027	0	416058	540778
2037-38	372188	15665	14243	9693	20425	0	432214	559406
2038-39	384372	16248	14387	9830	20733	0	445570	574694
2039-40	396948	16859	14532	9967	21046	0	459352	590441
2040-41	409942	17487	14679	10105	21361	0	473574	606649
2041-42	423344	18139	14828	10243	21678	0	488232	623317
2042-43	437192	18816	14980	10382	21998	0	503368	640493
2043-44	448190	19456	15081	10472	22206	0	515405	653960
2044-45	459466	20114	15182	10563	22415	0	527740	667740
2045-46	471019	20793	15283	10655	22625	0	540375	681835
2046-47	482864	21504	15385	10750	22835	0	553338	696283
2047-48	495027	22243	15487	10845	23045	0	566647	711090
2048-49	504257	22922	15549	10890	23158	0	576776	722168
2049-50	513662	23633	15612	10935	23271	0	587113	733472

Year/ Types of vehicles	Car/Jeep/Van	Minibus /LCV	Bus/ 2- Axle	3 - Axle	4 to 6 Axle	7 and Above Axle	Total Tollable Traffic (No.)	PCU (Including Exempted)
2050-51	523239	24367	15675	10980	23385	0	597646	744987
2051-52	532994	25122	15738	11025	23499	0	608378	756712
2052-53	542929	25901	15801	11070	23613	0	619314	768652
2053-54	552559	26706	15864	11116	23727	0	629972	780330

## 5.2 Toll Revenue at all toll plazas

Toll revenue has been worked out for concession period as per projected traffic and worked out rates.

## 5.4 Revenue Forecast

Revenue forecast with traffic numbers as per above analysis and rates worked out is given in following table.

**Table 5-30: Total Toll Revenue – Rs. Cr (Pessimistic)**

Year /TP no.	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19	Total
2024-25	20.94	0.00	13.76	96.56	11.76	13.18	34.35	90.79	37.17	15.89	47.46	7.01	101.21	24.23	6.08	26.34	21.62	112.75	18.59	21.31	7.92	65.25	794.19
2025-26	22.99	0.00	15.68	106.98	12.98	14.98	38.21	99.47	41.77	17.70	53.20	7.68	111.54	27.12	6.70	29.47	24.10	123.85	21.08	25.29	8.84	74.28	883.92
2026-27	25.20	0.00	17.18	117.77	14.72	16.59	42.20	110.39	46.18	19.40	58.60	8.51	123.63	29.86	7.45	33.01	26.76	140.30	23.70	27.61	9.71	86.82	985.56
2027-28	28.11	0.00	19.15	132.36	16.24	18.80	47.49	122.63	51.90	21.95	65.55	9.40	137.79	34.29	8.53	37.09	29.72	154.31	26.41	30.68	10.69	96.32	1,099.41
2028-29	31.61	0.00	21.80	144.44	17.94	20.81	52.23	134.89	57.28	24.32	72.66	10.20	151.43	37.68	9.21	40.78	32.44	174.05	28.53	33.12	12.34	109.35	1,217.11
2029-30	34.36	0.00	23.71	159.67	20.02	23.34	57.56	147.54	63.24	26.76	80.60	11.40	166.50	41.61	10.14	45.66	35.85	188.28	31.33	36.65	13.43	117.87	1,335.54
2030-31	38.72	0.00	26.50	176.00	22.09	25.64	63.51	162.04	70.01	29.54	89.33	12.53	184.40	45.54	11.34	49.45	39.33	204.73	35.85	42.69	14.99	131.99	1,476.21
2031-32	42.88	0.00	29.08	193.48	24.58	28.41	70.14	178.24	78.04	32.52	98.23	13.56	203.03	51.16	12.60	54.94	43.02	230.11	38.60	46.40	17.37	151.21	1,637.61
2032-33	47.30	0.00	32.42	213.14	26.85	31.59	77.45	195.30	85.59	36.17	109.13	14.89	222.92	56.87	13.98	61.62	47.40	249.01	42.48	50.53	18.87	164.43	1,797.92
2033-34	52.34	0.00	35.44	231.64	29.67	34.75	84.42	212.64	93.68	39.54	118.95	16.29	243.56	61.85	15.30	67.39	51.50	276.60	47.60	55.05	20.13	183.58	1,971.91
2034-35	56.64	0.00	38.75	254.21	32.53	37.97	92.51	232.08	102.72	43.28	130.74	17.74	264.52	67.57	16.68	73.65	56.60	297.32	51.58	62.25	22.79	199.88	2,152.02
2035-36	62.56	0.00	43.00	277.83	35.65	41.95	101.16	252.18	112.13	47.55	143.17	19.43	289.77	74.86	18.25	81.39	61.70	328.50	56.97	68.36	24.84	222.68	2,363.93

Year /TP no.	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19	Total
<b>2036-37</b>	70.79	0.00	46.60	303.35	39.04	46.01	110.89	274.63	123.05	52.44	156.33	20.99	315.71	80.81	20.20	88.93	67.27	363.40	63.15	74.35	27.72	247.18	<b>2,592.83</b>
<b>2037-38</b>	76.42	0.00	51.26	329.78	42.47	50.71	121.56	298.58	136.13	56.95	171.44	23.07	345.77	89.22	22.10	97.78	73.28	389.52	68.37	79.80	29.93	265.28	<b>2,819.42</b>
<b>2038-39</b>	83.05	0.00	56.48	357.10	46.70	54.68	131.92	324.52	146.71	62.35	186.86	25.10	374.88	96.94	24.10	106.08	80.14	426.09	74.89	89.03	32.97	294.52	<b>3,075.12</b>
<b>2039-40</b>	91.70	0.00	61.23	389.45	50.90	60.17	144.12	352.87	160.31	67.73	204.11	27.22	409.29	105.13	26.42	116.18	87.00	467.48	81.39	97.06	36.06	323.30	<b>3,359.13</b>
<b>2040-41</b>	99.92	0.00	66.74	422.06	54.81	65.89	156.75	381.69	175.54	73.97	222.91	29.44	443.83	115.03	28.97	125.89	93.99	506.66	88.47	107.12	39.48	358.04	<b>3,657.20</b>
<b>2041-42</b>	109.21	0.00	73.08	459.66	59.95	71.72	170.61	413.49	189.70	80.53	242.76	32.18	482.17	125.68	31.66	138.59	102.24	553.78	96.42	115.25	43.55	390.51	<b>3,982.76</b>
<b>2042-43</b>	119.43	0.00	79.71	500.21	65.31	78.54	186.01	449.81	207.95	87.97	265.20	35.10	525.54	137.65	34.74	150.95	111.60	604.23	105.21	128.04	48.04	431.11	<b>4,352.39</b>
<b>2043-44</b>	131.13	0.00	86.87	542.96	71.31	86.14	202.14	488.21	226.96	96.01	288.78	37.99	571.26	149.46	37.98	163.37	120.77	654.11	116.23	138.38	51.42	468.49	<b>4,729.98</b>
<b>2044-45</b>	141.66	0.00	93.84	584.74	77.49	93.55	219.21	527.24	245.51	103.96	312.88	41.34	616.80	161.97	41.00	177.01	130.43	706.46	123.05	152.82	55.97	507.26	<b>5,114.19</b>
<b>2045-46</b>	153.46	0.00	102.93	634.00	84.03	101.67	237.79	570.47	266.97	113.04	339.80	44.54	667.10	176.11	44.32	193.61	141.87	773.37	134.90	162.07	61.35	558.08	<b>5,561.47</b>
<b>2046-47</b>	169.69	0.00	110.62	685.62	91.48	110.33	258.36	616.36	290.32	122.82	367.93	48.64	724.16	191.73	48.39	210.70	153.85	835.96	146.96	178.69	66.64	606.54	<b>6,035.79</b>
<b>2047-48</b>	183.26	0.00	121.81	746.27	100.17	121.49	282.68	671.42	317.36	134.14	402.06	52.73	786.14	209.30	53.07	229.74	166.73	916.05	159.72	195.95	72.96	669.16	<b>6,592.22</b>
<b>2048-49</b>	198.53	0.00	131.11	802.95	107.71	130.74	304.25	722.38	341.92	144.47	435.41	57.11	847.60	226.00	57.23	248.44	180.25	980.63	173.86	210.08	78.62	715.15	<b>7,094.43</b>
<b>2049-50</b>	216.53	0.00	141.69	869.02	116.63	141.59	330.22	779.52	370.81	156.82	470.96	62.06	915.33	244.84	61.75	269.46	194.44	1064.95	187.82	227.89	86.67	781.42	<b>7,690.43</b>
<b>2050-51</b>	234.70	0.00	154.05	938.50	127.06	153.44	355.87	842.06	401.58	169.95	509.57	66.90	988.85	265.06	67.08	291.33	210.43	1153.44	203.70	248.03	93.64	848.57	<b>8,323.83</b>
<b>2051-52</b>	255.47	0.00	167.93	1017.53	137.55	168.27	387.09	914.47	438.36	184.89	553.66	72.98	1073.01	289.16	73.12	317.26	228.33	1249.92	222.35	269.71	101.11	926.58	<b>9,048.74</b>
<b>2052-53</b>	277.11	0.00	181.47	1096.70	148.71	181.34	417.90	984.38	473.79	199.23	599.59	78.72	1155.96	311.47	78.88	343.03	245.85	1347.44	240.52	292.95	109.95	1002.40	<b>9,767.37</b>
<b>2053-54</b>	299.53	0.00	196.87	1186.08	161.00	196.91	453.14	1062.95	512.84	216.71	648.94	85.42	1250.98	339.38	85.76	373.67	266.11	1455.66	260.13	316.08	120.40	1086.12	<b>10574.70</b>

**Table 5-31: Total Toll Revenue – Rs. Cr (Most Likely)**

Year /TP no.	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19	Total
<b>2024-25</b>	20.94	0.00	13.76	96.56	11.76	13.18	34.35	90.79	37.17	15.89	47.46	7.01	101.21	24.23	6.08	26.34	21.62	112.75	18.59	21.31	7.92	65.25	<b>794.19</b>
<b>2025-26</b>	23.04	0.00	15.72	107.20	13.00	15.03	38.35	99.70	41.89	17.75	53.32	7.69	111.86	27.15	6.71	29.53	24.15	124.20	21.12	25.39	8.88	74.47	<b>886.16</b>
<b>2026-27</b>	25.31	0.00	17.27	118.25	14.77	16.65	42.48	110.88	46.41	19.52	58.89	8.53	124.31	29.98	7.47	33.16	26.90	141.03	23.81	27.77	9.77	87.25	<b>990.41</b>
<b>2027-28</b>	28.28	0.00	19.33	133.21	16.33	18.92	47.95	123.47	52.26	22.14	66.02	9.44	138.84	34.51	8.57	37.35	29.98	155.45	26.61	30.93	10.78	97.03	<b>1,107.39</b>
<b>2028-29</b>	31.88	0.00	22.05	145.64	18.07	20.98	52.86	136.18	57.81	24.57	73.39	10.33	152.86	38.00	9.26	41.17	32.79	175.87	28.84	33.52	12.49	110.42	<b>1,228.98</b>
<b>2029-30</b>	34.73	0.00	24.02	161.35	20.22	23.57	58.38	149.32	64.03	27.09	81.62	11.65	168.46	42.08	10.21	46.19	36.31	190.88	31.79	37.24	13.66	119.31	<b>1,352.09</b>
<b>2030-31</b>	39.24	0.00	26.87	178.27	22.33	25.92	64.67	164.43	71.12	29.99	90.70	12.91	187.03	46.15	11.42	50.13	39.93	208.23	36.50	43.52	15.30	133.94	<b>1,498.60</b>
<b>2031-32</b>	43.56	0.00	29.56	196.52	24.89	28.79	71.67	181.25	79.51	33.11	100.03	14.07	206.42	51.97	12.72	55.80	43.78	234.78	39.45	47.44	17.80	153.79	<b>1,666.89</b>
<b>2032-33</b>	48.15	0.00	32.99	217.09	27.24	32.07	79.37	199.04	87.42	36.90	111.47	15.56	227.17	57.89	14.13	62.70	48.37	254.69	43.56	51.79	19.41	167.58	<b>1,834.60</b>

Year /TP no.	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19	Total
<b>2033-34</b>	53.43	0.00	36.14	236.43	30.20	35.35	86.76	217.21	95.94	40.45	121.75	17.03	248.82	63.15	15.50	68.72	52.64	283.62	48.97	56.56	20.76	187.56	<b>2,016.98</b>
<b>2034-35</b>	57.97	0.00	39.57	260.12	33.22	38.71	95.34	237.67	105.45	44.36	134.11	18.56	270.89	69.17	16.95	75.27	57.96	305.61	53.19	64.07	23.57	204.69	<b>2,206.45</b>
<b>2035-36</b>	64.16	0.00	44.00	285.03	36.52	42.84	104.49	258.84	115.40	48.85	147.14	20.35	297.55	76.84	18.59	83.34	63.29	338.39	58.90	70.52	25.75	228.57	<b>2,429.35</b>
<b>2036-37</b>	72.77	0.00	47.75	312.04	40.08	47.09	114.79	282.57	126.98	53.96	161.01	22.00	325.05	83.12	20.61	91.25	69.06	375.19	65.40	76.87	28.80	254.33	<b>2,670.73</b>
<b>2037-38</b>	78.73	0.00	52.62	340.16	43.75	52.02	126.11	307.99	140.93	58.73	176.96	24.20	357.04	92.12	22.58	100.55	75.34	403.17	70.98	82.70	31.19	273.58	<b>2,911.47</b>
<b>2038-39</b>	85.80	0.00	58.24	369.46	48.26	56.20	137.17	335.61	152.28	64.44	193.43	26.37	388.12	100.29	24.67	109.46	82.59	442.17	77.89	92.43	34.40	304.52	<b>3,183.81</b>
<b>2039-40</b>	95.00	0.00	63.40	404.14	52.78	61.99	150.18	365.86	166.80	70.13	211.81	28.65	424.83	108.98	27.11	120.35	89.86	486.35	84.83	101.00	37.69	335.20	<b>3,486.95</b>
<b>2040-41</b>	103.78	0.00	69.36	439.27	57.01	68.02	163.74	396.83	183.04	76.79	231.93	31.01	461.77	119.48	29.80	130.83	97.35	528.32	92.38	111.72	41.33	372.19	<b>3,805.93</b>
<b>2041-42</b>	113.68	0.00	76.24	479.80	62.55	74.21	178.65	430.98	198.29	83.82	253.23	33.93	502.94	130.79	32.63	144.48	106.20	578.77	100.87	120.48	45.69	407.05	<b>4,155.28</b>
<b>2042-43</b>	124.59	0.00	83.43	523.66	68.36	81.45	195.31	469.99	217.91	91.77	277.41	37.05	549.65	143.54	35.92	157.85	116.26	632.90	110.28	134.17	50.51	450.55	<b>4,552.56</b>
<b>2043-44</b>	137.04	0.00	91.09	569.76	74.77	89.50	212.71	511.20	238.31	100.38	302.79	40.14	598.93	156.30	39.33	171.21	125.99	686.76	122.08	145.40	54.16	490.79	<b>4,958.63</b>
<b>2044-45</b>	148.35	0.00	98.55	615.08	81.36	97.39	231.19	553.24	258.31	108.95	328.77	43.74	648.26	169.91	42.51	185.91	136.34	743.50	129.54	161.01	59.05	532.69	<b>5,373.63</b>
<b>2045-46</b>	161.00	0.00	108.27	668.52	88.37	106.08	251.37	599.80	281.49	118.77	357.94	47.20	702.97	185.27	46.03	203.72	148.56	815.86	142.37	171.23	64.86	587.40	<b>5,857.05</b>
<b>2046-47</b>	178.37	0.00	116.58	724.73	96.37	115.37	273.65	649.47	306.79	129.37	388.55	51.65	765.19	202.28	50.37	222.20	161.41	883.94	155.49	189.33	70.60	639.96	<b>6,371.67</b>
<b>2047-48</b>	193.07	0.00	128.59	790.79	105.72	127.36	299.92	709.30	336.01	141.67	425.64	56.14	833.01	221.45	55.34	242.80	175.25	970.93	169.38	208.18	77.46	707.72	<b>6,975.71</b>
<b>2048-49</b>	209.64	0.00	138.71	852.99	113.90	137.36	323.58	764.93	362.83	152.85	461.88	60.92	900.39	239.51	59.92	263.06	190.03	1041.88	184.75	223.59	83.64	758.12	<b>7,524.48</b>
<b>2049-50</b>	229.14	0.00	150.22	925.56	123.59	149.12	352.00	827.40	394.36	166.23	500.70	66.31	974.83	259.89	64.92	285.85	205.62	1134.13	200.09	243.01	92.38	830.33	<b>8,175.69</b>
<b>2050-51</b>	248.95	0.00	163.70	1002.10	134.92	161.96	380.26	895.92	428.07	180.48	542.98	71.61	1055.73	281.80	70.81	309.66	223.24	1231.29	217.52	264.98	100.03	903.85	<b>8,869.88</b>
<b>2051-52</b>	271.59	0.00	178.85	1089.26	146.39	177.97	414.54	975.36	468.42	196.80	591.35	78.24	1148.42	307.92	77.48	337.89	242.97	1337.45	238.00	288.73	108.30	989.28	<b>9,665.22</b>
<b>2052-53</b>	295.33	0.00	193.73	1177.03	158.65	192.21	448.49	1052.43	507.41	212.55	641.91	84.56	1240.38	332.21	83.92	366.01	262.42	1445.25	258.04	314.27	118.09	1072.66	<b>10,457.55</b>
<b>2053-54</b>	319.96	0.00	210.68	1276.31	172.15	209.18	487.43	1139.09	550.39	231.72	696.29	91.93	1345.52	362.58	91.61	399.48	284.92	1565.00	279.72	339.83	129.62	1164.97	<b>11348.37</b>

**Table 5-32: Total Toll Revenue –Rs. Cr (Optimistic)**

Year /TP no.	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19	Total
<b>2024-25</b>	20.94	0.00	13.76	96.56	11.76	13.18	34.35	90.79	37.17	15.89	47.46	7.01	101.21	24.23	6.08	26.34	21.62	112.75	18.59	21.31	7.92	65.25	<b>794.19</b>
<b>2025-26</b>	23.08	0.00	15.76	107.57	13.03	15.06	38.44	99.93	41.99	17.78	53.41	7.70	112.08	27.21	6.72	29.62	24.23	124.51	21.19	25.46	8.89	74.63	<b>888.29</b>
<b>2026-27</b>	25.42	0.00	17.37	118.95	14.84	16.75	42.69	111.48	46.61	19.59	59.18	8.57	124.92	30.14	7.49	33.35	27.08	141.71	23.92	27.93	9.80	87.67	<b>995.46</b>
<b>2027-28</b>	28.47	0.00	19.51	134.29	16.45	19.08	48.30	124.51	52.62	22.26	66.56	9.51	139.88	34.77	8.61	37.70	30.26	156.61	26.77	31.21	10.82	97.75	<b>1,115.96</b>
<b>2028-29</b>	32.18	0.00	22.28	147.23	18.24	21.22	53.42	137.62	58.42	24.78	74.15	10.43	154.41	38.38	9.32	41.64	33.22	177.62	29.07	33.90	12.58	111.49	<b>1,241.63</b>
<b>2029-30</b>	35.17	0.00	24.32	163.55	20.43	23.91	59.20	151.26	64.90	27.39	82.65	11.80	170.58	42.56	10.31	46.80	36.95	193.22	32.13	37.76	13.78	120.78	<b>1,369.43</b>
<b>2030-31</b>	39.82	0.00	27.29	181.14	22.61	26.38	65.72	167.03	72.22	30.40	92.07	13.10	189.79	46.76	11.58	50.89	40.79	211.33	36.95	44.22	15.48	135.90	<b>1,521.48</b>
<b>2031-32</b>	44.33	0.00	30.09	200.13	25.25	29.39	72.98	184.59	80.89	33.60	101.80	14.31	209.98	52.74	12.94	56.80	44.87	238.89	39.99	48.30	18.05	156.38	<b>1,696.28</b>
<b>2032-33</b>	49.16	0.00	33.65	221.62	27.66	32.86	80.99	203.26	89.13	37.53	113.70	15.87	231.58	58.84	14.42	63.97	49.72	259.84	44.24	52.87	19.73	170.82	<b>1,871.46</b>
<b>2033-34</b>	54.66	0.00	36.95	241.85	30.74	36.33	88.73	222.37	98.06	41.21	124.52	17.43	254.20	64.39	15.85	70.32	54.19	290.06	49.83	57.88	21.14	191.61	<b>2,062.32</b>
<b>2034-35</b>	59.42	0.00	40.55	266.72	33.90	39.90	97.70	244.01	108.03	45.30	137.50	19.05	277.36	70.77	17.35	77.24	59.75	313.28	54.27	65.73	24.07	209.57	<b>2,261.44</b>
<b>2035-36</b>	65.91	0.00	45.18	292.94	37.35	44.30	107.29	266.46	118.49	49.98	151.27	20.95	305.36	78.92	19.05	85.77	65.36	347.64	60.23	72.51	26.36	234.50	<b>2,495.81</b>
<b>2036-37</b>	74.93	0.00	49.13	321.43	41.12	48.84	118.15	291.58	130.65	55.39	165.96	22.72	334.44	85.70	21.14	94.16	71.51	386.35	67.05	79.21	29.54	261.56	<b>2,750.57</b>
<b>2037-38</b>	81.21	0.00	54.28	351.28	44.98	54.10	130.09	318.67	145.28	60.46	182.86	25.04	368.26	95.20	23.19	104.03	78.26	416.03	72.94	85.41	32.05	281.99	<b>3,005.62</b>
<b>2038-39</b>	88.68	0.00	60.20	382.51	49.72	58.64	141.92	348.14	157.40	66.52	200.21	27.36	401.29	103.90	25.40	113.51	85.95	457.31	80.29	95.72	35.46	314.68	<b>3,294.78</b>
<b>2039-40</b>	98.38	0.00	65.67	419.44	54.47	64.85	155.87	380.46	172.88	72.59	219.67	29.80	440.34	113.25	27.96	125.03	93.69	504.25	87.73	104.84	38.94	347.24	<b>3,617.37</b>
<b>2040-41</b>	107.72	0.00	72.01	457.08	58.94	71.37	170.51	413.73	190.24	79.63	241.04	32.36	479.86	124.46	30.78	136.20	101.67	549.11	95.88	116.26	42.82	386.48	<b>3,958.13</b>
<b>2041-42</b>	118.26	0.00	79.33	500.54	64.80	78.09	186.64	450.43	206.65	87.14	263.72	35.49	523.89	136.60	33.76	150.74	111.06	602.96	105.07	125.74	47.48	423.69	<b>4,332.07</b>
<b>2042-43</b>	129.91	0.00	86.99	547.56	70.94	85.96	204.60	492.50	227.65	95.64	289.46	38.83	574.02	150.34	37.19	165.09	121.86	660.89	115.25	140.39	52.60	470.12	<b>4,757.79</b>
<b>2043-44</b>	143.38	0.00	95.33	597.44	77.74	94.72	223.31	537.08	249.52	104.78	316.97	42.21	627.11	164.04	40.82	179.55	132.45	718.96	127.87	152.50	56.53	513.27	<b>5,195.58</b>
<b>2044-45</b>	155.72	0.00	103.52	646.81	84.79	103.34	243.20	582.90	271.07	113.93	345.26	46.12	680.49	178.64	44.29	195.54	143.64	780.30	135.98	169.30	61.77	558.41	<b>5,645.03</b>
<b>2045-46</b>	169.55	0.00	114.14	705.03	92.30	112.87	264.96	633.82	296.04	124.46	377.00	49.92	739.64	195.23	48.12	214.94	156.90	858.36	149.74	180.52	67.99	617.27	<b>6,168.81</b>
<b>2046-47</b>	188.45	0.00	123.31	766.41	100.88	123.08	289.02	688.18	323.36	135.84	410.35	54.78	806.89	213.57	52.81	235.10	170.93	932.29	163.84	200.08	74.16	674.08	<b>6,727.40</b>
<b>2047-48</b>	204.60	0.00	136.48	838.48	110.91	136.20	317.44	753.35	354.98	149.03	450.79	59.70	880.51	234.28	58.20	257.60	186.09	1026.42	178.81	220.55	81.56	747.23	<b>7,383.21</b>
<b>2048-49</b>	222.63	0.00	147.55	906.35	119.74	147.28	343.34	814.46	384.07	161.12	490.27	64.87	953.71	254.16	63.08	279.74	202.05	1104.14	195.56	237.47	88.29	802.42	<b>7,982.29</b>
<b>2049-50</b>	243.86	0.00	160.14	985.48	130.17	160.27	374.45	883.14	418.31	175.60	532.72	70.73	1034.74	276.58	68.41	304.72	218.96	1204.92	212.29	258.72	97.74	881.03	<b>8,692.98</b>
<b>2050-51</b>	265.53	0.00	174.90	1069.21	142.42	174.51	405.61	958.64	455.09	191.10	578.96	76.54	1123.08	300.80	74.71	330.92	238.16	1311.45	231.33	282.84	106.05	961.44	<b>9,453.30</b>
<b>2051-52</b>	290.28	0.00	191.46	1164.80	154.85	192.24	443.43	1046.09	499.07	208.76	631.87	83.80	1224.63	329.64	81.84	361.95	259.71	1428.02	253.73	308.95	115.03	1054.91	<b>10,325.05</b>

Year /TP no.	1	1A	2	3	4	4A	5	6	7	8	9	10	11	12	13	14	15	16	17	18	18A	19	Total
<b>2052-53</b>	316.28	0.00	207.79	1261.43	168.16	208.09	481.15	1131.36	541.92	225.86	687.52	90.76	1325.73	356.69	88.74	393.01	281.02	1546.91	275.81	337.10	125.69	1146.67	<b>11,197.69</b>
<b>2053-54</b>	343.39	0.00	226.42	1370.81	182.87	226.98	524.38	1226.98	589.21	246.68	747.64	98.94	1441.68	390.44	97.04	429.98	305.66	1679.17	299.73	365.38	138.28	1248.30	<b>12179.97</b>

#### 5.4 Modification in concession period.

Modification in concession period is analysed as per provisions of DCA and same is summarised in table below for all scenarios.

##### Pessimistic Case

Target Point 1- April 2033									
Target Month - March 2029	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Modified Concession Period
NORR	173.18	164.50	-5.01%	No	-	0.00%	30.00	0.00	

Target Point 2- April 2043											
Target Month - March 2036	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Total Change in Concession period	Calculated Modified Concession Period	Final Concession Period subject to Cap
NORR	448.25	394.35	-12.02%	No	-	0.00%	30.00	0.00	0.00	30.00	

### Most Likely Case

Target Point 1- April 2033									
Target Month - March 2029	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Modified Concession Period
NORR	173.18	168.28	-2.83%	No	-	0.00%	30.00	0.00	

Target Point 2- April 2043											
Target Month - March 2036	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Total Change in Concession period	Calculated Modified Concession Period	Final Concession Period subject to Cap
NORR	448.25	413.47	-7.76%	No	-	0.00%	30.00	0.00	0.00	30.00	

### Optimistic Case

Target Point 1- April 2033									
Target Month - March 2029	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Modified Concession Period
NORR	173.18	172.09	-0.63%	No	-	0.00%	30.00	0.00	

Target Point 2- April 2043											
Target Month - March 2036	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Total Change in Concession period	Calculated Modified Concession Period	Final Concession Period subject to Cap
NORR	448.25	420.80	-6.12%	No	-	0.00%	30.00	0.00	0.00	30.00	

Hyderabad NORR-Modification in Concession Period						
Types of Scenarios	Pessimistic Case		Most likely Case		Optimistic Case	
Target Month	April 2033	April 2043	April 2033	April 2043	April 2033	April 2043
Target Revenue (Rs. Crores)	173.18	448.25	173.18	448.25	173.18	448.25
Calculated Revenue (Rs. Crores)	164.50	394.35	168.28	413.47	172.09	420.80
Difference %	-5.01%	-12.02%	-2.83%	-7.76%	-0.63%	-6.12%
If qualifies for Modification in Concession Period	No	No	No	No	No	No
Qualifying Increment or shortfall	-	-	-	-	-	-
Change in Concession period %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Original Concession Period	30.00	30.00	30.00	30.00	30.00	30.00
Change in Concession period	0.00	0.00	0.00	0.00	0.00	0.00
Total Change in Concession period	0.00		0.00		0.00	
Calculated Modified Concession Period	30.00		30.00		30.00	
Final Concession Period subject to Cap	0.00		0.00		0.00	

Thus, there is no modification expected in concession period due to variation in revenue as per above estimates in all scenarios.

## CHAPTER 6

### CONCLUSION & RECOMMENDATIONS

#### 6.1 Conclusion & Recommendations

The Outer Ring Road, officially as, Jawaharlal Nehru Outer Ring Road and abbreviated as, O.R.R., is a 158 kilometer, 8-lanes ring road expressway encircling Hyderabad, capital of the Indian state of Telangana. ORR is one of the most important infrastructural developments which has complimented growth of Hyderabad as major metro of India. On Eastern side it has provided express connectivity to major commercial and upscale residential centres of Gachibowli, Banjara Hills, Jublee Hills, Hitec- City, Manikonda, Nanakramguda. As a result, large number of residential and commercial projects have come up on this north-east part of ORR. Tellapur, Mokila, Kollur, Narsingi can be named as few of these. On north and western side ORR connects to Shamirpet and Genome Valley.

ORR also provides fast connectivity to various radial state and national highways connecting to Mumbai, Nagpur, Karimnagar, Warangal, Suryapet, Vijayawada, Bengaluru. Regional traffic now does not need to go into congested network of Hyderabad.

All above indicates that Hyderabad Ring Road or Nehru Outer Ring Road (NORR) has potential of good traffic growth on sustainable basis, and it can be considered as a stable healthy project from the traffic and revenue point of view.



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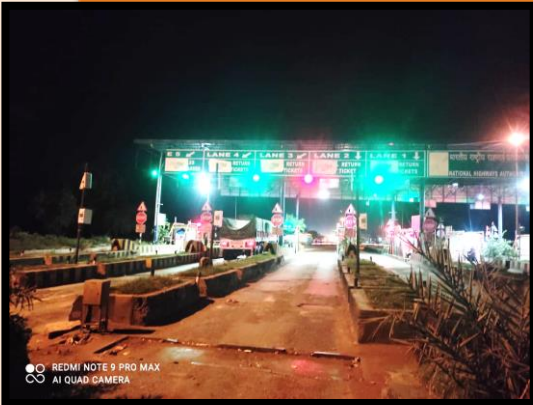
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# Six Laning of Santalpur – Samakhiyali Section of NH-27 from Km 339.200 to km 430.100 in State of Gujarat



**OCTOBER 2024**

## TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)



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from Km 339.200 to km 430.100 in  
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**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

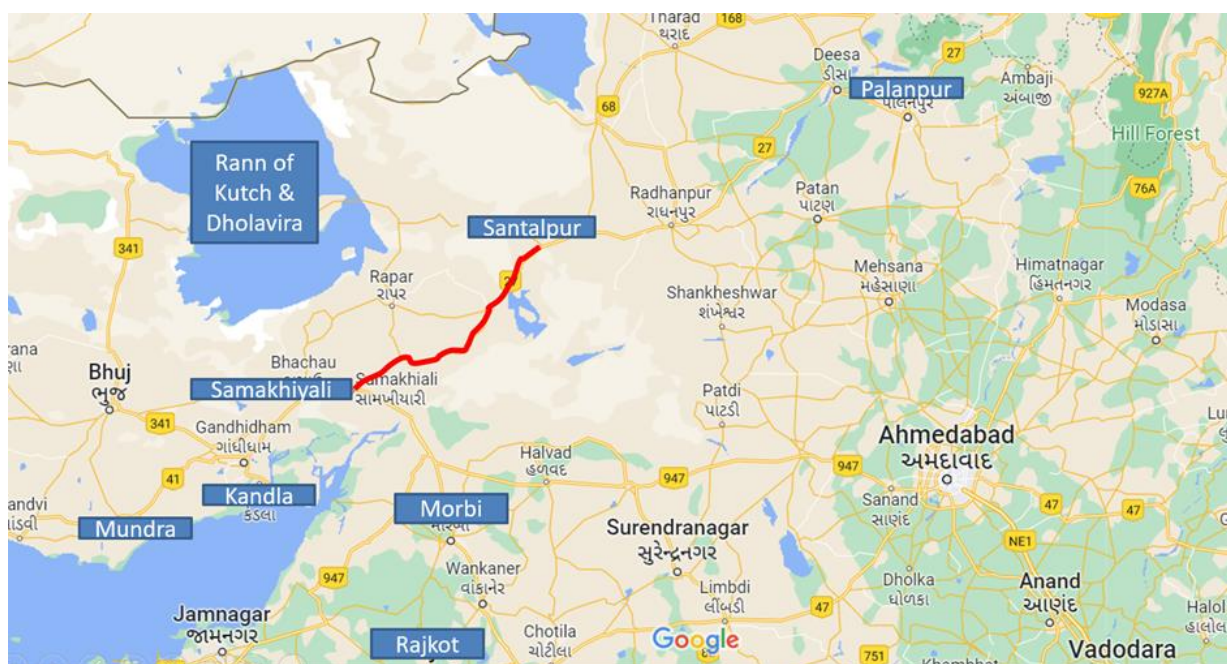
## INTRODUCTION

### 1.1 Background

Project stretch from Santalpur to Samakhiyali (Km 339.200 to km 430.100) is a 90.40 km long 4-lane National Highway Section on NH-27 in the state of Gujarat. NH-27 which is basically the east west connector of country.

Project stretch is gateway link to both Kandla and Mundra ports and also to region of Saurashtra from northern part of India. Stretch is also part of Jamnagar – Amritsar Expressway which will boost the connectivity of Saurashtra and both ports from north Indian states of Punjab, Haryana, Rajasthan, and part of Uttar Pradesh.

The Government of India had entrusted National Highways Authority of India (NHAI) with developing of road infrastructure to match growing transportation demands of expanding economy. The Authority had resolved to undertake the six laning of existing four lane highway section from Santalpur to Samakhiyali (Km 339.200 to km 430.100) on BOT basis. This report is part of the traffic and revenue assessment of stretch including future growth projections. Project Highway alignment is depicted in the following figure.



*Figure 1-1 : Alignment of Project Stretch*

## 1.2 Objective of the Study

M/s IRB Infrastructure Developers Limited (IRB) intends to participate in bidding for Six Laning of Santalpur- Samakhiyali section of NH-27 on BOT basis.

This report named as “**Traffic Study & Toll Revenue Projection Report**” mainly focuses on traffic and revenue aspects of the project. Other parameters like competing road, area developments etc. have been considered from a traffic development point of view.

### 1.2.1 Scope of Services

The broad scope of work covered in the assignment is as follows.

- a) Analysis of Traffic Growth
- b) Toll Rate Growth
- c) Revenue Forecasting

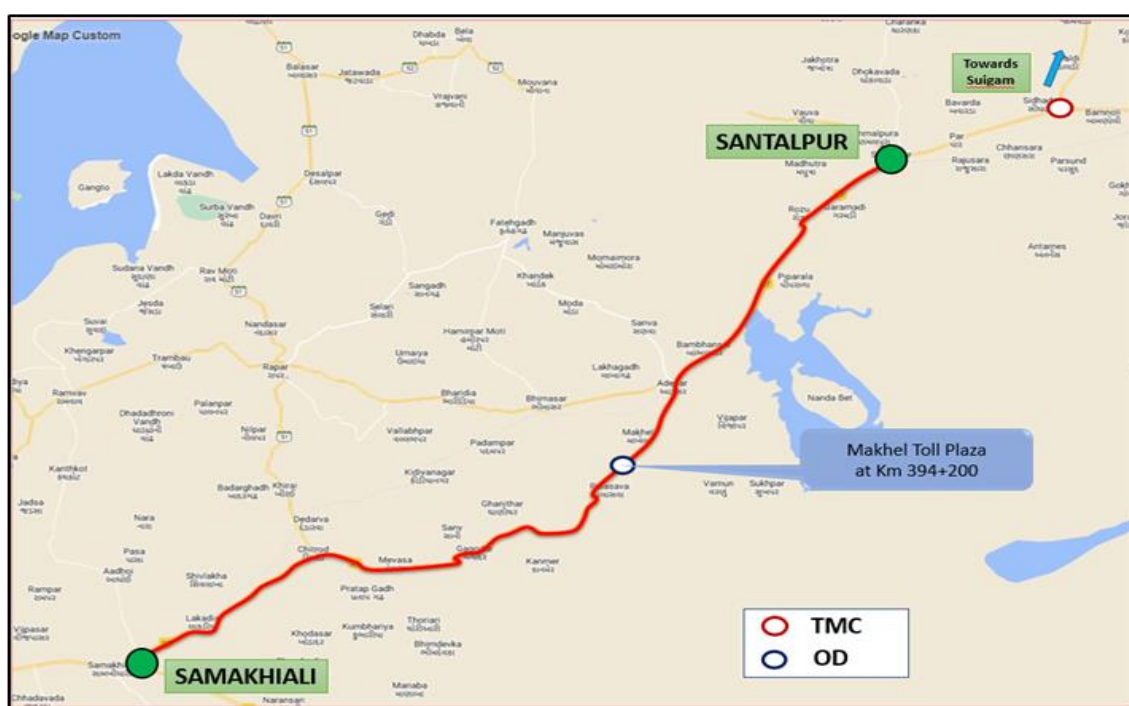
The Concessionaire has provided basic traffic data and other project details on the basis of which the above analysis has been carried out.

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Stretch Description

Project stretch from Santalpur to Samakhiali is gateway link for both the ports of Mundra and Kandla and also of Saurashtra region. The stretch is having combined traffic of NH-27 which is coming from Palanpur / Radhanpur Abu Road and northern link from north Indian states via NH-68 and small section of SH-127 from Suigaon to Sidhadha on project highway. The following figure shows this the alignment of the project highway in the above context.



**Figure 2-1 : Project Alignment with Toll Plaza**

As discussed previously, the project stretch is gateway link to both ports of Kandla and Mundra and also area of Saurashtra. On the north of the project stretch lies the great Rann of Kutch which is also emerging as an important tourist destination of area. The presence of the historical Harrapan site of Dholavira in Rann of Kutch adds value to historical tourism.

## 2.2 Project Corridor Illustration

Project stretch has one Toll Plaza at Makhel. It has six lanes on either side including an oversized lane. As observed and inquired, Toll Operations are running smoothly and there no significant violations or forced exemption on toll plaza.



**Figure 2-2 : Photographs showing Project Corridor**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza location on Samkhayali–Santalpur section of NH-27 for year 2024-2025.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project.
- Establish base year traffic.
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

Table 3-1 below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. No	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 394.200 Toll Plaza at Makhel	AADT for Year 2024- 2025 (Four months data from April 2024 to July 2024)	AADT for Year 2024- 2025 (Four months data from April 2024 to July 2024).	AADT for Year 2024- 2025 (Four months data from April 2024 to July 2024).	AADT for Year 2024- 2025 (Four months data from April 2024 to July 2024).	AADT for Year 2024- 2025 (Four months data from April 2024 to July 2024).

### 3.2 Classified traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations based on monthly data shared with NHAI.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in the table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Min Bus /LCV
- Truck / Bus
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of the report.

### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data for the year 2024-2025 (traffic data from April 2024 to July 2024).

Since the traffic data available for this update is for only four months, from April 2024 to July 2024, it may not represent the whole year traffic. Hence a seasonality factor for balance part of year has been applied to average traffic of current four months to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Makhel Toll Plaza at Km 394+200**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	1682
2	LCV	91
3	Bus	226
4	Truck	291
5	3-Axle	223
6	Multi Axle	7453
7	Oversized Vehicle	11
	<b>Total</b>	<b>9977</b>

## 3.4 Data Analysis

### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in **Table 3-4**.

**Table 3-4 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

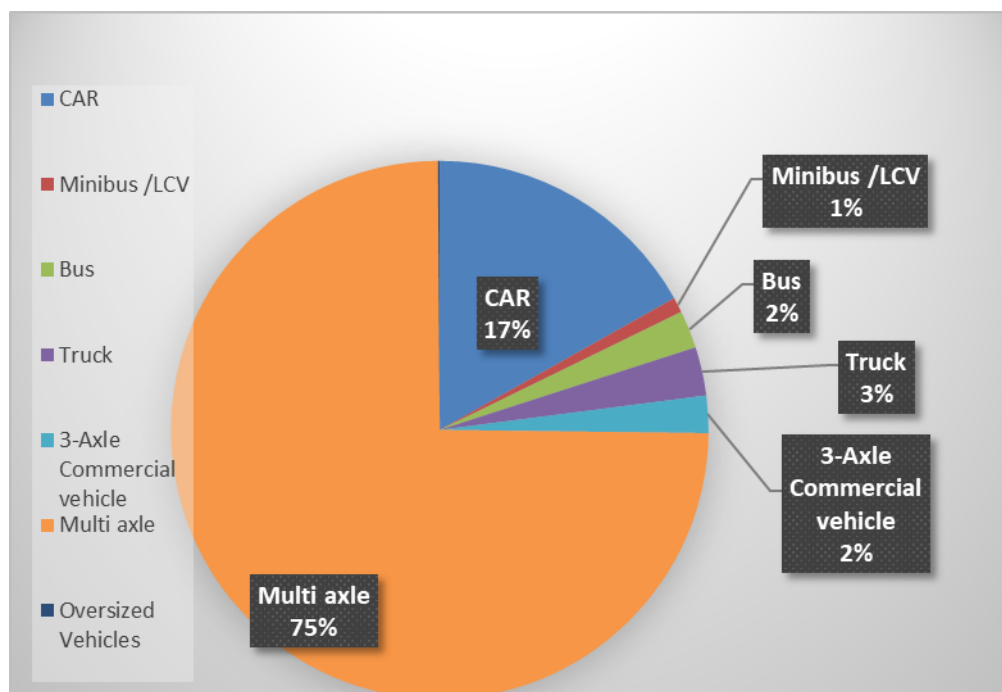
**Table 3-5 : Traffic in PCU at Project Stretch Base Year 2024-25**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2024-25	Makhel at Km 394.200	9977	37627	3.77

It can be observed from above that project traffic has PCU index more than 3.5 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-1 : Model Split of Tollable Vehicle**

It is observed that car traffic forms about 17% of total traffic at toll plaza locations while multi axle commercial vehicles are about 77% of total traffic. Truck / Bus and LCV share about 5% and 1% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-6 : Journey Type Bifurcation of Traffic at Makhel TP KM 394.200**

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	8453
2	Return Journey	1414
3	Local Commercial Single Journey	107
4	Monthly Pass Local	2
5	Monthly Pass	2

Most dominant part of the above is the single journey type followed by return journey at project stretch. Monthly pass commuters are a very low fraction of the total traffic on the project corridor.

The single journey component in total traffic numbers is as high as 85%. Return journey component is 14%. The number of monthly pass Local is 0% and Local Commercial Single journey is 1% at Makhel toll plaza.

It is observed that the project corridor demonstrates pattern of single journey dominated mix of traffic which is typical of major national highways having more long-distance traffic.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

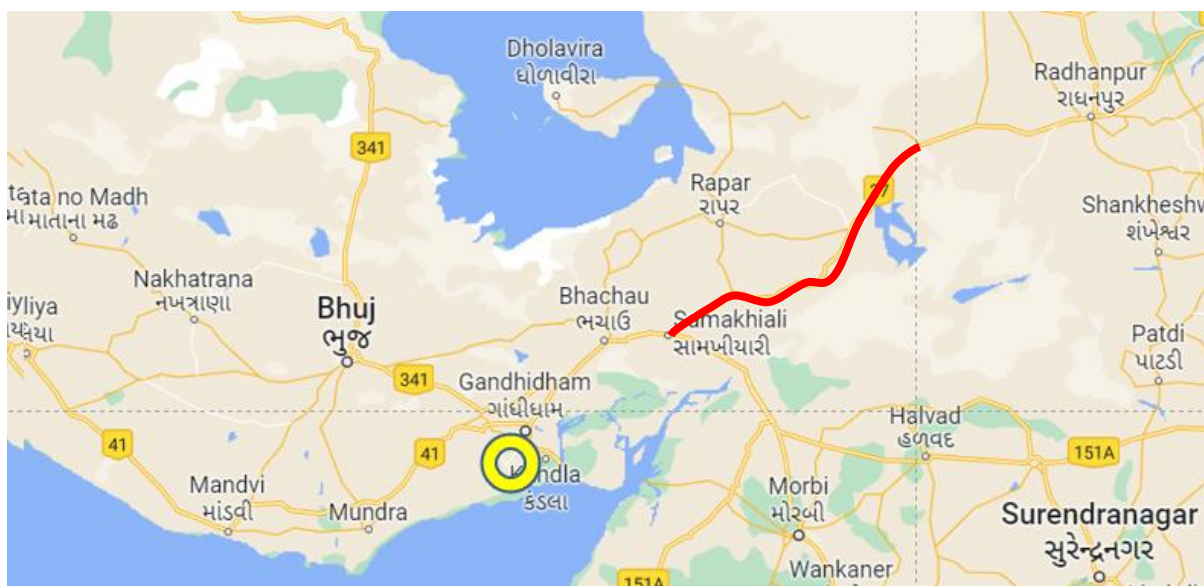
Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc,
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Development in the Project Influence Area

The Project Highway acts as gateway for the traffic of northern, western and part of central India leading to the major western ports of Kandla and Mundra in Gujarat. The Project Highway would majorly cater to the export and import traffic. The contribution of Kandla and Mundra port is about 60% of total traffic at project stretch. Hence, growth and expansion at port will have a major positive impact on project traffic.



Brief details of key influencing establishments around the project corridor are as summarized below:

#### a. Kandla Port

- Kandla is the largest Cargo handling major government port with a capacity of approximately 120 MMTA. It shares about 15% of all major port traffic. The port has shown good consistent growth over past years.
- Kandla Port handles a variety of cargo ranging from Bulk Cargo like Coal, Grain, Fertilizer, Minerals, Ores, Steel, Edible Oils, Chemicals, and Petroleum Products to Container Cargo, Automobiles and Crude Oil.
- Petroleum Oil Lubricants (“POL”) is about 64% of total cargo handled by the Port.
- At present Kandla is having a Container Terminal with a capacity of 0.75 MTEU.
- The Government of India has recently approved the development of two new mega container terminals at Tuna-Tekra in Kandla Port at an estimated cost of ~ Rs 6,000 crores. This would result in increase in capacity of dry cargo from 60MMTA to about 79 MMTA and increase in container cargo capacity from 6 lakh TEU to 26 lakh TEU.
- The Container Terminal and Multipurpose Cargo Terminal are expected to be completed in ~FY25 / FY26 at a total expenditure of ~Rs.

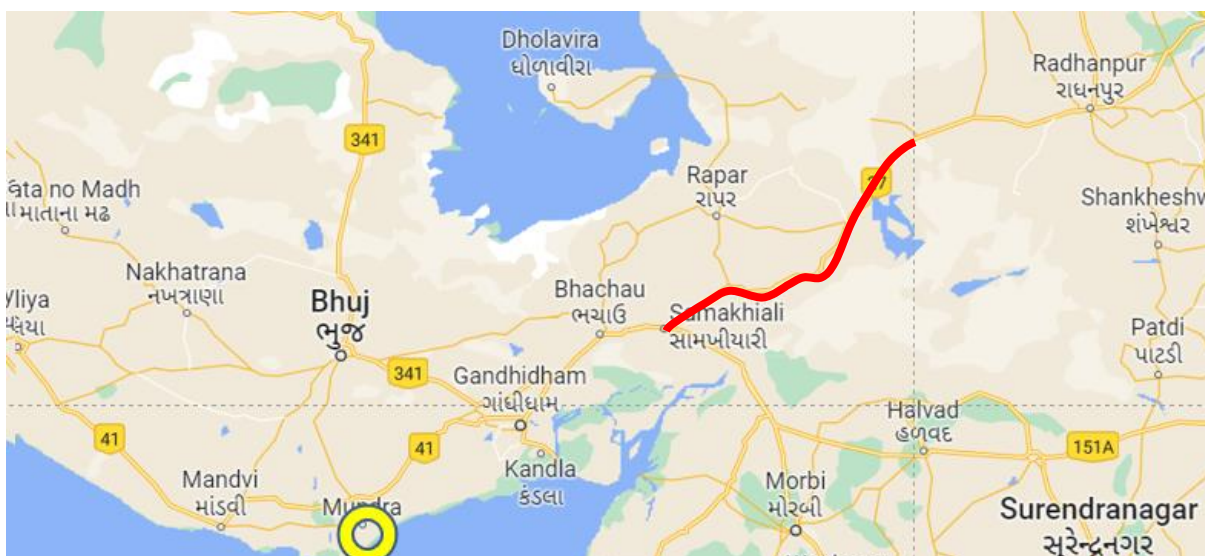


6000 Cr. The development of the two mega terminals of Container & Multipurpose Cargo is expected to induce migration of some of the traffic from JNPT, Mumbai to Kandla and Mundra port in Gujarat.

- The above development of two major terminal is expected to give high traffic growth on Project Highway.
- **DP World wins bid for development of a mega-container terminal at India's Deendayal Port**
  - DP World has won a major concession to develop, operate and maintain the mega-container terminal at Deendayal port in Gujarat, on the western coast of India.
  - The project involves the construction of a mega-container terminal at Tuna-Tekra through a Public-Private Partnership (PPP). Once complete, the terminal will include a 1,100-metre berth and will be capable of handling vessels carrying more than 18,000 TEUs. Total capacity will be 2.19 million TEUs.
  - The contract was awarded by the Deendayal Port Authority under on a Build-Operate-Transfer (BOT) basis.
  - Once complete, the terminal will help unlock future container traffic growth in India, catering to exports and imports from Northern, Western and Central India, reducing logistics cost and enhancing efficiencies across supply chains. The project will complement initiatives of the Government of India, such as the PM Gati Shakti Master Plan and National Logistics Policy, which has been introduced to provide greater focus on developing multimodal logistics infrastructure promoting economic growth.
  - DP World's strategic investments in ports and terminals in the country is aligned with the Indian Government's Vision 2047, which aims to quadruple the country's port handling capacity.

Development of mega container terminal would have positive impact on project traffic as it would enhance the hinterland logistic relations and volume of export / import with Kandla port.

## b. Mundra Port



- Mundra port is located further to Kandla port and is the largest private port in India with about 330 MMTA capacity, 24 berths & 10 Terminals. The port is owned by Adani Group having 12 ports in total. The mega port at Mundra is a major economic gateway that caters to the northern hinterland of India with multimodal connectivity.
- Mundra port has handled 144 MMT in year 20-21 which is highest by any India port.
- The port handles multiple products – coal, POL, Liquid, Dry Bulk. The Mundra port has expansion plans for various products including Waterfront Development, Multi- Purpose cargo and Liquid/ Gas/ Cryogenic Cargo handling quay development.

- The container handling capacity at Mundra port has shown a very impressive growth of over 15% in past 12 years starting with 0.92 MTEU in FY10 to 6.94 MTEU



expected in FY23. The total Container handling capacity at Mundra port is 7.5 MTEU and would be operating at over 90% Capacity Utilization by end of FY23.

- Mundra port is coming up with expansion of Container Terminal of 1.2 MTEU at estimated expense of R. 1239 Cr. The expansion work of Container Terminal is under progress and is expected to be operational by FY24.
- Other growth drivers in long term at ports of Kandla and Mundra Ports will be increasingly adoption of China+1 policy by Europe and US market. The diversification

of manufacturing facilities to India in addition to other emerging Asian economies is expected to boost exports consistently over next 10 years.

- China decision to cap its steel production and no export of steel from Russia would help India steel export.
- Coal import has also seen a surge due to domestic shortage of Coal.
- Defence Corridor at Jhansi and also Tata Aircraft manufacturing plant at Vadodara would have some add on to port traffic.
- As per an ICRA report, the port traffic is expected to grow by 6-8% per year.
- The above development of major terminal is expected to give high traffic growth on Project Highway.

### c. Barmer Refinery

- A 9 MTA capacity refinery and a 2 MTPA Petrochemical Complex is under construction at Pachpadra near Barmer. The complex is a 74:26 Venture between HPCL & Govt. of Rajasthan being developed across 4400 acres at a cost of Rs. 5000 Cr.
- This refinery will relate to Jamnagar Refinery and Bathinda Refinery through Amritsar Jamnagar Expressway
- The refinery is likely to be commissioned by FY25.
- About 6.5 MTA crude will be transported from Gujarat for processing
- RIICO (Rajasthan State Industrial Development & Investment Corporation Limited) to develop PCPIR - Petroleum, Chemical and Petrochemical Investment Region in vicinity of Refinery cum Petrochemical Complex (area ~100km)
- Development of a third refinery enroute Jamnagar to Amritsar, viz; Bhatinda, Barmer and Jamnagar will lead to Petrochemical based traffic growth along Project Highway (via Amritsar Jamnagar Expressway).



#### d. Ceramic Cluster at Morbi



- Morbi accounts for 70% of total ceramic production in India and 2nd largest ceramic tile producing cluster in world.
- The cluster houses ~ 1,000 ceramic units, catering to 18 % of global demand and earns Rs 15,000 crore from exports.
- The ceramic cluster provides 10 Lakhs plus employment and produces over 14000 SQM tiles per day. The tiles are exported through Kandla and Mundra Port.
- The tiles are exported to more than 160 countries through Kandla and Mundra Port which are within 180 km from Morbi. This results in competitive pricing of the tiles in the international market due to savings in transportation costs. Domestic brands like Kajaria, HR Johnson, AGL, Somani outsource from Morbi. Global brands housed in Morbi include Daltile, Portobello, Emser, RAK, etc.
- Rajasthan has the highest proven reserves of China Clay followed by Gujarat. China clay mining is in Nagaur, Bikaner, Jaisalmer, Jodhpur, Bhilwara, and Chittorgarh.
- The Project highway is enroute to supply raw material to Morbi and finished products to domestic market in north India.
- The ceramic industry in India is expected to grow annually at a rate of ~9-10%.

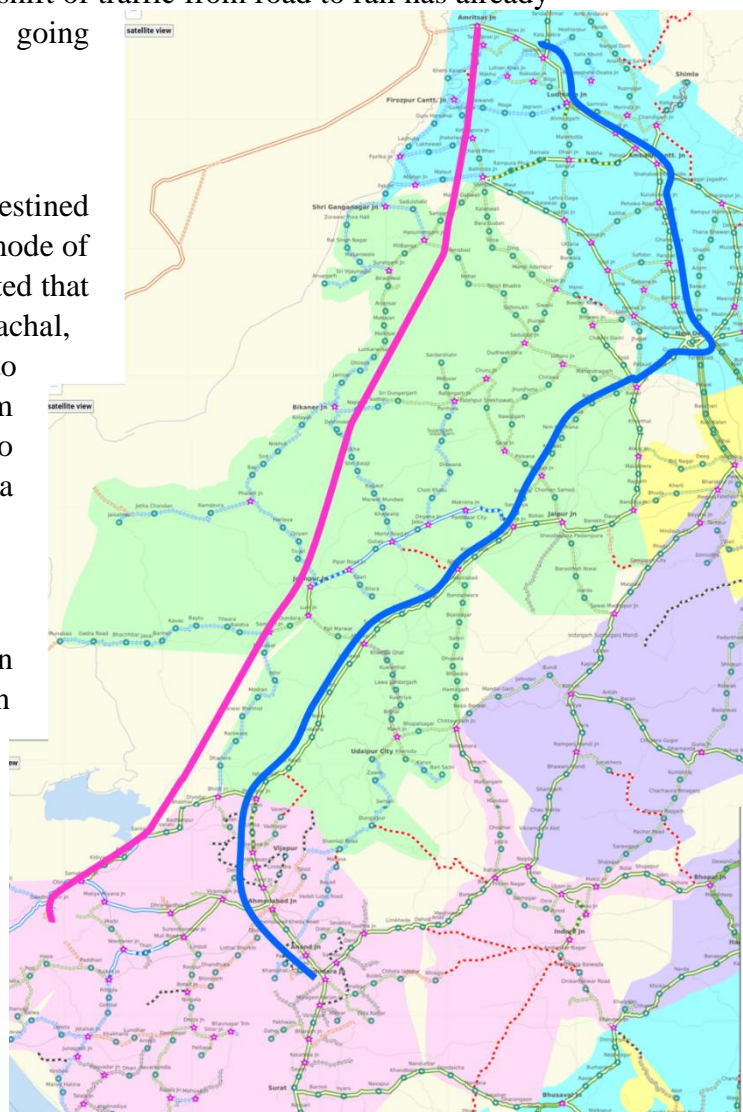
#### Western DFCC -

Western DFCC is 1500 km plus dedicated freight corridor of railway which connects Dadri in Uttar Pradesh to JNPT in Mumbai. It is designed to carry double stack, higher capacity trains at higher speed. The section from Rewari to Palanpur is already operational since March 2021. The balance section from Palanpur-Makarapura-Sachin-Vaitarna-JNPT is expected to be commissioned in stages by end of FY24.

The Kandla and Mundra ports are connected to Palanpur by an operational western railway line. Since rail movement from Rewari to Palanpur and Palanpur to Kandla / Mundra are operational since long, the modal shift of traffic from road to rail has already taken place and no diversion is expected going forward.

Further, only the traffic originating and destined within 50-75 kms of the DFCC will find rail mode of transport logistically viable. It is also to be noted that the cargo originating from Punjab, Himachal, Haryana will have to travel from Sahnewal to Dadri, Rewari along Eastern DFCC from where it will have to take Western DFCC to reach Palanpur which is connected to Ports via Western Railway.

The traffic originating from the northern hinterland has to take rail route via. Eastern DFCC by 450 kms from Sahnewal upto Dadri and then take Western DFCC from Dadri to Palanpur by 786 kms and further Palanpur to Gandhidham/Kandla by western rail which is 300 kms. Thus, the total rail route will be over 1500 kms which is ~25% longer as compared to alternative road network via. upcoming Jamnagar-Amritsar Expressway having a length of ~ 1200 kms.



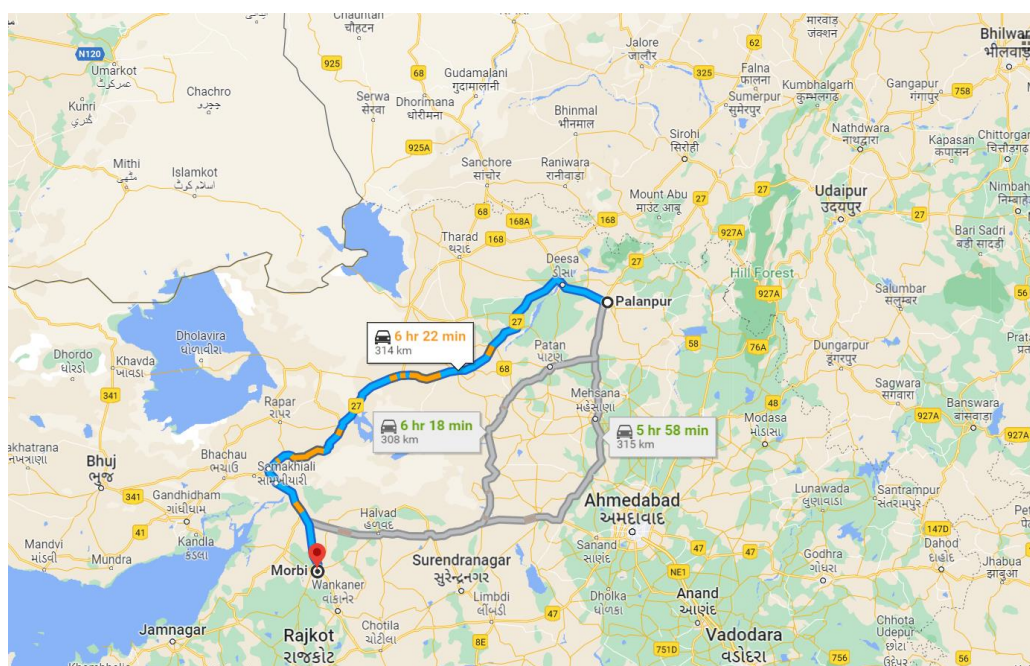
Thus, we do not see the material impact of DFC on the Project and no further diversion of good traffic to DFCC is envisaged.

### e. Amritsar – Jamnagar Expressway

The Amritsar – Jamnagar Expressway (AJE) is an access controlled 1300 km long partly greenfield / brownfield expressway. The AJE which is 4-lane up to PB/HR border and then 6-lane up to Jamnagar is under execution and is likely to be commissioned in FY25. The AJE will not only act as port connectivity expressway but will also have induced traffic due to connectivity of 3 refineries enroute, the Bhatinda refinery, Barmer refinery and Jamnagar refinery. Further all the major cities enroute the AJE are developing bypass / ring roads which will facilitate diversion of long-distance traffic. Thus, the long-distance traffic will have a better level of service and shorter turnaround time for port bound traffic which will be comparable to Freight movement by rail.

### f. Morbi – Rajasthan via Mehsana: Divergence

There is some traffic originating from Morbi, Rajkot and travelling towards Punjab, Himachal, Haryana, Rajasthan and are taking alternate route via. Mehsana, Palanpur. Once the AJE is commissioned, the distance to the northern states via. AJE will be shorter by ~5-7%.



We have conducted OD survey along this alternate route near Mehsana and have worked out a total impact of divergence from alternate route and the development of AJE together will be nearly +2% for all categories of commercial vehicles.

Summary of impact as estimated is given in table below.

Sr. No	Development Factor	Impact	Action
1	Amritsar Jamnagar Expressway	Reduces travel time substantially. Connects Rajasthan, Haryana, UP & Punjab with a faster connectivity. New fast connectivity may add to growth in the initial years of its commissioning. May also add new development area around its greenfield corridor	4% additional traffic including divergence may be taken in year 2025-26, expected commissioning of full stretch
2	Barmer Refinery	New refinery. About 70% of crude is expected to come from Gujarat and also Amritsar – Jamnagar Expressway would provide fast access to ports for export / import,	It will add to traffic growth on the project road once Expressway is commissioned. No additional impact separately
3	Kandla Mundra Ports	About 30% of the traffic on project stretch has Kandla Mundra connection. Both ports are doing good in terms of growth. These basically serve to northern hinterland of Rajasthan, Gujarat, Haryana, Punjab and UP	Capacity and facility expansion of both ports would support traffic growth on the project stretch. No additional impact on traffic
4	Morbi Tile Industry	90% of India's Ceramic is produced in Morbi. Over 1000 Ceramic factories. Domestic supplies to northern India through project stretch.	Would support traffic growth on project stretch. Would be part of growth

Sr. No	Development Factor	Impact	Action
5	Road Network	No Competing Road Network	No Impact
6	DFCC	Kandla to Palanpur is existing rail line and Palnpur to Rewari is operational since last year. DFCC stretches from Rewari to Palanpur is already operational. Most of the traffic has already been shifted. Lack of last mile connectivity from DFCC hub to final destination of Goods will keep dependability of road network for goods transport.	No additional diversion is envisaged.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor Udaipur to Gujarat Border section of NH-8 has been done taking the above factors into consideration. “*IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways*” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in *IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways*.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, in order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for cars and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

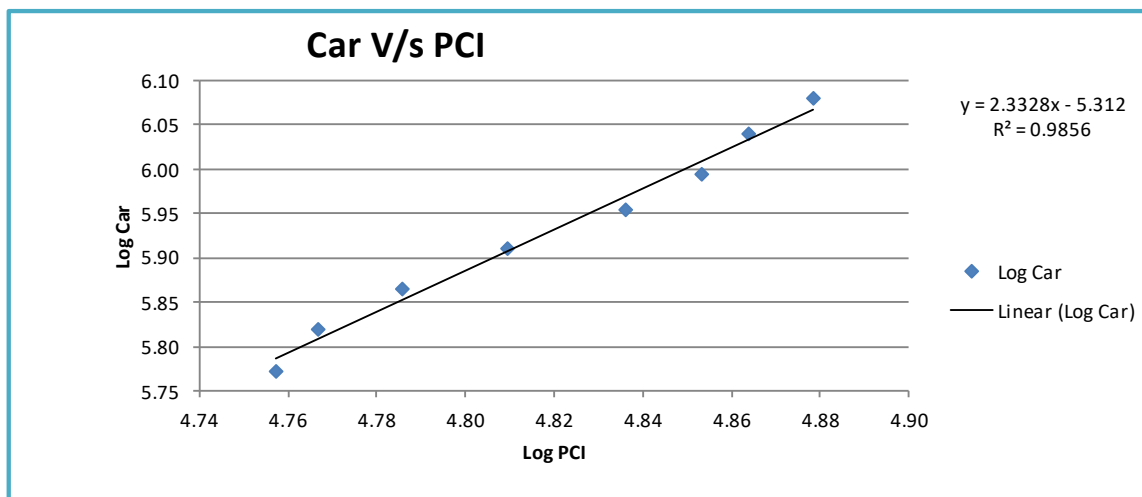
The project corridor spreads across the state of Gujarat. Toll plazas at Makhel is in the state of Gujarat but the traffic on project stretch has certain contribution from other states as well. For elasticity calculations, working data from such states in addition to Gujarat has been analyzed.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-1 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	57192	591069	4.76	5.77		
2012	58441	659542	4.77	5.82	2%	
2013	61053	733916	4.79	5.87	4%	
2014	64496	814079	4.81	5.91	6%	
2015	68565	899307	4.84	5.95	6%	
2016	71324	988391	4.85	5.99	4%	
2017	73109	1095526	4.86	6.04	3%	
2018	75555	1204005	4.88	6.08	3%	4.1%

Regression analysis of same is given in figure below.

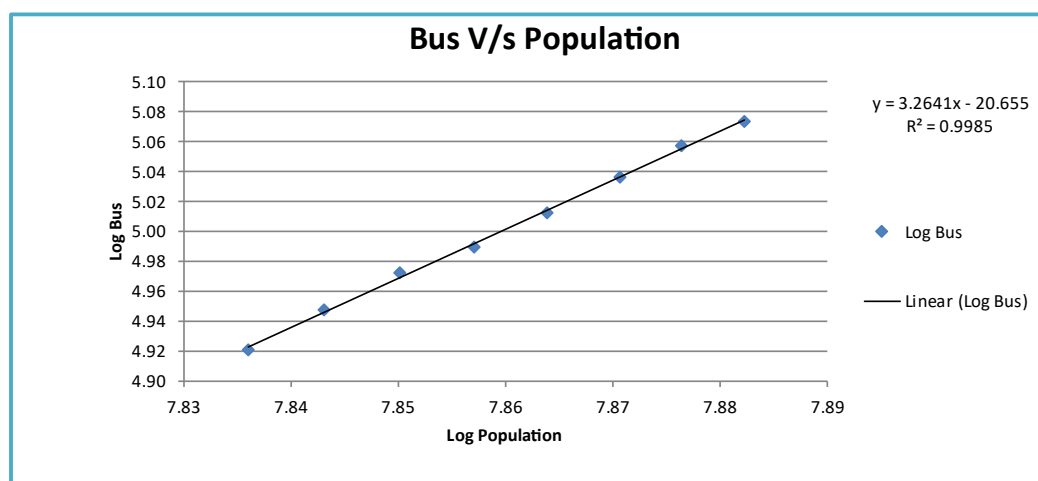


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**

**Table 5-2 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	68548000	83345	7.84	4.92		
2012	69687000	88616	7.84	4.95	2%	
2013	70825000	93892	7.85	4.97	2%	
2014	71963000	97650	7.86	4.99	2%	
2015	73102000	102818	7.86	5.01	2%	
2016	74240000	108680	7.87	5.04	2%	
2017	75248000	113964	7.88	5.06	1%	
2018	76256000	118301	7.88	5.07	1%	1.5%

Regression analysis of same is given in figure below.



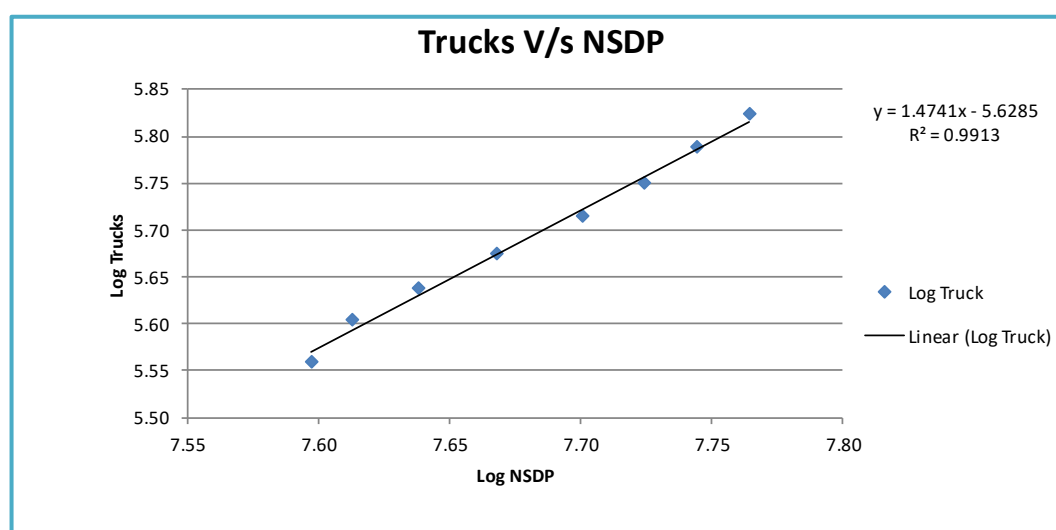
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

Elasticity of LCV has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-3 : Trucks Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NSDP	Log LCV	NSDP Growth	Average Growth
2011	39533093	362028	7.60	5.56		
2012	40980249	401983	7.61	5.60	4%	
2013	43429222	434379	7.64	5.64	6%	
2014	46540773	472365	7.67	5.67	7%	
2015	50192151	517604	7.70	5.71	8%	
2016	52965038	561158	7.72	5.75	6%	
2017	55442912	613055	7.74	5.79	5%	
2018	58059438	665926	7.76	5.82	5%	5.7%

The following figure depicts regression analysis and extrapolation.



**Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.**

Elasticity of Goods Traffic has been worked out by regression analysis with NSDP. The following table represents the data and details.

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-4 : Summary Regression Analysis Rajasthan**

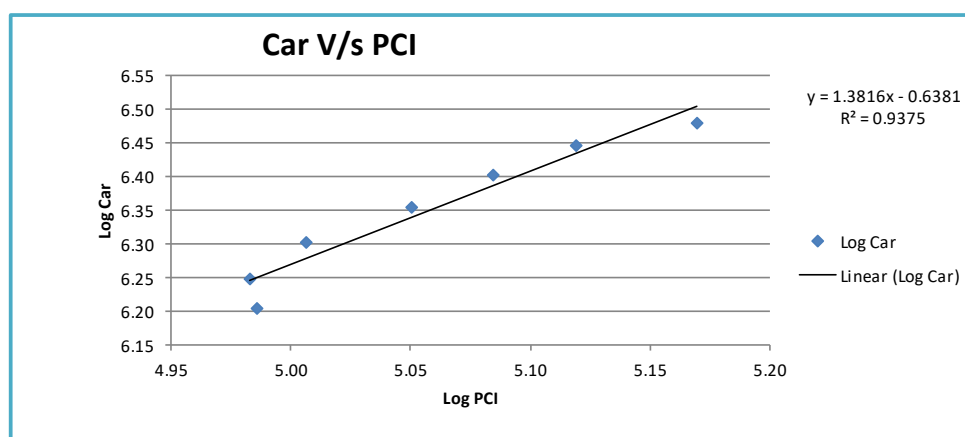
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth	Growth Elastic Model	Remarks
Rajasthan	Car/Jeep	PCI	$y = 2.3328x - 5.312$	$R^2 = 0.9856$	2.3328	4.07%	9.49%	Good Regression
	Bus	Population	$y = 3.2641x - 20.6548$	$R^2 = 0.9985$	3.2641	1.53%	5.01%	Good Regression
	Truck	NSDP	$y = 1.4741x - 5.6285$	$R^2 = 0.9913$	1.4741	5.65%	8.33%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-5 : Per Capita Income Vs Car Gujarat**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2012	96683	1602129	4.99	6.20		
2013	96039	1771298	4.98	6.25	-1%	
2014	101424	2008748	5.01	6.30	6%	
2015	112267	2260084	5.05	6.35	11%	
2016	121512	2527537	5.08	6.40	8%	
2017	131503	2794957	5.12	6.45	8%	
2018	147787	3011656	5.17	6.48	12%	7.4%

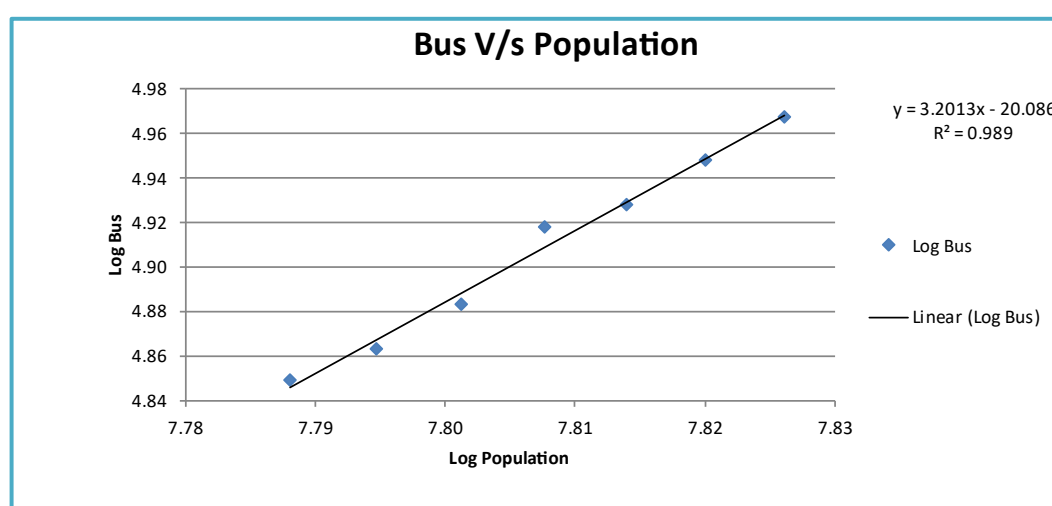
Regression analysis of same is given in figure below.

**Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat**

**Table 5-6 : Population Vs Bus Gujarat**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2012	61383000	70615	7.79	4.85		
2013	62327000	72998	7.79	4.86	2%	
2014	63271000	76435	7.80	4.88	2%	
2015	64214000	82734	7.81	4.92	1%	
2016	65158000	84734	7.81	4.93	1%	
2017	66084000	88734	7.82	4.95	1%	
2018	67010000	92734	7.83	4.97	1%	1.5%

Regression analysis of same is given in figure below.

**Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat**

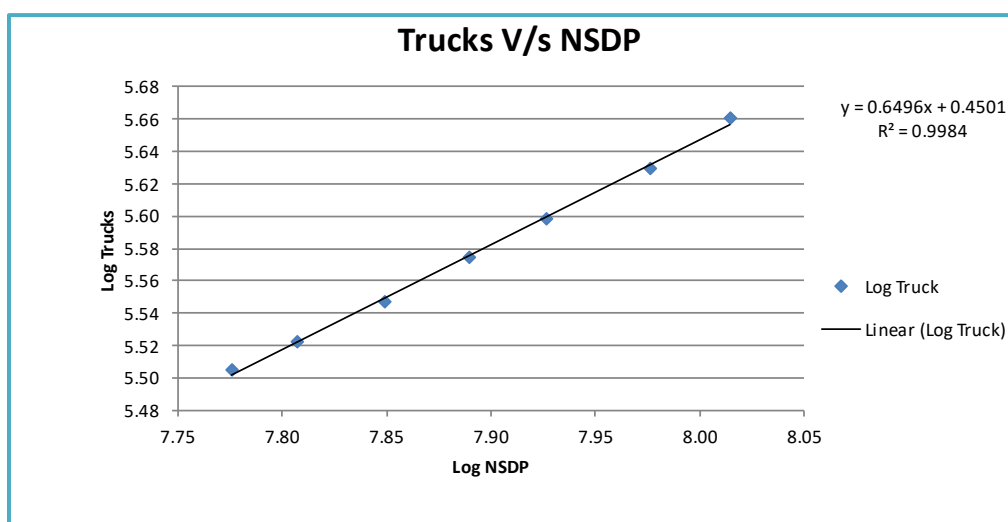
Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-7 : Truck Vs NSDP Gujarat**

Year	NSDP	Trucks	Log NSDP	Log LCV	NSDP Growth	Average Growth
2012	59665883	319207	7.78	5.50		
2013	64148881	332185	7.81	5.52	8%	
2014	70562884	352225	7.85	5.55	10%	
2015	77477522	375265	7.89	5.57	10%	
2016	84393034	396061	7.93	5.60	9%	
2017	94651119	425799	7.98	5.63	12%	

Year	NSDP	Trucks	Log NSDP	Log LCV	NSDP Growth	Average Growth
2018	103439901	457299	8.01	5.66	9%	9.6%

The following figure depicts regression analysis and extrapolation.



**Figure 5-6 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Gujarat.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-8 : Summary Regression Analysis Gujarat**

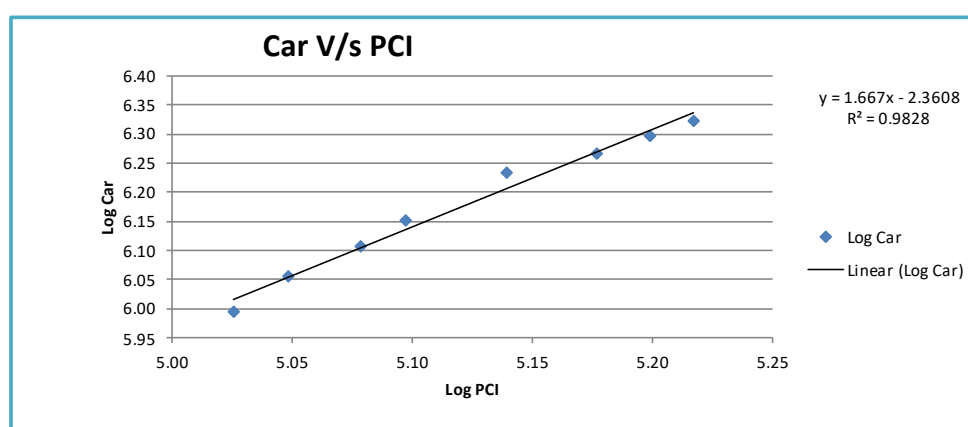
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth	Growth Elastic Model	Remarks
Gujarat	Car/Jeep	PCI	$y = 1.3816x - 0.6381$	$R^2 = 0.9375$	1.4	7%	10.24%	Good Regression
	Bus	Population	$y = 3.2013x - 20.0857$	$R^2 = 0.989$	3.2	1%	4.71%	Good Regression
	Truck	NSDP	$y = 0.6496x - 0.4501$	$R^2 = 0.9984$	0.6	10%	6.24%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Haryana & Punjab State.

**Table 5-9 : Per Capita Income Vs Car Haryana & Punjab**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	106085	989519	5.03	6.00		
2012	111780	1134616	5.05	6.05	5%	
2013	119791	1278272	5.08	6.11	7%	
2014	125032	1420621	5.10	6.15	4%	
2015	137833	1711692	5.14	6.23	10%	
2016	150259	1851788	5.18	6.27	9%	
2017	158039	1976788	5.20	6.30	5%	
2018	164976	2106788	5.22	6.32	4%	6.5%

Regression analysis of same is given in figure below.



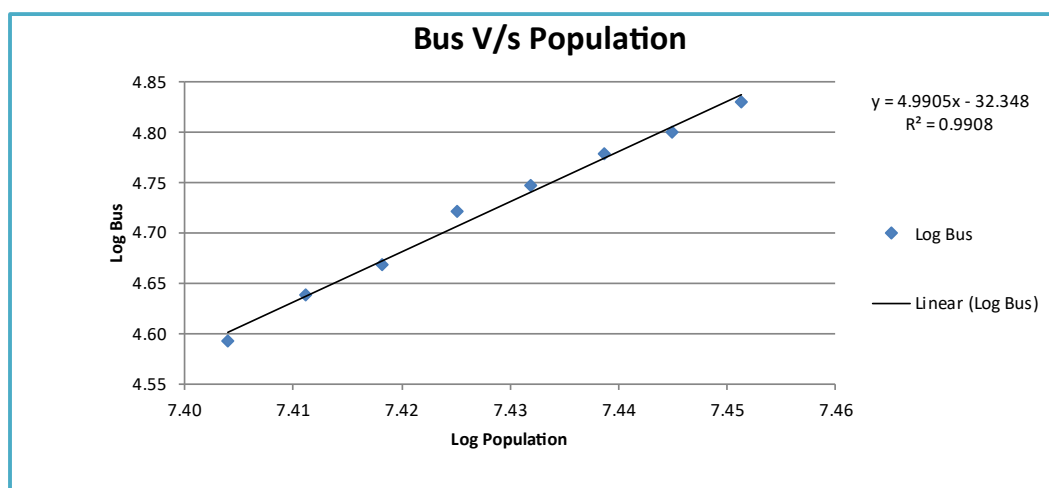
**Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana & Punjab**

**Table 5-10 : Population Vs Bus Haryana & Punjab**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	25351000	39153	7.40	4.59		
2012	25772000	43456	7.41	4.64	2%	
2013	26193000	46558	7.42	4.67	2%	
2014	26614000	52640	7.43	4.72	2%	
2015	27034000	55781	7.43	4.75	2%	
2016	27455000	60129	7.44	4.78	2%	

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2017	27861000	63129	7.44	4.80	1%	
2018	28266000	67629	7.45	4.83	1%	1.6%

Regression analysis of same is given in figure below.



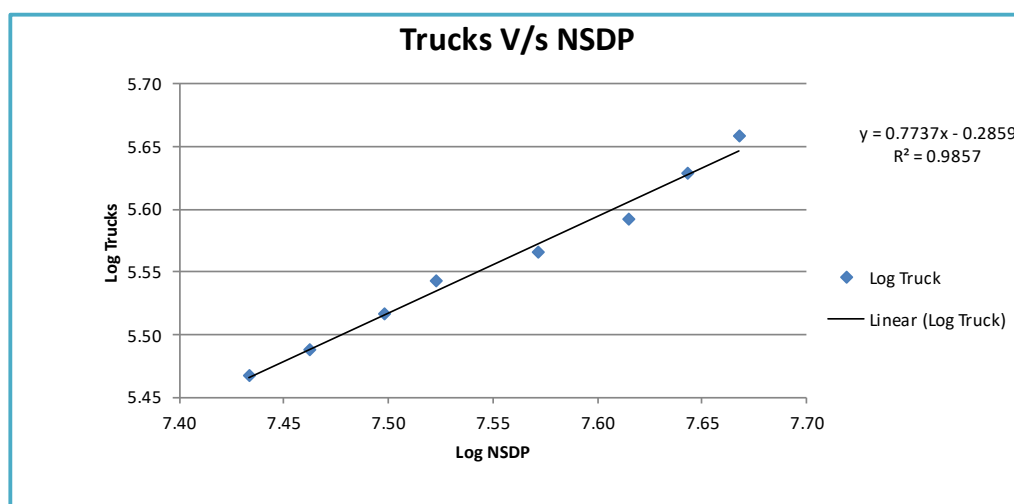
**Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Haryana & Punjab**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-11 : Truck Vs NSDP Haryana & Punjab**

Year	NSDP	Trucks	Log NSDP	Log LCV	NSDP Growth	Average Growth
2011	27115248	292735	7.43	5.47		
2012	28975622	307509	7.46	5.49	7%	
2013	31493120	327882	7.50	5.52	9%	
2014	33335925	348732	7.52	5.54	6%	
2015	37270025	367730	7.57	5.57	12%	
2016	41205461	390321	7.61	5.59	11%	
2017	43952345	425321	7.64	5.63	7%	
2018	46533095	455321	7.67	5.66	6%	8.0%

The following figure depicts regression analysis and extrapolation.



**Figure 5-9 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Haryana & Punjab.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-12 : Summary Regression Analysis Haryana & Punjab**

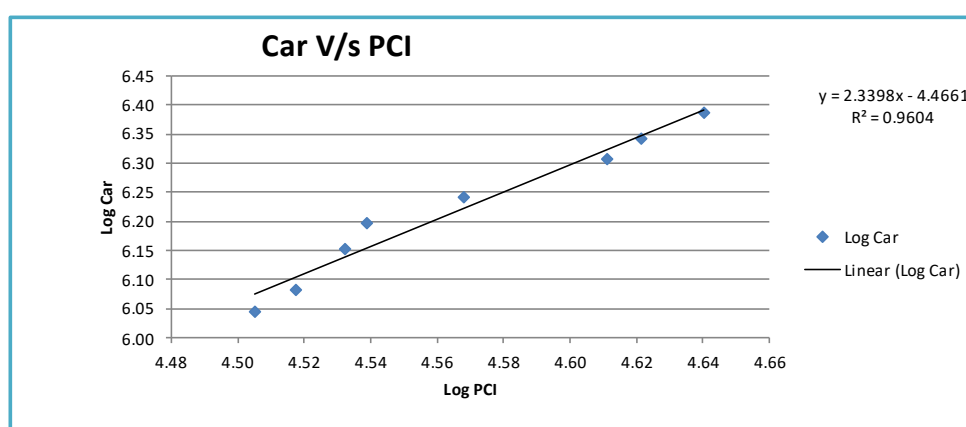
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth	Growth Elastic Model	Remarks
Haryana & Punjab	Car/Jeep	PCI	$y = 1.667x - 2.3608$	$R^2 = 0.9828$	1.6670	6.53%	10.89%	Good Regression
	Bus	Population	$y = 4.9905x - 32.348$	$R^2 = 0.9908$	4.9905	1.57%	7.82%	Good Regression
	Truck	NSDP	$y = 0.7737x - 0.2859$	$R^2 = 0.9857$	0.7737	8.04%	6.22%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Uttar Pradesh State.

**Table 5-13 : Per Capita Income Vs Car Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth
2011	32002	1108100	4.51	6.04		
2012	32908	1205374	4.52	6.08	3%	
2013	34044	1423020	4.53	6.15	3%	
2014	34583	1572217	4.54	6.20	2%	
2015	36973	1746117	4.57	6.24	7%	
2016	40847	2027972	4.61	6.31	10%	
2017	41832	2195783	4.62	6.34	2%	
2018	43670	2439845	4.64	6.39	4%	4.6%

Regression analysis of same is given in figure below.



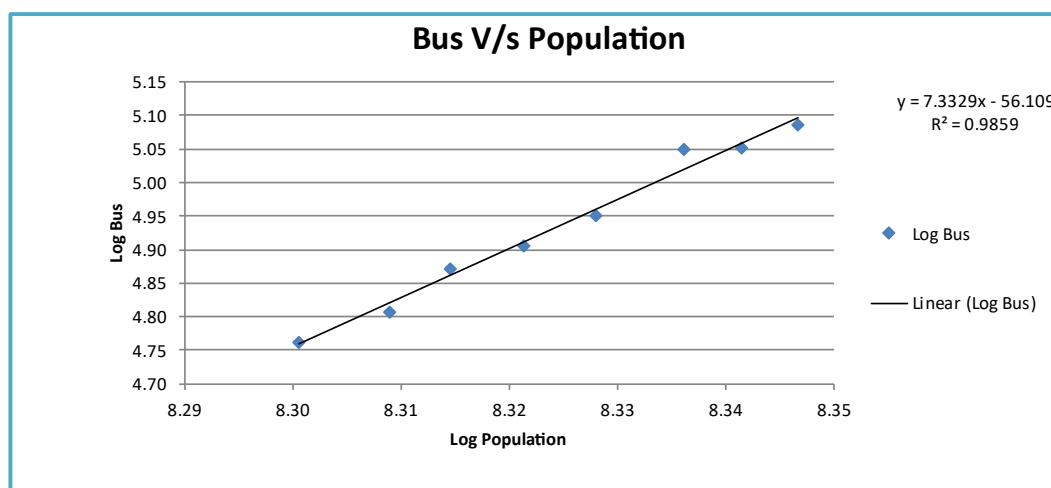
**Figure 5-10 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh**

**Table 5-14 : Population Vs Bus Uttar Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2011	199812000	57901	8.30	4.76		
2012	203670000	64147	8.31	4.81	2%	
2013	206322000	74389	8.31	4.87	1%	
2014	209577000	80460	8.32	4.91	2%	
2015	212832000	89127	8.33	4.95	2%	
2016	216870000	112020	8.34	5.05	2%	

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth
2017	219510000	112766	8.34	5.05	1%	
2018	222150000	121975	8.35	5.09	1%	1.5%

Regression analysis of same is given in figure below.



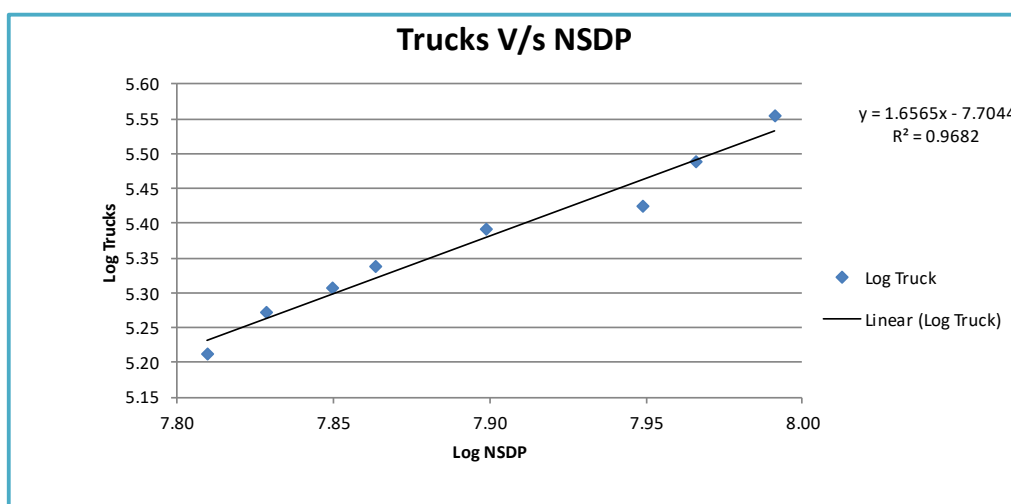
**Figure 5-11 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-15 : Truck Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NSDP	Log LCV	NSDP Growth	Average Growth
2011	64513155	162813	7.81	5.21		
2012	67355218	186404	7.83	5.27	4%	
2013	70746910	202761	7.85	5.31	5%	
2014	72968630	217609	7.86	5.34	3%	
2015	79204874	245688	7.90	5.39	9%	
2016	88845325	265167	7.95	5.42	12%	
2017	92380571	307096	7.97	5.49	4%	
2018	97915937	356828	7.99	5.55	6%	6.2%

The following figure depicts regression analysis and extrapolation.



**Figure 5-12 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Uttar Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-16 : Summary Regression Analysis Uttar Pradesh**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth	Growth Elastic Model	Remarks
Uttar Pradesh	Car/Jeep	PCI	$y = 2.3398x - 4.4661$	$R^2 = 0.9604$	2.3398	4.58%	10.72%	Good Regression
	Bus	Population	$y = 7.3329x - 56.1092$	$R^2 = 0.9859$	7.3329	1.53%	11.19%	Good Regression
	Truck	NSDP	$y = 1.6565x - 7.7044$	$R^2 = 0.9682$	1.6565	6.18%	10.24%	Good Regression

**Table 5-17 : Results of Regression Analysis**

<b>Results of Regression Analysis</b>					
<b>State</b>	<b>Vehicle Category</b>	<b>Independent Variable</b>	<b>Regression Equation</b>	<b>R Square</b>	<b>Elasticity Coefficient</b>
<b>GUJRAT</b>	Car/Jeep	PCI	$y = 1.3816x - 0.6381$	$R^2 = 0.9375$	1.3816
	Bus	Population	$y = 3.2013x - 20.0857$	$R^2 = 0.989$	3.2013
	Truck	NSDP	$y = 0.6496x - 0.4501$	$R^2 = 0.9984$	0.6496
<b>UTTAR PRADESH</b>	Car/Jeep	PCI	$y = 2.3398x - 4.4661$	$R^2 = 0.9604$	2.3398
	Bus	Population	$y = 7.3329x - 56.1092$	$R^2 = 0.9859$	7.3329
	Truck	NSDP	$y = 1.6565x - 7.7044$	$R^2 = 0.9682$	1.6565
<b>RAJASTHAN</b>	Car/Jeep	PCI	$y = 2.3328x - 5.312$	$R^2 = 0.9856$	2.3328
	Bus	Population	$y = 3.2641x - 20.6548$	$R^2 = 0.9985$	3.2641
	Truck	NSDP	$y = 1.4741x - 5.6285$	$R^2 = 0.9913$	1.4741
<b>HARYANA &amp; PUNJAB</b>	Car/Jeep	PCI	$y = 1.667x - 2.3608$	$R^2 = 0.9828$	1.667
	Bus	Population	$y = 4.9905x - 32.348$	$R^2 = 0.9908$	4.9905
	Truck	NSDP	$y = 0.7737x - 0.2859$	$R^2 = 0.9857$	0.7737

The economic model for predicting growth is a good tool, however other local, regional, and national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### **5.4 Analysis of Historic Traffic Data**

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trends of growth. Project stretch of Udaipur to Gujarat on NH-8 is under tolling operation with current concessionaire and has three years of tolling history from 2017-18 (Part year). As traffic data available with the project concessionaire is of less than three years, we do not have sufficient data points to be able to establish a reliable past trend of traffic growth. A minimum of about 5 -6 years' traffic data is required for establishing a reliable past trend.

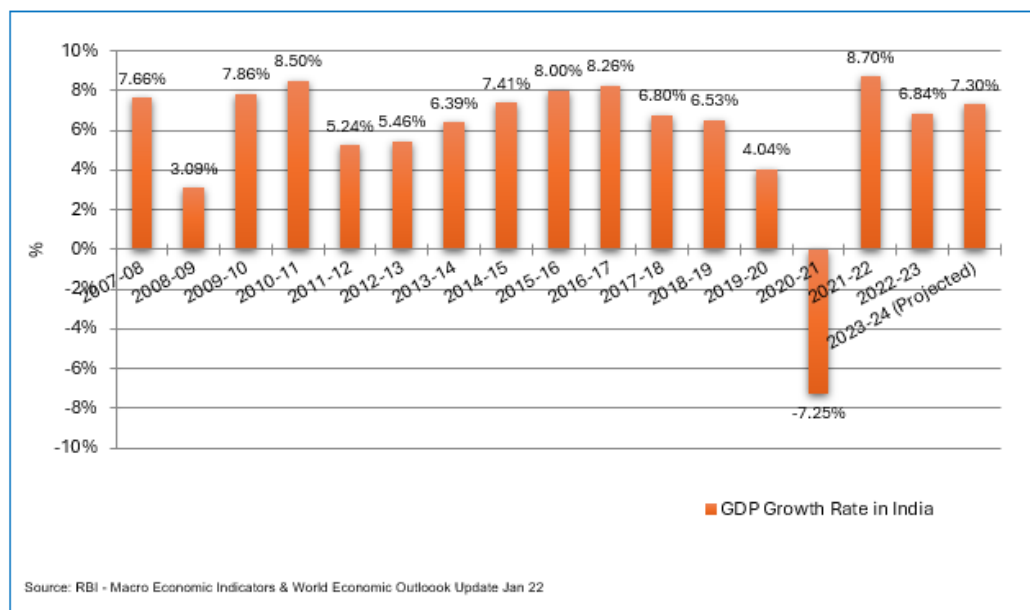
#### **5.5 Other Factors Influencing Growth**

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

## ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-13 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. The World Economic Outlook update also has predicted a growth rate of about 7.5 % in the year 2022-23. Recommended Growth Rates of Traffic

### 5.5.1 Recommended Growth Rates of Traffic for Project Stretch

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as below. The rate of growth is moderate in light of overall regional trends. Growth of multi-Axle is kept slightly higher as trend of technological advances in logistic industry favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, the rate of growth diminishes. The same growth rate is not sustainable for long. Traffic growth is suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic, Pessimistic** and **Most Likely** with a positive and negative variation 0.5% from Most Likely case for corridor in both states.

**Table 5-18 : Recommended Growth Rates Optimistic**

Category / Year	FY24 - FY28	FY29 - FY33	FY34 - FY38	FY39- FY43	FY44 - FY48	FY49 - FY53
Car/Jeep/Van	8.06%	7.16%	6.13%	5.57%	5.57%	5.57%
Mini LCV	3.30%	3.22%	2.85%	2.25%	2.25%	2.25%
Bus	3.29%	2.84%	2.41%	2.21%	2.21%	2.21%
Minibus	3.29%	2.84%	2.41%	2.23%	2.23%	2.23%
LCV	3.30%	2.91%	2.59%	2.25%	2.25%	2.25%
2- Axle	2.83%	2.45%	2.19%	2.06%	2.06%	2.06%
3 - Axle	7.06%	6.28%	5.45%	4.81%	4.81%	4.81%
4 to6 Axle	7.86%	6.93%	6.00%	5.43%	5.43%	5.43%
7 and Above Axle	7.06%	6.28%	5.45%	4.81%	4.81%	4.81%

**Table 5-19 : Recommended Growth Rates Pessimistic**

Category / Year	FY24 - FY28	FY29 - FY33	FY34 - FY38	FY39- FY43	FY44 - FY48	FY49 - FY53
Car/Jeep/Van	7.56%	6.66%	5.63%	5.07%	5.07%	5.07%
Mini LCV	2.80%	2.72%	2.35%	1.75%	1.75%	1.75%
Bus	2.79%	2.34%	1.91%	1.71%	1.71%	1.71%
Minibus	2.79%	2.34%	1.91%	1.73%	1.73%	1.73%
LCV	2.80%	2.41%	2.09%	1.75%	1.75%	1.75%
2- Axle	2.33%	1.95%	1.69%	1.56%	1.56%	1.56%
3 - Axle	6.56%	5.78%	4.95%	4.31%	4.31%	4.31%
4 to6 Axle	7.36%	6.43%	5.50%	4.93%	4.93%	4.93%
7 and Above Axle	6.56%	5.78%	4.95%	4.31%	4.31%	4.31%

**Table 5-20 : Recommended Growth Rates Most Likely**

Category / Year	FY24 - FY28	FY29 - FY33	FY34 - FY38	FY39- FY43	FY44 - FY48	FY49 - FY53
Car/Jeep/Van	7.81%	6.91%	5.88%	5.32%	5.32%	5.32%
Mini LCV	3.05%	2.97%	2.60%	2.00%	2.00%	2.00%
Bus	3.04%	2.59%	2.16%	1.96%	1.96%	1.96%
Minibus	3.04%	2.59%	2.16%	1.98%	1.98%	1.98%
LCV	3.05%	2.66%	2.34%	2.00%	2.00%	2.00%
2- Axle	2.58%	2.20%	1.94%	1.81%	1.81%	1.81%
3 - Axle	6.81%	6.03%	5.20%	4.56%	4.56%	4.56%

Category / Year	FY24 - FY28	FY29 - FY33	FY34 - FY38	FY39- FY43	FY44 - FY48	FY49 - FY53
<b>4 to6 Axle</b>	7.61%	6.68%	5.75%	5.18%	5.18%	5.18%
<b>7 and Above Axle</b>	6.81%	6.03%	5.20%	4.56%	4.56%	4.56%

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza – Chainage 394+200 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1682	91	226	291	223	7453	11	9977	37627
2025-26	1818	94	234	300	238	8039	12	10735	40505
2026-27	1965	97	242	309	254	8671	13	11551	43604
2027-28	2123	100	250	318	272	9352	14	12429	46940
2028-29	2275	103	257	326	289	10001	15	13266	50118
2029-30	2437	106	264	334	307	10694	16	14158	53506
2030-31	2611	109	272	343	326	11436	17	15114	57136
2031-32	2797	112	280	352	346	12228	18	16133	61006
2032-33	2997	115	288	361	368	13076	19	17224	65148
2033-34	3180	118	295	369	388	13860	20	18230	68973
2034-35	3357	121	302	377	407	14613	21	19198	72650
2035-36	3543	124	309	385	426	15405	22	20214	76511
2036-37	3740	127	316	393	446	16241	23	21286	80584
2037-38	3948	130	323	401	467	17122	24	22415	84873
2038-39	4168	133	330	410	490	18051	25	23607	89400
2039-40	4400	136	337	419	514	19031	26	24863	94171
2040-41	4645	139	345	428	538	20064	27	26186	99196
2041-42	4904	142	353	437	563	21152	28	27579	104486
2042-43	5177	145	361	446	590	22300	29	29048	110066
2043-44	5465	148	369	455	618	23511	30	30596	115948
2044-45	5769	151	377	464	647	24786	31	32225	122136
2045-46	6090	154	385	473	677	26131	32	33942	128660

**Table 6-2 : Total Tollable Traffic @ Toll Plaza - Chainage 394+200 KM**  
(Pessimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1682	91	226	291	223	7453	11	9977	37627

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2025-26	1810	94	233	299	237	8002	12	10687	40321
2026-27	1946	97	240	307	252	8591	13	11446	43207
2027-28	2093	100	247	315	268	9224	14	12261	46304
2028-29	2232	103	253	321	283	9816	15	13023	49197
2029-30	2380	106	259	327	299	10448	16	13835	52282
2030-31	2539	109	265	333	317	11119	17	14699	55560
2031-32	2708	112	272	339	335	11834	18	15618	59048
2032-33	2888	115	279	346	354	12594	19	16595	62756
2033-34	3050	118	285	352	372	13287	20	17484	66136
2034-35	3204	120	290	358	388	13941	21	18322	69321
2035-36	3366	122	295	364	404	14627	22	19200	72659
2036-37	3537	124	300	370	422	15348	23	20124	76169
2037-38	3716	126	306	376	440	16104	24	21092	79847
2038-39	3904	128	312	382	459	16897	25	22107	83704
2039-40	4102	130	318	388	479	17730	26	23173	87754
2040-41	4309	132	324	394	499	18604	27	24289	91998
2041-42	4527	134	330	400	520	19520	28	25459	96444
2042-43	4756	136	336	406	543	20481	29	26687	101110
2043-44	4997	138	342	412	566	21491	30	27976	106009
2044-45	5250	140	348	418	590	22550	31	29327	111143
2045-46	5516	142	354	424	615	23661	32	30744	116527

Traffic projections for Most Likely scenario is given as under

**Table 6-3 : Total Tollable Traffic @ Toll Plaza - Chainage 394+200 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1682	91	226	291	223	7453	11	9977	37627
2025-26	1815	94	233	299	238	8020	12	10711	40410
2026-27	1956	97	240	307	254	8629	13	11496	43394
2027-28	2109	100	248	315	272	9285	14	12343	46610
2028-29	2254	103	255	323	288	9905	15	13143	49647
2029-30	2410	106	262	331	306	10568	16	13999	52894
2030-31	2576	109	269	339	324	11274	17	14908	56345
2031-32	2753	112	276	347	343	12028	18	15877	60026
2032-33	2943	115	283	355	363	12832	19	16910	63948
2033-34	3116	118	289	363	382	13570	20	17858	67550
2034-35	3281	120	295	370	400	14272	21	18759	70975
2035-36	3455	122	301	378	418	15011	22	19707	74578
2036-37	3638	125	307	386	437	15788	23	20704	78365
2037-38	3832	128	313	394	457	16605	24	21753	82347
2038-39	4035	131	319	402	477	17465	25	22854	86531
2039-40	4250	134	326	410	499	18369	26	24014	90934
2040-41	4476	137	333	418	522	19320	27	25233	95562
2041-42	4714	140	340	426	546	20320	28	26514	100426
2042-43	4964	143	347	434	571	21372	29	27860	105539
2043-44	5228	146	354	442	596	22478	30	29274	110909
2044-45	5505	149	361	450	623	23642	31	30761	116559

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2045-46	5797	152	368	458	651	24866	32	32324	122497

## 6.2 Modification in Concession Period

Modification in concession period due to variation in traffic is worked out as per procedure given in RFP. There are three milestones for traffic testing in the years 2028, 2033 and 2038. The working of modification in concession period is given as under for all scenarios.

- Appointed date – 28<sup>th</sup> December 2023
- Concession Period (Days) – 7300 (For 20 Years)
- Hence, Original Concession end date is – 23<sup>rd</sup> December 2043

### *Pessimistic Case*

Sr. No	Target Date	Target Traffic	Actual Traffic	Variation in CP as per CA %	Change in CP (Days)	Total Variation in CP Years
1	01-Oct-28	58741	49197	11.25%	625	<b>1.7</b>
2	01-Oct-33	66539	66136	0.00%	0	
3	01-Oct-38	84919	83704	0.00%	0	

### *Optimistic Case*

Sr. No	Target Date	Target Traffic	Actual Traffic	Variation in CP as per CA %	Change in CP (Days)	Total Variation in CP Years
1	01-Oct-28	58741	50118	9.68%	538	<b>1.5</b>
2	01-Oct-33	67713	68973	0.00%	0	
3	01-Oct-38	86419	89400	0.00%	0	

***Most Likely Case***

Sr. No	Target Date	Target Traffic	Actual Traffic	Variation in CP as per CA %	Change in CP (Days)	Total Variation in CP Years
1	01-Oct-28	58741	49647	10.48%	583	<b>1.6</b>
2	01-Oct-33	67112	67550	0.00%	0	
3	01-Oct-38	85651	86531	0.00%	0	

Hence a positive variation of about **625 days** in concession period is expected as per traffic projections in *Pessimistic case*.

**538 days** in concession period is expected as per traffic projections in *Optimistic case* and **583 days** in concession period is expected as per traffic projections in *Most likely case*.

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

The fee schedule in the CA of Udaipur- Gujarat Border section of NH-8 is based on the old toll policy. As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

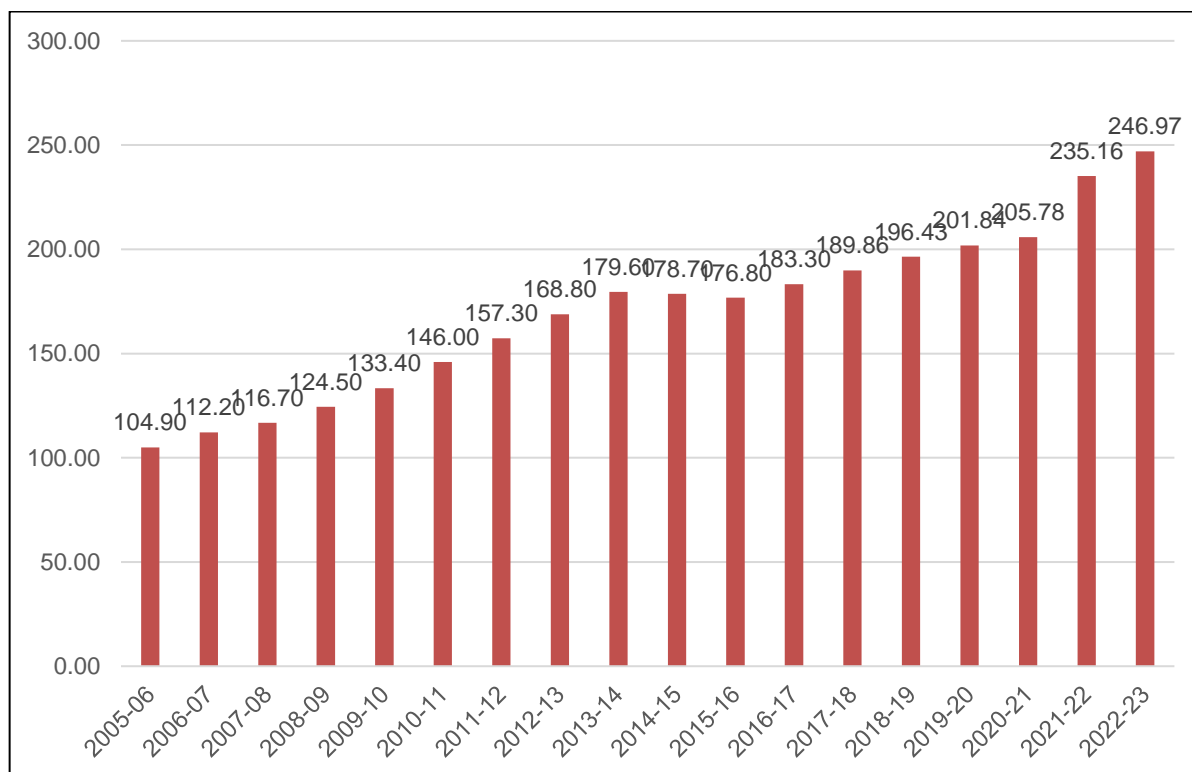
1. Monthly Pass: For frequent user's monthly pass would be issued at fee 30 time the single journey fee.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travelers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van I - Rs. 275 per month
  - b) Other local Commercial at 50% of the regular single journey toll fee

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2018-19. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it takes 5% and Suitably Stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45
Oversized Vehicles (7 or more Axles)	4.20

There is no bypass or structure to be factored in for rates calculations.

Toll rates are calculated as per guidelines provided in schedule R (rounded to nearest Rs.) for the concession period and are given below.

Thus, worked out rates for various categories of vehicle and discounts are given as under

**Table 7-2 : Toll Rates for Single Journey @ Km TP-394+200 KM**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	100	160	335	335	365	520	635
2025-26	100	160	335	335	365	520	635
2026-27	150	245	510	510	555	795	970
2027-28	150	245	510	510	555	795	970
2028-29	160	255	535	535	580	835	1020
2029-30	165	270	560	560	610	880	1070
2030-31	175	280	590	590	645	925	1125
2031-32	185	295	620	620	675	975	1185
2032-33	195	310	650	650	710	1025	1245
2033-34	205	325	685	685	750	1075	1310
2034-35	215	345	720	720	785	1130	1380
2035-36	225	365	760	760	830	1190	1450
2036-37	235	380	800	800	870	1255	1525
2037-38	250	400	840	840	920	1320	1605
2038-39	260	425	885	885	965	1390	1690
2039-40	275	445	935	935	1020	1465	1780
2040-41	290	470	985	985	1075	1540	1880
2041-42	305	495	1035	1035	1130	1625	1980
2042-43	325	520	1090	1090	1190	1715	2085
2043-44	340	550	1150	1150	1255	1805	2200
2044-45	360	580	1215	1215	1325	1905	2315
2045-46	380	610	1280	1280	1395	2005	2445

**Table 7-3 : Toll Rates for Return Journey @ TP-394+200 KM**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	150	245	510	510	560	805	975
2025-26	150	245	510	510	560	805	975
2026-27	225	365	760	760	830	1195	1455
2027-28	225	365	760	760	830	1195	1455
2028-29	235	380	800	800	875	1255	1530
2029-30	250	400	840	840	920	1320	1605
2030-31	260	420	885	885	965	1390	1690
2031-32	275	445	930	930	1015	1460	1775
2032-33	290	465	980	980	1065	1535	1870
2033-34	305	490	1030	1030	1125	1615	1965
2034-35	320	515	1085	1085	1180	1700	2065
2035-36	335	545	1140	1140	1245	1785	2175
2036-37	355	570	1200	1200	1310	1880	2290
2037-38	375	605	1265	1265	1375	1980	2410

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2038-39	395	635	1330	1330	1450	2085	2540
2039-40	415	670	1400	1400	1530	2195	2675
2040-41	435	705	1475	1475	1610	2315	2815
2041-42	460	740	1555	1555	1695	2440	2970
2042-43	485	780	1640	1640	1785	2570	3125
2043-44	510	825	1725	1725	1885	2710	3295
2044-45	540	870	1820	1820	1985	2855	3475
2045-46	565	915	1920	1920	2095	3010	3665

**Table 7-4 : Toll Rates for Monthly Pass Local @ TP-394+200 KM**

Year	Car
2024-25	330
2025-26	375
2026-27	375
2027-28	390
2028-29	410
2029-30	435
2030-31	455
2031-32	480
2032-33	505
2033-34	530
2034-35	560
2035-36	585
2036-37	620
2037-38	650
2038-39	685
2039-40	720
2040-41	760
2041-42	800
2042-43	845
2043-44	890
2044-45	940
2045-46	990

**Table 7-5 : Toll Rates for Monthly Pass @ TP-394+200 KM**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2024-25	3280	5300	11105	11105	12115	17410	21200
2025-26	3280	5300	11105	11105	12115	17410	21200
2026-27	5005	8085	16940	16940	18480	26565	32335
2027-28	5005	8085	16940	16940	18480	26565	32335
2028-29	5260	8495	17800	17800	19415	27910	33980
2029-30	5525	8930	18705	18705	20405	29335	35710
2030-31	5810	9385	19665	19665	21450	30835	37540
2031-32	6110	9865	20675	20675	22555	32420	39470
2032-33	6425	10375	21745	21745	23720	34095	41510

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2033-34	6755	10915	22870	22870	24950	35865	43660
2034-35	7110	11485	24060	24060	26250	37735	45935
2035-36	7480	12085	25320	25320	27625	39710	48340
2036-37	7875	12720	26650	26650	29075	41795	50880
2037-38	8290	13390	28060	28060	30610	44000	53565
2038-39	8730	14100	29545	29545	32235	46335	56405
2039-40	9195	14850	31120	31120	33950	48800	59410
2040-41	9685	15645	32785	32785	35765	51410	62585
2041-42	10205	16485	34545	34545	37685	54170	65945
2042-43	10755	17375	36405	36405	39715	57090	69500
2043-44	11335	18315	38375	38375	41860	60175	73260
2044-45	11955	19310	40455	40455	44135	63445	77235
2045-46	12605	20360	42660	42660	46540	66900	81445

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2044-45 years starting from the year 2024-25 are shown in tables below.

**Table 7-6 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Location / Year	Makhel Toll	Total
2024-25	153.13	153.13
2025-26	187.16	187.16
2026-27	270.71	270.71
2027-28	307.08	307.08
2028-29	344.38	344.38
2029-30	386.71	386.71
2030-31	435.20	435.20
2031-32	490.01	490.01
2032-33	547.66	547.66
2033-34	609.56	609.56
2034-35	676.05	676.05
2035-36	752.71	752.71
2036-37	832.16	832.16
2037-38	922.72	922.72
2038-39	1024.55	1024.55
2039-40	1138.03	1138.03

Location / Year	Makhel Toll	Total
<b>2040-41</b>	1261.37	<b>1261.37</b>
<b>2041-42</b>	1402.48	<b>1402.48</b>
<b>2042-43</b>	1555.06	<b>1555.06</b>
<b>2043-44</b>	1733.82	<b>1733.82</b>
<b>2044-45</b>	1917.59	<b>1917.59</b>
<b>2045-46</b>	2131.14	<b>2131.14</b>

**Table 7-7 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Location / Year	Makhel Toll	Total
<b>2024-25</b>	153.13	<b>153.13</b>
<b>2025-26</b>	186.34	<b>186.34</b>
<b>2026-27</b>	268.27	<b>268.27</b>
<b>2027-28</b>	302.97	<b>302.97</b>
<b>2028-29</b>	338.22	<b>338.22</b>
<b>2029-30</b>	378.08	<b>378.08</b>
<b>2030-31</b>	423.50	<b>423.50</b>
<b>2031-32</b>	474.64	<b>474.64</b>
<b>2032-33</b>	528.00	<b>528.00</b>
<b>2033-34</b>	584.96	<b>584.96</b>
<b>2034-35</b>	645.64	<b>645.64</b>
<b>2035-36</b>	715.48	<b>715.48</b>
<b>2036-37</b>	787.21	<b>787.21</b>
<b>2037-38</b>	868.73	<b>868.73</b>
<b>2038-39</b>	959.95	<b>959.95</b>
<b>2039-40</b>	1061.28	<b>1061.28</b>
<b>2040-41</b>	1170.63	<b>1170.63</b>
<b>2041-42</b>	1295.34	<b>1295.34</b>
<b>2042-43</b>	1429.41	<b>1429.41</b>
<b>2043-44</b>	1586.11	<b>1586.11</b>
<b>2044-45</b>	1745.96	<b>1745.96</b>
<b>2045-46</b>	1931.34	<b>1931.34</b>

**Table 7-8 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

Location / Year	Makhel Toll	Total
<b>2024-25</b>	153.13	<b>153.13</b>
<b>2025-26</b>	186.77	<b>186.77</b>
<b>2026-27</b>	269.49	<b>269.49</b>
<b>2027-28</b>	305.02	<b>305.02</b>
<b>2028-29</b>	341.33	<b>341.33</b>
<b>2029-30</b>	382.47	<b>382.47</b>

Location / Year	Makhel Toll	Total
<b>2030-31</b>	429.38	<b>429.38</b>
<b>2031-32</b>	482.35	<b>482.35</b>
<b>2032-33</b>	537.88	<b>537.88</b>
<b>2033-34</b>	597.28	<b>597.28</b>
<b>2034-35</b>	660.80	<b>660.80</b>
<b>2035-36</b>	734.02	<b>734.02</b>
<b>2036-37</b>	809.62	<b>809.62</b>
<b>2037-38</b>	895.67	<b>895.67</b>
<b>2038-39</b>	992.10	<b>992.10</b>
<b>2039-40</b>	1099.40	<b>1099.40</b>
<b>2040-41</b>	1215.56	<b>1215.56</b>
<b>2041-42</b>	1348.43	<b>1348.43</b>
<b>2042-43</b>	1491.70	<b>1491.70</b>
<b>2043-44</b>	1659.26	<b>1659.26</b>
<b>2044-45</b>	1830.73	<b>1830.73</b>
<b>2045-46</b>	2029.75	<b>2029.75</b>

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Samakhiali to Santalpur of NH-27 in state of Gujarat is a four-lane national highway which is being upgraded to six lanes. Project corridor is main feeder road from North India and other parts of Gujarat and Rajasthan to major ports of Kandla and Mundra. Due to this there is considerable volume of heavy commercial vehicles on stretch. Jamnagar – Amrtisar Expressway would also add good value to project traffic as will provide faster connectivity to north India to Jamnagar refinery and also to Mundra and Kandla port. Morbi tile Industry is also a good contributor to traffic of project road. As Indian economy is poised to grow at good rate, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give a positive impact to traffic flow on the project. The following can be considered as major outcomes of the study.

- a) There is a good amount of tollable traffic running on the project.
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy.
- c) The Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road.

Based on the above it can be considered a stable healthy project from the traffic and revenue point of view.



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**FOUR LANE LALITPUR- SAGAR- LAKHNADON SECTION (FROM KM  
99+005 TO KM 415+089) OF NH-44 (OLD NH-26) IN THE STATES OF  
UTTAR PRADESH & MADHYA PRADESH  
(TOT BUNDLE-12)**



**OCTOBER 2024**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**



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**FOUR LANE LALITPUR- SAGAR- LAKHNADON SECTION (FROM  
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**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

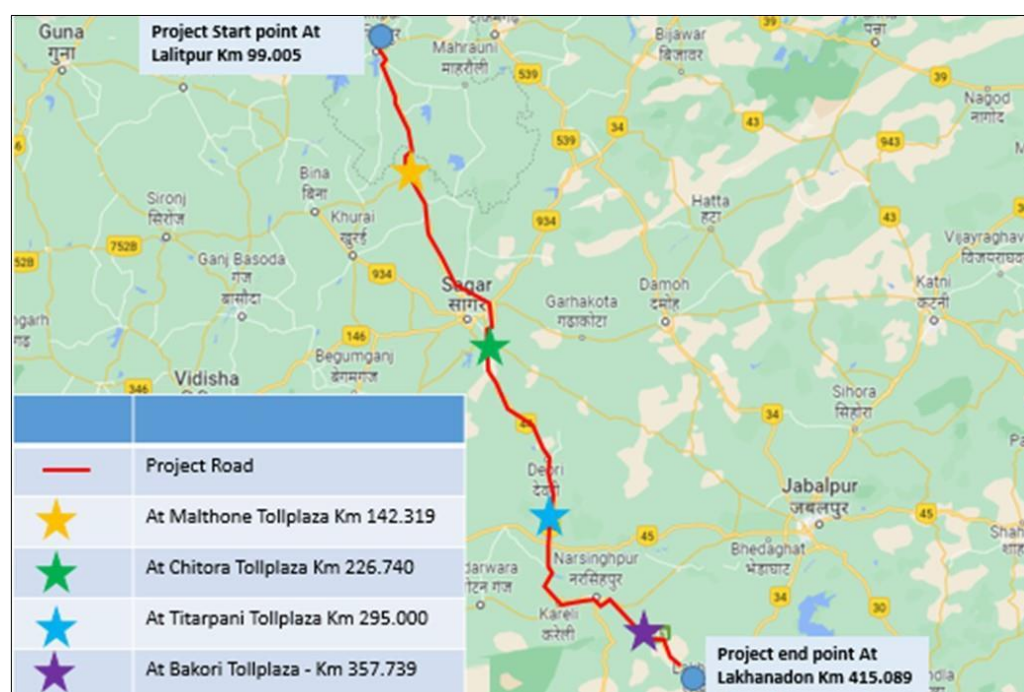
## INTRODUCTION

### 1.1 Background

The National Highways Authority of India (NHAI) introduced the Toll, Operate and Transfer (TOT) model for partnership with private developers in the road sector. Under this model, NHAI passes on the toll collection rights and operation and maintenance obligations for 20 years to the private developer against payment of upfront, one-time, lump sum concession fees quoted by the private developer as part of the comprehensive bidding process. Projects under this model are awarded as a bundle of operational national highways, which allows the investor to offset the risks of one project against another. Since existing and operational roads are auctioned under the TOT model.

Under the Toll Operate and Transfer (ToT) 12 bundle, NHAI had invited tenders for selection of concessionaire for maintenance of the National Highway stretch Lalitpur-Sagar-Lakhanadon from Km 99.00 to Km 415.089 section of NH-44 (old NH26).

M/s. IRB Infrastructure Developers Limited., has been declared as the selected bidder for the project. This report is for ToT bundle 12 “Lalitpur-Sagar- Lakhanadon from Km 99.00 to Km 415.089 section of NH-44 spanning in the states of Uttar Pradesh and Madhya Pradesh. Project Highway alignment is depicted in the following figure.



**Figure 1-1: Project Stretch of TOT Bundle 12**

## 1.2 Objective of the Study

M/s IRB Infrastructure Developers Limited (IRB) intends to develop a traffic study report for Four Laning of Lalitpur-Sagar- Lakhnadon from Km 99.00 to Km 415.089 section of NH-44 on BOT basis. GMD Consultants have been assigned the work of conducting traffic study and developing revenue model based on traffic projections and forecast.

The year 2024-25 has been taken as the base year for projections and forecasting of traffic in the horizon year. This report fulfils part of the requirement of the assignment.

## 1.3 Scope of Services

The following may be referred to as broad scope of Traffic Study of Four Laning of Lalitpur-Sagar- Lakhnadon from Km 99.00 to Km 415.089 section of NH-44.

- Classified Traffic Volume Count at main toll plaza location at Toll Plaza locations. This data was supplied by the Concessionaire.
- Establishment of traffic pattern
- Working out traffic demand elasticity and growth
- Traffic forecast up to concession period.
- Preparation of revenue model up to concession period
- Any other analysis relevant to scope

## CHAPTER 2

### PROJECT DETAILS

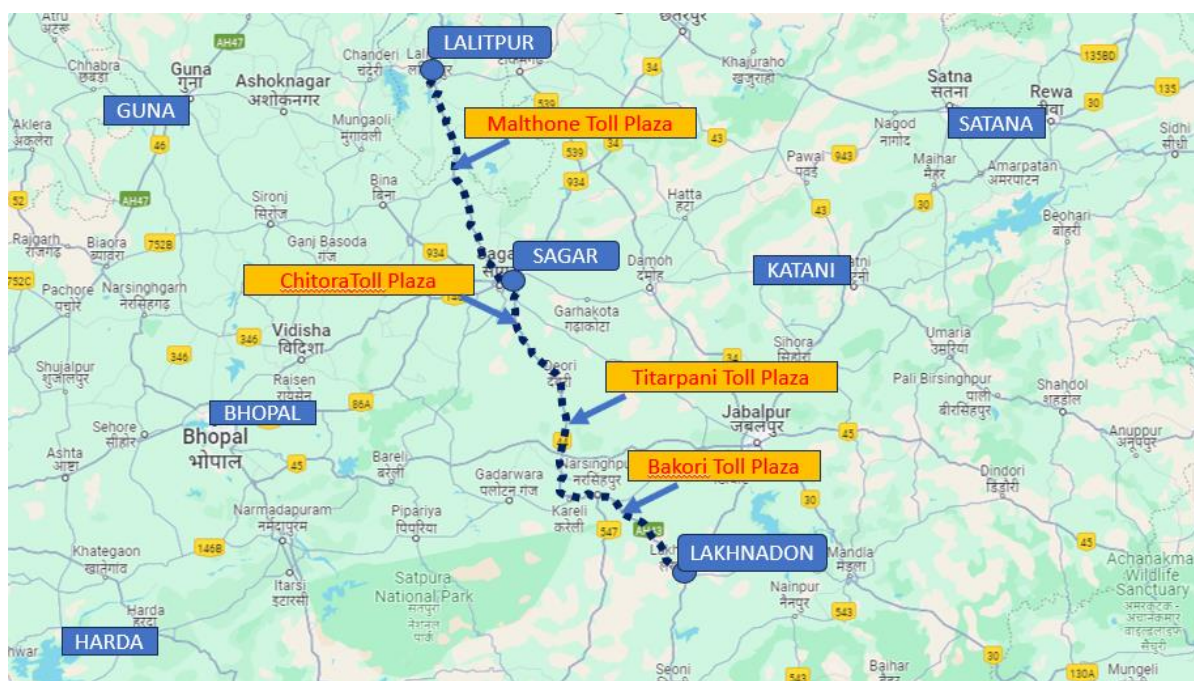
#### 2.1 Project Corridor

The project stretch is a section of NH-44, which is the longest National Highway in the country, running through North, Central and South India. It starts from Jammu & Kashmir and passes through the states of Punjab, Haryana, Delhi, Uttar Pradesh, Rajasthan, Madhya Pradesh, Maharashtra, Telangana, Andhra Pradesh, Karnataka and Tamil Nadu.

#### Project Stretch Description

The project stretch under this study starts from km 99.005 of NH-44 at Lalitpur in the state of Uttar Pradesh and ends at km 415.089 of NH-44 at Lakhnadon in the state of Madhya Pradesh. The length of project stretch is 316.084 km and has 4-lane configuration with four number of Toll Plazas (Malthone at ch.142+319, Chitora at Ch. 226+740, Titarpani at 295+000 and Bakori (Bachai at ch.357+739).

The following figure shows this the alignment of the project highway in the above context.



**Figure 2-1 : Project Alignment with Toll Plaza**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Lalitpur – Sagar - Lakhnadon section of NH-44- Provided by Concessionaire for base year 2024-25 (traffic data from April 2024 to July 2024).
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project
- Establish base year traffic
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

*Table 3-1* below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	<b>Km 142.319 Toll Plaza at Malthone</b>	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)
2	<b>Km 226.740 Toll Plaza at Chitora</b>	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)
3	<b>Km 295.000 Toll Plaza at Titarpani</b>	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)	AADT from previous traffic study report for year 2024-25 (Four month from April 2024 to July 2024)
4	<b>Km 357.739 Toll Plaza at Bakori</b>	AADT from previous traffic study report for year 2024-25	AADT from previous traffic study report for year	AADT from previous traffic study report for	AADT from previous traffic study report for year	AADT from previous traffic study report for year

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		(Four month from April 2024 to July 2024)	2024-25 (Four month from April 2024 to July 2024)	year 2024-25 (Four month from April 2024 to July 2024)	2024-25 (Four month from April 2024 to July 2024)	2024-25 (Four month from April 2024 to July 2024)

All toll plazas are located in Madhya Pradesh.

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations-based traffic survey done at project stretch.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in table below .

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Bus
- Truck /
- 3 Axle commercial vehicle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data as per traffic survey conducted at toll plaza locations. It may not represent the whole year traffic as this pertains to specific period only. Hence a seasonality factor has been applied to average traffic of current period to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations.

Following table shows Annual Average Daily Traffic (AADT) for Base year 2024-25 as considered.

**Table 3-3 : Traffic Data at Malthone Toll Plaza at Km 142.319**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
1	Car	1439
2	Minibus /LCV	266
3	Bus	115
4	Truck	1262
5	3-Axle Commercial vehicle	1322
6	Multi axle	1573

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
7	Oversize Vehicle	4
	<b>Total</b>	<b>5981</b>

**Table 3-4 : Traffic Data at Chitora Toll Plaza at Km 226.740**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
1	Car	1631
2	Minibus /LCV	426
3	Bus	100
4	Truck	1456
5	3-Axle Commercial vehicle	1433
6	Multi axle	1867
7	Oversize Vehicle	5
	<b>Total</b>	<b>6918</b>

**Table 3-5 : Traffic Data at Titarpani Toll Plaza at Km 295.000**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
1	Car	1715
2	Minibus /LCV	384
3	Bus	104

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
4	Truck	1503
5	3-Axle Commercial vehicle	1532
6	Multi axle	2293
7	Oversize Vehicle	6
	<b>Total</b>	<b>7537</b>

**Table 3-6 : Traffic Data at Bakori Toll Plaza at Km 357.739**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
1	Car	973
2	Minibus /LCV	331
3	Bus	87
4	Truck	1302
5	3-Axle Commercial vehicle	1284
6	Multi axle	1649
7	Oversize Vehicle	5
	<b>Total</b>	<b>5631</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 3-7.

**Table 3-7 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

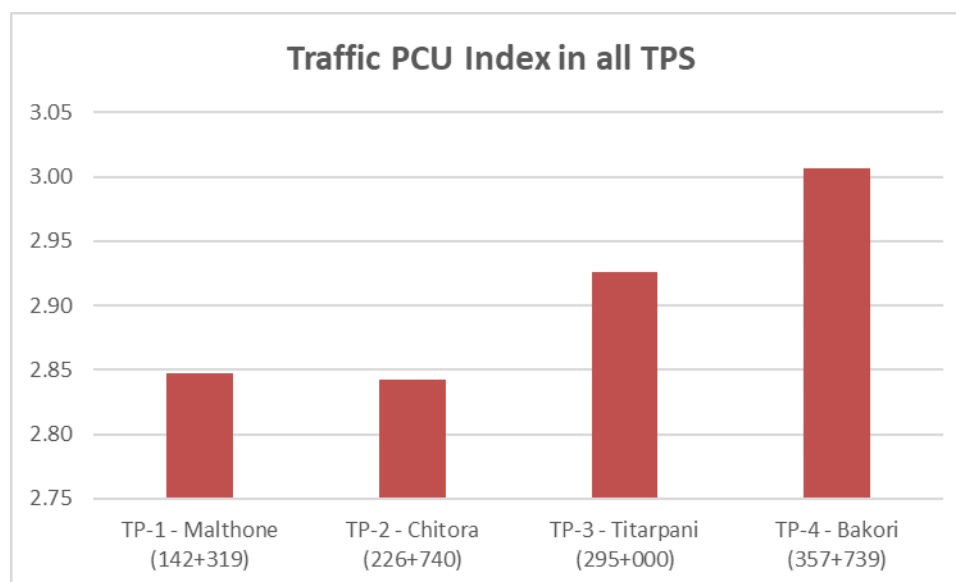
Traffic volume at each toll plaza was converted to PCU and same is presented as under

**Table 3-8 : Traffic in PCU at Project Stretch**

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
	Km 142.319 Toll Plaza at Malthone	5981	17032	2.85

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
<b>2024 – 2025 (Base Year)</b>	Km 226.740 Toll Plaza at Chitora	6918	19661	2.84
	Km 295.000 Toll Plaza at Titarpani	7537	22054	2.93
	Km 357.739 Toll Plaza at Bakori	5631	16932	3.01

It can be observed from above that project traffic has PCU index 2.5 to 3.5 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at four toll plaza locations.



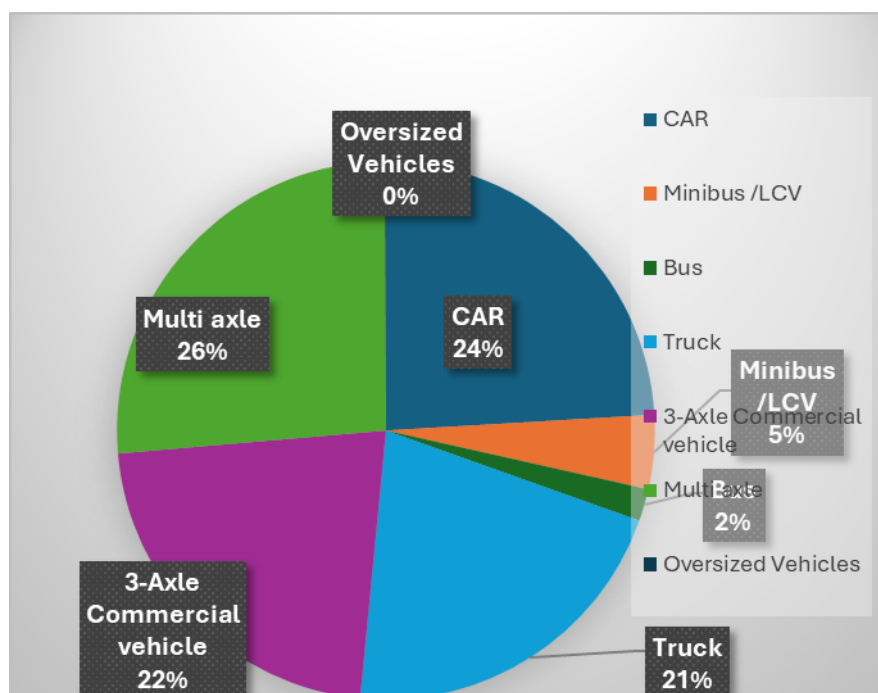
**Figure 3-1 : Comparison of PCU Index**

It can be observed that PCU index is consistent at all four toll plaza locations.

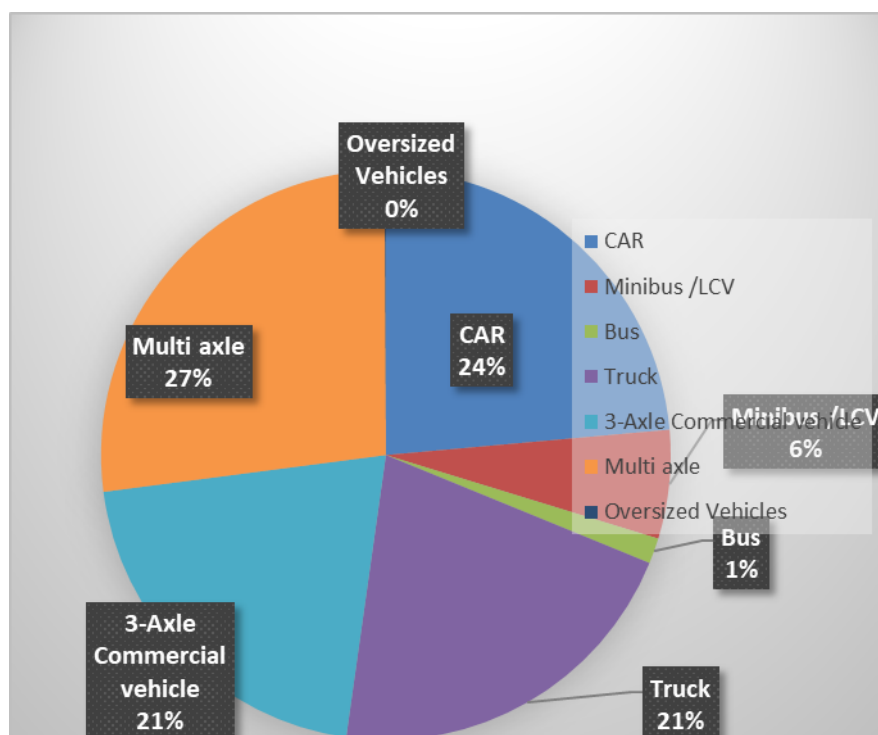
### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds

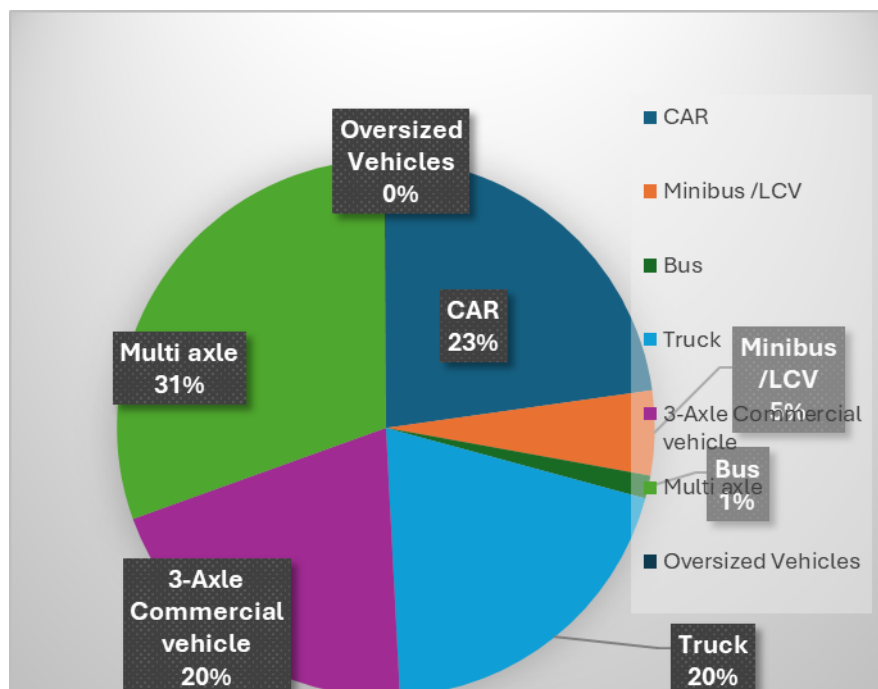
to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



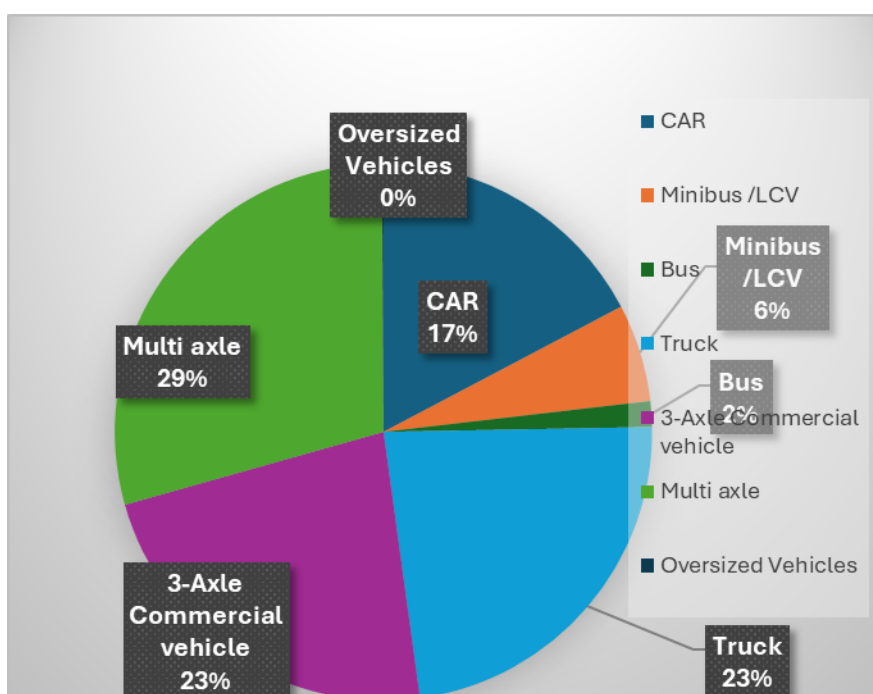
**Figure 3-2: Model split of tollable vehicle @ Km 142.319**



**Figure 3-3: Model split of tollable vehicle @ Km 226.740**



**Figure 3-4: Model split of tollable vehicle @ Km 295.000**



**Figure 3-5: Model split of tollable vehicle @ Km 357+739**

It is observed that car traffic forms about 24% of total traffic at toll plaza location KM 142.319 while multi axle commercial vehicles are about 48% of total traffic. Truck / Bus and LCV share about 23% and 5% of traffic volume respectively.

It is observed that car traffic forms about 24% of total traffic at toll plaza location KM 226.740 while multi axle commercial vehicles are about 48% of total traffic. Truck / Bus and LCV share about 22% and 6% of traffic volume respectively.

It is observed that car traffic forms about 23% of total traffic at toll plaza location KM 295.000 while multi axle commercial vehicles are about 51% of total traffic. Truck / Bus and LCV share about 21% and 5% of traffic volume respectively.

It is observed that car traffic forms about 17% of total traffic at toll plaza location KM 357.739 while multi axle commercial vehicles are about 52% of total traffic. Truck / Bus and LCV share about 25% and 6% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-9 : Journey Type Bifurcation of Traffic at Malthone Toll Plaza KM 142.319**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	5325
2	Return Journey	630
3	Local Commercial Single Journey	23
4	Monthly Pass Local	3
5	Monthly Pass	0

**Table 3-10 : Journey Type Bifurcation of Traffic at Chitora Toll Plaza KM 226.740**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	5738
2	Return Journey	962
3	Local Commercial Single Journey	198
4	Monthly Pass Local	20
5	Monthly Pass	0

**Table 3-11 : Journey Type Bifurcation of Traffic at Titarpani Toll Plaza KM 295.000**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	6199
2	Return Journey	1158
3	Local Commercial Single Journey	175
4	Monthly Pass Local	5
5	Monthly Pass	0

**Table 3-12 : Journey Type Bifurcation of Traffic at Bakori Toll Plaza KM 357.739**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	5114
2	Return Journey	440

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
3	Local Commercial Single Journey	69
4	Monthly Pass Local	8
5	Monthly Pass	0

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor. Same is discussed in subsequent chapter.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Regional Network

Project road is in existence for long and traffic is almost settled. However, there are a few upcoming corridors which may have interest in project road catchments. These are discussed below.

**Delhi – Mumbai Expressway** - The access controlled greenfield expressway connects Delhi and Mumbai (up to Jawaharlal Nehru Port Trust) and passes through states of Haryana, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra. DME alignment will largely cater to traffic between North of India and Gujarat/Western Maharashtra and is not likely to affect traffic on the project road which caters to traffic on NH-44 which is north south highway. Hence it is not likely to impact project road traffic.



**Surat – Chennai Expressway** - The alignment will largely cater to traffic between states of Gujarat and Central Maharashtra /Andhra Pradesh/ Telangana/Karnataka/Tamilnadu and is not parallel to Project Road. Therefore, it is not likely to affect traffic on the project road.

**Pune – Bangalore Expressway** – Entire catchment of this proposed expressway falls south of project road. It is not likely to affect the project road traffic.

All other major highways in the region exist and traffic is settled in the region. On the local level also, there is no formidable competing route network. Hence it is not envisaged that there

will be any major impact on project road traffic in the near future due to regional or local network developments.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor of Lalitpur-Sagar- Lakhnadon from Km 99.00 to Km 415.089 section of NH-44 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, In order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log } (P) = k \times \text{Log } (EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

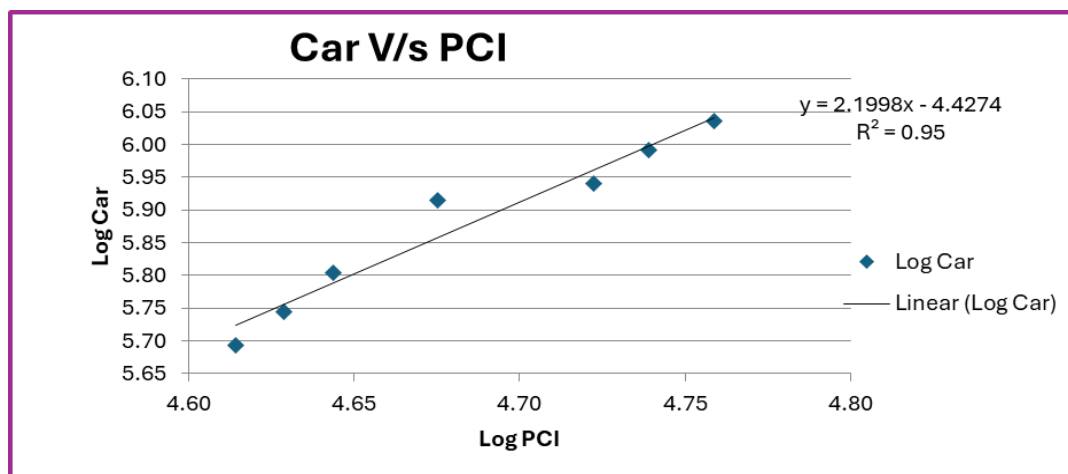
The project corridor spreads across state of Madhya Pradesh & Uttar Pradesh. Toll plazas at Malthone, Chitora, Titarpani and Bakori are in the state of Madhya Pradesh. Project traffic has share of majorly states like Madhya Pradesh, Uttar Pradesh and Rajasthan. For elasticity calculations, working data from these states also has been analysed.

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Maharashtra State.

**Table 5-1 : Per Capita Income Vs Car Madhya Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	38497	424644	4.59	5.63		
2012	41142	493412	4.61	5.69	7%	
2013	42548	555461	4.63	5.74	3%	
2014	44027	637626	4.64	5.80	3%	
2015	47351	820391	4.68	5.91	8%	
2016	52782	869777	4.72	5.94	11%	
2017	54829	982124	4.74	5.99	4%	
2018	57401	1087124	4.76	6.04	5%	5.9%

Regression analysis of same is given in figure below

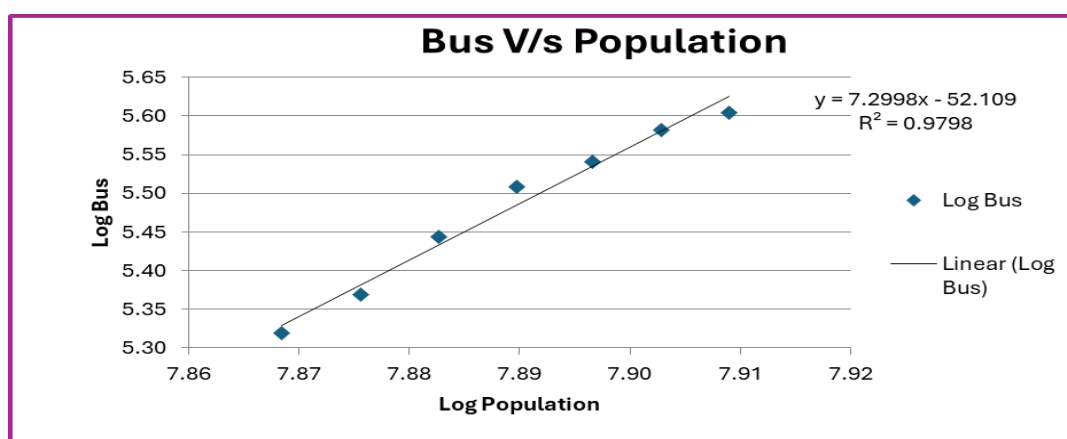


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Madhya Pradesh**

**Table 5-2 : Population Vs Bus Madhya Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	72627000	181770	7.86	5.26		
2012	73863000	208530	7.87	5.32	2%	
2013	75099000	233569	7.88	5.37	2%	
2014	76334000	277898	7.88	5.44	2%	
2015	77570000	322227	7.89	5.51	2%	
2016	78806000	347227	7.90	5.54	2%	
2017	79948000	382227	7.90	5.58	1%	
2018	81090000	402227	7.91	5.60	1%	1.6%

Regression analysis of same is given in figure below



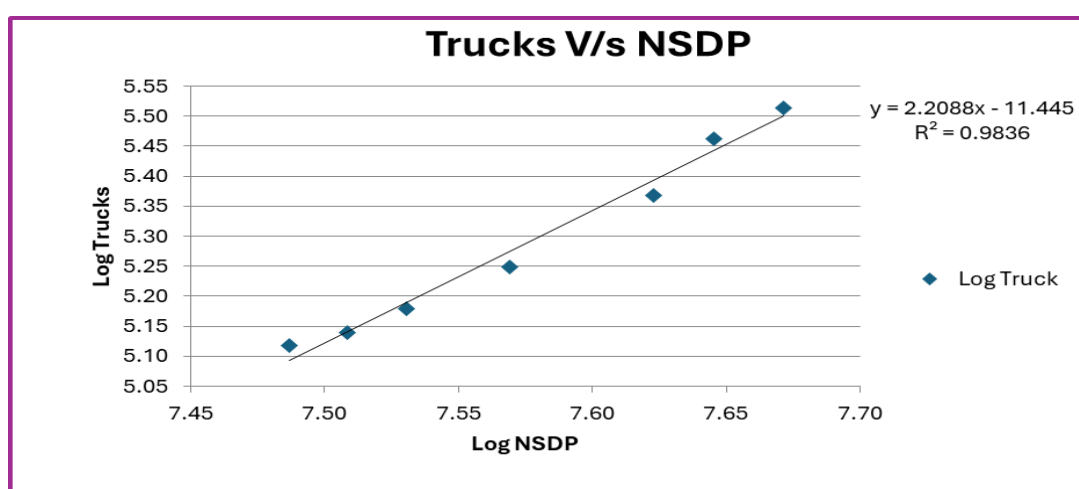
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Madhya Pradesh**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-3 : Trucks Traffic Vs NSDP Madhya Pradesh**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	28237104	121916	7.45	5.09		
2012	30685334	131098	7.49	5.12	9%	
2013	32259760	137815	7.51	5.14	5%	
2014	33924690	150921	7.53	5.18	5%	
2015	37071567	177352	7.57	5.25	9%	
2016	41946525	233553	7.62	5.37	13%	
2017	44200243	289754	7.65	5.46	5%	
2018	46928896	326291	7.67	5.51	6%	7.6%

Following figure depict regression analysis and extrapolation.

**Figure 5-3 : Regression and Elasticity Trucks vs. NSDP – Extrapolation Madhya Pradesh**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-4 : Summary Regression Analysis Madhya Pradesh**

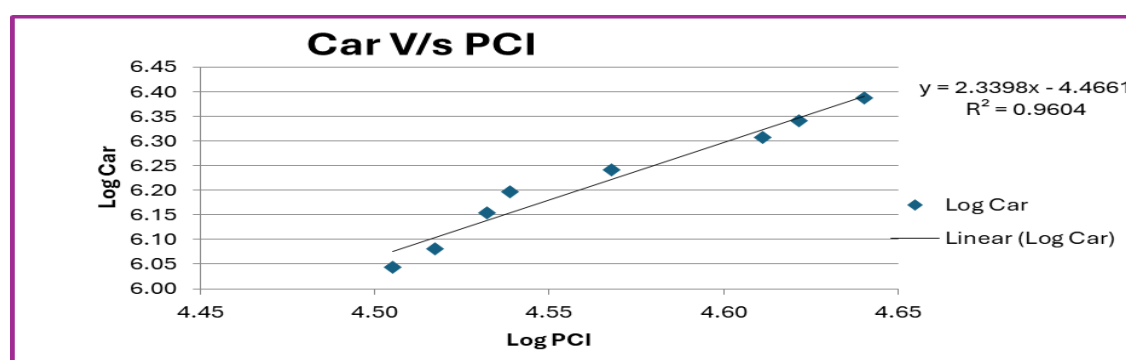
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
<b>MADHYA PRADESH</b>	<b>Car/Jeep</b>	PCI	$y = 2.2965x - 4.8829$	$R^2 = 0.9634$	2.3	6%	13.57%	Good Regression
	<b>Bus</b>	Population	$y = 7.4978x - 53.6722$	$R^2 = 0.9862$	7.5	2%	11.90%	Good Regression
	<b>Truck</b>	NSDP	$y = 2.2088x - 11.4451$	$R^2 = 0.9694$	2.2	8%	16.70%	Good Regression

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Uttar Pradesh State.

**Table 5-5 : Per Capita Income Vs Car Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	32002	1108100	4.51	6.04		
2012	32908	1205374	4.52	6.08	3%	
2013	34044	1423020	4.53	6.15	3%	
2014	34583	1572217	4.54	6.20	2%	
2015	36973	1746117	4.57	6.24	7%	
2016	40847	2027972	4.61	6.31	10%	
2017	41832	2195783	4.62	6.34	2%	
2018	43670	2439845	4.64	6.39	4%	4.6%

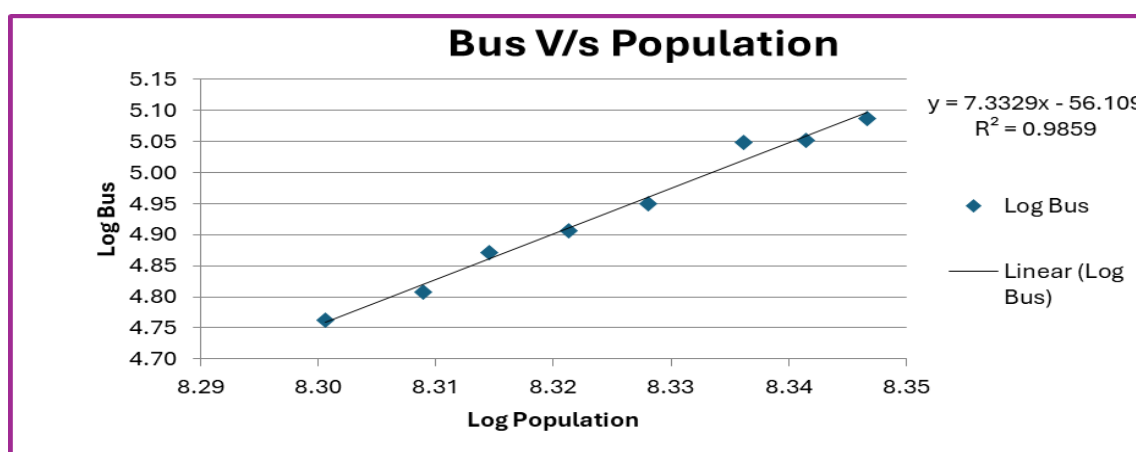
Regression analysis of same is given in figure below



**Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh****Table 5-6 : Population Vs Bus Uttar Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	199812000	57901	8.30	4.76		
2012	203670000	64147	8.31	4.81	2%	
2013	206322000	74389	8.31	4.87	1%	
2014	209577000	80460	8.32	4.91	2%	
2015	212832000	89127	8.33	4.95	2%	
2016	216870000	112020	8.34	5.05	2%	
2017	219510000	112766	8.34	5.05	1%	
2018	222150000	121975	8.35	5.09	1%	1.5%

Regression analysis of same is given in figure below

**Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh**

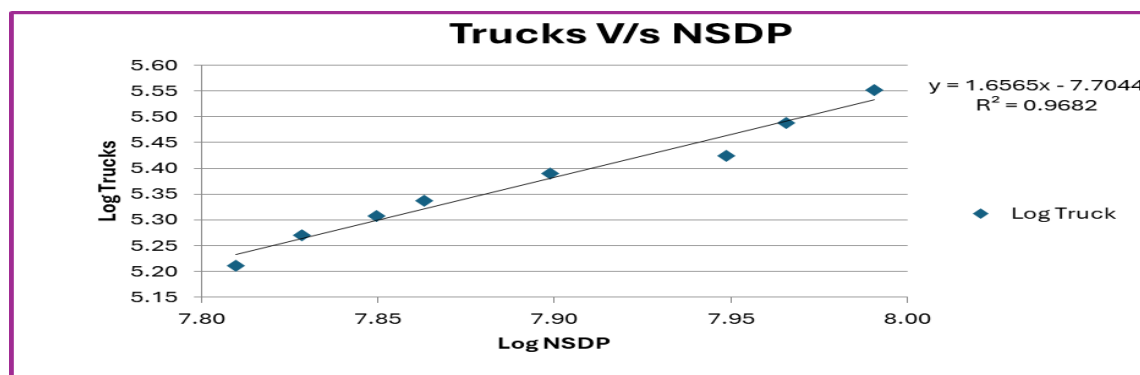
Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-7 : Trucks Traffic Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	64513155	162813	7.81	5.21		
2012	67355218	186404	7.83	5.27	4%	
2013	70746910	202761	7.85	5.31	5%	
2014	72968630	217609	7.86	5.34	3%	
2015	79204874	245688	7.90	5.39	9%	
2016	88845325	265167	7.95	5.42	12%	

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2017	92380571	307096	7.97	5.49	4%	
2018	97915937	356828	7.99	5.55	6%	6.2%

Following figure depict regression analysis and extrapolation.



**Figure 5-6 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Uttar Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below

**Table 5-8 : Summary Regression Analysis Uttar Pradesh**

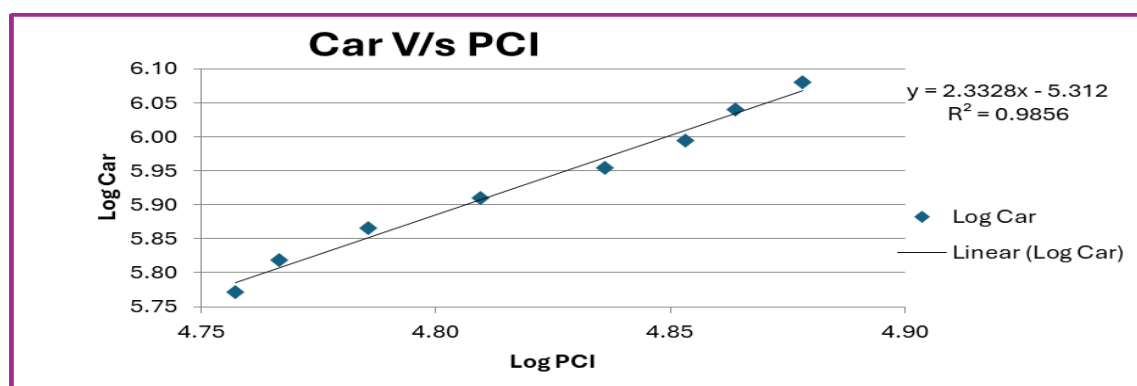
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
UTTAR PRADESH	Car/Jeep	PCI	$y = 2.3398x - 4.4661$	$R^2 = 0.9604$	2.3398	4.58%	10.72%	Good Regression
	Bus	Population	$y = 7.3329x - 56.1092$	$R^2 = 0.9859$	7.3329	1.53%	11.19%	Good Regression
	Truck	NSDP	$y = 1.6565x - 7.7044$	$R^2 = 0.9682$	1.6565	6.18%	10.24%	Good Regression

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-9 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	57192	591069	4.76	5.77		
2012	58441	659542	4.77	5.82	2%	
2013	61053	733916	4.79	5.87	4%	
2014	64496	814079	4.81	5.91	6%	
2015	68565	899307	4.84	5.95	6%	
2016	71324	988391	4.85	5.99	4%	
2017	73109	1095526	4.86	6.04	3%	
2018	75555	1204005	4.88	6.08	3%	4.1%

Regression analysis of same is given in figure below

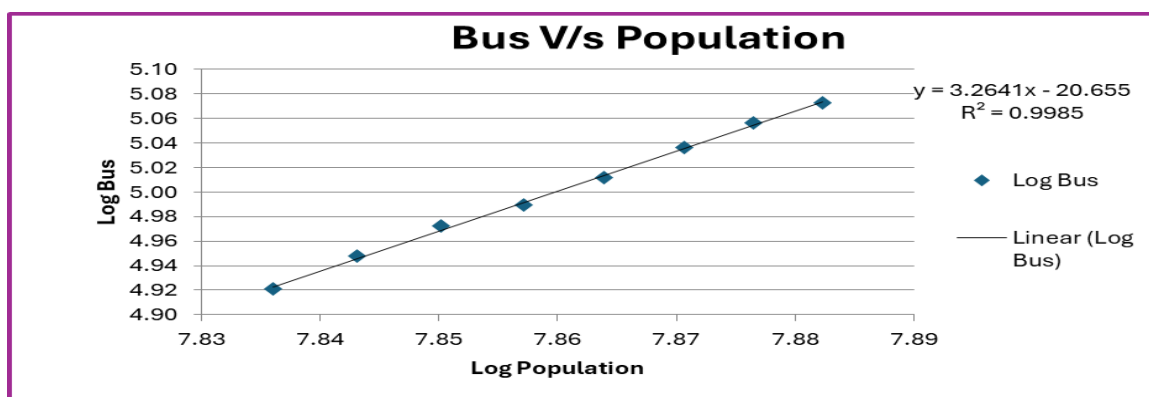


**Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**

**Table 5-10 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	68548000	83345	7.84	4.92		
2012	69687000	88616	7.84	4.95	2%	
2013	70825000	93892	7.85	4.97	2%	
2014	71963000	97650	7.86	4.99	2%	
2015	73102000	102818	7.86	5.01	2%	
2016	74240000	108680	7.87	5.04	2%	
2017	75248000	113964	7.88	5.06	1%	
2018	76256000	118301	7.88	5.07	1%	1.5%

Regression analysis of same is given in figure below



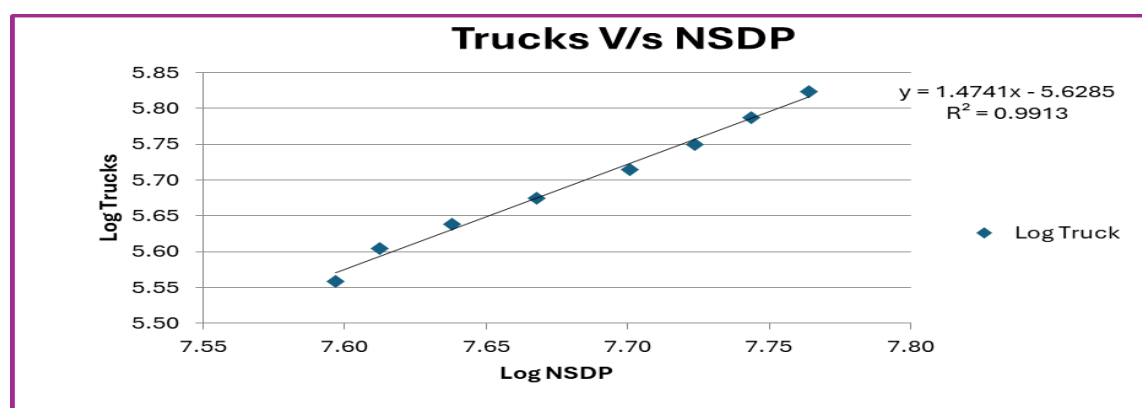
**Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

Elasticity of goods traffic has been worked out by regression analysis with NSDP. Following table represents the data and details.

**Table 5-11 : Trucks Traffic Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	39533093	362028	7.60	5.56		
2012	40980249	401983	7.61	5.60	4%	
2013	43429222	434379	7.64	5.64	6%	
2014	46540773	472365	7.67	5.67	7%	
2015	50192151	517604	7.70	5.71	8%	
2016	52965038	561158	7.72	5.75	6%	
2017	55442912	613055	7.74	5.79	5%	
2018	58059438	665926	7.76	5.82	5%	5.7%

Following figure depict regression analysis and extrapolation.



**Figure 5-9 : Regression and Elasticity NSDP vs. Trucks – Extrapolation Rajasthan**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. Higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below

**Table 5-12 : Summary Regression Analysis Rajasthan**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
RAJASTHAN	Car/Jeep	PCI	$y = 2.3328x - 5.312$	R <sup>2</sup> = 0.9856	2.3328	4.07%	9.49%	Good Regression
	Bus	Population	$y = 3.2641x - 20.6548$	R <sup>2</sup> = 0.9985	3.2641	1.53%	5.01%	Good Regression
	Truck	NSDP	$y = 1.4741x - 5.6285$	R <sup>2</sup> = 0.9913	1.4741	5.65%	8.33%	Good Regression

Economical model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

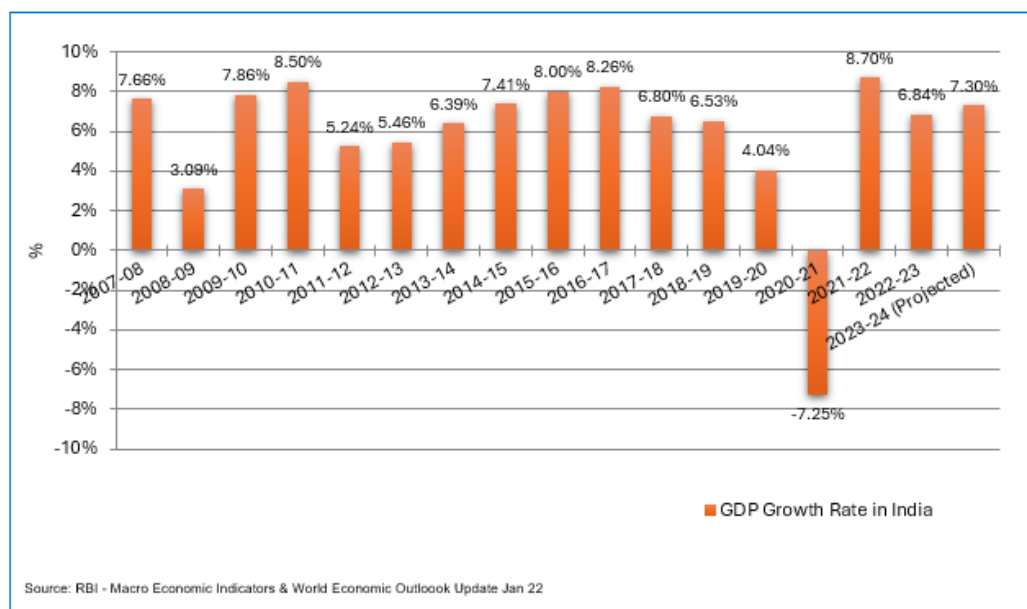
#### 5.4 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

#### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-10 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. Leading banking and financial institutions have estimated that India would keep on registering good growth in coming years and the growth in year 2023-24 is expected to be around 7.3%.

## 5.5 Developments along and around the Project Corridor & State

**MADHYA PRADESH:** Madhya Pradesh state, which is located in central India is bound on the north by Uttar Pradesh, on the east by Chhattisgarh, on the south by Maharashtra, and on the west by Gujarat and Rajasthan. It is the second largest Indian state and one of the fastest growing states in the country. At current prices, the Gross State Domestic Product (GSDP) of Madhya Pradesh is estimated at Rs.1,151,049 crore trillion (US\$ 150.74 billion) in 2022-23, registering an annual growth of 10% over FY21. Between 2015-16 and 2021-22, The GSDP increased at a CAGR (in Rs.) of 13.09% from 2015-16 to 2021-22. Net State Domestic Product (NSDP) of Madhya Pradesh was about Rs. 8.27 trillion (US\$ 113.94 billion) in 2020-21. Between 2015-16 and 2020-21, state's NSDP grew at a CAGR of around 11.22%

**UTTAR PRADESH:** The state has an area of 240,928 sq kms and is the most populous state in India, with population of 199.8 million as per 2011 census with an average population density of 828 persons per sq. km. The economy of Uttar Pradesh is the third largest of all the states in India. Nominal GDP of the state for the year 2022-23 is Rs. 21.74 trillion.

It is reported that the economy of Uttar Pradesh is growing at a faster rate than the national economy at about 9%. In terms of traffic and transportation as well Uttar Pradesh is one of the leader states in India now.

- **Air Connectivity:** Major national & international airports connecting the rest of India, Middle East & Southeast Asian countries; Only state to have 05 International Airports (03 existing & 02 upcoming at Jewar (G. Noida & Ayodhya)
- **Railway Network:** Largest railway network in the country spanning over 8,949 km; 05 Railway Zones
- **Inland Waterway:** India's 1st Inland Waterway is operational in UP (1100 km Haldia - Varanasi tract)
- **Expressways:** Uttar Pradesh boasts state of art expressways ensuring seamless connectivity; 13 Expressways (existing & upcoming)
- **Road Network:** Largest Road Network in India; 4 Lakh Km Total Road Length 11,737 Km Total National Highway

Logistics hubs emerging across UP: MMLH Dadri, MMTH Boraki, MMT Varanasi etc.

From the above it can be expected that the project corridor would serve as one of the important transportation links in the area and would contribute to the growth of the region.

## 5.6 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as under. Rate of growth is moderated in light of overall regional trend. Growth of Multi-Axle is kept slightly higher as trend of technological advances in logistic industry Favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, rate of growth diminishes. Same growth rate is not sustainable for long. Traffic growth has been suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.25% from Most Likely case for corridor in both states.

### 5.6.1 Recommended Growth Rates of Traffic for Madhya Pradesh Part of Stretch

**Table 5-13 : Recommended Growth Rates Optimistic**

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	6.64%	5.57%	5.25%	5.03%	4.41%
LCV	4.92%	4.05%	2.38%	2.01%	2.86%
Minibus	4.18%	3.53%	2.95%	2.68%	2.43%
Bus	4.18%	3.53%	2.95%	2.68%	2.43%
2- Axle	4.92%	4.64%	3.27%	2.75%	2.47%
3 - Axle	4.92%	4.64%	3.27%	2.75%	2.47%
4 to 6 Axle	4.53%	4.34%	3.09%	2.60%	2.34%
7 and Above Axle	4.53%	4.34%	3.09%	2.60%	2.34%

**Table 5-14 : Recommended Growth Rates Pessimistic**

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	6.14%	5.07%	4.75%	4.53%	3.91%
LCV	4.42%	3.55%	1.88%	1.51%	2.36%
Minibus	3.68%	3.03%	2.45%	2.18%	1.93%
Bus	3.68%	3.03%	2.45%	2.18%	1.93%
2- Axle	4.42%	4.14%	2.77%	2.25%	1.97%
3 - Axle	4.42%	4.14%	2.77%	2.25%	1.97%
4 to 6 Axle	4.03%	3.84%	2.59%	2.10%	1.84%
7 and Above Axle	4.03%	3.84%	2.59%	2.10%	1.84%

**Table 5-15 : Recommended Growth Rates Most Likely**

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	6.39%	5.32%	5.00%	4.78%	4.16%
LCV	4.67%	3.80%	2.13%	1.76%	2.61%
Minibus	3.93%	3.28%	2.70%	2.43%	2.18%
Bus	3.93%	3.28%	2.70%	2.43%	2.18%
2- Axle	4.67%	4.39%	3.02%	2.50%	2.22%
3 - Axle	4.67%	4.39%	3.02%	2.50%	2.22%
4 to 6 Axle	4.28%	4.09%	2.84%	2.35%	2.09%
7 and Above Axle	4.28%	4.09%	2.84%	2.35%	2.09%

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza 1- Chainage 142.319 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1439	266	115	1262	1322	1573	4	5981	17032
2025-26	1535	279	120	1324	1387	1644	4	6293	17863
2026-27	1637	292	125	1389	1455	1718	4	6620	18731
2027-28	1746	306	130	1457	1526	1795	4	6964	19640
2028-29	1862	321	135	1529	1601	1876	4	7328	20599
2029-30	1965	334	140	1600	1675	1957	4	7675	21536
2030-31	2074	347	145	1674	1752	2041	4	8037	22510
2031-32	2190	361	150	1752	1833	2130	4	8420	23540
2032-33	2312	375	155	1833	1918	2223	4	8820	24614
2033-34	2440	390	160	1918	2007	2319	4	9238	25734
2034-35	2568	399	165	1981	2072	2390	4	9579	26594
2035-36	2703	408	170	2046	2140	2464	4	9935	27489
2036-37	2845	417	175	2113	2210	2540	4	10304	28413
2037-38	2994	427	180	2182	2282	2618	4	10687	29366
2038-39	3151	437	185	2253	2356	2698	4	11084	30348
2039-40	3309	446	190	2315	2421	2768	4	11453	31230
2040-41	3475	455	195	2379	2487	2840	4	11835	32139

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2041-42	3649	464	200	2444	2555	2914	4	12230	33073
2042-43	3832	473	205	2511	2625	2989	4	12639	34033
2043-44	4024	482	210	2580	2697	3066	4	13063	35023

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 2- Chainage 226.740 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1631	426	100	1456	1433	1867	5	6918	19661
2025-26	1739	447	105	1528	1504	1951	5	7279	20623
2026-27	1855	469	110	1604	1578	2040	5	7661	21637
2027-28	1977	493	115	1683	1656	2133	5	8062	22700
2028-29	2108	517	120	1766	1738	2230	5	8484	23813
2029-30	2225	538	125	1848	1819	2327	5	8887	24902
2030-31	2349	560	130	1934	1903	2428	5	9309	26039
2031-32	2480	582	135	2024	1991	2533	5	9750	27224
2032-33	2619	606	140	2118	2083	2643	5	10214	28467
2033-34	2765	631	145	2216	2179	2757	5	10698	29761
2034-35	2911	646	150	2289	2251	2842	5	11094	30762
2035-36	3063	661	155	2364	2325	2930	5	11503	31794
2036-37	3223	677	160	2442	2401	3021	5	11929	32865
2037-38	3392	693	165	2522	2480	3115	5	12372	33973
2038-39	3570	709	170	2605	2561	3211	5	12831	35114
2039-40	3749	724	175	2677	2632	3294	5	13256	36133
2040-41	3937	739	180	2751	2705	3379	5	13696	37182
2041-42	4135	754	185	2827	2780	3467	5	14153	38266
2042-43	4343	769	190	2905	2857	3558	5	14627	39386
2043-44	4562	784	195	2985	2936	3651	5	15118	40538

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 3- Chainage 295.000 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1715	384	104	1503	1532	2293	6	7537	22054
2025-26	1829	403	108	1577	1608	2396	6	7927	23122
2026-27	1950	423	112	1655	1688	2505	6	8339	24249
2027-28	2079	443	116	1736	1771	2618	6	8769	25421
2028-29	2217	464	120	1821	1858	2737	6	9223	26654
2029-30	2340	483	124	1905	1944	2856	6	9658	27863
2030-31	2470	503	128	1993	2034	2980	6	10114	29127
2031-32	2607	523	132	2085	2128	3110	6	10591	30449
2032-33	2751	544	136	2182	2226	3245	6	11090	31829
2033-34	2904	565	140	2283	2329	3386	6	11613	33272
2034-35	3057	579	144	2358	2406	3490	6	12040	34382
2035-36	3217	593	148	2435	2485	3598	6	12482	35529
2036-37	3386	608	152	2515	2567	3709	6	12943	36718
2037-38	3563	623	156	2597	2651	3823	6	13419	37940
2038-39	3750	638	160	2682	2738	3941	6	13915	39209
2039-40	3938	652	164	2756	2814	4043	6	14373	40339
2040-41	4136	666	168	2832	2892	4147	6	14847	41500
2041-42	4343	680	172	2910	2972	4255	6	15338	42700
2042-43	4561	694	176	2990	3054	4366	6	15847	43936
2043-44	4790	708	180	3072	3138	4479	6	16373	45205

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 4- Chainage 357.739 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	973	331	87	1302	1284	1649	5	5631	16932
2025-26	1038	347	91	1366	1346	1723	5	5916	17744
2026-27	1108	364	95	1433	1412	1801	5	6218	18601
2027-28	1182	382	99	1503	1481	1882	5	6534	19496
2028-29	1261	400	103	1577	1553	1967	5	6866	20434
2029-30	1331	416	107	1650	1624	2052	5	7185	21355
2030-31	1406	433	111	1726	1699	2141	5	7521	22321
2031-32	1484	450	115	1806	1777	2233	5	7870	23324
2032-33	1567	468	119	1890	1859	2330	5	8238	24381
2033-34	1654	487	123	1977	1945	2431	5	8622	25482
2034-35	1741	498	127	2042	2008	2506	5	8927	26319
2035-36	1833	510	131	2109	2073	2583	5	9244	27183
2036-37	1929	522	135	2178	2140	2662	5	9571	28073
2037-38	2030	535	139	2249	2209	2744	5	9911	28994
2038-39	2136	548	143	2322	2281	2828	5	10263	29945
2039-40	2243	559	147	2386	2343	2901	5	10584	30787
2040-41	2355	570	151	2452	2407	2976	5	10916	31655
2041-42	2472	581	155	2519	2473	3053	5	11258	32546
2042-43	2595	593	159	2588	2541	3132	5	11613	33465
2043-44	2726	605	163	2659	2610	3213	5	11981	34411

**Table 6-5 : Total Tollable Traffic @ Toll Plaza 1- Chainage 142.319 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1439	266	115	1262	1322	1573	4	5981	17032
2025-26	1529	277	119	1318	1380	1636	4	6263	17776
2026-27	1623	289	123	1376	1441	1702	4	6558	18554
2027-28	1723	301	127	1437	1504	1770	4	6866	19362
2028-29	1829	314	131	1501	1570	1841	4	7190	20209
2029-30	1921	325	135	1563	1635	1911	4	7494	21025
2030-31	2018	336	139	1628	1702	1984	4	7811	21875
2031-32	2120	348	143	1695	1772	2060	4	8142	22760
2032-33	2228	360	147	1765	1845	2139	4	8488	23683
2033-34	2341	372	151	1838	1921	2221	4	8848	24642
2034-35	2452	379	154	1889	1974	2279	4	9131	25345
2035-36	2568	386	158	1942	2028	2338	4	9424	26070
2036-37	2690	393	162	1996	2084	2399	4	9728	26819
2037-38	2818	400	166	2051	2142	2461	4	10042	27588
2038-39	2951	407	170	2108	2201	2525	4	10366	28379
2039-40	3084	413	174	2156	2250	2578	4	10659	29063
2040-41	3223	419	178	2205	2300	2632	4	10961	29763
2041-42	3369	425	182	2255	2352	2688	4	11275	30488
2042-43	3521	431	186	2306	2405	2745	4	11598	31229
2043-44	3680	437	190	2358	2459	2803	4	11931	31988

**Table 6-6 : Total Tollable Traffic @ Toll Plaza 2- Chainage 226.740 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1631	426	100	1456	1433	1867	5	6918	19661
2025-26	1731	445	104	1520	1497	1942	5	7244	20523
2026-27	1836	464	108	1587	1564	2020	5	7584	21422
2027-28	1949	485	112	1657	1634	2101	5	7943	22363
2028-29	2069	506	116	1730	1707	2185	5	8318	23342
2029-30	2173	524	119	1801	1778	2269	5	8669	24286
2030-31	2283	543	123	1875	1852	2356	5	9037	25272
2031-32	2399	562	127	1952	1929	2447	5	9421	26300
2032-33	2520	581	131	2032	2009	2541	5	9819	27365
2033-34	2647	602	135	2115	2092	2639	5	10235	28474
2034-35	2772	613	138	2173	2151	2708	5	10560	29286
2035-36	2903	624	141	2233	2211	2778	5	10895	30118
2036-37	3040	635	144	2295	2273	2850	5	11242	30976
2037-38	3185	646	147	2359	2336	2924	5	11602	31861
2038-39	3337	657	151	2424	2401	3000	5	11975	32773
2039-40	3489	667	154	2478	2456	3063	5	12312	33560

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2040-41	3647	677	157	2533	2512	3128	5	12659	34367
2041-42	3812	687	160	2589	2569	3194	5	13016	35192
2042-43	3985	697	163	2646	2627	3261	5	13384	36036
2043-44	4166	707	167	2706	2687	3330	5	13768	36914

**Table 6-7 : Total Tollable Traffic @ Toll Plaza 3- Chainage 295.000 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1715	384	104	1503	1532	2293	6	7537	22054
2025-26	1821	401	108	1570	1599	2386	6	7891	23018
2026-27	1933	418	112	1640	1669	2482	6	8260	24019
2027-28	2051	437	116	1713	1744	2582	6	8649	25072
2028-29	2176	456	120	1789	1822	2685	6	9054	26163
2029-30	2286	472	124	1863	1898	2788	6	9437	27222
2030-31	2402	488	128	1940	1977	2895	6	9836	28324
2031-32	2523	505	132	2020	2059	3006	6	10251	29468
2032-33	2650	522	136	2103	2145	3121	6	10683	30657
2033-34	2784	541	140	2190	2234	3241	6	11136	31899
2034-35	2916	552	143	2251	2295	3326	6	11489	32805
2035-36	3054	563	146	2314	2358	3413	6	11854	33738
2036-37	3198	574	149	2379	2422	3502	6	12230	34695
2037-38	3350	585	153	2445	2488	3593	6	12620	35681
2038-39	3510	596	157	2513	2556	3686	6	13024	36696
2039-40	3669	606	160	2570	2613	3763	6	13387	37568
2040-41	3835	616	163	2629	2671	3841	6	13761	38460
2041-42	4008	626	166	2689	2731	3921	6	14147	39377
2042-43	4189	636	170	2750	2792	4003	6	14546	40320
2043-44	4378	646	174	2812	2854	4088	6	14958	41290

**Table 6-8 : Total Tollable Traffic @ Toll Plaza 4- Chainage 357.739 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	973	331	87	1302	1284	1649	5	5631	16932
2025-26	1034	346	90	1360	1340	1715	5	5890	17663
2026-27	1098	361	93	1420	1399	1784	5	6160	18426
2027-28	1166	377	97	1483	1460	1856	5	6444	19226
2028-29	1238	394	101	1549	1524	1930	5	6741	20059
2029-30	1302	408	104	1613	1586	2004	5	7022	20864
2030-31	1369	423	107	1680	1651	2081	5	7316	21705
2031-32	1439	438	110	1749	1719	2161	5	7621	22577
2032-33	1512	454	113	1821	1790	2244	5	7939	23486

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2033-34	1589	470	117	1896	1863	2330	5	8270	24430
2034-35	1665	479	120	1949	1914	2390	5	8522	25110
2035-36	1744	488	123	2003	1967	2452	5	8782	25812
2036-37	1827	497	126	2059	2021	2515	5	9050	26531
2037-38	1914	507	129	2116	2077	2580	5	9328	27273
2038-39	2005	517	132	2175	2134	2647	5	9615	28038
2039-40	2096	524	135	2224	2182	2703	5	9869	28691
2040-41	2191	531	138	2274	2231	2760	5	10130	29359
2041-42	2290	539	141	2325	2281	2818	5	10399	30043
2042-43	2393	547	144	2377	2332	2877	5	10675	30742
2043-44	2501	555	147	2431	2384	2937	5	10960	31459

Traffic projections for Most Likely scenario is given as under

**Table 6-9 : Total Tollable Traffic @ Toll Plaza 1- Chainage 142.319 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1439	266	115	1262	1322	1573	4	5981	17032
2025-26	1532	278	119	1321	1383	1640	4	6277	17816
2026-27	1630	291	123	1383	1447	1710	4	6588	18639
2027-28	1734	304	127	1448	1514	1783	4	6914	19499
2028-29	1845	318	132	1516	1584	1859	4	7258	20402
2029-30	1943	330	136	1583	1653	1935	4	7584	21280
2030-31	2046	342	140	1652	1725	2014	4	7923	22191
2031-32	2155	355	144	1724	1800	2096	4	8278	23142
2032-33	2269	368	148	1800	1879	2181	4	8649	24135
2033-34	2389	382	152	1879	1961	2270	4	9037	25171
2034-35	2508	390	156	1936	2020	2334	4	9348	25950
2035-36	2633	398	160	1995	2081	2400	4	9671	26756
2036-37	2764	406	164	2055	2144	2468	4	10005	27586
2037-38	2902	414	168	2117	2209	2538	4	10352	28444
2038-39	3047	423	172	2181	2275	2610	4	10712	29329
2039-40	3192	430	176	2236	2332	2671	4	11041	30107
2040-41	3344	437	180	2292	2390	2734	4	11381	30907
2041-42	3503	445	184	2349	2450	2798	4	11733	31729
2042-43	3670	453	188	2408	2511	2864	4	12098	32577
2043-44	3845	461	192	2468	2574	2931	4	12475	33446

**Table 6-10 : Total Tollable Traffic @ Toll Plaza 2- Chainage 226.740 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1631	426	100	1456	1433	1867	5	6918	19661
2025-26	1734	446	104	1525	1500	1947	5	7261	20574
2026-27	1845	467	108	1597	1570	2030	5	7622	21528
2027-28	1963	489	112	1672	1644	2116	5	8001	22525
2028-29	2088	512	116	1750	1721	2207	5	8399	23571
2029-30	2199	532	120	1827	1797	2298	5	8778	24593
2030-31	2316	553	124	1907	1876	2392	5	9173	25653
2031-32	2439	574	128	1991	1958	2490	5	9585	26759
2032-33	2568	596	132	2078	2044	2592	5	10015	27911
2033-34	2704	618	136	2169	2134	2698	5	10464	29112
2034-35	2838	632	140	2235	2199	2775	5	10824	30018
2035-36	2980	646	144	2303	2266	2854	5	11198	30954
2036-37	3130	660	148	2373	2335	2935	5	11586	31918
2037-38	3286	674	152	2445	2406	3018	5	11986	32910
2038-39	3450	689	156	2519	2479	3103	5	12401	33932
2039-40	3614	701	160	2583	2541	3176	5	12780	34832
2040-41	3787	713	164	2648	2605	3251	5	13173	35760
2041-42	3968	725	168	2715	2671	3327	5	13579	36712
2042-43	4157	739	172	2783	2738	3405	5	13999	37690
2043-44	4354	753	176	2853	2807	3485	5	14433	38697

**Table 6-11 : Total Tollable Traffic @ Toll Plaza 3- Chainage 295.000 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	1715	384	104	1503	1532	2293	6	7537	22054
2025-26	1825	401	108	1574	1602	2391	6	7907	23065
2026-27	1941	420	112	1648	1678	2493	6	8298	24131
2027-28	2064	440	116	1725	1757	2600	6	8708	25245
2028-29	2195	460	120	1806	1840	2711	6	9138	26410
2029-30	2311	477	124	1885	1921	2822	6	9546	27543
2030-31	2434	495	128	1968	2006	2937	6	9974	28726
2031-32	2563	514	132	2054	2094	3057	6	10420	29958
2032-33	2699	534	136	2144	2186	3182	6	10887	31244
2033-34	2841	554	140	2238	2282	3313	6	11374	32588
2034-35	2983	566	144	2306	2350	3407	6	11762	33591
2035-36	3131	578	148	2376	2422	3504	6	12165	34631
2036-37	3288	590	152	2448	2496	3603	6	12583	35702
2037-38	3452	602	156	2522	2572	3705	6	13015	36805
2038-39	3624	615	160	2598	2650	3810	6	13463	37943
2039-40	3797	626	164	2663	2715	3900	6	13871	38939
2040-41	3978	637	168	2730	2782	3992	6	14293	39965
2041-42	4168	648	172	2799	2850	4086	6	14729	41017
2042-43	4366	660	176	2869	2922	4182	6	15181	42103

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2043-44	4574	672	180	2941	2996	4280	6	15649	43220

**Table 6-12 : Total Tollable Traffic @ Toll Plaza 4- Chainage 357.739 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	973	331	87	1302	1284	1649	5	5631	16932
2025-26	1036	347	91	1363	1343	1719	5	5904	17706
2026-27	1103	363	95	1427	1405	1792	5	6190	18515
2027-28	1174	380	99	1494	1470	1868	5	6490	19362
2028-29	1249	397	103	1564	1538	1947	5	6803	20244
2029-30	1316	412	107	1633	1605	2026	5	7104	21109
2030-31	1386	428	111	1705	1675	2108	5	7418	22010
2031-32	1460	444	115	1780	1748	2194	5	7746	22951
2032-33	1538	461	119	1858	1824	2283	5	8088	23929
2033-34	1620	478	123	1939	1903	2376	5	8444	24947
2034-35	1701	488	126	1998	1960	2443	5	8721	25701
2035-36	1786	498	130	2058	2019	2512	5	9008	26481
2036-37	1875	509	134	2120	2080	2583	5	9306	27287
2037-38	1969	520	138	2184	2142	2656	5	9614	28116
2038-39	2067	531	142	2250	2206	2731	5	9932	28970
2039-40	2165	541	146	2306	2261	2795	5	10219	29716
2040-41	2268	551	150	2364	2317	2861	5	10516	30485
2041-42	2376	561	154	2423	2375	2928	5	10822	31272
2042-43	2489	571	158	2484	2434	2997	5	11138	32083
2043-44	2608	581	162	2546	2494	3067	5	11463	32910

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

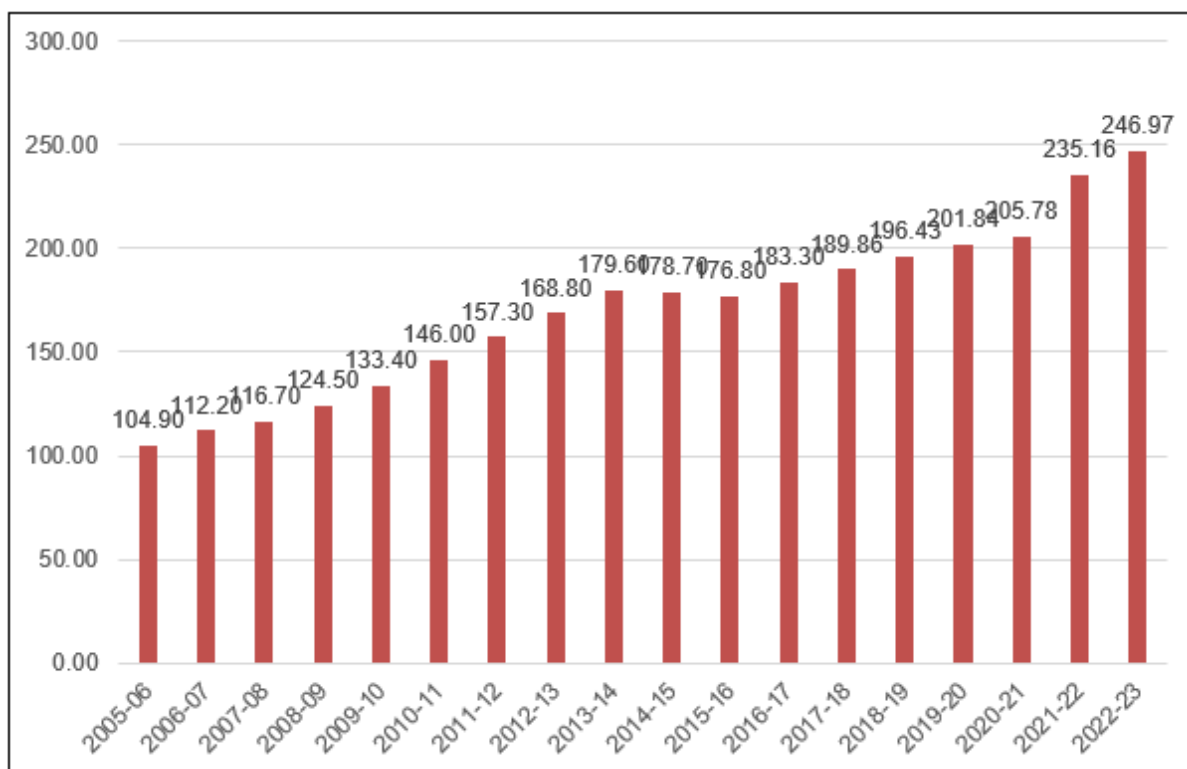
1. Monthly Pass: For frequent users monthly pass would be issued at fee at 2/3<sup>rd</sup> rate for 50 single journey trips.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van - Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza)

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2022-23. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it takes 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Oversized Vehicles (7 or more Axles)	4.20

These rates are then modified for as per procedure provided in guidelines of notification considering factors listed below.

- Annual revision of fee rate - @3%
- Application of WPI

Base rates have been worked out to map the current rates.

**Table 7-2 : Toll Rates for Forecasting Year Single Journey @ Km 142.319**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	125	200	420	420	460	660	805
2025-26	130	210	440	440	480	695	845
2026-27	135	220	465	465	505	730	885
2027-28	145	235	490	490	530	765	930
2028-29	150	245	515	515	560	805	980
2029-30	160	255	540	540	590	845	1030
2030-31	165	270	565	565	620	890	1080
2031-32	175	285	595	595	650	935	1140
2032-33	185	300	625	625	685	985	1195
2033-34	195	315	660	660	720	1035	1260
2034-35	205	330	695	695	755	1090	1325
2035-36	215	350	730	730	795	1145	1395
2036-37	225	365	770	770	840	1205	1470
2037-38	240	385	810	810	885	1270	1545
2038-39	250	405	855	855	930	1340	1630
2039-40	265	430	900	900	980	1410	1715
2040-41	280	450	945	945	1035	1485	1810
2041-42	295	475	1000	1000	1090	1565	1905
2042-43	310	500	1050	1050	1150	1650	2010
2043-44	330	530	1110	1110	1210	1740	2115

**Table 7-3 : Toll Rates for Forecasting Year Single Journey (Rs. Rupees) @ Km 226.740**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
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Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	155	250	525	525	575	825	1005
2025-26	170	275	580	580	630	905	1105
2026-27	180	290	605	605	660	950	1160
2027-28	190	305	640	640	695	1000	1220
2028-29	200	320	670	670	730	1050	1280
2029-30	210	335	705	705	770	1105	1345
2030-31	220	355	740	740	810	1160	1415
2031-32	230	370	780	780	850	1220	1485
2032-33	240	390	820	820	895	1285	1565
2033-34	255	410	860	860	940	1350	1645
2034-35	270	435	905	905	990	1425	1730
2035-36	280	455	955	955	1040	1500	1825
2036-37	295	480	1005	1005	1095	1575	1920
2037-38	315	505	1060	1060	1155	1660	2020
2038-39	330	530	1115	1115	1215	1750	2130
2039-40	345	560	1175	1175	1280	1840	2245
2040-41	365	590	1240	1240	1350	1940	2365
2041-42	385	625	1305	1305	1425	2045	2490
2042-43	405	655	1375	1375	1500	2155	2625
2043-44	430	690	1450	1450	1580	2275	2770

**Table 7-4 : Toll Rates for Forecasting Year Single Journey (Rs. Rupees) @ Km 295.000**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	125	200	415	415	455	655	795
2025-26	130	210	440	440	475	685	835
2026-27	135	220	460	460	500	720	880
2027-28	145	230	485	485	525	760	920
2028-29	150	240	510	510	555	795	970
2029-30	160	255	535	535	580	835	1020
2030-31	165	270	560	560	610	880	1070
2031-32	175	280	590	590	645	925	1125
2032-33	185	295	620	620	675	975	1185
2033-34	195	310	655	655	710	1025	1245
2034-35	205	330	685	685	750	1080	1310
2035-36	215	345	725	725	790	1135	1380
2036-37	225	365	760	760	830	1195	1455
2037-38	235	385	800	800	875	1260	1530

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2038-39	250	405	845	845	920	1325	1610
2039-40	265	425	890	890	970	1395	1700
2040-41	275	445	940	940	1025	1470	1790
2041-42	290	470	990	990	1080	1550	1885
2042-43	310	495	1040	1040	1135	1635	1990
2043-44	325	525	1100	1100	1200	1720	2095

**Table 7-5 : Toll Rates for Forecasting Year Single Journey (Rs. Rupees) @ Km 357.739**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	155	245	515	515	565	810	985
2025-26	160	260	540	540	590	850	1035
2026-27	170	270	570	570	620	895	1090
2027-28	175	285	600	600	655	940	1145
2028-29	185	300	630	630	685	985	1200
2029-30	195	315	660	660	720	1035	1265
2030-31	205	330	695	695	760	1090	1330
2031-32	215	350	730	730	800	1145	1395
2032-33	225	365	770	770	840	1205	1470
2033-34	240	385	810	810	885	1270	1545
2034-35	250	405	850	850	930	1335	1625
2035-36	265	430	895	895	980	1405	1710
2036-37	280	450	945	945	1030	1480	1800
2037-38	295	475	995	995	1085	1560	1895
2038-39	310	500	1045	1045	1140	1640	2000
2039-40	325	525	1105	1105	1205	1730	2105
2040-41	345	555	1160	1160	1265	1820	2220
2041-42	360	585	1225	1225	1335	1920	2340
2042-43	380	615	1290	1290	1410	2025	2465
2043-44	400	650	1360	1360	1485	2135	2600

**Table 7-6 : Toll Rates for Forecasting Year Return Journey @ Km 142.319**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	185	300	630	630	690	990	1205

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2025-26	195	315	665	665	725	1040	1265
2026-27	205	330	695	695	760	1090	1330
2027-28	215	350	730	730	800	1150	1395
2028-29	225	365	770	770	840	1205	1470
2029-30	240	385	810	810	880	1270	1545
2030-31	250	405	850	850	925	1335	1625
2031-32	265	425	895	895	975	1400	1705
2032-33	280	450	940	940	1025	1475	1795
2033-34	290	470	990	990	1080	1550	1890
2034-35	310	495	1040	1040	1135	1635	1990
2035-36	325	525	1095	1095	1195	1720	2090
2036-37	340	550	1155	1155	1260	1810	2205
2037-38	360	580	1215	1215	1325	1905	2320
2038-39	380	610	1280	1280	1395	2005	2445
2039-40	400	645	1350	1350	1470	2115	2575
2040-41	420	680	1420	1420	1550	2230	2710
2041-42	440	715	1495	1495	1635	2350	2860
2042-43	465	755	1580	1580	1720	2475	3015
2043-44	490	795	1665	1665	1815	2610	3175

**Table 7-7 : Toll Rates for Forecasting Year Return Journey (Rs. Rupees) @ Km 226.740**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	235	375	790	790	860	1240	1510
2025-26	255	415	865	865	945	1360	1655
2026-27	270	435	910	910	995	1430	1740
2027-28	285	455	955	955	1045	1500	1825
2028-29	295	480	1005	1005	1095	1575	1920
2029-30	310	505	1055	1055	1155	1660	2020
2030-31	330	530	1110	1110	1210	1745	2120
2031-32	345	560	1170	1170	1275	1835	2230
2032-33	365	585	1230	1230	1340	1930	2345
2033-34	380	615	1295	1295	1410	2030	2470
2034-35	400	650	1360	1360	1485	2135	2600
2035-36	425	685	1435	1435	1565	2245	2735
2036-37	445	720	1510	1510	1645	2365	2880
2037-38	470	760	1590	1590	1735	2490	3030
2038-39	495	800	1675	1675	1825	2625	3195

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2039-40	520	840	1760	1760	1920	2765	3365
2040-41	550	885	1855	1855	2025	2910	3545
2041-42	580	935	1955	1955	2135	3070	3735
2042-43	610	985	2065	2065	2250	3235	3940
2043-44	645	1040	2175	2175	2370	3410	4150

**Table 7-8 : Toll Rates for Forecasting Year Return Journey (Rs. Rupees) @ Km 295.000**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	185	300	625	625	680	980	1195
2025-26	195	315	655	655	715	1030	1255
2026-27	205	330	690	690	750	1080	1315
2027-28	215	345	725	725	790	1135	1385
2028-29	225	365	760	760	830	1195	1455
2029-30	235	380	800	800	875	1255	1530
2030-31	250	400	840	840	920	1320	1605
2031-32	260	420	885	885	965	1390	1690
2032-33	275	445	930	930	1015	1460	1780
2033-34	290	470	980	980	1070	1535	1870
2034-35	305	490	1030	1030	1125	1615	1970
2035-36	320	520	1085	1085	1185	1700	2070
2036-37	340	545	1140	1140	1245	1790	2180
2037-38	355	575	1205	1205	1310	1885	2295
2038-39	375	605	1265	1265	1380	1985	2420
2039-40	395	635	1335	1335	1455	2095	2550
2040-41	415	670	1405	1405	1535	2205	2685
2041-42	440	705	1480	1480	1615	2325	2830
2042-43	460	745	1560	1560	1705	2450	2980
2043-44	485	785	1645	1645	1795	2585	3145

**Table 7-9 : Toll Rates for Forecasting Year Return Journey (Rs. Rupees) @ Km 357.739**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	230	370	775	775	845	1215	1480
2025-26	240	390	815	815	885	1275	1555

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2026-27	250	410	855	855	930	1340	1630
2027-28	265	430	900	900	980	1410	1715
2028-29	280	450	945	945	1030	1480	1800
2029-30	295	475	990	990	1080	1555	1895
2030-31	310	500	1045	1045	1140	1635	1990
2031-32	325	525	1095	1095	1195	1720	2095
2032-33	340	550	1155	1155	1260	1810	2205
2033-34	360	580	1215	1215	1325	1905	2320
2034-35	375	610	1280	1280	1395	2005	2440
2035-36	395	640	1345	1345	1465	2110	2565
2036-37	420	675	1415	1415	1545	2220	2705
2037-38	440	710	1490	1490	1625	2340	2845
2038-39	465	750	1570	1570	1715	2460	2995
2039-40	490	790	1655	1655	1805	2595	3160
2040-41	515	830	1745	1745	1900	2735	3325
2041-42	545	875	1835	1835	2005	2880	3505
2042-43	570	925	1935	1935	2110	3035	3695
2043-44	605	975	2040	2040	2225	3200	3895

**Table 7-10 : Toll Rates for Monthly Pass Local@ Km 142.319**

Year	Car	Minibus /LCV
2024-25	355	355
2025-26	375	375
2026-27	390	390
2027-28	410	410
2028-29	435	435
2029-30	455	455
2030-31	480	480
2031-32	505	505
2032-33	530	530
2033-34	560	560
2034-35	585	585
2035-36	620	620
2036-37	650	650
2037-38	685	685
2038-39	720	720
2039-40	760	760
2040-41	800	800
2041-42	845	845

Year	Car	Minibus /LCV
2042-43	890	890
2043-44	940	940

**Table 7-11 : Toll Rates for Monthly Pass Local@ Km 226.740**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890

**Table 7-12 : Toll Rates for Monthly Pass Local@ Km 295.000**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620

Year	Car	Minibus /LCV
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890

**Table 7-13 : Toll Rates for Monthly Pass Local@ Km 357.739**

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	355	355
2026-27	375	375
2027-28	390	390
2028-29	410	410
2029-30	435	435
2030-31	455	455
2031-32	480	480
2032-33	505	505
2033-34	530	530
2034-35	560	560
2035-36	585	585
2036-37	620	620
2037-38	650	650
2038-39	685	685
2039-40	720	720
2040-41	760	760
2041-42	800	800
2042-43	845	845
2043-44	890	890

**Table 7-14 : Toll Rates for Monthly Pass @ Km 142.319**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	4145	6695	14030	14030	15305	22000	26780
2025-26	4355	7030	14735	14735	16075	23105	28130
2026-27	4575	7390	15480	15480	16885	24275	29550
2027-28	4805	7765	16265	16265	17745	25505	31050
2028-29	5050	8160	17095	17095	18650	26805	32635
2029-30	5310	8575	17970	17970	19605	28180	34305
2030-31	5580	9015	18895	18895	20610	29630	36070
2031-32	5870	9485	19870	19870	21675	31160	37930

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2032-33	6175	9975	20900	20900	22800	32775	39900
2033-34	6495	10495	21990	21990	23990	34480	41980
2034-35	6835	11045	23140	23140	25245	36285	44175
2035-36	7195	11625	24355	24355	26570	38195	46495
2036-37	7575	12240	25640	25640	27970	40210	48950
2037-38	7980	12885	27000	27000	29455	42340	51545
2038-39	8400	13575	28440	28440	31025	44595	54290
2039-40	8850	14300	29960	29960	32680	46980	57195
2040-41	9325	15065	31565	31565	34435	49500	60265
2041-42	9830	15880	33265	33265	36290	52170	63510
2042-43	10360	16735	35065	35065	38255	54990	66945
2043-44	10925	17645	36970	36970	40330	57975	70580

**Table 7-15 : Toll Rates for Monthly Pass @ Km 226.740**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	4145	6695	14030	14030	15305	22000	26780
2025-26	4355	7030	14735	14735	16075	23105	28130
2026-27	4575	7390	15480	15480	16885	24275	29550
2027-28	4805	7765	16265	16265	17745	25505	31050
2028-29	5050	8160	17095	17095	18650	26805	32635
2029-30	5310	8575	17970	17970	19605	28180	34305
2030-31	5580	9015	18895	18895	20610	29630	36070
2031-32	5870	9485	19870	19870	21675	31160	37930
2032-33	6175	9975	20900	20900	22800	32775	39900
2033-34	6495	10495	21990	21990	23990	34480	41980
2034-35	6835	11045	23140	23140	25245	36285	44175
2035-36	7195	11625	24355	24355	26570	38195	46495
2036-37	7575	12240	25640	25640	27970	40210	48950
2037-38	7980	12885	27000	27000	29455	42340	51545
2038-39	8400	13575	28440	28440	31025	44595	54290
2039-40	8850	14300	29960	29960	32680	46980	57195
2040-41	9325	15065	31565	31565	34435	49500	60265
2041-42	9830	15880	33265	33265	36290	52170	63510
2042-43	10360	16735	35065	35065	38255	54990	66945
2043-44	10925	17645	36970	36970	40330	57975	70580

**Table 7-16 : Toll Rates for Monthly Pass @ Km 295.000**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	4105	6630	13885	13885	15150	21780	26510
2025-26	4310	6960	14585	14585	15915	22875	27850

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2026-27	4530	7315	15325	15325	16720	24030	29255
2027-28	4760	7685	16100	16100	17565	25250	30740
2028-29	5000	8075	16925	16925	18460	26540	32310
2029-30	5255	8490	17790	17790	19405	27900	33965
2030-31	5525	8925	18705	18705	20405	29330	35710
2031-32	5810	9390	19670	19670	21460	30845	37555
2032-33	6115	9875	20690	20690	22570	32445	39500
2033-34	6430	10390	21770	21770	23750	34140	41560
2034-35	6770	10935	22910	22910	24990	35925	43735
2035-36	7125	11510	24110	24110	26305	37815	46035
2036-37	7500	12115	25385	25385	27695	39810	48465
2037-38	7900	12760	26730	26730	29160	41920	51030
2038-39	8320	13435	28155	28155	30715	44150	53750
2039-40	8765	14155	29660	29660	32355	46510	56620
2040-41	9235	14915	31250	31250	34090	49005	59660
2041-42	9730	15720	32935	32935	35930	51650	62875
2042-43	10255	16570	34715	34715	37875	54440	66275
2043-44	10815	17470	36600	36600	39930	57400	69875

**Table 7-17 : Toll Rates for Monthly Pass @ Km 357.739**

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2024-25	5085	8215	17210	17210	18775	26990	32855
2025-26	5340	8630	18075	18075	19720	28350	34510
2026-27	5610	9065	18990	18990	20720	29780	36255
2027-28	5895	9525	19955	19955	21770	31295	38095
2028-29	6195	10010	20975	20975	22880	32890	40040
2029-30	6515	10520	22045	22045	24050	34575	42090
2030-31	6850	11065	23180	23180	25290	36350	44255
2031-32	7200	11635	24375	24375	26595	38230	46540
2032-33	7575	12240	25640	25640	27975	40210	48955
2033-34	7970	12875	26980	26980	29430	42305	51505
2034-35	8390	13550	28390	28390	30970	44520	54200
2035-36	8830	14260	29880	29880	32600	46860	57045
2036-37	9295	15015	31460	31460	34320	49335	60060
2037-38	9790	15810	33125	33125	36140	51950	63245
2038-39	10310	16650	34890	34890	38065	54715	66610
2039-40	10860	17545	36755	36755	40095	57640	70170
2040-41	11445	18485	38730	38730	42250	60735	73935
2041-42	12060	19480	40815	40815	44525	64005	77920
2042-43	12710	20535	43025	43025	46935	67470	82135
2043-44	13400	21650	45360	45360	49485	71130	86595

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2043-44 years starting from the year 2024-25 are shown in tables below.

**Table 7-18 : Toll Revenue Optimistic Scenario**

(Rs. Crores)

Location / Year	TP-1 - Malthone (142+319)	TP-2 - Chitora (226+740)	TP-3 - Titarpani (295+000)	TP-4 - Bakori (357+739)	Total
2024-25	88.54	126.12	111.81	108.59	435.06
2025-26	97.34	145.17	122.92	119.18	484.60
2026-27	107.29	159.54	135.26	131.50	533.58
2027-28	118.57	176.74	149.82	145.34	590.47
2028-29	130.40	193.83	164.33	159.23	647.80
2029-30	143.33	213.27	180.24	174.75	711.58
2030-31	157.24	234.20	198.11	192.38	781.94
2031-32	173.29	257.97	218.62	211.86	861.75
2032-33	190.24	283.00	239.68	232.25	945.16
2033-34	209.14	310.69	263.71	255.75	1039.30
2034-35	227.31	338.42	286.75	277.35	1129.83
2035-36	247.56	368.84	312.68	302.48	1231.56
2036-37	268.69	399.53	338.72	328.10	1335.04
2037-38	292.63	435.41	368.48	356.90	1453.42
2038-39	318.39	473.47	400.84	387.31	1580.02
2039-40	345.93	513.77	435.49	421.36	1716.55
2040-41	373.72	555.84	470.70	454.11	1854.37
2041-42	405.35	602.64	510.27	492.34	2010.60
2042-43	439.15	652.86	552.72	533.66	2178.38
2043-44	477.96	710.42	600.96	579.80	2369.14

**Table 7-19 : Toll Revenue Pessimistic Scenario**

(Rs. Crores)

Location / Year	TP-1 - Malthone (142+319)	TP-2 - Chitora (226+740)	TP-3 - Titarpani (295+000)	TP-4 - Bakori (357+739)	Total
2024-25	88.54	126.12	111.81	108.59	435.06
2025-26	96.87	144.49	122.36	118.63	482.35
2026-27	106.30	158.03	133.99	130.25	528.57
2027-28	116.93	174.25	147.77	143.31	582.26
2028-29	127.98	190.19	161.32	156.27	635.76

Location / Year	TP-1 - Malthone (142+319)	TP-2 - Chitora (226+740)	TP-3 - Titarpani (295+000)	TP-4 - Bakori (357+739)	Total
2029-30	140.00	208.24	176.12	170.68	695.04
2030-31	152.89	227.64	192.60	187.01	760.14
2031-32	167.69	249.58	211.47	204.99	833.73
2032-33	183.22	272.45	230.71	223.66	910.04
2033-34	200.50	297.65	252.61	245.16	995.92
2034-35	216.90	322.65	273.34	264.55	1077.44
2035-36	235.07	349.96	296.66	287.14	1168.84
2036-37	253.94	377.25	319.81	309.98	1260.97
2037-38	275.26	409.13	346.27	335.59	1366.25
2038-39	298.14	442.80	374.89	362.49	1478.31
2039-40	322.35	478.16	405.32	392.51	1598.34
2040-41	346.55	514.85	436.00	421.00	1718.39
2041-42	374.15	555.50	470.40	454.27	1854.33
2042-43	403.48	598.78	507.08	489.98	1999.33
2043-44	437.11	648.52	548.77	529.80	2164.20

**Table 7-20 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

Location / Year	TP-1 - Malthone (142+319)	TP-2 - Chitora (226+740)	TP-3 - Titarpani (295+000)	TP-4 - Bakori (357+739)	Total
2024-25	88.54	126.12	111.81	108.59	435.06
2025-26	97.10	144.83	122.64	118.92	483.50
2026-27	106.80	158.78	134.64	130.88	531.11
2027-28	117.78	175.47	148.83	144.33	586.41
2028-29	129.21	191.96	162.88	157.73	641.79
2029-30	141.70	210.72	178.25	172.71	703.38
2030-31	155.11	230.85	195.44	189.68	771.07
2031-32	170.52	253.69	215.10	208.44	847.75
2032-33	186.76	277.62	235.31	227.95	927.64
2033-34	204.83	304.02	258.34	250.43	1017.62
2034-35	222.11	330.37	280.24	270.88	1103.59
2035-36	241.30	359.27	304.91	294.71	1200.20
2036-37	261.26	388.25	329.52	318.96	1297.98
2037-38	283.88	422.08	357.67	346.12	1409.76
2038-39	308.19	457.91	388.19	374.74	1529.03
2039-40	334.02	495.68	420.72	406.75	1657.18
2040-41	359.99	535.02	453.70	437.37	1786.08
2041-42	389.53	578.69	490.67	473.11	1932.00
2042-43	421.07	625.36	530.24	511.61	2088.28
2043-44	457.23	678.88	575.23	554.50	2265.85

## 7.6 Modification in Concession Period

Modification of the concession period shall be done on the basis of Revenue targets given in the contract for milestones 1 & 2.

Modification in concession period as per provisions of DCA and same is summarized in table for all scenarios.

### Pessimistic Case

Target Point 1- March 2031											
Target Month - March 2029	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Modified Concession Period		
TOT-12	70	63.58	-9.17%	No	-	0.00%	20.00	0.00			
Target Point 2- March 2038											
Target Month - March 2036	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Total Change in Concession period	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-12	123	114.04	-7.28%	No	-	0.00%	20.00	0.00	0.00	20.00	

### Most likely Case

Target Point 1- March 2031										
Target Month - March 2029	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period	Change in Concession period	Modified Concession Period	
TOT-12	70	64.51	-7.85%	No	-	0.00%	20.00	0.00		

Target Point 2- March 2038											
Target Month - March 2036	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or short fall	Change in Concession period %	Original Concession Period	Change in Concession period	Total Change in Concession period	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-12	123	117.69	-4.32%	No	-	0.00%	20.00	0.00	0.00	20.00	

### Optimistic Case

Target Point 1- March 2031											
Target Month - March 2029	Targe t Revenue (Rs. Crore s)	Calcul ated Reven ue (Rs. Crore s)	Differ ence %	If qualifies for Modification in Concession Period	Qualif ying incre ment or shortf all	Chang e in Conce ssion period %	Origin al Conce ssion Period	Chang e in Conce ssion period	Modified Concessio n Period		
TOT-12	70	65.42	-6.54%	No	-	0.00%	20.00	0.00			
Target Point 2- March 2038											
Tar get Mo nth - Ma rch 203 6	Targ et Reve nue (Rs. Cror es)	Calcul ated Reven ue (Rs. Crore s)	Differ ence %	If qualifie s for Modific ation in Conces sion Period	Qual ifyin g incre ment or short fall	Chang e in Conce ssion period %	Origin al Conce ssion Period	Chang e in Conce ssion period	Total Chang e in Conce ssion period	Calcul ated Modifi ed Conce ssion Period	Final Conc essio n Perio d subje ct to Cap
TO T-12	123	121.35	- 1.34%	No	-	0.00%	20.00	0.00	0.00	20.00	

**TOT-12 (Lalitpur to Lakhadon)-Modification in Concession Period**

Types of Scenarios	Pessimistic Case		Most likely Case		Optimistic Case	
Target Month	Mar-31	Mar-38	Mar-31	Mar-38	Mar-31	Mar-38
Target Revenue (Rs. Crores)	70	123.00	70	123	70.00	123.00
Calculated Revenue (Rs. Crores)	63.58	114.04	64.51	117.69	65.42	121.35
Differences %	-9.17%	-7.28%	-7.85%	-4.32%	-6.54%	-1.34%
If qualifies for Modification in Concession Period	No	No	No	No	No	No
Qualifying Increment or shortfall	-	-	-	-	-	-
Change in Concession period %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Original Concession Period	20.00	20.00	20.00	20.00	20.00	20.00
Change in Concession period	0.00	0.00	0.00	0.00	0.00	0.00
Total Change in Concession period	0.00		0.00		0.00	
Calculated Modified Concession Period	20.00		20.00		20.00	
Final Concession Period subject to Cap	0.00		0.00		0.00	

Thus, there is no modification expected in concession period due to variation in revenue as per above estimates in all scenarios.

## CHAPTER 8

### CONCLUSION & RECOMMENDATIONS

#### 8.1 Conclusion & Recommendations

Project stretch of Lalitpur-Sagar- Lakhnadon from Km 99.00 to Km 415.089 section of NH-44 in state of Madhya Pradesh and Uttar Pradesh is currently four lane road. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the important regional network connecting Uttar Pradesh, Madhya Pradesh to Southern States and vice-versa. There are large number of townships, industrial corridors and other business establishment coming up along project corridor. As discussed, dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give positive impact to traffic flow on project. The following can be considered as major outcomes of the study

- a) There is good amount of tollable traffic running on project
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy
- c) Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road

Based on above it can be considered a stable healthy project from traffic and revenue point of view.



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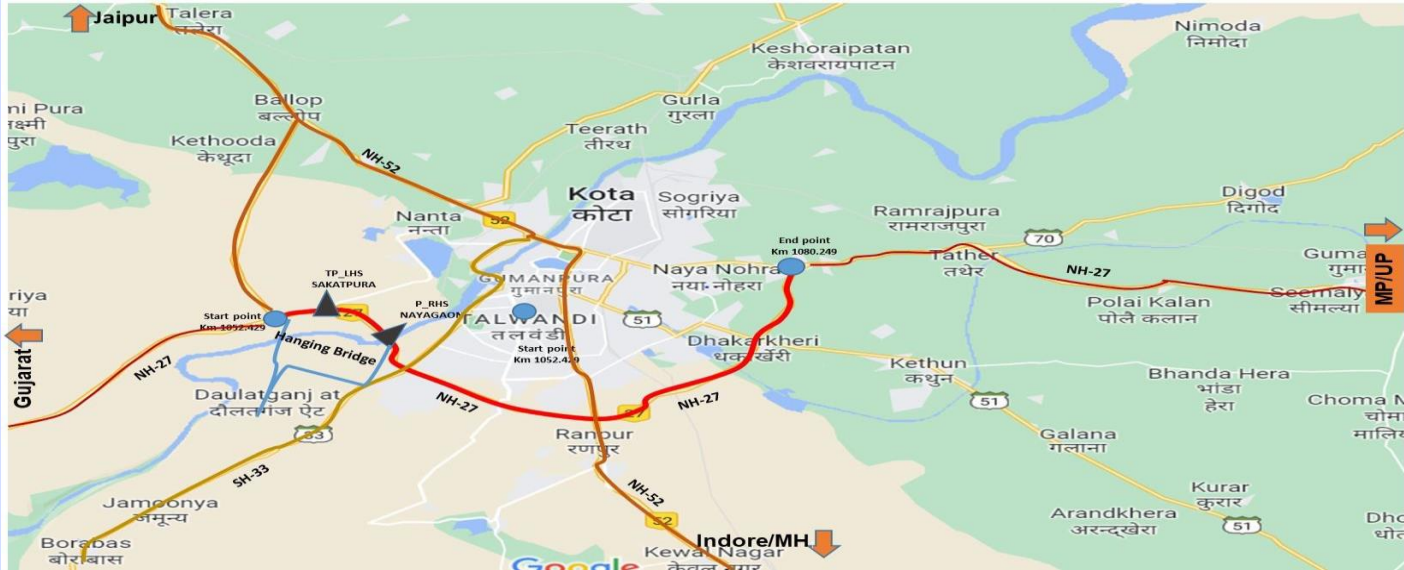
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# KOTA BYPASS SECTION OF NH-76 (new NH-27) IN THE STATE OF RAJASTHAN UNDER (TOT Bundle-13)



## TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

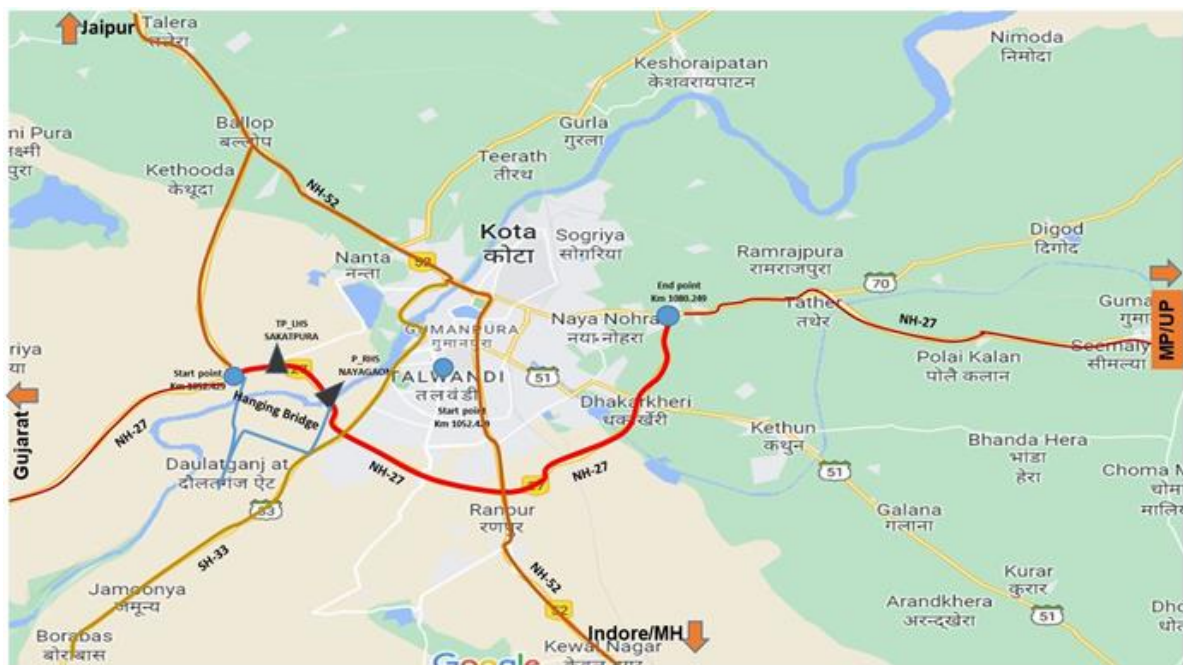
## INTRODUCTION

### 1.1 Background

The National Highways Authority of India (NHAI) introduced the Toll, Operate and Transfer (TOT) model for partnership with private developers in the road sector. Under this model, NHAI passes on the toll collection rights and operation and maintenance obligations for 20 years to the private developer against payment of upfront, one-time, lump sum concession fees quoted by the private developer as part of the comprehensive bidding process. Projects under this model are awarded as a bundle of operational national highways, which allows the investor to offset the risks of one project against another. Since existing and operational roads are auctioned under the TOT model.

Under the Toll Operate and Transfer (ToT) 13 bundle, NHAI had invited tenders for selection of concessionaire for maintenance of the National Highway stretch Kota Bypass section NH-27 in the state of Rajasthan.

M/s. IRB Infrastructure Developers Limited., has been declared as the selected bidder for the project. This report is for Part Section ToT bundle 13 “Kota Bypass section NH-27 spanning in the state of Rajasthan. Project Highway alignment is depicted in the following figure.



*Figure 1-1: Project Stretch of ToT Bundle 13 (Part)*

## 1.2 Objective of the Study

M/s IRB Infrastructure Developers Limited (IRB) intends to develop a traffic study report for Four Laning of Kota Bypass section NH-27 on BOT basis. GMD Consultants have been assigned the work of conducting traffic study and developing revenue model based on traffic projections and forecast.

The year 2024-25 has been taken as the base year for projections and forecasting of traffic in the horizon year. This report fulfils part of the requirement of the assignment.

## 1.3 Scope of Services

Following may be referred to as broad scope of Traffic Study of Four Laning of Kota Bypass section NH-27

Classified Traffic Volume Count at main toll plaza location at Toll Plaza locations. This data was supplied by the Concessionaire.

- Establishment of traffic pattern
- Working out traffic demand elasticity and growth
- Traffic forecast up to concession period.
- Preparation of revenue model up to concession period
- Any other analysis relevant to scope

## CHAPTER 2

### PROJECT DETAILS

#### 2.1 Project Corridor

The project stretch is a section of NH-44, which is the longest National Highway in the country, running through North, Central and South India. The Kota Bypass section is located along the Project Stretch starting from Km 1052+429 of NH-27 and ends at Km 1080+249 of NH-27 including a Cable-Stayed Bridge on the Chambal River in the State of Rajasthan.

#### Project Stretch Description

The project stretch under this study starts from Km 1052+429 of NH-27 and ends at Km 1080+249 of NH-27 at Jhansi in the state of Rajasthan. The length of project stretch is 27.820 km and has 4-lane configuration with single staggered of Toll Plaza (Sakatpura (LHS) at ch.1055+217 KM and Nayagaon (RHS) at ch.1058+837 KM).

The following figure shows this the alignment of the project highway in the above context.



**Figure 2-1 : Project Alignment with Toll Plaza**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Kota Bypass section of NH-27- Provided by Concessionaire for year 2023-24 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project
- Establish base year traffic
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

*Table 3-1* below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 1055+217 Toll Plaza at Sakatpura (LHS Carriageway), Km 1058+837 Toll Plaza at Nayagaon (RHS Carriageway)	AADT from previous traffic study report for Year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for Year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for Year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for Year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for Year 2023-24 & Four month from April 2024 to July 2024

Toll plaza is located in Rajasthan.

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations-based traffic survey done at project stretch.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in table below .

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)
	2 – Axle Truck

Vehicle Type	
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Bus
- Truck /
- 3 Axle commercial vehicle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data as per traffic survey conducted at toll plaza locations. It may not represent the whole year traffic as this pertains to specific period only. Hence a seasonality factor has been applied to average traffic of current period to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Toll Plaza Sakatpura (Km 1055+217) / Nayagaon (Km 1058+837)**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) - 2023-24	Annual Average Daily Traffic (Nos.) - 2024-25
1	Car	3733	2420
2	Minibus /LCV	68	582

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) - 2023-24	Annual Average Daily Traffic (Nos.) - 2024-25
3	Bus	513	84
4	Truck	538	1253
5	3-Axle Commercial vehicle	745	1013
6	Multi axle	2493	2898
7	Oversized Vehicles	0	5
	<b>Total</b>	<b>8090</b>	<b>8255</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 3-4.

**Table 3-4 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0

Vehicle Type	PCUs
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

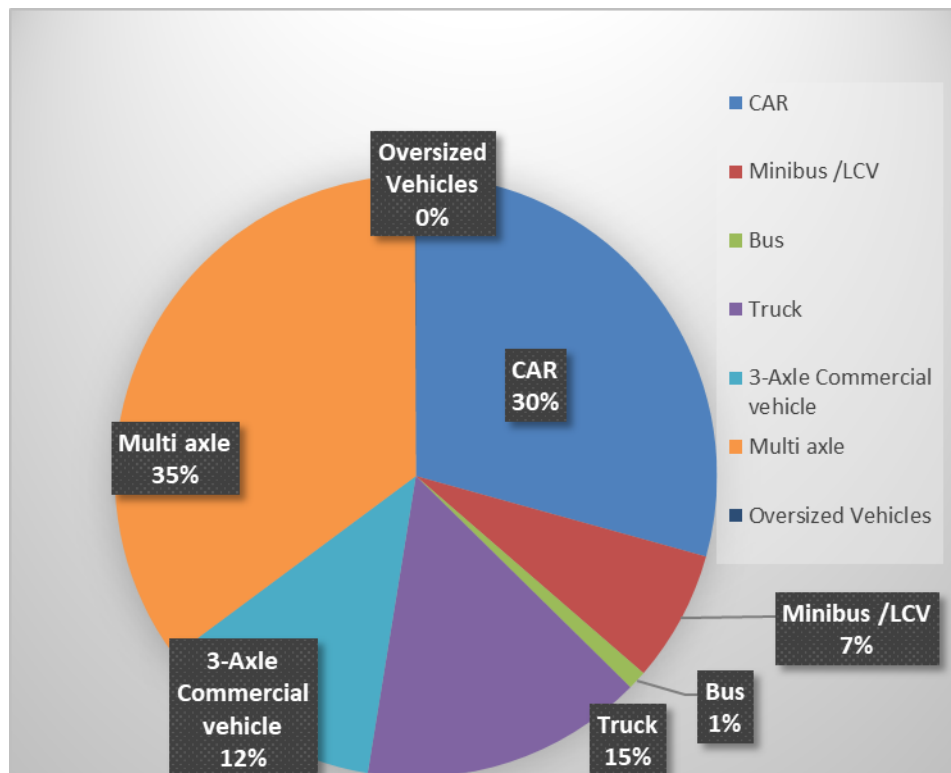
**Table 3-5 : Traffic in PCU at Project Stretch**

Year	Toll Plaza Location (Km)	Traffic No.	PCU	PCU Index
2023-2024	Km 1055+217 Toll Plaza at Sakatpura	8090	19753	2.44
	Km 1058+837 Toll Plaza at Nayagaon			
2024-2025	Km 1055+217 Toll Plaza at Sakatpura	8255	23406	2.84
	Km 1058+837 Toll Plaza at Nayagaon			

It can be observed from above that project traffic has PCU index 2 to 2.6 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at four toll plaza locations.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-2: Model split of tollable vehicle @ Km 1055+217/ Km 1058+837**

It is observed that car traffic forms about 30% of total traffic at toll plaza location KM 1055+217/ Km 1058+837 while multi axle commercial vehicles are about 35% of total traffic. Truck / Bus and LCV share about 16% and 7% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like,

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25

**Table 3-6 : Journey Type Bifurcation of Traffic at Sakatpura/Nayagaon Toll Plaza KM 1055+217/ Km 1058+837**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	6094
2	Return Journey	2110

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
3	Local Commercial Single Journey	49
4	Monthly Pass Local	2
5	Monthly Pass	0

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data
3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor. Same is discussed in subsequent chapter.

## CHAPTER 4

# INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

### 4.1 Introduction

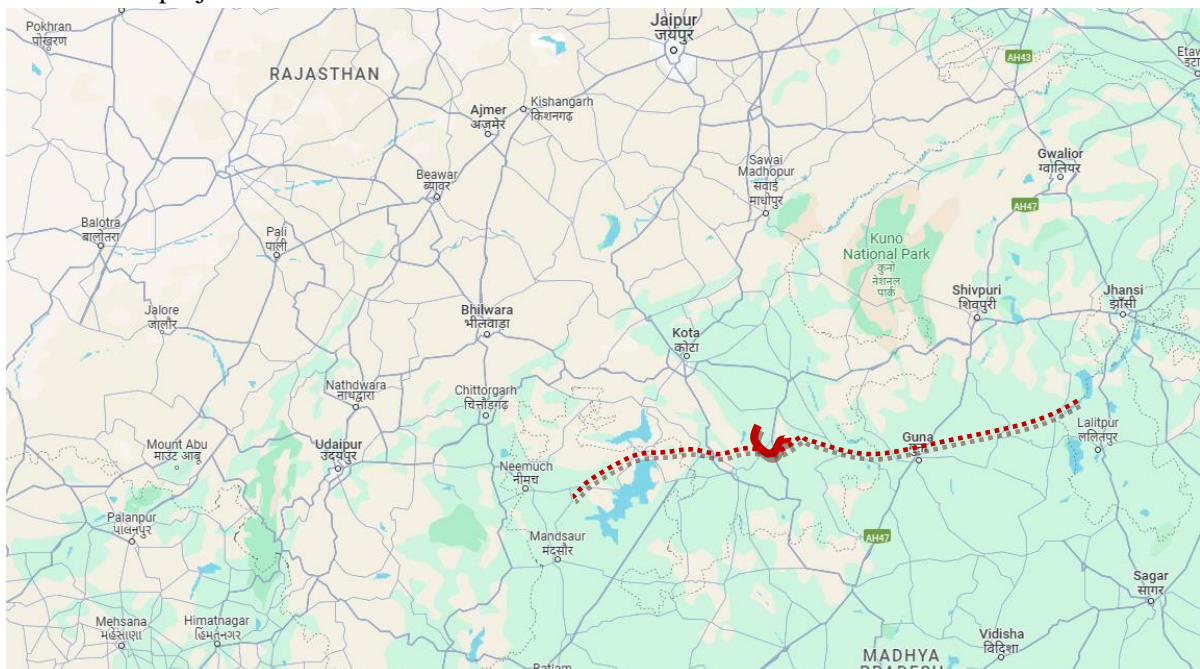
Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

### 4.2 Regional Network

Kota Bypass is part of NH-27 which is major East – West connectivity in India. As can be seen from the data made available that most of the traffic on Kota Bypass is either local in nature or is part of the East – West connectivity corridor. Gwalior, Chittorgarh, Jhalawar, Bhilwara areas have major influence on project traffic.



In such a case upcoming corridors like Delhi Mumbai Expressway or Mumbai Vadodara Expressway or DFCC which basically cater for North -South connectivity, are not expected to have any substantial impact on project road traffic.

**Delhi – Mumbai Expressway** - The access controlled greenfield expressway connects Delhi and Mumbai (up to Jawaharlal Nehru Port Trust) and passes through states of Haryana, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra. DME alignment will largely cater to traffic between North of India and Gujarat/Western Maharashtra and is not likely to affect traffic on the project road which caters to traffic on East – West connectivity and local traffic.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

Traffic growth forecast for project corridor of Kota Bypass from Km 1052+429 to Km 1080+249 section of NH-27 has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-12015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population
- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, In order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\text{Log}(P) = k \times \text{Log}(EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

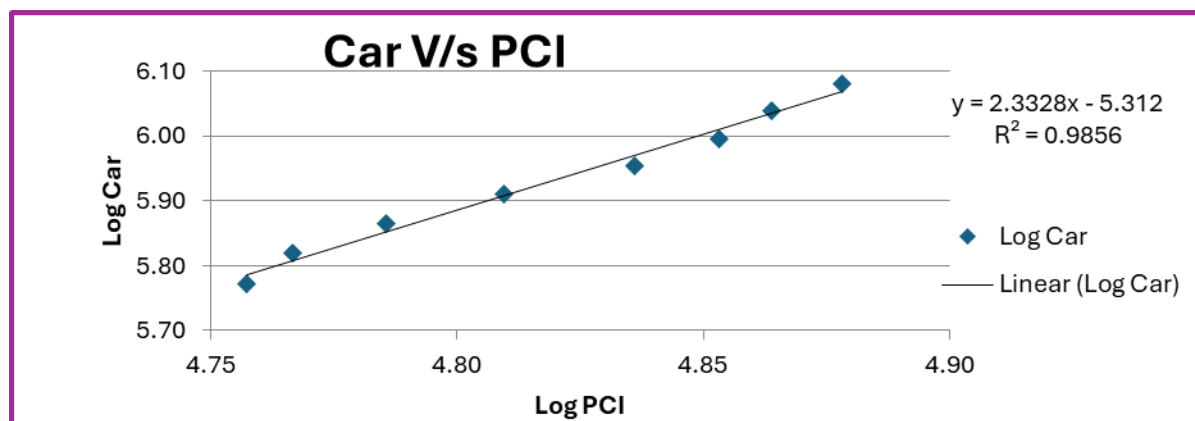
The project corridor spreads across state of Rajasthan. Toll plazas at Sakatpura and Nayagaon in the state of Rajasthan. Project traffic has share of majorly states like Rajasthan, Madhya Pradesh, Uttar Pradesh, Gujrat and Delhi. For elasticity calculations, working data from these states also has been analysed.

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-1 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	57192	591069	4.76	5.77		
2012	58441	659542	4.77	5.82	2%	
2013	61053	733916	4.79	5.87	4%	
2014	64496	814079	4.81	5.91	6%	
2015	68565	899307	4.84	5.95	6%	
2016	71324	988391	4.85	5.99	4%	
2017	73109	1095526	4.86	6.04	3%	
2018	75555	1204005	4.88	6.08	3%	4.1%

Regression analysis of same is given in figure below.

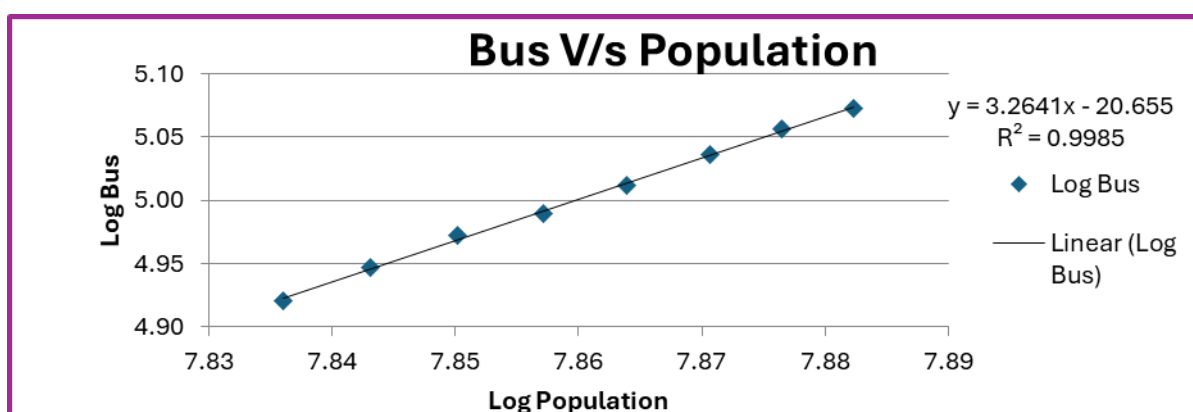


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**

**Table 5-2 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	68548000	83345	7.84	4.92		
2012	69687000	88616	7.84	4.95	2%	
2013	70825000	93892	7.85	4.97	2%	
2014	71963000	97650	7.86	4.99	2%	
2015	73102000	102818	7.86	5.01	2%	
2016	74240000	108680	7.87	5.04	2%	
2017	75248000	113964	7.88	5.06	1%	
2018	76256000	118301	7.88	5.07	1%	1.5%

Regression analysis of same is given in figure below.



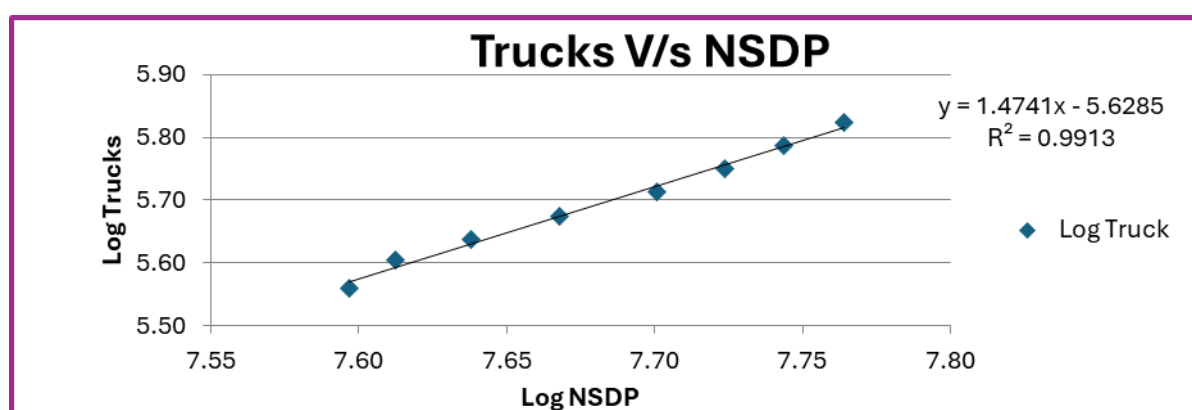
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-3 : Trucks Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	39533093	362028	7.60	5.56		
2012	40980249	401983	7.61	5.60	4%	
2013	43429222	434379	7.64	5.64	6%	
2014	46540773	472365	7.67	5.67	7%	
2015	50192151	517604	7.70	5.71	8%	
2016	52965038	561158	7.72	5.75	6%	
2017	55442912	613055	7.74	5.79	5%	
2018	58059438	665926	7.76	5.82	5%	5.7%

The following figure depicts regression analysis and extrapolation.

**Figure 5-3 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Rajasthan.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-4 : Summary Regression Analysis Rajasthan**

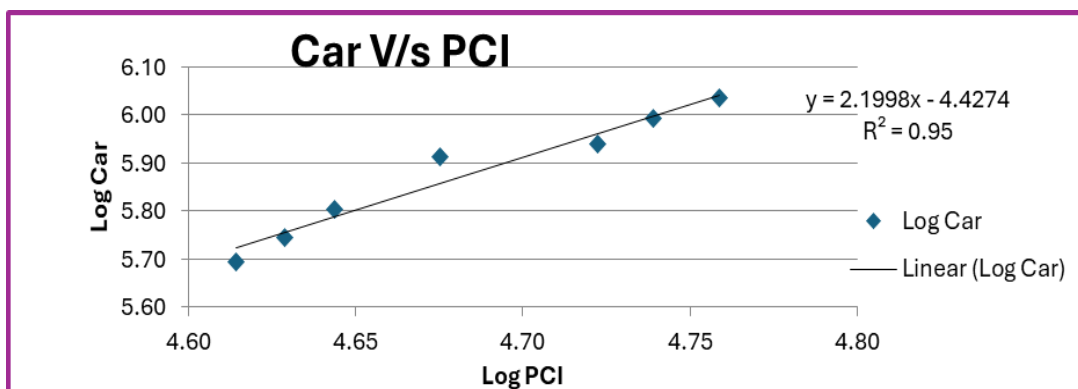
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
<b>RAJASTHAN</b>	<b>Car/Jeep</b>	PCI	$y = 2.3328x - 5.312$	$R^2 = 0.9856$	2.3328	4.07%	9.49%	Good Regression
	<b>Bus</b>	Population	$y = 3.2641x - 20.6548$	$R^2 = 0.9985$	3.2641	1.53%	5.01%	Good Regression
	<b>Truck</b>	NSDP	$y = 1.4741x - 5.6285$	$R^2 = 0.9913$	1.4741	5.65%	8.33%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Madhya Pradesh State.

**Table 5-5 : Per Capita Income Vs Car Madhya Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	38497	424644	4.59	5.63		
2012	41142	493412	4.61	5.69	7%	
2013	42548	555461	4.63	5.74	3%	
2014	44027	637626	4.64	5.80	3%	
2015	47351	820391	4.68	5.91	8%	
2016	52782	869777	4.72	5.94	11%	
2017	54829	982124	4.74	5.99	4%	
2018	57401	1087124	4.76	6.04	5%	5.9%

Regression analysis of same is given in figure below.

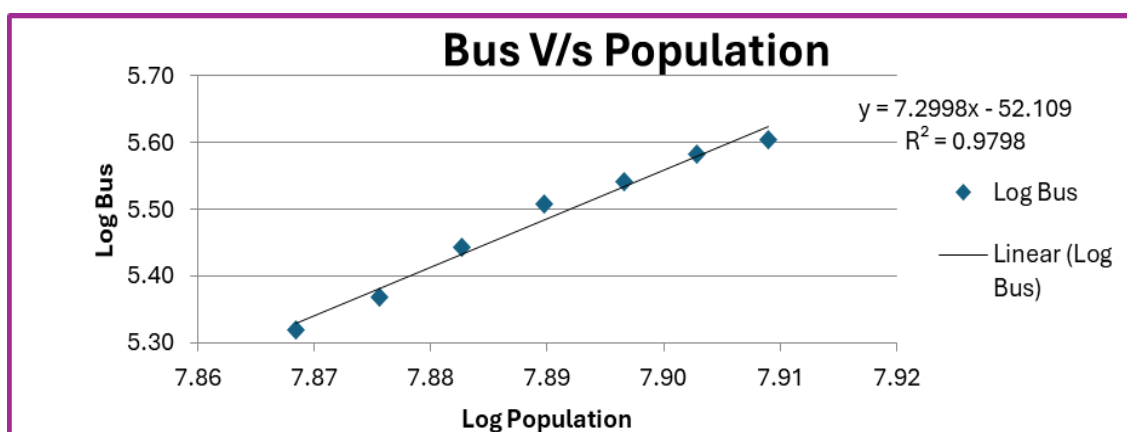


**Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Madhya Pradesh**

**Table 5-6 : Population Vs Bus Madhya Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	72627000	181770	7.86	5.26		
2012	73863000	208530	7.87	5.32	2%	
2013	75099000	233569	7.88	5.37	2%	
2014	76334000	277898	7.88	5.44	2%	
2015	77570000	322227	7.89	5.51	2%	
2016	78806000	347227	7.90	5.54	2%	
2017	79948000	382227	7.90	5.58	1%	
2018	81090000	402227	7.91	5.60	1%	1.6%

Regression analysis of same is given in figure below.



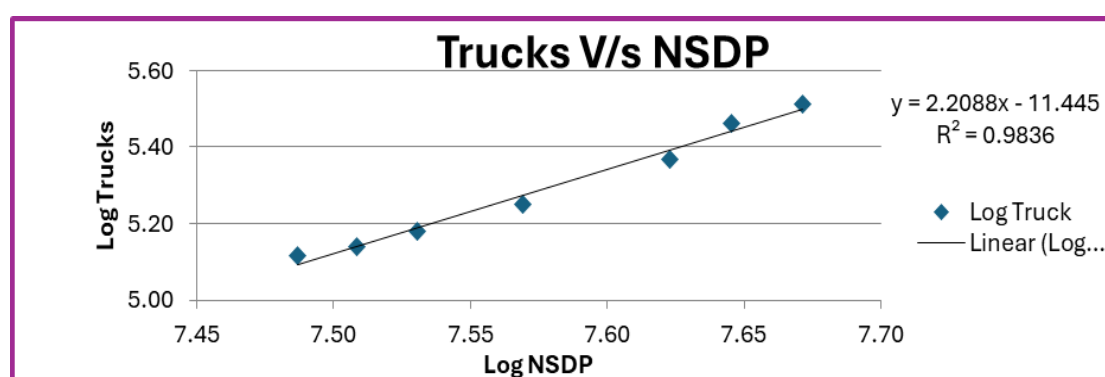
**Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Madhya Pradesh**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-7 : Trucks Vs NSDP Madhya Pradesh**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	28237104	121916	7.45	5.09		
2012	30685334	131098	7.49	5.12	9%	
2013	32259760	137815	7.51	5.14	5%	
2014	33924690	150921	7.53	5.18	5%	
2015	37071567	177352	7.57	5.25	9%	
2016	41946525	233553	7.62	5.37	13%	
2017	44200243	289754	7.65	5.46	5%	
2018	46928896	326291	7.67	5.51	6%	7.6%

The following figure depicts regression analysis and extrapolation.

**Figure 5-6 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Madhya Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-8 : Summary Regression Analysis Madhya Pradesh**

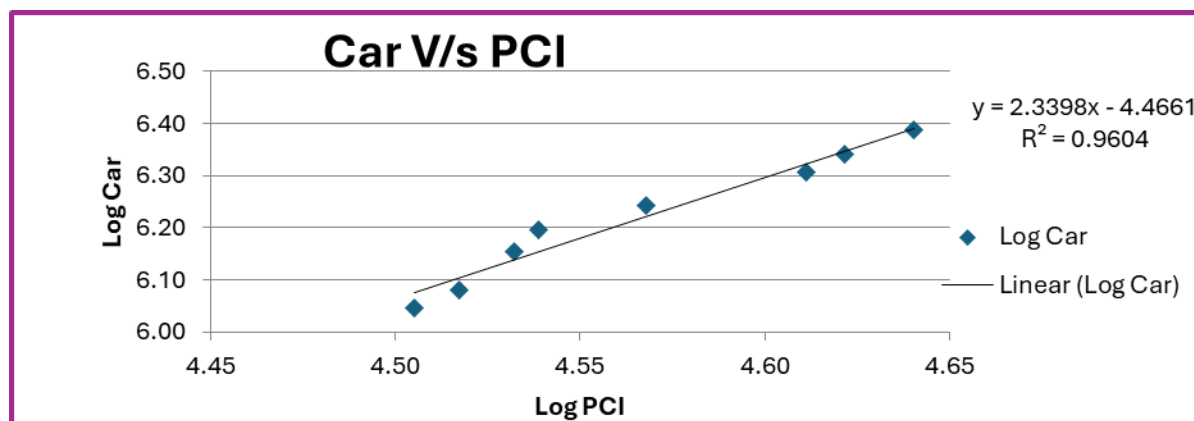
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
<b>MADHYA PRADESH</b>	<b>Car/Jeep</b>	PCI	$y = 2.2965x - 4.8829$	$R^2 = 0.9634$	2.3	6%	13.57%	Good Regression
	<b>Bus</b>	Population	$y = 7.4978x - 53.6722$	$R^2 = 0.9862$	7.5	2%	11.90%	Good Regression
	<b>Truck</b>	NSDP	$y = 2.2088x - 11.4451$	$R^2 = 0.9694$	2.2	8%	16.70%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Uttar Pradesh State.

**Table 5-9 : Per Capita Income Vs Car Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	32002	1108100	4.51	6.04		
2012	32908	1205374	4.52	6.08	3%	
2013	34044	1423020	4.53	6.15	3%	
2014	34583	1572217	4.54	6.20	2%	
2015	36973	1746117	4.57	6.24	7%	
2016	40847	2027972	4.61	6.31	10%	
2017	41832	2195783	4.62	6.34	2%	
2018	43670	2439845	4.64	6.39	4%	4.6%

Regression analysis of same is given in figure below.

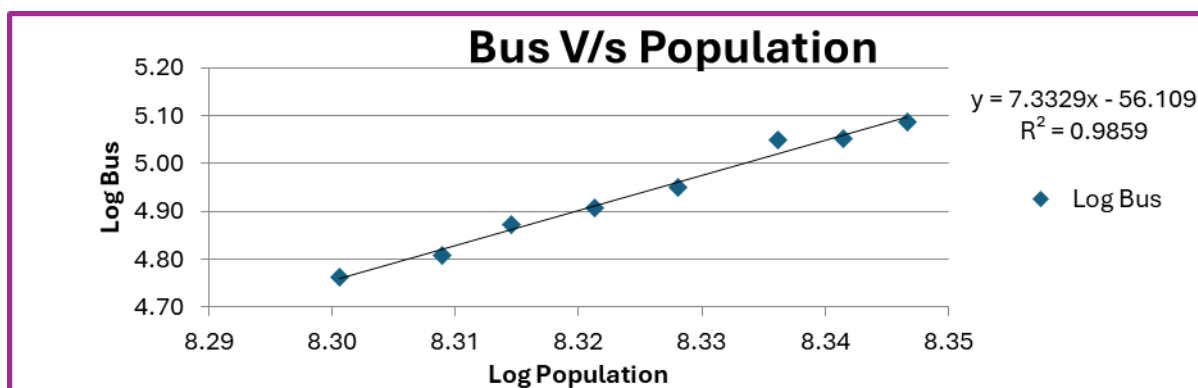


**Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh**

**Table 5-10 : Population Vs Bus Uttar Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	199812000	57901	8.30	4.76		
2012	203670000	64147	8.31	4.81	2%	
2013	206322000	74389	8.31	4.87	1%	
2014	209577000	80460	8.32	4.91	2%	
2015	212832000	89127	8.33	4.95	2%	
2016	216870000	112020	8.34	5.05	2%	
2017	219510000	112766	8.34	5.05	1%	
2018	222150000	121975	8.35	5.09	1%	1.5%

Regression analysis of same is given in figure below.



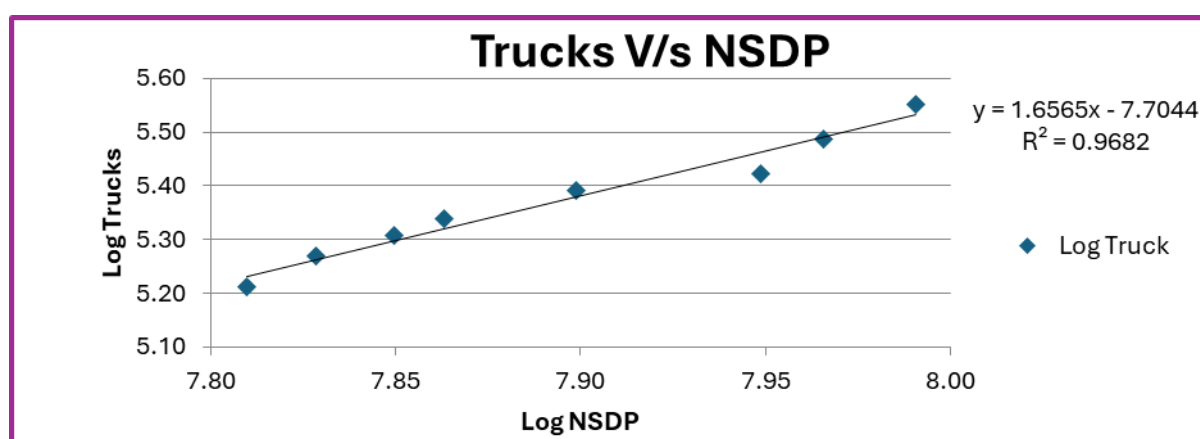
**Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-11 : Trucks Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	64513155	162813	7.81	5.21		
2012	67355218	186404	7.83	5.27	4%	
2013	70746910	202761	7.85	5.31	5%	
2014	72968630	217609	7.86	5.34	3%	
2015	79204874	245688	7.90	5.39	9%	
2016	88845325	265167	7.95	5.42	12%	
2017	92380571	307096	7.97	5.49	4%	
2018	97915937	356828	7.99	5.55	6%	6.2%

The following figure depicts regression analysis and extrapolation.

**Figure 5-9 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Uttar Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-12 : Summary Regression Analysis Uttar Pradesh**

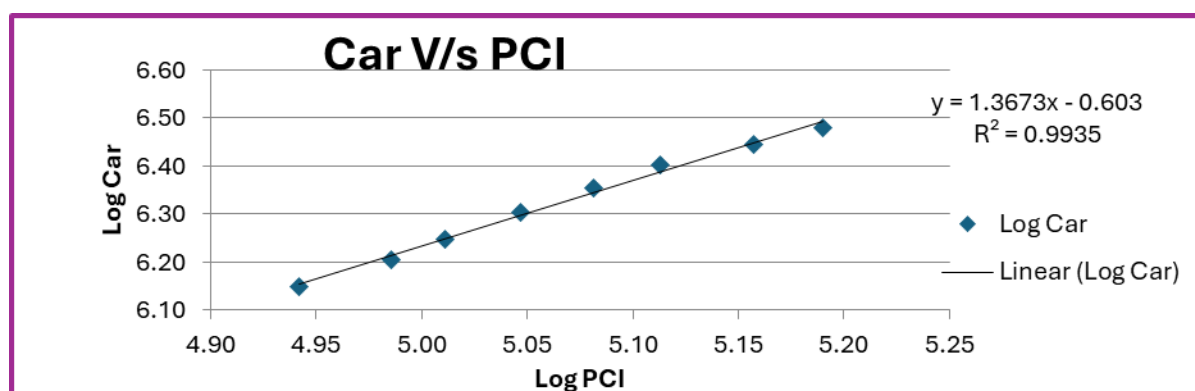
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
UTTAR PRADESH	Car/Jeep	PCI	$y = 2.3398x - 4.4661$	$R^2 = 0.9604$	2.3398	4.58%	10.72%	Good Regression
	Bus	Population	$y = 7.3329x - 56.1092$	$R^2 = 0.9859$	7.3329	1.53%	11.19%	Good Regression
	Truck	NSDP	$y = 1.6565x - 7.7044$	$R^2 = 0.9682$	1.6565	6.18%	10.24%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Gujrat State.

**Table 5-13 : Per Capita Income Vs Car Gujrat**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	87481	1411898	4.94	6.15		
2012	96683	1602129	4.99	6.20	11%	
2013	102589	1771298	5.01	6.25	6%	
2014	111370	2008748	5.05	6.30	9%	
2015	120683	2260084	5.08	6.35	8%	
2016	129738	2527537	5.11	6.40	8%	
2017	143604	2794957	5.16	6.45	11%	
2018	154887	3011656	5.19	6.48	8%	8.5%

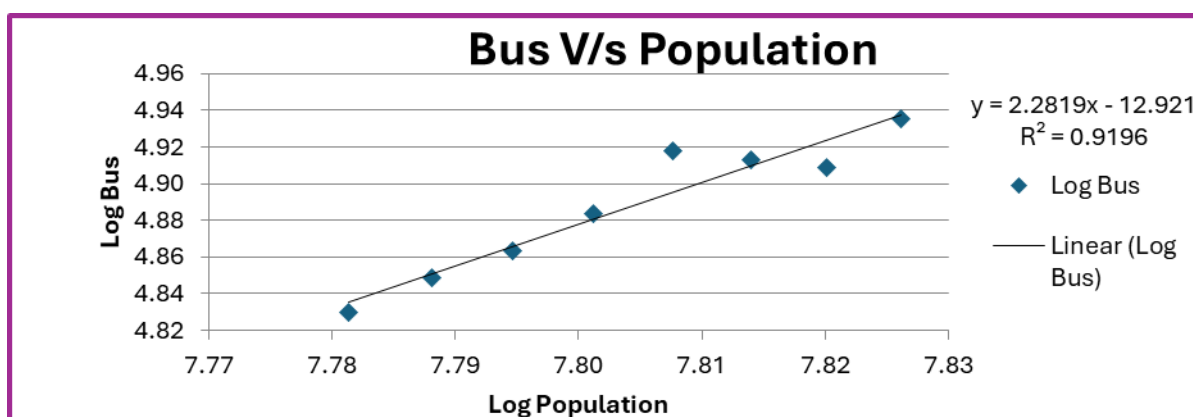
Regression analysis of same is given in figure below.



**Figure 5-10 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat****Table 5-14 : Population Vs Bus Gujarat**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	60440000	67546	7.78	4.83		
2012	61383000	70615	7.79	4.85	2%	
2013	62327000	72998	7.79	4.86	2%	
2014	63271000	76435	7.80	4.88	2%	
2015	64214000	82734	7.81	4.92	1%	
2016	65158000	81911	7.81	4.91	1%	
2017	66084000	81087	7.82	4.91	1%	
2018	67010000	86156	7.83	4.94	1%	1.5%

Regression analysis of same is given in figure below.

**Figure 5-11 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat**

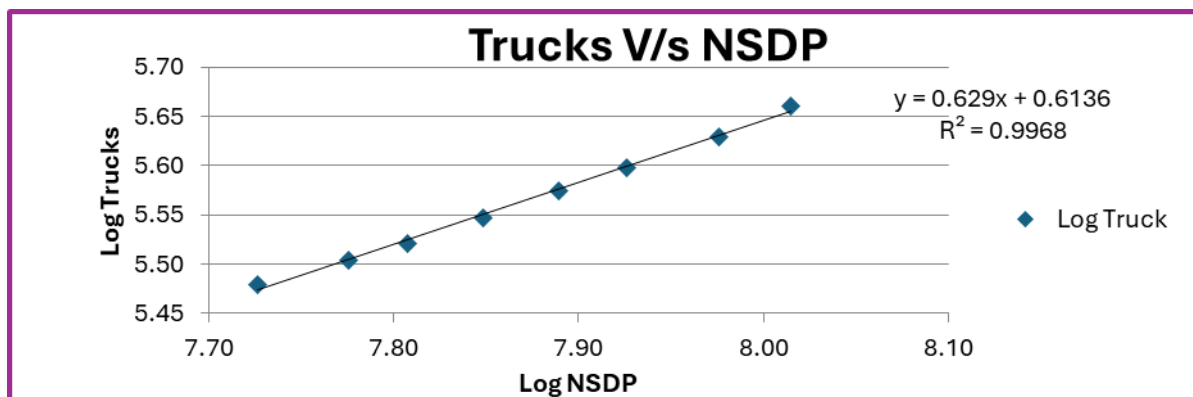
Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-15 : Trucks Vs NSDP Gujarat**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	53280946	301533	7.73	5.48		
2012	59665883	319207	7.78	5.50	12%	
2013	64148881	332185	7.81	5.52	8%	
2014	70562884	352225	7.85	5.55	10%	
2015	77477522	375265	7.89	5.57	10%	
2016	84393034	396061	7.93	5.60	9%	

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2017	94651119	425799	7.98	5.63	12%	
2018	103439901	457299	8.01	5.66	9%	10.0%

The following figure depicts regression analysis and extrapolation.



**Figure 5-12 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Gujarat.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-16 : Summary Regression Analysis Gujarat**

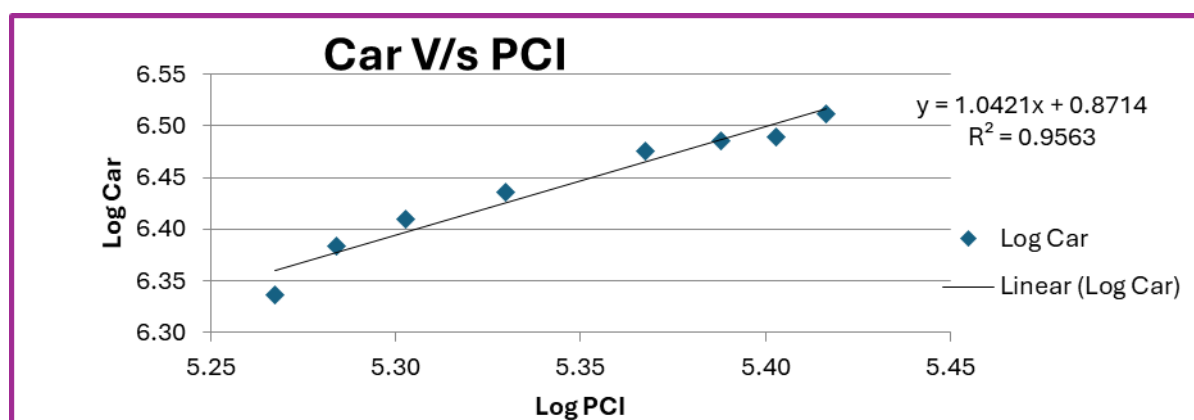
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
GUJARAT	Car/Jeep	PCI	$y = 1.3673x - 0.603$	$R^2 = 0.9935$	1.3673	8.51%	11.64%	Good Regression
	Bus	Population	$y = 2.2819x - 12.9206$	$R^2 = 0.9196$	2.2819	1.49%	3.39%	Good Regression
	Truck	NSDP	$y = 0.629x - 0.6136$	$R^2 = 0.9968$	0.6290	9.95%	6.26%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Delhi State.

**Table 5-17 : Per Capita Income Vs Car Delhi**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	185001	2172069	5.27	6.34		
2012	192220	2416974	5.28	6.38	4%	
2013	200702	2568380	5.30	6.41	4%	
2014	213669	2730071	5.33	6.44	6%	
2015	233115	2986579	5.37	6.48	9%	
2016	244255	3061817	5.39	6.49	5%	
2017	252960	3087309	5.40	6.49	4%	
2018	260967	3249670	5.42	6.51	3%	5.1%

Regression analysis of same is given in figure below.

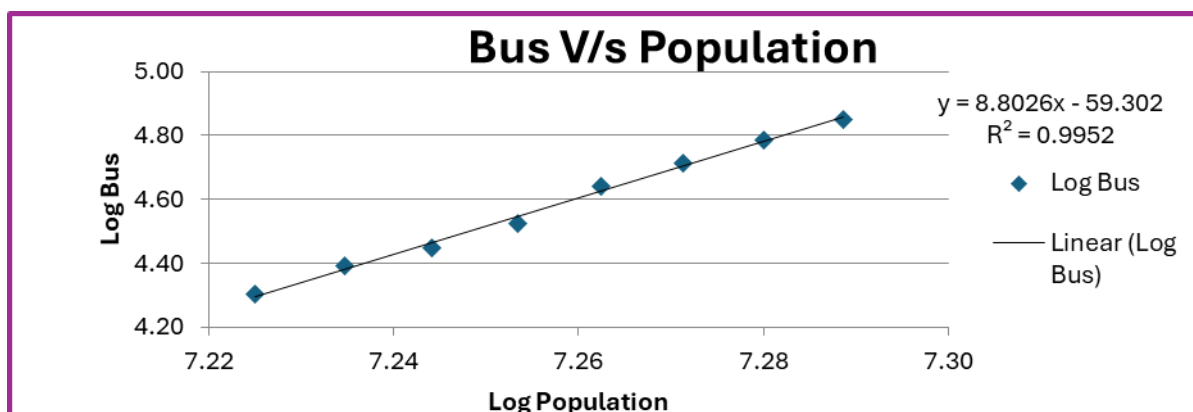


**Figure 5-13 : Regression and Elasticity PCI vs. Car – Extrapolation Delhi**

**Table 5-18 : Population Vs Bus Delhi**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	16788000	20142	7.22	4.30		
2012	17166000	24642	7.23	4.39	2%	
2013	17544000	28142	7.24	4.45	2%	
2014	17921000	33342	7.25	4.52	2%	
2015	18299000	43723	7.26	4.64	2%	
2016	18677000	51823	7.27	4.71	2%	
2017	19056000	61023	7.28	4.79	2%	
2018	19435000	71043	7.29	4.85	2%	2.1%

Regression analysis of same is given in figure below.



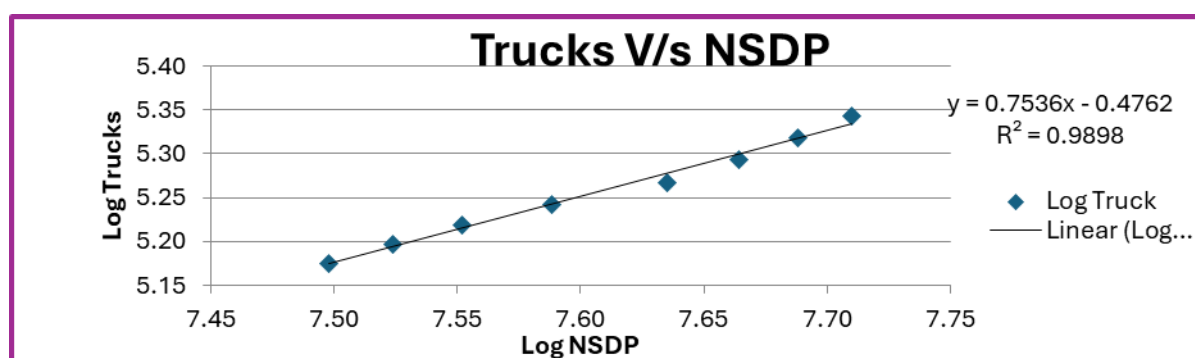
**Figure 5-14 : Regression and Elasticity Population vs. Bus – Extrapolation Delhi**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-19 : Trucks Vs NSDP Delhi**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	31465002	149277	7.50	5.17		
2012	33419330	157277	7.52	5.20	6%	
2013	35652751	165477	7.55	5.22	7%	
2014	38763874	174577	7.59	5.24	9%	
2015	43172959	185027	7.64	5.27	11%	
2016	46159238	196527	7.66	5.29	7%	
2017	48763115	208417	7.69	5.32	6%	
2018	51295715	220417	7.71	5.34	5%	7.2%

The following figure depicts regression analysis and extrapolation.



**Figure 5-15 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Delhi.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-20 : Summary Regression Analysis Delhi**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
DELHI	Car/Jeep	PCI	$y = 1.0421x - 0.8714$	$R^2 = 0.9563$	1.0421	5.05%	5.27%	Good Regression
	Bus	Population	$y = 8.8026x - 59.3021$	$R^2 = 0.9952$	8.8026	2.11%	18.61%	Good Regression
	Truck	NSDP	$y = 0.7536x - 0.4762$	$R^2 = 0.9898$	0.7536	7.25%	5.46%	Good Regression

Economical model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trend of growth. Project stretch of Kota Bypass has recently been awarded to Concessionaire. Hence credible historical traffic data is currently not available.

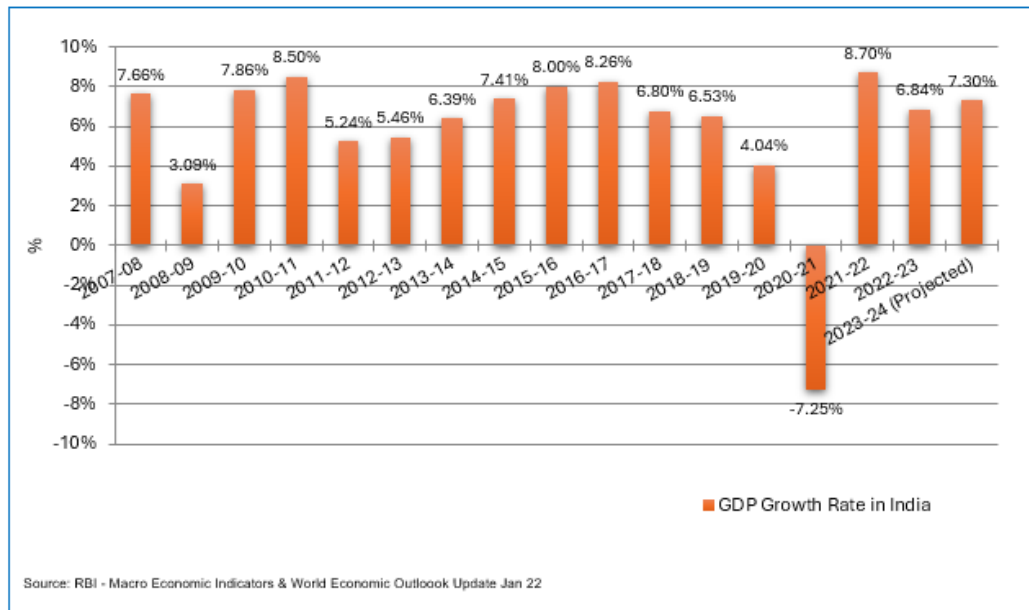
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

## ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-16 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. Leading banking and financial institutions have estimated that India would keep on registering good growth in coming years and the growth in year 2023-24 is expected to be around 7.3%.

### 5.6 Developments along and around the Project Corridor & State

**RAJASTHAN:** Rajasthan is a state where tradition and glory meet in the midst of colours. It is endowed with magnificent forts, palaces, havellies, natural resources, heritage, beauty and culture. With the lofty hills of Aravali-one of the oldest mountain ranges of the world and the golden sand dunes of the Great Indian Desert, Rajasthan is the only desert of the sub-continent. Rajasthan is

located in the north-western region of India. It is the largest State in the Republic of India. It forms a corridor between the northern and the western states in the country.

**KOTA DISTRICT:** Kota district is one of the fifty districts of Rajasthan state. Kota is also the educational headquarters of this state. The town is considered as the Coaching Centre Hub of India.

Overall Rajasthan has 11<sup>th</sup> rank in India in terms of GDP. The state economy has shown promising growth in the past year in the range of 8-9% and it is expected that this would continue to grow in the same pattern and would contribute to growth of economy of country and region.

From the above it can be expected that the project corridor would serve as one of the important transportation links in the area and would contribute to the growth of the region.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as under. Rate of growth is moderated in light of overall regional trend. Growth of Multi-Axle is kept slightly higher as trend of technological advances in logistic industry Favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, rate of growth diminishes. Same growth rate is not sustainable for long. Traffic growth has been suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic**, **Pessimistic** and **Most Likely** with a positive and negative variation 0.25% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Stretch

*Table 5-21 : Recommended Growth Rates Optimistic*

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	8.48%	7.48%	6.62%	6.39%	5.51%
Mini LCV	4.78%	3.29%	2.38%	2.01%	2.79%
Bus	4.09%	2.58%	2.36%	2.14%	1.94%
Mini - Bus	4.09%	2.58%	2.36%	2.14%	1.94%
LCV	4.78%	3.29%	2.38%	2.01%	1.82%
2- Axle	4.43%	3.29%	2.38%	2.01%	1.82%
3 - Axle	4.43%	3.29%	2.38%	2.01%	1.82%
4 to6 Axle	5.82%	4.31%	3.09%	2.60%	2.34%
7 and Above Axle	4.43%	3.29%	2.38%	2.01%	1.82%

*Table 5-22 : Recommended Growth Rates Pessimistic*

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	7.98%	6.98%	6.12%	5.89%	5.01%
Mini LCV	4.28%	2.79%	1.88%	1.51%	2.29%
Bus	3.59%	2.08%	1.86%	1.64%	1.44%
Mini - Bus	3.59%	2.08%	1.86%	1.64%	1.44%
LCV	4.28%	2.79%	1.88%	1.51%	1.32%
2- Axle	3.93%	2.79%	1.88%	1.51%	1.32%
3 - Axle	3.93%	2.79%	1.88%	1.51%	1.32%

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
<b>4 to6 Axle</b>	5.32%	3.81%	2.59%	2.10%	1.84%
<b>7 and Above Axle</b>	3.93%	2.79%	1.88%	1.51%	1.32%

***Table 5-23 : Recommended Growth Rates Most Likely***

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
<b>Car/Jeep/Van</b>	8.23%	7.23%	6.37%	6.14%	5.26%
<b>Mini LCV</b>	4.53%	3.04%	2.13%	1.76%	2.54%
<b>Bus</b>	3.84%	2.33%	2.11%	1.89%	1.69%
<b>Mini - Bus</b>	3.84%	2.33%	2.11%	1.89%	1.69%
<b>LCV</b>	4.53%	3.04%	2.13%	1.76%	1.57%
<b>2- Axle</b>	4.18%	3.04%	2.13%	1.76%	1.57%
<b>3 - Axle</b>	4.18%	3.04%	2.13%	1.76%	1.57%
<b>4 to6 Axle</b>	5.57%	4.06%	2.84%	2.35%	2.09%
<b>7 and Above Axle</b>	4.18%	3.04%	2.13%	1.76%	1.57%

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza - Chainage 1055+217 KM/1058+837 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	2420	582	84	1253	1013	2898	5	8255	23406
2025-26	2625	610	87	1308	1058	3066	5	8759	24719
2026-27	2848	639	91	1366	1105	3245	5	9299	26118
2027-28	3089	669	95	1426	1154	3435	5	9873	27598
2028-29	3350	701	99	1489	1205	3635	5	10484	29161
2029-30	3600	724	101	1538	1245	3791	5	11004	30420
2030-31	3869	747	103	1588	1286	3954	5	11552	31736
2031-32	4158	772	105	1641	1328	4124	5	12133	33119
2032-33	4469	798	108	1695	1372	4303	5	12750	34577
2033-34	4803	824	111	1751	1417	4489	5	13400	36099
2034-35	5121	844	113	1793	1451	4627	5	13954	37302
2035-36	5459	864	116	1836	1486	4769	5	14535	38552
2036-37	5821	884	119	1880	1522	4916	5	15147	39855
2037-38	6206	905	122	1924	1559	5068	5	15789	41207
2038-39	6617	927	125	1969	1596	5224	5	16463	42608
2039-40	7039	946	128	2008	1629	5360	5	17115	43896
2040-41	7489	965	131	2048	1662	5500	5	17800	45232
2041-42	7967	984	134	2090	1696	5643	5	18519	46619
2042-43	8476	1004	137	2132	1730	5790	5	19274	48057
2043-44	9017	1024	140	2175	1765	5941	5	20067	49550

**Table 6-2 : Total Tollable Traffic @ Toll Plaza 1 - Chainage 1055+217 KM/1058+837 KM**  
**(Pessimistic Growth Scenario)**

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	2420	582	84	1253	1013	2898	5	8255	23406
2025-26	2613	607	87	1302	1053	3051	5	8718	24602
2026-27	2821	633	90	1353	1095	3213	5	9210	25866
2027-28	3045	660	93	1406	1138	3384	5	9731	27197
2028-29	3287	688	96	1461	1183	3563	5	10283	28595
2029-30	3517	707	98	1501	1216	3699	5	10743	29691
2030-31	3762	727	100	1543	1250	3840	5	11227	30834
2031-32	4025	747	102	1586	1285	3986	5	11736	32024
2032-33	4306	767	104	1630	1322	4138	5	12272	33268
2033-34	4606	789	106	1675	1359	4295	5	12835	34560
2034-35	4888	804	108	1707	1385	4406	5	13303	35544
2035-36	5187	819	110	1739	1411	4520	5	13791	36558
2036-37	5505	835	112	1772	1438	4637	5	14304	37613
2037-38	5842	851	114	1805	1465	4758	5	14840	38704
2038-39	6200	867	116	1839	1493	4881	5	15401	39832
2039-40	6565	880	118	1867	1515	4984	5	15934	40836
2040-41	6952	893	120	1895	1537	5088	5	16490	41866
2041-42	7361	906	122	1923	1560	5195	5	17072	42935
2042-43	7794	919	124	1952	1583	5305	5	17682	44045
2043-44	8252	933	126	1981	1607	5416	5	18320	45188

Traffic projections for Most Likely scenario is given as under

**Table 6-3 : Total Tollable Traffic @ Toll Plaza 1 - Chainage 1055+217 KM/1055+217 KM/1058+837 KM**  
**(Most Likely Growth Scenario)**

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	2420	582	84	1253	1013	2898	5	8255	23406
2025-26	2619	608	87	1306	1055	3059	5	8739	24663
2026-27	2834	636	90	1360	1100	3229	5	9254	25991
2027-28	3067	665	93	1416	1146	3409	5	9801	27393
2028-29	3319	695	96	1475	1194	3599	5	10383	28875
2029-30	3559	717	98	1520	1231	3744	5	10874	30052
2030-31	3816	739	100	1566	1269	3896	5	11391	31284
2031-32	4091	761	102	1614	1308	4053	5	11934	32566

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2032-33	4387	784	104	1663	1348	4217	5	12508	33907
2033-34	4704	807	106	1713	1389	4388	5	13112	35307
2034-35	5004	824	108	1750	1419	4513	5	13623	36402
2035-36	5322	841	110	1787	1449	4641	5	14155	37529
2036-37	5661	859	112	1825	1480	4773	5	14715	38702
2037-38	6022	878	114	1864	1512	4909	5	15304	39922
2038-39	6406	897	116	1903	1545	5049	5	15921	41187
2039-40	6798	913	118	1936	1573	5168	5	16511	42327
2040-41	7215	929	120	1970	1601	5290	5	17130	43509
2041-42	7658	945	122	2004	1630	5415	5	17779	44734
2042-43	8127	961	124	2039	1659	5542	5	18457	45996
2043-44	8625	978	126	2075	1689	5672	5	19170	47309

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

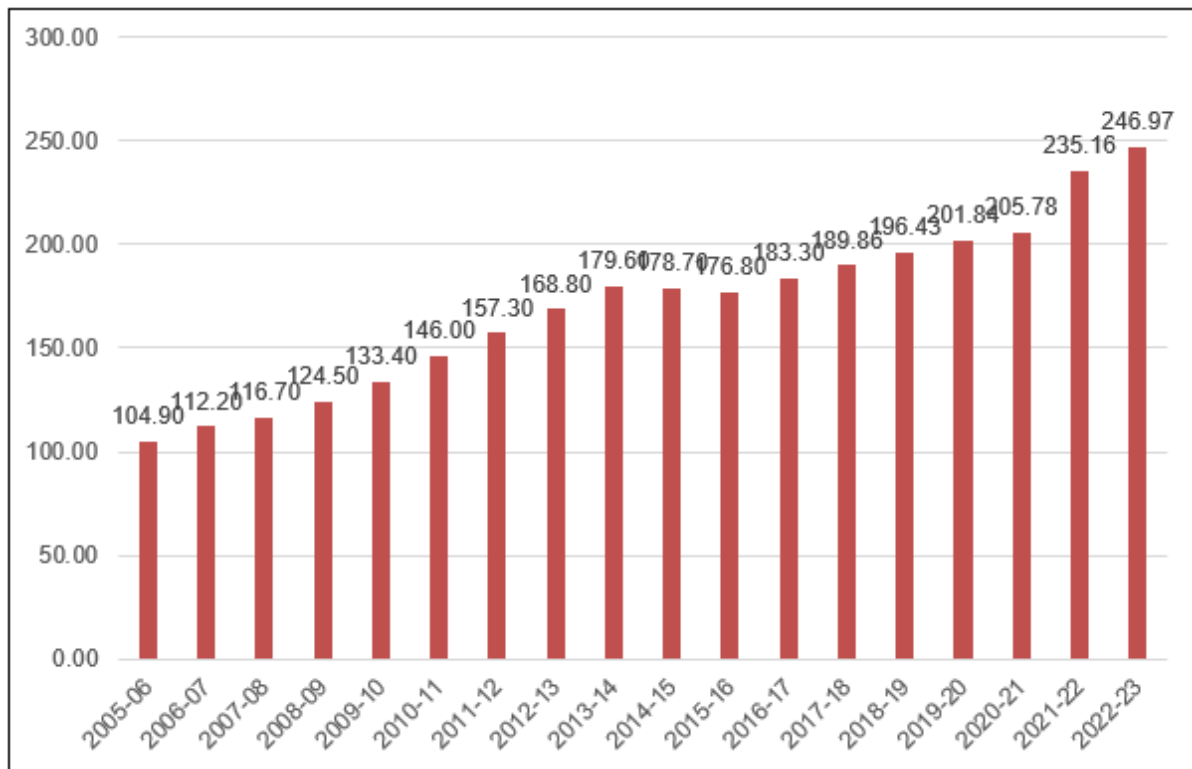
1. Monthly Pass: For frequent users monthly pass would be issued at fee at 2/3<sup>rd</sup> rate for 50 single journey trips.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van - Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza)

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2022-23. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is taken 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Oversized Vehicles (7 or more Axles)	4.20

These rates are then modified for as per procedure provided in guidelines of notification considering factors listed below.

- Annual revision of fee rate - @3%
- Application of WPI

Base rates have been worked out to map the current rates. These shall be updated when more details come in. Base toll rates are given below.

Above rates are applicable for base year 2024-25. These rates have been escalated for future year as NHAI policy and MORTH guideline for future revenue working

**Table 7-2 : Toll Rates for Single Journey @ Toll Plaza 1 - Chainage 1055+217 KM/1055+217 KM/1058+837 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	80	130	270	270	295	420	515
2025-26	85	135	285	285	310	445	540
2026-27	90	140	295	295	325	465	565
2027-28	90	150	310	310	340	490	595
2028-29	95	155	330	330	360	515	625
2029-30	100	165	345	345	375	540	660
2030-31	105	175	360	360	395	570	690
2031-32	115	180	380	380	415	595	725
2032-33	120	190	400	400	435	630	765
2033-34	125	200	420	420	460	660	805
2034-35	130	210	445	445	485	695	845
2035-36	140	225	465	465	510	730	890
2036-37	145	235	490	490	535	770	940
2037-38	155	245	520	520	565	810	990
2038-39	160	260	545	545	595	855	1040
2039-40	170	275	575	575	625	900	1095
2040-41	180	290	605	605	660	950	1155
2041-42	190	305	640	640	695	1000	1220
2042-43	200	320	670	670	735	1055	1285
2043-44	210	340	710	710	775	1110	1355

**Table 7-3 : Toll Rates for Return Journey @ Toll Plaza 1 - Chainage 1055+217 KM/1055+217 KM/1058+837 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	120	195	405	405	440	635	770
2025-26	125	200	425	425	460	665	810
2026-27	130	210	445	445	485	700	850
2027-28	140	225	470	470	510	735	895
2028-29	145	235	490	490	535	770	940
2029-30	155	245	515	515	565	810	985
2030-31	160	260	545	545	595	850	1035
2031-32	170	275	570	570	625	895	1090
2032-33	180	285	600	600	655	945	1150
2033-34	185	300	630	630	690	990	1205
2034-35	195	320	665	665	725	1045	1270
2035-36	205	335	700	700	765	1100	1335
2036-37	220	350	735	735	805	1155	1410
2037-38	230	370	775	775	845	1220	1480
2038-39	240	390	820	820	890	1285	1560
2039-40	255	410	860	860	940	1350	1645
2040-41	270	435	910	910	990	1425	1735
2041-42	285	455	955	955	1045	1500	1825
2042-43	300	480	1010	1010	1100	1580	1925
2043-44	315	505	1065	1065	1160	1665	2030

**Table 7-4: Toll Rates for Monthly Pass Local @ Toll Plaza 1 - Chainage 1055+217 KM/1055+217 KM/1058+837 KM**

Year	Car
2024-25	355
2025-26	375
2026-27	390
2027-28	410
2028-29	435
2029-30	455
2030-31	480
2031-32	505
2032-33	530
2033-34	560
2034-35	585
2035-36	620
2036-37	650
2037-38	685

Year	Car
2038-39	720
2039-40	760
2040-41	800
2041-42	845
2042-43	890
2043-44	940

**Table 7-5: Toll Rates for Monthly Pass @ Toll Plaza 1 - Chainage 1055+217 KM/1055+217 KM/1058+837 KM**

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2024-25	2650	4280	8965	8965	9780	14060	17115
2025-26	2780	4495	9415	9415	10275	14765	17975
2026-27	2925	4720	9895	9895	10790	15515	18885
2027-28	3070	4960	10395	10395	11340	16300	19845
2028-29	3230	5215	10925	10925	11920	17130	20855
2029-30	3395	5480	11485	11485	12530	18010	21925
2030-31	3570	5765	12075	12075	13175	18935	23050
2031-32	3750	6060	12700	12700	13855	19915	24245
2032-33	3945	6375	13355	13355	14570	20945	25500
2033-34	4150	6705	14055	14055	15330	22040	26830
2034-35	4370	7060	14790	14790	16135	23190	28235
2035-36	4600	7430	15565	15565	16980	24410	29715
2036-37	4840	7820	16390	16390	17875	25700	31285
2037-38	5100	8235	17255	17255	18825	27060	32945
2038-39	5370	8675	18175	18175	19825	28500	34700
2039-40	5655	9140	19145	19145	20885	30025	36555
2040-41	5960	9630	20175	20175	22010	31635	38515
2041-42	6280	10150	21260	21260	23195	33340	40590
2042-43	6620	10695	22410	22410	24450	35145	42785
2043-44	6980	11275	23630	23630	25775	37055	45110

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2043-44 years starting from the year 2024-25 are shown in tables below.

**Table 7-6 : Toll Revenue Optimistic Scenario**  
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	73.25	73.25
2025-26	81.56	81.56
2026-27	90.08	90.08
2027-28	100.07	100.07
2028-29	110.94	110.94
2029-30	121.38	121.38
2030-31	133.17	133.17
2031-32	146.50	146.50
2032-33	160.75	160.75
2033-34	175.80	175.80
2034-35	191.21	191.21
2035-36	208.60	208.60
2036-37	226.00	226.00
2037-38	246.45	246.45
2038-39	267.72	267.72
2039-40	291.29	291.29
2040-41	315.76	315.76
2041-42	342.66	342.66
2042-43	371.82	371.82
2043-44	404.67	404.67

**Table 7-7 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	73.25	73.25
2025-26	81.17	81.17
2026-27	89.24	89.24
2027-28	98.66	98.66
2028-29	108.84	108.84
2029-30	118.50	118.50
2030-31	129.37	129.37
2031-32	141.64	141.64
2032-33	154.64	154.64
2033-34	168.29	168.29
2034-35	182.16	182.16
2035-36	197.72	197.72

Location / Year	TP-01	Total
2036-37	213.16	<b>213.16</b>
2037-38	231.32	<b>231.32</b>
2038-39	250.09	<b>250.09</b>
2039-40	270.75	<b>270.75</b>
2040-41	292.06	<b>292.06</b>
2041-42	315.35	<b>315.35</b>
2042-43	340.53	<b>340.53</b>
2043-44	368.79	<b>368.79</b>

**Table 7-8 : Toll Revenue Most Likely Scenario  
(Rs. Crores)**

Location / Year	TP-01	Total
2024-25	73.25	<b>73.25</b>
2025-26	81.39	<b>81.39</b>
2026-27	89.66	<b>89.66</b>
2027-28	99.38	<b>99.38</b>
2028-29	109.90	<b>109.90</b>
2029-30	119.94	<b>119.94</b>
2030-31	131.31	<b>131.31</b>
2031-32	144.12	<b>144.12</b>
2032-33	157.74	<b>157.74</b>
2033-34	172.10	<b>172.10</b>
2034-35	186.74	<b>186.74</b>
2035-36	203.19	<b>203.19</b>
2036-37	219.60	<b>219.60</b>
2037-38	238.90	<b>238.90</b>
2038-39	258.96	<b>258.96</b>
2039-40	281.05	<b>281.05</b>
2040-41	303.89	<b>303.89</b>
2041-42	328.92	<b>328.92</b>
2042-43	356.06	<b>356.06</b>
2043-44	386.55	<b>386.55</b>

## 7.6 Modification in Concession Period

Modification of the concession period shall be done on the basis of Revenue targets given in the contract for milestones 1 & 2.

Modification in concession period as per provisions of DCA and same is summarized in table for all scenarios.

### Pessimistic Case

Target Point 1- March 2031											
Target Month - March 2031	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period		Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period (Year)	Modified Concession Period	
TOT-13 - Kota	9.11	10.82	18.77 %	No		-	0.00%	20.00	0.00		
Target Point 2- March 2038											
Target Month - March 2038	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period	Total Change in Concession period (Year)	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-13 - Kota	16.81	19.29	14.77 %	No	-	0.00%	20.00	0.00	0.00	20.00	

### Most likely Case

Target Point 1- March 2031											
Target Month - March 2031	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period		Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period (Year)	Modified Concession Period	
TOT-13 - Kota	9.11	10.98	20.55 %	Yes		0.55%	- 0.42%	20.00	-0.08		

Target Point 2- March 2038											
Target Month - March 2038	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period	Total Change in Concession period (Year)	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-13 - Kota	16.81	19.93	18.56 %	No	-	0.00%	20.00	0.00	-0.08	19.92	

### Optimistic Case

Target Point 1- March 2031											
Target Month - March 2031	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period (Year)	Modified Concession Period		
TOT-13 - Kota	9.11	11.14	22.29 %	Yes	2.29%	- 1.71%	20.00	-0.34			
Target Point 2- March 2038											
Target Month - March 2038	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period	Total Change in Concession period (Year)	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-13 - Kota	16.81	20.56	22.31 %	No	-	0.00%	20.00	0.00	-0.34	19.66	

**TOT-13 (Kota bypass)-Modification in Concession Period**

Types of Scenarios	Pessimistic Case		Most likely Case		Optimistic Case	
Target Month	Mar-31	Mar-38	Mar-31	Mar-38	Mar-31	Mar-38
Target Revenue (Rs. Crores)	9.11	16.81	9.11	16.81	9.11	16.81
Calculated Revenue (Rs. Crores)	10.82	19.29	10.98	19.93	11.14	20.56
Differences %	18.77%	14.77%	20.55%	18.56%	22.29%	22.31%
If qualifies for Modification in Concession Period	No	No	Yes	No	Yes	No
Qualifying Increment or shortfall	-	-	0.55%	-	2.29%	-
Change in Concession period %	0.00%	0.00%	-0.42%	0.00%	-1.71%	0.00%
Original Concession Period	20.00	20.00	20.00	19.92	20.00	20.00
Change in Concession period	0.00	0.00	-0.08	0.00	-0.34	0.00
Total Change in Concession period	0.00		-0.08		-0.34	
Calculated Modified Concession Period	20.00		19.92		19.66	
Final Concession Period subject to Cap	0.00		0.00		0.00	

Thus, there is no modification expected in concession period due to variation in revenue as per above estimates in Pessimistic scenarios.

Reduction in Concession Period of about 29 days is expected as per revenue in *Most likely scenarios*.

Reduction in Concession Period of about 124 days is expected as per revenue in *Optimistic scenarios*.

## CHAPTER 8

# CONCLUSION & RECOMMENDATIONS

### 8.1 Conclusion & Recommendations

Project stretch of Kota Bypass from Km 1052+429 to Km 1080+249 section of NH-27 in state of Rajasthan is currently four lane road. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the important regional network East-West connectivity. Kota Bypass is part of Silchar – Porbandar East – West Corridor. There are large number of townships, industrial corridors and other business establishment coming up along project corridor. As discussed, dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give positive impact to traffic flow on project. The following can be considered as major outcomes of the study

- a) There is good amount of tollable traffic running on project
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy
- c) Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road

Based on above it can be considered a stable healthy project from traffic and revenue point of view.



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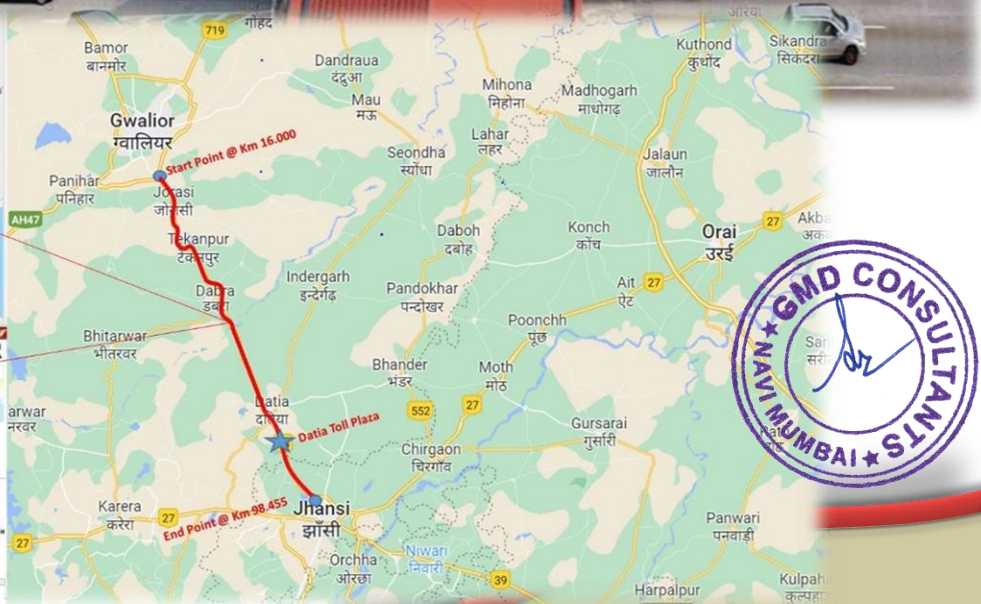
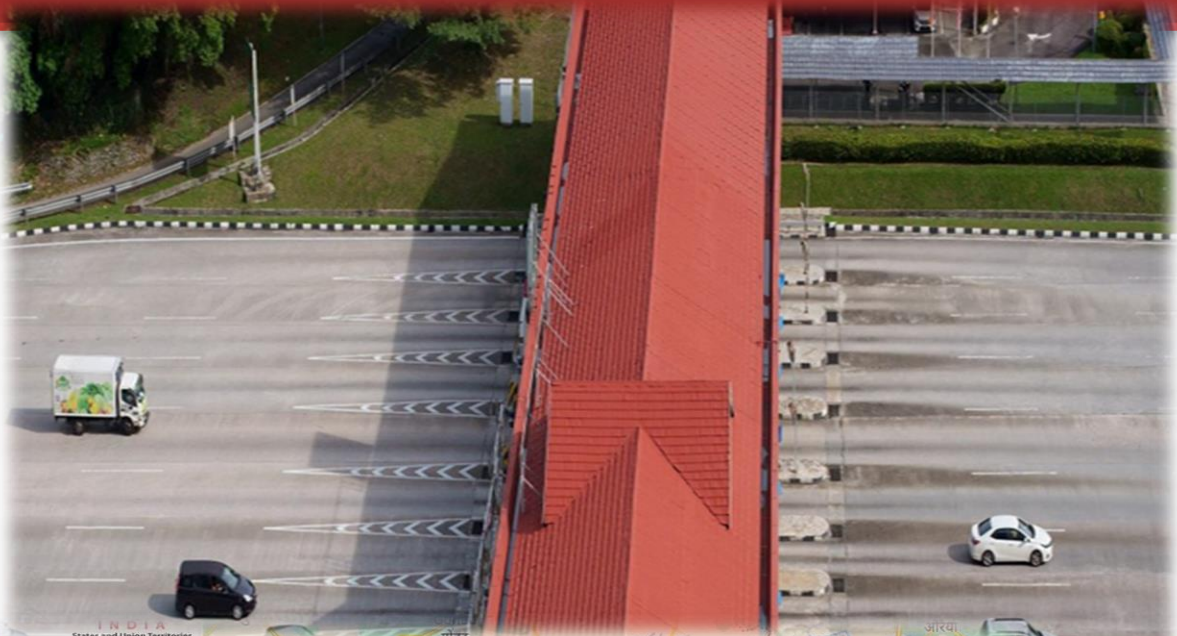
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**Gwalior -Jhansi section from km 0.000 to km  
103.000 (revised section km 16.000 to km  
98.455) of NH-75 (New NH-44) in the state of  
Madhya Pradesh and Uttar Pradesh  
(TOT Bundle -13)**



**TRAFFIC STUDY &  
REVENUE  
PROJECTION REPORT  
(FINAL)  
OCTOBER 2024**

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**Gwalior -Jhansi section from 0.000 to km 103.000  
(revised section km 16.000 to km 98.455) of NH-75  
(New NH-44) in the state of Madhya Pradesh and  
Uttar Pradesh  
(TOT Bundle -13)**

**TRAFFIC STUDY & REVENUE  
PROJECTION REPORT  
(FINAL)**

**OCTOBER 2024**



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## ABBREVIATIONS

<b>AADT</b>	- Annual Average Daily Traffic	<b>NHAI</b>	- National Highway Authority of India
<b>BOT</b>	- Build Operate Transfer	<b>NHDP</b>	- National Highways Development Project
<b>CAGR</b>	- Compound Annual Growth Rate	<b>NSDP</b>	- Net State Domestic Product
<b>CTV</b>	- Classified traffic volume	<b>O&amp;M</b>	- Operation & Maintenance
<b>DBFOT</b>	- Design, Build, Finance, Operate & Transfer	<b>PCDP</b>	- Per Capita Domestic Product
<b>EME</b>	- Earth Moving Equipment	<b>PCI</b>	- Per Capita Income
<b>GDP</b>	- Gross Domestic Product	<b>PCU</b>	- Passenger Car Unit
<b>GSDP</b>	- Gross State Domestic Product	<b>PSC</b>	- Pre-stressed Concrete
<b>HCM</b>	- Heavy Construction Machinery	<b>RCC</b>	- Reinforced cement concrete
<b>HCV</b>	- Heavy Commercial Vehicle	<b>RHS</b>	- Right Hand Side
<b>HTMS</b>	- Highway Traffic Management System	<b>SH</b>	- State Highway
<b>IRC</b>	- Indian Road Congress	<b>TP</b>	- Toll Plaza
<b>IRR</b>	- Internal Rate of Return	<b>WPI</b>	- Wholesale Price Index
<b>LCV</b>	- Light Commercial Vehicle	<b>SIR</b>	- Special Investment Region
<b>LHS</b>	- Left Hand Side	<b>c.</b>	- Circa
<b>LGV</b>	- Light Goods Vehicle	<b>ROB</b>	- Railway Over Bridge
<b>MAV</b>	- Multi Axle Vehicle	<b>MDR</b>	- Major District Road
<b>MORTH</b>	- Ministry of Road Transport and Highways	<b>ODR</b>	- Other District Road
<b>NH</b>	- National Highway	<b>CA</b>	- Concession Agreement
<b>PCC</b>	- Plain Cement Concrete	<b>RMT</b>	- Running Meter
<b>CR</b>	- Coarse Rubble		

# CHAPTER 1

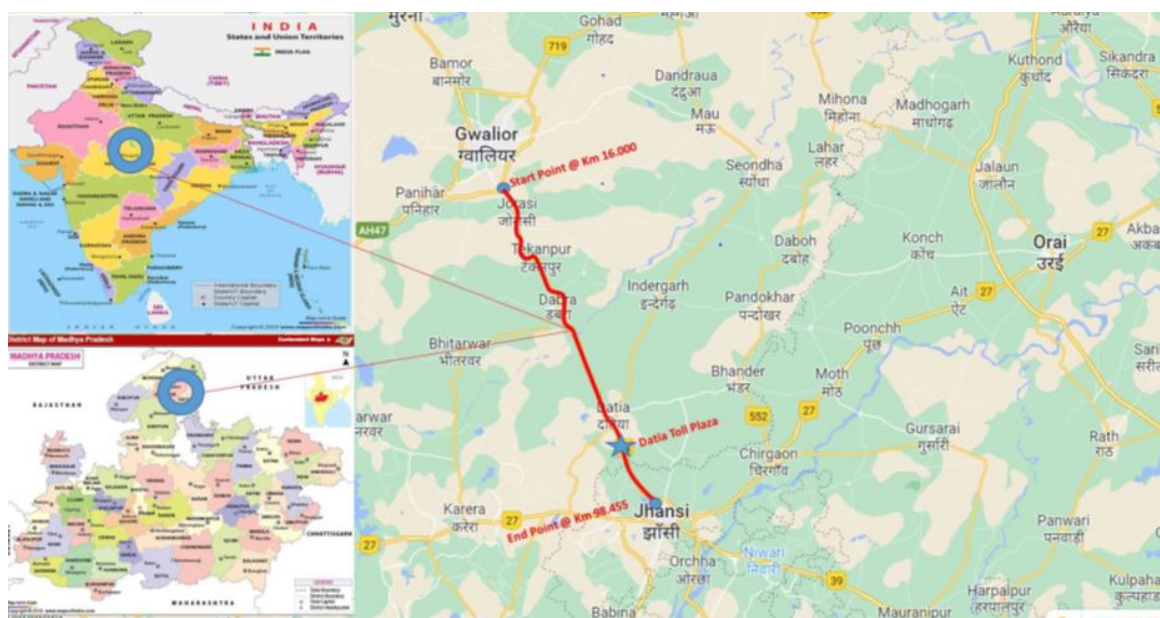
## INTRODUCTION

### 1.1 Background

The National Highways Authority of India (NHAI) introduced the Toll, Operate and Transfer (TOT) model for partnership with private developers in the road sector. Under this model, NHAI passes on the toll collection rights and operation and maintenance obligations for 20 years to the private developer against payment of upfront, one-time, lump sum concession fees quoted by the private developer as part of the comprehensive bidding process. Projects under this model are awarded as a bundle of operational national highways, which allows the investor to offset the risks of one project against another. Existing and operational roads are auctioned under the TOT model.

Under the Toll Operate and Transfer (ToT) 13 bundle, NHAI had invited tenders for selection of concessionaire for maintenance of the National Highway stretch from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) in the state of Madhya Pradesh and Uttar Pradesh.

M/s. IRB Infrastructure Developers Limited., has been declared as the selected bidder for the project. This report is for part section of ToT bundle 13 “Gwalior to Jhansi from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) in the state of Madhya Pradesh and Uttar Pradesh. Project Highway alignment is depicted in the following figure.



**Figure 1-1: Project Stretch of ToT Bundle 13 (Part)**

## 1.2 Objective of the Study

M/s IRB Infrastructure Developers Limited (IRB) intends to develop a traffic study report for Four Laning of Gwalior to Jhansi from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) in the state of Madhya Pradesh and Uttar Pradesh on BOT basis. GMD Consultants have been assigned the work of conducting traffic study and developing revenue model based on traffic projections and forecast.

The year 2024-25 has been taken as the base year for projections and forecasting of traffic in the horizon year. This report fulfils part of the requirement of the assignment.

## 1.3 Scope of Services

The following may be referred to as broad scope of Traffic Study of Four Laning of Gwalior to Jhansi from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) in the state of Madhya Pradesh and Uttar Pradesh.

Classified Traffic Volume Count at main toll plaza location at Toll Plaza locations. This data was supplied by the Concessionaire.

- Establishment of traffic pattern
- Working out traffic demand elasticity and growth
- Traffic forecast up to concession period.
- Preparation of revenue model up to concession period
- Any other analysis relevant to scope

## CHAPTER 2

### PROJECT DETAILS

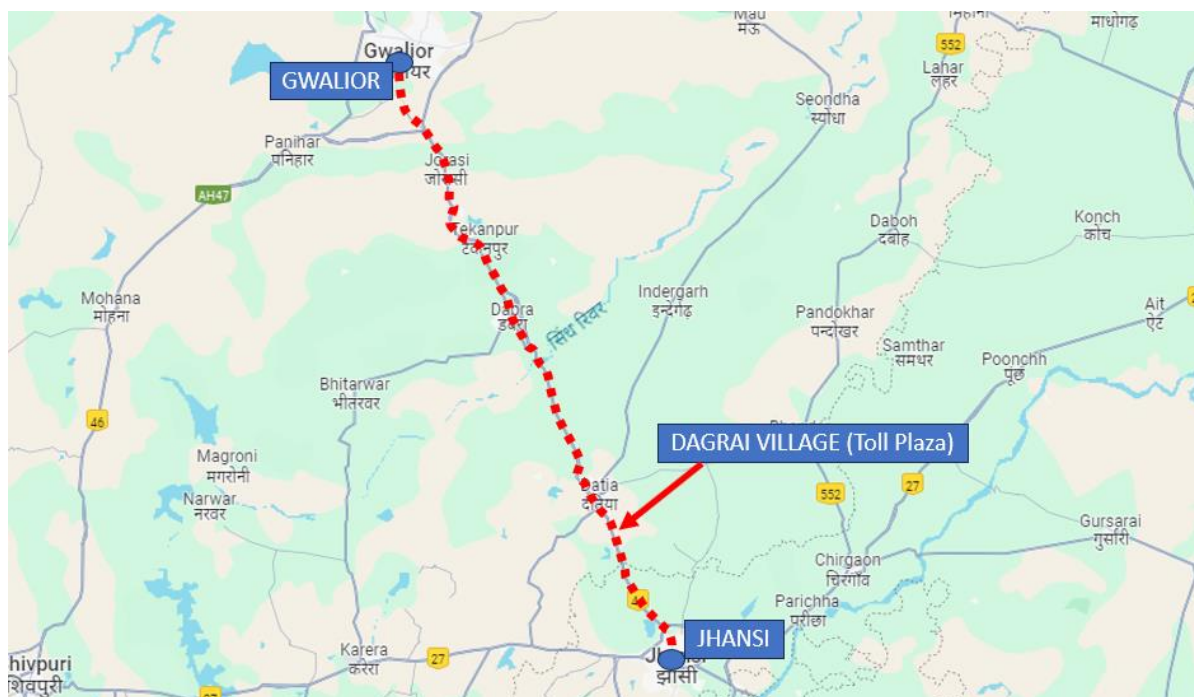
#### 2.1 Project Corridor

The project stretch is a section of NH-44, which is the longest National Highway in the country, running through North, Central and South India. A major part of the project section from Gwalior to Jhansi Road lies in Gwalior and Datia district of Madhya Pradesh followed by Jhansi district. The major towns along the project corridor are Gwalior, Tekampur, Dabra, Datia and Jhansi.

#### Project Stretch Description

The project stretch under this study starts from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) in the state of Madhya Pradesh and Uttar Pradesh. The length of project stretch is 80.127 km and has 4-lane configuration with single Toll Plaza (Dagrai village at ch.97.900 KM).

The following figure shows this the alignment of the project highway in the above context.



**Figure 2-1 : Project Alignment with Toll Plaza**

## CHAPTER 3

### TRAFFIC SURVEYS AND ANALYSIS

#### 3.1 Traffic Surveys

The Consultants have collected the required information for project corridor to understand the general traffic and travel characteristics on the corridor.

The following traffic data has been collected from a client for a project.

- Classified traffic volume counts at toll plaza locations on Gwalior- Jhansi section km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44), provided by Concessionaire for year 2023-24 and traffic data from April 2024 to July 2024.
- Local Component of traffic
- Component of Return Journey
- Component of Monthly Pass Journey

The main objective of the traffic data analysis is to:

- Determine the existing traffic movement characteristics of the project
- Establish base year traffic
- Identification of travel patterns and modal split of project traffic
- Deriving growth factors for traffic forecasting
- Estimation of corridor traffic including traffic diversion if any
- Preparation of revenue model and projection of revenue as per toll policy for various scenarios

*Table 3-1* below lists provides details of locations from where traffic details have been collected.

**Table 3-1 : Traffic Data Details**

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
1	Km 97.900 Toll Plaza at Dagrai Village	AADT from previous traffic study report for year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for year 2023-24 & Four month from April 2024 to July 2024	AADT from previous traffic study report for year 2023-24 & Four month from April 2024 to July 2024

Toll plaza is located in Uttar Pradesh.

### 3.2 Classified Traffic Volume

The objective of conducting a Classified Traffic Volume Count is to understand the traffic flow pattern including modal split on a roadway. The Classified Traffic Volume Count survey has been provided by the concessionaire of project highway from actual traffic data gathered at toll plaza locations-based traffic survey done at project stretch.

The vehicles can broadly be classified into fast moving / motorized and slow moving / non-motorized vehicles, which can be further classified into specific categories of vehicles. The groupings of vehicles are further segregated to capture the tollable vehicle categories specifically and toll exempted vehicles are counted separately. The detailed vehicle classification system as per IRC: 64-1990 is given in table below.

**Table 3-2 : Vehicle Classification System**

Vehicle Type	
Auto Rickshaw	
Passenger Car	Car, Jeep, Taxi & Van (Old / new technology)
Bus	Minibus
	Standard Bus
Truck	Light Goods Vehicle (LCV)

Vehicle Type	
	2 – Axle Truck
	3 Axle Truck (HCV)
	Multi Axle Truck (4-6 Axle)
	Oversized Vehicles (7 or more axles)
Other Vehicles	Agriculture Tractor, Tractor & Trailer

Source - IRC: 64 – 1990

However, since the project highway is currently under toll operation, the data collected corresponds to the category of tollable vehicles. The following are the types of vehicles as per concession agreement.

- Car / Jeep / van
- Minibus /LCV
- Bus
- Truck /
- 3 Axle commercial vehicle
- Multi Axle

### 3.3 Traffic Characteristic

Toll revenue of project highway does not solely depend on traffic volume. There are certain characteristics of traffic which have substantial potential to affect toll collection. Component of local traffic, component of passenger and commercial traffic, portion of return journey traffic, % of monthly pass traffic are some of such characteristics of traffic. These will be discussed in subsequent sections of report.

#### 3.3.1 Traffic Data

Project concessionaire has provided Traffic data as per traffic survey conducted at toll plaza locations. It may not represent the whole year traffic as this pertains to specific period only. Hence a seasonality factor has been applied to average traffic of current period to arrive at Annual Average Daily Traffic of base year 2024-25. Same corrected traffic is used for future projections and revenue calculations. The following table shows historical traffic on project stretch and derived Annual Average Daily Traffic (AADT) for year 2024-25.

**Table 3-3 : Traffic Data at Dagrai Village Toll Plaza at Km 97.900**

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.)- 2023-24	Annual Average Daily Traffic (Nos.)- 2024-25
1	Car	4865	4096
3	Minibus /LCV	558	364
4	Bus	210	170
6	Truck	1026	1390
7	3-Axle Commercial vehicle	1253	1361
8	Multi axle	1393	1694
9	Oversized Vehicles	0	4
	<b>Total</b>	<b>9,305</b>	<b>9078</b>

### 3.4 Data Analysis

#### 3.4.1 Analysis of Traffic Volume Count

Understanding the character of existing traffic forms the basis of the traffic forecast. The various vehicle types having different sizes and characteristics can be converted into a single unit called Passenger Car Unit (PCU). Passenger Car equivalents for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “IRC-64-1990: Guidelines for Capacity of Roads in Rural areas”. The adopted passenger car unit values (PCU) are presented in Table 3-4.

**Table 3-4 : PCU Factors Adopted for Study**

Vehicle Type	PCUs
Car	1.0
Minibus	1.5
Standard Bus	3.0
LCV/LGV	1.5
2 Axle Truck	3.0
3 – 6 Axle Truck	4.5
MAV	4.5
Auto Rickshaw	1.0
Van/Tempo	1.0
Agriculture Tractor with Trailer	4.5
Agriculture Tractor without Trailer	1.5

Source: IRC: 64-1990

Traffic volume at each toll plaza was converted to PCU and same is presented as under

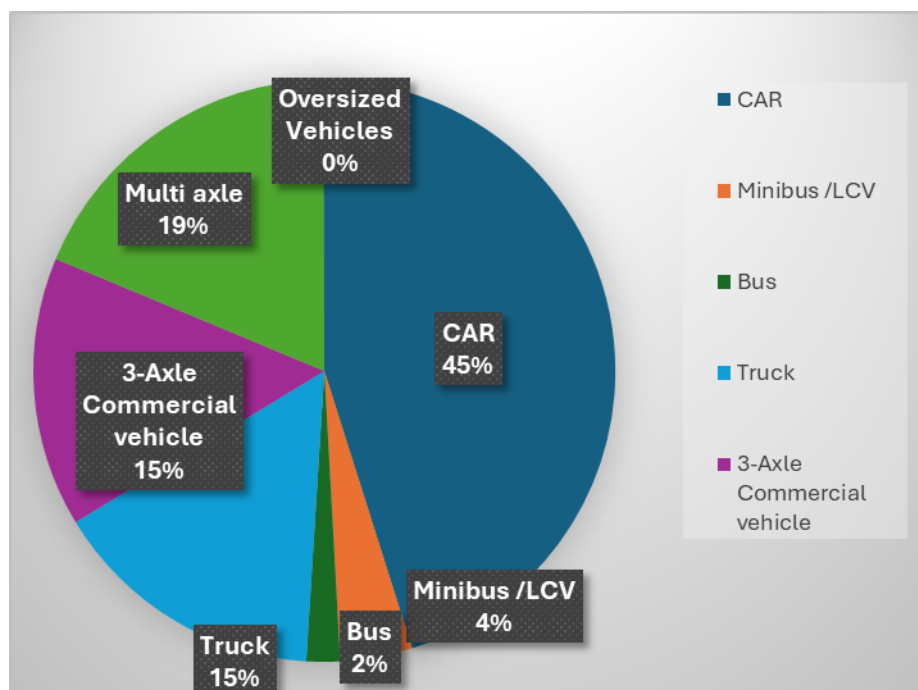
**Table 3-5 : Traffic in PCU at Project Stretch**

Year	Toll Plaza Location (Km)	Traffic No.	PCU	PCU Index
2023-2024	Km 97.900 Toll Plaza at Dagrai Village	9305	19438	2.09
2024-2025	Km 97.900 Toll Plaza at Dagrai Village	9078	21044	2.32

It can be observed from above that project traffic has PCU index 2 to 2.5 which is an indicator of high proportion of commercial traffic in traffic mix in project corridor. The following figure illustrates variation of PCU index at four toll plaza locations.

### 3.4.2 Components of Traffic

As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential negatively.



**Figure 3-2: Model split of tollable vehicle @ Km 97.900**

It is observed that car traffic forms about 45% of total traffic at toll plaza location KM 134.000 while multi axle commercial vehicles are about 34% of total traffic. Truck / Bus and LCV share about 17% and 4% of traffic volume respectively.

Another important bifurcation of traffic is components of traffic with respect various type of toll ticketing like

1. Single Journey
2. Multi Journey
3. Monthly Pass (Local and General)

The following table provides numbers of vehicles falling in each of above category on base year 2024-25.

**Table 3-6 : Journey Type Bifurcation of Traffic at Dagrai Village Toll Plaza KM  
97.900**

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
1	Single Journey	6298
2	Return Journey	2672
3	Local Commercial Single Journey	68
4	Monthly Pass Local	38
5	Monthly Pass	2

It is observed that the project corridor demonstrates a similar pattern of single journey dominated mix of traffic across the entire stretch which is typical of major national highways.

### 3.5 Secondary Data Collection

There are several other factors which have a substantial impact on traffic patterns and growth on any project corridor. The following are some of such important factors.

- Industrial development around project corridor and its catchment
- Educational infrastructure along project corridor
- Demographic pattern
- Urban area development
- Tourism potential
- Upcoming major infrastructural or Industrial projects
- Special Industry in project corridor
- Overall trends of economic growth local as well as national / regional

Hence in addition to traffic details on the project site, secondary data was also collected from various other sources. Typical secondary data includes the following:

1. Vehicle registration data of regional and national level.
2. Economic Data
  - a) GDP
  - b) NSDP
  - c) Population Growth
  - d) Per Capita Income growth
  - e) Industrial Growth
  - f) Special Industry Potential
  - g) Regional and National development vision / plan
  - h) Any other relevant data

### 3. Competing road network

We have collected and utilized such underlying data in the study to estimate the growth and risk factors for traffic along the project corridor. Same is discussed in subsequent chapter.

## CHAPTER 4

### INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

#### 4.1 Introduction

Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

Following Factors can be considered as major contributors to friction on transportation network.

- Travel Speed / Travel Time
- Geometric deficiencies like blind horizontal curves and steep vertical gradients etc.
- Configuration of road
- Riding quality
- Traffic delays,
- Length of road,
- Passing through built up or Urban Area,
- Terrain,
- Facilities,

#### 4.2 Regional Network

Project road has been in existence for a long time and traffic is almost settled. However, there are few upcoming corridors which may have interest in project road catchments. These are discussed below.

**Delhi – Mumbai Expressway** - The access controlled greenfield expressway connects Delhi and Mumbai (up to Jawaharlal Nehru Port Trust) and passes through states of Haryana, Rajasthan, Madhya Pradesh, Gujarat and Maharashtra. DME alignment will largely cater to traffic between North of India and Gujarat/Western Maharashtra and is not likely to affect traffic on the project road which caters to traffic on NH-44 which is north south highway. Hence it is not likely to impact project road traffic.



**Surat – Chennai Expressway** - The alignment will largely cater to traffic between states of Gujarat and Central Maharashtra /Andhra Pradesh/ Telangana/Karnataka/Tamilnadu and is not parallel to Project Road. Therefore, it is not likely to affect traffic on the project road.

**Pune – Bangalore Expressway** – Entire catchment of this proposed expressway falls south of project road. It is not likely to affect the project road traffic.

All other major highways in the region exist and traffic is settled in the region. On the local level also, there is no formidable competing route network. Hence it is not envisaged that

there will be any major impact on project road traffic in the near future due to regional or local network developments.

## CHAPTER 5

### GROWTH OF TRAFFIC ON PROJECT HIGHWAY

#### 5.1 Introduction

Traffic growth is a function of the interplay of a number of contributory factors such as National economy, Government policy, socio-economic conditions of the people, and changes in land uses along the project corridor precincts etc. As these factors have a number of uncertainties associated with them, forecasts of traffic are dependent on the projections of other factors such as population, gross domestic product (GDP), vehicle ownership, per capita income (PCI), agricultural output, fuel consumption etc. Future patterns of change in these factors can be estimated with only a reasonable degree of accuracy and hence the resultant traffic forecast levels may not be precise.

The traffic growth forecast for the project corridor of Gwalior-Jhansi from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) has been done taking the above factors into consideration. “**IRC: 108-2015-Guidelines for Traffic Prediction on Rural Highways**” is established best practice and has been used for traffic growth forecast.

#### 5.2 Trend Analysis

One of the methods of estimation of future rate of growth is to assume the same rate of growth as in the past. Although such a method is more suitable for projects of short durations say 5-10 years, however for long term projections it would be erroneous to assume that the past rate of growth will continue to prevail for a long time in future. Economic conditions, which are major influencing factors, are bound to change over a long period of time. Thus, it would be necessary to modify the past trends of growth suitably.

Elasticity model of growth projection is one of the most widely acceptable methods for traffic forecast. The same is recommended in **IRC: 108-12015-Guidelines for Traffic Prediction on Rural Highways**.

In this method the past trend of vehicular data is paired with an economic indicator and a regression analysis is done to yield the economic model of growth. Growth of vehicle traffic varies for different types of vehicles. It is a proven fact that the growth pattern for passenger and goods vehicle is different. Traffic growth on any highway typically depends on a number of economic parameters. Most important and direct parameters are given as under

- Per Capita Income
- Net State Domestic Product (NSDP)
- Population

It can be observed that the ownership of a car is more closely related to affordability; hence per capita is the index which closely fits the growth of car traffic among other criteria. In a similar fashion, the following can be pairs of vehicle type and independent variable for elasticity modeling of growth.

- Car / Jeep – Per Capita Income
- Bus / Minibus – Population

- Goods Vehicle – NSDP

### 5.3 Estimation of Traffic Demand Elasticity

Elasticity of traffic demand is defined as the rate at which traffic intensity varies due to a change in the corresponding indicator selected. Hence, In order to estimate the elasticity of traffic demand, it is necessary to establish relationship between the growth in number of given category of vehicles with the relevant economic variable considered, such as NSDP, per capita income and population growth. Latest available data for vehicle registration, per capita income, NSDP and population is used in analysis.

As per IRC: 108-1996 the model for estimating elasticity index for the project corridor is of the following form and is given as below:

$$\log(P) = k \times \log(EI) + A$$

Where,

$P$  = Number of Vehicles (Mode wise)

$EI$  = Economic Indicator

$A$  = Regression constant

$k$  = Elasticity coefficient (Regression coefficient)

The elasticity for car and bus (passenger vehicles) is calculated based on the Population and Per Capita Domestic Product (PCDP) and the elasticity for trucks is calculated based on the Net State Domestic Product (NSDP).

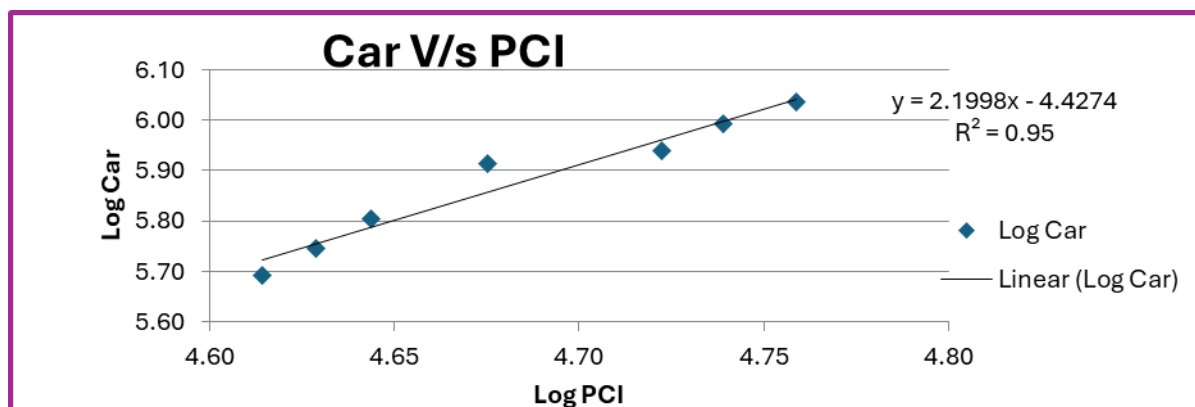
The project corridor spreads across state of Madhya Pradesh & Uttar Pradesh. Toll plaza at Dagrai Village in the state of Uttar Pradesh. Project traffic has share of majorly states like Madhya Pradesh, Uttar Pradesh, Delhi, Haryana and Rajasthan. For elasticity calculations, working data from these states also has been analysed.

Following tables and graphs depict regression and elasticity of growth model for stretch falling in Madhya Pradesh State.

**Table 5-1 : Per Capita Income Vs Car Madhya Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	38497	424644	4.59	5.63		
2012	41142	493412	4.61	5.69	7%	
2013	42548	555461	4.63	5.74	3%	
2014	44027	637626	4.64	5.80	3%	
2015	47351	820391	4.68	5.91	8%	
2016	52782	869777	4.72	5.94	11%	
2017	54829	982124	4.74	5.99	4%	
2018	57401	1087124	4.76	6.04	5%	5.9%

Regression analysis of same is given in figure below.

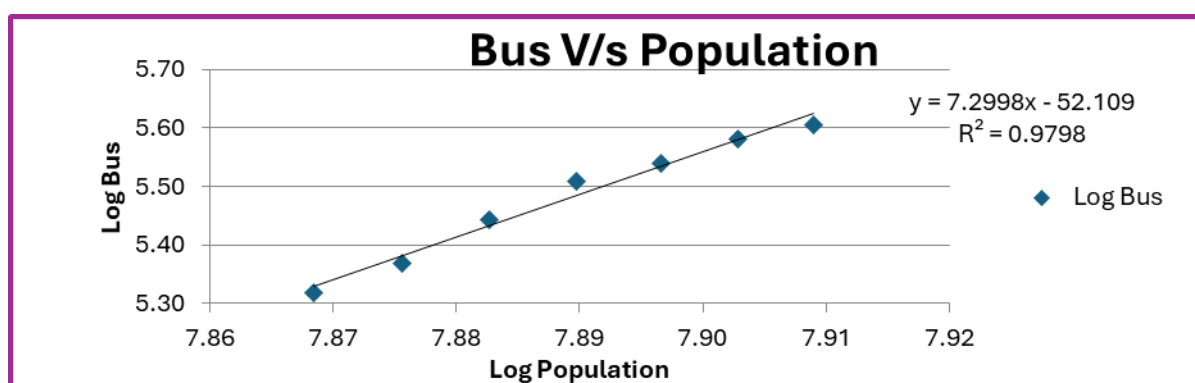


**Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Madhya Pradesh**

**Table 5-2 : Population Vs Bus Madhya Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	72627000	181770	7.86	5.26		
2012	73863000	208530	7.87	5.32	2%	
2013	75099000	233569	7.88	5.37	2%	
2014	76334000	277898	7.88	5.44	2%	
2015	77570000	322227	7.89	5.51	2%	
2016	78806000	347227	7.90	5.54	2%	
2017	79948000	382227	7.90	5.58	1%	
2018	81090000	402227	7.91	5.60	1%	1.6%

Regression analysis of same is given in figure below.



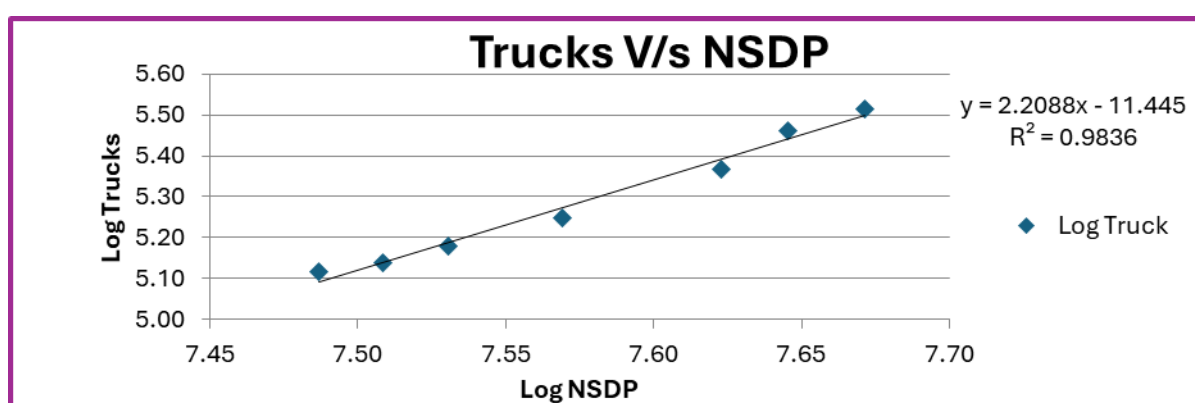
**Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Madhya Pradesh**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-3 : LCV Vs NSDP Madhya Pradesh**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	28237104	121916	7.45	5.09		
2012	30685334	131098	7.49	5.12	9%	
2013	32259760	137815	7.51	5.14	5%	
2014	33924690	150921	7.53	5.18	5%	
2015	37071567	177352	7.57	5.25	9%	
2016	41946525	233553	7.62	5.37	13%	
2017	44200243	289754	7.65	5.46	5%	
2018	46928896	326291	7.67	5.51	6%	7.6%

The following figure depicts regression analysis and extrapolation.



**Figure 5-3 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Madhya Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-4 : Summary Regression Analysis Madhya Pradesh**

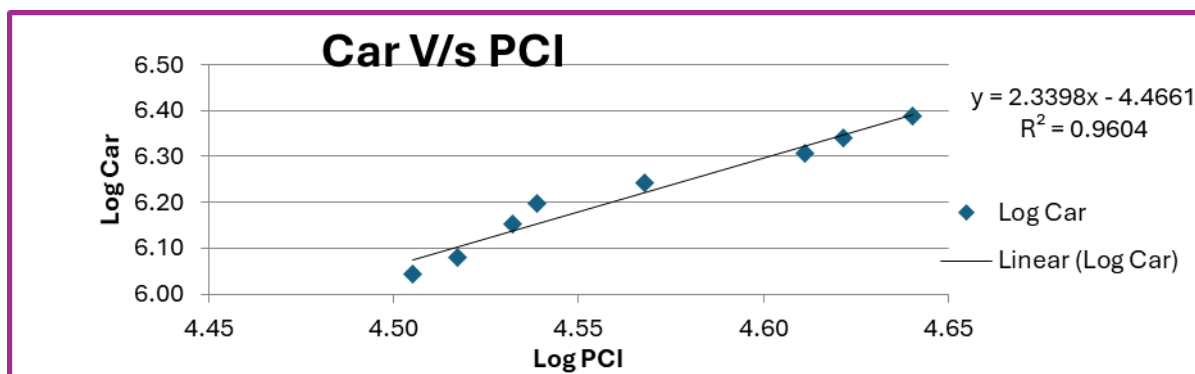
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
<b>MADHYA PRADESH</b>	<b>Car/Jeep</b>	PCI	$y = 2.2965x - 4.8829$	$R^2 = 0.9634$	2.3	6%	13.57%	Good Regression
	<b>Bus</b>	Population	$y = 7.4978x - 53.6722$	$R^2 = 0.9862$	7.5	2%	11.90%	Good Regression
	<b>Truck</b>	NSDP	$y = 2.2088x - 11.4451$	$R^2 = 0.9694$	2.2	8%	16.70%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Uttar Pradesh State.

**Table 5-5 : Per Capita Income Vs Car Uttar Pradesh**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	32002	1108100	4.51	6.04		
2012	32908	1205374	4.52	6.08	3%	
2013	34044	1423020	4.53	6.15	3%	
2014	34583	1572217	4.54	6.20	2%	
2015	36973	1746117	4.57	6.24	7%	
2016	40847	2027972	4.61	6.31	10%	
2017	41832	2195783	4.62	6.34	2%	
2018	43670	2439845	4.64	6.39	4%	4.6%

Regression analysis of same is given in figure below.

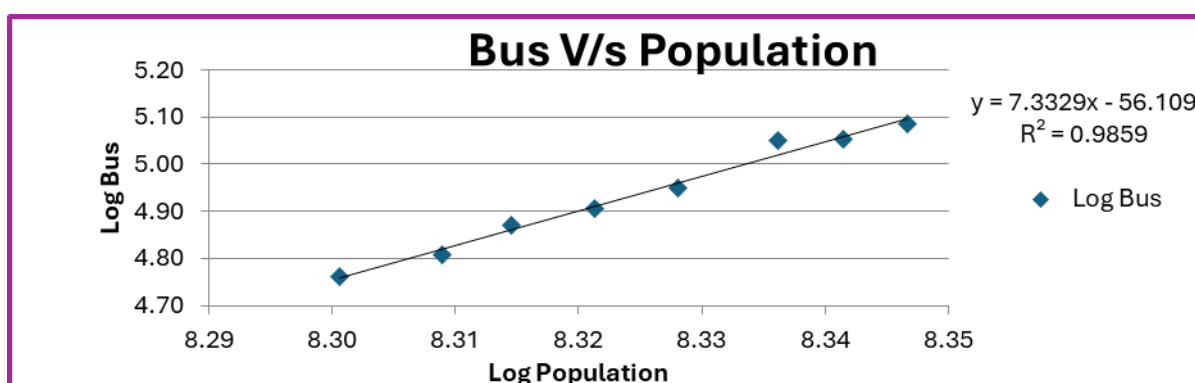


**Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh**

**Table 5-6 : Population Vs Bus Uttar Pradesh**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	199812000	57901	8.30	4.76		
2012	203670000	64147	8.31	4.81	2%	
2013	206322000	74389	8.31	4.87	1%	
2014	209577000	80460	8.32	4.91	2%	
2015	212832000	89127	8.33	4.95	2%	
2016	216870000	112020	8.34	5.05	2%	
2017	219510000	112766	8.34	5.05	1%	
2018	222150000	121975	8.35	5.09	1%	1.5%

Regression analysis of same is given in figure below.



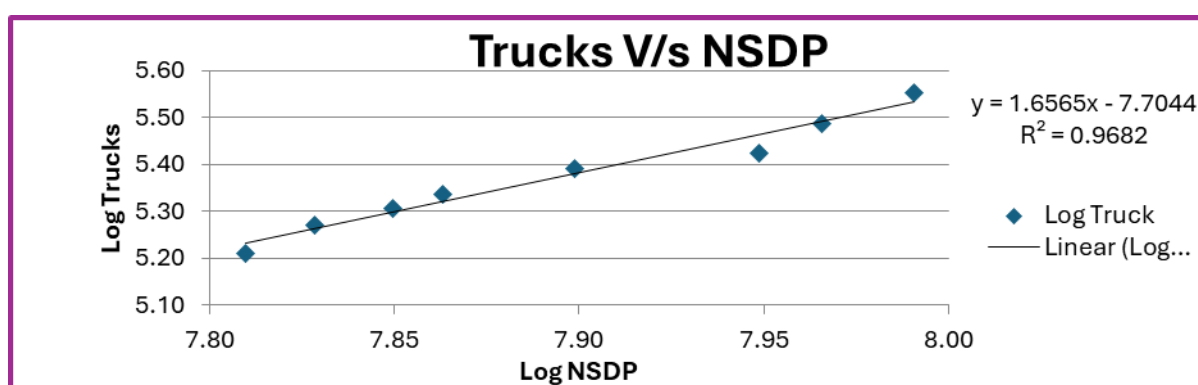
**Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-7 Trucks Vs NSDP Uttar Pradesh**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	64513155	162813	7.81	5.21		
2012	67355218	186404	7.83	5.27	4%	
2013	70746910	202761	7.85	5.31	5%	
2014	72968630	217609	7.86	5.34	3%	
2015	79204874	245688	7.90	5.39	9%	
2016	88845325	265167	7.95	5.42	12%	
2017	92380571	307096	7.97	5.49	4%	
2018	97915937	356828	7.99	5.55	6%	6.2%

The following figure depicts regression analysis and extrapolation.



**Figure 5-6 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Uttar Pradesh.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-8 : Summary Regression Analysis Uttar Pradesh**

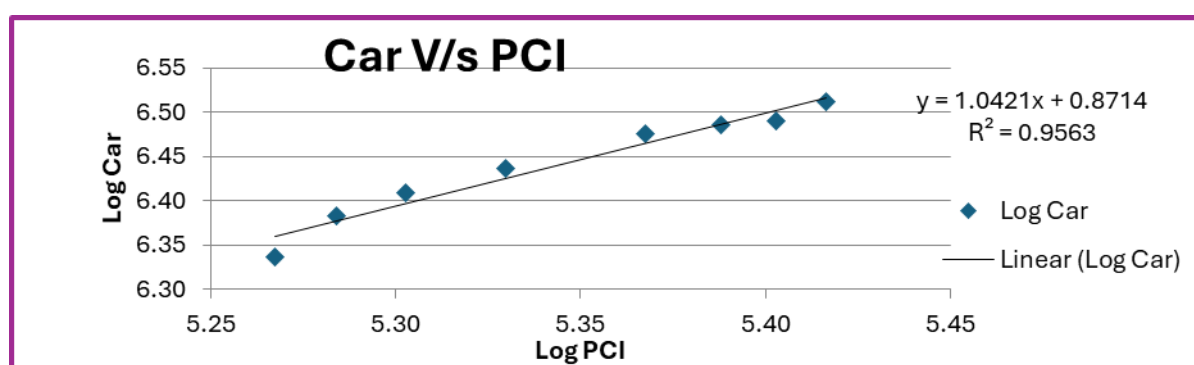
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
UTTAR PRADESH	Car/Jeep	PCI	$y = 2.3398x - 4.4661$	$R^2 = 0.9604$	2.3398	4.58%	10.72%	Good Regression
	Bus	Population	$y = 7.3329x - 56.1092$	$R^2 = 0.9859$	7.3329	1.53%	11.19%	Good Regression
	Truck	NSDP	$y = 1.6565x - 7.7044$	$R^2 = 0.9682$	1.6565	6.18%	10.24%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Delhi State.

**Table 5-9 : Per Capita Income Vs Car Delhi**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	185001	2172069	5.27	6.34		
2012	192220	2416974	5.28	6.38	4%	
2013	200702	2568380	5.30	6.41	4%	
2014	213669	2730071	5.33	6.44	6%	
2015	233115	2986579	5.37	6.48	9%	
2016	244255	3061817	5.39	6.49	5%	
2017	252960	3087309	5.40	6.49	4%	
2018	260967	3249670	5.42	6.51	3%	5.1%

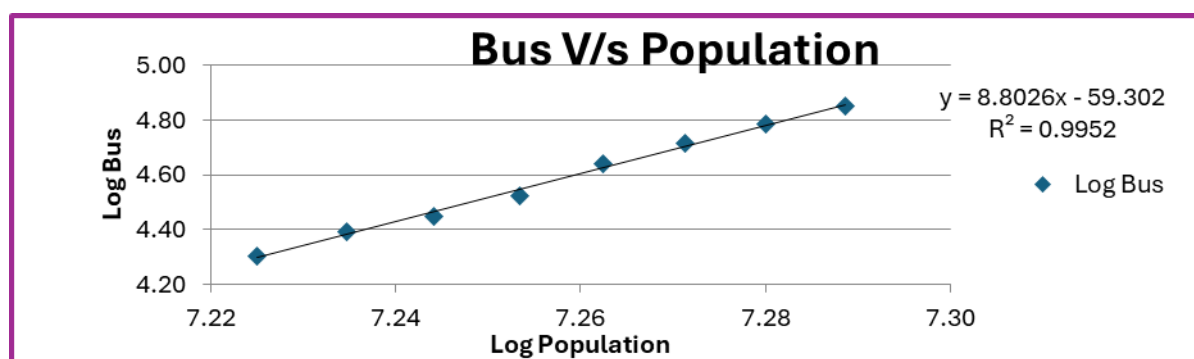
Regression analysis of same is given in figure below.



**Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Delhi****Table 5-10 : Population Vs Bus Delhi**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	16788000	20142	7.22	4.30		
2012	17166000	24642	7.23	4.39	2%	
2013	17544000	28142	7.24	4.45	2%	
2014	17921000	33342	7.25	4.52	2%	
2015	18299000	43723	7.26	4.64	2%	
2016	18677000	51823	7.27	4.71	2%	
2017	19056000	61023	7.28	4.79	2%	
2018	19435000	71043	7.29	4.85	2%	2.1%

Regression analysis of same is given in figure below.

**Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Delhi**

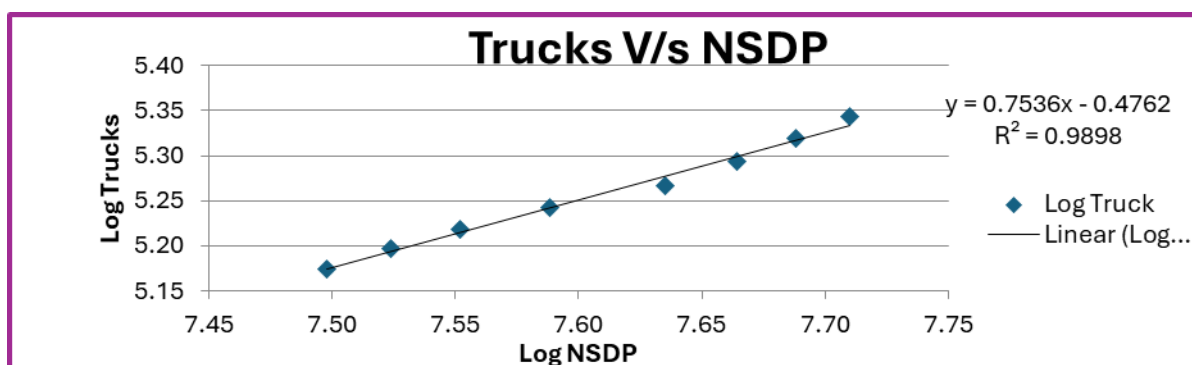
Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-11 Trucks Vs NSDP Delhi**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	31465002	149277	7.50	5.17		
2012	33419330	157277	7.52	5.20	6%	
2013	35652751	165477	7.55	5.22	7%	
2014	38763874	174577	7.59	5.24	9%	
2015	43172959	185027	7.64	5.27	11%	
2016	46159238	196527	7.66	5.29	7%	
2017	48763115	208417	7.69	5.32	6%	

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2018	51295715	220417	7.71	5.34	5%	7.2%

The following figure depicts regression analysis and extrapolation.



**Figure 5-9 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Delhi.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R<sup>2</sup> statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R<sup>2</sup> more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-12 : Summary Regression Analysis Delhi**

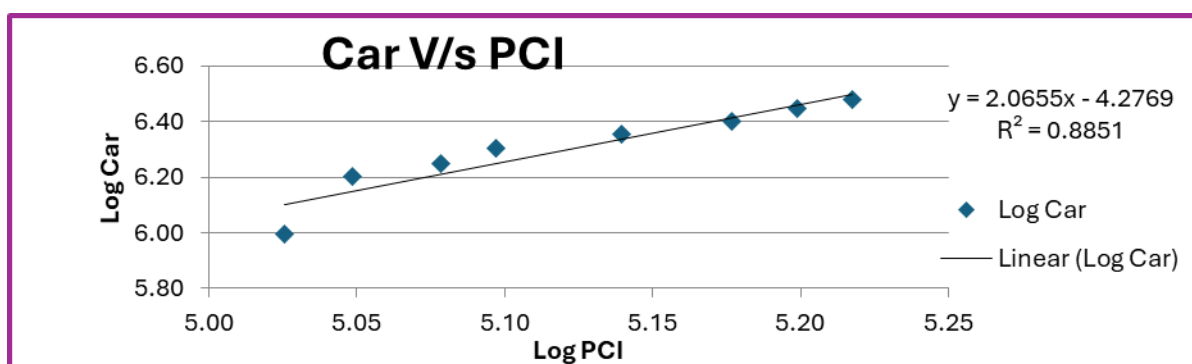
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
DELHI	Car/Jeep	PCI	$y = 1.0421x - 0.8714$	R <sup>2</sup> = 0.9563	1.0421	5.05%	5.27%	Good Regression
	Bus	Population	$y = 8.8026x - 59.3021$	R <sup>2</sup> = 0.9952	8.8026	2.11%	18.61%	Good Regression
	Truck	NSDP	$y = 0.7536x - 0.4762$	R <sup>2</sup> = 0.9898	0.7536	7.25%	5.46%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Haryana State.

**Table 5-13 : Per Capita Income Vs Car Haryana**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	106085	989519	5.03	6.00		
2012	111780	1602129	5.05	6.20	5%	
2013	119791	1771298	5.08	6.25	7%	
2014	125032	2008748	5.10	6.30	4%	
2015	137833	2260084	5.14	6.35	10%	
2016	150259	2527537	5.18	6.40	9%	
2017	158039	2794957	5.20	6.45	5%	
2018	164976	3011656	5.22	6.48	4%	6.5%

Regression analysis of same is given in figure below.

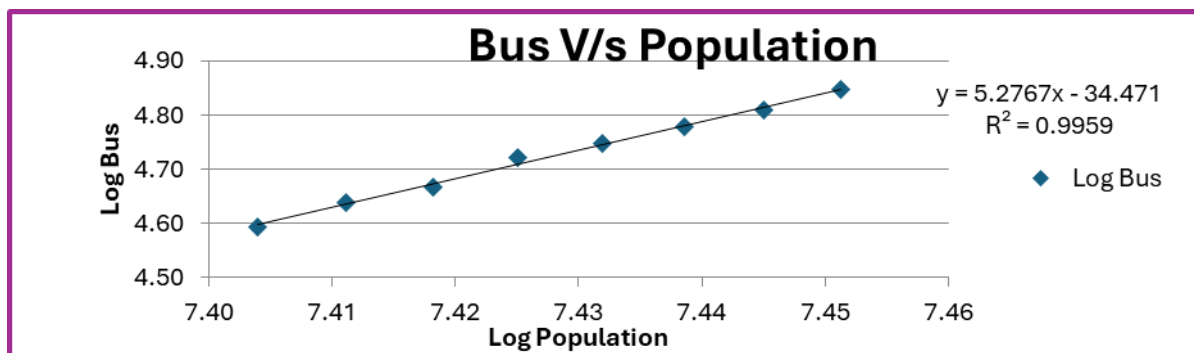


**Figure 5-10 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana**

**Table 5-14 : Population Vs Bus Haryana**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	25351000	39153	7.40	4.59		
2012	25772000	43456	7.41	4.64	2%	
2013	26193000	46558	7.42	4.67	2%	
2014	26614000	52640	7.43	4.72	2%	
2015	27034000	55781	7.43	4.75	2%	
2016	27455000	60129	7.44	4.78	2%	
2017	27861000	64629	7.44	4.81	1%	
2018	28266000	70229	7.45	4.85	1%	1.6%

Regression analysis of same is given in figure below.



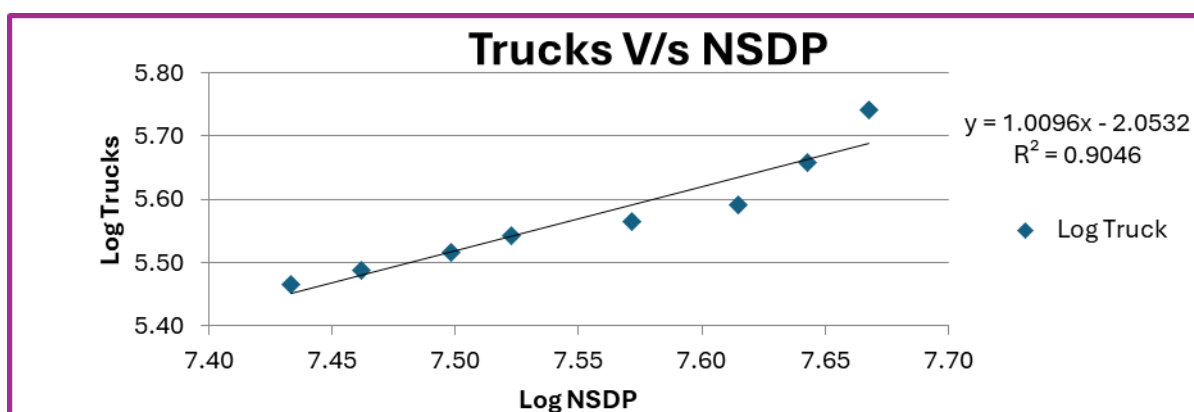
**Figure 5-11 : Regression and Elasticity Population vs. Bus – Extrapolation Haryana**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-15 Trucks Vs NSDP Haryana**

Year	NSDP	Trucks	Log NDSP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	27115248	292735	7.43	5.47		
2012	28975622	307509	7.46	5.49	7%	
2013	31493120	327882	7.50	5.52	9%	
2014	33335925	348732	7.52	5.54	6%	
2015	37270025	367730	7.57	5.57	12%	
2016	41205461	390321	7.61	5.59	11%	
2017	43952345	455321	7.64	5.66	7%	
2018	46533095	550321	7.67	5.74	6%	8.0%

The following figure depicts regression analysis and extrapolation.



**Figure 5-12 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Haryana.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by R<sup>2</sup> values are presented in the Table below.

**Table 5-16 : Summary Regression Analysis Haryana**

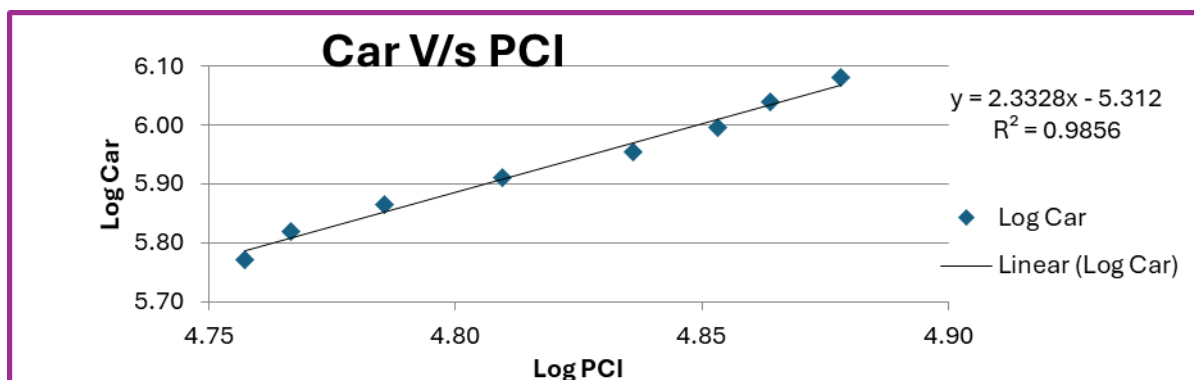
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
HARYANA	Car/Jeep	PCI	$y = 2.0655x - 4.2769$	R <sup>2</sup> = 0.8851	2.0655	6.53%	13.49%	Good Regression
	Bus	Population	$y = 5.2767x - 34.4708$	R <sup>2</sup> = 0.9959	5.2767	1.57%	8.27%	Good Regression
	Truck	NSDP	$y = 1.0096x - 2.0532$	R <sup>2</sup> = 0.9046	1.0096	8.04%	8.12%	Good Regression

The following tables and graphs depict regression and elasticity of growth model for stretch falling in Rajasthan State.

**Table 5-17 : Per Capita Income Vs Car Rajasthan**

Year	PCI	Car	Log PCI	Log Car	PCI Growth	Average Growth (8 Year)
2011	57192	591069	4.76	5.77		
2012	58441	659542	4.77	5.82	2%	
2013	61053	733916	4.79	5.87	4%	
2014	64496	814079	4.81	5.91	6%	
2015	68565	899307	4.84	5.95	6%	
2016	71324	988391	4.85	5.99	4%	
2017	73109	1095526	4.86	6.04	3%	
2018	75555	1204005	4.88	6.08	3%	4.1%

Regression analysis of same is given in figure below.

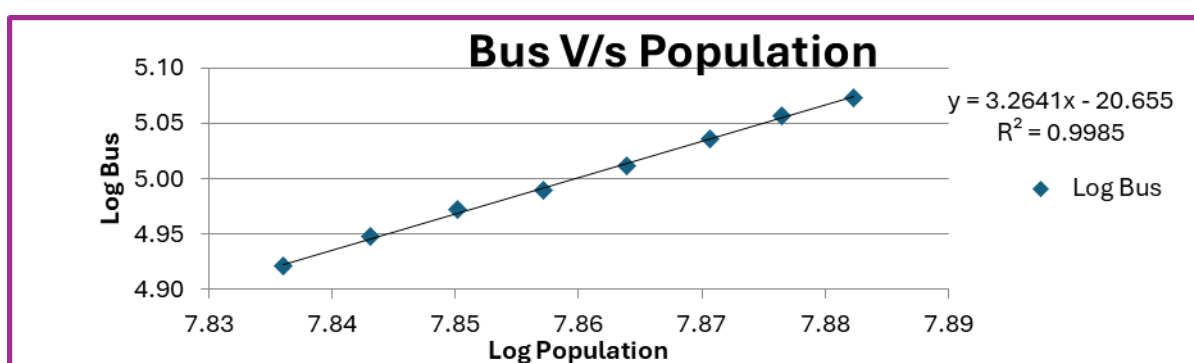


**Figure 5-13 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**

**Table 5-18 : Population Vs Bus Rajasthan**

Year	Population	Buses	Log Pop	Log Bus	Pop Growth	Average Growth (8 Year)
2011	68548000	83345	7.84	4.92		
2012	69687000	88616	7.84	4.95	2%	
2013	70825000	93892	7.85	4.97	2%	
2014	71963000	97650	7.86	4.99	2%	
2015	73102000	102818	7.86	5.01	2%	
2016	74240000	108680	7.87	5.04	2%	
2017	75248000	113964	7.88	5.06	1%	
2018	76256000	118301	7.88	5.07	1%	1.5%

Regression analysis of same is given in figure below.



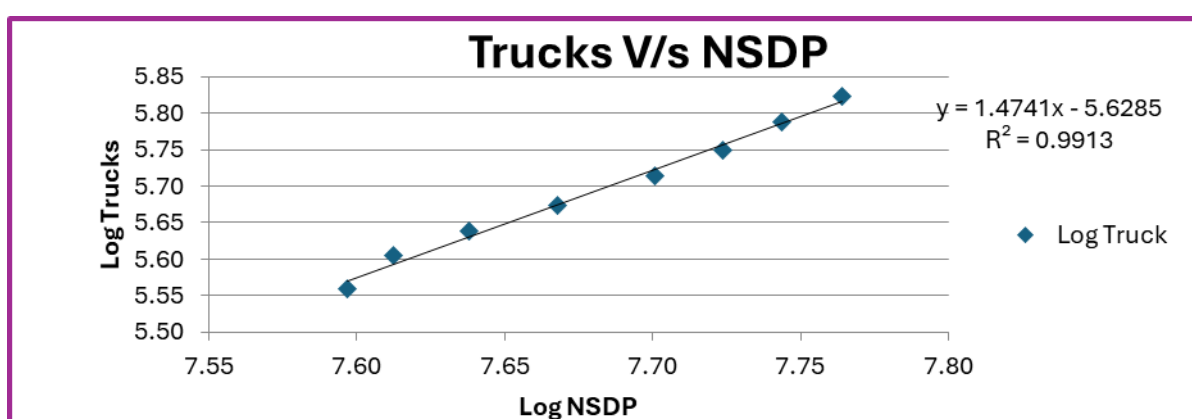
**Figure 5-14 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan**

Elasticity of Trucks has been worked out by regression analysis with NSDP. The following table represents the data and details.

**Table 5-19 Trucks Vs NSDP Rajasthan**

Year	NSDP	Trucks	Log NSDP	Log Truck	NSDP Growth	Average Growth (8 Year)
2011	39533093	362028	7.60	5.56		
2012	40980249	401983	7.61	5.60	4%	
2013	43429222	434379	7.64	5.64	6%	
2014	46540773	472365	7.67	5.67	7%	
2015	50192151	517604	7.70	5.71	8%	
2016	52965038	561158	7.72	5.75	6%	
2017	55442912	613055	7.74	5.79	5%	
2018	58059438	665926	7.76	5.82	5%	5.7%

The following figure depicts regression analysis and extrapolation.

**Figure 5-15 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Rajasthan.**

Using the regression analysis above, we have arrived at the elasticity of traffic demand for each class of vehicle to a given change in relevant economic indicators. Average traffic growth of a vehicle class is multiplied by the corresponding elasticity coefficient to arrive at traffic growth. R2 statistical measure of how close the data are to the fitted regression line. It varies from 0 to 1. The higher the value of R2 more representative is the regression model of data.

The results of these analyses for *the good fit* regression as reflected by  $R^2$  values are presented in the Table below.

**Table 5-20 : Summary Regression Analysis Rajasthan**

State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth (8yrs)	Growth Elastic Model	Remarks
RAJASTHAN	Car/Jeep	PCI	$y = 2.3328x - 5.312$	$R^2 = 0.9856$	2.3328	4.07%	9.49%	Good Regression
	Bus	Population	$y = 3.2641x - 20.6548$	$R^2 = 0.9985$	3.2641	1.53%	5.01%	Good Regression
	Truck	NSDP	$y = 1.4741x - 5.6285$	$R^2 = 0.9913$	1.4741	5.65%	8.33%	Good Regression

Economical model for predicting growth is good tool, however other local, regional, national factors should also be considered before finalizing growth factors. Considering factors such as proposed developments and other influencing economic factors, moderated growth should be considered. These factors are discussed in subsequent sections.

#### 5.4 Analysis of Historic Traffic Data

Historical traffic data forms useful information for any highway project. It provides useful information for establishing past trend of growth. Project stretch of Gwalior\_ Jhansi has recently been awarded to Concessionaire. Hence credible historical data on project traffic is not available.

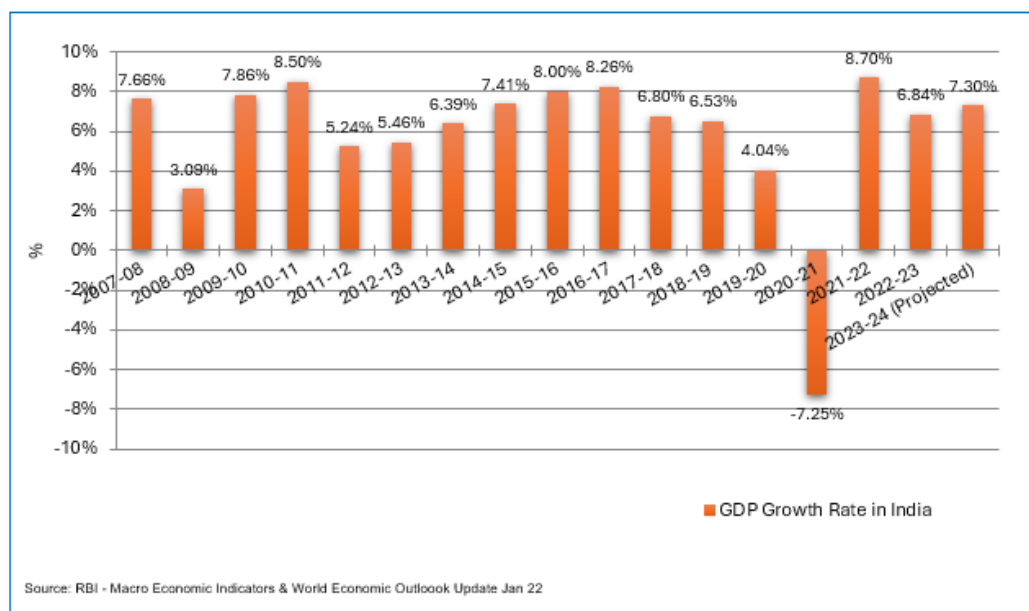
#### 5.5 Other Factors Influencing Growth

There are many factors which have an impact on traffic growth. As discussed previously these factors can be economical, social, educational, and industrial.

Potentiality of such factors for project highway is discussed as under.

#### ECONOMY

After witnessing a slowdown during 2011-12, the economy recovered in 2013-14, and a high growth rate of GDP was recorded in up to 2018-19. Pandemic of COVID-19 impacted all economies of world including India. Following figure show trend of GDP growth in India.



**Figure 5-16 : Growth of GDP in India**

FY 2017-18 recorded a growth of 6.7% which had a slight impact of GST and demonetization. Indian economy appears on recovery path with estimated growth of 6.8% in FY 2018-19. The government took major policy decisions including tax infrastructure reforming, banking sector improvement and ease of doing business.

Major economies of world collapsed due to pandemic COVID-19 including India. Indian economy is also registered negative growth in financial year 2020-21. After that Indian economy recovered handsomely and registered a growth of about 9% in Year 2021-22. This was partly due to low base of year 2020-21 as well.

Honorable Prime Minister has announced a major relief package of Rs. 20 lakh crores which is about 10% of GDP. This is aimed at turning this major crisis of COVID-19 into an opportunity by providing major impetus to industrial production to the limit of becoming a self-reliant economy. With major thrust of this package being on **Make -In- India** it is expected that industry in India would grow at rapid pace and recover handsomely in post COVID-19 scenario. Leading banking and financial institutions have estimated that India would keep on registering good growth in coming years and the growth in year 2023-24 is expected to be around 7.3%.

## 5.6 Developments along and around the Project Corridor & State

**MADHYA PRADESH:** Madhya Pradesh state, which is located in central India is bound on the north by Uttar Pradesh, on the east by Chhattisgarh, on the south by Maharashtra, and on the west by Gujarat and Rajasthan. It is the second largest Indian state and one of the fastest growing states in the country. At current prices, the Gross State Domestic Product (GSDP) of Madhya Pradesh is estimated at Rs.1,151,049 crore trillion (US\$ 150.74 billion) in 2022-23, registering an annual growth of 10% over FY21. Between 2015-16 and 2021-22, The GSDP increased at a CAGR (in Rs.) of 13.09% from 2015-16 to 2021-22. Net State Domestic Product (NSDP) of Madhya Pradesh was about Rs. 8.27 trillion (US\$ 113.94 billion) in 2020-21. Between 2015-16 and 2020-21, state's NSDP grew at a CAGR of around 11.22%

**GWALIOR DISTRICT:** Gwalior district is one of the fifty-two districts of Madhya Pradesh state. Gwalior is also the administrative headquarters of this district. The population density in the district is 446 people per sq. Km. In the year 2020 the number of live births in the district was 61265 out of which 34162 were male and 27102 were females.

**INDUSTRIAL PROFILE OF GWALIOR DISTRICT:** The economy of the district is basically based on various Industrial sectors. It comprises 3 prominent industrial areas namely Sitholi, Banmore and Malanpur. Earlier the place had two main big manufacturing industries, such as Gwalior Grasim and J.C. Mills of Birlanagar.

**DATIA DISTRICT:** Datia district is one of the fifty-two districts in the state of Madhya Pradesh with its administrative headquarter located at Datia city. According to the census of the district has population of 7,86,754 out of which 420,157 are males and 3,66,597 are females.

The chief agriculture products in the district are all food grains and cotton.

**UTTAR PRADESH:** The state has an area of 240,928 sq kms and is the most populous state in India, with population of 199.8 million as per 2011 census with an average population density of 828 persons per sq. km. The economy of Uttar Pradesh is the third largest of all the states in India. Nominal GDP of the state for the year 2022-23 is Rs. 21.74 trillion.

It is reported that the economy of Uttar Pradesh is growing at a faster rate than the national economy at about 9%. In terms of traffic and transportation as well Uttar Pradesh is one of the leader states in India now.

- Air Connectivity: Major national & international airports connecting the rest of India, Middle East & Southeast Asian countries; Only state to have 05 International Airports (03 existing & 02 upcoming at Jewar (G. Noida & Ayodhya)
- Railway Network: Largest railway network in the country spanning over 8,949 km; 05 Railway Zones
- Inland Waterway: India's 1st Inland Waterway is operational in UP (1100 km Haldia - Varanasi tract)
- Expressways: Uttar Pradesh boasts state of art expressways ensuring seamless connectivity; 13 Expressways (existing & upcoming)
- Road Network: Largest Road Network in India; 4 Lakh Km Total Road Length 11,737 Km Total National Highway

Logistics hubs emerging across UP: MMLH Dadri, MMTH Boraki, MMT Varanasi etc.

From the above it can be expected that the project corridor would serve as one of the important transportation links in the area and would contribute to the growth of the region.

**JHANSI DISTRICT:** Jhansi district is a district of Uttar Pradesh state with its headquarters located at Jhansi city. The district is named Jhansi after the headquarter city Jhansi. According to 2011 census the district has a population of 19,98,603 out of which 10,57,436 are males and 9,41,167 are females. To some extent the economy of the district is based on agriculture some of its chief agriculture products are wheat, barley, pea, gram, paddy, groundnut, and different types of pulses. The foremost industries of the district are BHEL Jhansi, Heidelberg cement factory, Baidyanth factory, government cotton mill, Paricha

thermal power plant, Indian hume pipe Co.Ltd. its silk material and industries are not only famous in the country but also in the world.

## 5.7 Recommended Growth Rates of Traffic

Based on the above analysis and after giving due consideration to the entire listed factors, the following overall growth rates are recommended for each category of vehicle as under. Rate of growth is moderated in light of overall regional trend. Growth of Multi-Axle is kept slightly higher as trend of technological advances in logistic industry Favors multi-axle over 2/3 axle carriage. It is also expected that as the economy moves from developing to developed, rate of growth diminishes. Same growth rate is not sustainable for long. Traffic growth has been suitably stepped down for future years.

Growth rates are recommended for three scenarios for sensitivity analysis namely **Optimistic, Pessimistic** and **Most Likely** with a positive and negative variation 0.25% from Most Likely case for corridor in both states.

### 5.7.1 Recommended Growth Rates of Stretch

*Table 5-21 : Recommended Growth Rates Optimistic*

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	7.90%	6.76%	5.15%	4.96%	4.29%
Mini LCV	4.87%	3.09%	2.38%	2.01%	3.22%
Bus	4.97%	3.91%	2.67%	2.45%	2.23%
Minibus	4.97%	3.91%	2.67%	2.45%	2.23%
LCV	4.54%	3.09%	2.38%	2.01%	1.82%
2- Axle	4.87%	3.56%	2.38%	2.01%	1.82%
3 - Axle	4.87%	3.56%	2.38%	2.01%	1.82%
4 to 6 Axle	5.53%	4.03%	3.09%	2.60%	2.34%
7 and Above Axle	5.53%	4.03%	3.09%	2.60%	2.34%

*Table 5-22 : Recommended Growth Rates Pessimistic*

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
Car/Jeep/Van	7.40%	6.26%	4.65%	4.46%	3.79%
Mini LCV	4.37%	2.59%	1.88%	1.51%	2.72%
Bus	4.47%	3.41%	2.17%	1.95%	1.73%
Minibus	4.47%	3.41%	2.17%	1.95%	1.73%
LCV	4.04%	2.59%	1.88%	1.51%	1.32%
2- Axle	4.37%	3.06%	1.88%	1.51%	1.32%
3 - Axle	4.37%	3.06%	1.88%	1.51%	1.32%
4 to 6 Axle	5.03%	3.53%	2.59%	2.10%	1.84%
7 and Above Axle	5.03%	3.53%	2.59%	2.10%	1.84%

**Table 5-23 : Recommended Growth Rates Most Likely**

Category / Year	FY 25-29	FY 30-34	FY 35-39	FY 40-44	FY 45-49
<b>Car/Jeep/Van</b>	7.65%	6.51%	4.90%	4.71%	4.04%
<b>Mini LCV</b>	4.62%	2.84%	2.13%	1.76%	2.97%
<b>Bus</b>	4.72%	3.66%	2.42%	2.20%	1.98%
<b>Minibus</b>	4.72%	3.66%	2.42%	2.20%	1.98%
<b>LCV</b>	4.29%	2.84%	2.13%	1.76%	1.57%
<b>2- Axle</b>	4.62%	3.31%	2.13%	1.76%	1.57%
<b>3 - Axle</b>	4.62%	3.31%	2.13%	1.76%	1.57%
<b>4 to 6 Axle</b>	5.28%	3.78%	2.84%	2.35%	2.09%
<b>7 and Above Axle</b>	5.28%	3.78%	2.84%	2.35%	2.09%

## CHAPTER 6

### TRAFFIC FORECAST

#### 6.1 Traffic Projections

Growth rates recommended in the previous section of the report are used to arrive at traffic projections for future years. Toll plaza wise futuristic traffic projection is given in tables below.

These projections have been done for the following three cases of growth up to concession period.

1. Optimistic Scenario
2. Pessimistic Scenario
3. Most Likely Scenario

**Table 6-1 : Total Tollable Traffic @ Toll Plaza - Chainage 97.900 KM**  
(Optimistic Growth Scenario)

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4096	364	170	1390	1361	1694	4	9078	21044
2025-26	4420	382	178	1457	1427	1788	4	9656	22243
2026-27	4769	401	187	1528	1496	1886	4	10271	23509
2027-28	5146	420	196	1602	1568	1991	4	10927	24852
2028-29	5551	440	206	1680	1644	2101	4	11626	26274
2029-30	5926	454	214	1740	1702	2186	4	12226	27430
2030-31	6326	468	222	1802	1762	2274	4	12858	28637
2031-32	6753	482	231	1866	1824	2366	4	13526	29904
2032-33	7210	497	240	1932	1888	2461	4	14232	31228
2033-34	7697	512	249	2001	1955	2560	4	14978	32618
2034-35	8093	525	256	2049	2001	2640	4	15568	33697
2035-36	8510	538	263	2098	2048	2722	4	16183	34811
2036-37	8948	551	270	2148	2097	2806	4	16824	35965
2037-38	9409	564	277	2199	2147	2893	4	17493	37161
2038-39	9893	578	284	2251	2198	2982	4	18190	38396
2039-40	10383	589	291	2297	2242	3059	4	18865	39540
2040-41	10896	600	298	2344	2287	3139	4	19568	40727
2041-42	11437	612	305	2391	2333	3221	4	20303	41955
2042-43	12005	625	312	2439	2380	3305	4	21070	43226
2043-44	12601	638	319	2488	2428	3391	4	21869	44541

**Table 6-2 : Total Tollable Traffic @ Toll Plaza - Chainage 97.900 KM  
(Pessimistic Growth Scenario)**

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4096	364	170	1390	1361	1694	4	9078	21044
2025-26	4399	379	177	1451	1420	1780	4	9610	22140
2026-27	4725	395	184	1514	1481	1870	4	10173	23288
2027-28	5074	413	192	1580	1545	1964	4	10772	24501
2028-29	5449	431	201	1649	1612	2062	4	11408	25779
2029-30	5791	442	208	1699	1661	2135	4	11940	26784
2030-31	6154	453	215	1751	1712	2210	4	12499	27831
2031-32	6538	464	222	1805	1764	2288	4	13085	28921
2032-33	6948	475	229	1861	1818	2369	4	13704	30063
2033-34	7382	488	236	1918	1873	2453	4	14354	31252
2034-35	7726	497	241	1954	1908	2517	4	14847	32125
2035-36	8085	506	246	1991	1944	2583	4	15359	33029
2036-37	8461	515	251	2028	1981	2650	4	15890	33957
2037-38	8854	525	256	2066	2018	2719	4	16442	34915
2038-39	9266	535	261	2106	2056	2789	4	17017	35906
2039-40	9679	543	266	2137	2087	2848	4	17564	36798
2040-41	10110	551	271	2169	2119	2908	4	18132	37718
2041-42	10560	560	276	2201	2151	2970	4	18722	38667
2042-43	11030	569	281	2234	2184	3033	4	19335	39647
2043-44	11521	578	286	2267	2217	3097	4	19970	40653

Traffic projections for Most Likely scenario is given as under

**Table 6-3 : Total Tollable Traffic @ Toll Plaza - Chainage 97.900 KM  
(Most Likely Growth Scenario)**

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4096	364	170	1390	1361	1694	4	9078	21044
2025-26	4410	381	178	1454	1423	1784	4	9634	22193
2026-27	4748	399	186	1521	1488	1878	4	10224	23401
2027-28	5111	417	195	1592	1556	1977	4	10852	24680
2028-29	5502	436	204	1666	1627	2082	4	11521	26034
2029-30	5860	449	211	1722	1680	2161	4	12087	27115
2030-31	6241	462	218	1779	1735	2243	4	12682	28242
2031-32	6646	475	226	1838	1792	2328	4	13309	29421
2032-33	7078	489	234	1899	1851	2416	4	13971	30654
2033-34	7538	503	243	1962	1912	2507	4	14669	31943
2034-35	7908	513	248	2004	1953	2578	4	15208	32912

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2035-36	8295	524	253	2047	1995	2651	4	15769	33914
2036-37	8701	535	260	2091	2037	2726	4	16354	34953
2037-38	9128	546	267	2136	2080	2803	4	16964	36028
2038-39	9576	557	274	2182	2124	2883	4	17600	37143
2039-40	10026	567	279	2221	2162	2951	4	18210	38160
2040-41	10497	577	286	2261	2200	3021	4	18846	39216
2041-42	10991	587	293	2302	2239	3092	4	19508	40306
2042-43	11508	597	300	2343	2279	3165	4	20196	41430
2043-44	12051	607	307	2385	2319	3239	4	20912	42588

## CHAPTER 7

### FORECAST OF TOLL REVENUE

#### 7.1 General

This chapter presents the tolling rate calculations, categories and toll revenue of the project.

#### 7.2 Discount Categories

As per the Toll Notification (Schedule - G) the discounts and special provisions have been considered. In addition to discounts as per Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as under

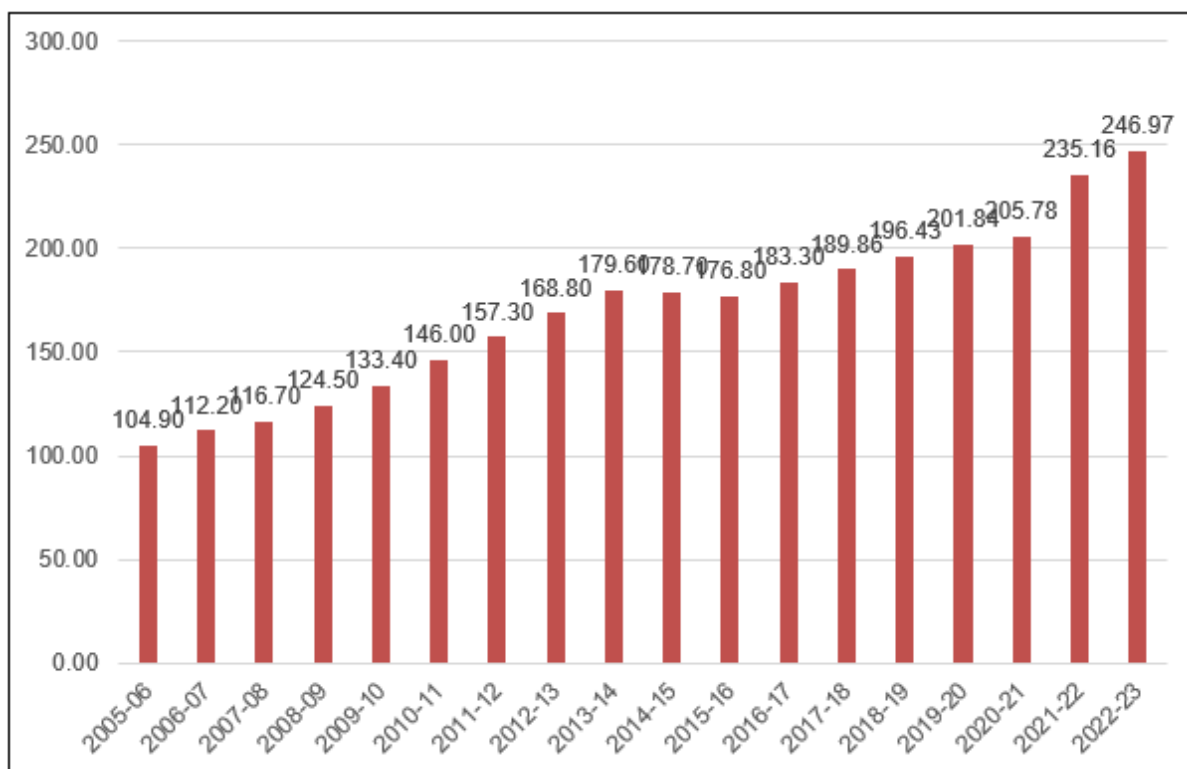
1. Monthly Pass: For frequent users monthly pass would be issued at fee at 2/3<sup>rd</sup> rate for 50 single journey trips.
2. Multiple Journeys (for Return Trip): Will be charged at 1.5 times single journey.
3. Single Journey: Full single journey toll would be charged to this category of vehicles who are infrequent travellers or whose frequency does not yield any discount from the above categories.
4. Local Discounts: There are several categories of local discounts.
  - a) Local Car Jeep Van - Rs. 275 per month (for locals residing within a radius of 20 kms from toll plaza)

Building of inflation and escalation of rate on the basis of WPI are done as per toll notification (Schedule G) as given under as extract from concession agreement.

The formula for determining the applicable rate of fee shall be as follows:-

$$\text{Applicable rate of fee} = \text{base rate} + \text{base rate} \times \left\{ \frac{\text{WPI A} - \text{WPI B}}{\text{WPI B}} \right\} \times 0.4$$

Factor of inflation / growth has been incorporated as per Schedule R. WPI numbers (2011-12 series) are available up to 2022-23. A moderate growth in Wholesale Price Index (WPI) has been assumed after that. The following graph provides historical rate of inflation (WPI) in India. Data has been sourced from the Office of Economic Advisor web site ([www.eaindustry.nic.in](http://www.eaindustry.nic.in)) WPI for year 2017-18 and 2018-2019 is worked back by applying a correlation factor for 2004-05 series as 2017-18 and 2018-2019 data is available in 2011-12 series only. Ratio of WPI for year 2016-17 for both series is used for conversion of WPI in 2004-05 series.



**Figure 7-1 : Historical Rate of WPI Inflation in India**

Average inflation in WPI in the last few years is steadily growing. It grew by the range of 4% - 5% in previous years. For future years initially it is taken 5% and suitably stepped down for future years.

### 7.3 Estimation of Toll Rates

As per the applicable MORTH notification and Schedule R of contract agreement, the following Base rate of fee for the categories mentioned in the table stands true in the National Highways Fee Rules applicable for contract.

**Table 7-1 : Base Toll Rates June 2007-08**

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Car, Jeep, Van or Light Motor Vehicle	0.65
Light Commercial Vehicle, Light Goods Vehicle or Minibus	1.05
Bus or Truck (Two Axles)	2.20
Three Axle Commercial Vehicles	2.40
Heavy Construction Machinery (HCM) or Earth Moving Equipment (EME) or Multi Axle Vehicle (MAV) (4 to 6 axles)	3.45

Type of Vehicle	Base Rate of Fee / Km (in Rs.)
Oversized Vehicles (7 or more Axles)	4.20

These rates are then modified for as per procedure provided in guidelines of notification considering factors listed below.

- Annual revision of fee rate - @3%
- Application of WPI

Base rates have been worked out to map the current rates. These shall be updated when more details come in. Base toll rates are given below.

**Table 7-2 : Toll Rates for Forecasting Year (Rs. Rupees) Single Journey @ Toll Plaza 1 – KM 97.900**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	145	230	485	485	530	760	925
2025-26	150	245	510	510	555	800	975
2026-27	160	255	535	535	585	840	1025
2027-28	165	270	565	565	615	885	1075
2028-29	175	280	590	590	645	930	1130
2029-30	185	295	620	620	680	975	1190
2030-31	195	310	655	655	715	1025	1250
2031-32	205	330	690	690	750	1080	1315
2032-33	215	345	725	725	790	1135	1380
2033-34	225	365	760	760	830	1195	1455
2034-35	235	380	800	800	875	1255	1530
2035-36	250	400	845	845	920	1320	1610
2036-37	260	425	890	890	970	1390	1695
2037-38	275	445	935	935	1020	1465	1785
2038-39	290	470	985	985	1075	1545	1880
2039-40	305	495	1035	1035	1130	1625	1980
2040-41	325	520	1095	1095	1190	1715	2085
2041-42	340	550	1150	1150	1255	1805	2200
2042-43	360	580	1215	1215	1325	1905	2315
2043-44	380	610	1280	1280	1395	2005	2445

**Table 7-3 : Toll Rates for Forecasting Year (Rs. Rupees) Return Journey @ Toll Plaza 1 – KM 97.900**

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2024-25	215	350	730	730	795	1140	1390
2025-26	225	365	765	765	835	1200	1460
2026-27	235	385	805	805	875	1260	1535
2027-28	250	405	845	845	920	1325	1610
2028-29	260	425	890	890	970	1390	1695
2029-30	275	445	935	935	1020	1465	1780
2030-31	290	470	980	980	1070	1540	1875
2031-32	305	490	1030	1030	1125	1620	1970
2032-33	320	520	1085	1085	1185	1700	2070
2033-34	335	545	1140	1140	1245	1790	2180
2034-35	355	575	1200	1200	1310	1885	2295
2035-36	375	605	1265	1265	1380	1985	2415
2036-37	395	635	1330	1330	1450	2090	2540
2037-38	415	670	1400	1400	1530	2200	2675
2038-39	435	705	1475	1475	1610	2315	2820
2039-40	460	740	1555	1555	1695	2440	2970
2040-41	485	780	1640	1640	1790	2570	3130
2041-42	510	825	1725	1725	1885	2710	3300
2042-43	540	870	1820	1820	1985	2855	3475
2043-44	565	915	1920	1920	2095	3010	3665

**Table 7-4: Toll Rates for Monthly Pass Local @ Toll Plaza 1 – KM 97.900**

Year	Car	Minibus /LCV
2024-25	355	355
2025-26	375	375
2026-27	390	390
2027-28	410	410
2028-29	435	435
2029-30	455	455
2030-31	480	480
2031-32	505	505
2032-33	530	530
2033-34	560	560
2034-35	585	585
2035-36	620	620
2036-37	650	650
2037-38	685	685
2038-39	720	720
2039-40	760	760
2040-41	800	800
2041-42	845	845
2042-43	890	890

Year	Car	Minibus /LCV
2043-44	940	940

**Table 7-5: Toll Rates for Monthly Pass @ Toll Plaza 1 – KM 97.900**

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2024-25	4780	7725	16185	16185	17655	25380	30900
2025-26	5025	8115	17000	17000	18545	26660	32455
2026-27	5275	8525	17860	17860	19485	28010	34100
2027-28	5545	8955	18770	18770	20475	29430	35830
2028-29	5830	9415	19725	19725	21515	30930	37655
2029-30	6125	9895	20735	20735	22620	32515	39585
2030-31	6440	10405	21800	21800	23780	34185	41620
2031-32	6775	10940	22925	22925	25010	35955	43770
2032-33	7125	11510	24115	24115	26310	37820	46040
2033-34	7495	12110	25370	25370	27680	39790	48440
2034-35	7890	12745	26700	26700	29125	41870	50970
2035-36	8305	13415	28105	28105	30660	44070	53650
2036-37	8740	14120	29585	29585	32275	46395	56485
2037-38	9205	14870	31155	31155	33990	48855	59480
2038-39	9695	15660	32815	32815	35795	51460	62645
2039-40	10215	16500	34570	34570	37710	54210	65995
2040-41	10760	17385	36425	36425	39735	57120	69535
2041-42	11340	18320	38385	38385	41875	60195	73280
2042-43	11955	19310	40460	40460	44140	63450	77245
2043-44	12605	20360	42660	42660	46535	66895	81440

## 7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on above rates and projected traffic. The estimates of toll revenue under *Optimistic*, *Pessimistic* and *Most Likely* growth scenarios are presented in the following section.

## 7.5 Toll Revenue at all toll plazas under Scenarios

Toll Revenue estimates under all scenarios at each of the toll plaza up to 2043-44 years starting from the year 2024-25 are shown in tables below.

**Table 7-6 : Toll Revenue Optimistic Scenario**

(Rs. Crores)

Location / Year	TP-01	Total
2024-25	120.19	120.19
2025-26	133.17	133.17

Location / Year	TP-01	Total
2026-27	147.82	147.82
2027-28	164.74	164.74
2028-29	181.95	181.95
2029-30	199.54	199.54
2030-31	219.02	219.02
2031-32	241.03	241.03
2032-33	263.46	263.46
2033-34	288.72	288.72
2034-35	313.36	313.36
2035-36	341.82	341.82
2036-37	370.16	370.16
2037-38	402.20	402.20
2038-39	437.33	437.33
2039-40	474.60	474.60
2040-41	514.25	514.25
2041-42	556.46	556.46
2042-43	604.78	604.78
2043-44	656.74	656.74

**Table 7-7 : Toll Revenue Pessimistic Scenario**  
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	120.19	120.19
2025-26	132.57	132.57
2026-27	146.48	146.48
2027-28	162.47	162.47
2028-29	178.57	178.57
2029-30	194.95	194.95
2030-31	213.04	213.04
2031-32	233.36	233.36
2032-33	253.90	253.90
2033-34	276.86	276.86
2034-35	298.87	298.87
2035-36	324.33	324.33
2036-37	349.46	349.46
2037-38	377.80	377.80
2038-39	408.82	408.82
2039-40	441.30	441.30
2040-41	475.67	475.67
2041-42	512.10	512.10
2042-43	553.76	553.76
2043-44	598.25	598.25

**Table 7-8 : Toll Revenue Most Likely Scenario**  
(Rs. Crores)

<b>Location / Year</b>	<b>TP-01</b>	<b>Total</b>
<b>2024-25</b>	120.19	<b>120.19</b>
<b>2025-26</b>	132.87	<b>132.87</b>
<b>2026-27</b>	147.14	<b>147.14</b>
<b>2027-28</b>	163.60	<b>163.60</b>
<b>2028-29</b>	180.29	<b>180.29</b>
<b>2029-30</b>	197.26	<b>197.26</b>
<b>2030-31</b>	216.02	<b>216.02</b>
<b>2031-32</b>	237.15	<b>237.15</b>
<b>2032-33</b>	258.62	<b>258.62</b>
<b>2033-34</b>	282.70	<b>282.70</b>
<b>2034-35</b>	306.00	<b>306.00</b>
<b>2035-36</b>	332.92	<b>332.92</b>
<b>2036-37</b>	359.59	<b>359.59</b>
<b>2037-38</b>	389.70	<b>389.70</b>
<b>2038-39</b>	422.69	<b>422.69</b>
<b>2039-40</b>	457.56	<b>457.56</b>
<b>2040-41</b>	494.58	<b>494.58</b>
<b>2041-42</b>	533.90	<b>533.90</b>
<b>2042-43</b>	578.88	<b>578.88</b>
<b>2043-44</b>	627.05	<b>627.05</b>

## 7.6 Modification in Concession Period

Modification of the concession period shall be done on the basis of Revenue targets given in the contract for milestones 1 & 2.

Modification in concession period as per provisions of DCA and same is summarized in table for all scenarios.

### Pessimistic Case

Target Point 1- March 2031											
Target Month - March 2031	Targ et Reve nue (Rs. Cror es)	Calcu lated Reve nue (Rs. Crore s)	Differ ence %	If qualifies for Modification in Concession Period	Quali fying incre ment or shortf all	Chan ge in Conce ssion perio d %	Origi nal Conce ssion Perio d (Year )	Chan ge in Conce ssion perio d (Year )	Modified Concessi on Period		
TOT-13 - Gwalior to Jhansi	17	17.82	4.80%	No	-	0.00%	20.00	0.00			
Target Point 2- March 2038											
Target Month - March 2038	Targ et Reve nue (Rs. Cror es)	Calcu lated Reve nue (Rs. Crore s)	Differ ence %	If qualifi es for Modifi cation in Conce ssion Period	Qua lifyi ng incre ment or shor tfall	Chan ge in Conce ssion perio d %	Origi nal Conce ssion Perio d (Year )	Chan ge in Conce ssion perio d	Total Chan ge in Conce ssion perio d (Year )	Calcu lated Modif ied Conce ssion Perio d	Fina l Concessi on Peri od subj ect to Cap
TOT-13 - Gwalior to Jhansi	31	31.56	1.80 %	No	-	0.00%	20.00	0.00	0.00	20.00	

### Most likely Case

Target Point 1- March 2031									
Target Month - March 2031	Targ et Reve nue (Rs. Cror es)	Calcu lated Reve nue (Rs. Crore s)	Differ ence %	If qualifies for Modification in Concession Period	Quali fying incre ment or shortf all	Chan ge in Conce ssion perio d %	Origi nal Conce ssion Perio d (Year )	Chan ge in Conce ssion perio d (Year )	Modified Concessi on Period
TOT-13 - Gwalior to Jhansi	17	18.07	6.28%	No	-	0.00%	20.00	0.00	

Target Point 2- March 2038											
Target Month - March 2038	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period	Total Change in Concession period (Year)	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-13 - Gwalior to Jhansi	31	32.56	5.02 %	No	-	0.00%	20.00	0.00	0.00	20.00	

### Optimistic Case

Target Point 1- March 2031									
Target Month - March 2031	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period (Year)	Modified Concession Period
TOT-13 - Gwalior to Jhansi	17	18.32	7.77%	No	-	0.00%	20.00	0.00	

Target Point 2- March 2038											
Target Month - March 2038	Target Revenue (Rs. Crores)	Calculated Revenue (Rs. Crores)	Difference %	If qualifies for Modification in Concession Period	Qualifying increment or shortfall	Change in Concession period %	Original Concession Period (Year)	Change in Concession period	Total Change in Concession period (Year)	Calculated Modified Concession Period	Final Concession Period subject to Cap
TOT-13 - Gwalior to Jhansi	31	33.60	8.39 %	No	-	0.00%	20.00	0.00	0.00	20.00	

**TOT-13 (Gwalior to Jhansi)-Modification in Concession Period**

Types of Scenarios	Pessimistic Case		Most likely Case		Optimistic Case	
Target Month	Mar-31	Mar-38	Mar-31	Mar-38	Mar-31	Mar-38
Target Revenue (Rs. Crores)	17	31	17	31	17	31
Calculated Revenue (Rs. Crores)	17.82	31.56	18.07	32.56	18.32	33.60
Differences %	4.80%	1.80%	6.28%	5.02%	7.77%	8.39%
If qualifies for Modification in Concession Period	No	No	No	No	No	No
Qualifying Increment or shortfall	-	-	-	-	-	-
Change in Concession period %	0.00%	0.00%	0.00%	0.00%	0.00%	0.00%
Original Concession Period	20.00	20.00	20.00	20.00	20.00	20.00
Change in Concession period	0.00	0.00	0.00	0.00	0.00	0.00
Total Change in Concession period	0.00		0.00		0.00	
Calculated Modified Concession Period	20.00		20.00		20.00	
Final Concession Period subject to Cap	0.00		0.00		0.00	

Thus, there is no modification expected in concession period due to variation in revenue as per above estimates in all scenarios.

## CHAPTER 8

# CONCLUSION & RECOMMENDATIONS

### 8.1 Conclusion & Recommendations

Project stretch of Gwalior-Jhansi from km 0.000 to km 103.000 (revised section km 16.000 to km 98.455) of NH-75 (New NH-44) in the state of Madhya Pradesh and Uttar Pradesh is currently four lane road. The road is in sound condition and serves healthy traffic volumes. Project corridor is a part of the important regional network connecting Uttar Pradesh, Madhya Pradesh to Southern States and vice-versa. There are large number of townships, industrial corridors and other business establishment coming up along project corridor. As discussed, dominant portion of traffic is long route traffic, which is more sensitive towards the growth of national economy. As Indian economy is poised to grow at 7%+ post COVID-19, the project corridor is expected to pick up the same trend in terms of traffic flow. All these developments have potential to give positive impact to traffic flow on project. The following can be considered as major outcomes of the study

- a) There is good amount of tollable traffic running on project
- b) Project corridor has potential to witness traffic growth @ 6-8% annually in near future due to various development in area and overall development of economy
- c) Project corridor has committed traffic as long route traffic and does not run a risk of traffic leakage due to quality competing road

Based on above it can be considered a stable healthy project from traffic and revenue point of view.



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