

January 28, 2025

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 for December 31, 2024 & Traffic Reports

We are enclosing herewith the Valuation Report dated January 27, 2025, issued by M/s. KPMG Valuation Services LLP [IBBI Reg. No. IBBI/RV-E/06/2020/115], as on December 31, 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	65,895
B. Liabilities (at book value)	30,787
C. Net Assets [A-B]	35,108
D. Outstanding Units (in Crore)	117.21
E. NAV at Fair Value (Rupees/per Unit) [C/D]	299.53

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.

Investment Manager To

IRB Infrastructure Trust

SEBI Regd. No.: IN/INVIT/19-20/0012

E-mail: info@irb.co.in ■ irbinfrastructuretrust@irb.co.in

Website: www.irb.co.in ■ www.irbinfratrust.co.in

Registered Office: 1101, Hiranandani Knowledge Park, 11th Floor, Technology Street,

Hill Side Avenue, Opp. Hiranandani Hospital, Powai, Mumbai - 400 076

Tel: 91-22-6733 6400 / 4053 6400 ■ Fax: 91-22-4053 6699

Corporate Office: 3rd Floor, IRB Complex, Chandivali Farm, Chandivali Village, Andheri (E), Mumbai - 400 072

Tel: 91-22- 6640 4220 / 4880 4200 ■ Fax: 91-22- 2857 3441



IRB Infrastructure Trust

Valuation of IRB Infrastructure Trust and its SPVs

Valuation Report

—

January 2025





KPMG Valuation Services LLP
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Lodha Excelus
Apollo Mills Compound
N.M. Joshi Marg, Mahalakshmi
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Strictly private and confidential

27 January 2025

**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
("Investment Manager")**

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 along with addendum dated 16 January 2025 (together referred as "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 16 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 31 December 2024 ("Valuation Date").

We hereby enclose our Valuation Report dated 27 January 2025. 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 299.53 per unit** as on 31 December 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

LLP Identification Number – AAP-2732

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

%	Percentage	IGTPL	IRB Gwalior Tollway Private Limited	NHAI	National Highways Authority of India
AETL	AE Tollway Limited	IKTPL	IRB Kota Tollway Private Limited	NHIDCL	National Highway and Infrastructure Development Corporation Limited
Bn	Billion	ILTPL	IRB Lalitpur Tollway Private Limited	NWC	Net Working Capital
CAGR	Compounded Annual Growth Rate	IMF	International Monetary Fund	O&M	Operation and Maintenance
Capex	Capital Expenditure	IMHTL	IRB Hapur Moradabad Tollway Limited	PAT	Profit After Tax
CGTL	CG Tollway Limited	INR	Indian Rupee	PBT	Profit Before Tax
Clients	IRB Infrastructure Trust, MMK Toll Road Private Limited and IDBI Trusteeship Services Limited	InvIT	Investment Trust	PDTPL	Palsit Dankuni Private Tollway Limited
CoCo	Comparable Companies	IRBI Trust	IRB Infrastructure Trust	PIB	Press Information Bureau
COD	Commercial operation date	IRBIDL	IRB Infrastructure Developers Limited	PV	Present Value
CoTrans	Comparable Transactions	IWTL	IRB Westcoast Tollway Limited	R(f)	Risk free rate of Return
Cr	Crore	k	Thousands	R(m)	Market rate of Return
CWIP	Capital Work In Progress	Kd	Cost of Debt	Rf	Risk-free Rate
DBFOT	Design, Build, Finance, Operate and Transfer	Ke	Cost of Equity	SEBI	Securities and Exchange Board of India
DCF	Discounted Cash Flow	KGTL	Kishangarh Gulabpura Tollway Limited	Sponsor	IRB Infrastructure Developers Limited
EBIT	Earnings Before Interest and Tax	Km	Kilometer	SPV	Special Purpose Vehicle
EBITDA	Earnings Before Interest, Tax, Depreciation and Amortization	KPMG	KPMG Valuation Services LLP	STPL	Samakhiali Tollway Private Limited
EV	Enterprise Value	KTL	Kaithal Tollway Limited	SYTL	Solapur Yedeshi Tollway Limited
FCFF	Free Cash Flows to Firm	LoE	Letter of Engagement	t	Trillion
FV	Fair Value	Management	Management of IRBI Trust and its 15 SPVs	TOT	Toll operate transfer
FY	Financial Year	MAT	Minimum Alternate Tax	UPEIDA	Uttar Pradesh Expressways Industrial Development Authority
IDBI		MBEL	Meerut Budaun Expressway Limited	UTL	Udaipur Tollway Limited
Trusteeship Services Ltd	Trustee	MMK Toll Road Private Limited	Investment Manager	Valuation Date	31 December 2024
IBEF	India Brand Equity Foundation	mn	Million	WACC	Weighted Average Cost Of Capital
IGEPL	IRB Golconda Expressway Private Limited	MoRTH	The Ministry of Road Transport and Highways	WPI	Wholesale Price Index
		NAV	Net Asset Value	YATL	Yedeshi Aurangabad Tollway Limited

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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 16 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 31 December 2024. This report has been prepared by KPMG pursuant to terms of LoE.
- As on 31 December 2024 IRBI Trust assets comprised of the following 16 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")
 - Meerut Budaun Expressway Limited ("MBEL")

Valuation Approach and Methodology

Approach	Method
Income Approach	Discounted Cash Flow Method (DCF)

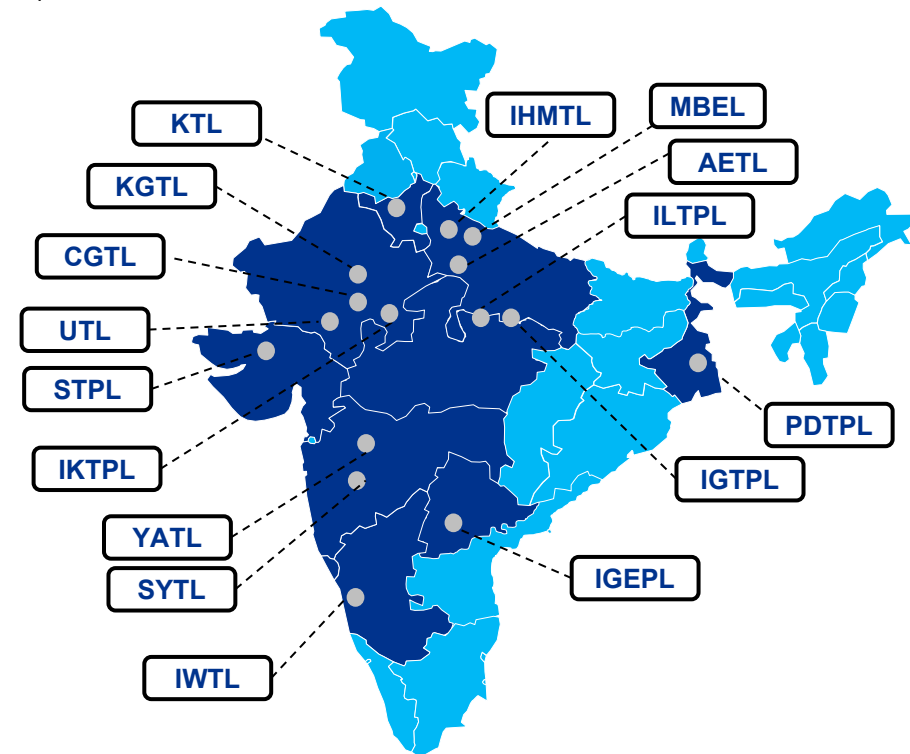
Source(s): Management information, KPMG analysis



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SPV Overview

IRBI Trust through its SPVs operates 12 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 / Uttar Pradesh Expressways Industrial Development Authority ("UPEIDA"). The map below represents the locations of the SPVs.



Valuation Conclusion

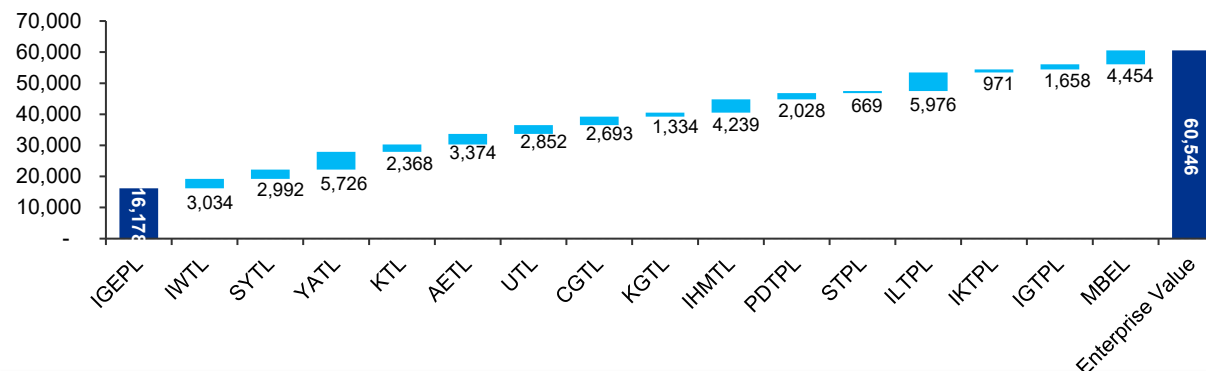
Valuation Conclusion (INR Crs)

Valuation Conclusion 31 December 2024	INR Crore
IRB Golconda Expressway Private Limited	16,178
IRB Westcoast Tollway Limited	3,034
Solapur Yedeshi Tollway Limited	2,992
Yedeshi Aurangabad Tollway Limited	5,726
Kaithal Tollway Limited	2,368
AE Tollway Limited	3,374
Udaipur Tollway Limited	2,852
CG Tollway Limited	2,693
Kishangarh Gulabpura Tollway Limited	1,334
IRB Hapur Moradabad Tollway Limited	4,239
Palsit Dankuni Tollway Private Limited	2,028
Samakhiali Tollway Private Limited	669
Lalitpur Tollway Private Limited	5,976
IRB Kota Tollway Private Limited	971
IRB Gwalior Tollway Private Limited	1,658
Meerut Budun Expressway Limited	4,454
Enterprise Value of the SPVs	60,546
Cash and cash equivalents	173
Surplus	297
Debt	(24,591)
PV of standalone expenses pertaining to IRBI Trust	(236)
Capital Creditors	(624)
Non-controlling interest	(458)
Equity value of IRBI Trust	35,108
NAV at fair value per unit as on 31 December 2024	
Equity Value of IRBI Trust (INR Cr)	35,108
Units outstanding (No.)	1,172,093,265
NAV at fair value per unit (INR)	299.53

Source(s): Management information, KPMG analysis

Enterprise Value of SPVs

INR Crore



The Enterprise Value of the SPVs is INR 60,546 crores and the 100% Equity Value of the IRBI Trust is INR 35,108 crores as on 31 December 2024.

The NAV at fair value per unit of IRBI Trust as on 31 December 2024 is INR 299.53 per unit.

Note: SPVs are individually referred as “Target”, “Business”, “Company”, “SPV” or the “Asset” Collectively referred as SPVs or Assets
 IRBI Trust has raised INR 1,714.92 cr in December 2024 through issue of 58.4 million units in right issue. Therefore, number of units outstanding have increased from 1113.7m to 1172.1m.
 Equity Value of IRBI Trust has increased from INR 32,822 cr as on 30 September 2024 to INR 35,108 cr on 31 December 2024, primarily due to funds raise by right issue to finance acquisition of 80.4 per cent stake in Meerut Budaun Expressway Limited.

2.

IRBI Trust Overview

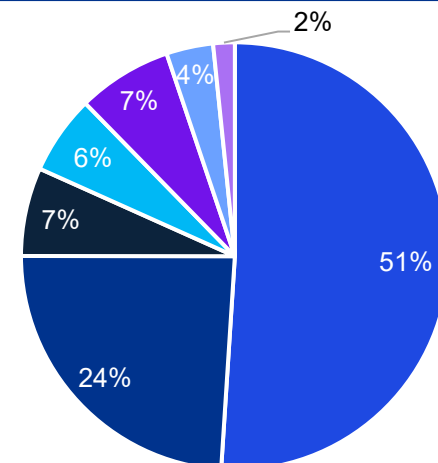
IRBI Trust Overview

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 on 31 December 2024 IRBI Trust assets comprised of 16 SPVs. IRBI Trust has acquired 12 DBFOT road assets and 4 TOT road asset. All SPVs of IRBI Trust except MBEL 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.
- In December 2024, IRBI Trust raised INR 1714.9 cr by way of right issue for acquisition of 80.4 per cent stake in MBEL from Sponsor and Anahera Investments Pte limited in a related party transaction.
- 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 Dec 2024

Shareholding Pattern of IRBI Trust as on 31 December 2024

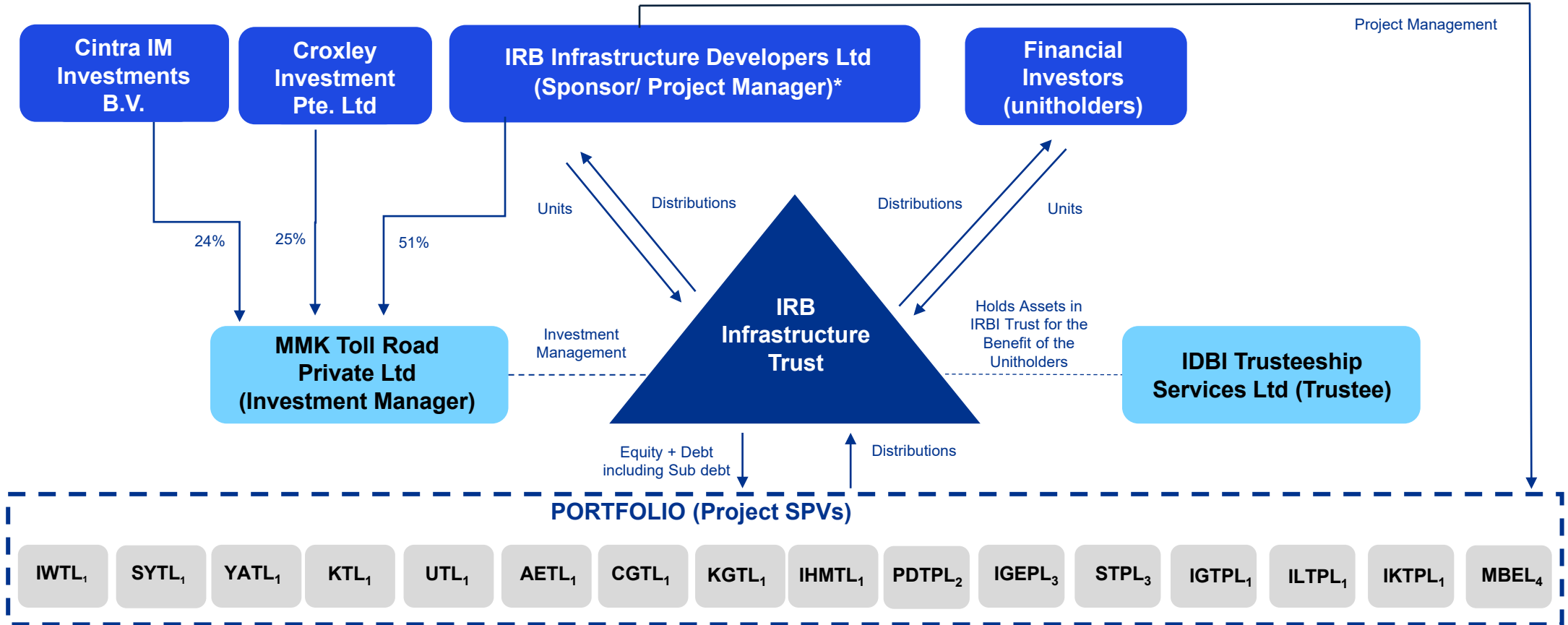


- IRB Infrastructure Developers Ltd
- Cintra InvIT Investments B.V.
- Anahera Investments Pte Ltd
- Bricklayers Investment Pte Ltd
- Chiswick Investments Pte Ltd
- Stretford End Investments Pte Ltd
- Dangenham Investments Pte Ltd

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



¹ 100% of each project SPV held by the IRBI Trust, together with nominee shareholders.

² 99.96% held by the IRBI Trust, with the Sponsor and Sponsor's nominee shareholders holding the remaining 0.04%.

³ 99.99% of IGEPL held by the IRBI Trust, with the Sponsor and Sponsor's nominee shareholders holding the remaining 0.01%.

⁴ 80.4% of MBEL held by the IRBI Trust, 10% by IRBI Developers and 9.6% by Anahera Investment Pte. Ltd.

Source(s): IRBI Trust Corporate Presentation, Management

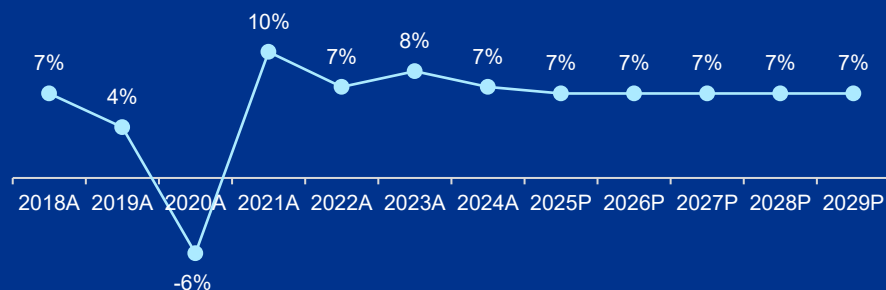
3.

Industry Overview

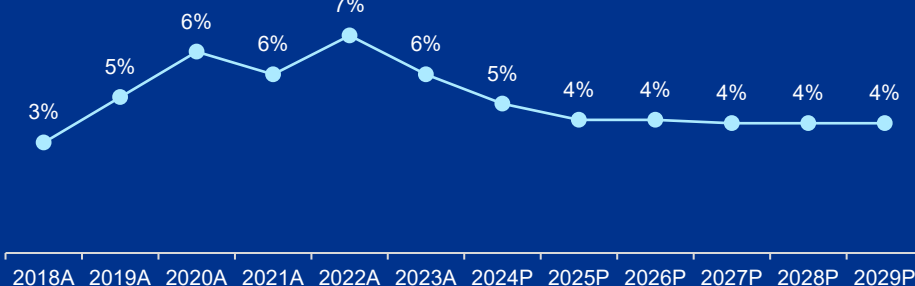
Indian Economy Outlook

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 (%)



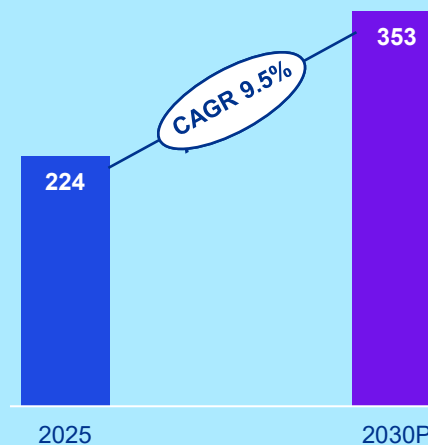
Source(s): International Monetary Fund ("IMF"), India Brand Equity Foundation ("IBEF"), Modor intelligence, EMIS

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.

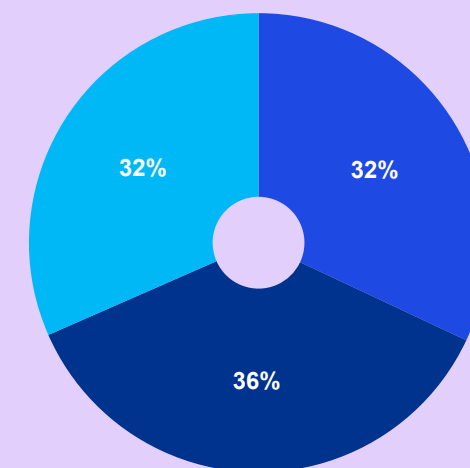
Capital investment outlay for infrastructure is being increased by 33 per cent, which would be 3.3 per cent of GDP and almost three times the outlay in 2019-20.

India Infrastructure market (USD billion)



Construction Industry

Market segmentation of India's Construction industry (2024)



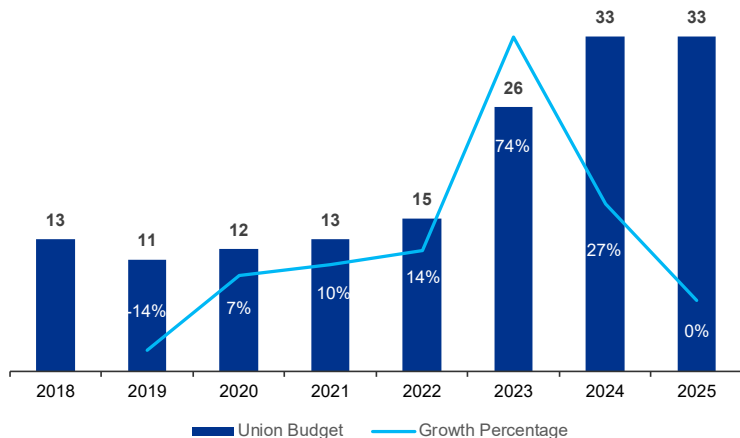
- Infrastructure construction
- Residential construction
- Commercial and special economic zones

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)

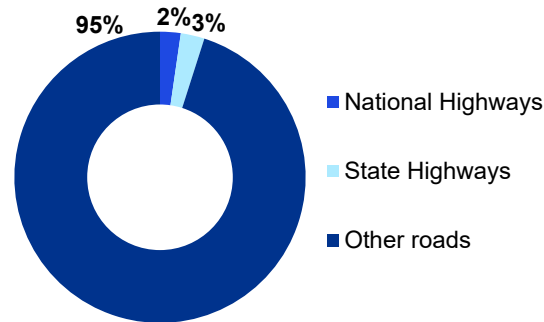


Source(s): MoRTH, IBEF, Invest India

2nd

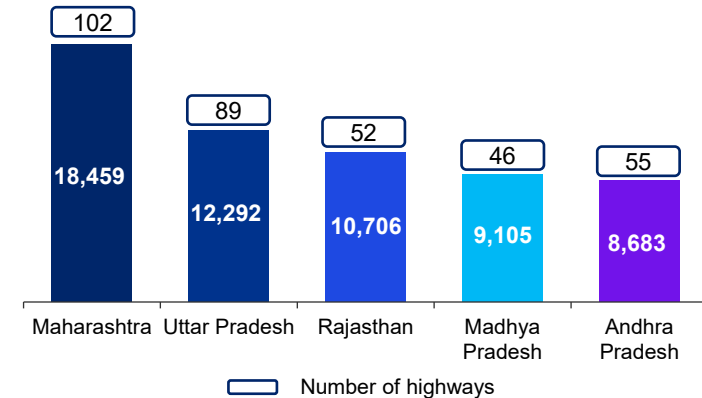
India has the second largest road network in the world of about 67 lakh km. This comprises National Highways, Expressways, State Highways, District Roads, Other District Roads and Village Roads.

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)

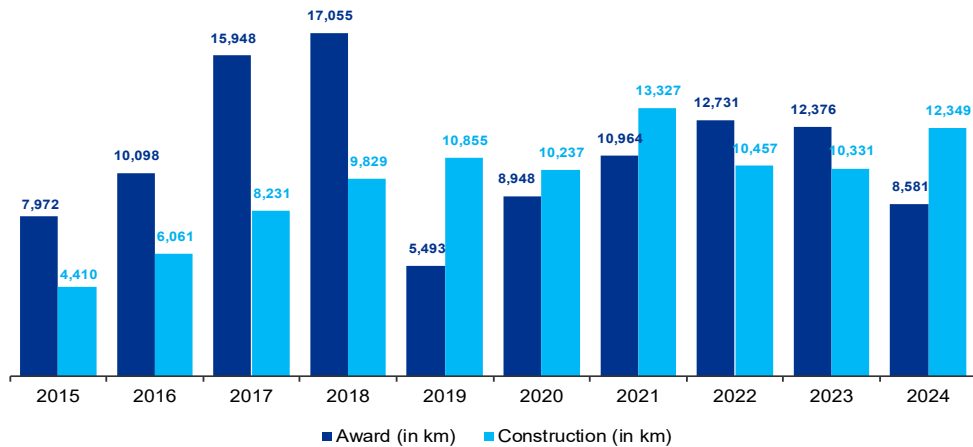
36.2%

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

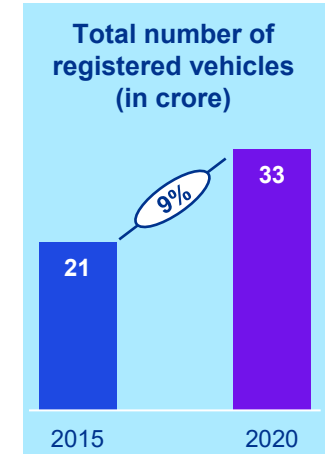
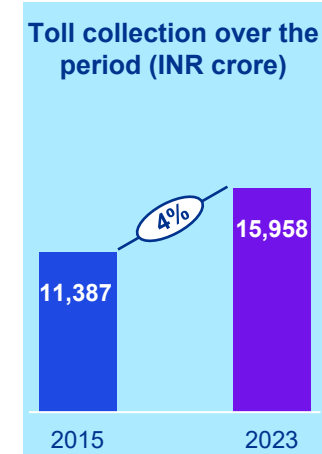
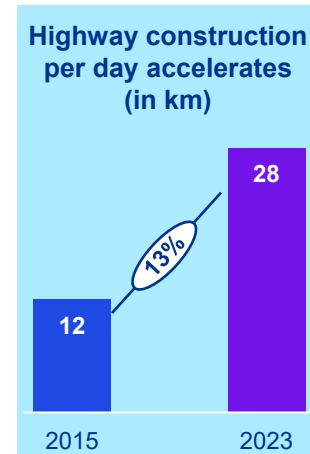
Toll operations efficiency increased due to adoption and growth of FASTag

10.2 Cr

As of 30th November 2024, banks have issued over 10.2 crore FASTags.

191 Cr

The average daily collection via FASTag on NH fee plaza is INR 191.4 crore thereby increasing efficiency in toll operations.



2023 data is as of 05 January 2024
○ - CAGR

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

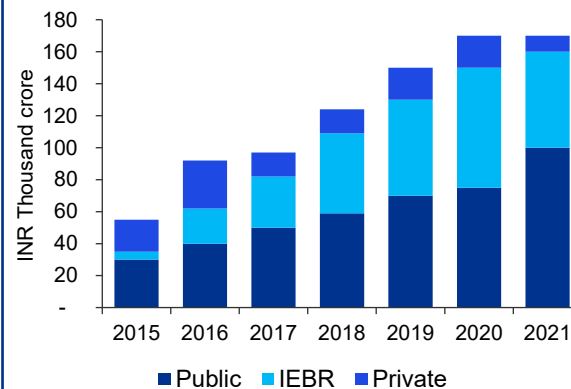
Under private financing, the private developer builds a road, and in return has the right to collect toll for a specified period of time. The developer is responsible for the maintenance of roads during this period.

Public financing

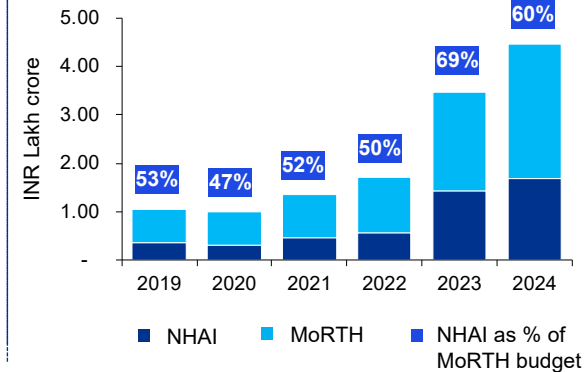
Funding from government sources includes budgetary allocations, which are financed from taxes, cesses, or dedicated road funds. Publicly funded projects are usually given to contractors under various contract models such as the Engineering Procurement Construction (EPC).

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

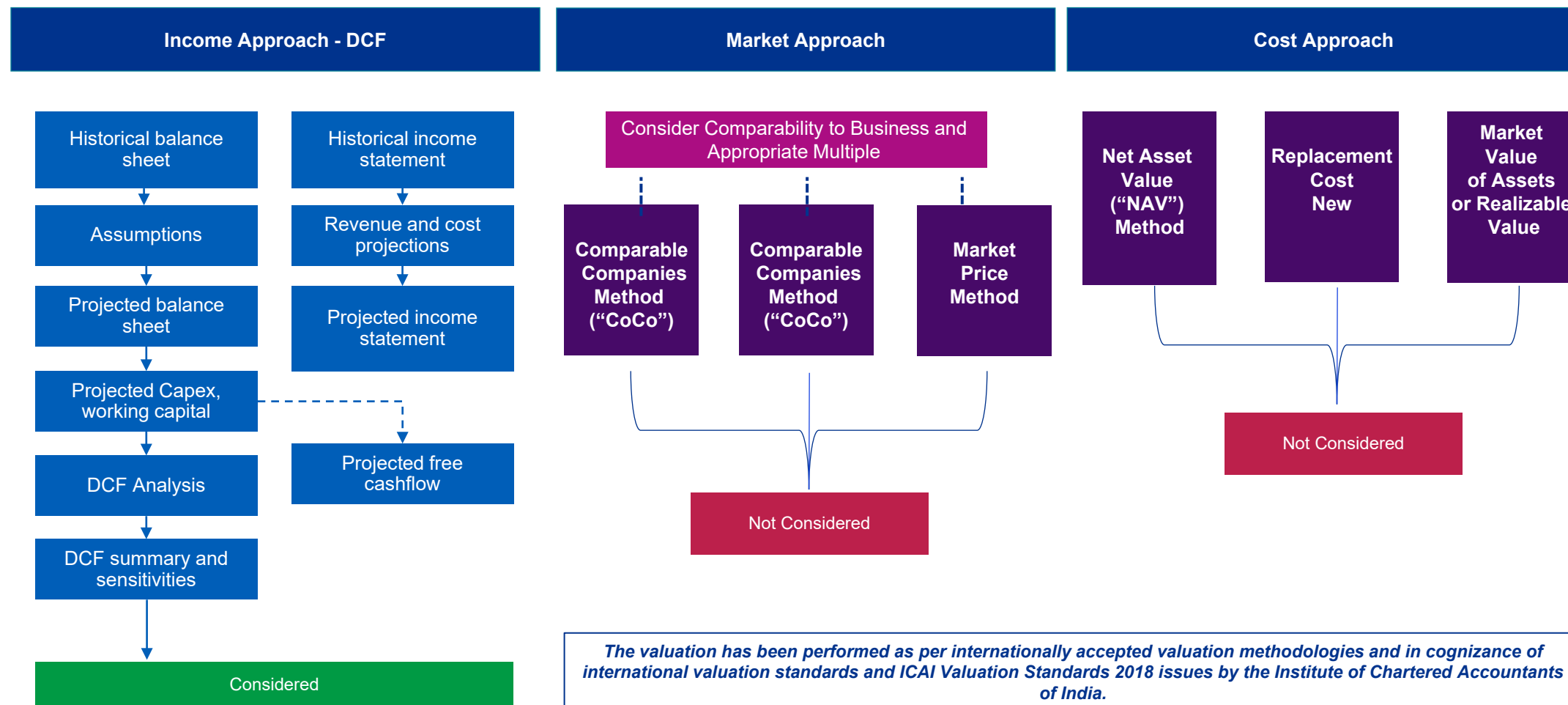
4.

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 of MBEL in December 2024 and other SPVs 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:

$$\text{WACC} = K_e * (E/(D + E)) + K_d * (1-T) * (D/(D + E))$$

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
β	=	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
α	=	company specific risk factor (alpha)

Summary - WACC

WACC calculation																
Name of SPV	IWTL	SYTL	YATL	CTL	AETL	UTL	CGTL	KGTL	IHMTL	PDTP	IGEPL	STPL	ILTPL	IKTPL	IGTPL	MBEL
Risk free rate of return	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%	6.8%
India 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%	7.0%
Beta	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97	0.97
Alpha										1.0%		1.0%				1.0%
Cost of Equity	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	13.6%	14.6%	13.6%	14.6%	13.6%	13.6%	13.6%	14.6%
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%	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%	25.2%
After Tax Cost of Debt	6.7%	6.4%	6.4%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%	6.7%
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%	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%	40.0%
Weighted Average Cost of Capital	9.48%	9.30%	9.30%	9.48%	9.48%	9.48%	9.48%	9.48%	9.48%	9.88%	9.48%	9.88%	9.48%	9.48%	9.48%	9.88%

Source: KPMG analysis

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

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	100%

Key Assumptions

a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI 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
New scheduled end date	06-Feb-48

- 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 January 2025 to 6 February 2048.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Westcoast Tollway prepared by an independent consultant appointed by the Management.

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Westcoast Tollway for detailed traffic volume analysis.
- Further, while estimating traffic growth, consultant has also taken in account potential benefit from being part of Mumbai – Kochi economic corridor which is expected to be operational in FY2027 and development of Tuticorin-Kochi economic corridor..
- 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. Please refer section 7.3 of the Westcoast Tollway Traffic Study Report for base toll rate and toll rate estimates.

c. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 2% to 5% y-o-y in forecast period post FY2030.

d. 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.

e. 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.

Source(s): Management information



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Discounted Cash Flows (1/3)

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	39	156	181	204	228	254	284	315	349
Less: Routine and Periodic maintenance	17	28	30	30	141	72	33	34	37
EBITDA [A]	22	128	151	174	87	182	251	281	313
EBITDA margin	56%	82%	83%	85%	38%	72%	88%	89%	90%
Depreciation	(8)	(30)	(34)	(38)	(42)	(44)	(45)	(50)	(56)
EBIT	13	99	117	137	45	138	206	231	257
EBIT margin	35%	63%	65%	67%	20%	54%	72%	73%	74%
Less: Tax on EBIT [B]	(2)	(17)	(21)	(24)	(8)	(24)	(36)	(40)	(45)
Change in working capital [C]	41	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	61	111	130	151	79	158	215	241	268
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	60	104	111	117	56	103	128	131	133

Source(s): Management information, KPMG analysis

Discounted Cash Flows (2/3)

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	12 months
Revenue	389	433	483	535	594	659	735	814	908	1,008
Less: Routine and Periodic maintenance	48	203	40	39	40	189	95	44	46	49
EBITDA [A]	342	230	443	496	554	470	639	770	861	959
EBITDA margin	88%	53%	92%	93%	93%	71%	87%	95%	95%	95%
Depreciation	(62)	(69)	(77)	(85)	(95)	(105)	(117)	(130)	(145)	(161)
EBIT	280	161	366	410	459	365	522	640	717	798
EBIT margin	72%	37%	76%	77%	77%	55%	71%	79%	79%	79%
Less: Tax on EBIT [B]	(49)	(28)	(64)	(72)	(80)	(64)	(91)	(158)	(188)	(241)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	293	202	379	424	474	406	548	612	673	718
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.200
Present value of cash flows [E*F]	133	83	143	146	149	117	144	147	148	144

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 10.2 months
Revenue	1,126	1,252	1,390	1,544	1,463
Less: Routine and Periodic maintenance	51	54	56	59	53
EBITDA [A]	1,075	1,198	1,333	1,485	1,410
EBITDA margin	95%	96%	96%	96%	96%
Depreciation	(180)	(200)	(222)	(246)	(234)
EBIT	895	998	1,112	1,239	1,176
EBIT margin	79%	80%	80%	80%	80%
Less: Tax on EBIT	(270)	(301)	(336)	(374)	(355)
Change in working capital	[C]	-	-	-	-
Less : Capex	[D]	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	804	896	998	1,111	1,055
Discounting period	18.750	19.750	20.750	21.750	22.675
Discount factor	[F]	0.183	0.167	0.153	0.139
Present value of cash flows [E*F]	147	150	152	155	135

Valuation conclusion

INR Crore

Present value of cash flows 3,035

Present value of release of working capital (1)

Enterprise Valuation 3,034

Present value of release in working capital represent negative working capital of INR 11 Cr released at the end of the concession period.

WACC 9.48%

Basis the above and using a WACC of 9.48%, the Enterprise Value of IWTL, as on 31 December 2024 is INR 3,034 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
Project location	Solapur Yedeshi
Concessionaire	SYTL
State	Maharashtra
Tollable length (kms)	98.7
No. of toll plazas	2
Concession agreement date	3-Mar-14
Appointed date	21-Jan-15
Four laning completion certificate date	15-Oct-19
Scheduled end date	21-Jan-44
New scheduled end date	20-Apr-44

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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 0.7 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 January 2025 to 20 April 2044.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Solapur to Yedeshi Section prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Solapur to Yedeshi Section Bypass for detailed traffic volume analysis.

Source(s): Management information

- Further, we have been given to understand 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 directing NHAI to submit a plan for augmentation of the road, and till then movement of commercial vehicles is restricted on corresponding section of the road. It has negatively impacted on traffic on SYTL and YATL. However, the matter is expected to be resolved during FY26, basis which it is anticipated that the diverted traffic would progressively come back on project stretch between FY26 and FY27.
- 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. Please refer section 7.3 of the Solapur to Yedeshi Section Traffic Study Report base toll rate and toll rate estimates.

c. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

d. 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.

e. 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.

Discounted Cash Flows (1/2)

Discounted Cash Flow										
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033	FY2034
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	35	176	212	237	265	294	329	365	407	451
Less: Routine and Periodic maintenance	9	39	41	22	23	24	25	26	89	93
EBITDA [A]	25	137	171	216	242	270	304	339	318	358
EBITDA margin	73%	78%	81%	91%	91%	92%	92%	93%	78%	79%
Depreciation	(6)	(21)	(24)	(27)	(30)	(33)	(37)	(41)	(46)	(51)
EBIT	19	116	147	189	212	237	267	297	272	307
EBIT margin	56%	66%	69%	80%	80%	81%	81%	81%	67%	68%
Less: Tax on EBIT [B]	(3)	(20)	(26)	(33)	(37)	(41)	(47)	(52)	(47)	(54)
Change in working capital [C]	5	19	15	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	27	136	160	183	205	229	257	287	270	305
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750	8.750
Discount factor [F]	0.989	0.935	0.856	0.783	0.716	0.655	0.600	0.549	0.502	0.459
Present value of cash flows [E*F]	26	127	137	143	147	150	154	157	136	140

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	1 months
Revenue	502	559	621	688	767	855	946	1,053	1,167	1,296	79
Less: Routine and Periodic maintenance	98	32	35	38	41	44	47	92	98	104	14
EBITDA [A]	404	527	587	651	726	812	900	961	1,069	1,193	65
EBITDA margin	81%	94%	94%	95%	95%	95%	95%	91%	92%	92%	82%
Depreciation	(57)	(63)	(71)	(78)	(88)	(97)	(108)	(120)	(133)	(149)	(9)
EBIT	347	464	516	572	638	714	792	841	936	1,044	56
EBIT margin	69%	83%	83%	83%	83%	84%	84%	80%	80%	81%	71%
Less: Tax on EBIT [B]	(61)	(81)	(90)	(100)	(169)	(191)	(213)	(228)	(256)	(290)	(16)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	344	446	497	551	557	621	687	732	814	903	49
Discounting period	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750	18.750	19.278
Discount factor [F]	0.420	0.384	0.352	0.322	0.294	0.269	0.246	0.225	0.206	0.189	0.180
Present value of cash flows [E*F]	144	171	175	177	164	167	169	165	168	170	9

Valuation conclusion		Present value of release in working capital represent working capital of negative INR 26 Cr released at the end of the concession period.
INR Crore		
Present value of cash flows	2,997	
Present value of release of working capital	(5)	
Enterprise Valuation	2,992	
WACC	9.30%	

Basis the above and using a WACC of 9.30%, the Enterprise Value of SYTL, as on 31 December 2024 is INR 2,992 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 4.0 years.



Premium

There is no premium clause in the concession agreement.

Source(s): Management information

Highlights

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

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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)	10%
1.5% increase for every 1% decrease	16%
Maximum increase in concession period	20%
Increase in concession period (years)	4.0
Revised concession period	30.0
Scheduled end date	1-July-41
New scheduled end date	15-Nov-45

- 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 15 November 2045. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 January 2025 to 15 November 2045.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Yedeshi to Aurangabad Section prepared by an independent consultant appointed by the Management.

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Yedeshi to Aurangabad Section for detailed traffic volume analysis.
- Further, we have been given to understand 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 directing NHAI to submit a plan for augmentation of the road, and till then movement of commercial vehicles is restricted on corresponding section of the road. It has negatively impacted on traffic on SYTL and YATL. However, the matter is expected to be resolved during FY26, basis which it is anticipated that the diverted traffic would progressively come back on project stretch between FY26 and FY27.
- 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. Please refer section 7.3 of the Yedeshi to Aurangabad Section Bypass Traffic Study Report base toll rate and toll rate estimates.

Source(s): Management information



Key Assumptions

c. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

d. 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.

e. 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.

Source(s): Management information



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Discounted Cash Flows [1/2]

Discounted Cash Flow										
INR crores	FY2025 3 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	68	350	417	464	507	557	609	667	726	795
Less: Routine and Periodic maintenance	14	58	61	30	31	33	35	37	148	155
EBITDA [A]	55	292	357	434	476	524	574	630	579	639
EBITDA margin	80%	84%	85%	94%	94%	94%	94%	95%	80%	80%
Depreciation	(8)	(52)	(53)	(54)	(59)	(65)	(71)	(78)	(85)	(93)
EBIT	46	240	304	380	417	460	504	553	494	547
EBIT margin	68%	69%	73%	82%	82%	82%	83%	83%	68%	69%
Less: Tax on EBIT [B]	(8)	(42)	(53)	(66)	(73)	(80)	(88)	(97)	(86)	(96)
Change in working capital [C]	(12)	31	27	19	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	35	281	331	387	403	444	486	534	492	544
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750	8.750
Discount factor [F]	0.989	0.935	0.856	0.783	0.716	0.655	0.600	0.549	0.502	0.459
Present value of cash flows [E*F]	34	263	283	303	289	291	292	293	247	250

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	FY2046
INR crores	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	7.5 months
Revenue	870	951	1,036	1,131	1,236	1,352	1,475	1,611	1,761	1,934	2,107	1,443
Less: Routine and Periodic maintenance	163	44	46	49	51	114	119	126	62	65	68	20
EBITDA [A]	707	907	990	1,082	1,185	1,238	1,355	1,485	1,699	1,868	2,039	1,423
EBITDA margin	81%	95%	96%	96%	96%	92%	92%	92%	96%	97%	97%	99%
Depreciation	(102)	(111)	(121)	(132)	(145)	(158)	(173)	(189)	(207)	(227)	(248)	(170)
EBIT	606	796	869	950	1,040	1,079	1,183	1,296	1,492	1,641	1,791	1,253
EBIT margin	70%	84%	84%	84%	84%	80%	80%	80%	85%	85%	85%	87%
Less: Tax on EBIT [B]	(106)	(139)	(152)	(166)	(182)	(189)	(299)	(365)	(428)	(470)	(513)	(365)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	602	768	838	916	1,003	1,049	1,056	1,120	1,271	1,398	1,526	1,058
Discounting period	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750	18.750	19.750	20.563
Discount factor [F]	0.420	0.384	0.352	0.322	0.294	0.269	0.246	0.225	0.206	0.189	0.173	0.161
Present value of cash flows [E*F]	253	295	295	295	295	283	260	252	262	264	263	170

Valuation conclusion	
INR Crore	
Present value of cash flows	5,731
Present value of release of working capital	(5)
Enterprise Valuation	5,726
WACC	9.30%

Present value of release in working capital represent working capital of negative INR 35 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.30%, the Enterprise Value of YATL, as on 31 December 2024 is INR 5,726 crore.

Please refer annexure 2b for WACC breakup.

Source(s): Management information, KPMG analysis



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

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	100%

Key Assumptions

a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHAI 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)	35%
1.5% increase for every 1% decrease	52%
Maximum increase in concession period	20%
Increase in concession period (years)	5.4
Revised concession period	32.4
Scheduled end date	14-July-42
New scheduled end date	06-Feb-49

- 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 January 2025 to 06 February 2049.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Kaithal to Rajasthan Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.

Source(s): Management information

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Kaithal to Rajasthan Section Bypass for detailed traffic volume analysis.
- Haryana Power Generation Cooperation Ltd. (HPGCL) is in process to set up a 800MW thermal unit based on super critical technology at Yamunagar (Hisar) as an expansion of existing coal base thermal plant. This is expected to give a boost to goods traffic plying on the KTL project road from Financial Year 2027. Traffic consultant has hence considered the same while estimating traffic volume for KTL.
- 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. Please refer section 7.3 of the Kaithal to Rajasthan Section Traffic Study Report base toll rate and toll rate estimates.

c. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

d. 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.

e. 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									
INR crores	FY2025 3 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	38	151	182	200	218	237	257	280	304
Less: Routine and Periodic maintenance	17	70	24	25	26	27	29	158	165
EBITDA [A]	22	81	158	176	192	210	229	122	139
EBITDA margin	57%	54%	87%	88%	88%	89%	89%	44%	46%
Depreciation	(8)	(26)	(29)	(32)	(34)	(37)	(40)	(44)	(48)
EBIT	14	55	130	144	158	173	188	78	91
EBIT margin	37%	37%	71%	72%	72%	73%	73%	28%	30%
Less: Tax on EBIT [B]	(2)	(10)	(23)	(25)	(28)	(30)	(33)	(14)	(16)
Change in working capital [C]	45	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	64	72	136	151	164	180	196	109	123
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	64	67	116	117	117	117	116	59	61

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	
Revenue	330	359	391	423	460	500	545	590	639	
Less: Routine and Periodic maintenance	173	35	36	38	40	42	138	145	152	
EBITDA [A]	157	324	355	385	420	458	407	445	487	
EBITDA margin	47%	90%	91%	91%	91%	92%	75%	75%	76%	
Depreciation	(52)	(57)	(62)	(67)	(73)	(77)	(84)	(91)	(98)	
EBIT	105	267	293	318	347	381	323	354	389	
EBIT margin	32%	75%	75%	75%	76%	76%	59%	60%	61%	
Less: Tax on EBIT [B]	(18)	(47)	(51)	(56)	(61)	(67)	(56)	(91)	(102)	
Change in working capital [C]	-	-	-	-	-	-	-	-	-	
Less : Capex [D]	-	-	-	-	-	-	-	-	-	
Free cash flows to the firm E = [A+B+C+D]	139	277	304	329	359	391	350	354	385	
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	
Present value of cash flows [E*F]	63	115	115	114	113	113	92	85	85	

Source(s): Management information, KPMG analysis

Discounted Cash Flows [3/3]

Discounted Cash Flow							
	FY2043	FY2044	FY2045	FY2046	FY2047	FY2048	FY2049
INR crores	12 months	12 months	12 months	12 months	12 months	12 months	10 months
Revenue	694	755	818	888	964	1,006	933
Less: Routine and Periodic maintenance	51	54	56	59	62	65	59
EBITDA [A]	643	702	761	829	901	940	874
EBITDA margin	93%	93%	93%	93%	94%	93%	94%
Depreciation	(107)	(117)	(126)	(137)	(149)	(155)	(144)
EBIT	536	585	635	692	753	785	730
EBIT margin	77%	77%	78%	78%	78%	78%	78%
Less: Tax on EBIT [B]	(157)	(177)	(192)	(209)	(227)	(237)	(220)
Change in working capital [C]	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	486	525	570	621	675	704	654
Discounting period	17.750	18.750	19.750	20.750	21.750	22.750	23.675
Discount factor [F]	0.200	0.183	0.167	0.153	0.139	0.127	0.117
Present value of cash flows [E*F]	97	96	95	95	94	90	77

Valuation conclusion

INR Crore

Present value of cash flows	2,370
Present value of release of working capital	(3)
Enterprise Valuation	2,368

WACC	9.48%
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Present value of release in working capital represent working capital of negative INR 23 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of KTL, as on 31 December 2024 is **INR 2,368 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
Project location	Agra Etawah
Concessionaire	AETL
State	Uttar Pradesh
Tollable length (kms)	124.52
No. of toll plazas	2
Concession agreement date	01-Sep-15
Appointed date	01-Aug-16
Six laning completion certificate date	24-Nov-20
Scheduled end date	31-Jul-40
New scheduled end date	19-Oct-45

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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)	38%
1.5% increase for every 1% decrease	57%
Maximum increase in concession period	20%
Increase in concession period (years)	4.8
Revised concession period	28.8
Scheduled end date	31-Jul-40
New scheduled end date	19-Oct-45

- 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 January 2025 to 19 October 2045.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Agra to Ethawah Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.

Source(s): Management information

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Agra to Ethawah Section Bypass for detailed traffic volume analysis.
- 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. Please refer section 7.3 of the Agra to Ethawah Section Traffic Study Report base toll rate and toll rate estimates.

c. Premium payable

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

d. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

e. 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.

f. 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	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	37	157	189	223	258	299	342	395	450
Less: Routine and Periodic maintenance	20	82	43	46	48	50	176	185	193
EBITDA [A]	18	75	145	177	210	249	166	210	256
EBITDA margin	48%	47%	77%	79%	81%	83%	49%	53%	57%
Depreciation	(10)	(41)	(46)	(53)	(58)	(65)	(73)	(82)	(91)
EBIT	8	34	99	124	152	183	94	128	166
EBIT margin	21%	21%	52%	56%	59%	61%	27%	32%	37%
Less: Tax on EBIT [B]	(1)	(6)	(17)	(22)	(27)	(32)	(16)	(22)	(29)
Change in working capital [C]	39	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	56	69	128	155	184	217	150	187	228
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	55	64	109	121	131	141	89	102	113

Source(s): Management information, KPMG analysis

Discounted Cash Flows [2/3]

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	12 months
Revenue	517	590	666	748	839	943	1,061	1,173	1,303	1,446
Less: Routine and Periodic maintenance	61	64	67	70	147	155	163	86	90	94
EBITDA [A]	456	526	599	677	692	788	898	1,088	1,214	1,351
EBITDA margin	88%	89%	90%	91%	82%	84%	85%	93%	93%	93%
Depreciation	(102)	(114)	(124)	(118)	(121)	(134)	(149)	(163)	(179)	(197)
EBIT	354	412	474	560	571	654	748	924	1,034	1,154
EBIT margin	69%	70%	71%	75%	68%	69%	71%	79%	79%	80%
Less: Tax on EBIT [B]	(62)	(72)	(83)	(98)	(100)	(114)	(173)	(263)	(305)	(340)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	394	454	516	579	592	674	725	824	908	1,011
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.200
Present value of cash flows [E*F]	178	188	195	200	187	194	190	198	199	203

Source(s): Management information, KPMG analysis

Discounted Cash Flows [3/3]

Discounted Cash Flow				
		FY2044	FY2045	FY2046
INR crores		12 months	12 months	7 months
Revenue		1,606	1,776	1,081
Less: Routine and Periodic maintenance		99	104	60
EBITDA	[A]	1,507	1,672	1,021
EBITDA margin		94%	94%	94%
Depreciation		(217)	(238)	(144)
EBIT		1,290	1,434	877
EBIT margin		80%	81%	81%
Less: Tax on EBIT	[B]	(379)	(421)	(257)
Change in working capital	[C]	-	-	-
Less : Capex	[D]	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	1,128	1,252	764
Discounting period		18.750	19.750	20.526
Discount factor	[F]	0.183	0.167	0.156
Present value of cash flows	[E*F]	206	209	119

Valuation conclusion	
INR Crore	
Present value of cash flows	3,390
Present value of release of working capital	(16)
Enterprise Valuation	3,374
WACC	9.48%

Present value of release in working capital represent working capital of negative INR 105 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of AETL, as on 31 December 2024 is INR 3,374 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 years.



Premium

UTL was engaged on payment of premium of INR 163.8 Crs to NHAI immediately after the 3rd 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
Project location	Udaipur Gujarat border
Concessionaire	UTL
State	Rajasthan/ Gujarat
Tollable length (kms)	113.8
No. of toll plazas	1
Concession agreement date	09-Dec-16
Appointed date	03-Sep-17
Six laning completion certificate date	01-Jun-21
Scheduled end date	02-Sep-38
New scheduled end date	29-Nov-42

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	100%

Key Assumptions

a. Modification in concession period

- As per Clause 29.2 of the concession agreement between NHA 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)	13%
1.5% increase for every 1% decrease	19%
Maximum increase in concession period	20%
Increase in concession period (years)	4
Revised concession period	25
Scheduled end date	02-Sep-38
New scheduled end date	28-Nov-42

- 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 28 November 2042. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 January 2025 to 28 November 2042.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Udaipur to Gujarat Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6

Source(s): Management information



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- of the Traffic Study Report for Udaipur to Gujarat Section Bypass for detailed traffic volume analysis.
- There are ROBs which are under construction in Ahmedabad – Shamlaji section. Due to this some traffic is temporarily diverted to alternate roads. It is expected that construction of these ROBs would be completed by FY25 end and stretch would be open for seamless traffic flow subsequently. The said diverted traffic is expected to come back on project stretch considering from Financial Year 2026.
- 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. Please refer section 7.3 of the Udaipur to Gujarat Section Traffic Study Report base toll rate and toll rate estimates.

e. Premium payable

- The premium payable to NHA 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 2% to 5% y-o-y in forecast period post FY2030.

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	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	42	188	227	270	300	339	377	421	467
Less: Routine and Periodic maintenance	23	99	28	24	145	151	154	33	29
EBITDA [A]	19	89	199	245	155	188	223	388	439
EBITDA margin	46%	47%	88%	91%	52%	55%	59%	92%	94%
Depreciation	(6)	(47)	(53)	(59)	(66)	(72)	(79)	(88)	(96)
EBIT	13	42	146	186	90	115	143	300	342
EBIT margin	31%	22%	64%	69%	30%	34%	38%	71%	73%
Less: Tax on EBIT [B]	(2)	(7)	(25)	(32)	(16)	(20)	(25)	(53)	(60)
Change in working capital [C]	-	-	-	39	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	17	82	174	251	140	167	198	336	379
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	17	77	148	196	99	109	117	182	188

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 8 months
Revenue	522	579	642	711	785	869	965	1,058	1,161	849
Less: Routine and Periodic maintenance	115	121	150	32	33	33	35	37	39	27
EBITDA [A]	406	458	492	679	753	835	930	1,021	1,123	823
EBITDA margin	78%	79%	77%	96%	96%	96%	96%	97%	97%	97%
Depreciation	(106)	(117)	(128)	(125)	(104)	(114)	(126)	(137)	(150)	(143)
EBIT	300	341	364	554	648	721	805	884	973	680
EBIT margin	58%	59%	57%	78%	83%	83%	83%	84%	84%	80%
Less: Tax on EBIT [B]	(52)	(60)	(64)	(97)	(113)	(210)	(234)	(257)	(283)	(207)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	354	398	429	582	639	625	696	764	840	616
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.581
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.203
Present value of cash flows [E*F]	160	165	162	201	201	180	183	183	184	125

Valuation conclusion

INR Crore

Present value of cash flows 2,878

Present value of release of working capital (25)

Enterprise Valuation 2,852

WACC 9.48%

Present value of release in working capital represent working capital of negative INR 128 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of UTL, as on 31 December 2024 is INR 2,852 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 3rd 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
Project location	Gulabpura Chittorgarh
Concessionaire	CGTL
State	Rajasthan
Tollable length (kms)	124.87
No. of toll plazas	2
Concession agreement date	9-Dec-16
Appointed date	4-Nov-17
Six laning completion certificate date	14-Aug-21
Scheduled end date	3-Nov-37
New scheduled end date	3-Feb-42

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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
New scheduled end date	03-Feb-42

- 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 January 2025 to 3 February 2042.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Chittorgarh to Gulabpura Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.

Source(s): Management information

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Chittorgarh to Gulabpura Section Bypass for detailed traffic volume analysis.
- 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. Please refer section 7.3 of the Chittorgarh to Gulabpura Section Traffic Study Report base toll rate and toll rate estimates.

c. Premium payable

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

d. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

e. 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.

f. 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									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	45	174	220	270	304	349	386	430	478
Less: Routine and Periodic maintenance	16	66	69	42	44	46	134	141	148
EBITDA [A]	30	108	151	229	261	303	252	289	330
EBITDA margin	65%	62%	69%	85%	86%	87%	65%	67%	69%
Depreciation	(13)	(44)	(49)	(55)	(61)	(68)	(74)	(82)	(89)
EBIT	17	64	101	174	200	235	178	207	241
EBIT margin	38%	37%	46%	64%	66%	67%	46%	48%	50%
Less: Tax on EBIT [B]	(3)	(11)	(18)	(30)	(35)	(41)	(31)	(36)	(42)
Change in working capital [C]	-	-	-	50	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	27	97	133	248	226	262	221	253	288
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	26	91	114	194	161	170	131	137	143

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 months
Revenue	531	591	654	721	796	879	972	1,067	995
Less: Routine and Periodic maintenance	56	67	109	115	122	76	81	87	80
EBITDA [A]	475	524	545	605	674	804	891	980	915
EBITDA margin	90%	89%	83%	84%	85%	91%	92%	92%	92%
Depreciation	(98)	(108)	(118)	(129)	(141)	(154)	(169)	(184)	(171)
EBIT	377	416	427	477	533	649	722	796	744
EBIT margin	71%	70%	65%	66%	67%	74%	74%	75%	75%
Less: Tax on EBIT [B]	(66)	(73)	(75)	(152)	(170)	(202)	(224)	(247)	(230)
Change in working capital [C]	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	409	451	471	453	504	601	667	733	685
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.671
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.221
Present value of cash flows [E*F]	185	186	178	156	159	173	175	176	151

Valuation conclusion

INR Crore

Present value of cash flows	2,707
Present value of release of working capital	(14)
Enterprise Valuation	2,693

WACC	9.48%
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Present value of release in working capital represent working capital of negative INR 66 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of CGTL, as on 31 December 2024 is INR 2,693 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 3rd 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
Project location	Kishangarh Gulabpura
Concessionaire	KGTL
State	Rajasthan
Tollable length (kms)	90
No. of toll plazas	1
Concession agreement date	22-Feb-17
Appointed date	21-Feb-18
Six laning completion certificate date	20-Jul-22
Scheduled end date	20-Feb-38
New scheduled end date	20-Jun-42

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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)	36%
1.5% increase for every 1% decrease	54%
Maximum increase in concession period	20%
Increase in concession period (years)	4
Revised concession period	24
Scheduled end date	20-Feb-38
New scheduled end date	20-Jun-42

- 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 January 2025 to 20 June 2042.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Kishangarh to Gulabpura section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.

Source(s): Management information

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Kishangarh to Gulabpura section for detailed traffic volume analysis.
- 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. Please refer section 7.2 of the Kishangarh to Gulabpura section Traffic Study Report base toll rate and toll rate estimates.

c. Premium payable

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

d. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

e. 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.

f. 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									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	20	70	96	125	154	176	198	224	251
Less: Routine and Periodic maintenance	6	26	128	29	30	32	33	35	141
EBITDA [A]	14	44	(32)	96	123	144	165	188	110
EBITDA margin	70%	63%	-33%	77%	80%	82%	83%	84%	44%
Depreciation	(9)	(33)	(35)	(39)	(43)	(47)	(52)	(57)	(63)
EBIT	5	11	(67)	57	81	96	113	131	47
EBIT margin	23%	15%	-69%	46%	52%	55%	57%	59%	19%
Less: Tax on EBIT [B]	-	(2)	-	(4)	(14)	(17)	(20)	(23)	(8)
Change in working capital [C]	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	14	42	(32)	92	109	127	145	165	102
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	14	39	(27)	71	78	83	86	90	50

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 months
Revenue	283	320	357	398	442	493	552	612	675	165
Less: Routine and Periodic maintenance	141	152	43	47	51	55	59	63	67	25
EBITDA [A]	142	169	313	351	391	437	493	549	608	140
EBITDA margin	50%	53%	88%	88%	88%	89%	89%	90%	90%	85%
Depreciation	(69)	(77)	(84)	(92)	(101)	(111)	(122)	(134)	(146)	(35)
EBIT	73	92	229	259	290	327	371	416	463	105
EBIT margin	26%	29%	64%	65%	66%	66%	67%	68%	68%	63%
Less: Tax on EBIT [B]	(13)	(16)	(40)	(45)	(51)	(57)	(124)	(138)	(153)	(35)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	129	153	273	306	340	380	369	411	455	105
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.338
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.208
Present value of cash flows [E*F]	59	63	103	105	107	109	97	99	100	22

Valuation conclusion

INR Crore

Present value of cash flows 1,348

Present value of release of working capital (14)

Enterprise Valuation 1,334

WACC 9.48%

Present value of release in working capital represent working capital of negative INR 70 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of KGTL, as on 31 December 2024 is INR 1,334 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 ~2.8 years.



Premium

IHMTL was engaged on payment of premium of INR 31.5 Crs to NHAI immediately after the 3rd 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
Project location	Hapur Moradabad
Concessionaire	IHMTL
State	Uttar Pradesh
Tollable length (kms)	99.87
No. of toll plazas	2
Concession agreement date	29-May-18
Appointed date	28-May-19
Six laning completion certificate date	7-Apr-23
Scheduled end date	31-May-41
New scheduled end date	12-June-44

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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)	8%
1.5% increase for every 1% decrease	13%
Maximum increase in concession period	20%
Increase in concession period (years)	2.8
Revised concession period	25
Scheduled end date	31-May-41
New scheduled end date	12-June-44

- 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 12 June 2044. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 January 2025 to 12 June 2044.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Hapur bypass to Moradabad section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.

Source(s): Management information

- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Hapur bypass to Moradabad section for detailed traffic volume analysis.
- 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. Please refer section 7.2 of the Hapur bypass to Moradabad section Traffic Study Report base toll rate and toll rate estimates.

c. Premium payable

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

d. 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 periodic and routine maintenance cost have been considered based on technical assessment done by the Management. Routine maintenance has been increased by 4% to 5% y-o-y in forecast period post FY2030.

e. 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.

f. 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.

g. Capex

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

Discounted Cash Flows [1/3]

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	74	319	361	402	444	485	534	580	637
Less: Routine and Periodic maintenance	2	99	100	95	10	16	85	88	69
EBITDA [A]	71	220	261	307	434	469	448	492	568
EBITDA margin	97%	69%	72%	76%	98%	97%	84%	85%	89%
Depreciation	(14)	(60)	(63)	(70)	(77)	(84)	(92)	(100)	(110)
EBIT	57	160	198	237	357	385	357	391	459
EBIT margin	77%	50%	55%	59%	80%	79%	67%	67%	72%
Less: Tax on EBIT [B]	(10)	(28)	(35)	(41)	(62)	(67)	(62)	(68)	(80)
Change in working capital [C]	4	-	-	-	-	-	-	-	-
Less : Capex [D]	(14)	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	51	192	226	266	371	402	386	423	488
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	51	179	193	207	264	261	229	230	242

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	701	768	832	896	970	1,049	1,140	1,228	1,332	1,435
Less: Routine and Periodic maintenance	15	13	227	245	253	23	19	23	26	29
EBITDA [A]	687	755	605	651	716	1,026	1,121	1,206	1,305	1,406
EBITDA margin	98%	98%	73%	73%	74%	98%	98%	98%	98%	98%
Depreciation	(120)	(132)	(143)	(154)	(166)	(179)	(195)	(210)	(227)	(246)
EBIT	567	623	463	498	550	847	926	996	1,078	1,160
EBIT margin	81%	81%	56%	56%	57%	81%	81%	81%	81%	81%
Less: Tax on EBIT [B]	(99)	(109)	(95)	(164)	(180)	(258)	(282)	(303)	(329)	(354)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	588	646	510	487	536	768	839	902	977	1,052
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.200
Present value of cash flows [E*F]	266	267	193	168	169	221	221	217	214	211

Source(s): Management information, KPMG analysis

Discounted Cash Flows [3/3]

Discounted Cash Flow		
INR crores	FY2044 12 months	FY2045 2 months
Revenue	1,560	336
Less: Routine and Periodic maintenance	32	4
EBITDA [A]	1,528	332
EBITDA margin	98%	99%
Depreciation	(266)	-
EBIT	1,262	332
EBIT margin	81%	99%
Less: Tax on EBIT [B]	(385)	(84)
Change in working capital [C]	-	-
Less : Capex [D]	-	-
Free cash flows to the firm E = [A+B+C+D]	1,144	249
Discounting period	18.750	19.350
Discount factor [F]	0.183	0.173
Present value of cash flows [E*F]	209	43

Valuation conclusion

INR Crore

Present value of cash flows	4,255
Present value of release of working capital	(16)
Enterprise Valuation	4,239

WACC	9.48%
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Present value of release in working capital represent working capital of negative INR 93 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of IHMTL, as on 31 December 2024 is INR 4,239 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 0.4 years.



Premium

PDTPL has to pay premium after the 1st 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
Project	Dankuni to Palsit
Concessionaire	PDTPL
State	West Bengal
Tollable length (kms)	63.83
No. of toll plazas	1
Concession agreement date	14-Jun-21
Appointed date	1-Apr-22
Completion certificate date	Under construction
Scheduled end date	1-Apr-39
New scheduled end date	9-Nov-38

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust	99.96%
IRB Infrastructure Developers Ltd and its nominees	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)	8%
1% decrease for every 1% increase beyond 5%	3%
Maximum decrease in concession period	20%
Decrease in concession period (years)	0.4
Revised concession period	16.6
Scheduled end date	1-April-39
New scheduled end date	9-Nov-38

- The Management has confirmed to us to consider revised concession period till 9 November 2038. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 January 2025 to 21 December 2038.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Palsit to Dankuni Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Palsit to Dankuni Section for detailed traffic volume analysis.

- 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. Please refer section 7.2 of the Palsit to Dankuni Section Traffic Study Report base toll rate and toll rate estimates.
- 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.

c. Premium payable

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

d. 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.

e. 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.

f. 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 151 Cr in the last quarter of FY2025 and 54 cr in FY2026 based on Management estimates. Management have provided statement of expenses/work in progress pertaining to capex as on 31 December 2024.

Source(s): Management information



Discounted Cash Flows [1/2]

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	47	256	317	313	342	374	406	440	473
Less: Routine and Periodic maintenance	11	45	47	50	85	93	93	62	66
EBITDA [A]	36	212	269	263	257	281	314	378	407
EBITDA margin	76%	83%	85%	84%	75%	75%	77%	86%	86%
Depreciation	(21)	(75)	(93)	(104)	(114)	(127)	(139)	(152)	(166)
EBIT	15	136	177	160	143	154	175	226	241
EBIT margin	31%	53%	56%	51%	42%	41%	43%	51%	51%
Less: Tax on EBIT [B]	-	(9)	(31)	(29)	(28)	(34)	(42)	(58)	(65)
Change in working capital [C]	(85)	-	-	85	-	-	-	-	-
Less : Capex [D]	(151)	(54)	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	(200)	149	239	319	230	247	272	320	342
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.988	0.932	0.848	0.772	0.702	0.639	0.582	0.529	0.482
Present value of cash flows [E*F]	(198)	138	202	246	161	158	158	169	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 7 months
Revenue	513	555	598	640	687	451
Less: Routine and Periodic maintenance	71	75	125	115	129	55
EBITDA [A]	443	480	473	524	559	397
EBITDA margin	86%	86%	79%	82%	81%	88%
Depreciation	(182)	(199)	(217)	(236)	(257)	(171)
EBIT	260	280	256	289	302	226
EBIT margin	51%	50%	43%	45%	44%	50%
Less: Tax on EBIT [B]	(74)	(84)	(82)	(95)	(103)	(77)
Change in working capital [C]	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	368	396	391	430	455	320
Discounting period	8.750	9.750	10.750	11.750	12.750	13.554
Discount factor [F]	0.438	0.399	0.363	0.330	0.301	0.279
Present value of cash flows [E*F]	161	158	142	142	137	89

Valuation conclusion	
INR Crore	
Present value of cash flows	2,030
Present value of release of working capital	(2)
Enterprise Valuation	2,028
WACC	9.88%

Present value of release in working capital represent negative working capital of INR 6 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.88%, the Enterprise Value of PDTPL, as on 31 December 2024 is INR 2,028 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
Project	Nehru Outer Ring Road, Hyderabad
Concessionaire	IGEPL
State	Telangana
Tollable length (kms)	158
No. of toll plazas	22
Concession agreement date	26-Mar-23
Appointed date	12-Aug-23
Completion certificate date	NA
Scheduled end date	11-Aug-53
New scheduled end date	NA

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust	99.99%
IRB Infrastructure Developers Ltd and its nominees	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 January 2025 to 11 August 2053.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the "Traffic Study for Hyderabad ORR" ("Traffic Study Report") prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 5 of the Traffic Study Report for Hyderabad ORR for detailed traffic volume analysis.

- 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 December 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. As given in the traffic report, WPI has been projected to grow by 5% and annual revision of fees will be by 3%. Please refer section 5.2 of the Hyderabad ORR Traffic Study Report base toll rate and toll rate estimates.

c. 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.

d. Fast tag charges

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

e. 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.

f. 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										
		FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores		3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue		209	898	1,015	1,148	1,245	1,377	1,517	1,693	1,858
Less: Routine and Periodic maintenance		32	168	224	233	403	411	420	430	277
Less: Fastag Expense		-	15.12	17.12	19.40	21.25	23.51	25.89	28.91	31.72
EBITDA	[A]	177	715	774	895	821	942	1,070	1,234	1,549
EBITDA margin		85%	80%	76%	78%	66%	68%	71%	73%	83%
Depreciation		(11)	(60)	(67)	(76)	(83)	(92)	(101)	(113)	(124)
EBIT		166	655	707	819	738	850	969	1,121	1,425
EBIT margin		79%	73%	70%	71%	59%	62%	64%	66%	77%
Less: Tax on EBIT	[B]	(12)	(113)	(128)	(158)	(139)	(170)	(202)	(243)	(323)
Change in working capital	[C]	-	-	126	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	165	602	773	737	681	772	868	991	1,226
Discounting period		0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor	[F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows	[E*F]	163	562	659	575	485	502	516	538	608

Source(s): Management information, KPMG analysis

Discounted Cash Flows [2/3]

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	12 months
Revenue	2,034	2,212	2,438	2,670	2,903	3,174	3,467	3,772	4,108	4,477
Less: Routine and Periodic maintenance	286	681	691	698	707	330	340	583	592	601
Less: Fastag Expense	34.73	37.77	41.63	45.58	49.56	54.19	59.19	64.40	70.14	76.43
EBITDA [A]	1,714	1,494	1,705	1,926	2,146	2,789	3,068	3,124	3,446	3,799
EBITDA margin	84%	68%	70%	72%	74%	88%	88%	83%	84%	85%
Depreciation	(136)	(148)	(163)	(179)	(195)	(212)	(232)	(253)	(275)	(301)
EBIT	1,577	1,345	1,542	1,747	1,951	2,577	2,835	2,871	3,170	3,498
EBIT margin	78%	61%	63%	65%	67%	81%	82%	76%	77%	78%
Less: Tax on EBIT [B]	(364)	(309)	(362)	(418)	(473)	(635)	(705)	(719)	(800)	(889)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	1,349	1,185	1,343	1,508	1,673	2,154	2,363	2,405	2,646	2,910
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.200
Present value of cash flows [E*F]	611	490	507	520	527	620	621	577	580	583

Source(s): Management information, KPMG analysis

Discounted Cash Flows [3/3]

Discounted Cash Flow											
	FY2044	FY2045	FY2046	FY2047	FY2048	FY2049	FY2050	FY2051	FY2052	FY2053	FY2054
INR crores	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	4 months
Revenue	4,882	5,275	5,723	6,227	6,785	7,322	7,905	8,567	9,302	10,050	3,972
Less: Routine and Periodic maintenance	612	384	392	932	943	950	959	437	447	859	319
Less: Fastag Expense	83.37	90.07	97.72	106.33	115.84	125.03	134.97	146.28	158.83	171.59	67.83
EBITDA [A]	4,188	4,801	5,233	5,189	5,725	6,248	6,811	7,984	8,696	9,019	3,585
EBITDA margin	86%	91%	91%	83%	84%	85%	86%	93%	93%	90%	90%
Depreciation	(327)	(354)	(383)	(417)	(455)	(491)	(530)	(574)	(623)	(674)	(266)
EBIT	3,860	4,448	4,850	4,771	5,271	5,757	6,281	7,410	8,073	8,345	3,319
EBIT margin	79%	84%	85%	77%	78%	79%	79%	86%	87%	83%	84%
Less: Tax on EBIT [B]	(987)	(1,141)	(1,250)	(1,239)	(1,374)	(1,505)	(1,647)	(1,942)	(2,121)	(2,203)	(878)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	3,201	3,660	3,983	3,950	4,352	4,742	5,164	6,042	6,575	6,816	2,707
Discounting period	18.750	19.750	20.750	21.750	22.750	23.750	24.750	25.750	26.750	27.750	28.432
Discount factor [F]	0.183	0.167	0.153	0.139	0.127	0.116	0.106	0.097	0.089	0.081	0.076
Present value of cash flows [E*F]	586	612	608	551	554	552	549	586	583	552	206

Valuation conclusion

INR Crores

Present value of cash flows	16,181
Present value of release of working capital	(3)
Enterprise Valuation	16,178

Present value of release in working capital represents negative working capital of INR 40 Cr released at the end of the concession period.

WACC	9.48%
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Basis the above and using a WACC of 9.48%, the Enterprise Value of IGEPL, as on 31 December 2024 is INR 16,178 crore.

Please refer annexure 2a for WACC breakup.

Source(s): Management information, KPMG analysis



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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 1.9 years.



Premium

STPL has agreed to pay to NHAI immediately after the 1st 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 2nd 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
Project location	Samakhiyali to Santalpur
Concessionaire	STPL
State	Gujarat
Tollable length (kms)	90.90
No. of toll plazas	1
Concession agreement date	12-May-23
Appointed date	28-Dec-23
Six laning completion certificate date	Under construction
Scheduled end date	27-Dec-43
New scheduled end date	6-Dec-45

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust	99.96%
IRB Infrastructure Developers Ltd and its nominees	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)	18%
1% increase for every 1% decrease beyond 5%	13%
Maximum increase in concession period	20%
Increase in concession period (years)	1.9
Revised concession period	21.9
Scheduled end date	27-Dec-43
New scheduled end date	6-Dec-45

- The Management has confirmed to us to consider revised concession period till 6th December 2045. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 January 2025 to 6 December 2045.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Santalpur-Samakhiali Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Santalpur-Samakhiali Section for detailed traffic volume analysis.

- 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. Please refer section 7.3 of the Santalpur-Samakhiali Section Traffic Study Report base toll rate and toll rate estimates.

c. Premium payable

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

d. 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.

e. 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.

f. 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.

g. Capex

- Capex has been forecasted to be INR 1,355 Cr between last quarter of FY2025 (INR 116 Cr) and FY2026 (INR 1,239 Cr) based on Management estimates. Management have provided statement of expenses/work in progress pertaining to capex as on 31 December 2024.

Source(s): Management information



Discounted Cash Flows [1/3]

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	40	157	257	168	183	201	221	243	266
Less: Routine and Periodic maintenance	1	12	24	25	25	26	27	64	65
EBITDA [A]	39	146	233	143	158	175	194	179	201
EBITDA margin	98%	93%	91%	85%	86%	87%	88%	74%	76%
Depreciation	(12)	(20)	(32)	(36)	(40)	(45)	(50)	(56)	(63)
EBIT	27	126	201	107	118	130	144	123	139
EBIT margin	68%	80%	78%	64%	64%	65%	65%	51%	52%
Less: Tax on EBIT [B]	(6)	(20)	(34)	(11)	(15)	(19)	(24)	(20)	(26)
Change in working capital [C]	-	(100)	-	101	(1)	-	-	-	-
Less : Capex [D]	(116)	(1,239)	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	(83)	(1,214)	199	233	142	156	170	159	175
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.988	0.932	0.848	0.772	0.702	0.639	0.582	0.529	0.482
Present value of cash flows [E*F]	(82)	(1,131)	169	180	100	100	99	84	84

Source(s): Management information, KPMG analysis

Discounted Cash Flows [2/3]

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	12 months
Revenue	290	313	339	365	395	428	463	498	538	581
Less: Routine and Periodic maintenance	66	29	30	31	31	32	76	77	79	34
EBITDA [A]	223	283	309	335	364	396	387	421	459	546
EBITDA margin	77%	91%	91%	92%	92%	93%	84%	85%	85%	94%
Depreciation	(70)	(77)	(85)	(93)	(103)	(114)	(126)	(139)	(154)	(170)
EBIT	154	206	224	241	261	282	261	282	306	377
EBIT margin	53%	66%	66%	66%	66%	66%	56%	57%	57%	65%
Less: Tax on EBIT [B]	(32)	(47)	(53)	(60)	(67)	(75)	(73)	(81)	(91)	(113)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	192	237	256	275	297	321	314	340	368	434
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750
Discount factor [F]	0.438	0.399	0.363	0.330	0.301	0.274	0.249	0.227	0.206	0.188
Present value of cash flows [E*F]	84	94	93	91	89	88	78	77	76	81

Source(s): Management information, KPMG analysis

Discounted Cash Flows [3/3]

Discounted Cash Flow				
		FY2044	FY2045	FY2046
INR crores		12 months	12 months	8 months
Revenue		630	694	500
Less: Routine and Periodic maintenance		35	36	25
EBITDA	[A]	594	658	475
EBITDA margin		94%	95%	95%
Depreciation		(188)	(207)	(197)
EBIT		406	451	277
EBIT margin		65%	65%	55%
Less: Tax on EBIT	[B]	(125)	(141)	(103)
Change in working capital	[C]	-	-	-
Less : Capex	[D]	-	-	-
Free cash flows to the firm	E = [A+B+C+D]	470	517	372
Discounting period		18.750	19.750	20.592
Discount factor	[F]	0.171	0.155	0.144
Present value of cash flows	[E*F]	80	80	53

Valuation conclusion	
INR Crores	
Present value of cash flows	669
Present value of release of working capital	0.16
Enterprise Valuation	669
WACC	9.88%

Present value of release in working capital represents positive working capital of INR 1.2 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.88%, the Enterprise Value of STPL, as on 31 December 2024 is INR 669 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
Project location	Gwalior-Jhansi stretch on NH75
Concessionaire	IGTPL
State	Madhya Pradesh and Uttar Pradesh
Tollable length (kms)	82.5
Concession agreement date	12-Jan-24
Appointed date	1-Apr-24
Completion certificate date	NA
Scheduled end date	31-Mar-44

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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 January 2025 to 31 March 2044.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Gwalior-Jhansi Section” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Gwalior-Jhansi Section for detailed traffic volume analysis.

- 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. Please refer section 7.3 of the Gwalior-Jhansi Section Traffic Study Report base toll rate and toll rate estimates.

c. 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.

d. 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.

e. 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.

f. Capex

- Capex is forecasted to be INR 14 Cr in the last quarter 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 on 31 December 2024.

Source(s): Management information



Discounted Cash Flows (1/2)

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	35	141	158	176	191	208	228	249	271
Less: Routine and Periodic maintenance	4	16	29	52	58	72	89	39	40
EBITDA [A]	31	126	129	124	134	137	139	210	231
EBITDA margin	89%	89%	82%	70%	70%	66%	61%	84%	85%
Depreciation	(6)	(26)	(29)	(32)	(35)	(39)	(42)	(46)	(50)
EBIT	25	100	100	92	99	98	97	164	181
EBIT margin	71%	71%	64%	52%	51%	47%	42%	66%	67%
Less: Tax on EBIT [B]	(4)	(16)	(17)	(15)	(18)	(19)	(19)	(37)	(42)
Change in working capital [C]	5	-	-	41	-	-	-	-	-
Less : Capex [D]	(14)	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	19	110	112	149	116	118	119	173	188
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	19	102	96	116	83	77	71	94	93

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	296	320	346	373	403	436	471	507	548	590	639
Less: Routine and Periodic maintenance	50	61	64	80	97	48	50	74	87	99	116
EBITDA [A]	246	259	282	293	306	388	422	433	460	491	523
EBITDA margin	83%	81%	82%	78%	76%	89%	89%	85%	84%	83%	82%
Depreciation	(55)	(59)	(64)	(69)	(75)	(81)	(87)	(94)	(101)	(109)	(118)
EBIT	191	200	218	224	232	307	335	339	359	382	405
EBIT margin	65%	62%	63%	60%	57%	70%	71%	67%	66%	65%	63%
Less: Tax on EBIT [B]	(46)	(49)	(55)	(58)	(61)	(82)	(90)	(93)	(100)	(108)	(116)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	199	210	227	235	245	306	331	340	360	383	407
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750	18.750
Discount factor [F]	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.200	0.183
Present value of cash flows [E*F]	90	87	86	81	77	88	87	82	79	77	74

Valuation conclusion*

INR Crores

Present value of cash flows	1,658
Present value of release of working capital	(0)
Enterprise Valuation	1,658

Present value of release in working capital represent negative working capital of INR 2.36 Cr released at the end of the concession period.

WACC	9.48%
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Basis the above and using a WACC of 9.48%, the Enterprise Value of IGTPPL on 31 December 2024 is INR 1,658 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
Project location	Lalitpur-Sagar-Lakhnadon stretch on NH26
Concessionaire	ILTPL
State	Uttar Pradesh and Madhya Pradesh
Tollable length (kms)	316.1
Concession agreement date	24-Nov-23
Appointed date	1-Apr-24
Completion certificate date	NA
Scheduled end date	31-Mar-44

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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 January 2025 to 31 March 2044.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Lalitpur” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Lalitpur for detailed traffic volume analysis.

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. Please refer section 7.3 of the Lalitpur Traffic Study Report base toll rate and toll rate estimates.

c. 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.

d. 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.

e. 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.

f. Capex

- Capex is forecasted to be INR 133 Cr in the last quarter 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 on 31 December 2024.

Source(s): Management information



Discounted Cash Flows (1/2)

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	117	482	535	593	639	699	764	838	914
Less: Routine and Periodic maintenance	16	67	70	73	142	148	153	159	165
EBITDA [A]	101	416	465	520	497	551	611	678	749
EBITDA margin	86%	86%	87%	88%	78%	79%	80%	81%	82%
Depreciation	(33)	(105)	(116)	(129)	(141)	(154)	(169)	(185)	(202)
EBIT	69	311	349	391	356	397	442	493	547
EBIT margin	58%	64%	65%	66%	56%	57%	58%	59%	60%
Less: Tax on EBIT [B]	(8)	(41)	(54)	(67)	(62)	(75)	(90)	(107)	(125)
Change in working capital [C]	37	-	-	156	-	-	-	-	-
Less : Capex [D]	(133)	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	(3)	374	412	609	436	476	521	571	624
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	(3)	350	351	475	310	309	309	310	309

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	1,001	1,082	1,173	1,266	1,370	1,484	1,604	1,723	1,858	2,003	2,166
Less: Routine and Periodic maintenance	90	93	213	219	226	233	240	111	113	301	305
EBITDA [A]	911	989	960	1,047	1,144	1,251	1,364	1,613	1,744	1,702	1,862
EBITDA margin	91%	91%	82%	83%	83%	84%	85%	94%	94%	85%	86%
Depreciation	(221)	(239)	(259)	(280)	(303)	(328)	(354)	(381)	(411)	(443)	(479)
EBIT	689	750	700	767	841	923	1,009	1,232	1,334	1,259	1,383
EBIT margin	69%	69%	60%	61%	61%	62%	63%	71%	72%	63%	64%
Less: Tax on EBIT	(166)	(186)	(178)	(200)	(225)	(251)	(280)	(342)	(376)	(365)	(405)
Change in working capital	[B]	[C]	[D]	[E]	[F]	[G]	[H]	[I]	[J]	[K]	[L]
Less : Capex	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	745	804	782	847	920	999	1,084	1,270	1,369	1,337	1,457
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.750	18.750
Discount factor	[F]	[G]	[H]	[I]	[J]	[K]	[L]	[M]	[N]	[O]	[P]
Present value of cash flows [E*F]	337	332	295	292	290	288	285	305	300	268	266

Valuation conclusion	
INR Crores	
Present value of cash flows	5,979
Present value of release of working capital	(3)
Enterprise Valuation	5,976
WACC	9.48%

Present value of release in working capital represent negative working capital of INR 18.73 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of ILTPL on 31 December 2024 is INR 1,658 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.

Probable reduction of concession period is estimated according to article 29 of concession agreement which comes to about 1.8 years.



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
Project location	Kota Bypass and Cable Stay Bridge
Concessionaire	IKTPL
State	Rajasthan
Tollable length (kms)	27.8
Concession agreement date	12-Jan-24
Appointed date	1-Apr-24
Completion certificate date	NA
Scheduled end date	31-Mar-44
New scheduled end date	3-June-42

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust and its nominees	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 higher than the caps mentioned above. Thus, there shall be modification to the concession period in line with the above articles of the concession agreement of 1.8 years.
- 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 January 2025 to 3 June 2042.

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Kota Bypass” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- While estimating traffic volume, consultant has considered factors such as the historical traffic data, GDP growth rate of India, developments along the project road and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Chapter 6 of the Traffic Study Report for Kota Bypass for detailed traffic volume analysis.

- 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. Please refer section 7.3 of the Kota Bypass Traffic Study Report base toll rate and toll rate estimates.

c. 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.

d. 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.

e. 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.

f. Capex

- Capex is forecasted to be INR 12 Cr in the last quarter 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 on 31 December 2024.

Source(s): Management information



Discounted Cash Flows (1/2)

Discounted Cash Flow									
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	23	89	100	111	122	132	145	158	172
Less: Routine and Periodic maintenance	5	21	22	23	32	33	25	26	27
EBITDA [A]	17	69	78	89	90	100	119	132	145
EBITDA margin	76%	77%	78%	80%	74%	75%	82%	83%	84%
Depreciation	(5)	(14)	(16)	(18)	(20)	(22)	(24)	(26)	(28)
EBIT	13	54	62	71	70	78	96	106	117
EBIT margin	56%	61%	62%	63%	58%	59%	66%	67%	68%
Less: Tax on EBIT [B]	(2)	(9)	(12)	(14)	(14)	(17)	(22)	(25)	(28)
Change in working capital [C]	5	-	-	22	-	-	-	-	-
Less : Capex [D]	(12)	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	8	60	67	97	76	83	98	107	117
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750
Discount factor [F]	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496
Present value of cash flows [E*F]	8	56	57	75	54	54	58	58	58

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 months
Revenue	188	203	220	238	258	279	301	324	350	67
Less: Routine and Periodic maintenance	47	48	30	31	32	44	45	35	36	17
EBITDA [A]	141	155	190	207	226	234	255	289	314	50
EBITDA margin	75%	76%	86%	87%	88%	84%	85%	89%	90%	75%
Depreciation	(31)	(33)	(36)	(39)	(42)	(45)	(49)	(53)	(57)	(11)
EBIT	110	122	154	168	184	189	206	236	257	39
EBIT margin	59%	60%	70%	71%	71%	68%	69%	73%	73%	58%
Less: Tax on EBIT	(27)	(31)	(40)	(44)	(49)	(51)	(56)	(65)	(71)	(4)
Change in working capital	-	-	-	-	-	-	-	-	-	-
Less : Capex	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	113	125	151	163	177	184	199	225	243	45
Discounting period	8.750	9.750	10.750	11.750	12.750	13.750	14.750	15.750	16.750	17.338
Discount factor	0.453	0.413	0.378	0.345	0.315	0.288	0.263	0.240	0.219	0.208
Present value of cash flows [E*F]	51	51	57	56	56	53	52	54	53	9

Valuation conclusion

INR Crores

Present value of cash flows	971
Present value of release of working capital	(0)
Enterprise Valuation	971

WACC	9.48%
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Present value of release in working capital represent negative working capital of INR 2.19 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.48%, the Enterprise Value of IKTPL on 31 December 2024 is **INR 971 crore.**

Please refer annexure 2a for WACC breakup.

Source(s): Management information, KPMG analysis



Meerut Budaun Expressway Limited

Overview



Project details

MBEL has entered into concession agreement with UPEIDA for development, maintenance and management of Ganga expressway for section from km 7.9 to km 137.6 (Meerut - Budaun section) on the NH334 on a DBFOT basis. The project stretch is 129.7 kms, 6 lane road stretching between Meerut and Budaun.

The project is currently under construction and tolling is expected to commence from October 2025.



Concession period

The term of the concession agreement is for a period of 30 years commencing from the appointed date.

Probable extension of concession period is estimated according to article 29 of concession agreement which comes to about 6 years.



Project Cost and Grant

Total project cost is appraised to be INR 6,538 cr. As per concession agreement MBEL will receive a grant of INR 1,746 crore from UPEIDA as equity support for towards construction cost. The Grant due to be received till 31 December 2024 is INR 721.7 crore.

Remaining project cost of INR 4,792 cr is proposed to be financed in 55:45 ratio of debt and equity. 100 per cent equity contribution in project cost amounting to INR 2,133 cr has already infused by shareholders in form of equity shares and NCDs.

Source(s): Management information, financial statements of Target



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Highlights

Particulars	Details
Project location	Meerut-Budaun stretch on NH334
Concessionaire	MBEL
State	Uttar Pradesh
Tollable length (kms)	129.7
Concession agreement date	06-Jan-2022
Appointed date	12-Oct-2022
Estimate completion date	10-Oct-2025
Concession Period	30 years from Appointed Date
Scheduled Concession end date	10-Oct-52
Expected Concession end date	10-Oct-2058

Shareholding as on 31 December 2024

Particulars	Stake %
IRB Infrastructure Trust	80.4%
IRB Infrastructure Developers Limited	10%
Anahera Investment Pte Ltd	9.6%

Key Assumptions

a. Modification in concession period

- As per Clause 29.2 of the concession agreement between UPEIDA and MBEL, “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 concession period shall, subject to payment of concession fee and additional concession fees 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”.
- Forecast traffic is estimated to be lower than target traffic by more than 20 per cent in all target traffic dates. Hence, Management has considered maximum possible extension in the concession period, 6 years and revised concession period till 10 October 2058 in the forecast. Thus, the explicit period for the current valuation analysis exercise has been considered from 1 January 2025 to 10 October 2058.
- Calculation of 20 per cent extension in the concession period as per the above explanation as follows:

Particulars						
Target Traffic year	2025-26	2030-31	2035-36	2040-41	2045-46	2050-51
Weighted Average daily traffic forecast	5,649	8,042	10,998	14,654	18,267	22,420
Target average daily traffic	25,719	40,759	61,199	87,256	1,18,274	1,48,644
Revised target traffic		32,607	48,959	69,805	94,619	1,18,915
Percent difference from target traffic	(78%)	(60%)	(78%)	(79%)	(81%)	(81%)
Percent difference exceeding 5%	(73%)	(55%)	(73%)	(74%)	(76%)	(76%)
Percent difference exceeding 5% Upto 20%	(20%)	(20%)	(20%)	(20%)	(20%)	(20%)

Source: Traffic Study Report

b. Revenue

- Toll revenue has been considered basis the pessimistic scenario presented in the “Traffic Study for Ganga Expressway” (“Traffic Study Report”) prepared by an independent consultant appointed by the Management.
- Traffic volume for the forecast period has been considered based on traffic report prepared by independent consultant in December 2024, which considers the GDP growth rate of India (as per OECD forecast and National Rail plan) and elasticity value of different vehicle type for computing the traffic growth rate. Please refer Section 4 of the Traffic Study Report for Ganga Expressway for detailed traffic volume analysis.

Source(s): Management information



- Annual revision of toll rate for the forecast period shall be in accordance with The Uttar Pradesh Expressway (Levy of Tolls and fixing of Fees and Realization Thereof) (Fourth Amendment) Rules, 2017 and amendment thereto. As per the said rules, 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 4%. Please refer section 5.2 of the Traffic Study Report base toll rate and toll rate estimates.

c. Periodic maintenance & routine maintenance costs

- Periodic and routine maintenance is based on the agreement with IRB Infrastructure Developers Limited till FY 2032. For the forecast period post FY 32 the periodic and routine maintenance cost have been considered based on the technical assessment done by the management and forecast submitted to the lenders.

d. Depreciation & amortization

- Management has forecast project cost net of grant to be depreciated in proportion to forecast revenue.

e. Tax

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

f. Capex

- MBEL has entered into fixed price EPC contract for construction of the expressway with the sponsor. EPC cost for the project is agreed at INR 5,912 Cr excluding GST. As at Valuation Date INR 1,193 cr of project cost including EPC Cost, contingencies and pre operative expenses (excluding interest during construction) are pending to be incurred of which INR 896.63 cr is to funded from grant to be received from UPEIDA. Balance capex of INR 299 cr is forecast to be incurred between Valuation Date to construction completion date which is expected to be 10 October 2025.

Discounted Cash Flows (1/3)

Discounted Cash Flow												
	FY2025	FY2026	FY2027	FY2028	FY2029	FY2030	FY2031	FY2032	FY2033	FY2034	FY2035	FY2036
INR crores	3 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months	12 months
Revenue	-	140	331	361	391	426	465	509	548	594	644	699
Less: Routine and Periodic maintenance	-	16	72	76	78	81	169	176	181	93	96	100
Less: Fastag Expense	-	0	1	1	1	1	2	2	2	2	2	2.32
EBITDA [A]	-	123	257	285	312	344	295	332	365	498	546	597
EBITDA margin	-	88%	78%	79%	80%	81%	63%	65%	67%	84%	85%	85%
Depreciation	-	(15)	(35)	(38)	(42)	(45)	(50)	(54)	(59)	(64)	(69)	(75)
EBIT	-	108	222	246	270	298	245	277	307	435	477	522
EBIT margin	-	77%	67%	68%	69%	70%	53%	54%	56%	73%	74%	75%
Less: Tax on EBIT [B]	-	(15)	(30)	(37)	(44)	(52)	(40)	(49)	(58)	(91)	(103)	(116)
Change in working capital [C]	-	(79)	-	-	-	-	-	-	-	-	-	-
Less : Capex [D]	(35)	(264)	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	(35)	(235)	227	248	268	292	255	283	308	407	443	481
Discounting period	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750	8.750	9.750	10.750
Discount factor [F]	0.99	0.932	0.848	0.772	0.702	0.639	0.582	0.529	0.482	0.438	0.399	0.363
Present value of cash flows [E*F]	(35)	(219)	193	191	188	186	148	150	148	179	177	175

Source(s): Management information, KPMG analysis

Discounted Cash Flows (2/3)

Discounted Cash Flow												
INR crores	FY2037 12 months	FY2038 12 months	FY2039 12 months	FY2040 12 months	FY2041 12 months	FY2042 12 months	FY2043 12 months	FY2044 12 months	FY2045 12 months	FY2046 12 months	FY2047 12 months	FY2048 12 months
Revenue	756	815	882	954	1,023	1,098	1,172	1,256	1,340	1,434	1,535	1,637
Less: Routine and Periodic maintenance	102	105	217	224	229	117	120	124	126	129	265	273
Less: Fastag Expense	3	3	3	3	3	4	4	4	4	5	5	5.49
EBITDA [A]	652	707	662	727	790	977	1,048	1,128	1,209	1,300	1,264	1,359
EBITDA margin	86%	87%	75%	76%	77%	89%	89%	90%	90%	91%	82%	83%
Depreciation	(81)	(88)	(95)	(103)	(110)	(118)	(126)	(135)	(145)	(155)	(166)	(177)
EBIT	570	619	567	624	680	859	921	992	1,065	1,145	1,099	1,181
EBIT margin	75%	76%	64%	65%	66%	78%	79%	79%	79%	80%	72%	72%
Less: Tax on EBIT [B]	(130)	(143)	(132)	(148)	(164)	(211)	(229)	(249)	(270)	(293)	(284)	(307)
Change in working capital [C]	-	-	-	-	-	-	-	-	-	-	130	-
Less : Capex [D]	-	-	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	522	563	530	579	626	766	819	878	939	1,007	1,110	1,051
Discounting period	11.750	12.750	13.750	14.750	15.750	16.750	17.750	18.750	19.750	20.750	21.750	22.750
Discount factor [F]	0.330	0.301	0.274	0.249	0.227	0.206	0.188	0.171	0.155	0.142	0.129	0.117
Present value of cash flows [E*F]	173	169	145	144	142	158	154	150	146	143	143	123

Source(s): Management information, KPMG analysis

Valuation of Individual SPVs — Meerut Budaun Expressway Limited

Discounted Cash Flows (3/3)

Discounted Cash Flow											
INR crores	FY2049 12 months	FY2050 12 months	FY2051 12 months	FY2052 12 months	FY2053 12 months	FY2054 12 months	FY2055 12 months	FY2056 12 months	FY2057 12 months	FY2058 12 months	FY2059 6 months
Revenue	1,746	1,864	1,995	2,136	2,270	2,427	2,588	2,772	2,951	3,160	1,783
Less: Routine and Periodic maintenance	277	141	144	148	155	163	368	382	394	198	110
Less: Fastag Expense	6	6	7	7	8	8	9	9	10	11	5.98
EBITDA [A]	1,462	1,716	1,844	1,980	2,108	2,256	2,212	2,381	2,547	2,952	1,668
EBITDA margin	84%	92%	92%	93%	93%	93%	85%	86%	86%	93%	94%
Depreciation	(189)	(202)	(216)	(231)	(246)	(263)	(280)	(300)	(320)	(342)	(188)
EBIT	1,273	1,514	1,628	1,749	1,862	1,993	1,931	2,080	2,228	2,609	1,479
EBIT margin	73%	81%	82%	82%	82%	82%	75%	75%	75%	83%	83%
Less: Tax on EBIT	(334)	(397)	(430)	(464)	(496)	(533)	(522)	(565)	(607)	(708)	(402)
Change in working capital	[C]	-	-	-	-	-	-	-	-	-	-
Less : Capex	[D]	-	-	-	-	-	-	-	-	-	-
Free cash flows to the firm E = [A+B+C+D]	1,129	1,319	1,415	1,516	1,612	1,723	1,690	1,816	1,941	2,243	1,266
Discounting period	23.750	24.750	25.750	26.750	27.750	28.750	29.750	30.750	31.750	32.750	33.514
Discount factor	[F]	0.107	0.097	0.088	0.080	0.073	0.067	0.061	0.055	0.050	0.042
Present value of cash flows [E*F]	120	128	125	122	118	115	102	100	97	102	54

Valuation conclusion	
INR Crore	
Present value of cash flows	4,454
Present value of release of working capital	(0)
Enterprise Valuation	4,454
WACC	9.88%

Present value of release in working capital represent negative working capital of INR 11 Cr released at the end of the concession period.

Basis the above and using a WACC of 9.88%, the Enterprise Value of MBEL on 31 December 2024 is **INR 4,454 crore.**

Please refer annexure 2c for WACC breakup.

Source(s): Management information, KPMG analysis



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6.

Valuation Conclusion

Valuation Conclusion (1/2)

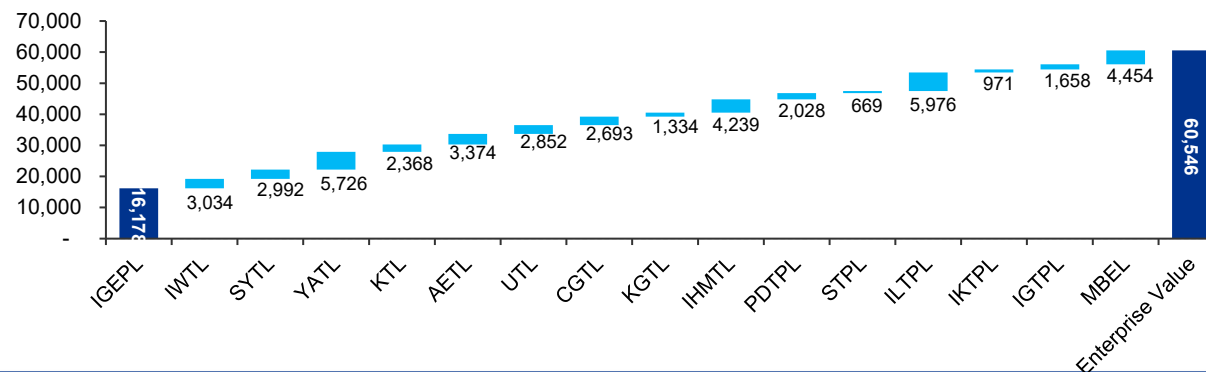
Valuation Conclusion (INR Crs)

Valuation Conclusion 31 December 2024	INR Crore
IRB Golconda Expressway Private Limited	16,178
IRB Westcoast Tollway Limited	3,034
Solapur Yedeshi Tollway Limited	2,992
Yedeshi Aurangabad Tollway Limited	5,726
Kaithal Tollway Limited	2,368
AE Tollway Limited	3,374
Udaipur Tollway Limited	2,852
CG Tollway Limited	2,693
Kishangarh Gulabpura Tollway Limited	1,334
IRB Hapur Moradabad Tollway Limited	4,239
Palsit Dankuni Tollway Private Limited	2,028
Samakhiali Tollway Private Limited	669
Lalitpur Tollway Private Limited	5,976
IRB Kota Tollway Private Limited	971
IRB Gwalior Tollway Private Limited	1,658
Meerut Budaun Expressway Limited	4,454
Enterprise Value of the SPVs	60,546
Cash and cash equivalents	173
Surplus	297
Debt	(24,591)
PV of standalone expenses pertaining to IRBI Trust	(236)
Capital Creditors	(624)
Non-controlling interest	(458)
Equity value of IRBI Trust	35,108
NAV at fair value per unit as on 31 December 2024	
Equity Value of IRBI Trust (INR Cr)	35,108
Units outstanding (No.)	1,172,093,265
NAV at fair value per unit (INR)	299.53

Source(s): Management information, KPMG analysis

Enterprise Value of SPVs

INR Crore



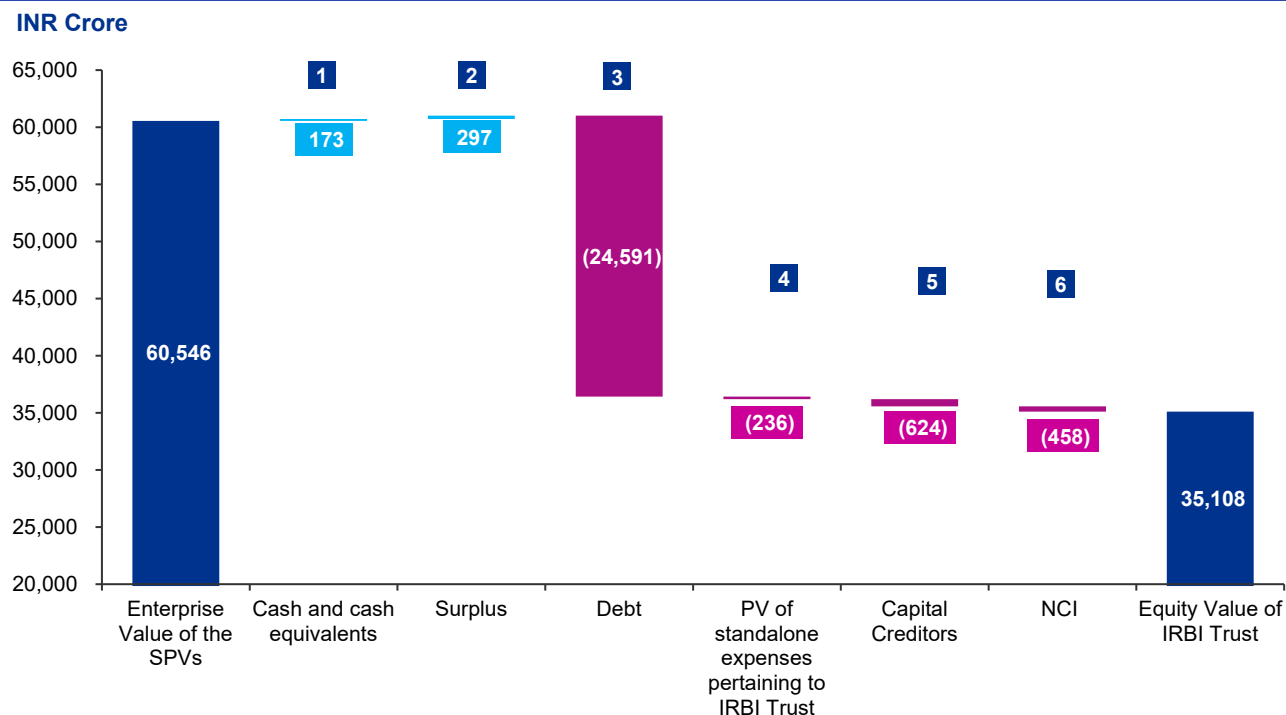
The Enterprise Value of the SPVs is INR 60,546 crores and the 100% Equity Value of the IRBI Trust is INR 35,108 crores as on 31 December 2024.

The NAV at fair value per unit of IRBI Trust as on 31 December 2024 is INR 299.53 per unit.

Note: SPVs are individually referred as “Target”, “Business”, “Company”, “SPV” or the “Asset” Collectively referred as SPVs or Assets
 IRBI Trust has raised INR 1,714.9 cr in December 2024 through issue of 58.4 million units in right issue. Therefore, number of units outstanding have increased from 1113.7m to 1172.1m.
 Equity Value of IRBI Trust has increased from INR 32,822 cr as on 30 September 2024 to INR 35,108 cr on 31 December 2024, primarily due to funds raise by right issue to finance acquisition of Meerut Budaun Expressway Limited.

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 60,546 crores and the 100% Equity Value of the IRBI Trust is INR 35,108 crores as on 31 December 2024.

The NAV at fair value per unit of IRBI Trust as on 31 December 2024 is INR 299.53 per unit.

Source(s): Management information, KPMG analysis

- 1 Cash and cash equivalents comprise cash in hand and balance with banks as on 31 December 2024.
- 2 Surplus assets primarily comprise investment in mutual funds of INR 274 Cr, accrued interest of INR 8cr, receivable towards mutual fund redemption of INR 2cr and advance tax net of provisions of INR 13 Cr as on 31 December 2024.
- 3 Debt primarily represents loan from banks and financial institutions, non-convertible debentures and bridge finance from Sponsors in MBEL of INR 24,878 Cr as on 31 December 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 288 Cr as on 31 December 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 624 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.
- 6 The Non-controlling interest ("NCI") represents value of minority investors in in PDTPL, STPL, IGEPL and MBEL. Refer Annexure 4a for detailed calculation.

7.

Annexures

Annexure 1: Sources of Information and Other Key Assumptions (1/3)

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, IGTPL, IKTPL and MBEL.
- Audited financial statements for all SPVs FY2024 except ILTPL, IGTPL, IKTPL and MBEL.
- Consolidated audited financial statements for FY2020, FY2021, FY2022, FY2023 and FY2024 of IRBI Trust.
- Provisional financial statements for 31 December 2024 for all the SPVs and IRBI Trust (standalone and consolidated).
- Financial projections of SPV's from 1 January 2025 till the end of the concession period of the respective SPV's and investment management expenses
- Other data for all the SPVs which is as follows –
 - Concession Agreements
 - Completion Certificates and PCC certificate
 - Traffic Reports prepared by T&T Consultants for MBEL and by GMD consultants for other SPVs
 - Toll Rate Notifications
 - Extract of O&M agreement with IRBIDL
- Since PDTPL, STPL and MBEL are still under construction, the Management has provided statement of expenses/work in progress pertaining to capex as on 31 December 2024.
- Management has provided project cost completion certificate for ILTPL, IGTPL, MBEL and IKTPL as on 31 December 2024.
- List of approvals, permits, licenses and litigations for the SPVs as on 31 December 2024.
- Management has provided Traffic consultant reports prepared by T&T Consultants (appointed independently by IRBI Trust) dated December 2024 for MBEL and by GMD Consultants for all other SPVs dated January 2025. 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.
- GMD Consultants in their traffic assessment have considered additional growth in traffic volume for FY2026-FY2028 considering recovery in project tendering and award process for major infrastructure process which was impacted due to general elections and state elections. Given technical nature of forecasting traffic volume and its correlation with economic recovery, review of this assumption is not part of our scope.

Annexure 1: Sources of Information and Other Key Assumptions (2/3)

- 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 IKTPL and till FY2030 for other SPVs other than MBEL) 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 assessment of 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.
- Management has informed us that routine and periodic maintenance for MBEL has been considered from a technical feasibility study performed by the Management. Given the technical nature of this study, review of the same is not part of our scope of work. Hence, We have considered the routine and periodic maintenance based on Management representation
- 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 0.7 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 13th May 2020 and Notification no. Covid-19/Roadmap/JS(H)/2020 dated 26th 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.

Annexure 1: Sources of Information and Other Key Assumptions (3/3)

- We noted that other financial liabilities of INR 4,203 Cr and sub-debt of INR 1.692 cr is outstanding in the consolidated financials of IRBI Trust is payable to IRBIDL as on 31 December 2024, which has 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 624 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

Risk free rate (Rf) 6.8%	<ul style="list-style-type: none"> 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.
Equity risk premium 7.0%	<ul style="list-style-type: none"> Equity risk premium is estimated based on KPMG's understanding of prevailing market return in India. We have considered historical long term equity market return in India and considering the risk-free rate of 6.8 per cent, the resulting ERP is estimated ~7.0 per cent.
Relevered beta 0.97	<ul style="list-style-type: none"> Beta is a measure of the risk of the shares of a company. β 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. We have considered companies involved in the road operating industry and infrastructure investment trusts. 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.
Cost of equity 13.6%	<ul style="list-style-type: none"> Based on above parameters cost of equity is 13.6%.
Post Tax Cost of Debt (Kd) 6.7 per cent	<ul style="list-style-type: none"> According to Management, average cost of the debt for SPVs has been estimated to be 9%. Based on a Pre-tax cost of debt of c.9 per cent and tax rate of c. 25.17 per cent, post-tax cost of debt is arrived at by multiplying pre-tax cost of debt by (1-Tax Rate).
WACC 9.5 per cent	<ul style="list-style-type: none"> Based on discussion with Management, we understand that above mentioned SPVs 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. Therefore, we have considered a target capital structure of 60% Debt and 40% Equity. Considering the above cost of equity of 13.6 per cent, the post-tax cost of debt of 6.7 per cent and the debt-to-equity ratio of 150%, the estimated weighted average cost of capital (WACC) is 9.5 per cent.

Source: KPMG analysis

Annexure 2b: WACC – SYTL and YATL

Risk free rate (Rf) 6.8%	<ul style="list-style-type: none"> 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.
Equity risk premium 7.0%	<ul style="list-style-type: none"> Equity risk premium is estimated based on KPMG's understanding of prevailing market return in India. We have considered historical long term equity market return in India and considering the risk-free rate of 6.8 per cent, the resulting ERP is estimated ~7.0 per cent.
Relevered beta 0.97	<ul style="list-style-type: none"> Beta is a measure of the risk of the shares of a company. β 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. We have considered companies involved in the road operating industry and infrastructure investment trusts. 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.
Cost of equity 13.6%	<ul style="list-style-type: none"> Based on above parameters cost of equity is 13.6%.
Post Tax Cost of Debt (Kd) 6.4 per cent	<ul style="list-style-type: none"> According to Management, the average cost of debt of STPL and YATL is 8.6%. Based on a pre-tax cost of debt of c.8.6 per cent and tax rate of c. 25.17 per cent, post-tax cost of debt is arrived at 6.4 per cent by multiplying pre-tax cost of debt by (1-Tax Rate).
WACC 9.3 per cent	<ul style="list-style-type: none"> Based on discussion with the Management we understand that all SYTL and YATL are operational and thus IRBI Trust can infuse higher leverage in their capital structure in the long term. Therefore, we have considered a target capital structure of 60% debt and 40% equity. Considering the above cost of equity of 13.6 per cent, the post-tax cost of debt of 6.4 per cent and the debt-to-equity ratio of 150%, the estimated weighted average cost of capital (WACC) is 9.3 per cent.

Source: KPMG analysis

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

<p>Risk free rate (Rf) 6.8%</p>	<ul style="list-style-type: none"> 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.
<p>Equity risk premium 7.0%</p>	<ul style="list-style-type: none"> Equity risk premium is estimated based on KPMG's understanding of prevailing market return in India. We have considered historical long term equity market return in India and considering the risk-free rate of 6.8 per cent, the resulting ERP is estimated ~7.0 per cent.
<p>Relevered beta 0.97</p>	<ul style="list-style-type: none"> Beta is a measure of the risk of the shares of a company. β 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. We have considered companies involved in the road operating industry and infrastructure investment trusts. 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.
<p>Alpha 1%</p>	<ul style="list-style-type: none"> Alpha is a 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 the operations and uncertainty related to expected growth in revenue. Alpha has been considered as 1 per cent for PDTPL, STPL and MBEL SPVs because as on the Valuation Date projects under the said SPVs is under construction.

Source: KPMG analysis



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

Cost of equity 14.6%	<ul style="list-style-type: none">Based on above parameters cost of equity is 14.6%.
Post Tax Cost of Debt (Kd) 6.7 per cent	<ul style="list-style-type: none">According to Management, average cost of the debt for SPVs has been estimated to be 9%. Based on a Pre-tax cost of debt of c.9 per cent and tax rate of c. 25.17 per cent, post-tax cost of debt is arrived at by multiplying pre-tax cost of debt by (1-Tax Rate).
WACC 9.8 per cent	<ul style="list-style-type: none">Based on discussion with the Management we understand that once the SPVs are operational and thus IRBI Trust can infuse higher leverage in their capital structure in the long term. Therefore, we have considered a target capital structure of 60% debt and 40% equity.Considering the above cost of equity of 14.6 per cent, the post-tax cost of debt of 6.7 per cent and the debt-to-equity ratio of 150%, the estimated weighted average cost of capital (WACC) is 9.9 per cent.

Source: KPMG analysis



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Annexure 3: Beta Computation

Beta computation 31 December 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	331,393	188,362	56.8%	36.2%	1.53	25.17%	1.07	150.0%	25.17%	2.27
PNC Infratech Limited	89,649	87,798	97.9%	49.5%	1.19	25.17%	0.69	150.0%	25.17%	1.46
Dilip Buildcon Limited	70,618	90,380	128.0%	56.1%	1.34	25.17%	0.68	150.0%	25.17%	1.45
Bharat Road Network Limited	3,902	13,095	335.6%	77.0%	0.76	25.17%	0.22	150.0%	25.17%	0.46
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
Indus Infra Trust	50,320	11,376	22.6%	18.4%	0.42	25.17%	0.36	150.0%	25.17%	0.76
India Grid Trust	120,580	193,822	160.7%	61.6%	0.45	25.17%	0.20	150.0%	25.17%	0.44
Powergrid Infrastructure Investment Trust	79,907	5,692	7.1%	6.7%	0.48	25.17%	0.46	150.0%	25.17%	0.97
IRB InvIT Fund	35,159	31,782	90.4%	47.5%	0.44	25.17%	0.26	150.0%	25.17%	0.56
G R Infraprojects Limited	155,017	43,012	27.7%	21.7%	0.96	25.17%	0.80	150.0%	25.17%	1.69
Median										0.97

Note:

- (a) Market capitalization of comparable companies has been considered based on 3-month volume weighted average share prices till 31 December 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 4a: Non-Controlling Interest (NCI)

Calculation of Non-Controlling Interest

INR Crores	PDTPL	STPL	IGEPL	MBEL
Enterprise Value of the SPV	2,028	669	16,178	4,454
Add: Cash and cash equivalents	1	0	3	149
Add: Surplus Assets	14	11	44	4
Less: Debt & debt like items	(1,297)	(175)	(5,710)	(2,022)
Less: Sub debt	-	-	(2,147)	-
Less: Capital creditors	(130)	(195)	0	(254)
Equity Value of the SPV	617	310	8,369	2,331
Stake held by IRBI Trust (%)	99.96%	99.96%	99.99%	80.40%
Stake held by Minority Shareholders (%)	0.04%	0.04%	0.01%	19.60%
Non-Controlling Interest	0.3	0.1	0.6	456.9

Basis the above the Value of Non-Controlling Interest is INR 458 Crore

Source(s): Management information, KPMG analysis

Annexure 4b: 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	3 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	0.125	0.750	1.750	2.750	3.750	4.750	5.750	6.750	7.750	8.750	9.750	10.750
Discount factor	0.989	0.934	0.853	0.779	0.712	0.650	0.594	0.543	0.496	0.453	0.413	0.378
Present value of cash flows	3.7	7.7	7.7	7.7	7.8	7.8	7.8	7.9	7.9	8.0	8.0	8.0

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	11.750	12.750	13.750	14.750	15.750	16.750	17.750	18.750	19.750	20.750	21.750	22.750	23.750
Discount factor	0.345	0.315	0.288	0.263	0.240	0.219	0.200	0.183	0.167	0.153	0.139	0.127	0.116
Present value of cash flows	8.1	8.1	8.1	8.2	8.2	8.3	8.3	8.3	8.4	8.4	8.5	8.5	8.5

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	24.750	25.750	26.750	27.750	28.432
Discount factor	0.106	0.097	0.089	0.081	0.076
Present value of cash flows	8.6	8.6	8.7	8.7	3.3

Valuation conclusion	
INR Crore	
Present value of cash flows	236
WACC	9.48%

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 on 31 December 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, MBEL 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 16 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 16 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/December 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	Sep-23	Dec-23/ Jan-24	Mar-24	Sep-24
IRB Westcoast Tollway Limited	3,741	3,392	3,435	3,255
Solapur Yedeshi Tollway Limited	2,403	2,652	2,610	2,884
Yedeshi Aurangabad Tollway Limited	4,216	4,411	4,396	5,289
Kaithal Tollway Limited	2,506	2,366	2,373	2,354
AE Tollway Limited	3,259	3,509	3,552	3,441
Udaipur Tollway Limited	2,673	2,663	2,647	2,650
CG Tollway Limited	2,803	2,854	2,827	2,750
Kishangarh Gulabpura Tollway Limited	2,206	2,068	2,053	1,623
IRB Hapur Moradabad Tollway Limited	4,176	4,303	4,318	4,400
Palsit Dankuni Tollway Private Limited	1,576	1,662	1,795	2,003
IRB Golconda Expressway Private Limited	12,682	14,025	14,428	15,803
Samakhiyali Tollway Private Limited	NA	365	497	715
Lalitpur Tollway Private Limited**	NA	222	4,988	5,874
IRB Kota Tollway Private Limited**	NA	149	719	926
IRB Gwalior Tollway Private Limited**	NA	90	1,342	1,537
Meerut Budadun Expressway Limited	NA	NA	NA	3,955

Note: Enterprise Valuation of SPVs has been presented in the above table

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
IRB Westcoast Tollway Limited		
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
Palsit Dankuni Private Tollway Limited		
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
Samakhiyali Tollway Private Limited		
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
IRB Gwalior Tollway Private Limited		
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
IRB Lalitpur Tollway Private Limited		
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
IRB Kota Tollway Private Limited		
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
IRB Lalitpur Tollway Private Limited		
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
Meerut Budaun Expressway Limited		
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	Received

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	FY 2031	FY 2032
IRB Westcoast Tollway Limited	40	-	42	-	1	-	111	41	-	-
Solapur Yedeshi Tollway Limited	-	-	18	19	20	-	-	-	-	-
Yedeshi Aurangabad Tollway Limited	-	-	29	31	32	-	-	-	-	-
Kaithal Tollway Kimited	-	-	45	48	-	-	-	-	-	128
AE Tollway Limited	-	-	39	41	-	-	-	-	123	130
Udaipur Tollway Limited	-	-	69	76	4	-	120	125	127	5
CG Tollway Limited	-	-	27	28	30	-	-	-	86	91
Kishangarh Gulabpura Tollway Limited	-	-	-	-	100	-	-	-	-	-
IRB Hapur Moradabad Tollway Limited	-	-	-	89	90	85	-	5	74	77
Palsit Dankuni Private Tollway Limited	-	-	-	-	-	-	55	61	57	-
IRB Golconda Expressway Private Limited	-	-	-	-	-	-	161	161	161	161
Samakhiyali Tollway Private Limited	-	-	-	-	0	-	-	-	-	36
IRB Lalitpur Tollway Private Limited	-	-	-	-	-	-	66	69	72	75
IRB Kota Tollway Private Limited	-	-	-	-	-	-	8	8	-	-
IRB Gwalior Tollway Private Limited	-	-	-	-	11	22	23	36	52	-
Meerut Budaun Expressway Limited	-	-	-	0	-	-	-	-	85	88

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 2033	FY 2034	FY 2035	FY 2036	FY 2037	FY 2038	FY 2039	FY 2040	FY 2041
IRB Westcoast Tollway Limited	2	12	166	2	-	-	148	53	-
Solapur Yedeshi Tollway Limited	61	64	67	-	-	-	-	-	-
Yedeshi Aurangabad Tollway Limited	110	115	121	-	-	-	-	60	63
Kaithal Tollway Kimited	134	140	-	-	-	-	-	94	99
AE Tollway Limited	135	-	-	-	-	73	77	81	-
Udaipur Tollway Limited	-	86	91	119	-	-	-	-	-
CG Tollway Limited	95	-	9	46	48	51	-	-	-
Kishangarh Gulabpura Tollway Limited	104	102	110	-	-	-	-	-	-
IRB Hapur Moradabad Tollway Limited	57	2	-	212	229	238	7	-	-
Palsit Dankuni Private Tollway Limited	-	-	-	80	71	80	-	-	-
IRB Golconda Expressway Private Limited	-	-	386	387	386	386	-	-	235
Samakhiyali Tollway Private Limited	37	38	-	-	-	-	-	43	44
IRB Lalitpur Tollway Private Limited	78	-	-	117	121	124	128	132	-
IRB Kota Tollway Private Limited	-	19	19	-	-	-	11	12	-
IRB Gwalior Tollway Private Limited	-	11	21	22	35	50	-	-	26
Meerut Budaun Expressway Limited	91	-	-	-	-	-	109	112	115

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 2042	FY 2043	FY 2044	FY 2045	FY 2046	FY 2047	FY 2048	FY 2049	FY 2050
IRB Westcoast Tollway Limited	-	-	-	-	-	-	-	-	-
Solapur Yedeshi Tollway Limited	42	44	46	-	-	-	-	-	-
Yedeshi Aurangabad Tollway Limited	66	-	-	-	-	-	-	-	-
Kaithal Tollway Limited	104	-	-	-	-	-	-	-	-
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	235	235	236	-	-	531	532	531	531
Samakhiyali Tollway Private Limited	45	-	-	-	-	-	-	-	-
IRB Lalitpur Tollway Private Limited	-	185	185	-	-	-	-	-	-
IRB Kota Tollway Private Limited	-	-	23	-	-	-	-	-	-
IRB Gwalior Tollway Private Limited	38	49	61	-	-	-	-	-	-
Meerut Budaun Expressway Limited	-	-	-	-	-	133	137	139	-

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 2051	FY 2052	FY 2053	FY 2054	FY 2055	FY 2056	FY 2057	FY 2058	FY 2059
IRB Westcoast Tollway Limited	-	-	-	-	-	-	-	-	-
Solapur Yedeshi Tollway Limited	-	-	-	-	-	-	-	-	-
Yedeshi Aurangabad Tollway Limited	-	-	-	-	-	-	-	-	-
Kaithal Tollway Kimited	-	-	-	-	-	-	-	-	-
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	-	-	404	150	-	-	-	-	-
Samakhiyali Tollway Private Limited	-	-	-	-	-	-	-	-	-
IRB Lalitpur Tollway Private Limited	-	-	-	-	-	-	-	-	-
IRB Kota Tollway Private Limited	-	-	-	-	-	-	-	-	-
IRB Gwalior Tollway Private Limited	-	-	-	-	-	-	-	-	-
Meerut Budaun Expressway Limited	-	-	-	-	197	202	206	-	-

Source(s): Management information

Annexure 5d (1/2) : 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 Limited	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. Aforesaid transaction is a related party transaction

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 5d (2/2) : Purchase price of the SPVs by the InvIT

Meerut Budaun Expressway Limited

IRBI Trust issued and allotted 58,400,000 units to the eligible unitholders of the Trust for cash aggregating to approximately INR 1,714.92 Cr. Proceeds from the issue were used for acquisition of 80.4 per cent of the equity share capital and debentures of MBEL for an aggregate purchase consideration of INR 1714.92 Cr. The transaction was a related party transaction.

Source(s): Management information



Annexure 5e: Pending litigations – IWTL (1/4)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 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 & seashore.	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.

Source(s): Management information

Annexure 5e: Pending litigations – IWTl (2/4)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 2024	Financial implications
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.
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 relating to the project These matters were referred to Arbitration.	Section 17 order pronounced in favour of the Claimants. Next hearing date is yet to be pronounced.	Rs 3107.07 Cr + 1316.37 Days (under CI 35.3)

Source(s): Management information

Annexure 5e: Pending litigations – IWTL (3/4)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 2024	Financial implications
6	Modern Road Makers Pvt. Ltd.	1) Ramesh Bhamoriya and 2) Shalini Verma	High Court Karnataka Dharwad (writ petition number 106542 / 2019)	<p>Earlier case</p> <p>1. Ramesh Bahmoria and Shalini Verma and husband of Shalini Verma were partners in the firm.</p> <p>2. Modern Road Makers Pvt. Ltd. had entered into agreement with late husband of Shalini Verma (R2) on behalf of the firm, for procuring some lands and Rs. 10 lakhs were advanced to him as partner of the firm, which remained unpaid.</p> <p>3. On the death of the husband of Shalini Verma, Ramesh Bahmoria (Plaintiff) had filed suit before Sr. Civil Judge CJM, Karwar seeking share in the profit and share in properties owned by the firm, wherein Modern Road Makers Pvt. Ltd. and Shalini Verma are respondents.</p> <p>4. Modern Road Makers Pvt. Ltd. filed written statement and a counter claim in the suit stating that sum of Rs. 10 lakhs is payable by Ramesh Bahmoria and Shalini Verma to Modern Road Makers Pvt. Ltd.</p>	The matter is pending.	Modern Road Makers Pvt. Ltd. has good case on merits. Modern Road Makers Pvt. Ltd. is to recover Rs. 10 lakhs from Ramesh Bahmoria and Shalini Verma. Hence, there are no financial implications in the matter.

Source(s): Management information

Annexure 5e: Pending litigations – IWTL (4/4)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 2024	Financial implications
6	Modern Road Makers Pvt. Ltd.	1) Ramesh Bhamoriya and 2) Shalini Verma	High Court Karnataka Dharwad (writ petition number 106542 / 2019)	<p>5. After filing the Written statement, the Ramesh Bahmoria filed application under order 23 Rule 1 to remove Modern Road Makers Pvt. Ltd. and other from the case. The trial court passed order on the said application without notice to Modern Road Makers Pvt. Ltd. or giving any opportunity of being heard to Modern Road Makers Pvt. Ltd.</p> <p>6. The Modern Road Makers Pvt. Ltd. being aggrieved by this order, challenged this order of the trial court as stated below in “current case”.</p> <p>Current case</p> <p>1. In the current case, the Modern Road Makers Pvt. Ltd. is the Plaintiff and Ramesh Bahmoria and Shalini Verma are the Respondents.</p> <p>2. Modern Road Makers Pvt. Ltd. challenged the order of the trial court, on the ground that no opportunity of hearing was given to Modern Road Makers Pvt. Ltd. and the rights of natural justice of Modern Road Makers Pvt. Ltd. of being heard are violated and Rs. 10 lakhs are pending to be received from Ramesh Bahmoria and Shalini Verma.</p>	The matter is pending.	Modern Road Makers Pvt. Ltd. has good case on merits. Modern Road Makers Pvt. Ltd. is to recover Rs. 10 lakhs from Ramesh Bahmoria and Shalini Verma. Hence, there are no financial implications in the matter.

Source(s): Management information



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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 December 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 December 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 07.03.2025	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 December 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 December 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 December 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 closed.	Financial implications cannot be ascertained as not mentioned in the petition. 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. 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.

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 December 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 11.02.2025	Rs. 288.07 Cr + 582.77 days of extension of Concesison Period

Source(s): Management information

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

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 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 01.02.2025	Rs. 1317.98 Cr + interest & Extension to Concession Period by 351.41 days

Source(s): Management information

Annexure 5e: Pending litigations – AETL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 2024	Financial implications
2	Hakim Singh Yadav and others	AE Tollway Private Limited	High Court of Allahabad	<p>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.</p> <p>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.</p>	The matter is pending.	

Source(s): Management information

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

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 2024	Financial implications
1	Pushkarlal Choudhary Dilip Choudhary	1. Udaipur Tollway Pvt. Ltd. 2. NHAI	Udaipur District Consumer Forum, Udaipur, State – Rajasthan (Case number 30/2018)	The complainant had filed complaint in the consumer forum claiming for Rs. 1625/- and interest at the rate of 18% p.a. on it alleging that the toll plaza employees had taken excess toll on the overloaded vehicle and misbehaving of Tolling Staff.	The matter is pending in the district consumer forum.	The concessionaire is entitled to collect the overloading charges from the overloaded vehicles as per the toll notification. Hence, the toll collected from the complainant is legitimate as the vehicle of the complainant was overloaded. The concessionaire has denied all the allegations against misbehaviour of toll plaza staff. Hence, Considering the merits of the matter, there are no financial implications in this matter.
2	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	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.

Source(s): Management information

Annexure 5e: Pending litigations – UTL (2/2)

Sr. No.	Complainant/ Applicant/ Plaintiff	Respondents	Name & address of the court and case number	Brief description of case	Status as on December 2024	Financial implications
3	Udaipur 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 23.01.2025	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 December 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 laining to 6 laining, 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 23.01.2025	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 December 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 23.01.2025	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 December 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 December 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 on 31 December 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	-	3,004	0	3,004	80
Solapur Yedeshi Tollway Limited	-	1,289	0	1,290	50
Yedeshi Aurangabad Tollway Limited	-	3,380	0	3,380	92
Kaithal Tollway Limited	-	1,926	-	1,926	91
AE Tollway Limited	0	2,963	0	2,963	81
Udaipur Tollway Limited	-	2,521	0	2,521	86
CG Tollway Limited	0	2,032	17	2,049	83
Kishangarh Gulabpura Tollway Limited	0	1,596	-	1,597	40
IRB Hapur Moradabad Tollway Limited	0	3,078	-	3,078	54
Palsit Dankuni Private Tollway Limited	-	2,061	1	2,062	44
IRB Golconda Expressway Private Limited	-	7,929	0	7,929	278
Samakhiyali Tollway Private Limited	-	708	0	708	14
IRB Lalitpur Tollway Private Limited	-	4,783	0	4,783	192
IRB Kota Tollway Private Limited	-	561	-	561	40
IRB Gwalior Tollway Private Limited	-	1,204	-	1,204	70
Meerut Budaun Expressway Limited	-	4,585	-	4,585	243

Source(s): Management information

Annexure 5g: Site pictures - IWTL



भारतीय राष्ट्रीय राजमार्ग प्राधिकरण रास्ते का उपयोग करने वालों के लिए पथकर सूची				
वाहन का प्रकार	एक घण्टे में एक यात्रा हेतु (रु.)	24 घण्टे में एक बार (रु.)	मासिक पास के दर (रु.)	जिले के अंदर वंजीकृत वाणिज्यिक वाहन की एक मासिक यात्रा हेतु (रु.)
दो-चक्रिया वाहन	110	165	3690	55
तीन-चक्रिया वाहन	175	260	5795	85
चार-चक्रिया वाहन	360	535	11930	180
पांच-चक्रिया वाहन	390	590	13055	195
छह-चक्रिया वाहन	550	825	18375	275
सात-चक्रिया वाहन	695	1045	23180	350



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

Annexure 5g: Site pictures - SYTL

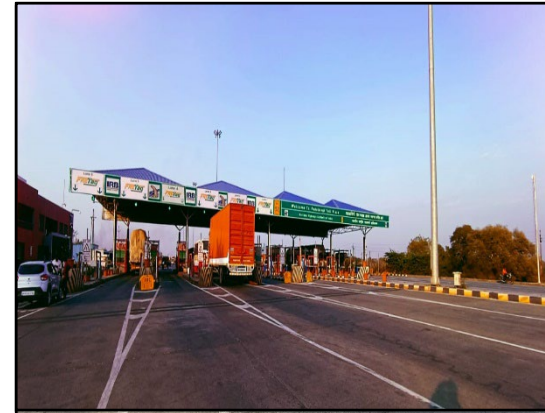


भारतीय राष्ट्रीय राजमार्ग प्राधिकरण वाहन शुल्क (₹)				जिला अंतर्गत नौदणी कृत वाणिज्य वाहनाच्या प्रत्येक फेऱ्यासाठी
वाहन प्रकार	एक ताफी यात्रे करीता	२४ तासांमध्ये एका वेळा	मासिक पास	
	75	110	2420	35
	115	175	3905	60
	245	370	8185	125
	270	400	8925	135
	385	575	12835	190
	470	705	15620	235



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

Annexure 5g: Site pictures - YATL

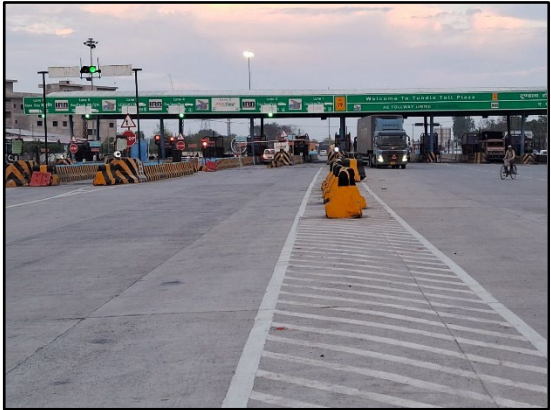
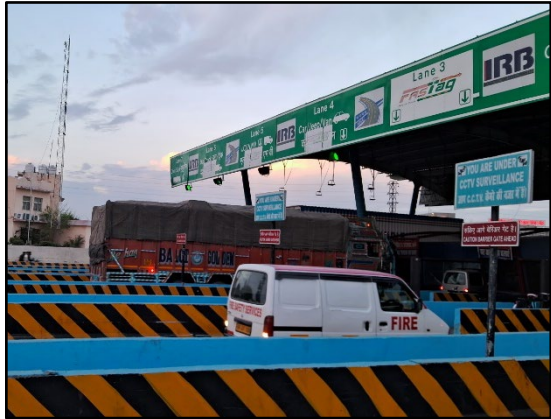


Source(s): Site visits conducted in February/March 2024.



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Annexure 5g: Site pictures - AETL



M/s AE Tollways Ltd. IRB		M/s AE Tollways Ltd. IRB	
TUNDLA Toll at CH 224.950 of NH-19 (NH-2)		TUNDLA Toll at CH 224.950 of NH-19 (NH-2)	
Toll Fee For Stretch From 199.660-252.250 Km of NH-2		Toll Fee For Stretch From 199.660-252.250 Km of NH-2	
User Fee Effective From -01-04-2023		User Fee Effective From -01-04-2023	
वाहनों के प्रकार		वाहनों के प्रकार	
कार, जीप, वैन या इसके समकक्ष वाहन	210	कार, जीप, वैन या इसके समकक्ष वाहन	105 195 3490 50
दोपहरे या त्रिपहरे वाले वाहन	340	दोपहरे या त्रिपहरे वाले वाहन	170 255 5635 85
बस और ट्रक (ले घुंरी)	710	बस और ट्रक (ले घुंरी)	355 530 11810 175
कृषि/मछली वाहन (ले घुंरी)	770	कृषि/मछली वाहन (ले घुंरी)	385 580 12880 195
भारी ट्रैक्टर, मशीनरी, मशीन, औद्योगिक वाहन (ले घुंरी)	1110	भारी ट्रैक्टर, मशीनरी, मशीन, औद्योगिक वाहन (ले घुंरी)	555 835 18520 280
कोई वाहन जो वाहन के प्रकार में से नहीं आता	1350	कोई वाहन जो वाहन के प्रकार में से नहीं आता	675 1015 22545 340

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

Annexure 5g: Site pictures - UTL



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

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 Magistrate
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

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 Chief Justice of High Court
15. The Judge of a High Court
16. The Member of Parliament
17. The Army Commander or Vice - Chief of Army Staff And Equivalent in other Services
18. The Chief Secretary to a State Government Within Concerned State
19. The Secretary to The Government of India
20. The Secretary, Council of States
21. The Secretary, House of People
22. The Foreign Dignitary on State Visit
23. 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
24. 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



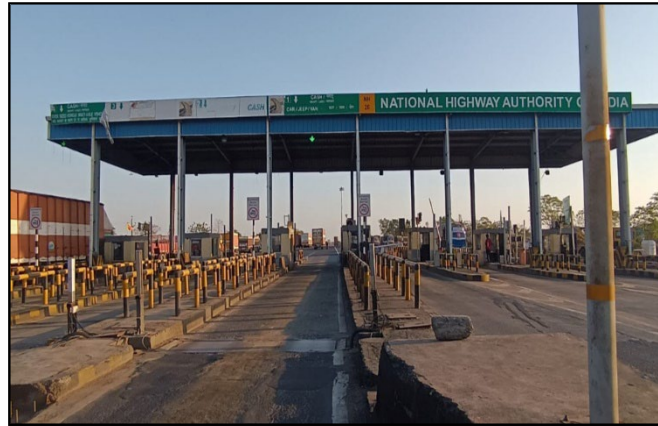
Source(s): Site visits conducted in February/March 2024.

Annexure 5g: Site pictures - IGTPL



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

Annexure 5g: Site pictures - ILTPL



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



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

Annexures

Annexure 5g: Site pictures - IKTPL



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



Annexure 5g: Site pictures - MBEL



Source(s): Site visit conducted in December 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 16 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”) along with addendum dated 16 January 2025. 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 31 December 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 31 December 2024. Additionally, our analysis is based on the business plan of the SPVs for the period from 1 January 2025 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 explicitly mentioned in the report.
- 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.**



JANUARY 2025

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



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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highway Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- 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 1st 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 124.524 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.

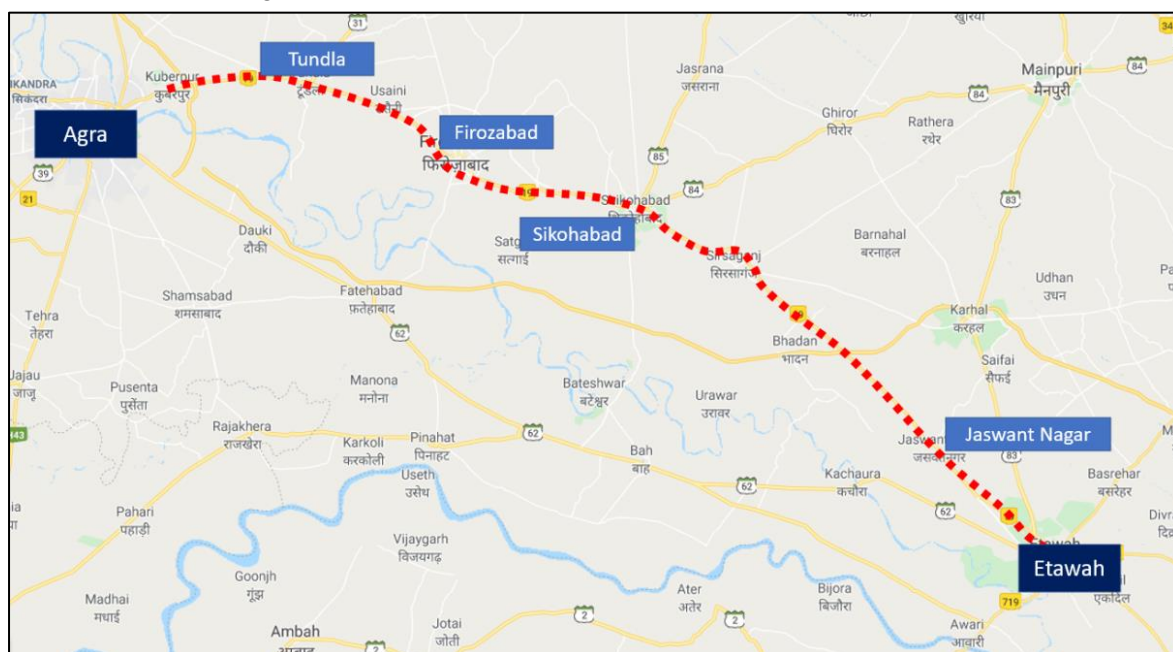


Figure 1-1: Alignment of Project Stretch

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.

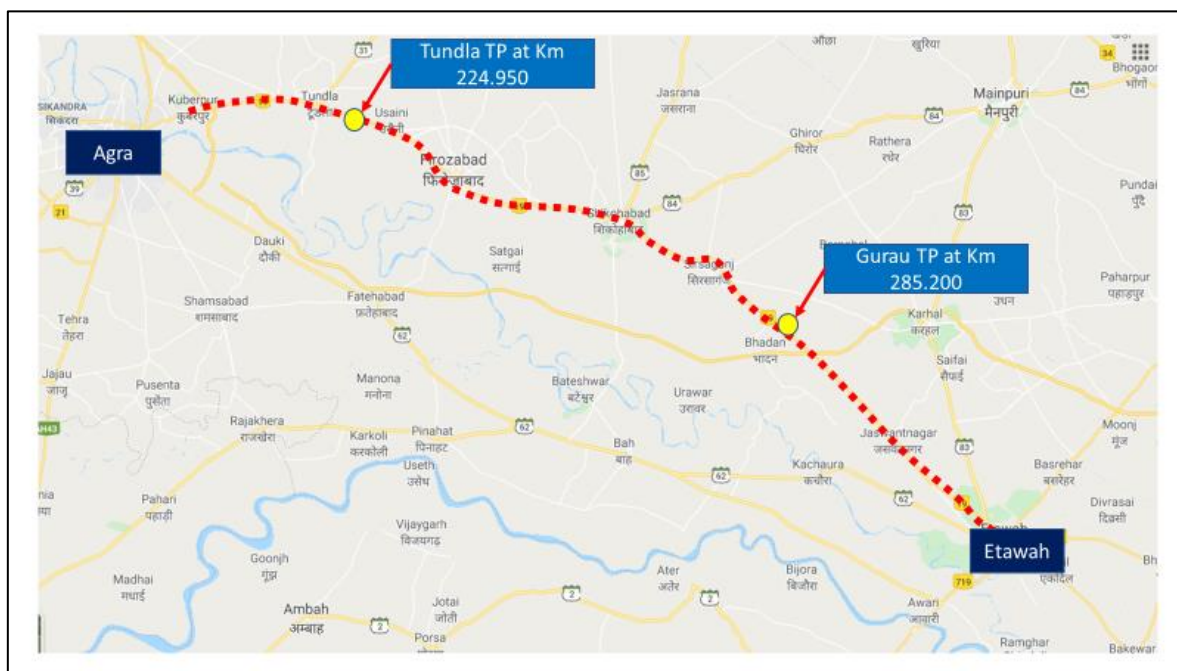


Figure 2-1: Project Alignment with Toll Plaza

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 November 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 & Eight month from	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		April 2024 to November 2024	month from April 2024 to November 2024	month from April 2024 to November 2024	month from April 2024 to November 2024	month from April 2024 to November 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 & Eight month from April 2024 to November 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2017-18, 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	3559

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	707
3	Bus	494	492	635	530	559	532
4	Truck	891	1100	1351	1410	1532	1478
5	3-Axle	901	909	882	839	826	692
6	Multi Axle	1426	1760	2138	2386	2685	2707
7	Oversize Vehicle	11	8	4	10	10	7
	Total	6892	9090	11197	9292	9880	9682

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	9925
2	LCV	1917	1514	1012	1082	1067	1020
3	Bus	1148	777	856	1181	1328	1234
4	Truck	1309	1272	1506	1775	1957	1904
5	3-Axle	955	948	924	887	879	768
6	Multi Axle	1255	1725	2179	2372	2764	2736
7	Oversize Vehicle	10	11	8	10	10	7
	Total	14918	12096	13832	16260	17580	17594

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	9682	24939	2.58
	Tundla Km 224.950	17594	35516	2.02

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.

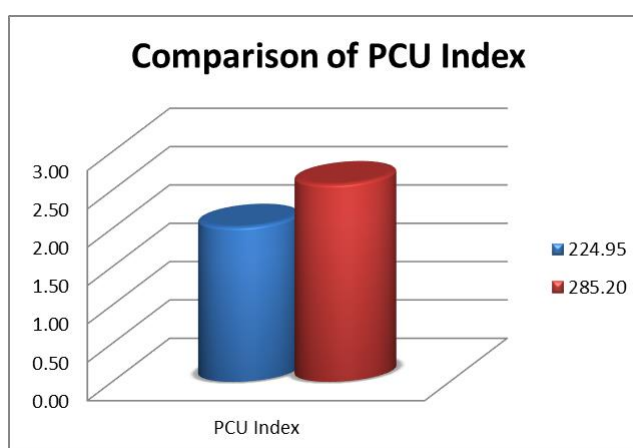


Figure 3-1: Comparison of PCU Index

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.

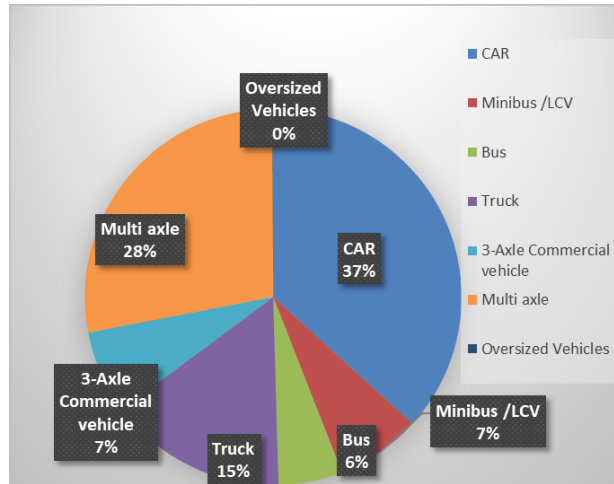


Figure 3-2 :Model Split of Tollable Vehicle-Km 285.200

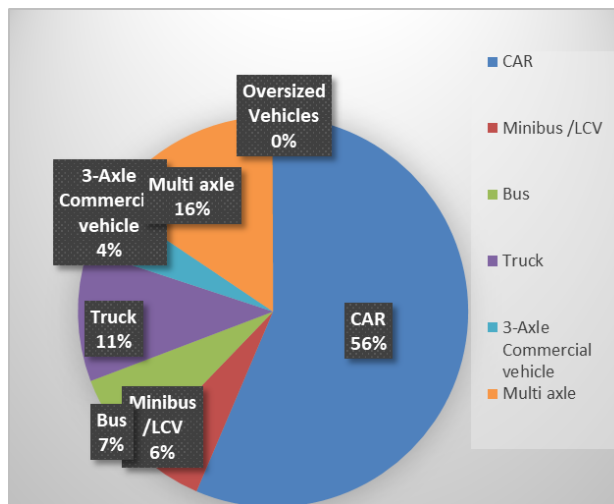


Figure 3-3 :Model Split of Tollable Vehicle-Km 224.950

It is observed that car traffic forms about 37% of total traffic at Gurau toll plaza location while multi axle commercial vehicles and trucks are about 63% 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 the above categories 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	6599
2	Return Journey	3062
3	Local Commercial Single Journey	12
4	Monthly Pass Local	9
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 68%. Return journey component is 32%.

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	8482
2	Return Journey	8813
3	Local Commercial Single Journey	109
4	Monthly Pass Local	182
5	Monthly Pass	7

At Tundla toll plaza single journey share drops to 48% 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.

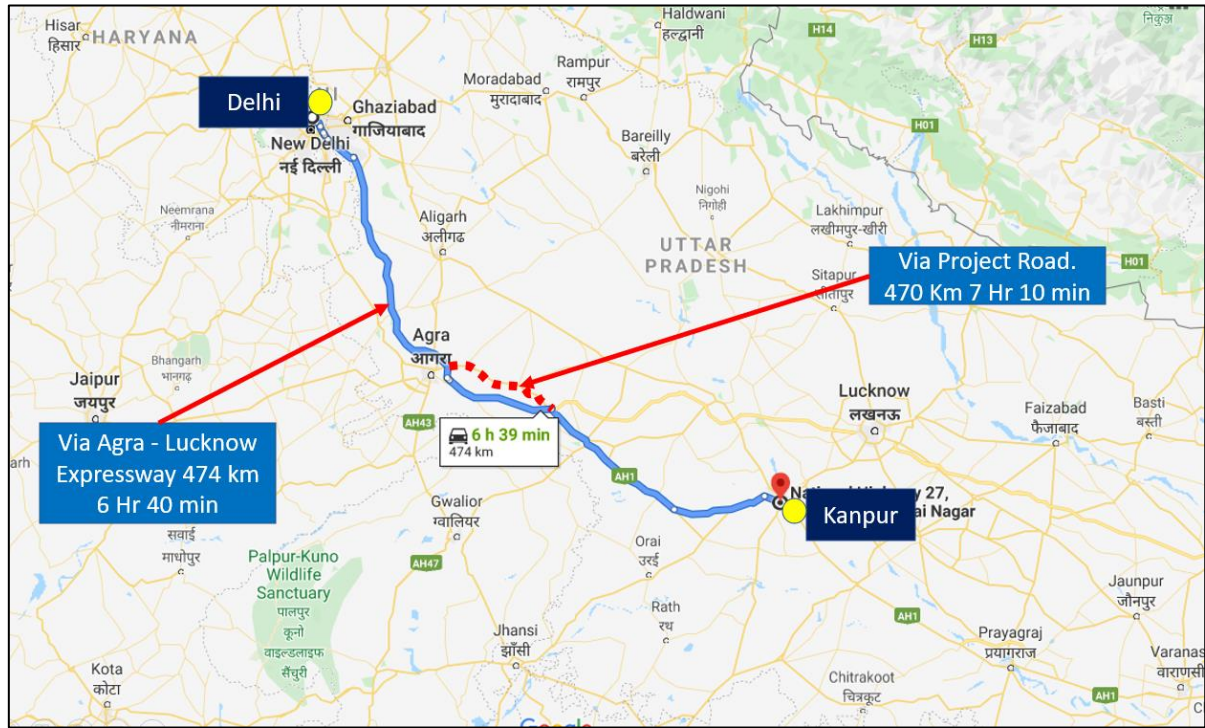


Figure 4-1: Alternate route at regional level.



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
Regional Level						
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
Local Level						
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.

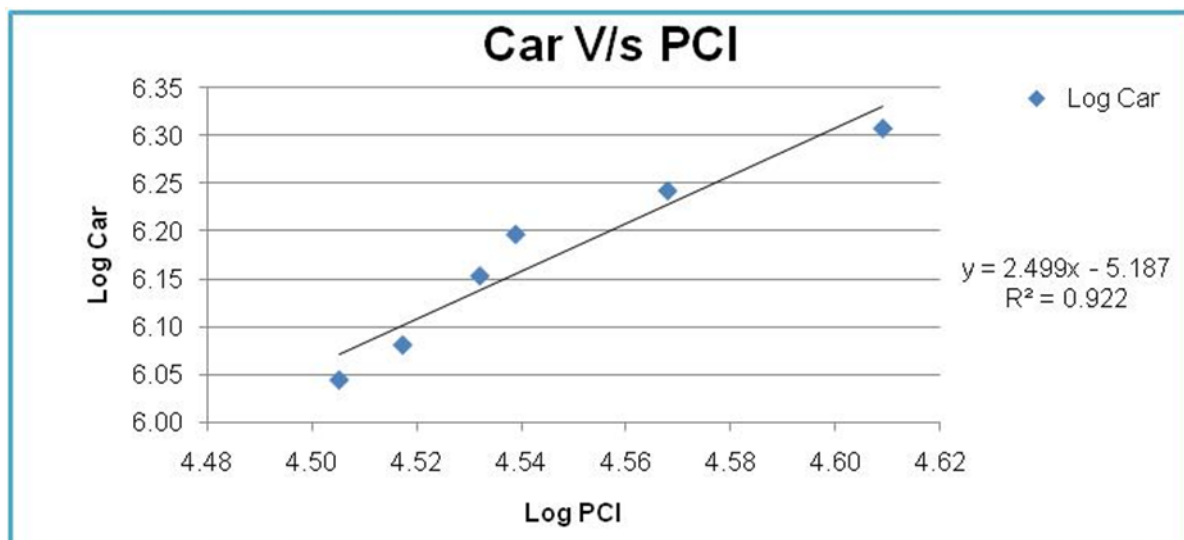


Figure 5-1: Regression and Elasticity PCI vs. Car-Extrapolation Uttar Pradesh

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.

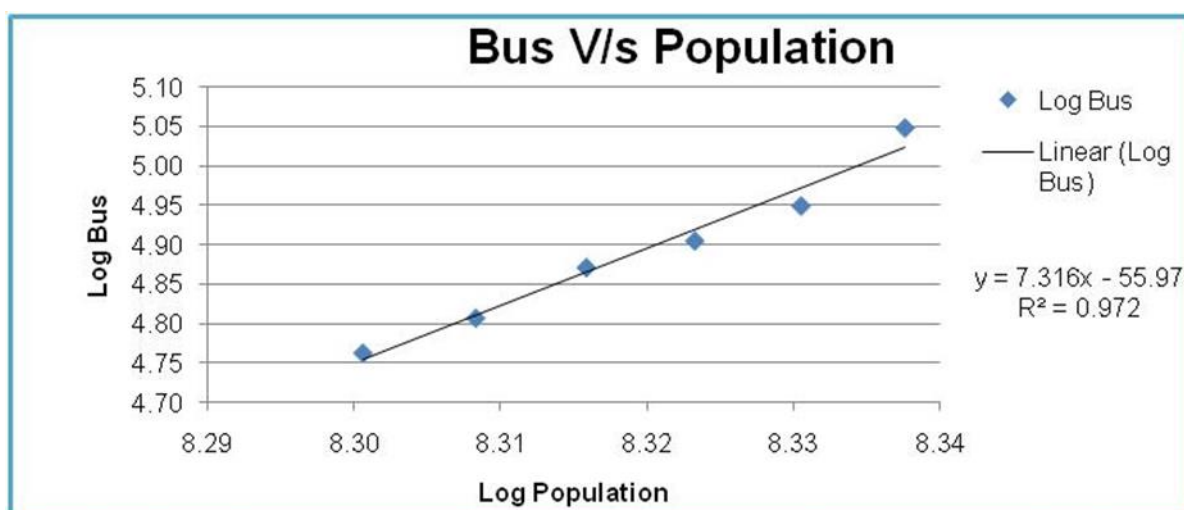


Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh

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.

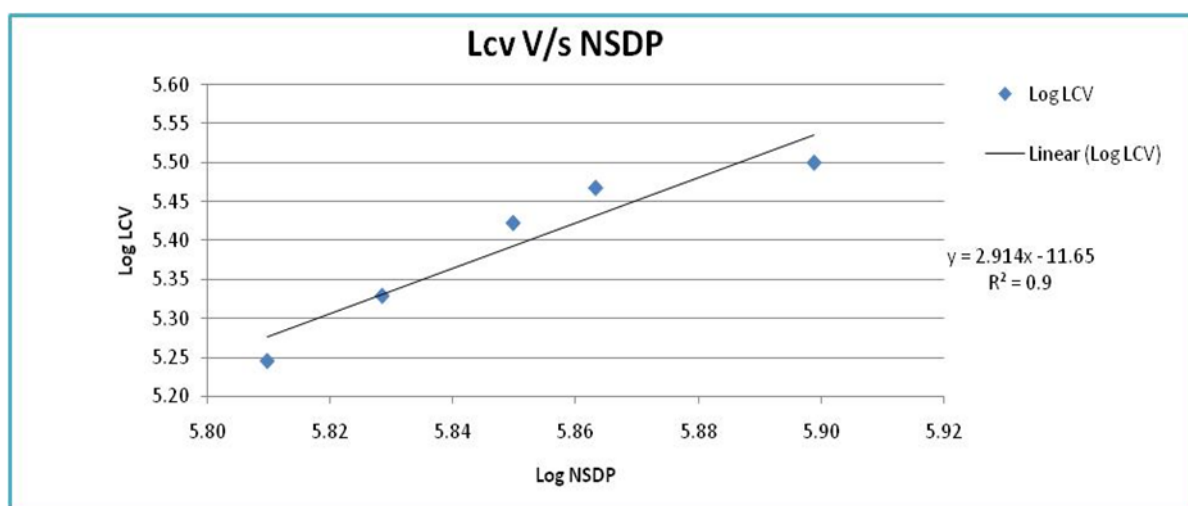


Figure 5-3: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Uttar Pradesh.

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.

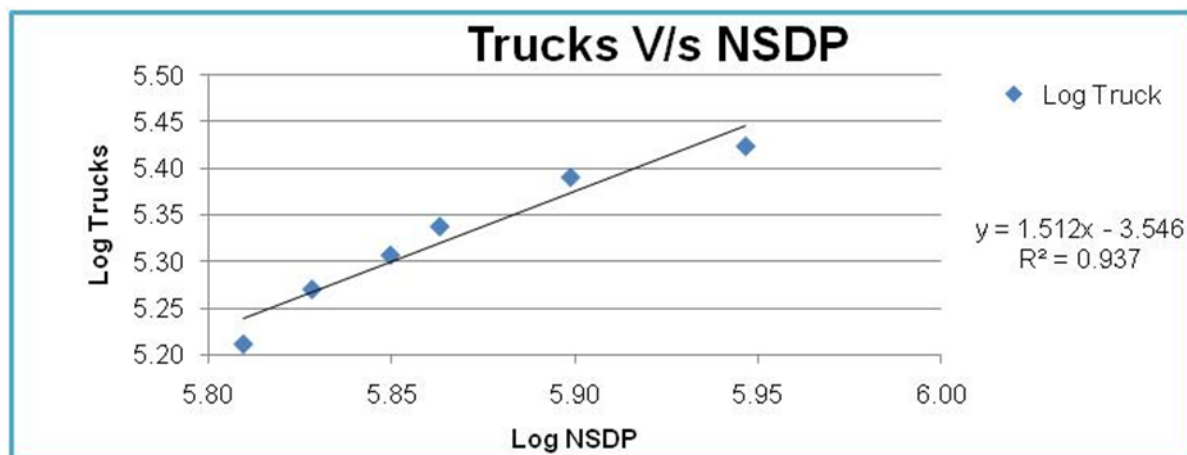


Figure 5-4: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Uttar Pradesh.

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. 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 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.

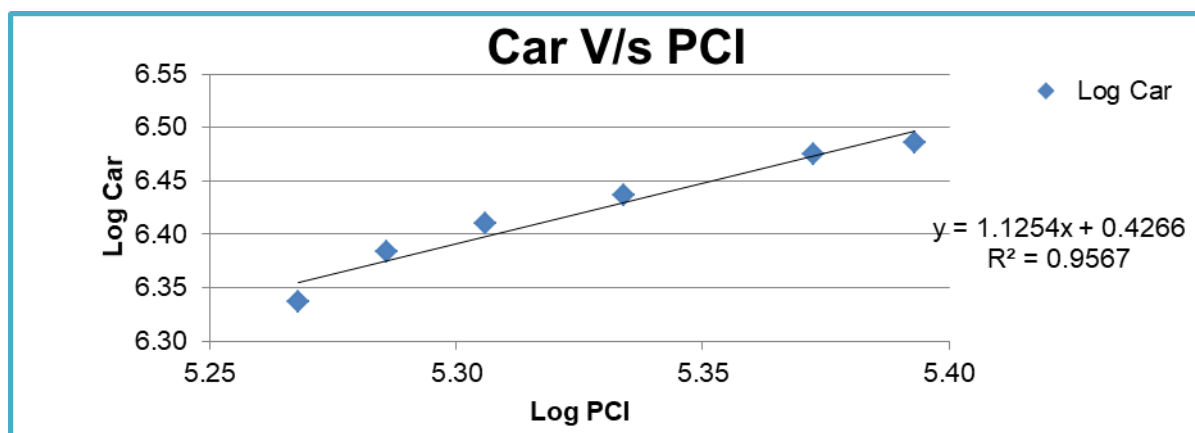


Figure 5-5: Regression and Elasticity PCI vs. Car–Extrapolation Delhi

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.

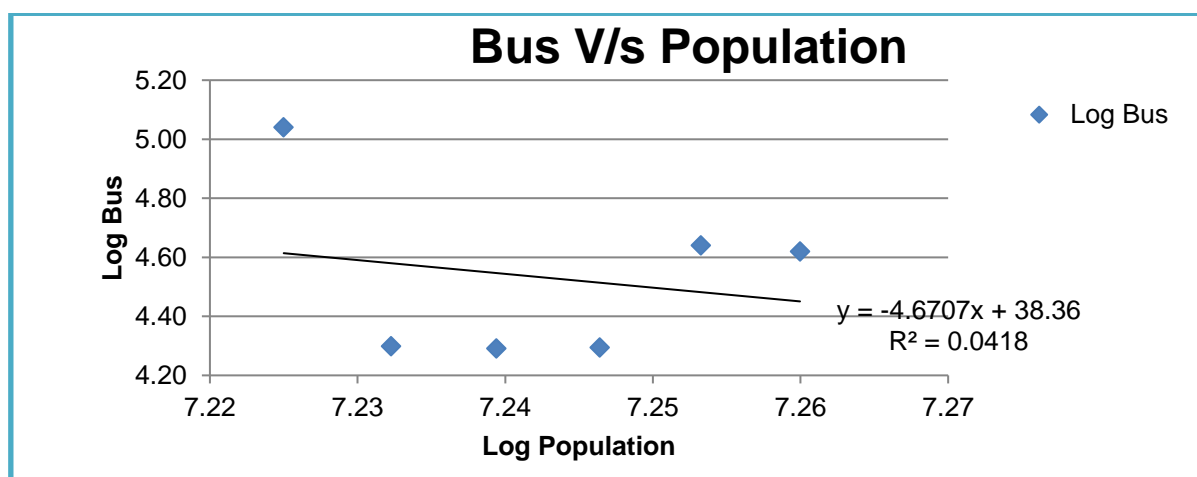


Figure 5-6: Regression and Elasticity Population vs. Bus – Extrapolation Delhi

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.

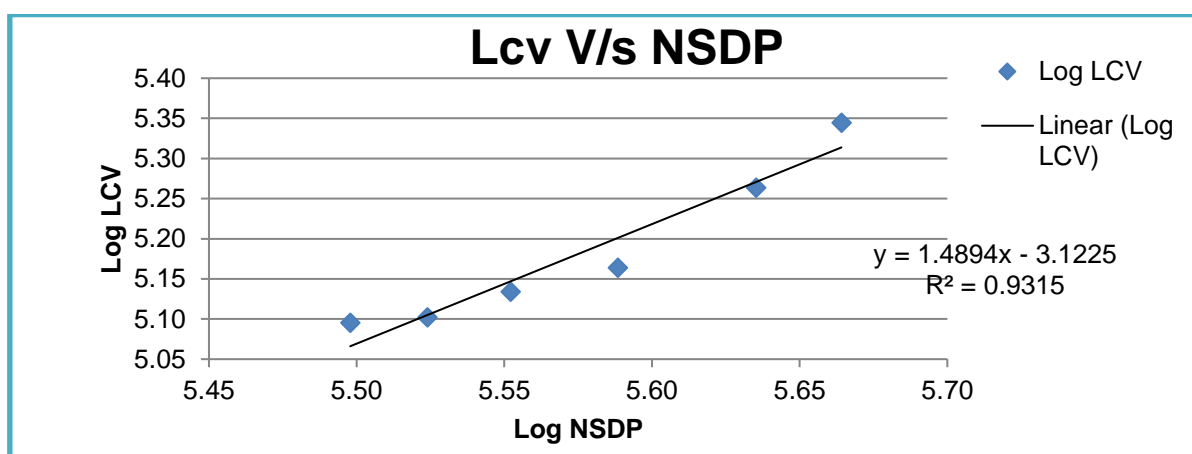


Figure 5-7: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Delhi.

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.

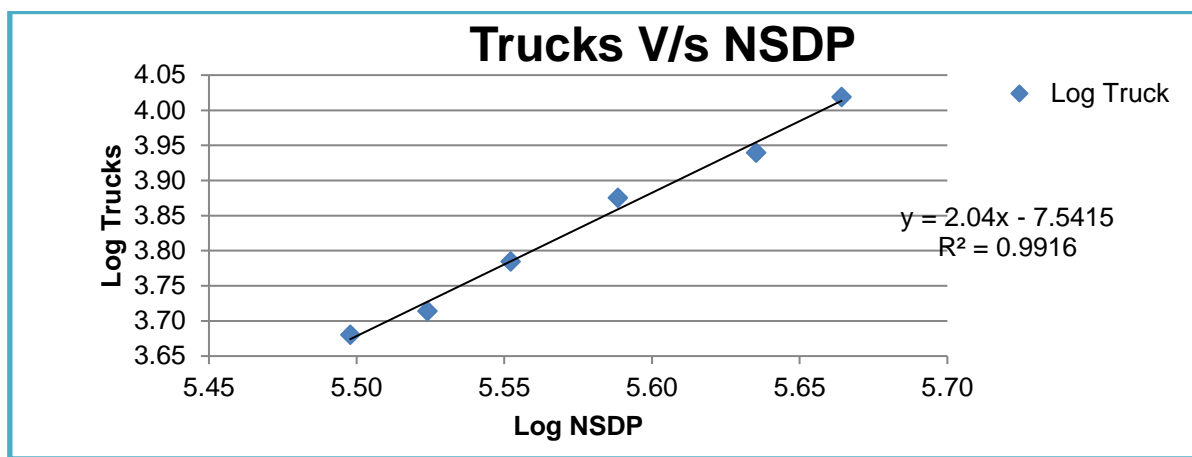


Figure 5-8: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Delhi.

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. 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 5-10 : 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.

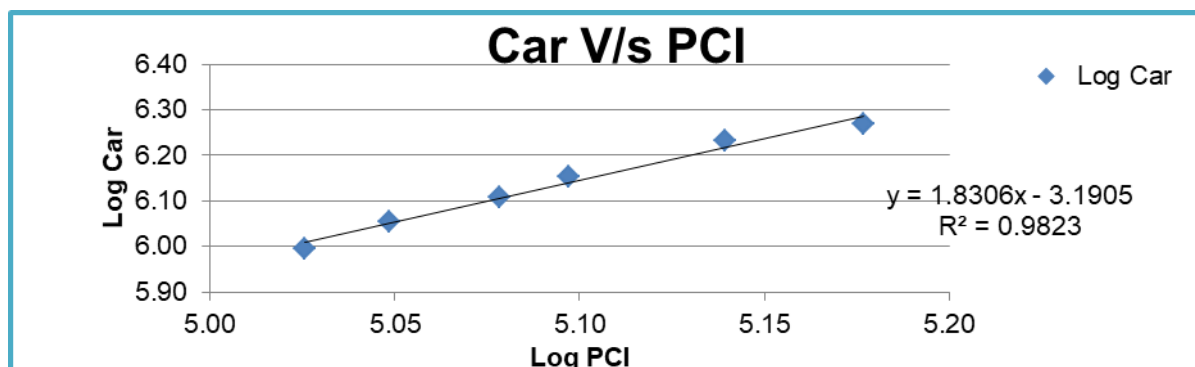


Figure 5-9: Regression and Elasticity PCI vs. Car–Extrapolation Haryana

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.

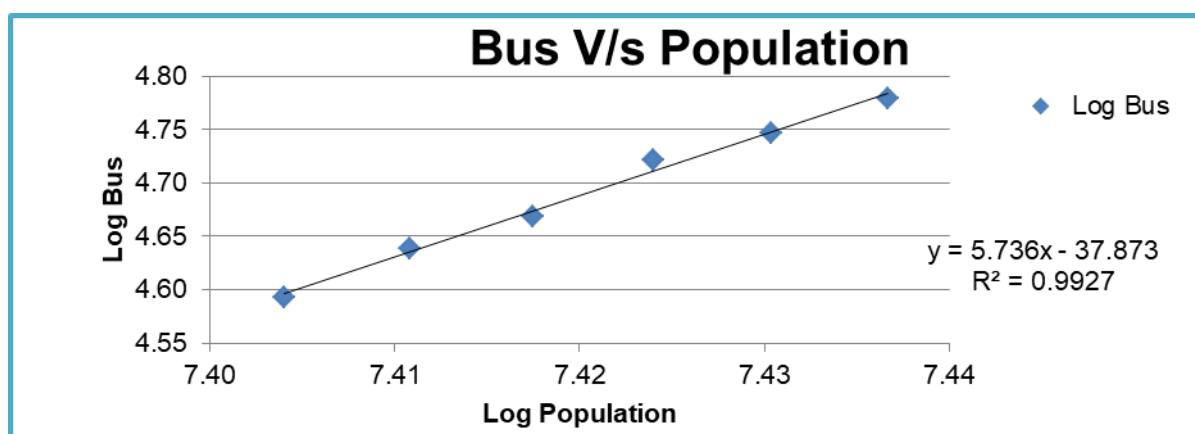


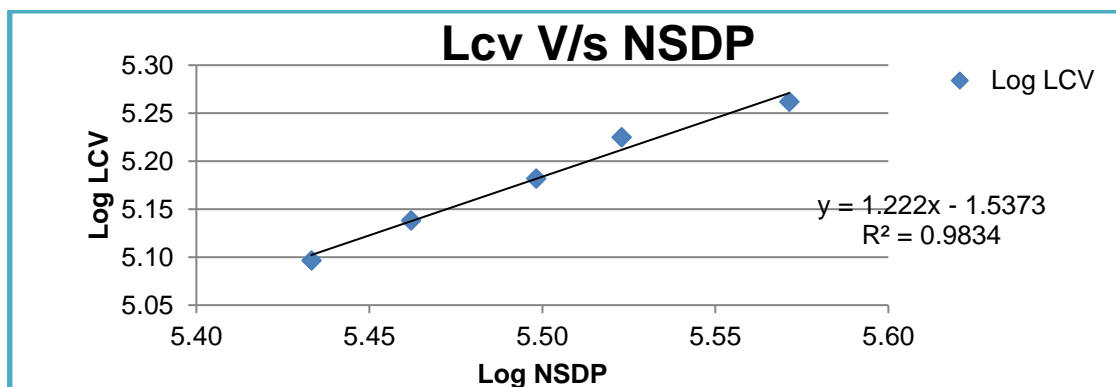
Figure 5-10: Regression and Elasticity Population vs. Bus – Extrapolation Haryana

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.

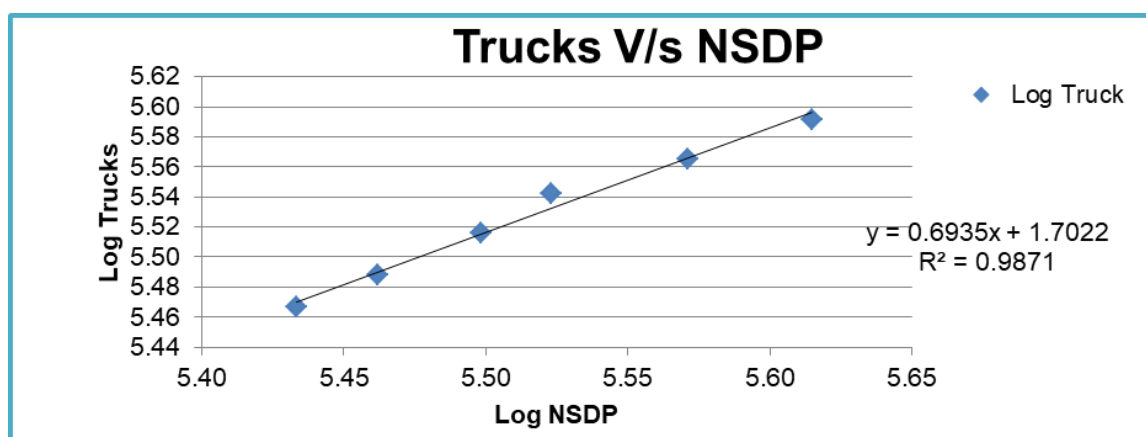


Figure 5-12: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Haryana.

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. 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 5-15 : 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.

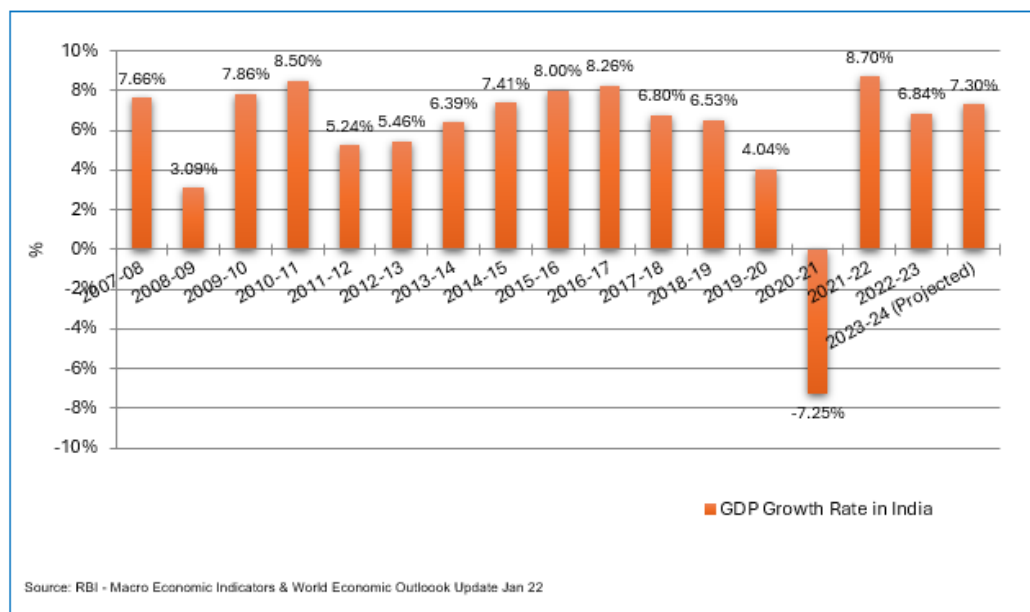


Figure 5-13 : Growth of GDP in India

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.

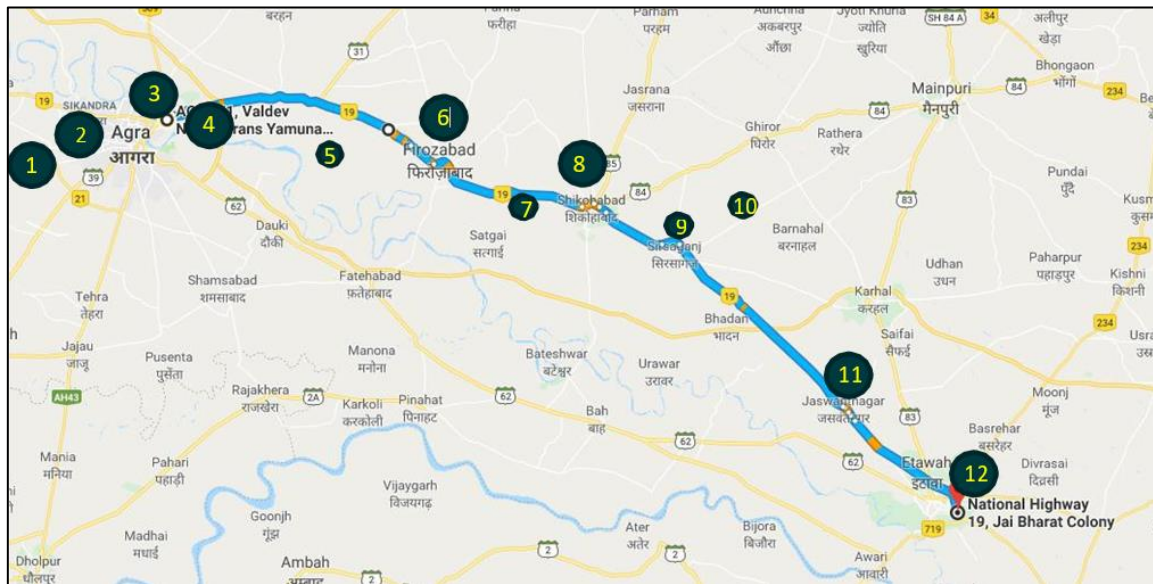


Figure 5-14 : Industrial Units along project corridor.

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	2025-2026	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	2025-2026	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	2025-2026	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%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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	9925	1020	1234	1904	768	2736	7	17594	35516
2025-26	10992	1099	1316	2058	832	2974	8	19279	38678
2026-27	12121	1177	1398	2214	898	3218	8	21034	41934
2027-28	13304	1255	1477	2371	964	3466	8	22845	45256
2028-29	14469	1326	1546	2515	1026	3699	8	24589	48401
2029-30	15736	1401	1618	2668	1092	3948	8	26471	51774
2030-31	17106	1479	1694	2829	1162	4210	8	28488	55361
2031-32	18595	1562	1773	2999	1235	4489	8	30661	59196
2032-33	20214	1649	1856	3180	1313	4787	8	33007	63312
2033-34	21974	1742	1943	3371	1396	5105	8	35539	67726
2034-35	23888	1840	2033	3574	1484	5443	8	38270	72451
2035-36	25660	1924	2099	3755	1563	5746	8	40755	76690
2036-37	27564	2013	2168	3945	1646	6066	8	43410	81194
2037-38	29609	2106	2239	4144	1734	6404	8	46244	85973
2038-39	31805	2203	2312	4354	1826	6762	8	49270	91051
2039-40	34164	2304	2388	4574	1923	7139	8	52500	96437
2040-41	36293	2390	2449	4766	2008	7469	8	55383	101194
2041-42	38555	2479	2512	4966	2097	7814	8	58431	106198
2042-43	40959	2571	2577	5174	2189	8175	8	61653	111459
2043-44	43512	2666	2643	5391	2285	8553	8	65058	116993
2044-45	46226	2764	2712	5617	2386	8948	8	68661	122819
2045-46	48606	2851	2765	5809	2471	9284	8	71794	127832

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	3559	707	532	1478	692	2707	7	9682	24939
2025-26	3941	762	568	1597	750	2943	8	10569	27109
2026-27	4345	817	603	1717	809	3185	8	11484	29326
2027-28	4769	872	637	1838	868	3430	8	12422	31577
2028-29	5186	921	667	1949	923	3660	8	13314	33691
2029-30	5640	973	698	2067	982	3905	8	14273	35949
2030-31	6130	1028	731	2191	1044	4164	8	15296	38344
2031-32	6663	1086	765	2323	1110	4441	8	16396	40907
2032-33	7242	1147	801	2462	1180	4736	8	17576	43640
2033-34	7872	1212	838	2610	1255	5050	8	18845	46560
2034-35	8558	1280	877	2767	1334	5386	8	20210	49685
2035-36	9193	1340	906	2907	1405	5687	8	21446	52485
2036-37	9875	1402	936	3054	1480	6005	8	22760	55447
2037-38	10608	1467	966	3208	1559	6341	8	24157	58578
2038-39	11395	1535	998	3370	1642	6695	8	25643	61891
2039-40	12240	1606	1031	3540	1729	7069	8	27223	65396
2040-41	13003	1666	1058	3688	1805	7395	8	28623	68469
2041-42	13814	1727	1085	3843	1884	7737	8	30098	71693
2042-43	14675	1791	1113	4004	1968	8094	8	31653	75076
2043-44	15589	1857	1142	4172	2055	8468	8	33291	78624
2044-45	16561	1926	1172	4347	2145	8859	8	35018	82344
2045-46	17414	1987	1195	4495	2222	9192	8	36513	85531

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	9925	1020	1234	1904	768	2736	7	17594	35516
2025-26	10944	1093	1310	2049	828	2960	8	19192	38501
2026-27	12011	1166	1385	2194	889	3188	8	20841	41546
2027-28	13122	1238	1457	2339	950	3418	8	22532	44634
2028-29	14205	1302	1518	2469	1006	3631	8	24139	47513
2029-30	15378	1370	1582	2607	1066	3857	8	25868	50591
2030-31	16640	1441	1648	2751	1128	4094	8	27710	53842
2031-32	18006	1515	1717	2903	1194	4345	8	29688	57309
2032-33	19485	1593	1788	3063	1264	4612	8	31813	61010
2033-34	21085	1674	1863	3232	1337	4895	8	34094	64956
2034-35	22815	1760	1941	3410	1415	5196	8	36545	69171
2035-36	24395	1832	1995	3566	1483	5460	8	38739	72881

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	26083	1907	2050	3728	1555	5738	8	41069	76800
2037-38	27888	1985	2107	3898	1629	6029	8	43544	80934
2038-39	29818	2066	2166	4076	1707	6335	8	46176	85308
2039-40	31882	2151	2226	4262	1790	6657	8	48976	89935
2040-41	33709	2220	2272	4420	1860	6931	8	51420	93921
2041-42	35642	2291	2319	4583	1933	7216	8	53992	98092
2042-43	37686	2365	2367	4753	2009	7513	8	56701	102465
2043-44	39846	2440	2416	4928	2087	7822	8	59547	107034
2044-45	42130	2518	2466	5110	2169	8145	8	62546	111831
2045-46	44090	2585	2502	5259	2236	8410	8	65090	115840

**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	3559	707	532	1478	692	2707	7	9682	24939
2025-26	3924	758	565	1589	747	2930	8	10521	26985
2026-27	4307	809	597	1701	802	3156	8	11380	29059
2027-28	4705	859	628	1813	857	3383	8	12253	31147
2028-29	5093	904	654	1914	908	3593	8	13074	33082
2029-30	5513	951	681	2020	962	3817	8	13952	35141
2030-31	5965	1000	710	2131	1018	4051	8	14883	37308
2031-32	6454	1052	740	2248	1077	4300	8	15879	39613
2032-33	6983	1106	770	2372	1140	4563	8	16942	42058
2033-34	7556	1163	802	2503	1206	4843	8	18081	44663
2034-35	8175	1223	835	2641	1276	5140	8	19298	47432
2035-36	8740	1273	858	2761	1338	5401	8	20379	49861
2036-37	9345	1326	882	2887	1403	5675	8	21526	52424
2037-38	9991	1380	906	3019	1470	5964	8	22738	55120
2038-39	10682	1437	932	3157	1541	6267	8	24024	57965
2039-40	11421	1497	958	3301	1615	6586	8	25386	60962
2040-41	12075	1545	978	3423	1678	6858	8	26565	63527
2041-42	12768	1594	998	3549	1744	7141	8	27802	66203
2042-43	13501	1646	1018	3680	1812	7436	8	29101	68998
2043-44	14275	1699	1039	3816	1883	7743	8	30463	71917
2044-45	15093	1753	1061	3957	1957	8062	8	31891	74963
2045-46	15796	1799	1077	4073	2018	8324	8	33095	77493

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	9925	1020	1234	1904	768	2736	7	17594	35516
2025-26	10968	1097	1313	2053	831	2967	8	19237	38592
2026-27	12065	1173	1391	2203	895	3204	8	20939	41746
2027-28	13212	1248	1467	2353	959	3443	8	22690	44951
2028-29	14335	1316	1532	2490	1018	3665	8	24364	47958
2029-30	15554	1388	1599	2635	1081	3902	8	26167	51176
2030-31	16870	1463	1670	2787	1147	4151	8	28096	54592
2031-32	18298	1541	1743	2948	1217	4416	8	30171	58242
2032-33	19845	1624	1820	3118	1291	4698	8	32404	62145
2033-34	21524	1711	1901	3297	1369	4998	8	34808	66319
2034-35	23344	1803	1985	3487	1452	5317	8	37396	70783
2035-36	25017	1881	2045	3654	1525	5601	8	39731	74751
2036-37	26811	1963	2106	3829	1602	5900	8	42219	78953
2037-38	28734	2049	2170	4013	1683	6214	8	44871	83405
2038-39	30794	2138	2236	4206	1768	6545	8	47695	88120
2039-40	33002	2231	2303	4408	1857	6894	8	50703	93112
2040-41	34977	2308	2357	4582	1934	7195	8	53361	97472
2041-42	37070	2388	2412	4763	2015	7509	8	56165	102049
2042-43	39287	2471	2468	4951	2099	7838	8	59122	106855
2043-44	41638	2557	2526	5146	2186	8180	8	62241	111894
2044-45	44129	2646	2585	5349	2276	8538	8	65531	117185
2045-46	46291	2723	2629	5519	2352	8838	8	68360	121683

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	3559	707	532	1478	692	2707	7	9682	24939
2025-26	3932	760	566	1594	748	2936	8	10544	27044
2026-27	4325	813	599	1711	805	3169	8	11430	29186
2027-28	4736	866	632	1828	862	3406	8	12338	31364
2028-29	5138	914	660	1934	915	3626	8	13195	33389
2029-30	5574	964	689	2046	971	3860	8	14112	35544
2030-31	6045	1016	719	2164	1030	4106	8	15088	37821
2031-32	6555	1070	751	2289	1093	4368	8	16134	40251
2032-33	7109	1128	784	2421	1159	4647	8	17256	42841
2033-34	7710	1189	818	2560	1229	4944	8	18458	45599
2034-35	8362	1253	854	2707	1304	5260	8	19748	48543
2035-36	8961	1307	880	2837	1370	5540	8	20903	51149
2036-37	9603	1364	907	2974	1439	5836	8	22131	53907
2037-38	10291	1424	934	3117	1512	6147	8	23433	56814
2038-39	11029	1486	963	3267	1589	6475	8	24817	59889
2039-40	11820	1551	992	3424	1669	6820	8	26284	63128

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2040-41	12528	1604	1015	3560	1738	7118	8	27571	65940
2041-42	13278	1660	1038	3700	1811	7429	8	28924	68882
2042-43	14073	1717	1062	3846	1886	7754	8	30346	71960
2043-44	14915	1777	1086	3998	1964	8093	8	31841	75179
2044-45	15807	1838	1112	4156	2045	8446	8	33412	78546
2045-46	16582	1891	1131	4288	2113	8742	8	34755	81390

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	32837	-38%	57%	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	32917	-38%	57%	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	32758	-38%	57%	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 2/3rd 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). 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.

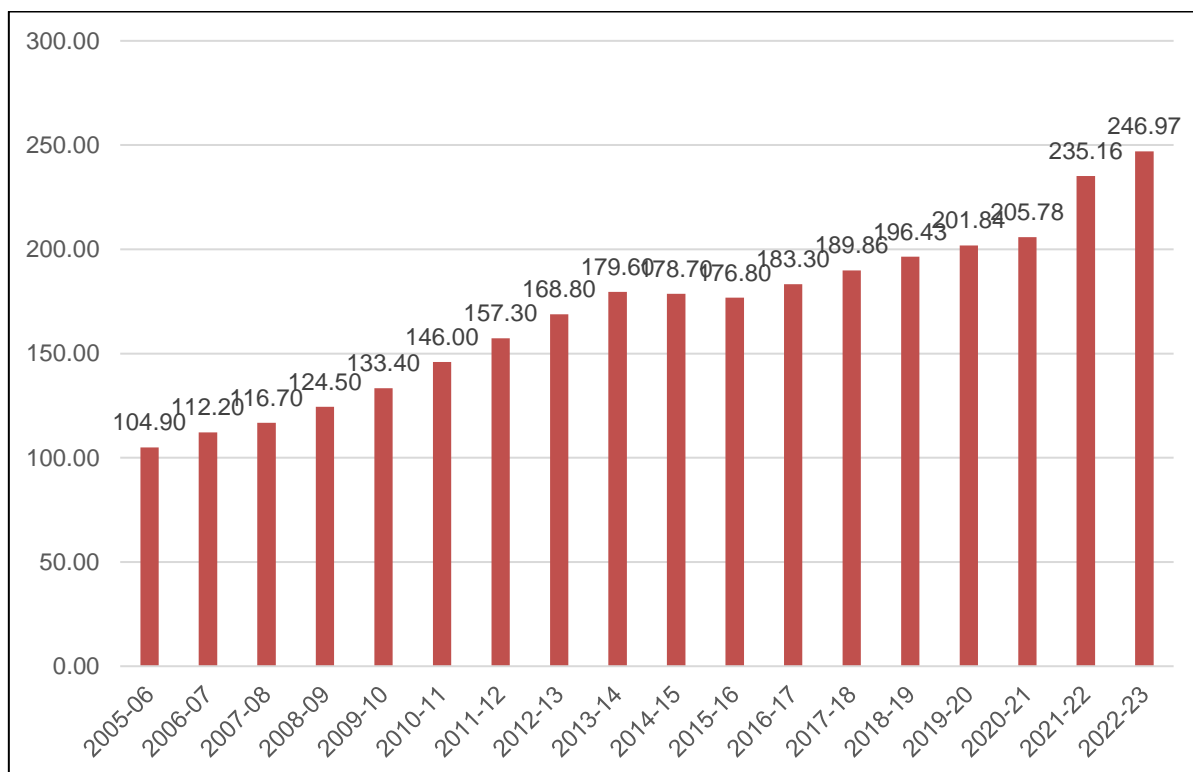


Figure 7-1 : Historical Rate of WPI Inflation in India

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	110	180	375	375	410	590	715
2026-27	115	190	395	395	430	620	755
2027-28	120	200	415	415	450	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	550	795	965
2032-33	155	255	530	530	580	835	1015
2033-34	165	265	560	560	610	880	1070
2034-35	175	280	590	590	640	925	1125
2035-36	185	295	620	620	675	970	1185
2036-37	195	310	650	650	710	1025	1245
2037-38	205	330	685	685	750	1075	1310
2038-39	215	345	725	725	790	1135	1380
2039-40	225	365	760	760	830	1195	1455
2040-41	235	385	800	800	875	1260	1530
2041-42	250	405	845	845	920	1325	1615
2042-43	265	425	890	890	970	1395	1700
2043-44	275	450	940	940	1025	1470	1790
2044-45	290	470	990	990	1080	1550	1890
2045-46	310	500	1045	1045	1140	1635	1990

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	430	615	750
2025-26	115	195	405	405	440	635	775
2026-27	125	205	425	425	465	670	815
2027-28	130	215	445	445	490	700	855
2028-29	135	225	470	470	515	735	895
2029-30	145	235	495	495	540	775	945
2030-31	150	250	520	520	565	815	990
2031-32	160	260	545	545	595	855	1040
2032-33	165	275	575	575	625	900	1095
2033-34	175	290	605	605	660	945	1150
2034-35	185	305	635	635	695	995	1210
2035-36	195	320	670	670	730	1050	1275
2036-37	205	335	705	705	765	1105	1345
2037-38	215	355	740	740	810	1160	1415

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2038-39	225	370	780	780	850	1225	1490
2039-40	240	390	820	820	895	1290	1570
2040-41	250	415	865	865	945	1355	1650
2041-42	265	435	910	910	995	1430	1740
2042-43	280	460	960	960	1050	1505	1835
2043-44	295	485	1015	1015	1105	1590	1935
2044-45	310	510	1070	1070	1165	1675	2040
2045-46	330	535	1125	1125	1230	1765	2150

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	165	270	565	565	615	885	1075
2026-27	175	285	590	590	645	930	1130
2027-28	185	295	620	620	680	975	1185
2028-29	195	310	655	655	715	1025	1245
2029-30	205	330	685	685	750	1075	1310
2030-31	215	345	720	720	785	1130	1380
2031-32	225	360	760	760	830	1190	1450
2032-33	235	380	800	800	870	1250	1525
2033-34	250	400	840	840	915	1315	1600
2034-35	260	420	885	885	965	1385	1685
2035-36	275	445	930	930	1015	1455	1775
2036-37	290	465	980	980	1065	1535	1865
2037-38	305	490	1030	1030	1125	1615	1965
2038-39	320	520	1085	1085	1185	1700	2070
2039-40	335	545	1140	1140	1245	1790	2180
2040-41	355	575	1205	1205	1310	1885	2295
2041-42	375	605	1270	1270	1385	1990	2420
2042-43	395	640	1335	1335	1455	2095	2550
2043-44	415	670	1410	1410	1535	2210	2690
2044-45	440	710	1485	1485	1620	2330	2835
2045-46	465	745	1565	1565	1710	2455	2990

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	590	590	640	920	1120
2025-26	175	290	610	610	665	955	1160
2026-27	185	305	640	640	695	1000	1220
2027-28	195	320	670	670	730	1050	1280
2028-29	205	335	705	705	770	1105	1345
2029-30	215	355	740	740	810	1160	1415
2030-31	225	370	780	780	850	1220	1485
2031-32	240	390	820	820	895	1285	1565
2032-33	250	410	860	860	940	1350	1645

Year	Car	Minibus /LCV	Bus	Truck	3 axles	Multi axle	Oversized Vehicles
2033-34	265	430	905	905	990	1420	1730
2034-35	275	455	955	955	1040	1495	1820
2035-36	290	480	1000	1000	1095	1570	1915
2036-37	305	505	1055	1055	1150	1655	2015
2037-38	325	530	1110	1110	1210	1740	2120
2038-39	340	560	1170	1170	1275	1835	2235
2039-40	360	590	1230	1230	1345	1930	2350
2040-41	380	620	1300	1300	1415	2035	2480
2041-42	400	655	1365	1365	1490	2145	2610
2042-43	420	690	1440	1440	1570	2260	2750
2043-44	440	725	1520	1520	1655	2380	2900
2044-45	465	765	1600	1600	1745	2510	3055
2045-46	490	805	1690	1690	1840	2650	3225

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

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875
2044-45	920	920
2045-46	970	970

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

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350

Year	Car	Minibus /LCV
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875
2044-45	920	920
2045-46	970	970

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	3580	5780	12110	12110	13210	18990	23120
2025-26	3700	5980	12525	12525	13665	19640	23910
2026-27	3885	6280	13155	13155	14350	20630	25115
2027-28	4085	6595	13820	13820	15075	21670	26380
2028-29	4290	6930	14520	14520	15840	22770	27720
2029-30	4510	7285	15260	15260	16645	23930	29130
2030-31	4740	7655	16040	16040	17500	25155	30620
2031-32	4980	8050	16865	16865	18395	26445	32195
2032-33	5240	8465	17735	17735	19345	27810	33855
2033-34	5510	8905	18655	18655	20350	29250	35610
2034-35	5800	9365	19625	19625	21410	30775	37465
2035-36	6100	9855	20650	20650	22530	32385	39425
2036-37	6420	10375	21735	21735	23710	34085	41495
2037-38	6760	10920	22885	22885	24965	35885	43685
2038-39	7120	11500	24095	24095	26285	37785	46000
2039-40	7500	12110	25380	25380	27685	39800	48450
2040-41	7900	12760	26735	26735	29165	41925	51040
2041-42	8325	13445	28170	28170	30730	44175	53780
2042-43	8770	14170	29685	29685	32385	46555	56675
2043-44	9245	14935	31295	31295	34140	49075	59740
2044-45	9750	15745	32990	32990	35990	51735	62985
2045-46	10280	16605	34790	34790	37950	54555	66415

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	3785	6235	13065	13065	14250	20485	24940
2025-26	3915	6450	13510	13510	14740	21190	25795
2026-27	4115	6775	14190	14190	15480	22255	27090
2027-28	4320	7115	14910	14910	16265	23380	28460
2028-29	4545	7475	15665	15665	17085	24565	29905
2029-30	4775	7855	16460	16460	17955	25815	31425
2030-31	5020	8260	17305	17305	18875	27135	33030
2031-32	5280	8680	18190	18190	19845	28530	34730
2032-33	5555	9130	19130	19130	20870	30000	36520
2033-34	5845	9605	20120	20120	21950	31555	38415
2034-35	6150	10105	21170	21170	23095	33200	40415
2035-36	6475	10630	22275	22275	24300	34935	42530
2036-37	6815	11190	23450	23450	25580	36770	44765
2037-38	7180	11780	24685	24685	26930	38710	47125
2038-39	7560	12405	25995	25995	28355	40760	49625
2039-40	7965	13065	27375	27375	29865	42930	52265
2040-41	8390	13765	28840	28840	31460	45225	55060
2041-42	8845	14505	30390	30390	33150	47655	58015
2042-43	9325	15285	32025	32025	34935	50220	61140
2043-44	9830	16110	33755	33755	36825	52935	64445
2044-45	10365	16985	35590	35590	38825	55810	67945
2045-46	10935	17910	37530	37530	40940	58850	71645

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	112.92	139.20	252.12
2025-26	126.56	156.70	283.26
2026-27	144.44	178.48	322.92
2027-28	163.22	202.54	365.76
2028-29	182.36	227.92	410.28
2029-30	205.04	255.83	460.87
2030-31	229.47	286.13	515.60

Year	TP-1	TP2	Total
2031-32	258.03	322.83	580.86
2032-33	288.20	360.67	648.87
2033-34	323.48	406.97	730.45
2034-35	362.90	457.13	820.03
2035-36	404.83	510.19	915.02
2036-37	448.43	567.22	1015.65
2037-38	498.13	631.12	1129.26
2038-39	553.99	703.47	1257.47
2039-40	618.39	783.84	1402.23
2040-41	678.99	863.83	1542.82
2041-42	749.24	955.63	1704.86
2042-43	826.30	1055.96	1882.27
2043-44	914.98	1168.19	2083.16
2044-45	1006.43	1289.06	2295.50
2045-46	1102.12	1417.30	2519.42

Table 7-11 : Toll Revenue Pessimistic Scenario

(Rs. Crores)

Year	TP-1	TP2	Total
2024-25	112.92	139.20	252.12
2025-26	125.99	156.00	281.99
2026-27	143.13	176.86	319.99
2027-28	160.98	199.78	360.76
2028-29	179.05	223.75	402.80
2029-30	200.37	249.98	450.35
2030-31	223.25	278.22	501.47
2031-32	249.84	312.50	562.34
2032-33	277.76	347.47	625.22
2033-34	310.34	390.21	700.55
2034-35	346.50	436.28	782.78
2035-36	384.72	484.62	869.35
2036-37	424.10	536.27	960.37
2037-38	468.82	593.80	1062.62
2038-39	518.94	658.68	1177.62
2039-40	576.53	730.54	1307.07
2040-41	630.07	801.30	1431.37
2041-42	691.95	882.21	1574.16
2042-43	759.44	970.20	1729.64
2043-44	836.89	1068.22	1905.12
2044-45	916.17	1173.17	2089.34
2045-46	998.35	1283.73	2282.08

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

Year	TP-1	TP2	Total
2024-25	112.92	139.20	252.12
2025-26	126.27	156.38	282.65
2026-27	143.80	177.67	321.47
2027-28	162.12	201.17	363.30
2028-29	180.77	225.83	406.60
2029-30	202.76	252.86	455.62
2030-31	226.43	282.08	508.51
2031-32	254.01	317.55	571.56
2032-33	283.08	353.88	636.95
2033-34	317.00	398.39	715.38
2034-35	354.81	446.43	801.24
2035-36	394.87	497.03	891.90
2036-37	436.33	551.25	987.58
2037-38	483.45	611.85	1095.30
2038-39	536.43	680.29	1216.73
2039-40	597.39	756.24	1353.63
2040-41	654.43	831.40	1485.83
2041-42	720.38	917.49	1637.87
2042-43	792.41	1011.45	1803.85
2043-44	875.43	1116.26	1991.69
2044-45	960.64	1228.90	2189.53
2045-46	1049.36	1347.96	2397.32

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)**

JANUARY 2025



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JANUARY 2025



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ABBREVIATIONS

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

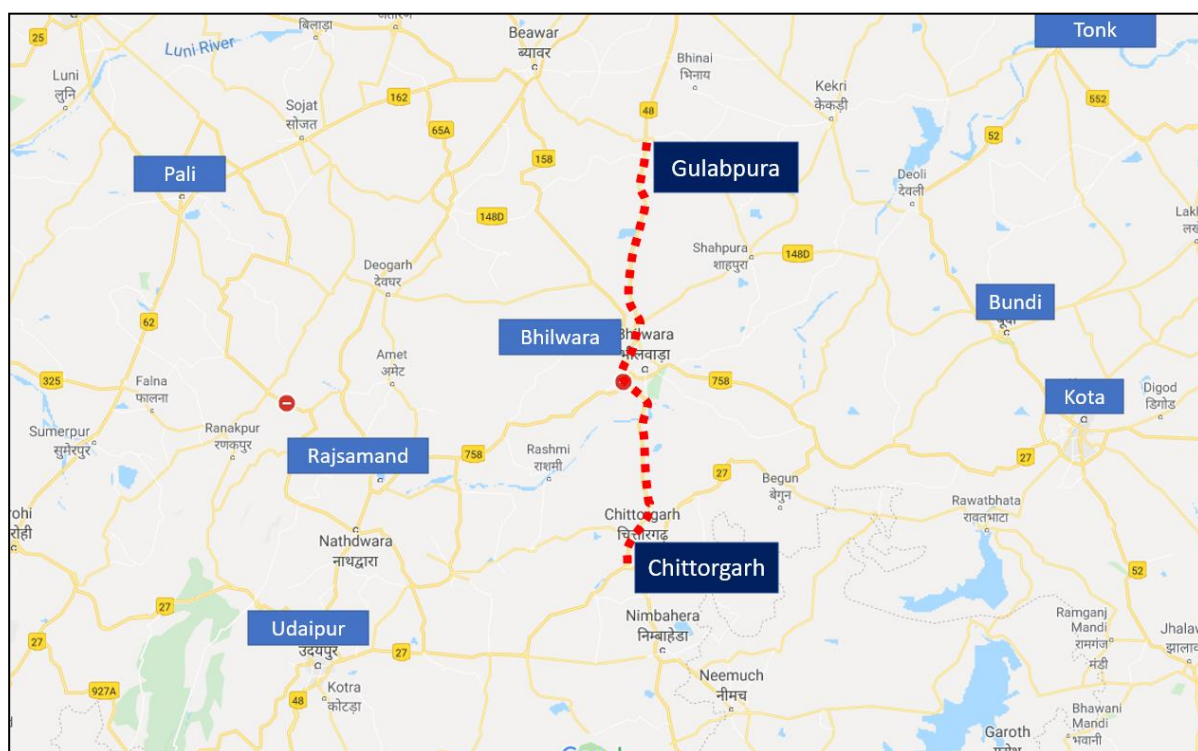


Figure 1-1: Alignment of Project Stretch

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.

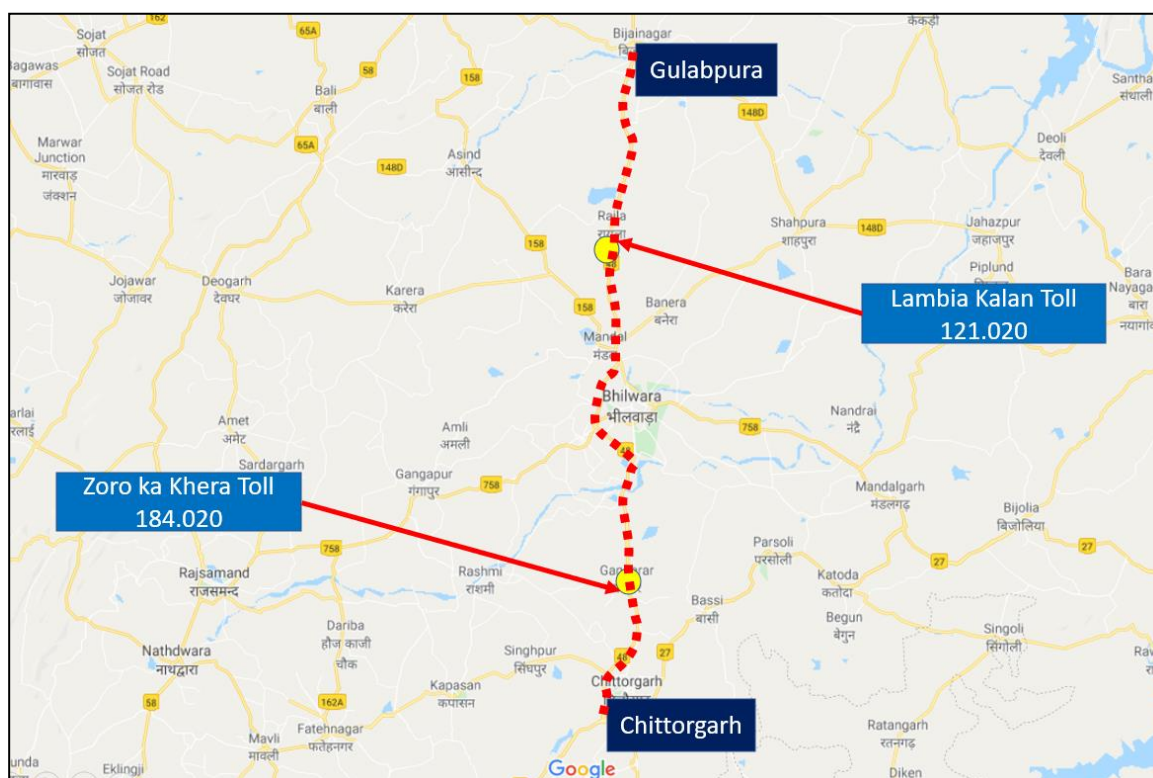


Figure 2-1: Project Alignment with Toll Plaza

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 November 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 121.020 Toll Plaza at Lambia Kalan	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 to	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 to	For Year 2018-19, 2019-20, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to

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

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	6758
2	Minibus /LCV	1266	933	585	768	754	764
3	Bus	428	270	376	446	455	402
4	Truck	1587	1321	1788	2455	2520	2372
5	3-Axle Commercial vehicle	2139	1591	1771	2006	1869	1624
6	Multi axle	4606	4011	4587	5086	5130	4953
7	Oversized Vehicle	23	19	30	11	12	5
Total		13612	11511	13949	17072	17590	16878

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	6699
2	Minibus /LCV	1081	824	549	716	777	826
3	Bus	423	265	347	408	435	403

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
4	Truck	1285	1164	1634	2306	2613	2706
5	3-Axle Commercial vehicle	1568	1344	1666	1950	2042	1985
6	Multi axle	4360	4201	4934	5536	5971	6096
7	Oversized Vehicle	21	21	21	14	12	9
Total		11781	10896	13592	16532	17926	18723

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

Vehicle Type	PCUs
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	16878	43409	2.57

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
	Jojro ka Khera Km 184.020	18723	50688	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.

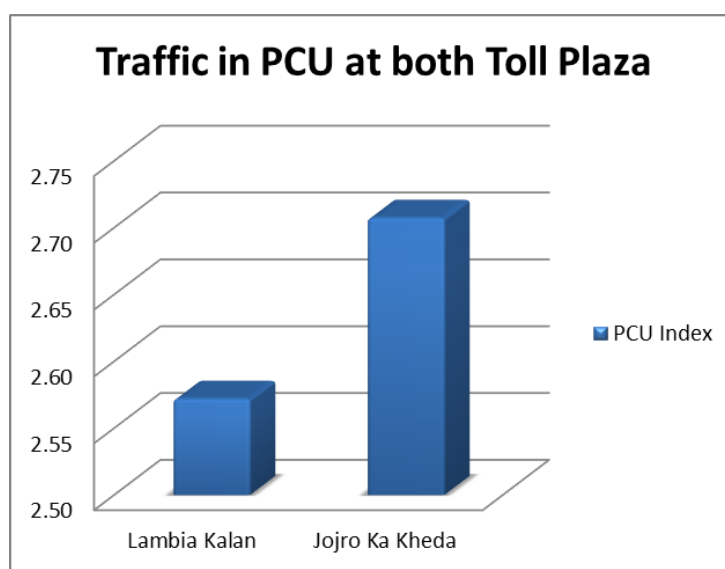


Figure 3-1: Comparison of PCU Index

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.

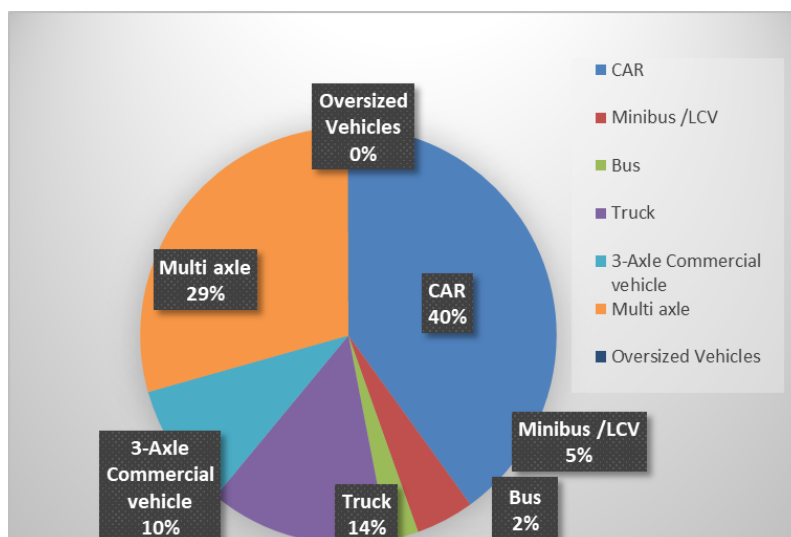


Figure 3-2 :Model Split of Tollable Vehicle-Km 121.020

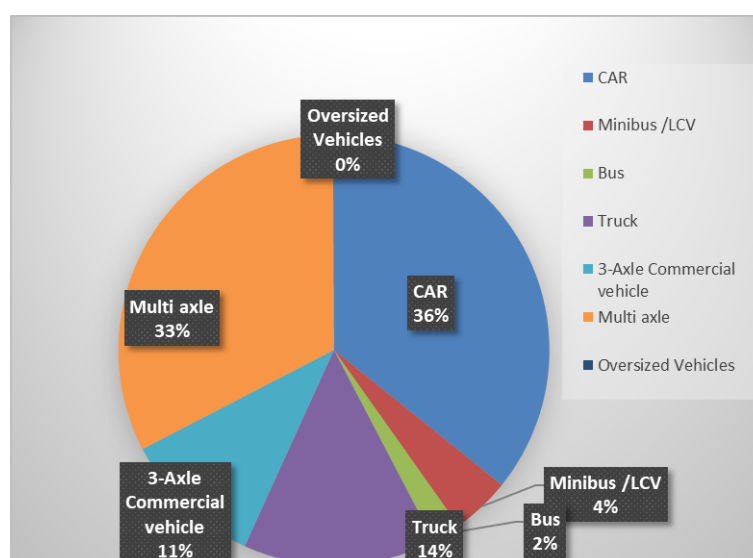


Figure 3-3 :Model Split of Tollable Vehicle- Km 184.020

It is observed that car traffic forms about 40% & 36% of total traffic at toll plaza locations while multi axle commercial vehicles are about 39% & 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	12071
2	Return Journey	4550
3	Local Commercial Single Journey	227
4	Monthly Pass Local	28
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 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	13273
2	Return Journey	5168
3	Local Commercial Single Journey	255
4	Monthly Pass Local	13
5	Monthly Pass	13

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.

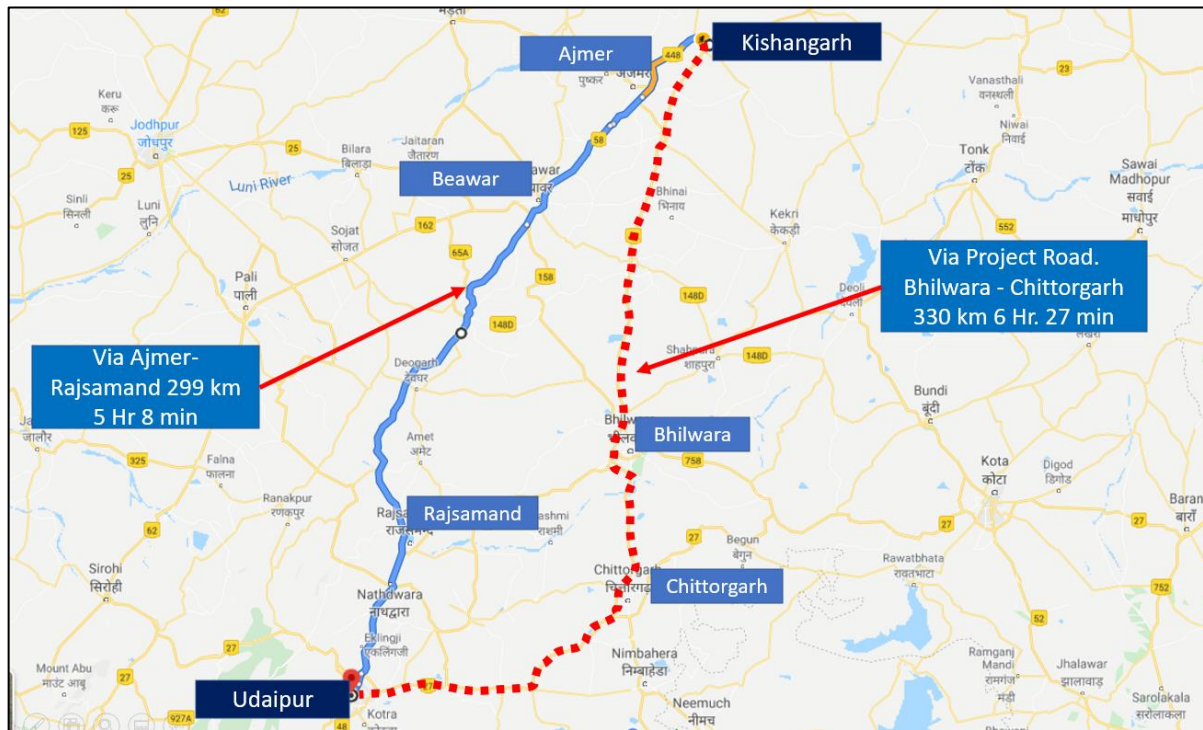


Figure 4-1: Alternate route at regional level.

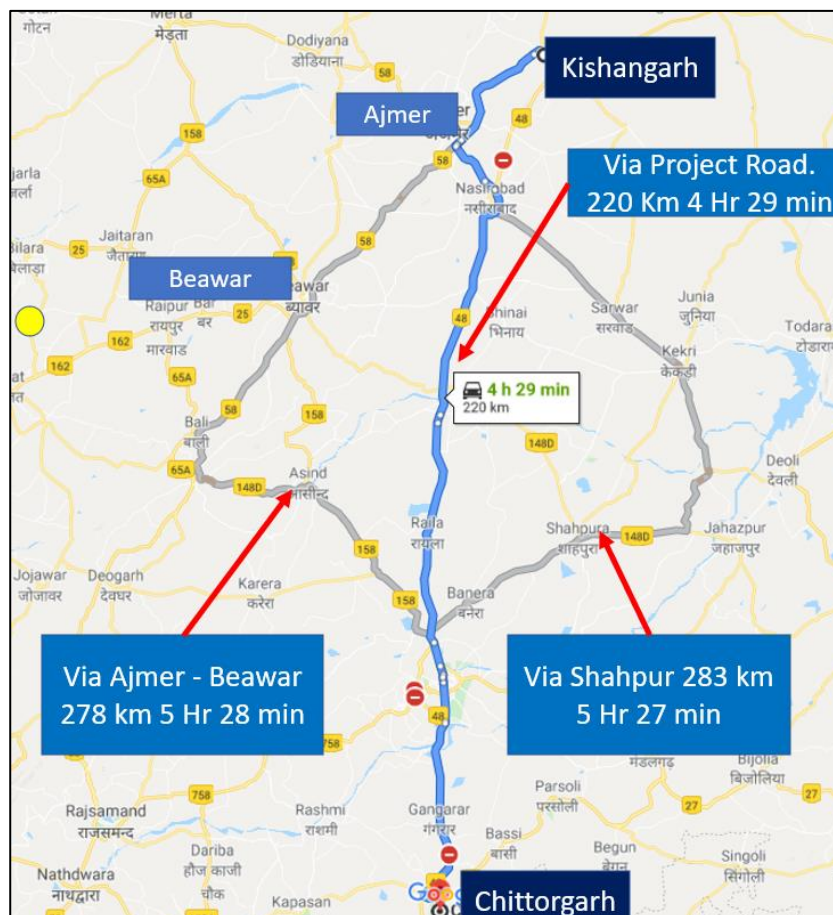


Figure 4-2: Alternate route at local level.

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.

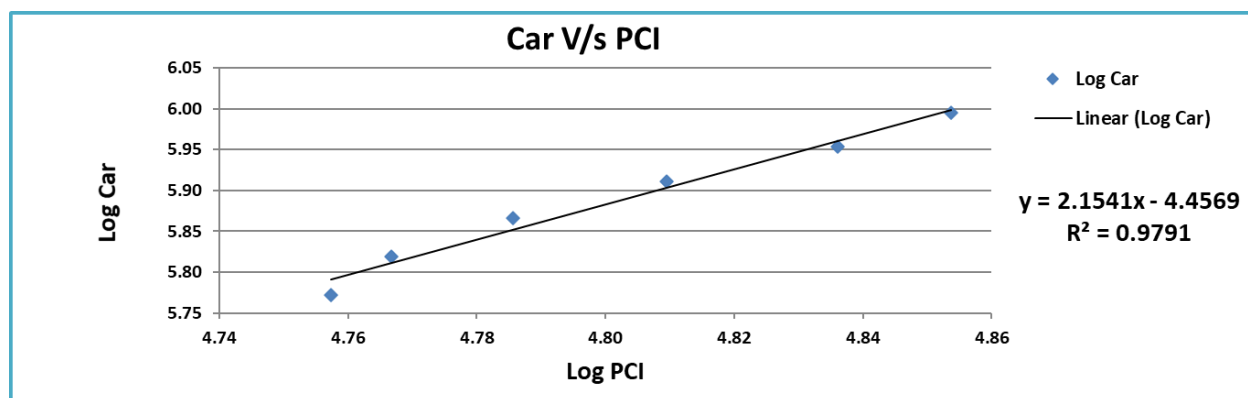


Figure 5-1: Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan

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.

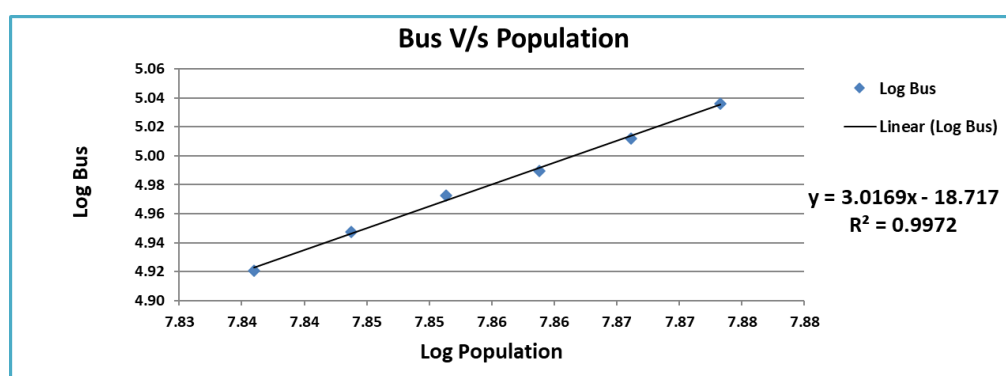


Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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.

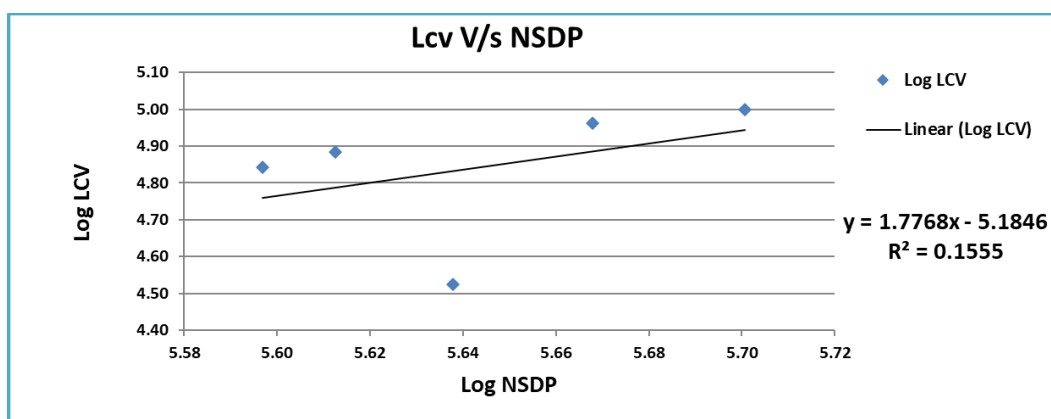


Figure 5-3: Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.

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%

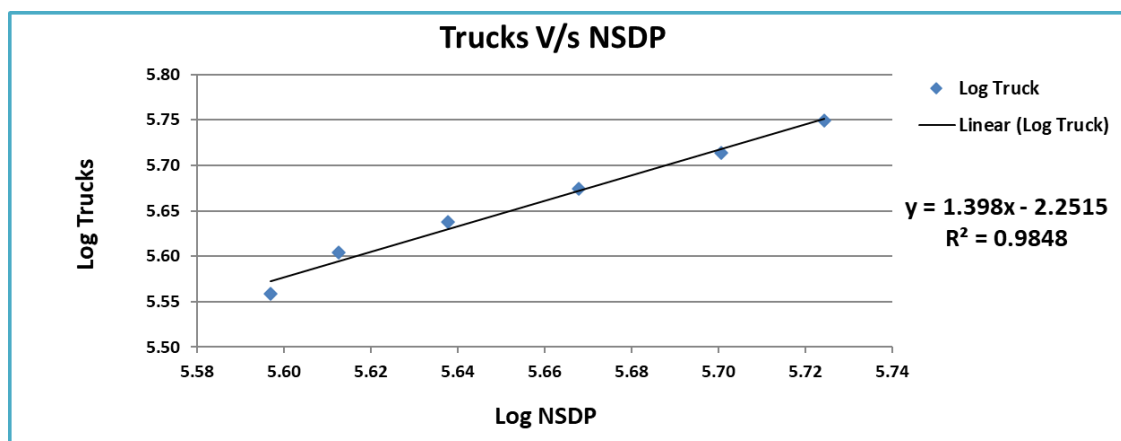


Figure 5-4: Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Rajasthan.

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.

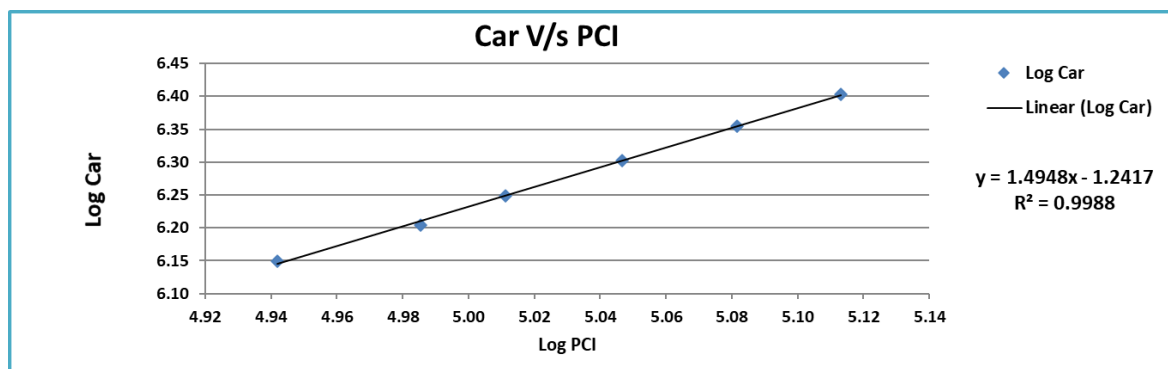


Figure 5-5: Regression and Elasticity PCI vs. Car – Extrapolation Gujarat

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.

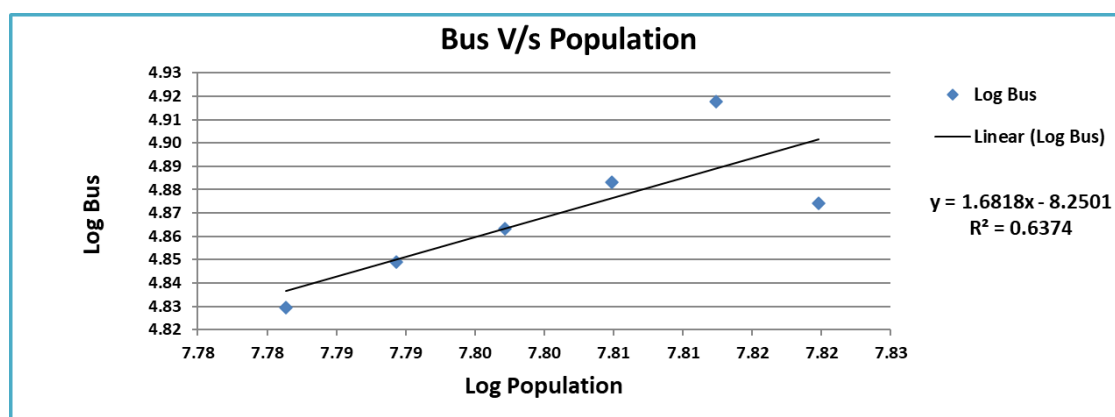


Figure 5-6: Regression and Elasticity Population vs. Bus – Extrapolation Gujarat

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.

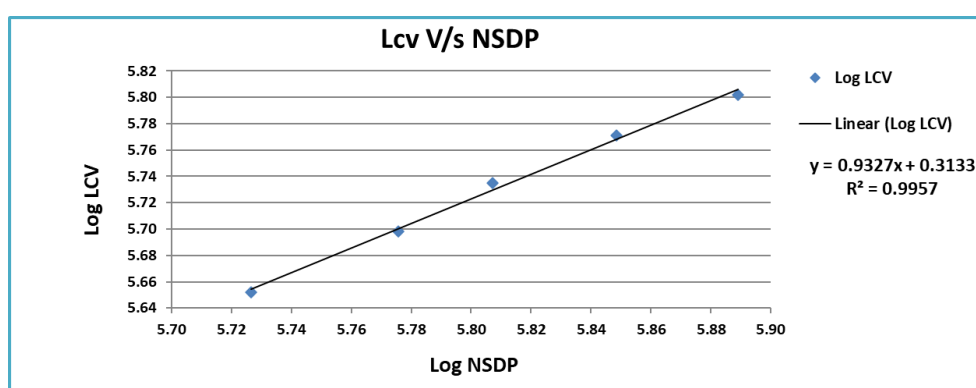


Figure 5-7: Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Gujarat.

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%

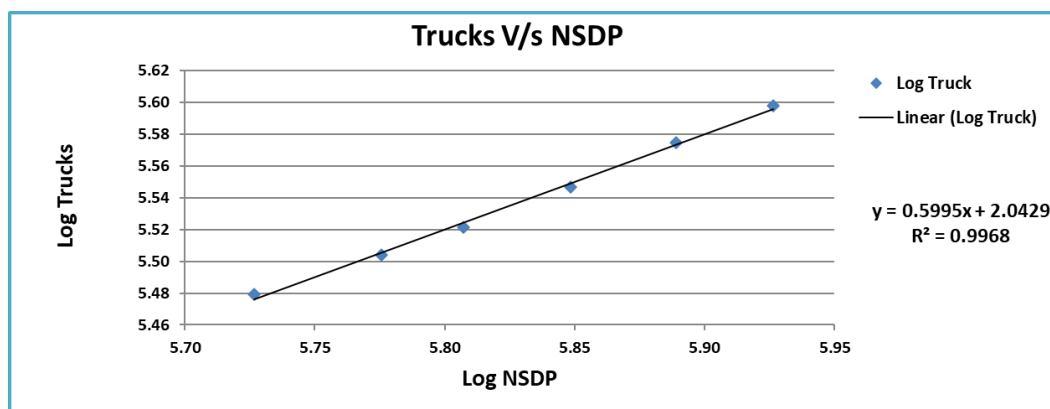


Figure 5-8: Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Gujarat.

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. 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 5-10 : 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.

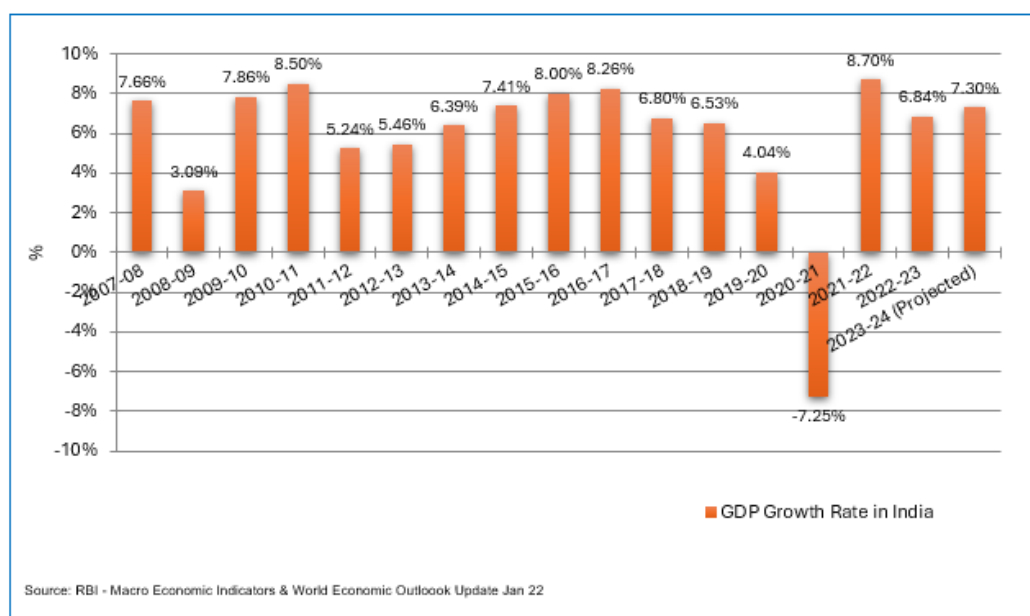


Figure 5-9 : Growth of GDP in India

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	2025-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.61%	8.31%	7.01%	6.58%	6.33%	6.09%
Bus	4.93%	4.73%	3.77%	3.56%	3.41%	3.26%
LCV	5.19%	4.89%	3.83%	3.34%	3.08%	2.83%
2- Axle	5.68%	5.38%	4.55%	4.05%	3.78%	3.53%
3 – Axle	6.02%	5.71%	4.55%	4.05%	3.78%	3.53%
4 to 6 Axle	6.37%	6.03%	4.55%	4.05%	3.78%	3.53%
7 and Above Axle	6.02%	5.71%	4.55%	4.05%	3.78%	3.53%

Table 5-12 : Recommended Growth Rates Pessimistic

Category / Year	2025-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.11%	7.81%	6.51%	6.08%	5.83%	5.59%
Bus	4.43%	4.23%	3.27%	3.06%	2.91%	2.76%
LCV	4.69%	4.39%	3.33%	2.84%	2.58%	2.33%
2- Axle	5.18%	4.88%	4.05%	3.55%	3.28%	3.03%
3 – Axle	5.52%	5.21%	4.05%	3.55%	3.28%	3.03%
4 to 6 Axle	5.87%	5.53%	4.05%	3.55%	3.28%	3.03%
7 and Above Axle	5.52%	5.21%	4.05%	3.55%	3.28%	3.03%

Table 5-13 : Recommended Growth Rates Most Likely

Category / Year	2025-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
Car/Jeep/Van	8.36%	8.06%	6.76%	6.33%	6.08%	5.84%
Bus	4.68%	4.48%	3.52%	3.31%	3.16%	3.01%
LCV	4.94%	4.64%	3.58%	3.09%	2.83%	2.58%
2- Axle	5.43%	5.13%	4.30%	3.80%	3.53%	3.28%
3 - Axle	5.77%	5.46%	4.30%	3.80%	3.53%	3.28%
4 to 6 Axle	6.12%	5.78%	4.30%	3.80%	3.53%	3.28%
7 and Above Axle	5.77%	5.46%	4.30%	3.80%	3.53%	3.28%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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- 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	6758	764	402	2372	1624	4953	5	16878	43409
2025-26	7476	816	482	2531	1778	5407	7	18497	47436
2026-27	8134	866	451	2720	1873	5747	5	19796	50449
2027-28	8916	916	533	2877	2030	6212	7	21491	54596
2028-29	9578	958	495	3048	2111	6515	5	22710	57317
2029-30	10406	1005	577	3196	2264	6974	7	24429	61439
2030-31	11052	1041	534	3357	2331	7216	5	25536	63774
2031-32	11869	1082	616	3493	2471	7613	7	27151	67522
2032-33	12611	1121	572	3667	2547	7882	5	28405	70142
2033-34	13539	1165	658	3817	2698	8313	7	30197	74246
2034-35	14393	1206	612	4006	2782	8610	5	31614	77170
2035-36	15388	1248	700	4151	2931	9033	7	33458	81286
2036-37	16301	1286	653	4334	3010	9316	5	34905	84166
2037-38	17425	1330	745	4493	3169	9770	7	36939	88638
2038-39	18464	1370	697	4690	3257	10081	5	38564	91838
2039-40	19733	1418	794	4863	3427	10569	7	40811	96704
2040-41	20871	1458	743	5062	3515	10880	5	42534	100001
2041-42	22252	1505	844	5237	3687	11375	7	44907	105033

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	6699	826	403	2706	1985	6096	9	18723	50688
2025-26	7391	883	430	2907	2138	6586	9	20344	54818
2026-27	8116	939	457	3108	2292	7082	9	22003	59005
2027-28	8872	994	483	3306	2446	7580	9	23690	63219
2028-29	9610	1041	505	3484	2586	8036	9	25271	67099
2029-30	10409	1092	528	3671	2734	8521	9	26964	71231
2030-31	11139	1134	548	3838	2858	8908	9	28434	74699
2031-32	11919	1177	568	4013	2987	9312	9	29985	78333
2032-33	12755	1222	589	4195	3123	9736	9	31629	82162
2033-34	13649	1268	610	4385	3265	10179	9	33365	86177
2034-35	14604	1315	632	4585	3414	10641	9	35200	90395
2035-36	15564	1359	654	4770	3552	11072	9	36980	94395
2036-37	16587	1404	676	4962	3695	11520	9	38853	98573
2037-38	17677	1450	699	5163	3845	11985	9	40828	102946
2038-39	18839	1497	723	5372	4000	12470	9	42910	107525
2039-40	20078	1546	749	5589	4162	12974	9	45107	112321
2040-41	21348	1593	775	5801	4320	13465	9	47311	117059
2041-42	22700	1641	801	6020	4483	13974	9	49628	121997

**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	6758	764	402	2372	1624	4953	5	16878	43409
2025-26	7442	812	481	2518	1770	5383	7	18413	47222
2026-27	8065	858	448	2695	1856	5694	5	19621	49995
2027-28	8799	905	528	2836	2002	6126	7	21203	53853
2028-29	9413	944	487	2991	2072	6395	5	22307	56279
2029-30	10178	986	568	3120	2212	6812	7	23883	60043
2030-31	10762	1016	521	3262	2265	7016	5	24847	62025
2031-32	11502	1051	601	3376	2390	7367	7	26294	65363
2032-33	12166	1084	554	3531	2449	7592	5	27381	67581
2033-34	13000	1121	637	3655	2584	7969	7	28973	71202
2034-35	13756	1156	589	3822	2649	8214	5	30191	73656
2035-36	14636	1189	674	3937	2780	8577	7	31800	77221
2036-37	15435	1221	624	4096	2838	8803	5	33022	79577
2037-38	16421	1257	712	4220	2978	9189	7	34784	83419
2038-39	17324	1291	660	4390	3040	9433	5	36143	86002
2039-40	18427	1328	751	4524	3188	9844	7	38069	90138
2040-41	19400	1361	698	4694	3247	10083	5	39488	92755
2041-42	20588	1397	791	4825	3396	10493	7	41497	96970

**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	6699	826	403	2706	1985	6096	9	18723	50688
2025-26	7355	880	427	2890	2128	6555	9	20244	54548
2026-27	8040	931	451	3073	2271	7015	9	21790	58430
2027-28	8749	981	473	3253	2412	7473	9	23350	62304
2028-29	9433	1024	493	3411	2537	7885	9	24792	65815
2029-30	10169	1068	513	3577	2668	8321	9	26325	69530
2030-31	10831	1103	530	3721	2775	8658	9	27627	72565
2031-32	11537	1139	547	3871	2886	9007	9	28996	75730
2032-33	12288	1176	564	4027	3003	9371	9	30438	79044
2033-34	13087	1214	582	4189	3124	9751	9	31956	82513
2034-35	13939	1254	601	4358	3250	10145	9	33556	86140
2035-36	14787	1289	619	4512	3366	10504	9	35086	89520
2036-37	15685	1325	638	4671	3485	10877	9	36690	93042
2037-38	16637	1362	658	4836	3608	11263	9	38373	96710
2038-39	17648	1400	678	5007	3735	11662	9	40139	100528
2039-40	18721	1439	698	5184	3866	12074	9	41991	104497
2040-41	19812	1476	718	5354	3992	12471	9	43832	108378
2041-42	20967	1513	739	5530	4122	12880	9	45760	112410

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	6758	764	402	2372	1624	4953	5	16878	43409
2025-26	7458	814	481	2524	1774	5394	7	18452	47321
2026-27	8099	861	449	2708	1864	5719	5	19705	50212
2027-28	8857	909	531	2856	2015	6168	7	21343	54214
2028-29	9496	949	491	3019	2090	6454	5	22504	56785
2029-30	10292	993	573	3157	2236	6893	7	24151	60730
2030-31	10908	1026	528	3309	2296	7115	5	25187	62886
2031-32	11685	1063	609	3434	2428	7490	7	26716	66429
2032-33	12389	1098	563	3598	2497	7734	5	27884	68836
2033-34	13269	1138	647	3736	2639	8139	7	29575	72699
2034-35	14074	1177	600	3913	2716	8409	5	30894	75390
2035-36	15012	1214	686	4045	2855	8804	7	32623	79241
2036-37	15868	1249	637	4214	2925	9055	5	33953	81840
2037-38	16922	1288	726	4356	3073	9478	7	35850	86002
2038-39	17891	1326	676	4538	3151	9752	5	37339	88882
2039-40	19077	1368	768	4693	3308	10204	7	39425	93386
2040-41	20130	1404	716	4875	3385	10476	5	40991	96329

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2041-42	21412	1445	811	5030	3543	10931	7	43179	100953

**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	6699	826	403	2706	1985	6096	9	18723	50688
2025-26	7372	882	429	2897	2133	6569	9	20291	54673
2026-27	8078	936	455	3088	2282	7047	9	21895	58709
2027-28	8810	989	480	3276	2430	7525	9	23519	62755
2028-29	9521	1034	501	3443	2561	7961	9	25030	66452
2029-30	10289	1081	523	3619	2701	8421	9	26643	70375
2030-31	10985	1119	541	3774	2817	8782	9	28027	73619
2031-32	11728	1158	560	3935	2938	9160	9	29488	77025
2032-33	12520	1200	580	4103	3064	9553	9	31029	80590
2033-34	13366	1243	600	4279	3195	9963	9	32655	84327
2034-35	14269	1287	621	4462	3332	10392	9	34372	88249
2035-36	15172	1326	641	4631	3458	10786	9	36023	91929
2036-37	16131	1368	662	4806	3588	11195	9	37759	95769
2037-38	17151	1410	683	4987	3724	11619	9	39583	99774
2038-39	18236	1453	705	5176	3864	12060	9	41503	103961
2039-40	19389	1497	727	5371	4010	12518	9	43521	108330
2040-41	20569	1540	749	5560	4151	12960	9	45538	112620
2041-42	21820	1583	772	5755	4297	13418	9	47654	117088

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 - 1st 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

Targe t Year	Target Traffi c	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variatio n in CP	Origi nal CP	Change in CP (In Years)
2026	76316	54647	-28%	43%	20%	20	4

Optimistic

Targe t Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variatio n in CP	Origi nal CP	Change in CP (In Years)
2026	76316	54920	-28%	42%	20%	20	4

Pessimistic

Targe t Year	Target Traffic	Actual Traffic	% of Excess / Short traffic	% Revision (+ or -) in CP as per CA	% Variatio n in CP	Origi nal CP	Change in CP (In Years)
2026	76316	54392	-29%	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) 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.

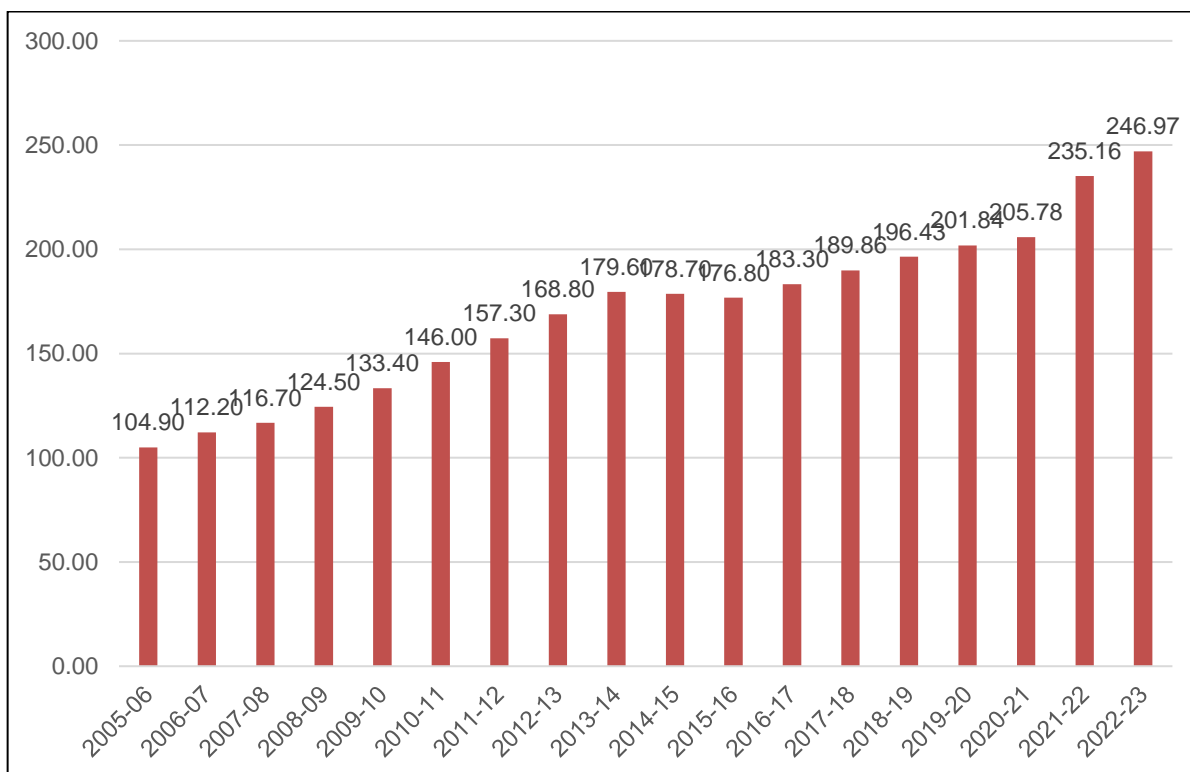


Figure 7-1 : Historical Rate of WPI Inflation in India

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	525	635
2025-26	100	165	345	345	375	540	660
2026-27	105	175	360	360	395	570	690
2027-28	110	180	380	380	415	595	725
2028-29	120	190	400	400	435	625	765
2029-30	125	200	420	420	460	660	800
2030-31	130	210	440	440	480	690	845
2031-32	135	220	465	465	505	730	885
2032-33	145	235	490	490	535	765	930
2033-34	150	245	515	515	560	805	980
2034-35	160	260	540	540	590	845	1030
2035-36	170	270	570	570	620	890	1085
2036-37	175	285	600	600	655	940	1140
2037-38	185	300	630	630	685	990	1205
2038-39	195	315	665	665	725	1040	1265
2039-40	205	335	700	700	760	1095	1335
2040-41	215	350	735	735	805	1155	1405
2041-42	230	370	775	775	845	1215	1480

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	170	360	360	390	560	685
2026-27	110	180	375	375	410	590	715
2027-28	115	190	395	395	430	620	755
2028-29	120	200	415	415	450	650	790
2029-30	130	210	435	435	475	685	830
2030-31	135	220	460	460	500	720	875
2031-32	140	230	480	480	525	755	920
2032-33	150	240	505	505	550	795	965
2033-34	155	255	535	535	580	835	1015
2034-35	165	265	560	560	610	880	1070
2035-36	175	280	590	590	645	925	1125
2036-37	185	295	620	620	675	975	1185
2037-38	195	310	655	655	715	1025	1245
2038-39	205	330	690	690	750	1080	1315
2039-40	215	345	725	725	790	1135	1385
2040-41	225	365	765	765	835	1195	1455
2041-42	240	385	805	805	875	1260	1535

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	245	515	515	565	810	990
2026-27	160	260	545	545	595	850	1035
2027-28	170	270	570	570	625	895	1090
2028-29	175	285	600	600	655	940	1145
2029-30	185	300	630	630	685	990	1205
2030-31	195	315	660	660	725	1040	1265
2031-32	205	330	695	695	760	1090	1330
2032-33	215	350	730	730	800	1150	1400
2033-34	230	370	770	770	840	1210	1470
2034-35	240	385	810	810	885	1270	1545
2035-36	250	405	855	855	930	1335	1630
2036-37	265	430	900	900	980	1410	1715
2037-38	280	450	945	945	1030	1480	1805
2038-39	295	475	995	995	1085	1560	1900
2039-40	310	500	1050	1050	1145	1645	2000
2040-41	325	525	1105	1105	1205	1730	2110
2041-42	345	555	1165	1165	1270	1825	2220

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	250	520	520	565	815	990
2025-26	160	255	535	535	585	840	1025
2026-27	165	270	565	565	615	885	1075
2027-28	175	280	590	590	645	930	1130
2028-29	185	295	620	620	680	975	1185
2029-30	195	310	655	655	715	1025	1250
2030-31	205	330	685	685	750	1075	1310
2031-32	215	345	720	720	790	1135	1380
2032-33	225	360	760	760	830	1190	1450
2033-34	235	380	800	800	870	1255	1525
2034-35	250	400	840	840	915	1320	1605
2035-36	260	420	885	885	965	1385	1690
2036-37	275	445	930	930	1015	1460	1775
2037-38	290	470	980	980	1070	1535	1870
2038-39	305	495	1030	1030	1125	1620	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

Table 7-6 : Toll Rates for Monthly Pass Local @ Km 121.020

Year	Car	Minibus /LCV
2024-25	340	1485
2025-26	350	1520
2026-27	370	1595
2027-28	385	1675
2028-29	405	1760
2029-30	425	1850
2030-31	450	1945
2031-32	470	2040
2032-33	495	2140
2033-34	520	2245
2034-35	550	2355
2035-36	575	2475
2036-37	605	2600
2037-38	640	2730
2038-39	675	2865
2039-40	710	3010
2040-41	745	3160
2041-42	785	3320

Table 7-7 : Toll Rates for Monthly Pass Local @ Km 184.020

Year	Car	Minibus /LCV
2024-25	340	1175
2025-26	350	1205
2026-27	370	1265
2027-28	385	1330
2028-29	405	1395
2029-30	425	1465
2030-31	450	1540
2031-32	470	1615
2032-33	495	1695
2033-34	520	1780
2034-35	550	1870
2035-36	575	1965
2036-37	605	2065
2037-38	640	2170
2038-39	675	2280
2039-40	710	2395
2040-41	745	2515
2041-42	785	2640

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	3285	5305	11115	11115	12125	17425	21215
2025-26	3395	5485	11495	11495	12540	18025	21945
2026-27	3565	5760	12075	12075	13170	18930	23050
2027-28	3745	6055	12680	12680	13835	19890	24210
2028-29	3935	6360	13325	13325	14535	20895	25440
2029-30	4135	6685	14005	14005	15275	21960	26735
2030-31	4350	7025	14720	14720	16060	23085	28100
2031-32	4570	7385	15475	15475	16885	24270	29545
2032-33	4810	7765	16275	16275	17755	25520	31070
2033-34	5060	8170	17120	17120	18675	26845	32680
2034-35	5320	8595	18010	18010	19645	28240	34380
2035-36	5600	9045	18950	18950	20675	29720	36180
2036-37	5895	9520	19945	19945	21760	31280	38080
2037-38	6205	10025	21000	21000	22910	32930	40090
2038-39	6535	10555	22115	22115	24125	34675	42215
2039-40	6880	11115	23290	23290	25405	36525	44460
2040-41	7250	11710	24535	24535	26765	38475	46840
2041-42	7640	12340	25850	25850	28200	40540	49350

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	3405	5500	11525	11525	12570	18075	22000
2025-26	3520	5690	11920	11920	13005	18695	22755
2026-27	3700	5975	12520	12520	13660	19635	23900
2027-28	3885	6275	13150	13150	14345	20625	25110
2028-29	4085	6595	13820	13820	15075	21670	26380
2029-30	4290	6930	14520	14520	15840	22775	27725
2030-31	4510	7285	15265	15265	16650	23940	29140
2031-32	4740	7660	16050	16050	17510	25170	30640
2032-33	4985	8055	16875	16875	18410	26465	32220
2033-34	5245	8475	17750	17750	19365	27840	33890
2034-35	5520	8915	18675	18675	20375	29290	35655
2035-36	5805	9380	19655	19655	21440	30820	37520
2036-37	6110	9875	20685	20685	22565	32440	39490
2037-38	6435	10395	21780	21780	23755	34150	41575
2038-39	6775	10945	22930	22930	25015	35960	43780
2039-40	7135	11525	24150	24150	26350	37875	46110
2040-41	7515	12145	25445	25445	27755	39900	48575
2041-42	7920	12795	26810	26810	29245	42040	51180

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	174.17	210.85	385.02
2025-26	193.50	236.43	429.93
2026-27	218.95	267.12	486.07
2027-28	246.49	301.53	548.01
2028-29	274.55	334.53	609.08
2029-30	307.05	374.16	681.20
2030-31	336.85	412.26	749.11
2031-32	373.43	454.11	827.54
2032-33	411.37	499.57	910.93
2033-34	453.38	550.52	1003.91
2034-35	499.96	607.74	1107.70
2035-36	551.19	669.30	1220.48
2036-37	604.57	733.24	1337.81
2037-38	664.14	806.14	1470.28
2038-39	730.33	886.12	1616.45
2039-40	805.17	975.18	1780.35
2040-41	880.97	1067.21	1948.19
2041-42	968.44	1170.84	2139.28

Table 7-11 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	TP-1	TP2	Total
2024-25	174.17	210.85	385.02
2025-26	192.62	235.29	427.90
2026-27	217.00	264.53	481.52
2027-28	243.11	297.12	540.23
2028-29	269.61	328.11	597.72
2029-30	300.10	365.22	665.32
2030-31	327.64	400.49	728.13
2031-32	361.40	439.03	800.43
2032-33	396.14	480.65	876.78
2033-34	434.52	527.14	961.66
2034-35	476.89	579.18	1056.07
2035-36	523.23	634.73	1157.96

Year	TP-1	TP2	Total
2036-37	571.21	692.19	1263.40
2037-38	624.49	757.45	1381.94
2038-39	683.43	828.52	1511.95
2039-40	749.93	907.28	1657.21
2040-41	816.63	988.11	1804.73
2041-42	893.44	1078.79	1972.24

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

Year	TP-1	TP2	Total
2024-25	174.17	210.85	385.02
2025-26	193.05	235.84	428.89
2026-27	217.96	265.83	483.79
2027-28	244.79	299.37	544.16
2028-29	272.08	331.38	603.45
2029-30	303.55	369.71	673.26
2030-31	332.25	406.34	738.58
2031-32	367.36	446.60	813.96
2032-33	403.68	490.15	893.84
2033-34	443.92	538.83	982.75
2034-35	488.44	593.39	1081.83
2035-36	537.23	651.94	1189.17
2036-37	587.96	712.52	1300.49
2037-38	644.46	781.50	1425.96
2038-39	706.97	856.80	1563.78
2039-40	777.49	940.57	1718.06
2040-41	848.71	1026.70	1875.40
2041-42	930.61	1123.65	2054.26

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)

JANUARY 2025



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IN THE STATE OF UTTAR PRADESH
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ABBREVIATIONS

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

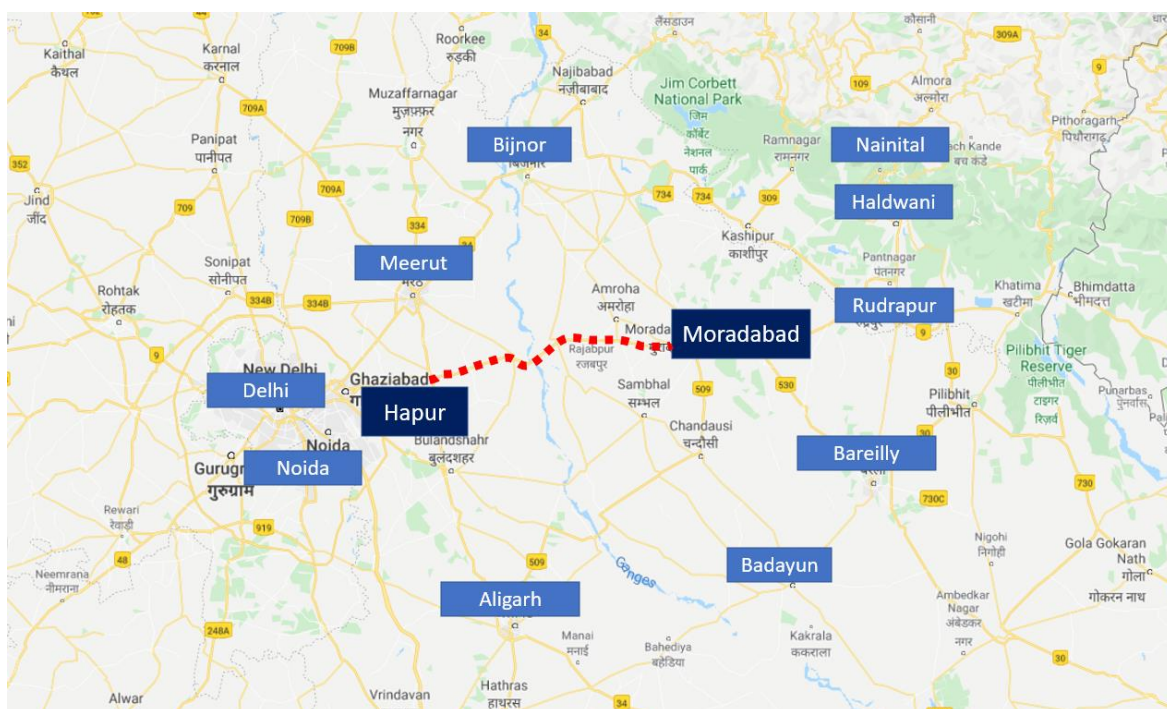


Figure 1-1: Alignment of Project Stretch

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 99.869 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.

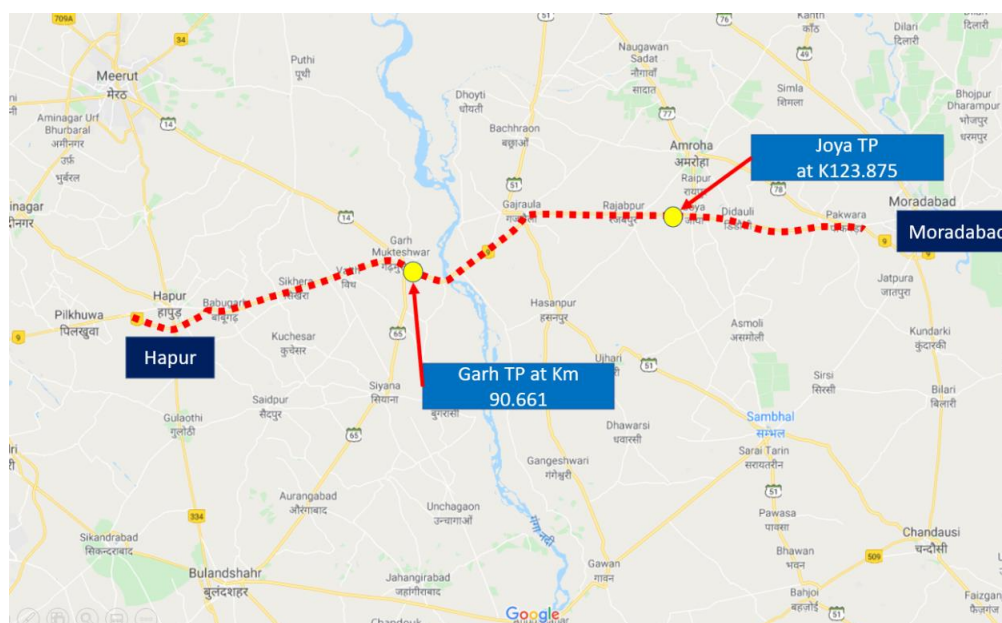


Figure 2-1: Project Alignment with Toll Plaza

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 November 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 & Eight month from April 2024 to November 2024	November 2023 & Eight month from April 2024 to November 2024	April 2023 to November 2023 & Eight month from April 2024 to November 2024	from April 2023 to November 2023 & Eight month from April 2024 to November 2024	April 2023 to November 2023 & Eight month from April 2024 to November 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 & Eight month from April 2024 to November 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from 2019 to 2020, 2020 to 2021, 2021 to 2022, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 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

Vehicle Type	
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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	29034
2	Minibus/LCV	3704	3119	1995	1730	1743	1722
3	Bus	2033	1573	1862	2069	2303	2325
4	Truck	1289	1354	1674	1972	2036	1692
5	3-Axle	1318	1105	1112	1070	1075	828
6	Multi Axle	1753	1635	1745	1962	2191	2096
7	Oversized Vehicle	2	6	6	9	7	4
	Total	24977	24657	30283	32899	36686	37701

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	19904
2	Minibus/LCV	2595	2259	1335	1181	1191	1267
3	Bus	1062	1303	1485	1768	2008	1890
4	Truck	1532	1040	1184	1436	1628	1657

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	774
6	Multi Axle	1365	1370	1458	1765	2017	2126
7	Oversize Vehicle	2	8	8	9	6	5
	Total	17982	17570	20246	23203	26481	27623

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

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
Garh Km 90.661	2019-2020	24977	42251	1.69
	2020-2021	24657	40024	1.62
	2021-2022	30283	46705	1.54
	2022-2023	32899	50882	1.55
	2023-2024	36686	56079	1.53
	2024-2025	37701	55601	1.47
Joya Km 123.875	2019-2020	17982	31508	1.75
	2020-2021	17570	30337	1.73
	2021-2022	20246	33545	1.66
	2022-2023	23203	38427	1.66
	2023-2024	26481	43300	1.64
	2024-2025	27623	44357	1.61

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.

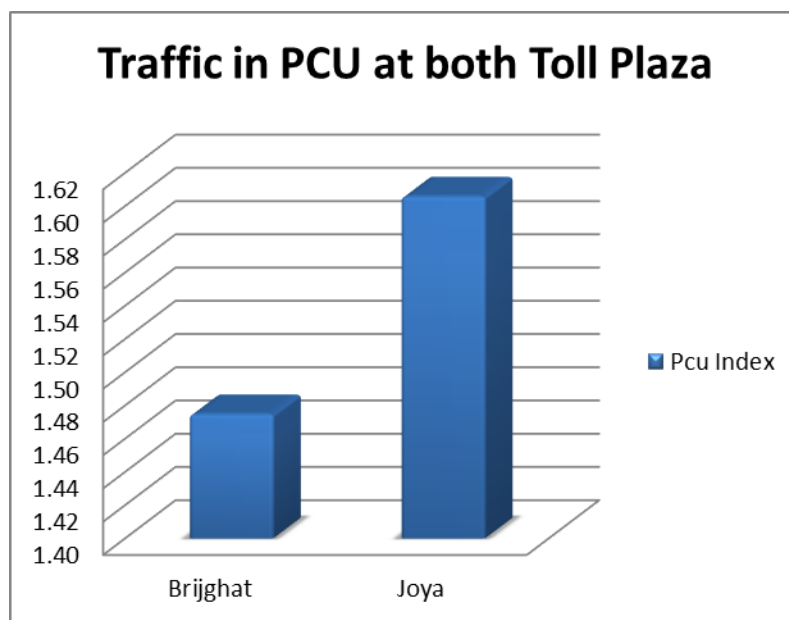


Figure 3-1: Comparison of PCU Index

It can be observed that PCU index is consistent at both toll plaza locations.

3.4.2 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.

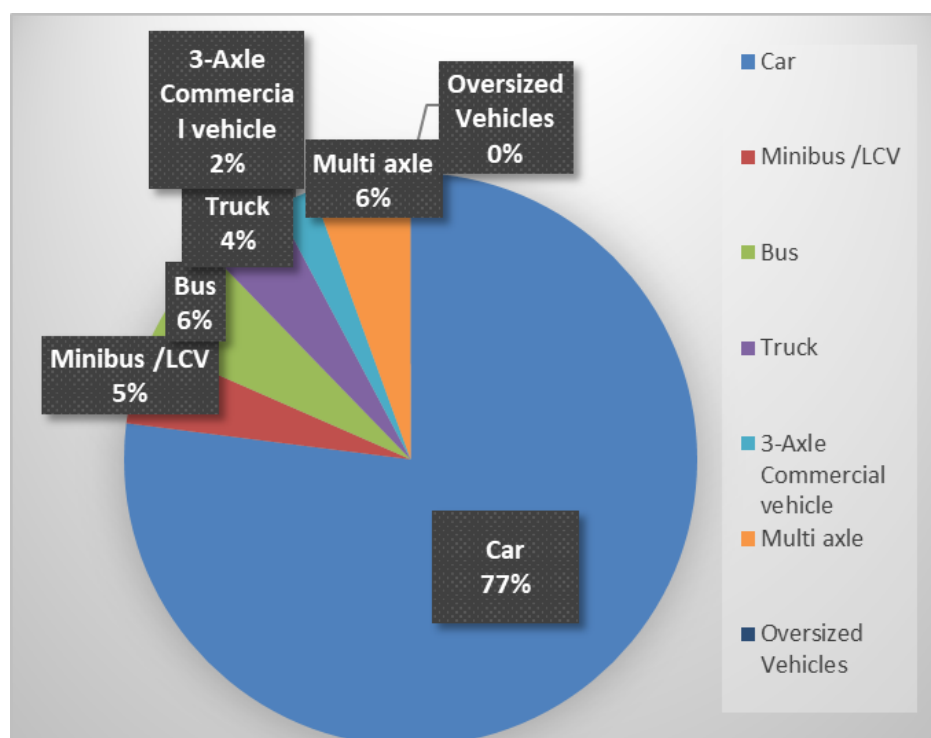


Figure 3-2: Model Split of Tollable Vehicle @TP-1

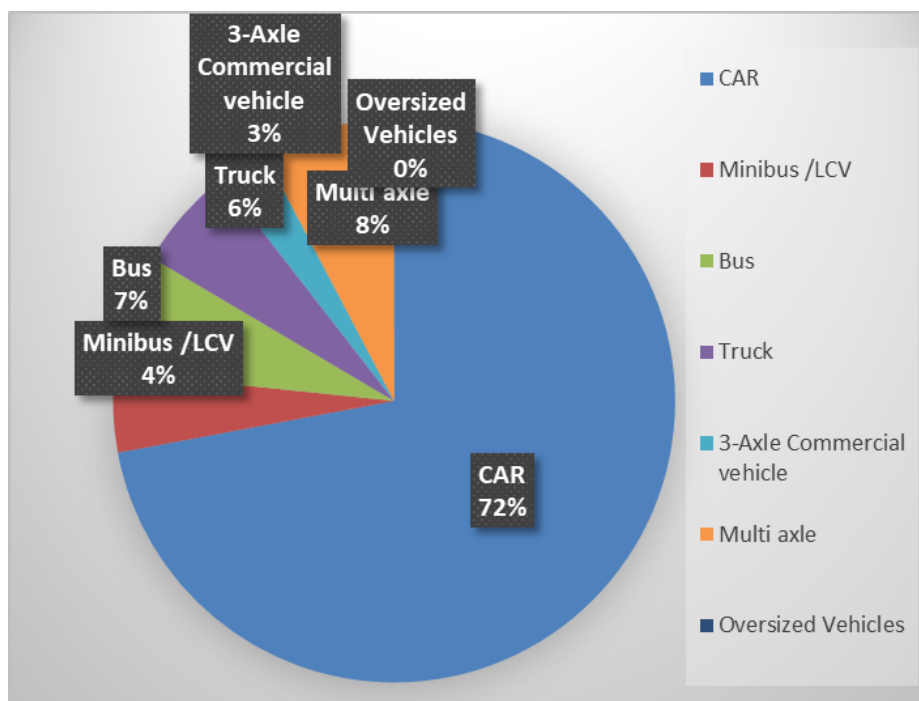


Figure 3-3: Model Split of Tollable Vehicle @TP-2

It is observed that car traffic forms about 77% - 72% of total traffic at toll plaza locations while multi axle commercial vehicles are about 8% -11% of total traffic. Truck / Bus and LCV share about 10%-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	16791
2	Return Journey	20864
3	Local Commercial Single Journey	9
4	Monthly Pass Local	32
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	14225
2	Return Journey	13366
3	Local Commercial Single Journey	15
4	Monthly Pass Local	10
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.

3.5 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 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.

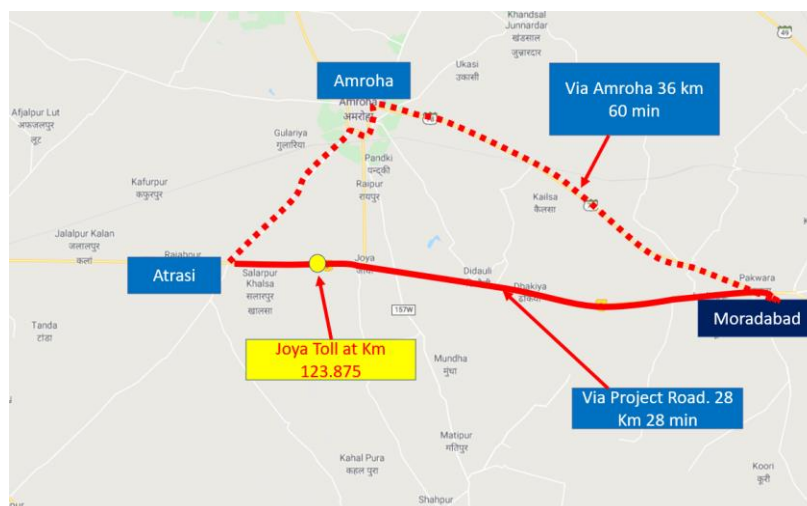


Figure 4-1: Alternate route at regional level

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.

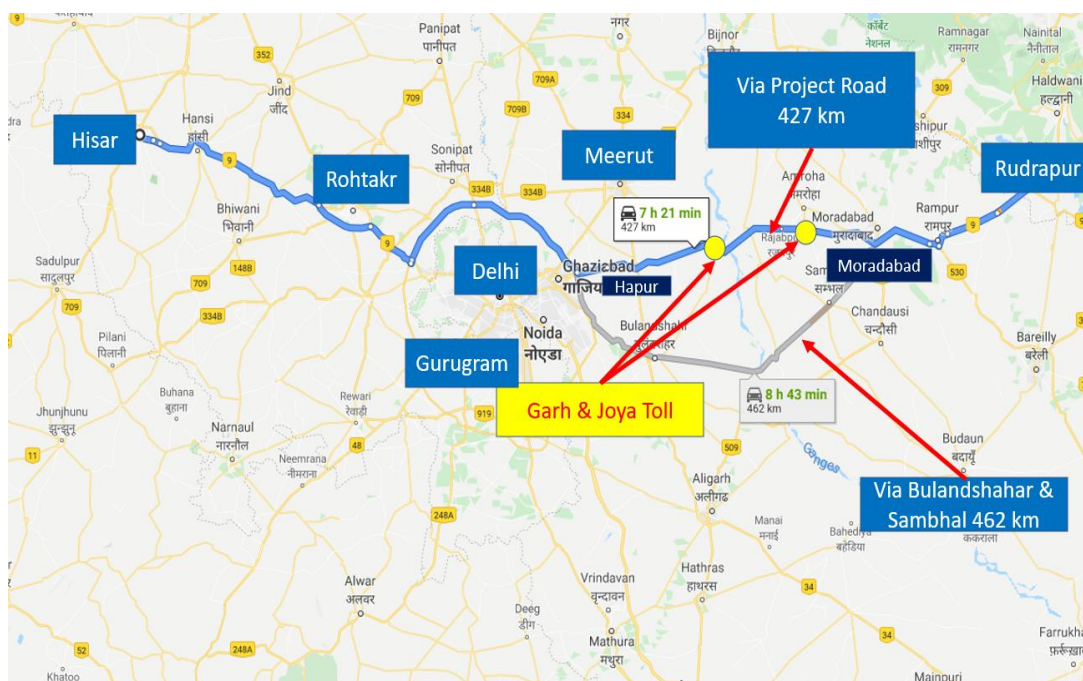


Figure 4-2: Alternate route at local level

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.

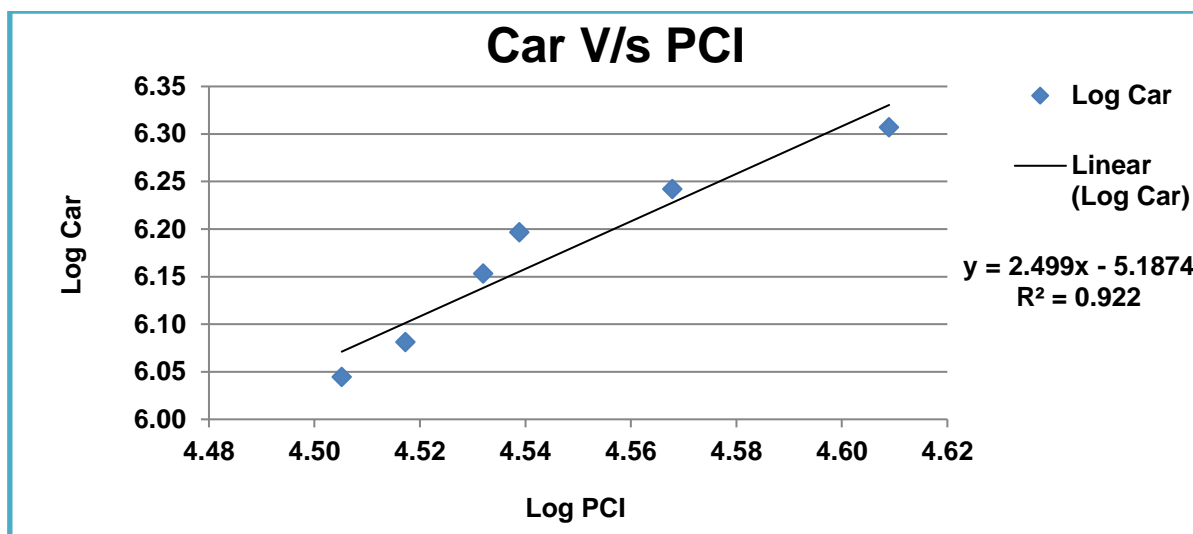


Figure 5-1: Regression and Elasticity PCI vs. Car–Extrapolation Uttar Pradesh

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.

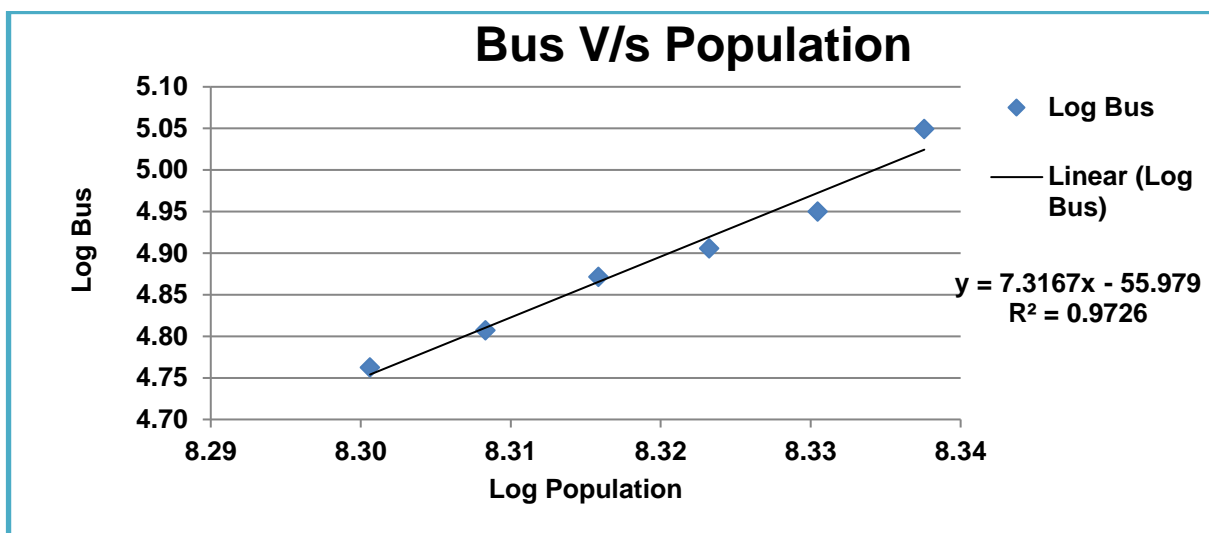


Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh

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.

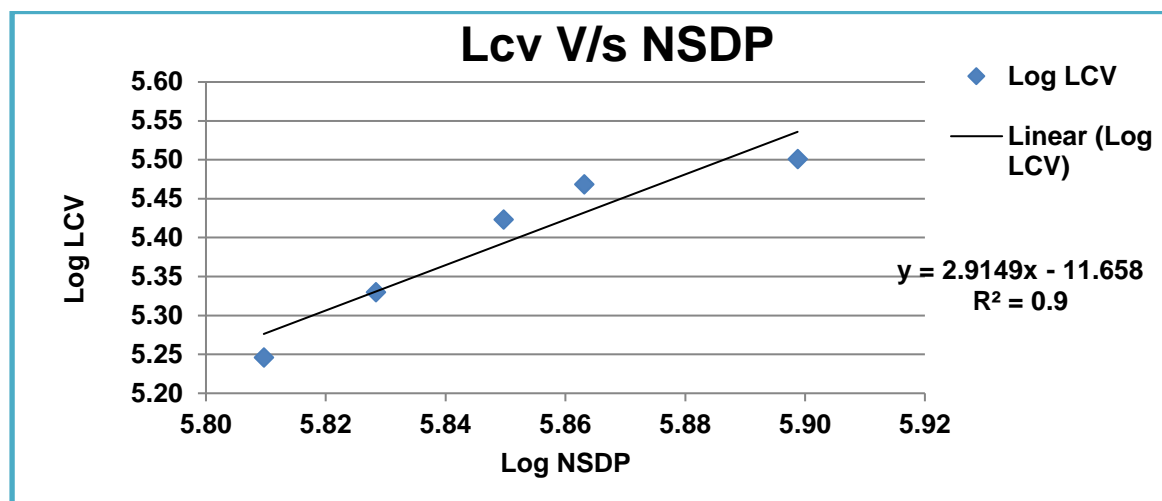


Figure 5-3: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Uttar Pradesh

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.

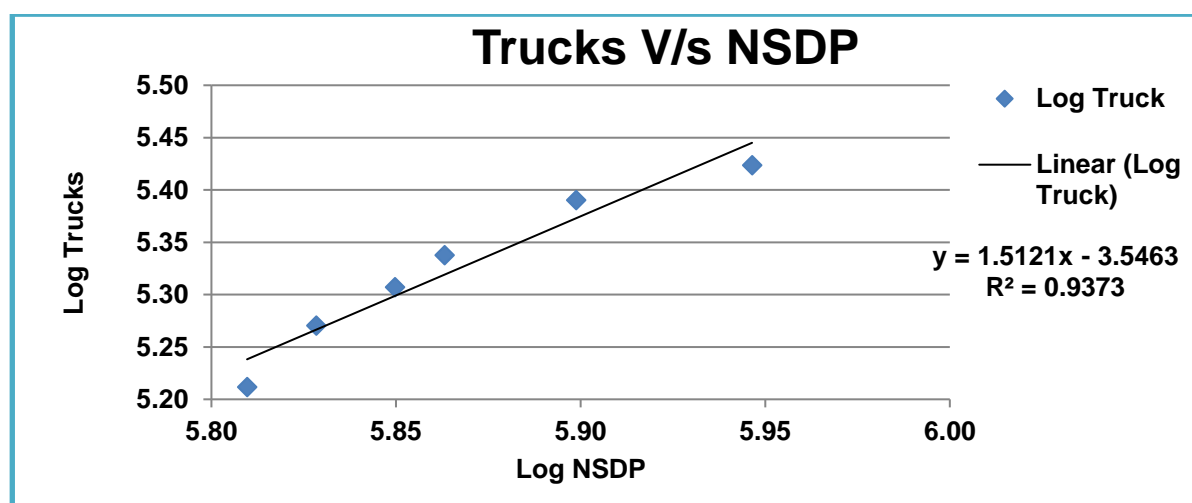


Figure 5-4: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Uttar Pradesh

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. 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 5-4 : 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 ² = 0.922	2.4990	4.94%	12.34%
	Bus	Population	$y = 7.3167x - 55.9791$	R ² = 0.9726	7.3167	1.72%	12.56%
	LCV	NSDP	$y = 2.9149x - 11.6585$	R ² = 0.9	2.9149	5.28%	15.40%
	Truck	NSDP	$y = 1.5121x - 3.5463$	R ² = 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.

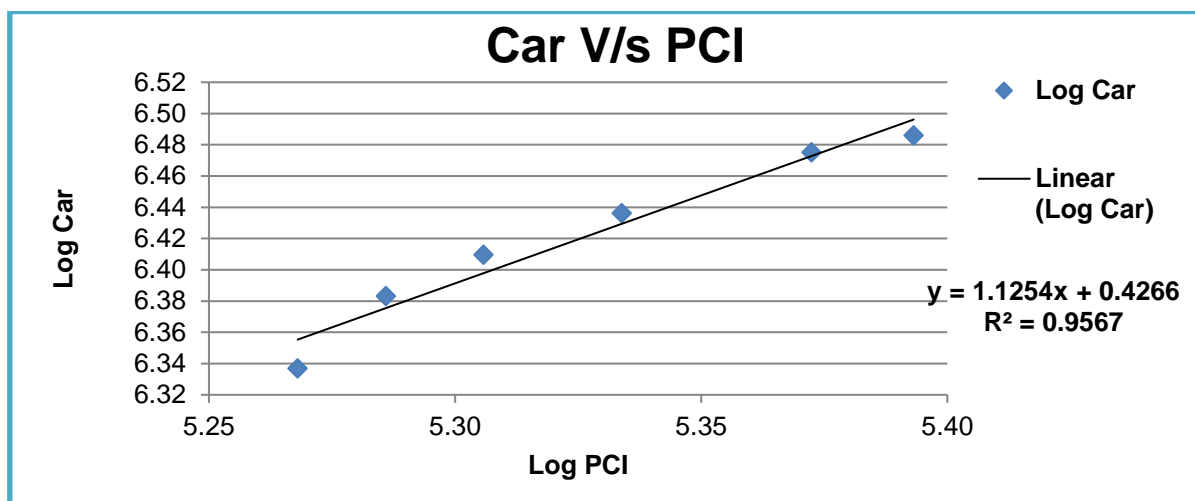


Figure 5-5: Regression and Elasticity PCI vs. Car–Extrapolation Delhi

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.

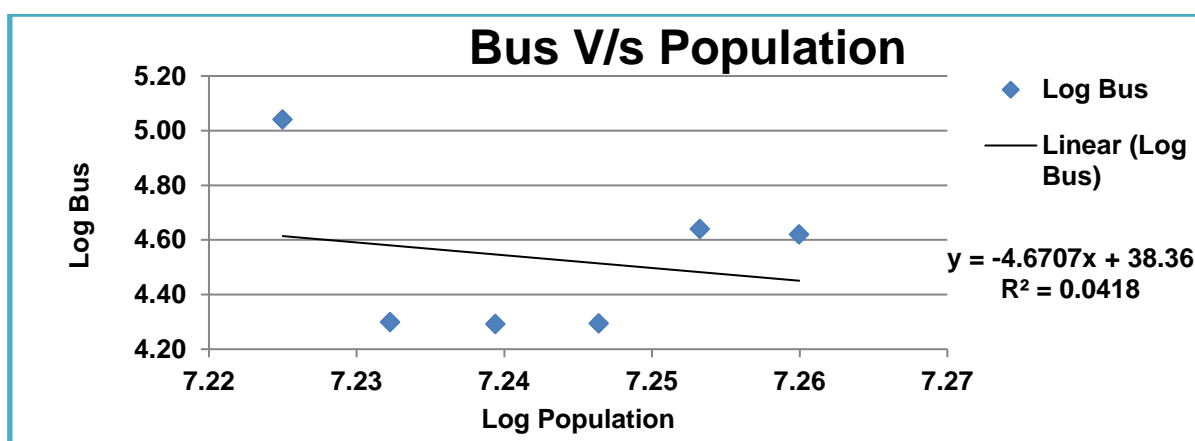


Figure 5-6: Regression and Elasticity Population vs. Bus – Extrapolation Delhi

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.

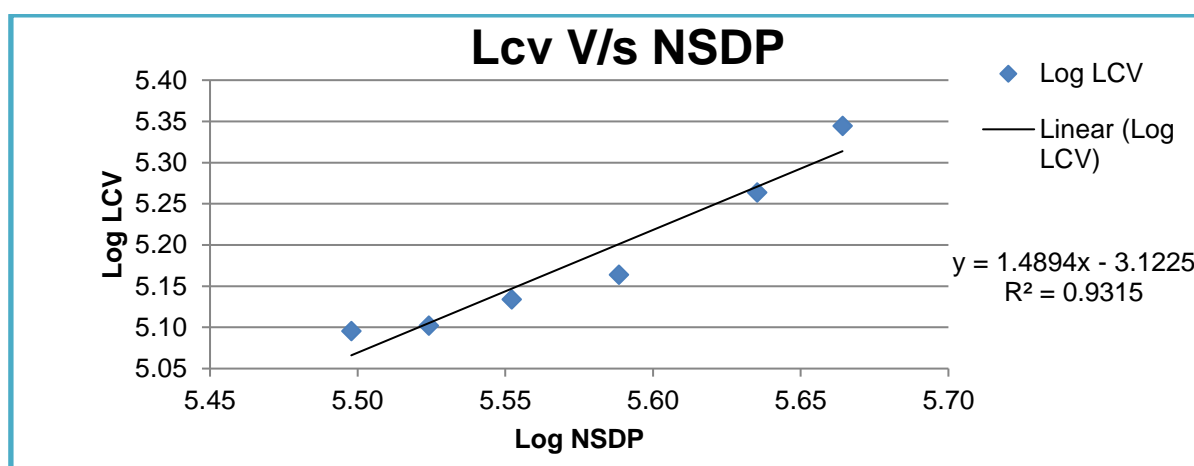
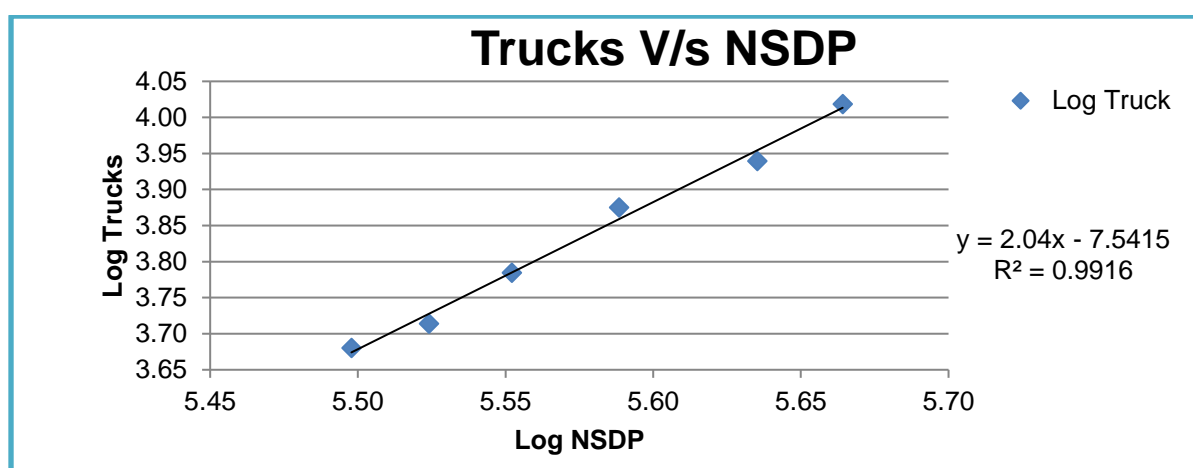


Figure 5-7: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Delhi

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. 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 5-8 : 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.

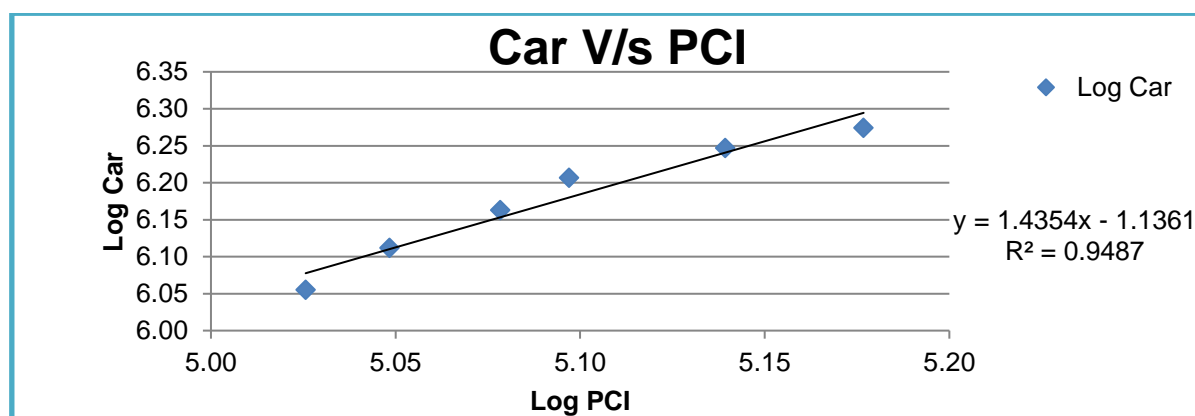
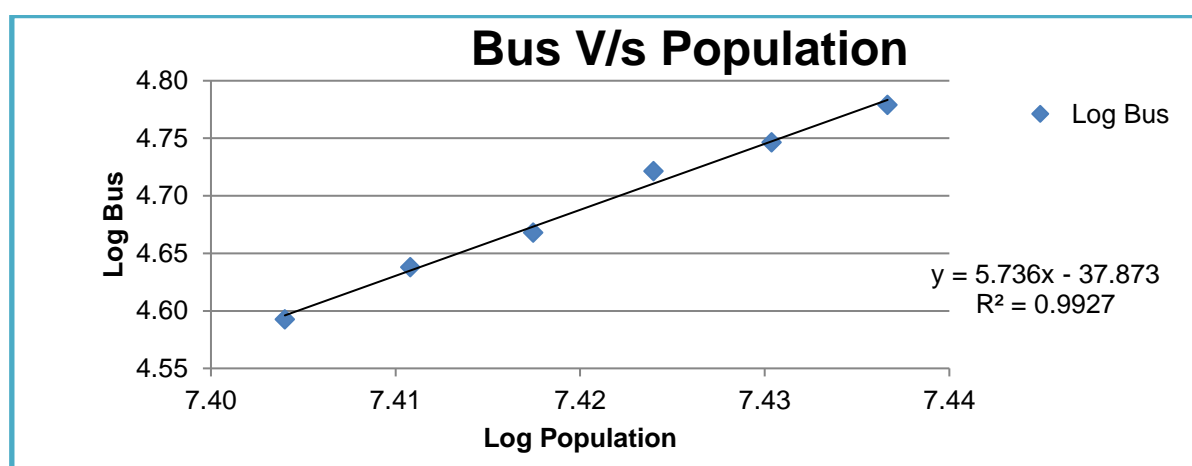
**Figure 5-9: Regression and Elasticity PCI vs. Car–Extrapolation Haryana**

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.

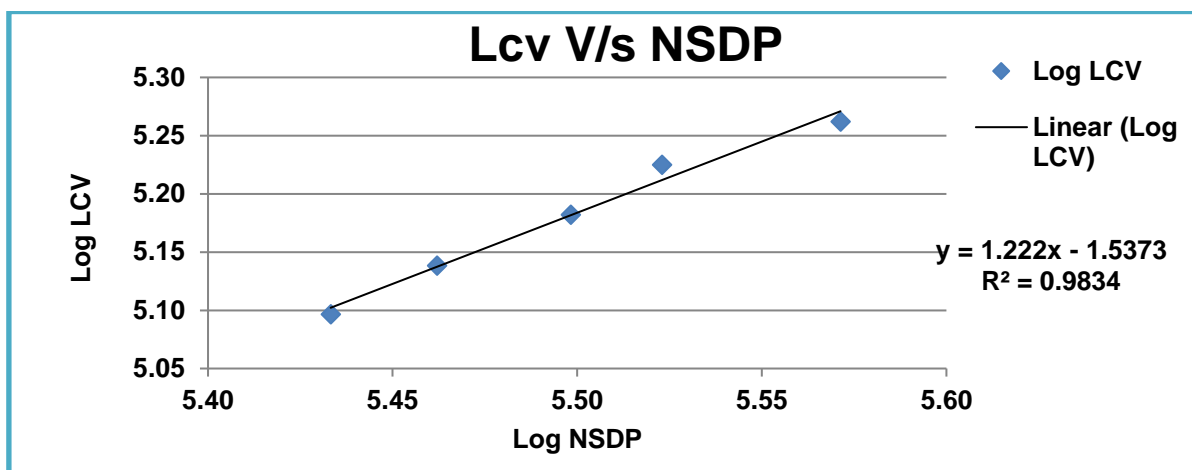


Figure 5-11: Regression and Elasticity NSDP vs. LCV Traffic – extrapolation Haryana

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.

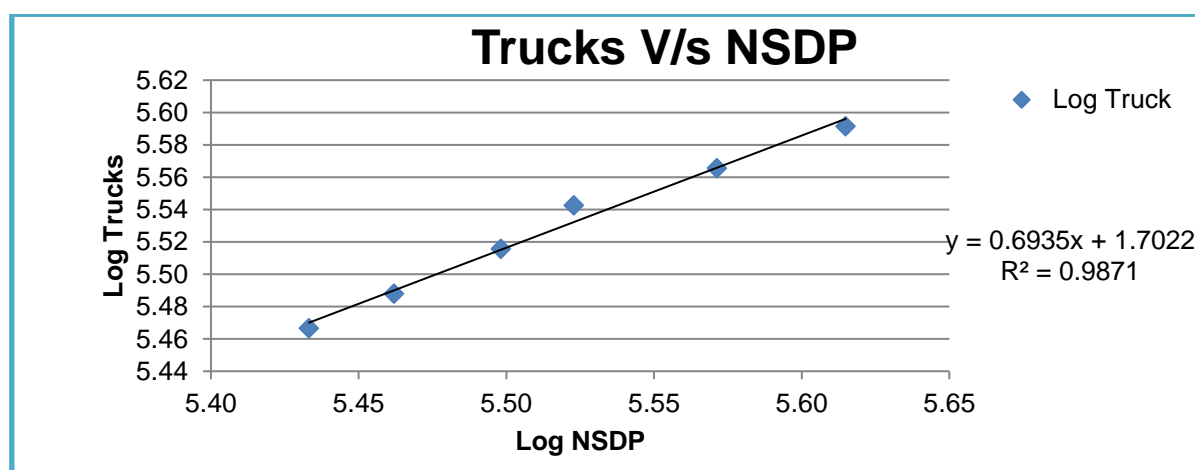


Figure 5-12: Regression and Elasticity NSDP vs. Truck Traffic – extrapolation Haryana

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. 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 5-13: 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.

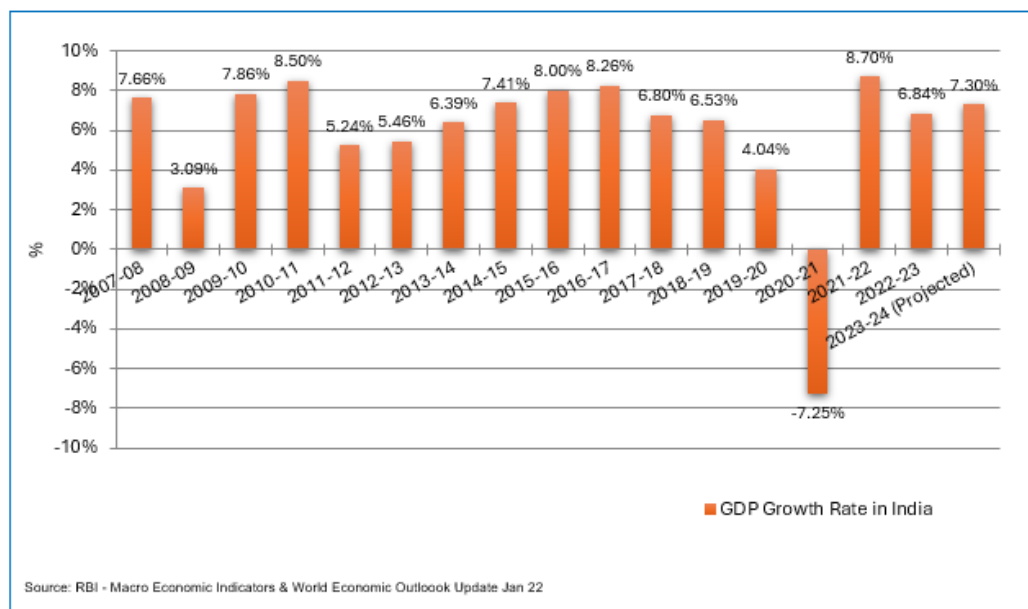


Figure 5-14: Growth of GDP in India

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.

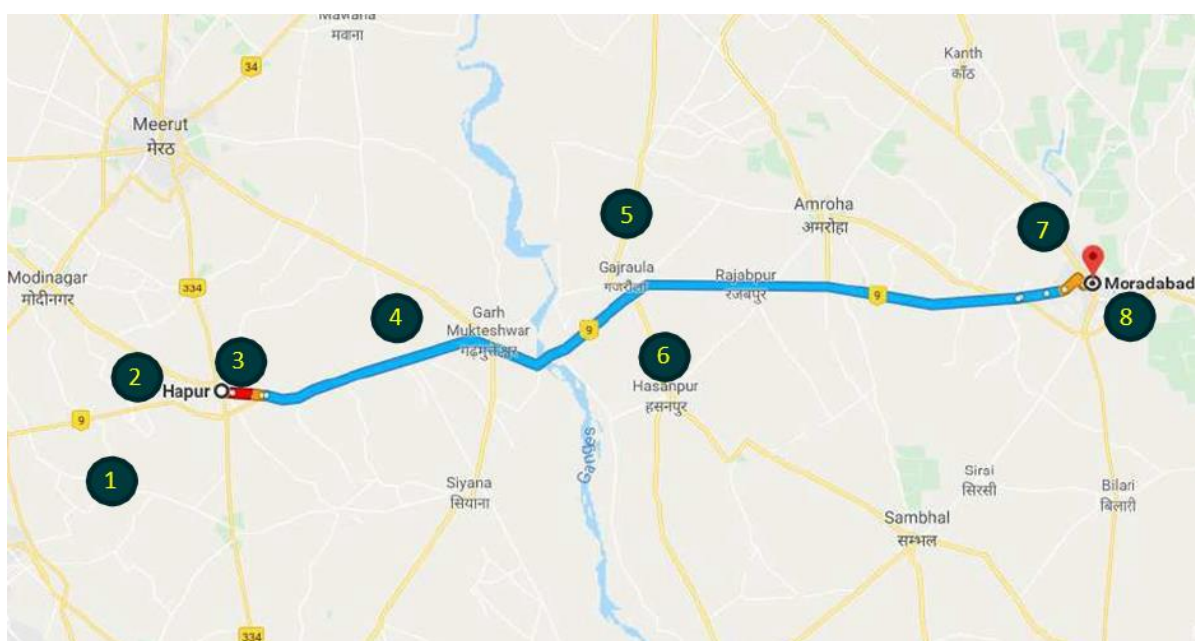


Figure 5-15: Industrial Units along project corridor

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	2025-2026	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	2025-2026	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

Category / Year	2025-2026	2026-2031	2031-2036	2036-2041	2041-2046
Car/Jeep/Van	5.98%	5.76%	5.53%	4.11%	3.92%
LCV	3.01%	2.81%	2.22%	1.51%	1.32%
Bus	3.08%	2.95%	3.19%	2.48%	2.37%
2- Axle	3.56%	3.36%	2.92%	1.51%	1.32%
3 - Axle	3.56%	3.36%	2.92%	1.51%	1.32%
4 to 6 Axle	3.89%	3.67%	3.18%	1.64%	1.43%
7 and Above Axle	3.89%	3.67%	3.18%	1.64%	1.43%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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	29034	1722	2325	1692	828	2096	4	37701	55601
2025-26	31361	1809	2446	1786	875	2220	4	40501	59404
2026-27	33718	1891	2561	1877	919	2340	4	43310	63174
2027-28	36082	1968	2669	1963	961	2455	4	46102	66879
2028-29	38251	2028	2754	2034	995	2551	4	48617	70140
2029-30	40551	2090	2842	2107	1031	2650	4	51275	73569
2030-31	42895	2141	2940	2173	1064	2741	4	53958	76990
2031-32	45374	2194	3041	2242	1097	2835	4	56787	80581
2032-33	47997	2249	3146	2313	1131	2933	4	59773	84357
2033-34	50771	2304	3254	2386	1167	3034	4	62920	88319
2034-35	53705	2361	3367	2462	1204	3138	4	66241	92485
2035-36	56048	2403	3459	2505	1225	3197	4	68841	95624
2036-37	58494	2445	3553	2549	1247	3258	4	71550	98888
2037-38	61046	2488	3650	2594	1269	3319	4	74370	102271
2038-39	63710	2532	3750	2640	1291	3382	4	77309	105788
2039-40	66489	2576	3852	2686	1314	3446	4	80367	109434
2040-41	69263	2616	3953	2729	1335	3504	4	83404	113024
2041-42	72153	2658	4056	2772	1356	3563	4	86562	116744
2042-43	75163	2700	4163	2815	1377	3623	4	89845	120600
2043-44	78300	2742	4272	2859	1399	3684	4	93260	124599
2044-45	81567	2786	4384	2904	1421	3746	4	96812	128748

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	19904	1267	1890	1657	774	2126	5	27623	44357
2025-26	21498	1331	1988	1750	818	2251	5	29641	47315
2026-27	23113	1392	2082	1839	859	2373	5	31663	50242
2027-28	24734	1449	2170	1924	898	2490	5	33670	53111
2028-29	26221	1493	2239	1993	930	2587	5	35468	55611
2029-30	27797	1539	2310	2065	963	2689	5	37368	58243
2030-31	29403	1577	2390	2130	994	2781	5	39280	60848
2031-32	31102	1616	2472	2198	1026	2876	5	41295	63579
2032-33	32899	1656	2557	2267	1058	2975	5	43417	66439
2033-34	34799	1697	2645	2339	1091	3077	5	45653	69439
2034-35	36810	1739	2736	2413	1125	3182	5	48010	72582
2035-36	38416	1770	2811	2456	1145	3242	5	49845	74919
2036-37	40092	1801	2888	2499	1165	3304	5	51754	77340
2037-38	41841	1832	2966	2543	1185	3366	5	53738	79841
2038-39	43666	1865	3047	2588	1206	3429	5	55806	82440
2039-40	45570	1898	3130	2634	1227	3494	5	57958	85136
2040-41	47472	1928	3212	2676	1246	3553	5	60092	87777
2041-42	49452	1958	3296	2718	1266	3613	5	62308	90510
2042-43	51515	1989	3383	2761	1286	3673	5	64612	93340
2043-44	53664	2020	3472	2804	1306	3735	5	67006	96270
2044-45	55903	2051	3563	2848	1326	3798	5	69494	99304

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	29034	1722	2325	1692	828	2096	4	37701	55601
2025-26	31215	1801	2434	1778	870	2209	4	40311	59121
2026-27	33404	1874	2536	1859	910	2317	4	42904	62575
2027-28	35579	1940	2630	1935	947	2419	4	45454	65929
2028-29	37541	1989	2700	1995	976	2501	4	47706	68810
2029-30	39611	2040	2773	2056	1007	2586	4	50077	71834
2030-31	41702	2080	2855	2111	1034	2662	4	52448	74819
2031-32	43903	2121	2939	2167	1061	2740	4	54935	77934
2032-33	46220	2163	3025	2225	1089	2821	4	57547	81194
2033-34	48660	2205	3114	2284	1118	2903	4	60288	84597
2034-35	51230	2249	3206	2345	1148	2988	4	63170	88165
2035-36	53209	2277	3278	2375	1163	3029	4	65335	90721
2036-37	55265	2306	3351	2405	1178	3071	4	67580	93364
2037-38	57399	2335	3426	2435	1193	3114	4	69906	96095
2038-39	59616	2364	3502	2466	1208	3157	4	72317	98915
2039-40	61919	2393	3580	2497	1223	3201	4	74817	101831
2040-41	64193	2419	3656	2524	1236	3239	4	77271	104663
2041-42	66550	2445	3733	2551	1249	3277	4	79809	107581

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2042-43	68993	2471	3812	2579	1262	3315	4	82436	110594
2043-44	71527	2497	3893	2607	1276	3354	4	85158	113712
2044-45	74154	2524	3976	2635	1290	3394	4	87977	116934

Table 6-4 : Total Tollable Traffic @ Toll Plaza 2- Joya @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	19904	1267	1890	1657	774	2126	5	27623	44357
2025-26	21399	1324	1979	1742	813	2241	5	29503	47094
2026-27	22900	1377	2062	1822	851	2351	5	31368	49773
2027-28	24391	1426	2138	1896	886	2455	5	33197	52360
2028-29	25735	1463	2195	1955	913	2539	5	34805	54567
2029-30	27154	1500	2255	2015	941	2626	5	36496	56877
2030-31	28587	1529	2322	2069	966	2703	5	38181	59138
2031-32	30096	1559	2390	2124	992	2783	5	39949	61499
2032-33	31684	1590	2460	2181	1018	2865	5	41803	63961
2033-34	33357	1621	2533	2239	1045	2949	5	43749	66533
2034-35	35118	1653	2608	2299	1073	3036	5	45792	69222
2035-36	36475	1673	2666	2328	1086	3078	5	47311	71098
2036-37	37884	1694	2726	2357	1100	3121	5	48887	73041
2037-38	39348	1716	2787	2386	1114	3164	5	50520	75044
2038-39	40868	1738	2849	2417	1128	3208	5	52213	77116
2039-40	42446	1760	2912	2448	1142	3253	5	53966	79253
2040-41	44005	1779	2974	2474	1154	3291	5	55682	81312
2041-42	45621	1798	3037	2500	1167	3330	5	57458	83438
2042-43	47296	1817	3101	2526	1180	3370	5	59295	85630
2043-44	49033	1837	3167	2554	1193	3410	5	61199	87898
2044-45	50834	1857	3234	2582	1206	3450	5	63168	90233

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	29034	1722	2325	1692	828	2096	4	37701	55601
2025-26	31288	1804	2440	1783	872	2215	4	40406	59265
2026-27	33560	1881	2548	1869	914	2329	4	43105	62873
2027-28	35829	1952	2649	1950	953	2437	4	45774	66398
2028-29	37894	2007	2727	2016	985	2527	4	48160	69478
2029-30	40078	2063	2808	2084	1018	2620	4	50675	72711
2030-31	42294	2109	2898	2145	1048	2704	4	53202	75917
2031-32	44632	2156	2990	2208	1079	2790	4	55859	79270
2032-33	47100	2204	3085	2272	1111	2879	4	58655	82784
2033-34	49704	2253	3184	2338	1143	2971	4	61597	86466

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2034-35	52453	2303	3286	2406	1176	3066	4	64694	90327
2035-36	54610	2338	3368	2442	1193	3116	4	67071	93166
2036-37	56856	2373	3452	2479	1211	3167	4	69542	96111
2037-38	59194	2409	3537	2517	1229	3219	4	72109	99160
2038-39	61629	2445	3625	2555	1247	3272	4	74777	102320
2039-40	64164	2482	3715	2593	1265	3325	4	77548	105587
2040-41	66681	2515	3804	2628	1282	3372	4	80286	108788
2041-42	69297	2548	3894	2663	1299	3421	4	83126	112100
2042-43	72016	2581	3986	2698	1316	3470	4	86071	115521
2043-44	74841	2615	4080	2734	1333	3520	4	89127	119063
2044-45	77777	2650	4177	2770	1350	3570	4	92298	122726

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	19904	1267	1890	1657	774	2126	5	27623	44357
2025-26	21449	1328	1984	1745	815	2246	5	29572	47203
2026-27	23006	1385	2072	1830	855	2363	5	31516	50011
2027-28	24561	1438	2154	1910	893	2473	5	33434	52740
2028-29	25976	1478	2217	1974	923	2563	5	35136	55091
2029-30	27473	1519	2282	2040	954	2657	5	36930	57559
2030-31	28991	1552	2355	2100	982	2742	5	38727	59992
2031-32	30594	1587	2430	2162	1010	2829	5	40617	62534
2032-33	32285	1622	2507	2225	1039	2919	5	42602	65189
2033-34	34070	1658	2587	2290	1070	3012	5	44692	67975
2034-35	35954	1695	2670	2356	1101	3107	5	46888	70882
2035-36	37433	1721	2737	2392	1118	3157	5	48563	72985
2036-37	38972	1747	2805	2428	1135	3209	5	50301	75160
2037-38	40575	1773	2875	2465	1153	3261	5	52107	77411
2038-39	42244	1800	2946	2502	1171	3314	5	53982	79737
2039-40	43981	1827	3020	2539	1189	3369	5	55930	82149
2040-41	45706	1851	3091	2573	1204	3417	5	57847	84486
2041-42	47499	1875	3165	2607	1219	3466	5	59836	86904
2042-43	49362	1899	3240	2641	1235	3516	5	61898	89403
2043-44	51298	1924	3317	2676	1252	3566	5	64038	91989
2044-45	53310	1950	3395	2711	1269	3617	5	66257	94659

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 - 1st 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	62329	-8%	11%	11%	22	2.5

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	62925	-7%	10%	10%	22	2.2

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)
2028	67413	61729	-8%	13%	13%	22	2.8

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 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) 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.

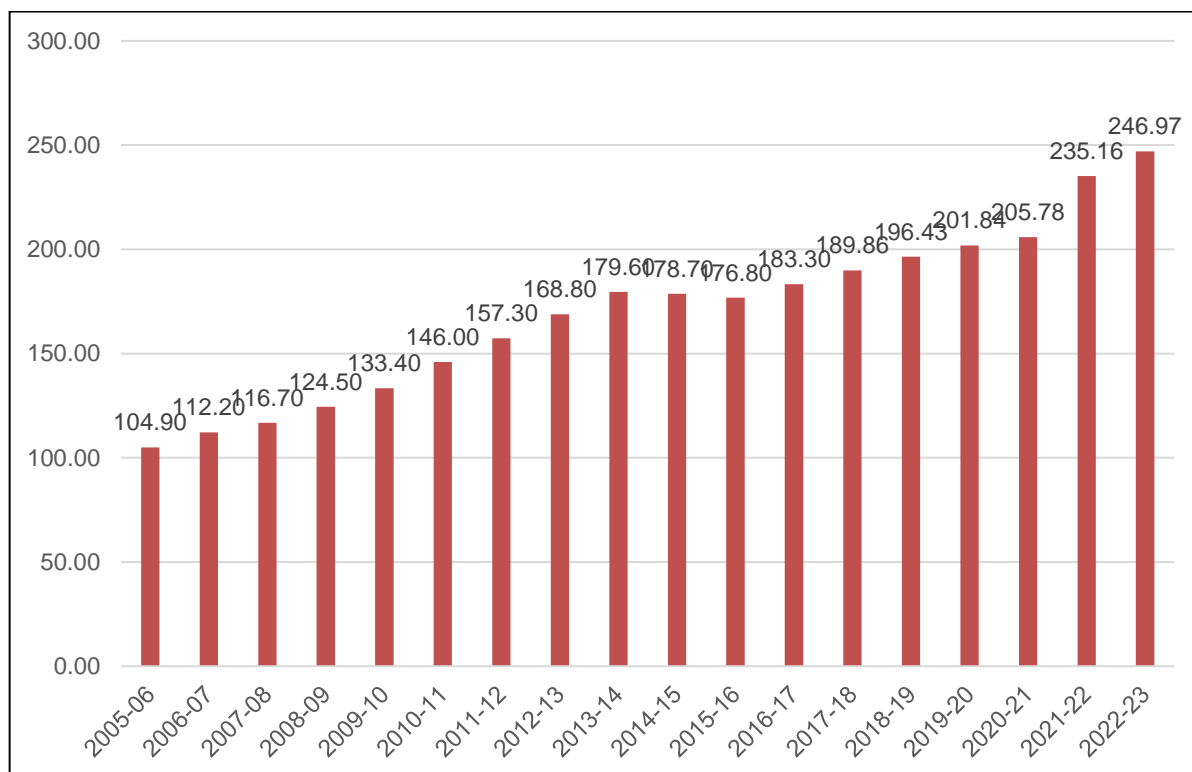


Figure 7-1 : Historical Rate of WPI Inflation in India

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	390	390	425	610	740
2026-27	125	200	415	415	455	650	790
2027-28	130	210	440	440	475	685	830
2028-29	140	225	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	275	565	565	615	880	1070
2033-34	180	285	595	595	645	925	1125
2034-35	190	300	625	625	680	975	1185
2035-36	200	320	655	655	715	1025	1245
2036-37	210	335	690	690	755	1080	1310
2037-38	220	350	730	730	795	1135	1380
2038-39	230	370	765	765	835	1195	1455
2039-40	245	390	810	810	880	1260	1535
2040-41	255	410	850	850	930	1330	1615
2041-42	270	435	895	895	980	1400	1705
2042-43	285	455	945	945	1030	1475	1795
2043-44	300	480	995	995	1085	1555	1895
2044-45	315	510	1050	1050	1145	1640	1995

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	70	115	245	245	265	385	465
2026-27	75	125	255	255	280	405	490
2027-28	80	130	270	270	295	425	515
2028-29	85	135	285	285	310	445	540
2029-30	90	140	300	300	325	465	570
2030-31	95	150	315	315	340	490	600

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2031-32	95	155	330	330	360	515	630
2032-33	100	165	345	345	380	545	660
2033-34	110	175	365	365	395	570	695
2034-35	115	185	385	385	420	600	730
2035-36	120	190	405	405	440	630	770
2036-37	125	205	425	425	465	665	810
2037-38	130	215	445	445	490	700	855
2038-39	140	225	470	470	515	740	900
2039-40	145	235	495	495	540	775	945
2040-41	155	250	520	520	570	820	995
2041-42	165	265	550	550	600	865	1050
2042-43	170	275	580	580	635	910	1105
2043-44	180	290	610	610	665	960	1165
2044-45	190	310	645	645	705	1010	1230

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	175	285	585	585	635	910	1110
2026-27	190	305	625	625	680	975	1185
2027-28	200	320	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	240	390	805	805	875	1255	1525
2032-33	255	410	845	845	920	1320	1600
2033-34	270	430	890	890	970	1385	1685
2034-35	280	455	935	935	1020	1460	1775
2035-36	295	475	985	985	1075	1535	1870
2036-37	310	500	1035	1035	1130	1620	1970
2037-38	330	530	1090	1090	1190	1705	2070
2038-39	345	555	1150	1150	1255	1795	2185
2039-40	365	585	1210	1210	1320	1890	2300
2040-41	385	615	1275	1275	1390	1995	2425
2041-42	405	650	1345	1345	1465	2100	2555
2042-43	425	685	1420	1420	1545	2215	2695
2043-44	450	725	1495	1495	1630	2335	2840
2044-45	475	760	1575	1575	1720	2465	2995

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	175	365	365	400	575	700
2026-27	115	185	385	385	420	605	735
2027-28	120	195	405	405	440	635	775
2028-29	125	205	425	425	465	665	810
2029-30	130	215	445	445	490	700	855
2030-31	140	225	470	470	515	735	895
2031-32	145	235	495	495	540	775	945
2032-33	155	250	520	520	565	815	990
2033-34	160	260	545	545	595	855	1045
2034-35	170	275	575	575	625	900	1100
2035-36	180	290	605	605	660	950	1155
2036-37	190	305	635	635	695	1000	1215
2037-38	200	320	670	670	730	1050	1280
2038-39	210	335	705	705	770	1105	1350
2039-40	220	355	745	745	810	1165	1420
2040-41	230	375	785	785	855	1230	1495
2041-42	245	395	825	825	900	1295	1575
2042-43	255	415	870	870	950	1365	1660
2043-44	270	440	915	915	1000	1440	1750
2044-45	285	460	965	965	1055	1515	1845

Table 7-5 : Toll Rates for Monthly Pass Local @ Km 90.661

Year	Car
2024-25	330
2025-26	335
2026-27	355
2027-28	370
2028-29	390
2029-30	410
2030-31	430
2031-32	455
2032-33	480
2033-34	505
2034-35	530
2035-36	560
2036-37	590
2037-38	620
2038-39	655
2039-40	690
2040-41	725
2041-42	765
2042-43	805
2043-44	850

Year	Car
2044-45	895

Table 7-6 : Toll Rates for Monthly Pass Local @ Km 123.87

Year	Car
2024-25	340
2025-26	350
2026-27	370
2027-28	385
2028-29	405
2029-30	425
2030-31	450
2031-32	470
2032-33	495
2033-34	520
2034-35	550
2035-36	575
2036-37	605
2037-38	640
2038-39	675
2039-40	710
2040-41	745
2041-42	785
2042-43	830
2043-44	875
2044-45	920

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	12365	12365	13485	19350	23545
2025-26	3930	6305	12995	12995	14160	20265	24630
2026-27	4205	6740	13890	13890	15135	21665	26330
2027-28	4415	7080	14600	14600	15905	22770	27675
2028-29	4640	7440	15345	15345	16720	23940	29095
2029-30	4875	7820	16135	16135	17580	25170	30590
2030-31	5125	8220	16965	16965	18485	26470	32175
2031-32	5390	8645	17845	17845	19445	27845	33845
2032-33	5665	9090	18775	18775	20455	29295	35610
2033-34	5960	9565	19755	19755	21525	30825	37470
2034-35	6270	10065	20790	20790	22655	32445	39440
2035-36	6600	10590	21885	21885	23845	34160	41520
2036-37	6945	11150	23040	23040	25110	35965	43720
2037-38	7310	11740	24265	24265	26445	37880	46050
2038-39	7700	12360	25560	25560	27855	39900	48510
2039-40	8110	13020	26925	26925	29345	42040	51110
2040-41	8540	13720	28375	28375	30925	44305	53860

Year	Car	Minibus /LCV	Bus	Truck	3 Axle	Multi axle	Oversized Vehicles
2041-42	9000	14455	29905	29905	32590	46700	56775
2042-43	9485	15235	31525	31525	34360	49230	59855
2043-44	9995	16060	33240	33240	36225	51910	63110
2044-45	10540	16935	35050	35050	38205	54745	66560

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	2330	3765	7885	7885	8600	12365	15050
2025-26	2410	3890	8155	8155	8895	12790	15565
2026-27	2530	4090	8565	8565	9345	13430	16350
2027-28	2660	4295	8995	8995	9815	14110	17175
2028-29	2795	4510	9455	9455	10310	14825	18045
2029-30	2935	4740	9935	9935	10835	15580	18965
2030-31	3085	4985	10440	10440	11390	16375	19935
2031-32	3245	5240	10980	10980	11975	17215	20960
2032-33	3410	5510	11545	11545	12595	18105	22040
2033-34	3590	5795	12145	12145	13250	19045	23185
2034-35	3775	6100	12775	12775	13935	20035	24390
2035-36	3970	6415	13445	13445	14665	21085	25665
2036-37	4180	6755	14150	14150	15435	22190	27015
2037-38	4400	7110	14895	14895	16250	23360	28440
2038-39	4635	7485	15685	15685	17115	24600	29950
2039-40	4880	7885	16520	16520	18025	25910	31540
2040-41	5140	8305	17405	17405	18985	27295	33225
2041-42	5420	8755	18340	18340	20005	28760	35010
2042-43	5710	9225	19325	19325	21085	30310	36895
2043-44	6020	9725	20370	20370	22225	31945	38890
2044-45	6345	10250	21480	21480	23430	33680	41005

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	207.11	108.10	315.22
2025-26	235.27	118.40	353.67
2026-27	266.30	132.65	398.95
2027-28	296.31	148.08	444.39
2028-29	327.54	162.46	489.99
2029-30	359.09	178.44	537.53
2030-31	396.21	197.03	593.24
2031-32	434.01	213.38	647.38
2032-33	478.92	234.59	713.51
2033-34	528.57	259.50	788.07
2034-35	580.28	285.59	865.87
2035-36	632.65	310.13	942.78
2036-37	685.48	335.13	1020.61
2037-38	747.06	362.43	1109.49
2038-39	809.47	396.21	1205.67
2039-40	887.97	428.89	1316.87
2040-41	959.66	465.75	1425.40
2041-42	1044.62	508.34	1552.96
2042-43	1135.48	546.66	1682.14
2043-44	1239.82	596.45	1836.27
2044-45	1344.84	646.93	1991.77

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

Year	TP-1	TP2	Total
2024-25	207.11	108.10	315.22
2025-26	234.17	117.85	352.03
2026-27	263.80	131.41	395.21
2027-28	292.14	146.02	438.16
2028-29	321.36	159.43	480.78
2029-30	350.69	174.25	524.94
2030-31	385.10	191.49	576.59
2031-32	419.78	206.41	626.19
2032-33	460.99	225.86	686.85
2033-34	506.41	248.65	755.06
2034-35	553.33	272.33	825.66
2035-36	600.36	294.28	894.64
2036-37	647.30	316.48	963.78
2037-38	701.97	340.63	1042.60
2038-39	756.86	370.55	1127.41
2039-40	826.25	399.15	1225.40

Year	TP-1	TP2	Total
2040-41	888.67	431.37	1320.04
2041-42	962.65	468.58	1431.23
2042-43	1041.33	501.42	1542.76
2043-44	1131.58	544.48	1676.05
2044-45	1221.46	587.66	1809.13

**Table 7-11 : Toll Revenue Most Likely Scenario
(Rs. Crores)**

Year	TP-1	TP2	Total
2024-25	207.11	108.10	315.22
2025-26	234.73	118.14	352.87
2026-27	265.04	132.06	397.10
2027-28	294.24	147.08	441.32
2028-29	324.45	160.95	485.40
2029-30	354.89	176.34	531.23
2030-31	390.63	194.29	584.91
2031-32	426.86	209.89	636.76
2032-33	469.88	230.22	700.10
2033-34	517.39	254.07	771.46
2034-35	566.63	278.91	845.54
2035-36	616.31	302.12	918.43
2036-37	666.13	325.64	991.77
2037-38	724.21	351.33	1075.54
2038-39	782.83	383.11	1165.94
2039-40	856.71	413.69	1270.40
2040-41	923.71	448.18	1371.89
2041-42	1003.11	488.00	1491.12
2042-43	1087.74	523.49	1611.23
2043-44	1184.92	569.79	1754.71
2044-45	1282.22	616.46	1898.68

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)

JANUARY 2025

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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)**

JANUARY 2025



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ABBREVIATIONS

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

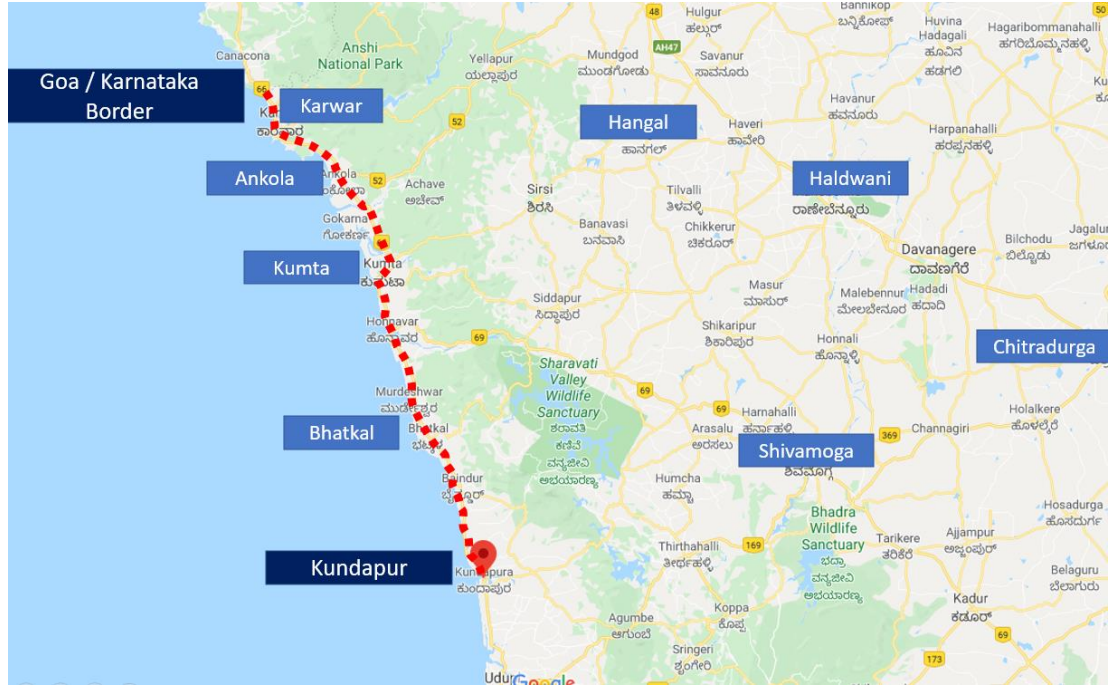


Figure 1-1 : Alignment of Project Stretch

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 November 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 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 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 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
3	Km 243 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 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period from February 2020 to March 2020, 2020-21, 2021-22, 2022-23, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 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

Vehicle Type	
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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	2678
2	Minibus/LCV	380	360	150	130	129	147
3	Bus	308	101	159	234	256	256
4	Truck	177	256	240	259	253	266
5	3 Axle	162	130	155	182	132	118
6	Multi Axle	339	329	519	627	462	341
7	Oversized Vehicles	8	7	5	6	5	4
Total		2859	2821	3202	4497	4295	3810

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	4518
2	Minibus/LCV	830	582	266	292	306	288
3	Bus	455	293	343	532	614	590

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
4	Truck	662	676	693	844	853	788
5	3 Axle	312	272	277	303	313	258
6	Multi Axle	888	815	869	1139	1186	1045
7	Oversized Vehicles	2	5	6	6	5	4
Total		5736	5401	5693	8198	8573	7491

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	5306
2	Minibus/LCV	756	602	318	394	397	386
3	Bus	463	295	334	523	582	557
4	Truck	700	684	814	950	941	846
5	3 Axle	305	273	315	319	325	273
6	Multi Axle	853	805	873	1123	1168	1045
7	Oversized Vehicles	2	7	6	6	5	4
Total		5679	5619	6304	9092	9554	8417

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
	Belekari at Km 119.00	2859	5557	1.94

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2019-20	Holegadde at Km 184.00	5736	12124	2.11
	Shirur at Km 243.00	5679	11986	2.11
2020-21	Belekeri at Km 119.00	2821	5150	1.83
	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	3810	6371	1.67
	Holegadde at Km 184.00	7491	14578	1.95
	Shirur at Km 243.00	8417	15632	1.86

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.

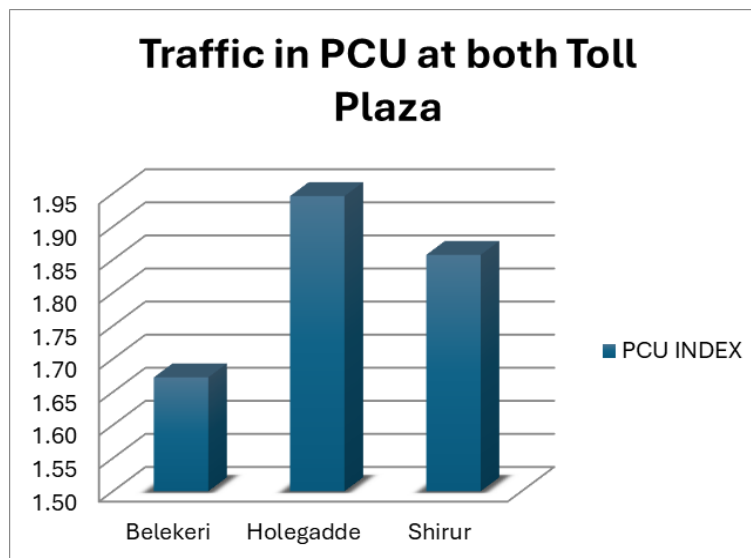
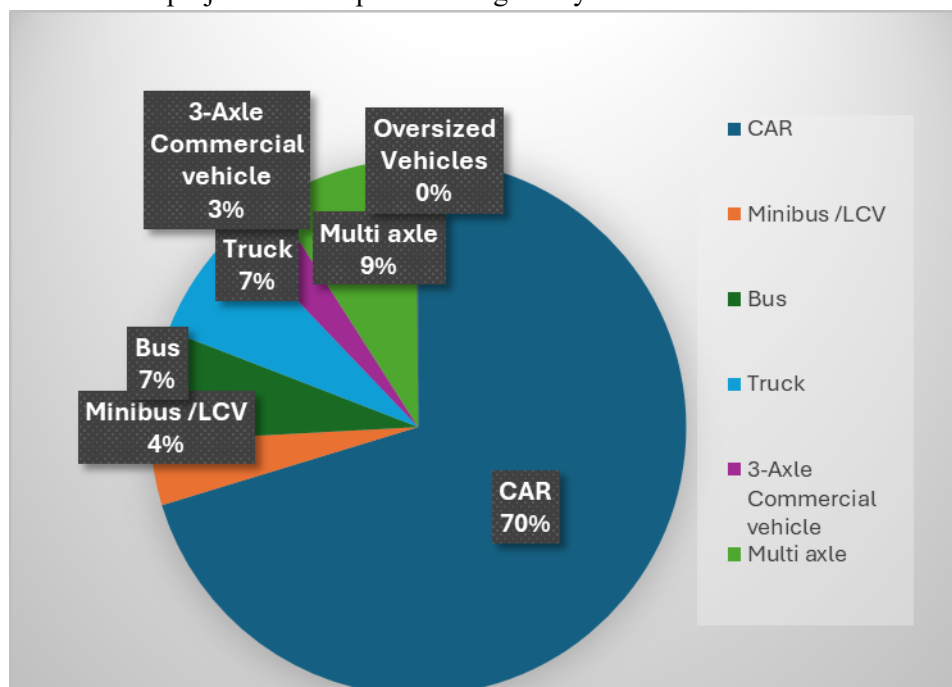


Figure 3-1 : Comparison of PCU Index

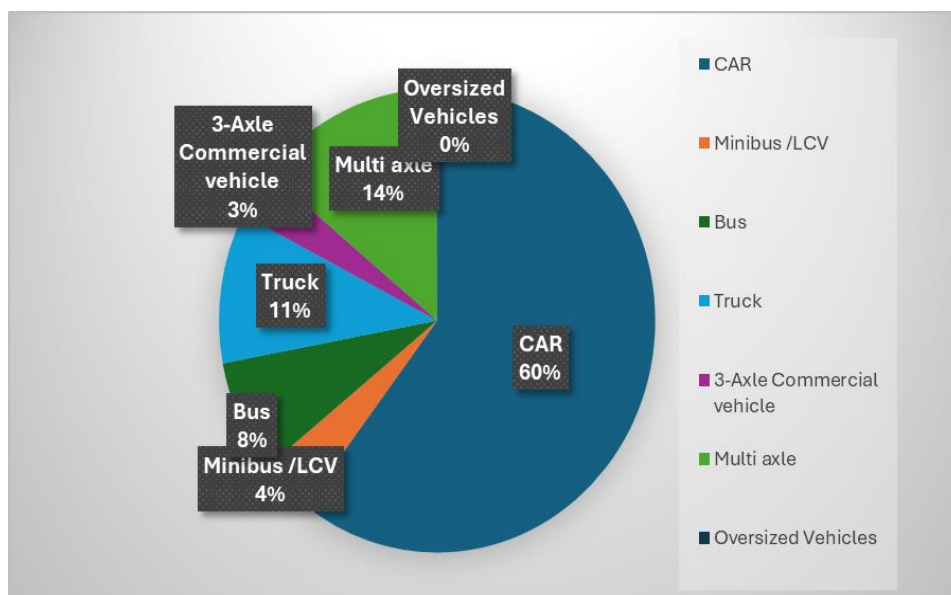
It can be observed that PCU index is consistent at all three plaza locations.

3.4.2 Components of Traffic

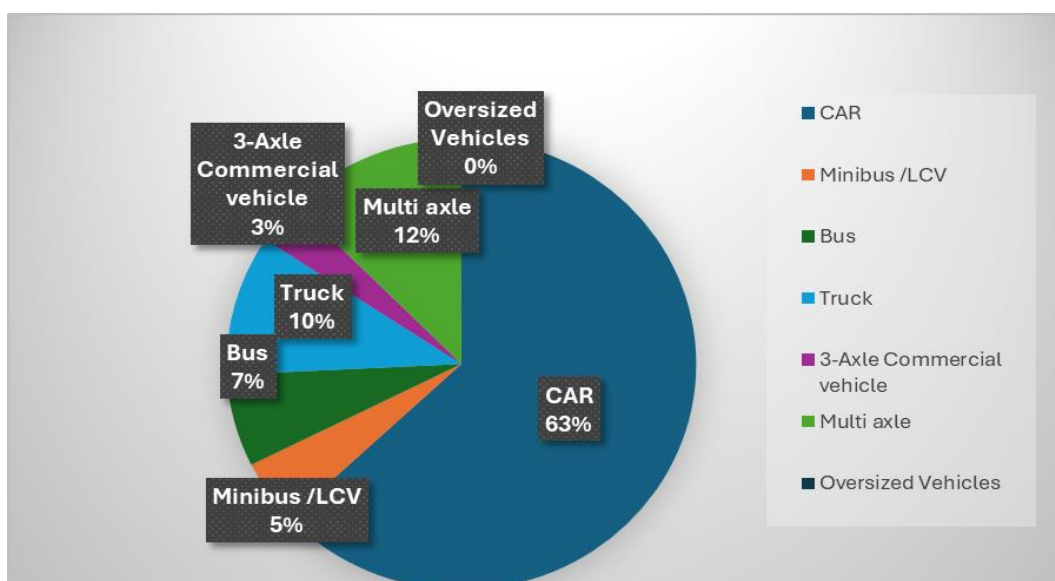
As discussed previously, components of traffic volume play an important role in determining project revenue. A larger component of commercial traffic with higher axle configuration adds to project revenue positively. Similarly, a larger component of local traffic affects the project revenue potential 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 70% of total traffic at toll plaza location 1 while multi axle along with 3 axle commercial vehicles are about 12% of total traffic. Truck / Bus and LCV share about 14% and 4% of traffic volume respectively at toll plaza on 119.000 km.

It is observed that car traffic forms about 60% 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 19% and 4% of traffic volume respectively at toll plaza on 184.000 km.

It is observed that car traffic forms about 63% 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 17% 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	2044
2	Return Journey	1590
3	Local Commercial Single Journey	168
4	Monthly Pass Local	2
5	Monthly Pass	7

Table 3-9 : Journey Type Bifurcation of Traffic at TP KM 184.00

Sr. No	Type	Traffic Volume (Nos.) 2024-25
1	Single Journey	4279
2	Return Journey	2840
3	Local Commercial Single Journey	360
4	Monthly Pass Local	3
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	4260
2	Return Journey	3882
3	Local Commercial Single Journey	258
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 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 57%. Return journey component is 38% 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 51%. Return journey component is 46% 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

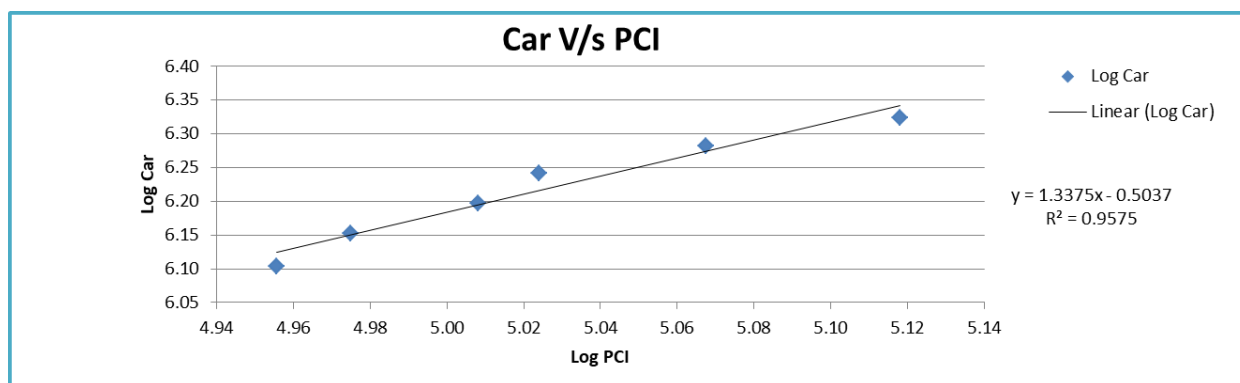


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Karnataka

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

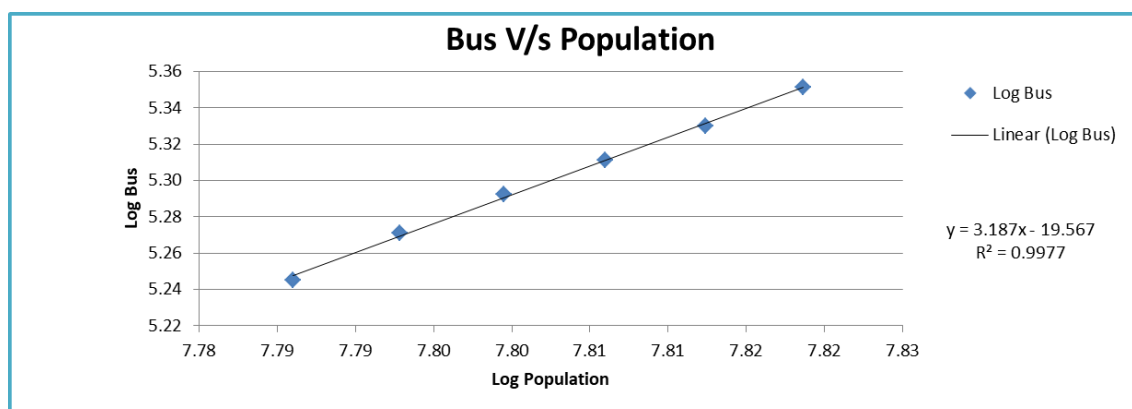


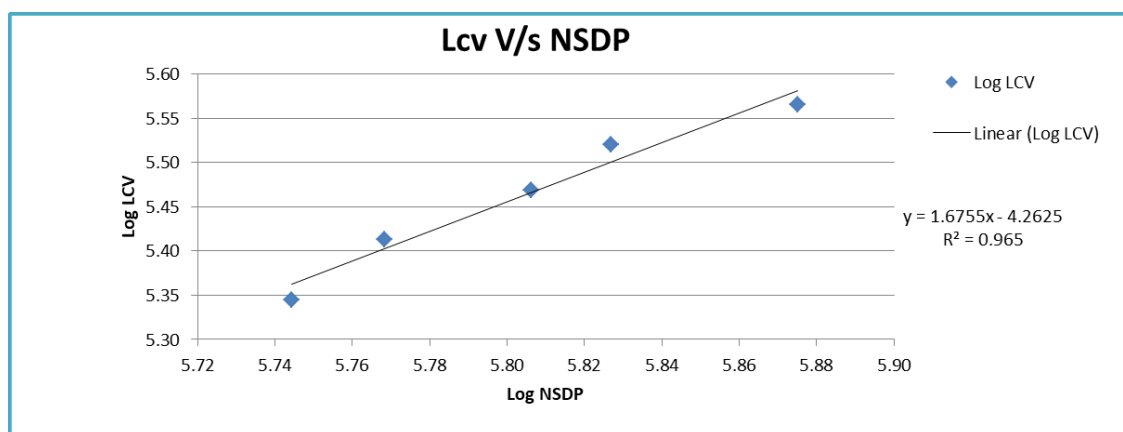
Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Karnataka

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.

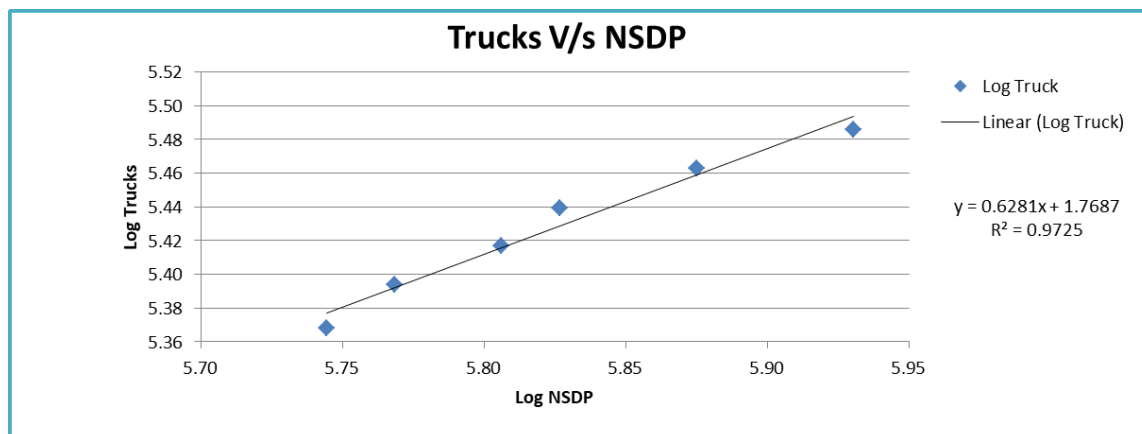


Figure 5-4 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Karnataka.

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. 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 R² values are presented in the Table below

Table 5-5 : Summary Regression Analysis Karnataka

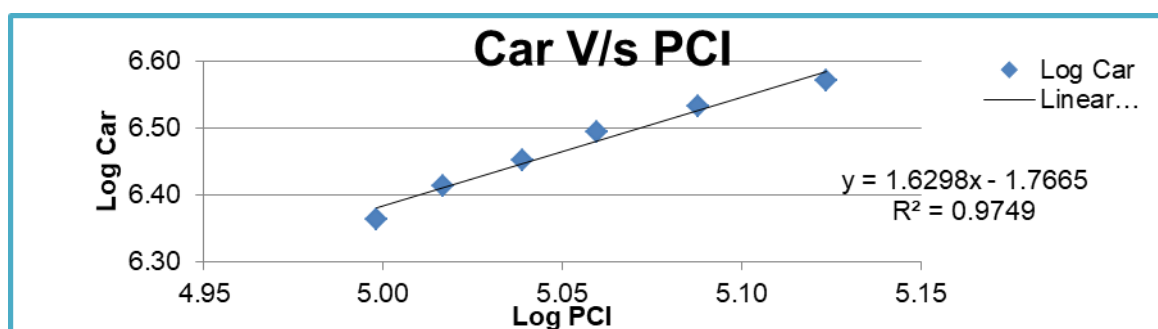
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average Growth	Growth Elastic Model
Karnataka	Car/Jeep	PCI	$y = 1.3375x + -0.5037$	$R^2 = 0.9575$	1.3375	7.83%	10.47%
	Bus	Population	$y = 3.187x - 19.567$	$R^2 = 0.9977$	3.1870	1.52%	4.83%
	LCV	NSDP	$y = 1.6755x - 4.2625$	$R^2 = 0.965$	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

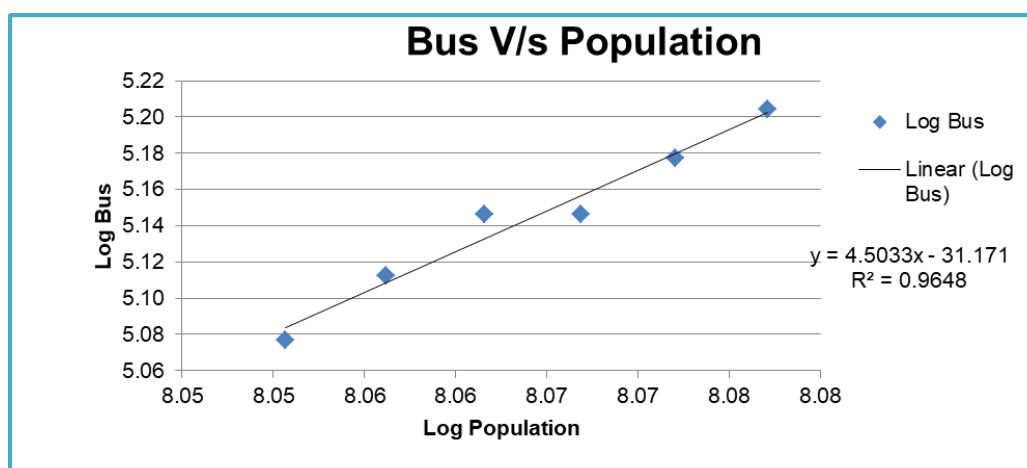


Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Maharashtra

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.

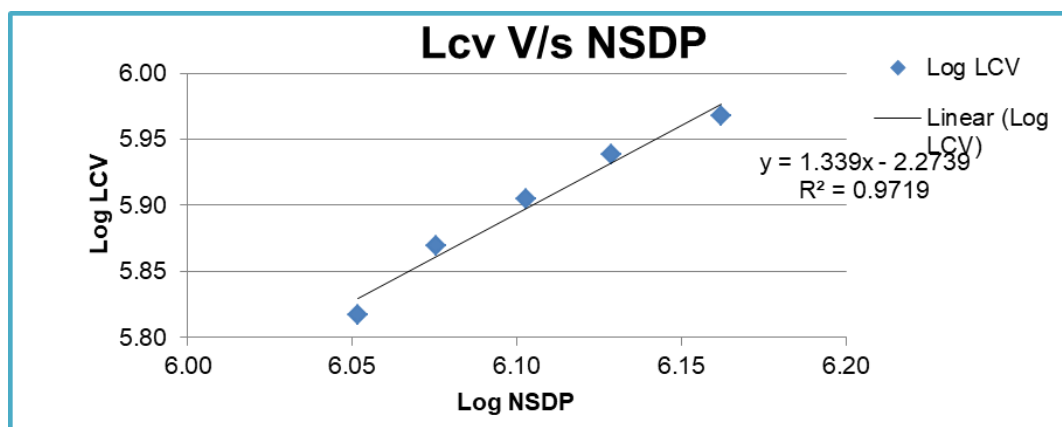


Figure 5-7 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Maharashtra.

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.

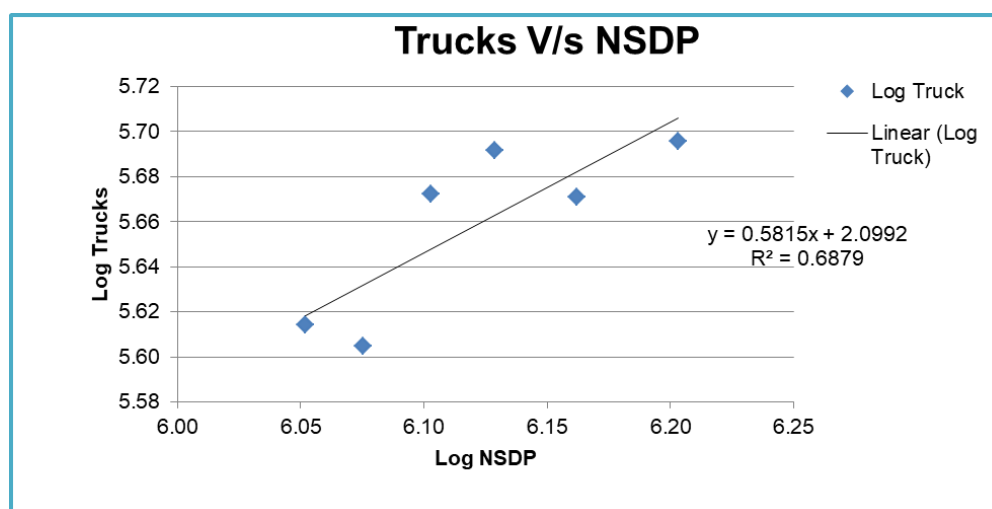


Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Maharashtra.

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. 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 R² 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 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%

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.

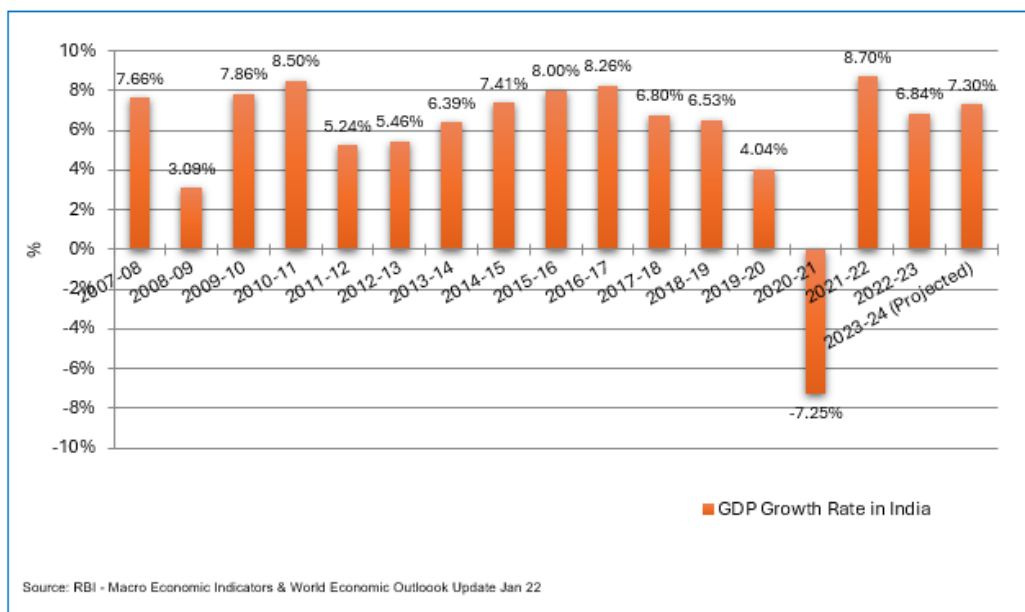


Figure 5-9 : Growth of GDP in India

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	2025-2030	2031-2035	2036-2040	2041-2045	2046-2050
Car/Jeep/Van	9.29%	8.50%	8.14%	8.03%	7.57%
Bus	5.28%	4.97%	4.90%	4.75%	4.52%
LCV	4.95%	4.12%	3.72%	3.70%	3.28%
2- Axle	5.04%	4.36%	4.04%	4.02%	3.68%
3 - Axle	5.32%	4.60%	4.26%	4.24%	3.88%
4 to 6 Axle	6.17%	5.33%	4.93%	4.90%	4.47%
7 and Above Axle	6.17%	5.33%	4.93%	4.90%	4.47%

Table 5-12 : Recommended Growth Rates Pessimistic

Category / Year	2025-2030	2031-2035	2036-2040	2041-2045	2046-2050
Car/Jeep/Van	8.79%	8.00%	7.64%	7.53%	7.07%
Bus	4.78%	4.47%	4.40%	4.25%	4.02%
LCV	4.45%	3.62%	3.22%	3.20%	2.78%
2- Axle	4.54%	3.86%	3.54%	3.52%	3.18%
3 - Axle	4.82%	4.10%	3.76%	3.74%	3.38%
4 to 6 Axle	5.67%	4.83%	4.43%	4.40%	3.97%
7 and Above Axle	5.67%	4.83%	4.43%	4.40%	3.97%

Table 5-13 : Recommended Growth Rates Most Likely

Category / Year	2025-2030	2031-2035	2036-2040	2041-2045	2046-2050
Car/Jeep/Van	9.04%	8.25%	7.89%	7.78%	7.32%
Bus	5.03%	4.72%	4.65%	4.50%	4.27%
LCV	5.03%	4.72%	4.65%	4.50%	4.27%
2- Axle	4.70%	3.87%	3.47%	3.45%	3.03%
3 - Axle	4.79%	4.11%	3.79%	3.77%	3.43%
4 to 6 Axle	5.07%	4.35%	4.01%	3.99%	3.63%
7 and Above Axle	5.92%	5.08%	4.68%	4.65%	4.22%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

Project road is part of planned Mumbai- Kochi Economic Corridor under Bharatmala Pariyojna. At present, various sections of the corridor are under advanced stage of construction and planning. Out of 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 financial year 2026-27. This would be shorter than the current preferred route of Bangalore highway (NH-48) by about 100 km. In such a case, it is expected that in the financial year 2026-27 – 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 the said period. 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	2678	147	256	266	118	341	4	3810	6371
2025-26	2982	157	275	284	126	368	4	4196	6947
2026-27	3377	171	300	310	137	405	4	4704	7715
2027-28	3724	181	319	328	145	434	4	5135	8343
2028-29	4069	190	336	345	153	461	4	5558	8949
2029-30	4446	200	353	363	161	490	4	6017	9600
2030-31	4823	208	370	379	168	516	4	6468	10226
2031-32	5232	216	388	396	176	543	4	6955	10898
2032-33	5677	224	407	414	184	572	4	7482	11620
2033-34	6160	234	426	432	192	602	4	8050	12388
2034-35	6684	244	448	450	200	634	4	8664	13215
2035-36	7228	253	470	468	208	665	4	9296	14056
2036-37	7816	263	493	487	216	698	4	9977	14958
2037-38	8452	273	517	507	225	732	4	10710	15921

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2038-39	9139	283	542	527	234	768	4	11497	16947
2039-40	9883	293	568	548	244	806	4	12346	18048
2040-41	10677	303	595	570	255	846	4	13250	19217
2041-42	11534	315	622	593	266	887	4	14221	20459
2042-43	12460	327	652	617	277	931	4	15268	21796
2043-44	13460	339	683	641	289	976	4	16392	23218
2044-45	14540	351	715	667	301	1024	4	17602	24742
2045-46	15640	363	747	691	313	1069	4	18827	26266
2046-47	16824	375	781	717	325	1117	4	20143	27900
2047-48	18097	387	816	743	337	1167	4	21551	29635

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	4518	288	590	788	258	1045	4	7491	14578
2025-26	5028	308	634	844	276	1130	4	8224	15855
2026-27	5697	335	693	921	301	1245	4	9196	17565
2027-28	6283	355	736	977	319	1335	4	10009	18937
2028-29	6867	372	775	1026	336	1418	4	10798	20235
2029-30	7505	390	816	1078	354	1506	4	11653	21629
2030-31	8143	406	856	1125	370	1587	4	12491	22965
2031-32	8836	423	899	1174	387	1672	4	13395	24393
2032-33	9587	440	944	1226	405	1762	4	14368	25919
2033-34	10401	458	990	1279	423	1856	4	15411	27534
2034-35	11285	476	1039	1335	442	1955	4	16536	29263
2035-36	12203	494	1089	1389	460	2051	4	17690	31006

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2036-37	13195	512	1143	1445	479	2152	4	18930	32866
2037-38	14268	530	1199	1503	500	2258	4	20262	34848
2038-39	15428	550	1258	1564	521	2369	4	21694	36961
2039-40	16682	570	1319	1627	543	2485	4	23230	39205
2040-41	18021	591	1381	1693	566	2607	4	24863	41577
2041-42	19469	613	1447	1761	589	2734	4	26617	44101
2042-43	21032	636	1515	1832	614	2868	4	28501	46793
2043-44	22721	659	1587	1905	640	3009	4	30525	49664
2044-45	24545	684	1663	1982	667	3156	4	32701	52727
2045-46	26404	706	1739	2054	693	3297	4	34897	55776
2046-47	28403	729	1817	2130	720	3444	4	37247	59014
2047-48	30554	752	1899	2208	747	3598	4	39762	62453

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	5306	386	557	846	273	1045	4	8417	15632
2025-26	5906	412	597	905	293	1130	4	9247	17012
2026-27	6691	448	652	986	321	1246	4	10348	18865
2027-28	7380	474	692	1045	341	1335	4	11271	20351
2028-29	8066	498	728	1097	359	1417	4	12169	21760
2029-30	8815	522	766	1152	377	1504	4	13140	23269
2030-31	9564	544	804	1203	394	1583	4	14096	24725
2031-32	10377	566	844	1255	412	1667	4	15125	26279
2032-33	11258	590	885	1310	430	1755	4	16232	27934
2033-34	12214	614	929	1367	450	1848	4	17426	29707

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2034-35	13252	640	975	1426	470	1946	4	18713	31600
2035-36	14331	664	1022	1484	490	2041	4	20036	33518
2036-37	15497	688	1072	1544	511	2141	4	21457	35563
2037-38	16758	714	1124	1606	532	2247	4	22985	37745
2038-39	18121	740	1179	1671	555	2357	4	24627	40071
2039-40	19595	767	1236	1739	579	2473	4	26393	42554
2040-41	21169	795	1294	1810	603	2594	4	28269	45174
2041-42	22869	824	1355	1883	628	2720	4	30283	47961
2042-43	24706	855	1419	1958	655	2853	4	32450	50941
2043-44	26691	887	1486	2036	682	2992	4	34778	54116
2044-45	28835	920	1556	2117	710	3138	4	37280	57503
2045-46	31018	951	1626	2195	737	3278	4	39809	60888
2046-47	33367	982	1699	2276	765	3424	4	42517	64486
2047-48	35894	1014	1776	2360	795	3577	4	45420	68323

**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	2678	147	256	266	118	341	4	3810	6371
2025-26	2968	157	274	284	126	367	4	4180	6925
2026-27	3347	171	298	308	137	402	4	4667	7660
2027-28	3674	181	315	325	145	429	4	5073	8249
2028-29	3997	189	330	340	152	453	4	5465	8803
2029-30	4347	197	345	355	159	479	4	5886	9393
2030-31	4694	205	360	369	166	502	4	6300	9964
2031-32	5069	213	375	384	173	526	4	6744	10570

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2032-33	5473	221	392	399	180	552	4	7221	11220
2033-34	5911	229	409	414	187	579	4	7733	11908
2034-35	6384	237	426	430	195	607	4	8283	12642
2035-36	6872	245	445	445	202	634	4	8847	13387
2036-37	7397	253	464	461	209	662	4	9450	14176
2037-38	7961	261	484	478	217	692	4	10097	15022
2038-39	8569	269	506	495	225	723	4	10791	15922
2039-40	9224	277	528	513	233	755	4	11534	16877
2040-41	9918	285	550	531	241	788	4	12317	17876
2041-42	10665	295	573	549	250	823	4	13159	18945
2042-43	11468	305	597	569	259	859	4	14061	20084
2043-44	12331	315	622	589	269	897	4	15027	21298
2044-45	13259	325	648	610	279	936	4	16061	22588
2045-46	14196	334	674	630	288	973	4	17099	23870
2046-47	15199	344	701	650	298	1011	4	18207	25230
2047-48	16274	354	729	671	308	1051	4	19391	26677

**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	4518	288	590	788	258	1045	4	7491	14578
2025-26	5007	306	630	840	275	1126	4	8188	15786
2026-27	5647	331	685	911	298	1235	4	9111	17401
2027-28	6200	349	724	962	315	1318	4	9872	18676
2028-29	6744	364	758	1005	330	1393	4	10598	19856
2029-30	7336	380	793	1051	346	1473	4	11383	21123

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2030-31	7922	393	828	1091	360	1545	4	12143	22319
2031-32	8555	407	866	1133	374	1620	4	12959	23593
2032-33	9239	422	905	1176	389	1699	4	13834	24946
2033-34	9977	437	945	1222	405	1781	4	14771	26381
2034-35	10774	452	988	1269	422	1867	4	15776	27909
2035-36	11597	467	1031	1313	438	1950	4	16800	29437
2036-37	12483	482	1076	1359	455	2036	4	17895	31056
2037-38	13436	497	1122	1407	472	2127	4	19065	32774
2038-39	14461	513	1172	1457	490	2221	4	20318	34600
2039-40	15564	529	1223	1509	508	2320	4	21657	36536
2040-41	16735	546	1274	1562	527	2422	4	23070	38560
2041-42	17995	563	1328	1617	546	2528	4	24581	40707
2042-43	19349	581	1385	1674	567	2639	4	26199	42992
2043-44	20805	599	1444	1732	588	2755	4	27927	45411
2044-45	22371	618	1505	1793	610	2876	4	29777	47982
2045-46	23953	635	1566	1850	631	2990	4	31629	50520
2046-47	25646	653	1628	1908	652	3109	4	33600	53198
2047-48	27459	671	1694	1969	674	3232	4	35703	56039

**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	5306	386	557	846	273	1045	4	8417	15632
2025-26	5879	410	595	901	291	1124	4	9204	16931
2026-27	6632	444	646	978	317	1233	4	10254	18688
2027-28	7280	468	683	1032	335	1315	4	11117	20068

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2028-29	7919	489	716	1079	351	1390	4	11948	21364
2029-30	8614	511	750	1128	368	1468	4	12843	22743
2030-31	9303	530	783	1172	383	1538	4	13713	24051
2031-32	10047	549	817	1217	398	1612	4	14644	25439
2032-33	10851	569	854	1264	414	1689	4	15645	26919
2033-34	11718	590	892	1313	431	1771	4	16719	28499
2034-35	12655	612	931	1364	448	1856	4	17870	30172
2035-36	13621	632	971	1412	465	1938	4	19043	31852
2036-37	14661	652	1014	1462	482	2023	4	20298	33635
2037-38	15780	673	1058	1514	500	2113	4	21642	35532
2038-39	16986	695	1104	1568	518	2206	4	23081	37544
2039-40	18284	717	1153	1623	538	2304	4	24623	39688
2040-41	19660	740	1202	1680	558	2405	4	26249	41931
2041-42	21140	764	1253	1738	579	2511	4	27989	44314
2042-43	22731	788	1306	1799	600	2621	4	29849	46841
2043-44	24443	812	1361	1863	622	2736	4	31841	49529
2044-45	26283	838	1418	1929	645	2856	4	33973	52386
2045-46	28141	861	1475	1990	666	2969	4	36106	55204
2046-47	30131	885	1534	2054	688	3086	4	38382	58192
2047-48	32262	909	1595	2119	711	3208	4	40808	61355

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	2678	147	256	266	118	341	4	3810	6371

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2025-26	2974	157	274	284	126	368	4	4187	6936
2026-27	3361	171	298	309	137	405	4	4685	7690
2027-28	3698	181	315	327	145	432	4	5102	8293
2028-29	4032	189	330	343	152	458	4	5508	8870
2029-30	4396	197	347	360	160	485	4	5949	9493
2030-31	4758	205	364	375	167	510	4	6383	10097
2031-32	5150	213	381	390	174	536	4	6848	10735
2032-33	5575	221	398	407	181	563	4	7349	11416
2033-34	6034	229	417	424	189	592	4	7889	12150
2034-35	6531	237	436	442	197	622	4	8469	12929
2035-36	7046	245	455	459	205	651	4	9065	13718
2036-37	7601	253	477	477	213	681	4	9706	14564
2037-38	8200	261	499	495	221	712	4	10392	15459
2038-39	8846	270	522	513	229	745	4	11129	16414
2039-40	9544	280	546	533	238	779	4	11924	17439
2040-41	10287	290	570	553	247	815	4	12766	18518
2041-42	11087	300	595	574	257	853	4	13670	19672
2042-43	11950	310	621	595	267	893	4	14640	20901
2043-44	12879	320	648	618	278	934	4	15681	22212
2044-45	13880	331	678	641	289	978	4	16801	23620
2045-46	14897	341	707	663	300	1019	4	17931	25022
2046-47	15988	351	737	686	311	1061	4	19138	26509
2047-48	17158	361	769	709	322	1106	4	20429	28095

**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	4518	288	590	788	258	1045	4	7491	14578
2025-26	5017	307	632	841	276	1128	4	8205	15819
2026-27	5671	333	689	914	301	1240	4	9152	17481
2027-28	6240	351	730	967	319	1326	4	9937	18800
2028-29	6804	367	767	1013	335	1405	4	10695	20040
2029-30	7418	384	805	1062	352	1488	4	11513	21365
2030-31	8030	399	843	1105	367	1564	4	12312	22630
2031-32	8693	414	882	1150	383	1644	4	13170	23975
2032-33	9410	430	923	1197	400	1728	4	14092	25409
2033-34	10186	447	966	1246	417	1816	4	15082	26934
2034-35	11026	464	1011	1298	435	1908	4	16146	28558
2035-36	11895	480	1057	1347	452	1998	4	17233	30192
2036-37	12833	497	1106	1399	470	2091	4	18400	31931
2037-38	13845	514	1157	1452	488	2189	4	19649	33776
2038-39	14937	532	1211	1507	507	2291	4	20989	35738
2039-40	16115	550	1267	1564	528	2398	4	22426	37826
2040-41	17368	568	1324	1622	549	2510	4	23945	40018
2041-42	18718	588	1384	1683	571	2626	4	25574	42349
2042-43	20175	608	1446	1747	593	2748	4	27321	44829
2043-44	21745	629	1511	1813	616	2875	4	29193	47464
2044-45	23437	651	1579	1881	641	3008	4	31201	50271
2045-46	25153	671	1647	1945	664	3135	4	33219	53053
2046-47	26995	691	1717	2012	687	3267	4	35373	55999
2047-48	28972	712	1790	2081	712	3404	4	37675	59125

**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	5306	386	557	846	273	1045	4	8417	15632
2025-26	5892	412	596	903	292	1128	4	9227	16977
2026-27	6660	448	650	982	319	1240	4	10303	18783
2027-28	7329	474	689	1039	338	1325	4	11198	20219
2028-29	7992	496	723	1088	355	1403	4	12061	21566
2029-30	8715	520	759	1140	372	1486	4	12996	23013
2030-31	9434	540	794	1187	388	1561	4	13908	24394
2031-32	10212	561	832	1236	405	1640	4	14890	25871
2032-33	11055	583	871	1287	422	1723	4	15945	27441
2033-34	11967	605	912	1339	440	1810	4	17077	29111
2034-35	12954	629	955	1394	459	1902	4	18297	30899
2035-36	13975	651	999	1446	477	1990	4	19542	32691
2036-37	15077	673	1045	1501	496	2083	4	20879	34604
2037-38	16266	697	1094	1558	516	2181	4	22316	36648
2038-39	17548	721	1145	1616	536	2283	4	23853	38812
2039-40	18932	745	1198	1677	557	2390	4	25503	41119
2040-41	20406	771	1252	1740	579	2500	4	27252	43544
2041-42	21994	797	1308	1806	602	2616	4	29127	46128
2042-43	23705	824	1366	1874	626	2738	4	31137	48878
2043-44	25550	852	1427	1945	650	2865	4	33293	51805
2044-45	27538	881	1490	2019	676	2998	4	35606	54924
2045-46	29554	907	1553	2089	700	3124	4	37931	58017
2046-47	31717	934	1619	2161	725	3256	4	40416	61303
2047-48	34040	962	1688	2235	751	3394	4	43074	64796

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 - 1st 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) 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.

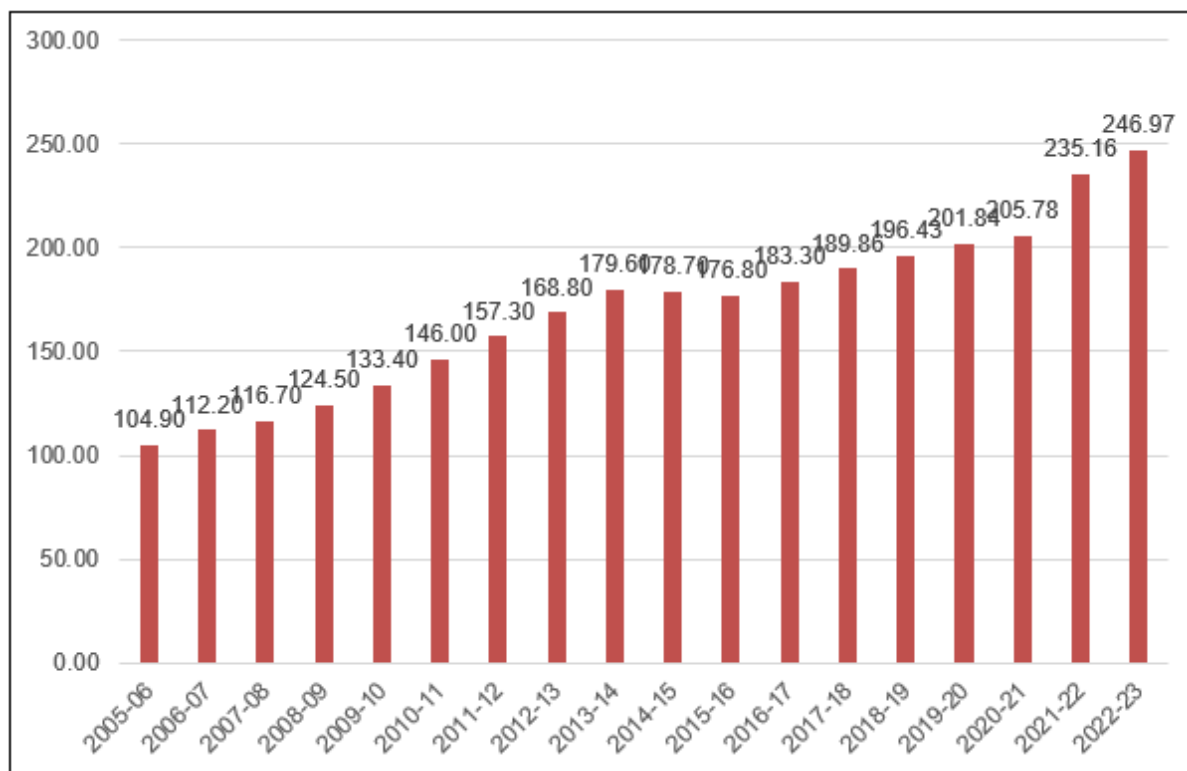


Figure 7-1 : Historical Rate of WPI Inflation in India

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	385	385	420	595	750
2026-27	125	195	405	405	445	625	790
2027-28	130	205	425	425	465	655	830
2028-29	140	220	450	450	490	690	870
2029-30	145	230	470	470	515	725	915
2030-31	155	240	495	495	545	765	965
2031-32	160	255	520	520	570	800	1015
2032-33	170	265	550	550	600	845	1065
2033-34	180	280	575	575	630	890	1120
2034-35	190	295	605	605	665	935	1180
2035-36	200	310	640	640	700	985	1240
2036-37	210	325	675	675	735	1035	1310
2037-38	220	345	710	710	775	1090	1380
2038-39	230	365	745	745	815	1150	1450
2039-40	245	380	785	785	860	1210	1530
2040-41	255	405	830	830	905	1275	1610
2041-42	270	425	875	875	955	1345	1700
2042-43	285	445	920	920	1010	1415	1790
2043-44	300	470	970	970	1060	1495	1885
2044-45	315	495	1025	1025	1120	1575	1990
2045-46	335	525	1080	1080	1180	1660	2100
2046-47	355	555	1140	1140	1245	1755	2215
2047-48	370	585	1200	1200	1315	1850	2335

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	115	185	380	380	415	590	735

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2026-27	120	195	400	400	440	620	775
2027-28	130	205	420	420	460	650	815
2028-29	135	215	440	440	485	685	855
2029-30	140	225	465	465	510	720	900
2030-31	150	235	490	490	535	755	945
2031-32	155	250	515	515	560	795	995
2032-33	165	260	540	540	590	835	1045
2033-34	175	275	570	570	620	880	1100
2034-35	185	290	600	600	655	925	1160
2035-36	195	305	630	630	690	975	1220
2036-37	205	320	665	665	725	1025	1285
2037-38	215	340	700	700	765	1080	1350
2038-39	225	355	735	735	805	1140	1420
2039-40	235	375	775	775	845	1200	1500
2040-41	250	395	815	815	895	1265	1580
2041-42	265	415	860	860	940	1330	1665
2042-43	275	440	905	905	990	1400	1755
2043-44	290	460	955	955	1045	1480	1850
2044-45	310	485	1010	1010	1100	1560	1950
2045-46	325	515	1065	1065	1165	1645	2055
2046-47	345	540	1120	1120	1225	1735	2170
2047-48	360	570	1185	1185	1295	1830	2290

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	650
2025-26	105	170	350	350	385	550	670
2026-27	110	175	370	370	400	580	705
2027-28	115	185	385	385	425	605	740
2028-29	120	195	405	405	445	640	775
2029-30	125	205	430	430	465	670	815
2030-31	135	215	450	450	490	705	860
2031-32	140	225	475	475	515	740	900
2032-33	145	235	495	495	540	780	950
2033-34	155	250	525	525	570	820	1000
2034-35	160	260	550	550	600	860	1050
2035-36	170	275	580	580	630	910	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	815	1175	1430
2041-42	235	375	790	790	860	1240	1505
2042-43	245	395	830	830	910	1305	1590
2043-44	260	420	875	875	955	1375	1675
2044-45	275	440	925	925	1010	1450	1765

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2045-46	290	465	975	975	1065	1530	1860
2046-47	305	490	1030	1030	1120	1615	1965
2047-48	320	520	1085	1085	1185	1700	2070

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	280	580	580	635	890	1125
2026-27	190	295	610	610	665	935	1185
2027-28	200	310	640	640	700	985	1245
2028-29	210	325	675	675	735	1035	1310
2029-30	220	345	705	705	775	1090	1375
2030-31	230	360	745	745	815	1145	1445
2031-32	240	380	780	780	855	1205	1520
2032-33	255	400	825	825	900	1265	1600
2033-34	270	420	865	865	945	1330	1680
2034-35	280	445	910	910	995	1400	1770
2035-36	295	465	960	960	1050	1475	1865
2036-37	315	490	1010	1010	1105	1555	1960
2037-38	330	515	1065	1065	1165	1635	2065
2038-39	345	545	1120	1120	1225	1725	2175
2039-40	365	575	1180	1180	1290	1815	2295
2040-41	385	605	1245	1245	1360	1915	2415
2041-42	405	635	1310	1310	1435	2015	2545
2042-43	430	670	1380	1380	1510	2125	2685
2043-44	450	710	1455	1455	1595	2240	2830
2044-45	475	745	1535	1535	1680	2365	2985
2045-46	500	785	1620	1620	1770	2490	3150
2046-47	530	830	1710	1710	1870	2630	3320
2047-48	560	875	1800	1800	1975	2775	3505

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	275	570	570	625	885	1105
2026-27	185	290	600	600	655	930	1160
2027-28	195	305	630	630	690	975	1220
2028-29	205	320	665	665	725	1025	1285
2029-30	215	335	695	695	765	1080	1350
2030-31	225	355	735	735	800	1135	1420
2031-32	235	375	770	770	845	1190	1490
2032-33	250	390	810	810	885	1255	1570
2033-34	260	410	855	855	935	1320	1650

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2034-35	275	435	900	900	980	1390	1735
2035-36	290	455	945	945	1035	1460	1825
2036-37	305	480	995	995	1090	1540	1925
2037-38	320	505	1050	1050	1145	1620	2025
2038-39	335	535	1105	1105	1205	1705	2135
2039-40	355	560	1160	1160	1270	1795	2250
2040-41	375	590	1225	1225	1340	1895	2370
2041-42	395	625	1290	1290	1410	1995	2495
2042-43	415	660	1360	1360	1485	2105	2630
2043-44	440	695	1435	1435	1570	2220	2775
2044-45	460	730	1510	1510	1655	2340	2925
2045-46	490	770	1595	1595	1745	2465	3085
2046-47	515	815	1680	1680	1840	2600	3255
2047-48	545	860	1775	1775	1940	2745	3435

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	155	250	525	525	575	825	1005
2026-27	165	265	555	555	605	865	1055
2027-28	170	275	580	580	635	910	1110
2028-29	180	290	610	610	665	955	1165
2029-30	190	305	640	640	700	1005	1225
2030-31	200	320	675	675	735	1055	1285
2031-32	210	340	710	710	775	1110	1355
2032-33	220	355	745	745	815	1170	1425
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	1435	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	1760	2145
2041-42	350	565	1185	1185	1290	1855	2260
2042-43	370	595	1250	1250	1360	1955	2385
2043-44	390	630	1315	1315	1435	2065	2510
2044-45	410	660	1385	1385	1515	2175	2650
2045-46	430	700	1460	1460	1595	2295	2790
2046-47	455	735	1540	1540	1685	2420	2945
2047-48	480	775	1625	1625	1775	2550	3105

Table 7-8 : Toll Rates for Monthly Pass Local Car Ticket @ all Toll Plaza

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875
2044-45	920	920
2045-46	970	970
2046-47	1025	1025
2047-48	1080	1080

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	6005	12360	12360	13525	19025	24015
2025-26	3985	6255	12870	12870	14080	19805	25010
2026-27	4190	6575	13525	13525	14805	20820	26290
2027-28	4405	6910	14225	14225	15565	21890	27645
2028-29	4630	7265	14950	14950	16360	23005	29055
2029-30	4870	7635	15715	15715	17200	24185	30545
2030-31	5120	8030	16525	16525	18085	25430	32120
2031-32	5385	8445	17380	17380	19020	26745	33780
2032-33	5665	8885	18280	18280	20005	28135	35535
2033-34	5960	9345	19235	19235	21050	29600	37385
2034-35	6275	9835	20240	20240	22150	31150	39345
2035-36	6605	10355	21305	21305	23320	32790	41415
2036-37	6955	10900	22435	22435	24550	34525	43605
2037-38	7320	11480	23625	23625	25855	36355	45920
2038-39	7710	12090	24880	24880	27230	38290	48365
2039-40	8125	12740	26215	26215	28690	40340	50955
2040-41	8560	13425	27620	27620	30230	42505	53695
2041-42	9025	14145	29110	29110	31860	44800	56590
2042-43	9510	14915	30685	30685	33585	47225	59655

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2043-44	10030	15725	32355	32355	35410	49790	62895
2044-45	10575	16580	34120	34120	37340	52505	66325
2045-46	11155	17490	35985	35985	39385	55380	69955
2046-47	11770	18450	37960	37960	41545	58420	73800
2047-48	12415	19465	40055	40055	43835	61635	77865

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	3735	5905	12220	12220	13360	18905	23625
2025-26	3880	6140	12700	12700	13885	19640	24555
2026-27	4080	6450	13345	13345	14590	20640	25805
2027-28	4290	6780	14030	14030	15340	21695	27125
2028-29	4505	7125	14745	14745	16120	22800	28510
2029-30	4735	7490	15500	15500	16945	23970	29965
2030-31	4980	7875	16295	16295	17815	25200	31505
2031-32	5240	8285	17135	17135	18735	26500	33135
2032-33	5510	8715	18025	18025	19705	27875	34850
2033-34	5795	9165	18960	18960	20730	29325	36665
2034-35	6100	9645	19955	19955	21815	30855	38585
2035-36	6420	10155	21000	21000	22960	32475	40610
2036-37	6760	10690	22110	22110	24175	34190	42755
2037-38	7120	11255	23280	23280	25455	36000	45020
2038-39	7495	11855	24520	24520	26810	37915	47415
2039-40	7895	12485	25830	25830	28240	39940	49950
2040-41	8320	13155	27215	27215	29755	42085	52625
2041-42	8770	13865	28680	28680	31360	44350	55460
2042-43	9245	14615	30230	30230	33055	46750	58460
2043-44	9745	15410	31870	31870	34845	49285	61635
2044-45	10275	16250	33605	33605	36745	51970	64990
2045-46	10840	17135	35445	35445	38755	54810	68545
2046-47	11430	18075	37385	37385	40880	57815	72300
2047-48	12060	19070	39445	39445	43130	60995	76280

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	5400	11315	11315	12340	17740	21595
2025-26	3455	5585	11700	11700	12765	18350	22340
2026-27	3630	5865	12290	12290	13405	19270	23460
2027-28	3815	6160	12910	12910	14085	20245	24645
2028-29	4010	6475	13565	13565	14795	21270	25895
2029-30	4210	6805	14255	14255	15550	22355	27215
2030-31	4425	7150	14985	14985	16345	23500	28605
2031-32	4655	7520	15755	15755	17185	24705	30075
2032-33	4895	7905	16565	16565	18075	25980	31625
2033-34	5150	8315	17425	17425	19010	27325	33265
2034-35	5415	8750	18335	18335	20000	28750	35000

Year	Car	Minibus /LCV	Bus	Truck	3-Axle	Multi axle	Oversized Vehicles
2035-36	5700	9205	19290	19290	21045	30255	36830
2036-37	6000	9690	20305	20305	22150	31845	38765
2037-38	6315	10205	21375	21375	23320	33525	40810
2038-39	6650	10745	22510	22510	24555	35300	42975
2039-40	7005	11315	23710	23710	25865	37180	45260
2040-41	7380	11920	24975	24975	27245	39165	47680
2041-42	7775	12560	26315	26315	28710	41265	50240
2042-43	8195	13235	27735	27735	30255	43490	52945
2043-44	8635	13950	29235	29235	31890	45845	55810
2044-45	9105	14710	30820	30820	33620	48330	58840
2045-46	9600	15510	32500	32500	35455	50965	62045
2046-47	10125	16360	34275	34275	37390	53750	65435
2047-48	10685	17255	36155	36155	39445	56700	69025

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
2024-25	24.54	57.52	56.31	138.37
2025-26	27.96	65.06	63.43	156.44
2026-27	32.56	75.68	74.05	182.30
2027-28	36.94	86.27	83.44	206.65
2028-29	41.87	96.42	93.57	231.85
2029-30	46.93	107.88	104.98	259.79
2030-31	52.82	120.65	117.65	291.12
2031-32	58.84	134.41	131.32	324.57
2032-33	66.18	150.03	145.62	361.83
2033-34	74.36	167.75	163.12	405.23

Year	TP-1	TP2	TP3	Total
2034-35	83.23	187.75	181.66	452.64
2035-36	93.45	209.86	203.40	506.71
2036-37	104.43	233.15	226.40	563.98
2037-38	116.73	259.81	252.61	629.15
2038-39	130.26	289.17	282.14	701.57
2039-40	147.04	323.13	315.29	785.46
2040-41	163.83	360.78	350.43	875.05
2041-42	183.92	402.96	393.12	980.00
2042-43	206.73	448.13	438.39	1093.25
2043-44	232.21	503.16	492.03	1227.40
2044-45	259.65	562.21	548.89	1370.76
2045-46	291.16	626.74	611.41	1529.31
2046-47	327.04	698.86	681.88	1707.78
2047-48	364.64	777.94	759.47	1902.05

Table 7-13 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	TP-1	TP2	TP3	Total
2024-25	24.54	57.52	56.31	138.37
2025-26	27.84	64.77	63.15	155.76
2026-27	32.32	74.95	73.41	180.68
2027-28	36.54	85.06	82.30	203.90
2028-29	41.18	94.64	91.87	227.69
2029-30	45.92	105.44	102.55	253.91
2030-31	51.44	117.37	114.41	283.22
2031-32	57.04	130.14	127.10	314.27
2032-33	63.87	144.61	140.21	348.68
2033-34	71.44	160.90	156.34	388.68

Year	TP-1	TP2	TP3	Total
2034-35	79.67	179.23	173.36	432.27
2035-36	89.02	199.41	193.18	481.61
2036-37	99.11	220.49	214.04	533.65
2037-38	110.29	244.52	237.75	592.56
2038-39	122.59	271.00	264.28	657.87
2039-40	137.72	301.40	293.98	733.09
2040-41	152.65	334.83	325.24	812.72
2041-42	170.48	372.20	363.20	905.88
2042-43	190.73	411.94	403.17	1005.84
2043-44	213.21	460.28	450.38	1123.87
2044-45	237.35	511.86	500.10	1249.30
2045-46	264.91	567.95	554.34	1387.20
2046-47	296.04	630.27	615.37	1541.68
2047-48	328.60	698.28	682.01	1708.90

Table 7-14 : Toll Revenue Most Likely Scenario

(Rs. Crores)

Year	TP-1	TP2	TP3	Total
2024-25	24.54	57.52	56.31	138.37
2025-26	27.92	64.92	63.30	156.13
2026-27	32.46	75.33	73.74	181.53
2027-28	36.75	85.71	82.85	205.31
2028-29	41.53	95.56	92.70	229.78
2029-30	46.45	106.69	103.72	256.86
2030-31	52.16	119.10	115.92	287.18
2031-32	57.94	132.35	129.12	319.41
2032-33	65.03	147.42	142.81	355.26
2033-34	72.92	164.37	159.62	396.91

Year	TP-1	TP2	TP3	Total
2034-35	81.48	183.46	177.45	442.39
2035-36	91.28	204.54	198.22	494.04
2036-37	101.81	226.65	220.19	548.65
2037-38	113.46	251.93	245.14	610.53
2038-39	126.25	279.82	273.18	679.25
2039-40	142.18	311.98	304.56	758.72
2040-41	158.02	347.43	337.65	843.09
2041-42	176.95	387.17	377.89	942.01
2042-43	198.31	429.55	420.50	1048.37
2043-44	222.31	481.09	470.89	1174.29
2044-45	248.12	536.17	524.17	1308.46
2045-46	277.70	596.36	582.46	1456.53
2046-47	311.17	663.37	648.10	1622.65
2047-48	346.10	736.72	720.14	1802.97

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)**

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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highway Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- 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 21st 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.

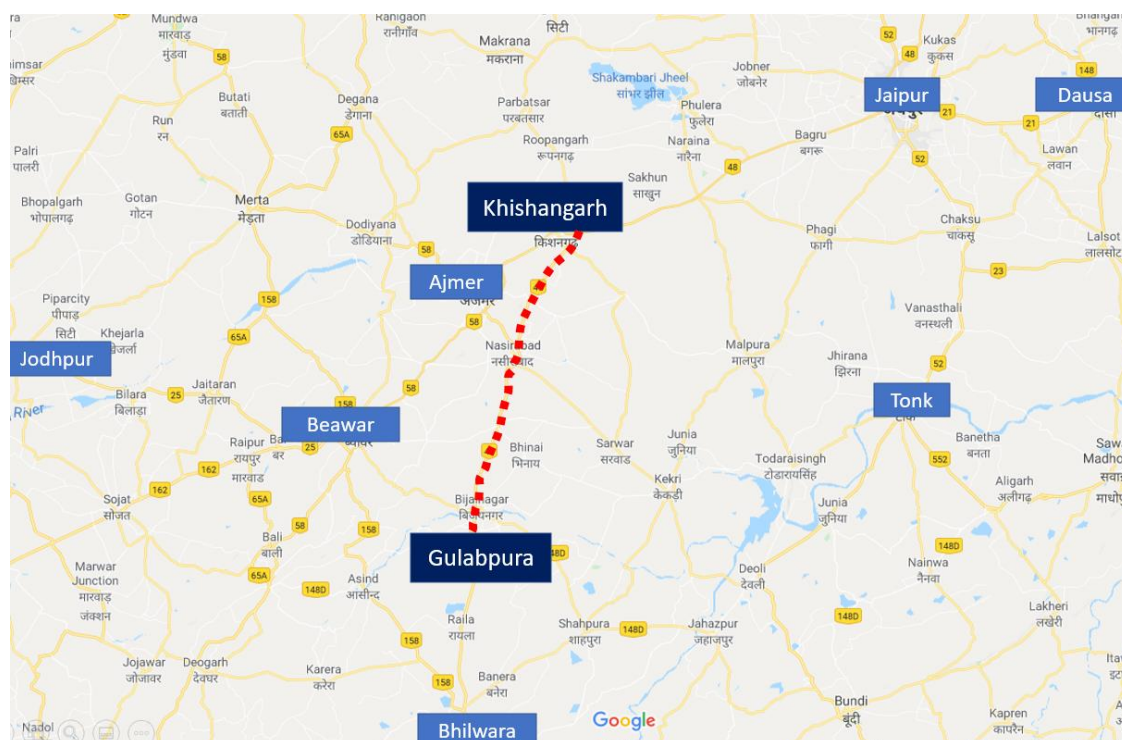


Figure 1-1 : Alignment of Project Stretch

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.

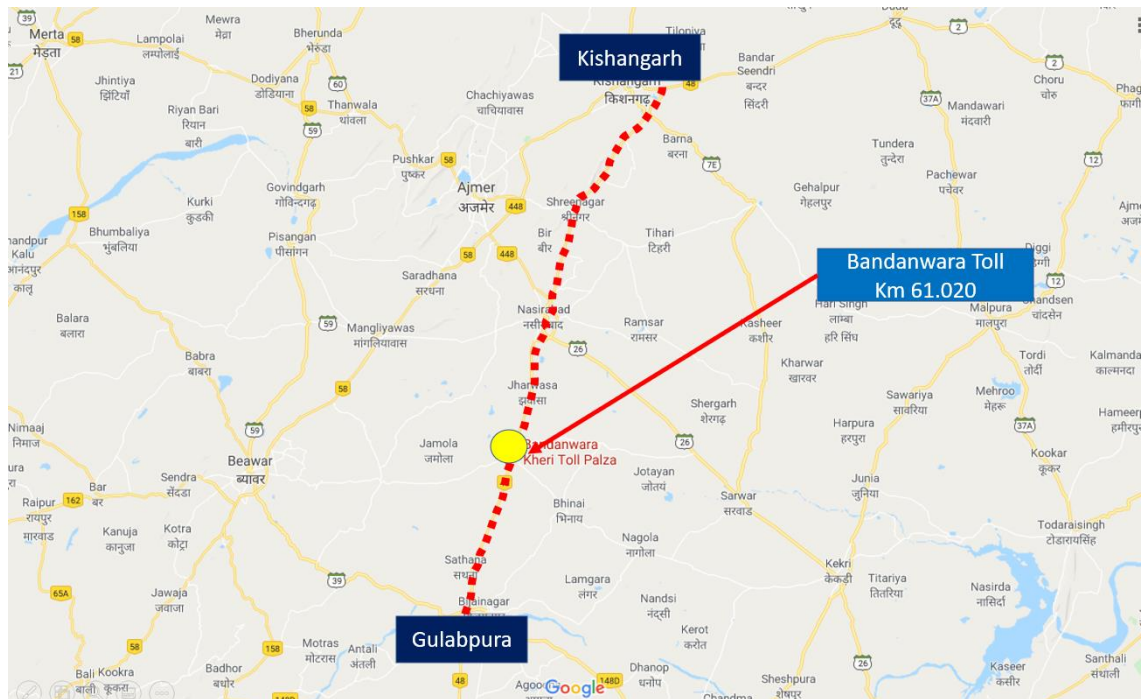


Figure 2-1 : Project Alignment with Toll Plaza

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 November 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, Eight month	For Year 2018-19, 2019-2020 ,2020-2021, 2021-2022, 2022-2023, Eight month	For Year 2018-19, 2019-2020 ,2020-2021, 2021-2022, 2022-2023, Eight month	For Year 2018-19, 2019-2020 ,2020-2021, 2021-2022, 2022-2023, Eight month

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	from April 2023 to November 2023 & Eight month from April 2024 to November 2024	from April 2023 to November 2023 & Eight month from April 2024 to November 2024	from April 2023 to November 2023 & Eight month from April 2024 to November 2024	from April 2023 to November 2023 & Eight month from April 2024 to November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	6220
2	Minibus /LCV	1009	326	522	736	868	669
3	Bus	376	38	337	486	624	180
4	Truck	1511	264	1756	2375	2803	2292
5	3-Axle Commercial vehicle	2095	318	1805	2045	2188	1715
6	Multi axle	4421	748	4141	4709	5396	4573
7	Oversized Vehicle	19	70	319	296	463	468
Total		12003	2212	12707	16046	18770	16117

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

Toll Plaza Location (Km)	Year	Traffic No	PCU	PCU Index
	2021-22	12707	36374	2.86
	2022-23	16046	43739	2.73
	2023-24	18770	50940	2.71
	2024-25	16117	42470	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.

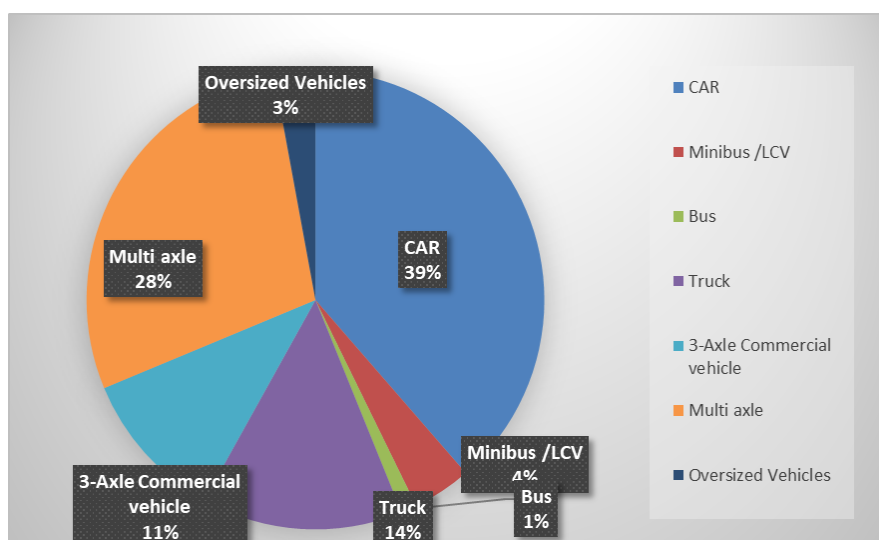


Figure 3-1 : Model Split of Tollable Vehicle

It is observed that car traffic forms about 39% of total traffic at toll plaza locations while multi axle commercial vehicles are about 42% 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	12317
2	Return Journey	3184
3	Local Commercial Single Journey	601
4	Monthly Pass Local	10
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.

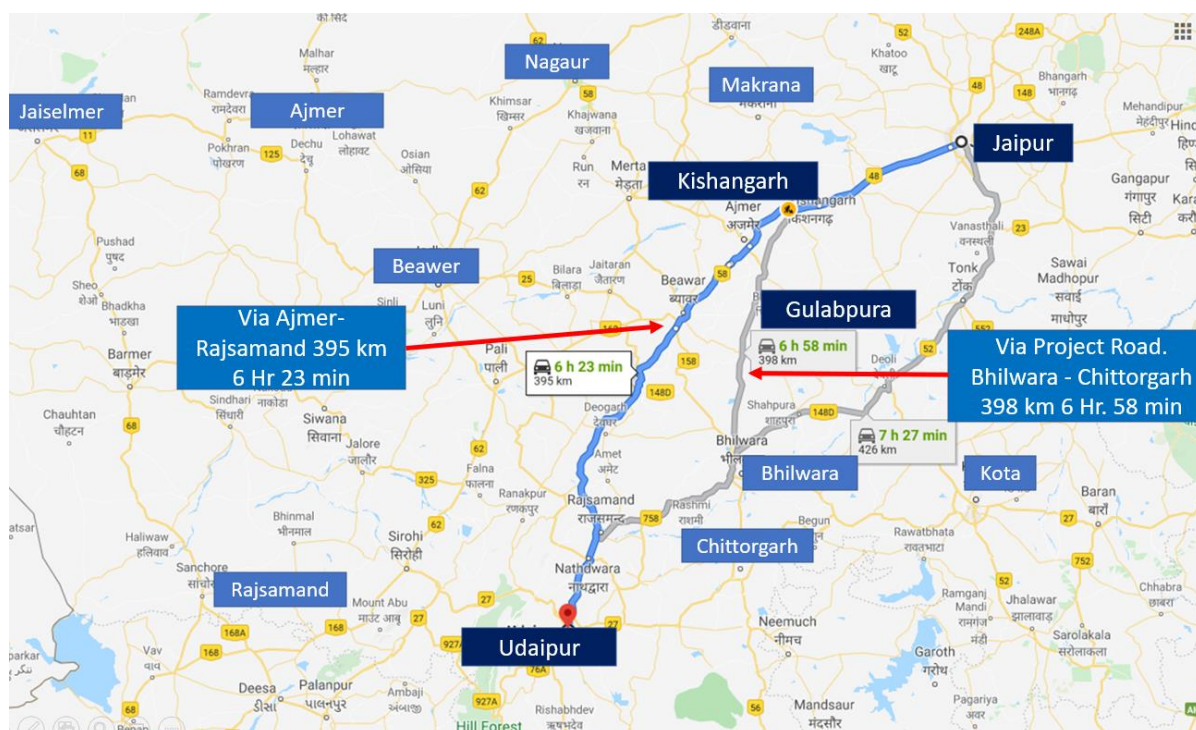


Figure 4-1 : Alternate route at regional level.

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
Regional Level						
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.

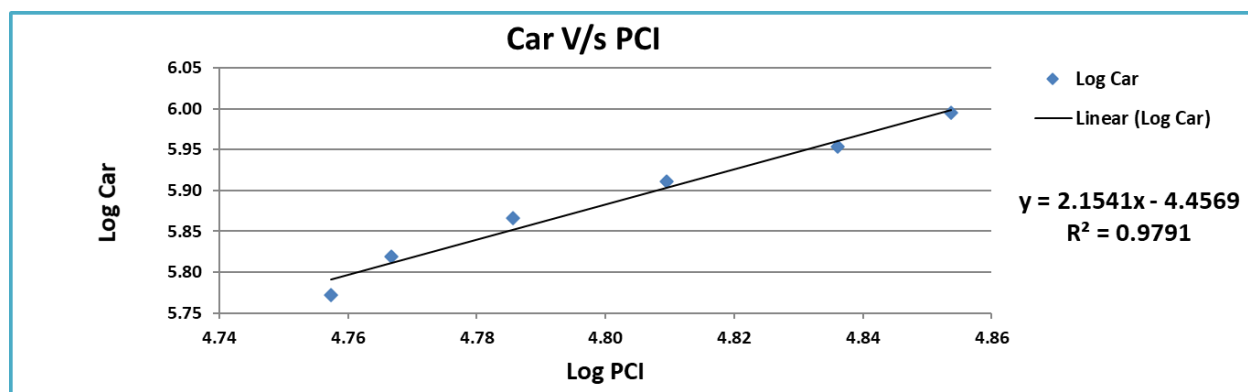
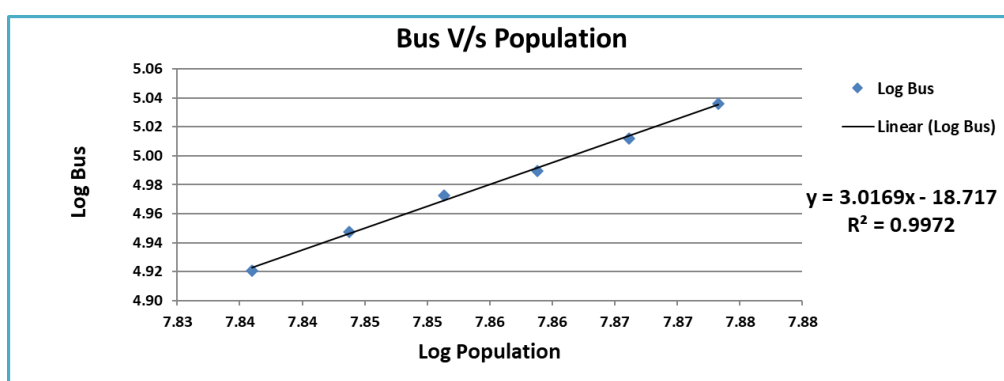


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan**Table 5-2 : Population Vs Bus Rajasthan**

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.

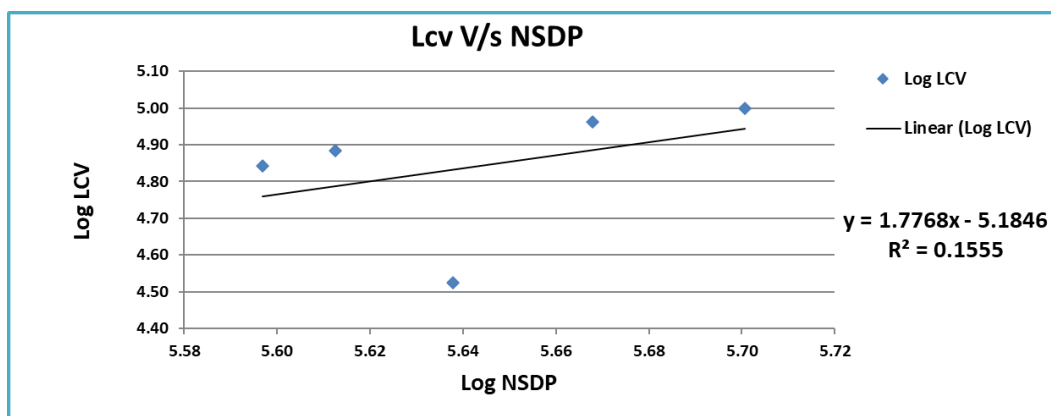


Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.

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%

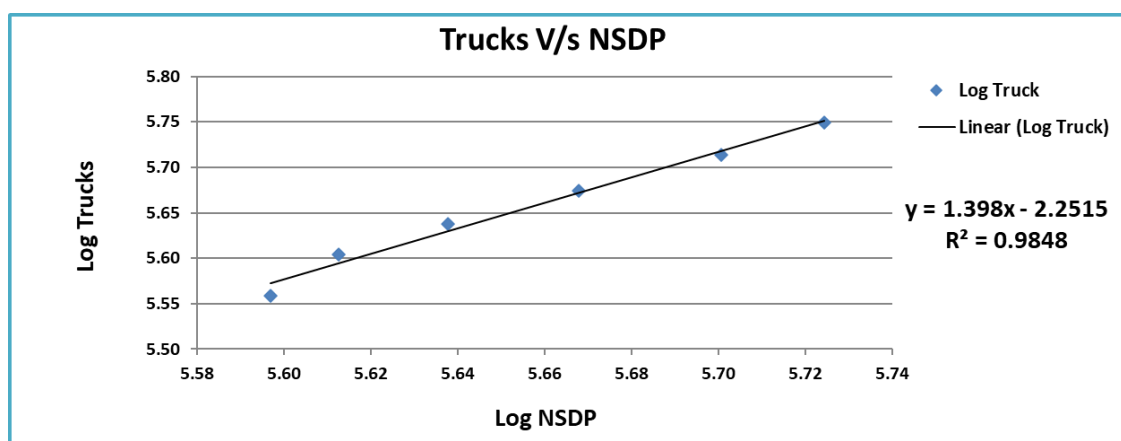


Figure 5-4 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Rajasthan.

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.

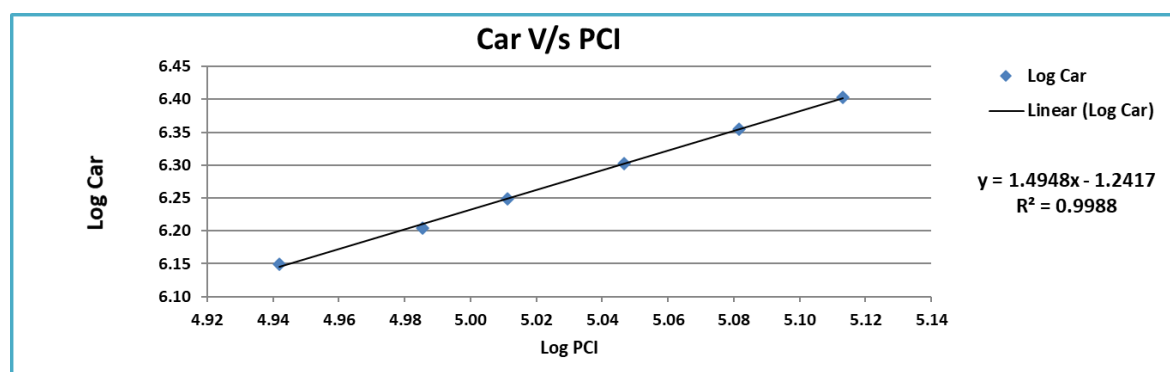


Figure 5-5 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat

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.

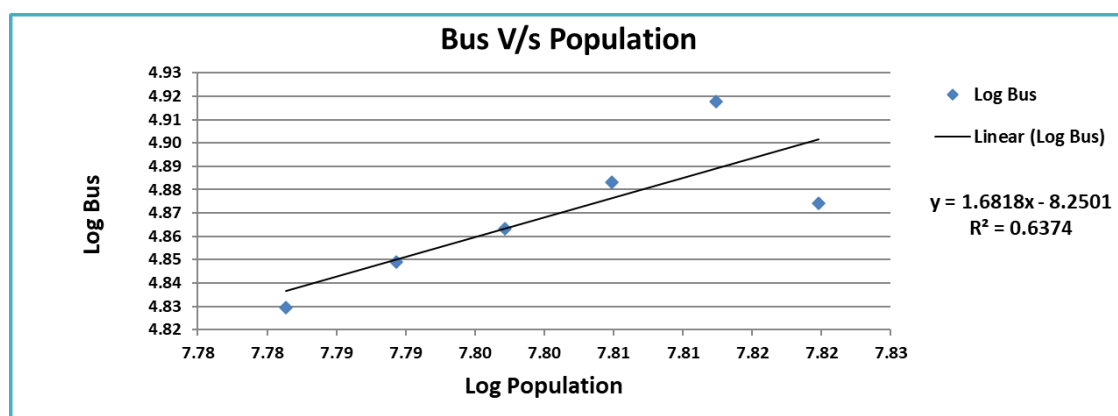


Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat

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.

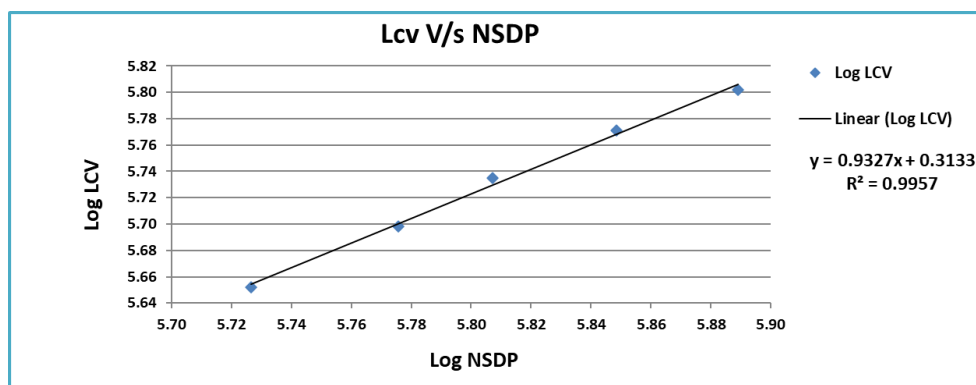


Figure 5-7 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Gujarat.

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%

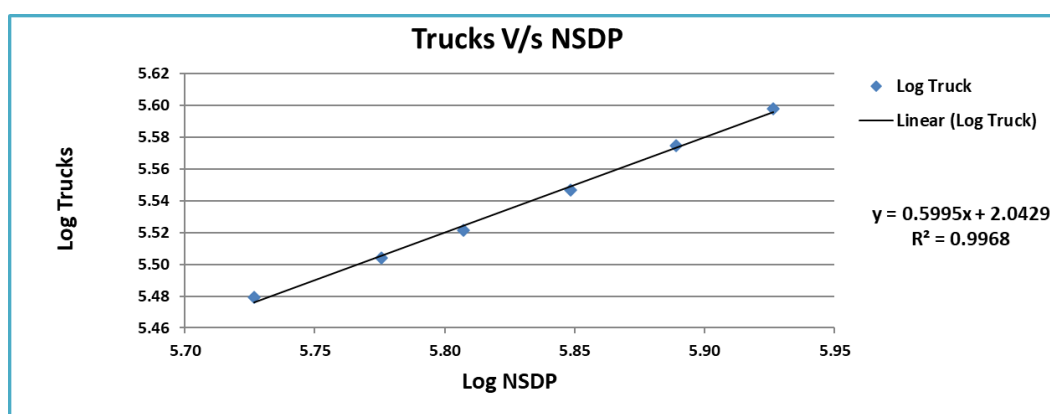


Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Gujarat.

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 R² 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.

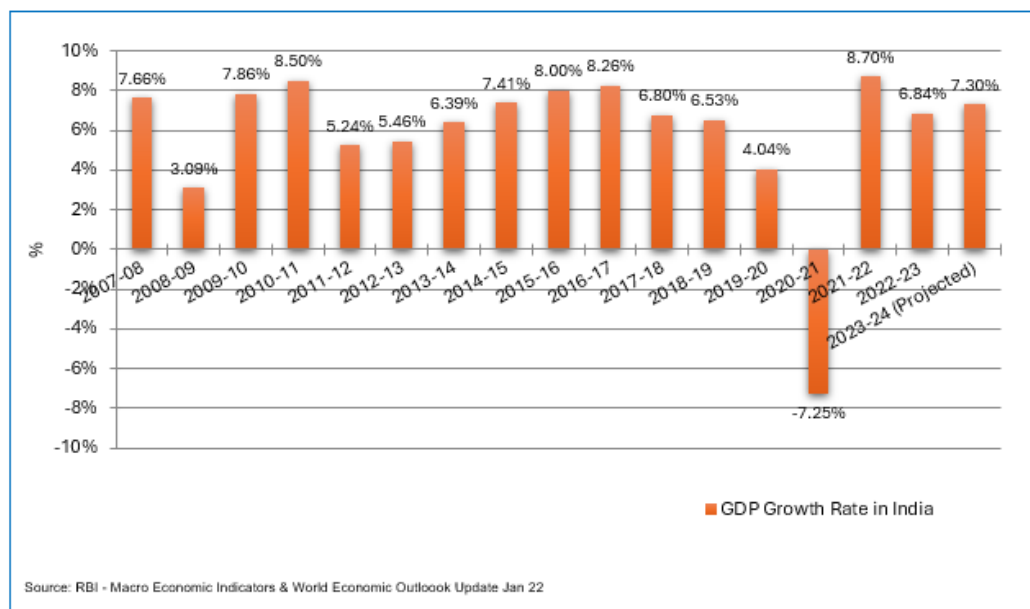


Figure 5-9 : Growth of GDP in India

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, Lead, 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.

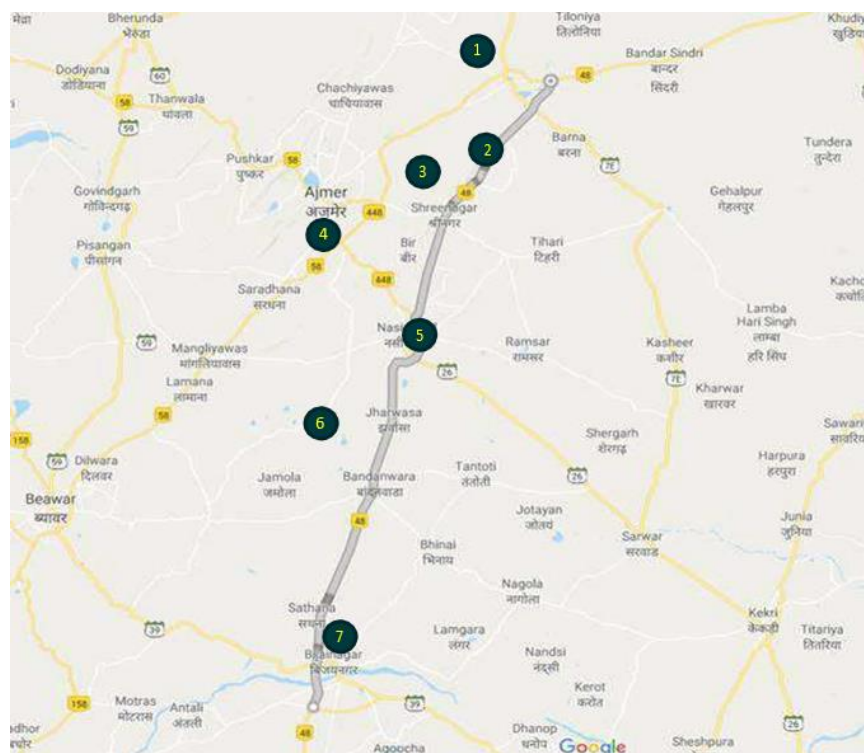


Figure 5-10 : Industrial Units along project corridor.

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	2025-2026	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	2025-2026	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	2025-2026	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%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 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	6220	669	180	2292	1715	4573	468	16117	42470
2025-26	6886	708	191	2429	1832	4930	504	17480	45757
2026-27	7587	746	201	2562	1948	5289	540	18873	49070
2027-28	8323	782	211	2689	2062	5648	576	20291	52390
2028-29	9047	811	219	2795	2163	5975	609	21619	55423
2029-30	9834	841	228	2906	2268	6321	644	23042	58644
2030-31	10636	873	237	3009	2366	6646	677	24444	61735
2031-32	11503	907	246	3115	2468	6987	712	25938	64996
2032-33	12441	942	255	3225	2574	7346	748	27531	68439
2033-34	13456	978	265	3339	2685	7724	786	29233	72085
2034-35	14554	1016	275	3456	2801	8121	826	31049	75936
2035-36	15664	1057	285	3563	2907	8487	863	32826	79590
2036-37	16858	1100	295	3674	3017	8869	902	34715	83436
2037-38	18142	1145	305	3788	3131	9268	942	36721	87477
2038-39	19524	1191	316	3905	3249	9685	984	38854	91731
2039-40	21011	1239	327	4026	3372	10121	1028	41124	96215
2040-41	22603	1292	338	4141	3495	10553	1072	43494	100776
2041-42	24191	1350	349	4241	3602	10930	1110	45773	104972
2042-43	25891	1410	360	4344	3713	11320	1149	48187	109368

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	6220	669	180	2292	1715	4573	468	16117	42470
2025-26	6856	704	190	2417	1823	4907	502	17399	45543
2026-27	7521	737	199	2536	1929	5241	536	18699	48615

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2027-28	8212	768	208	2649	2032	5571	569	20009	51661
2028-29	8885	793	215	2741	2120	5866	599	21219	54395
2029-30	9613	818	223	2836	2213	6176	630	22509	57283
2030-31	10349	846	230	2921	2298	6463	659	23766	60014
2031-32	11141	875	238	3010	2386	6763	689	25102	62890
2032-33	11994	905	246	3101	2478	7077	721	26522	65918
2033-34	12911	936	254	3195	2573	7406	754	28029	69101
2034-35	13899	968	262	3291	2671	7750	789	29630	72449
2035-36	14888	1002	270	3376	2759	8060	820	31175	75566
2036-37	15947	1038	278	3464	2850	8383	853	32813	78842
2037-38	17083	1075	287	3554	2944	8719	887	34549	82278
2038-39	18299	1113	296	3646	3041	9068	922	36385	85873
2039-40	19603	1153	305	3740	3141	9430	959	38331	89641
2040-41	20991	1196	314	3829	3240	9786	995	40351	93449
2041-42	22360	1243	323	3902	3324	10087	1025	42264	96876
2042-43	23819	1292	332	3977	3409	10397	1056	44282	100450

**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	6220	669	180	2292	1715	4573	468	16117	42470
2025-26	6871	705	190	2423	1828	4918	503	17438	45646
2026-27	7554	740	200	2549	1940	5265	538	18786	48845
2027-28	8268	773	209	2669	2048	5610	573	20150	52029
2028-29	8966	800	217	2769	2142	5921	604	21419	54913
2029-30	9723	828	225	2872	2240	6249	637	22774	57963
2030-31	10491	858	233	2966	2332	6555	668	24103	60875
2031-32	11319	889	241	3063	2427	6876	700	25515	63938
2032-33	12213	921	249	3164	2525	7213	734	27019	67170
2033-34	13178	954	258	3268	2628	7566	770	28622	70583
2034-35	14220	989	267	3375	2735	7936	807	30329	74178
2035-36	15268	1027	276	3471	2832	8273	841	31988	77559
2036-37	16394	1066	285	3570	2933	8624	877	33749	81112
2037-38	17602	1107	294	3672	3037	8991	914	35617	84844
2038-39	18899	1149	304	3776	3144	9373	953	37598	88762
2039-40	20292	1193	314	3883	3256	9771	993	39702	92879
2040-41	21779	1241	324	3985	3367	10163	1033	41892	97051
2041-42	23255	1293	334	4072	3462	10501	1067	43984	100855
2042-43	24831	1347	344	4161	3559	10850	1102	46194	104828

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 - 1st 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

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	76236	48840	-36%	54%	20%	20	4.0

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	76236	49072	-36%	53%	20%	20	4.0

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	76236	48606	-36%	54%	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) 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.

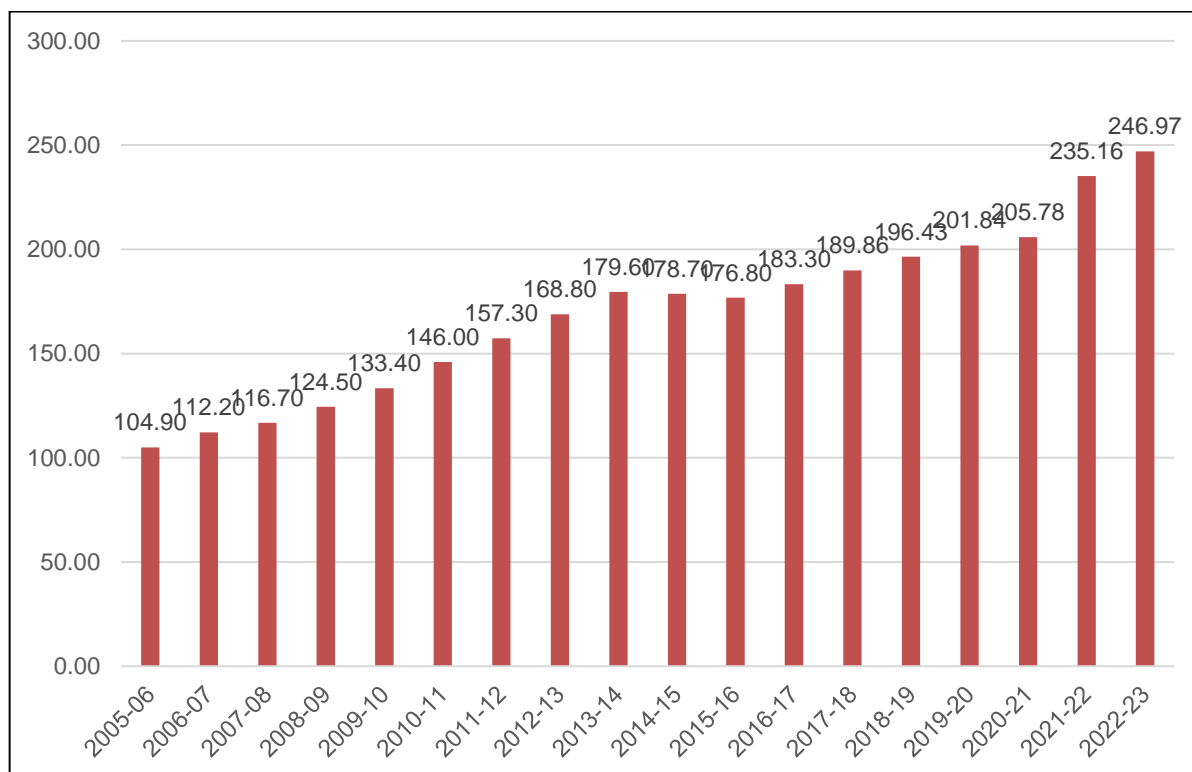


Figure 7-1 : Historical Rate of WPI Inflation in India

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	930
2025-26	150	240	505	505	550	790	960
2026-27	155	250	530	530	575	830	1010
2027-28	165	265	555	555	605	870	1060
2028-29	170	280	585	585	635	915	1115
2029-30	180	290	615	615	670	960	1170
2030-31	190	305	645	645	705	1010	1230
2031-32	200	325	675	675	740	1060	1295
2032-33	210	340	710	710	775	1115	1360
2033-34	220	355	750	750	815	1175	1430
2034-35	235	375	790	790	860	1235	1505
2035-36	245	395	830	830	905	1300	1585
2036-37	260	415	875	875	950	1370	1665
2037-38	270	440	920	920	1000	1440	1755
2038-39	285	460	965	965	1055	1515	1845
2039-40	300	485	1020	1020	1110	1600	1945
2040-41	315	510	1075	1075	1170	1685	2050
2041-42	335	540	1130	1130	1235	1775	2160
2042-43	350	570	1190	1190	1300	1870	2275

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	360	755	755	825	1185	1440
2026-27	235	380	790	790	865	1240	1515
2027-28	245	395	830	830	910	1305	1590
2028-29	260	415	875	875	955	1370	1670
2029-30	270	440	920	920	1005	1440	1755
2030-31	285	460	965	965	1055	1515	1845
2031-32	300	485	1015	1015	1110	1595	1940
2032-33	315	510	1070	1070	1165	1675	2040
2033-34	330	535	1125	1125	1225	1760	2145
2034-35	350	565	1180	1180	1290	1855	2255
2035-36	365	595	1245	1245	1355	1950	2375
2036-37	385	625	1310	1310	1430	2055	2500
2037-38	405	660	1380	1380	1505	2160	2630
2038-39	430	695	1450	1450	1585	2275	2770

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles
2039-40	450	730	1530	1530	1665	2395	2920
2040-41	475	770	1610	1610	1755	2525	3075
2041-42	500	810	1695	1695	1850	2660	3240
2042-43	530	855	1790	1790	1950	2805	3415

Table 7-4 : Toll Rates for Monthly Pass Local@ Chainage KM 61.02

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830

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	4790	7735	16205	16205	17680	25415	30940
2025-26	4955	8000	16765	16765	18290	26290	32005
2026-27	5200	8405	17605	17605	19205	27610	33615
2027-28	5465	8825	18495	18495	20175	29005	35310
2028-29	5740	9275	19435	19435	21200	30475	37100
2029-30	6035	9745	20420	20420	22280	32025	38990
2030-31	6345	10245	21465	21465	23420	33665	40980
2031-32	6670	10770	22570	22570	24620	35395	43090
2032-33	7010	11330	23735	23735	25890	37220	45310
2033-34	7375	11915	24965	24965	27235	39150	47660
2034-35	7760	12535	26265	26265	28655	41190	50140
2035-36	8165	13190	27640	27640	30150	43345	52765
2036-37	8595	13885	29090	29090	31735	45620	55535
2037-38	9050	14615	30625	30625	33410	48025	58470

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2038-39	9530	15390	32250	32250	35180	50575	61565
2039-40	10035	16210	33965	33965	37055	53265	64845
2040-41	10570	17075	35780	35780	39035	56110	68310
2041-42	11140	17995	37700	37700	41130	59120	71975
2042-43	11740	18965	39730	39730	43345	62305	75850

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 plazas up to 2042-43 starting from the year 2024-25 are shown in tables below.

Table 7-6 : Toll Revenue Optimistic Scenario

(Rs. Crores)

Year	TP-1
2024-25	245.22
2025-26	274.19
2026-27	307.78
2027-28	345.72
2028-29	382.62
2029-30	424.85
2030-31	469.92
2031-32	520.34
2032-33	573.63
2033-34	635.17
2034-35	704.58
2035-36	777.16
2036-37	855.57
2037-38	940.75
2038-39	1037.48
2039-40	1149.06
2040-41	1262.15
2041-42	1384.67
2042-43	1516.75

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

Year	TP-1
2024-25	245.22
2025-26	272.90
2026-27	304.83
2027-28	340.72
2028-29	375.33
2029-30	414.81
2030-31	456.65
2031-32	503.33
2032-33	552.28
2033-34	608.61
2034-35	671.85
2035-36	737.45
2036-37	807.99
2037-38	884.25
2038-39	970.60
2039-40	1069.96
2040-41	1169.70
2041-42	1277.23
2042-43	1392.44

Table 7-8 : Toll Revenue Most Likely Scenario**(Rs. Crores)**

Year	TP-1
2024-25	245.22
2025-26	273.55
2026-27	306.39
2027-28	343.25
2028-29	378.99
2029-30	419.80
2030-31	463.25
2031-32	511.74
2032-33	562.81
2033-34	621.68
2034-35	687.94
2035-36	756.95
2036-37	831.30
2037-38	911.86
2038-39	1003.27
2039-40	1108.57
2040-41	1214.72
2041-42	1329.45
2042-43	1452.86

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)

JANUARY 2025



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JANUARY 2025



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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highway Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- 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 15th 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 29th 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 29th 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.

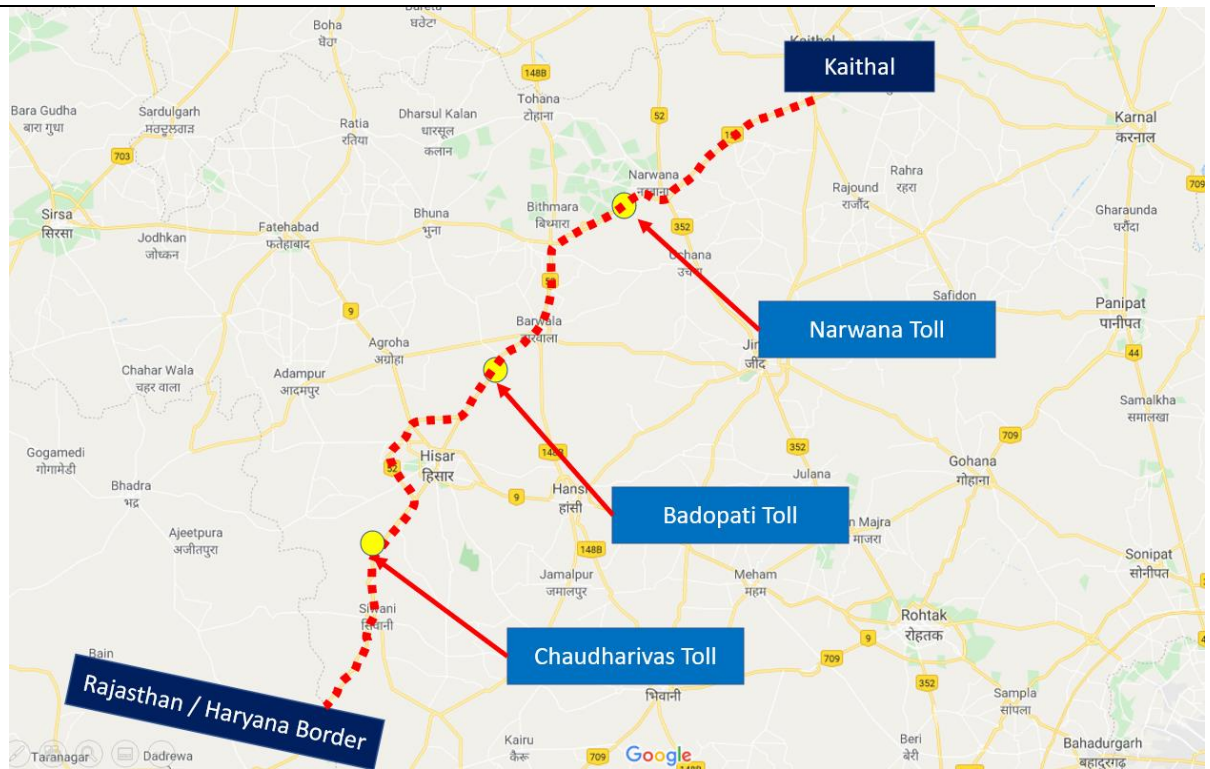


Figure 2-1 : Project Alignment with Toll Plaza

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 November 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 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024
2	Km 171 Toll Plaza at Badopatti	AADT for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024
3	Km 212 Toll Plaza at Chaudhariwas	AADT for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		November 2024	2024	November 2024	November 2024	November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	4226
2	Minibus/LCV	633	569	381	325	367	235
3	Bus	310	279	315	289	338	344
4	Truck	320	287	529	462	477	398
5	3-Axle	314	283	416	345	321	234
6	Multi Axle	771	694	1347	1343	1382	1084
7	Oversized Vehicles	5	5	20	47	48	33
	Total	5305	4774	7357	6905	7215	6555

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	4256
2	Minibus/LCV	630	567	374	331	306	333
3	Bus	431	387	395	384	405	432
4	Truck	327	295	577	503	437	410
5	3-Axle	376	339	505	400	336	325
6	Multi Axle	923	831	1522	1326	1130	1060
7	Oversized Vehicles	3	3	16	46	55	60
	Total	8077	7272	8303	7581	6800	6876

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	3587
2	Minibus/LCV	592	532	335	335	356	353
3	Bus	162	147	181	159	164	144
4	Truck	367	331	629	522	497	446
5	3-Axle	470	423	630	537	452	372
6	Multi Axle	1395	1257	2121	1812	1656	1373
7	Oversized Vehicles	6	5	29	65	65	69
	Total	5939	5347	8295	7506	7356	6344

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	Narwana Km 125.79	5305	10226	1.93
	Badopatti Km 171.58	8077	13901	1.72
	Chaudhariwas Km 212.400	5939	13136	2.21
	Narwana Km 125.79	4774	9203	1.93

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2020-21	Badopatti Km 171.58	7272	12516	1.72
	Chaudhariwas Km 212.400	5347	11832	2.21
2021-22	Narwana Km 125.79	7357	14849	2.02
	Badopatti Km 171.58	8303	16824	2.03
	Chaudhariwas Km 212.400	8295	18866	2.27
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	6555	12534	1.91
	Badopatti Km 171.58	6876	13297	1.93
	Chaudhariwas Km 212.400	6344	13492	2.13

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.

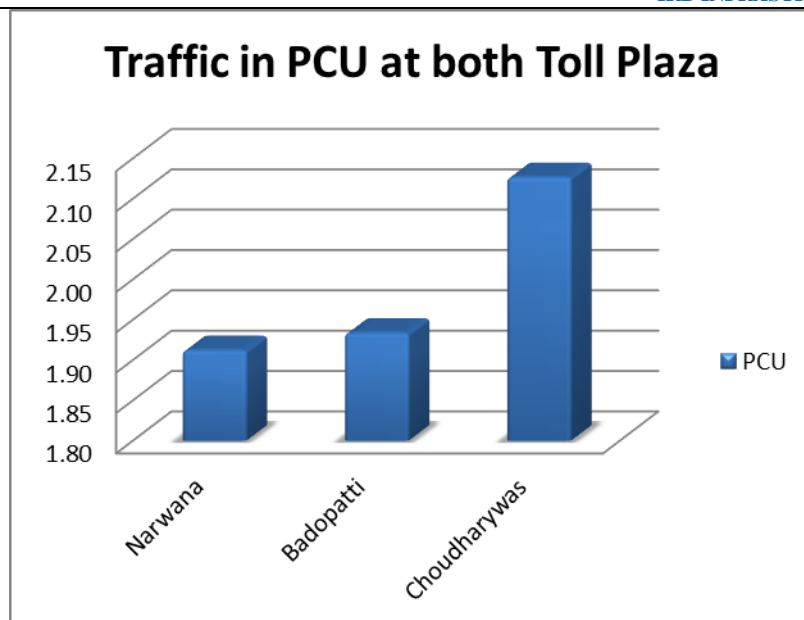


Figure 3-1 : Comparison of PCU Index

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.

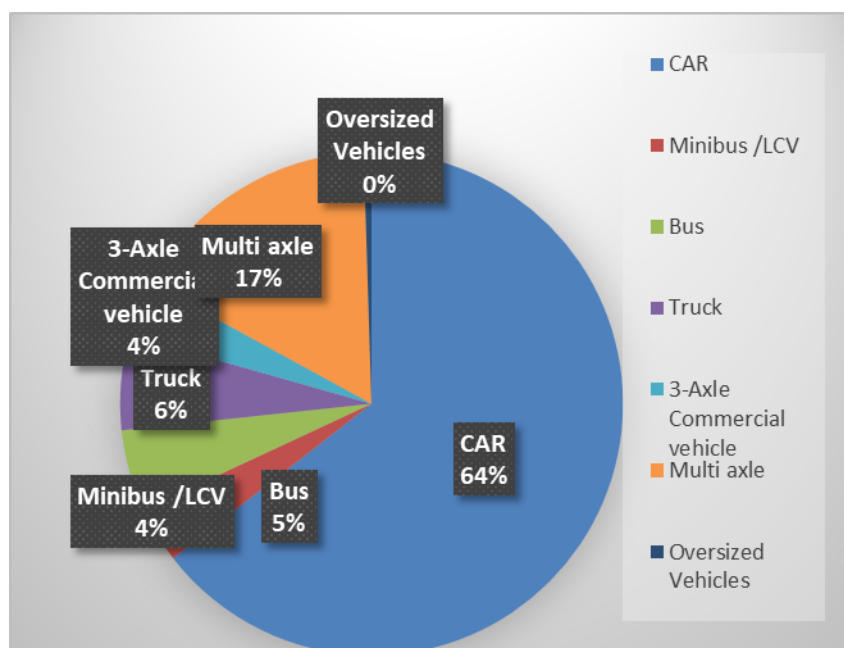


Figure 3-2 :Model Split of Tollable Vehicle-Km 125.790

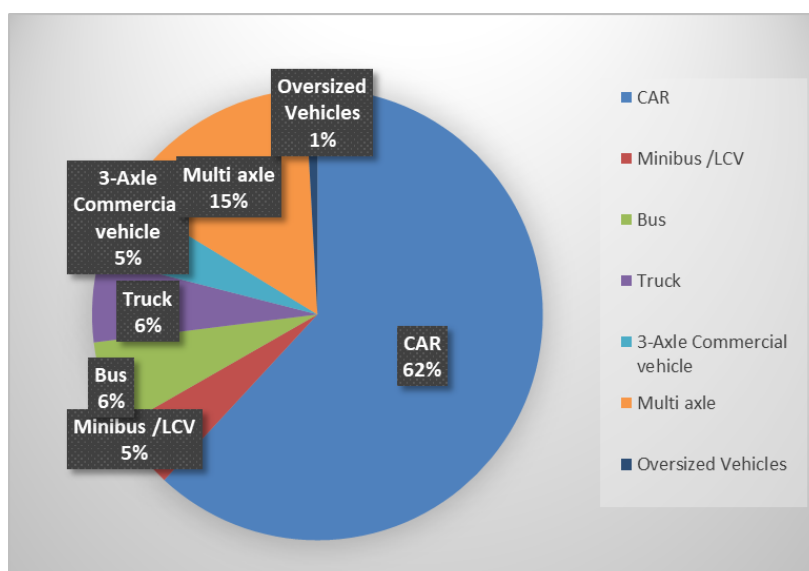


Figure 3-3 :Model Split of Tollable Vehicle-Km 171.58

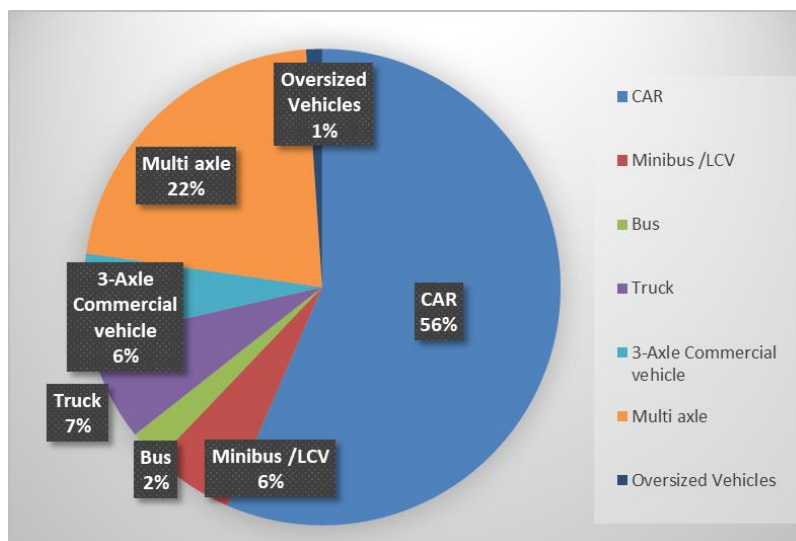


Figure 3-4 :Model Split of Tollable Vehicle-Km 212.400

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	3583
2	Return Journey	2890
3	Local Commercial Single Journey	55
4	Monthly Pass Local	27
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 55%. Return journey component is 44%. 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	3659
2	Return Journey	2944
3	Local Commercial Single Journey	173
4	Monthly Pass Local	100
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	3790
2	Return Journey	2440

Sr. No	Type	Traffic Volume (Nos.) 2024-25
3	Local Commercial Single Journey	79
4	Monthly Pass Local	35
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 from 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.

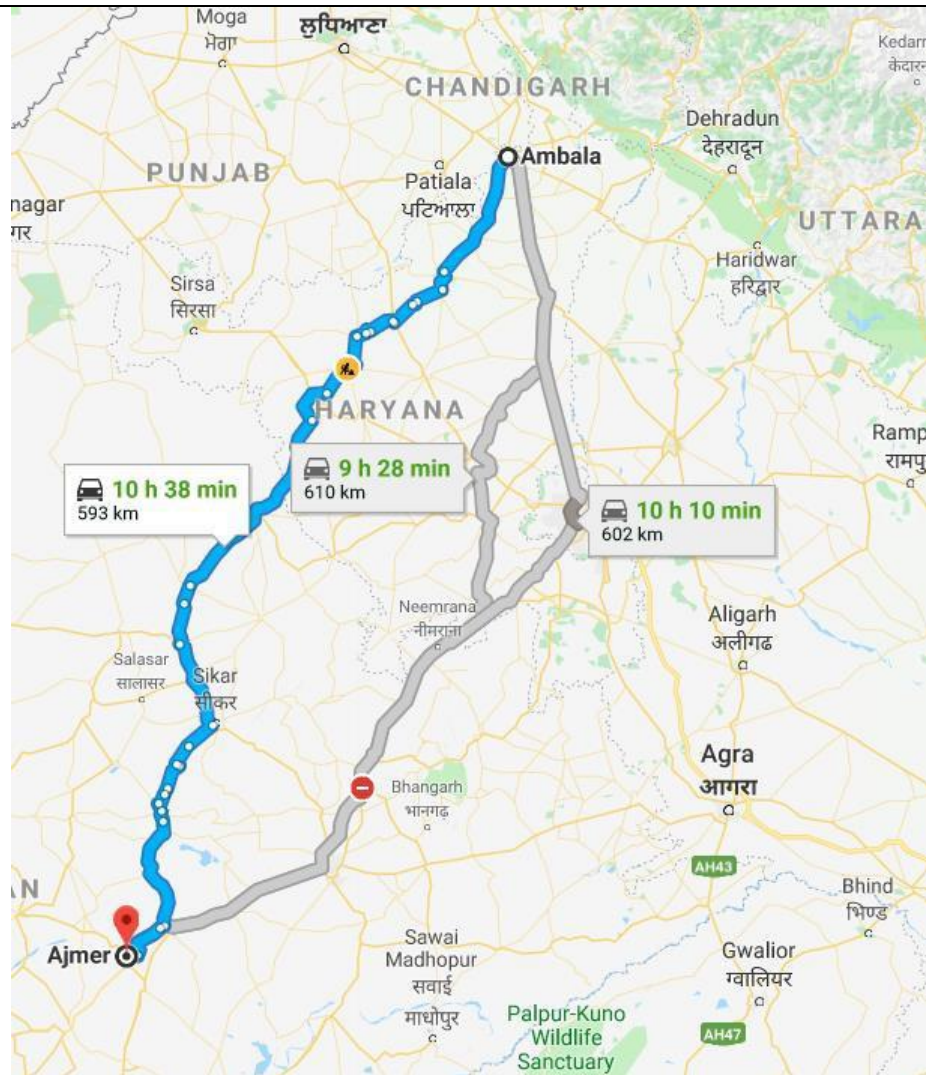


Figure 4-1 : Alternate route at regional level between Zones.

Above figure depicts alternate route between Ambala and Ajmer. Following figure shows alternate routes between Ludhiana and Ajmer

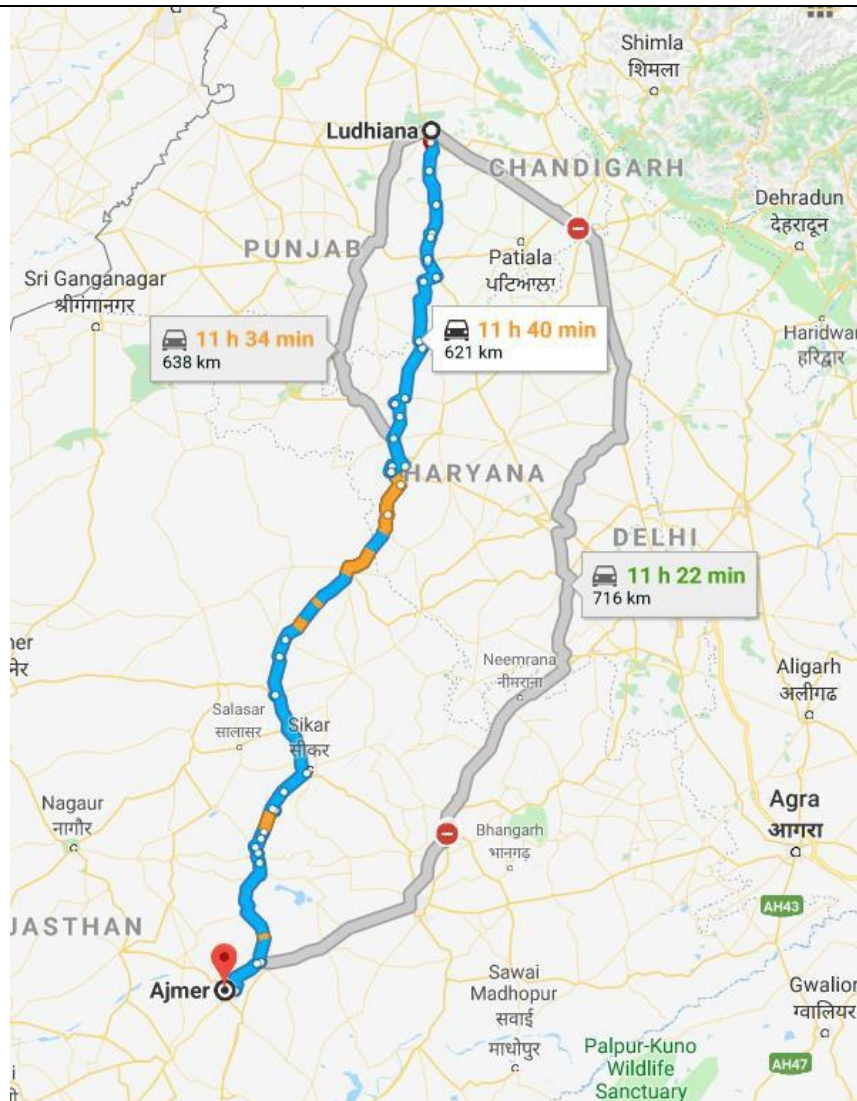


Figure 4-2 : Alternate route at regional level between Ludhiana & Ajmer

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
Regional Level						
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.

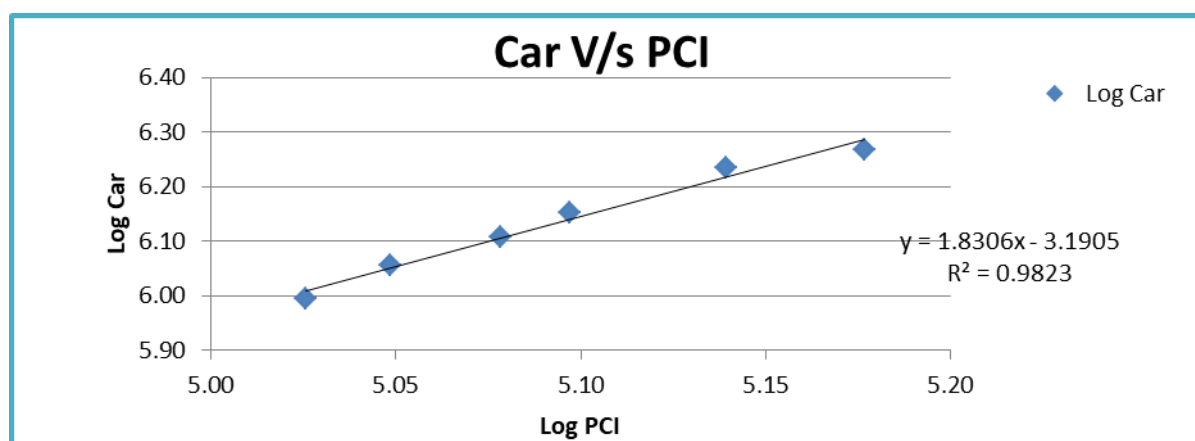
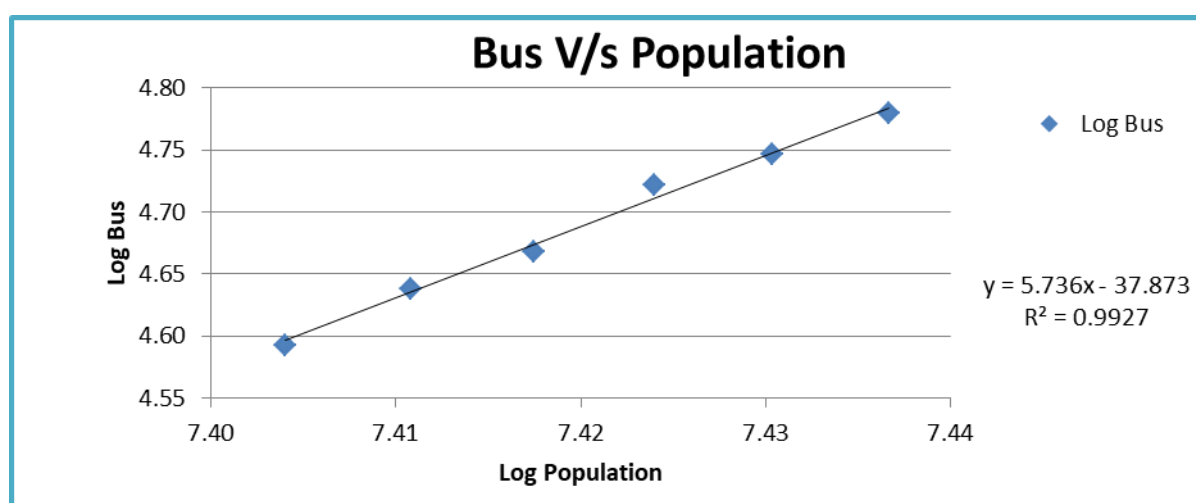


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana**Table 5-2 : Population Vs Bus Haryana**

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.

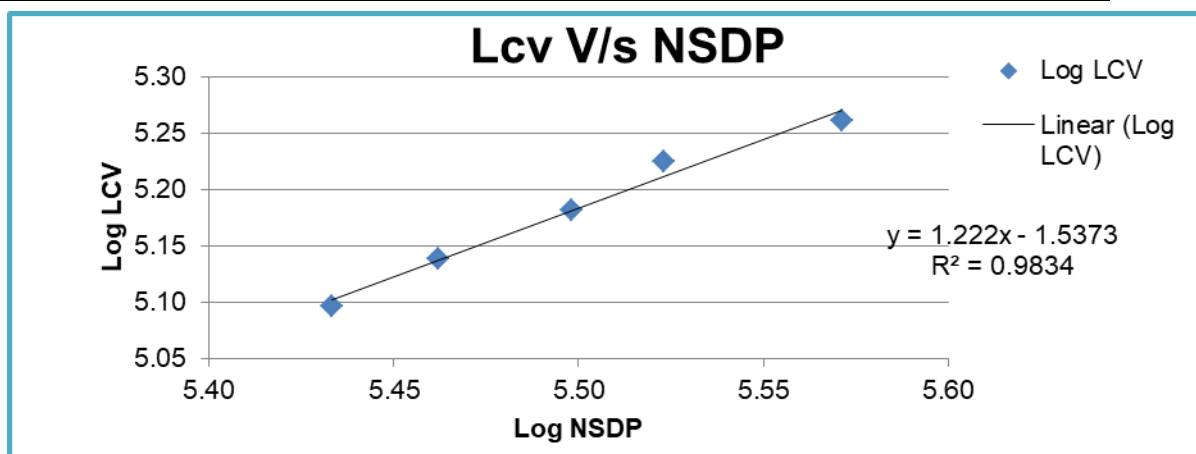


Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Haryana.

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.

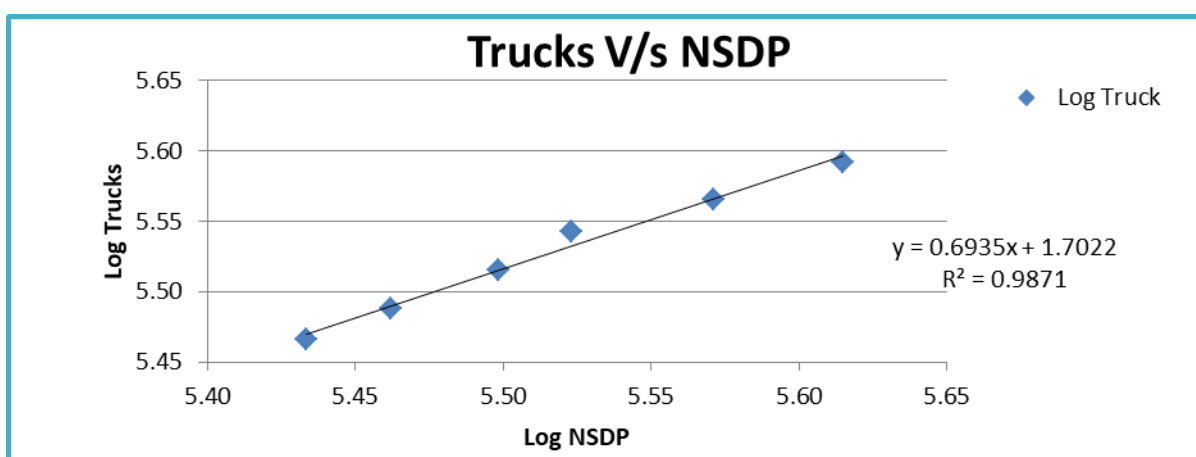


Figure 5-4 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Haryana.

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. 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 R² values are presented in the Table below.

Table 5-5 : Summary Regression Analysis Haryana

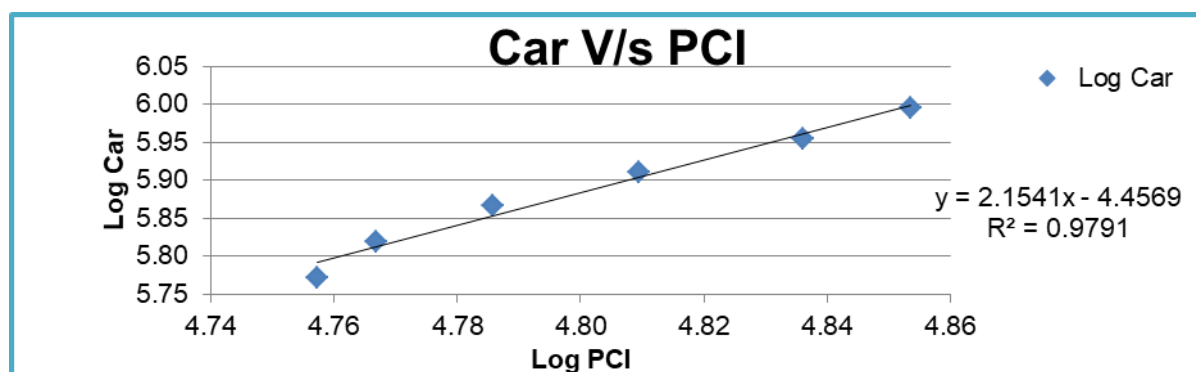
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Haryana	Car/Jeep	PCI	$y = 1.8306x - 3.1905$	$R^2 = 0.9823$	1.8306	7.23%	13.24%	Good Regression
	Bus	Population	$y = 5.736x - 37.8732$	$R^2 = 0.9927$	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.

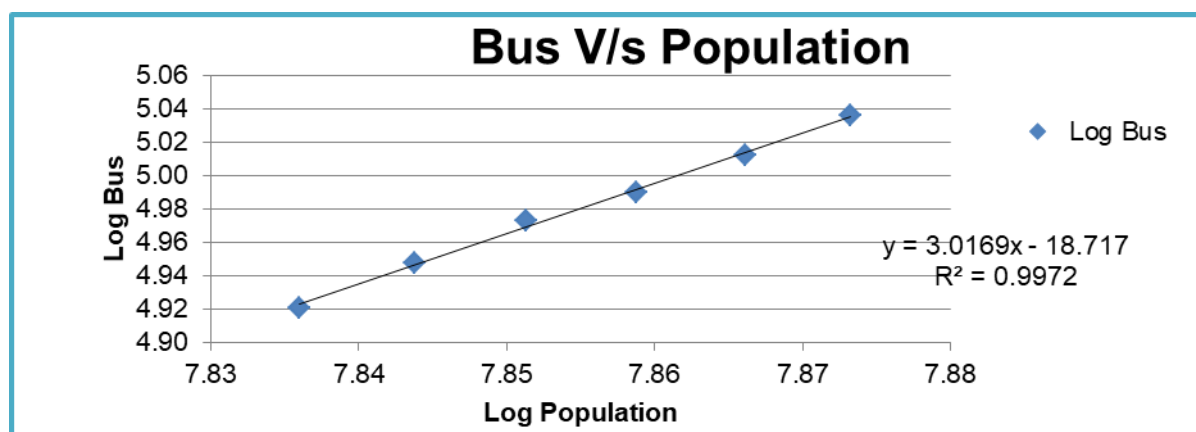


Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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.

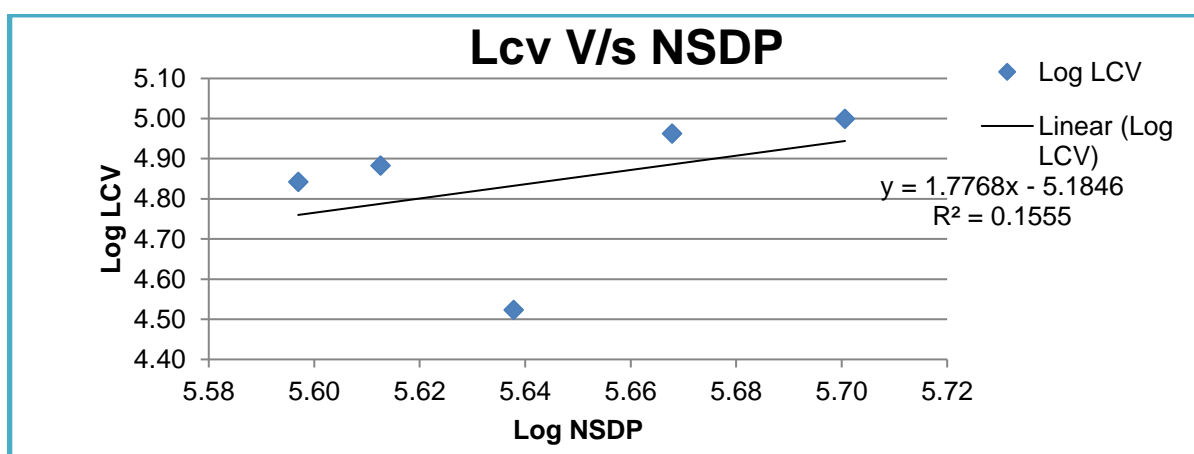
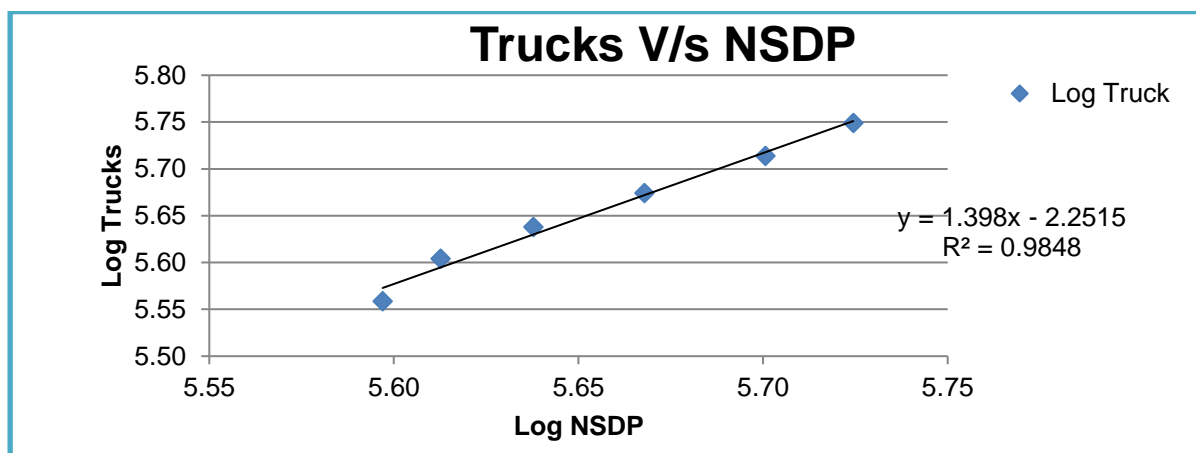


Figure 5-7 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.

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. 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 R² 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.

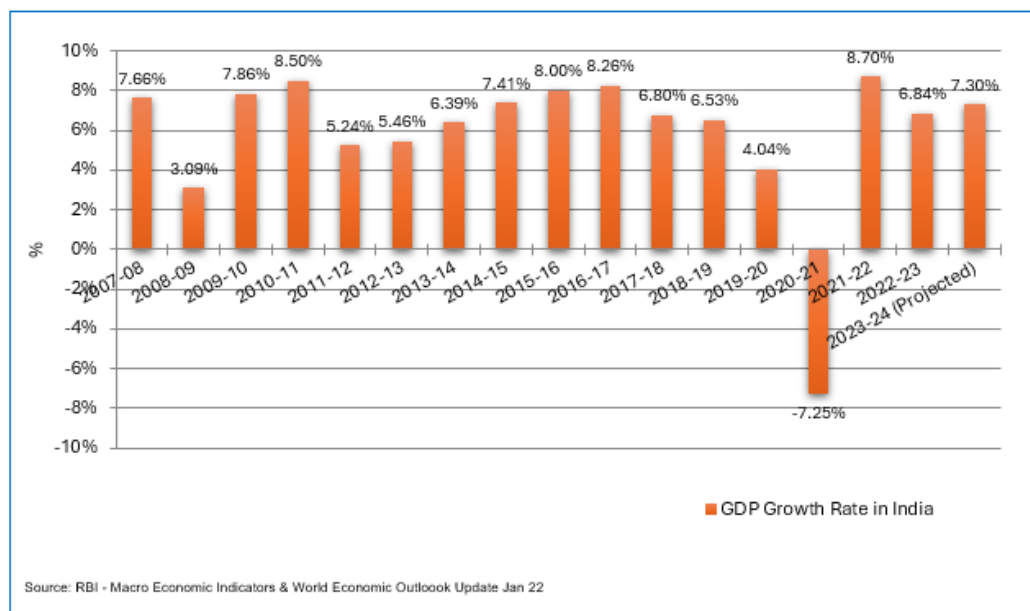


Figure 5-9 : Growth of GDP in India

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, Dundaheera 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, EVRY, 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%
4 to 6 Axle	3.46%	3.24%	3.03%	2.82%	2.62%	2.41%
7 and Above Axle	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
Car/Jeep/Van	5.42%	5.20%	4.97%	4.75%	4.53%	4.31%
Bus	2.96%	2.84%	2.47%	2.36%	2.25%	2.15%
LCV	3.13%	2.92%	2.47%	2.28%	2.10%	1.92%
2- Axle	3.71%	3.49%	2.98%	2.79%	2.61%	2.42%
3 - Axle	3.71%	3.49%	2.98%	2.79%	2.61%	2.42%
4 to 6 Axle	3.71%	3.49%	3.28%	3.07%	2.87%	2.66%
7 and Above Axle	3.71%	3.49%	3.28%	3.07%	2.87%	2.66%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in financial year 2026 - 2028.

Haryana Power Generation Cooperation Ltd. (HPGCL) is in process to set up a 800MW thermal unit based on super critical technology at Yamunagar (Hisar) as an expansion of existing coal base thermal plant. This is expected to give a boost to goods traffic plying on the Project stretch from Financial Year 2027.

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	4226	235	344	398	234	1084	33	6555	12534
2025-26	4542	248	362	421	247	1146	35	7001	13319
2026-27	4858	260	379	506	297	1378	42	7720	15184
2027-28	5172	271	394	530	311	1444	44	8166	15980
2028-29	5455	280	406	550	323	1498	46	8558	16660
2029-30	5753	289	418	570	335	1554	48	8967	17365
2030-31	6054	297	429	589	345	1609	50	9373	18054
2031-32	6370	306	441	608	356	1665	52	9798	18771
2032-33	6703	315	453	628	368	1724	54	10245	19524
2033-34	7053	324	465	648	380	1785	56	10711	20303
2034-35	7421	333	477	668	393	1848	58	11198	21112
2035-36	7792	342	489	688	405	1909	60	11685	21912
2036-37	8181	351	501	708	418	1972	62	12193	22742
2037-38	8590	360	514	730	431	2038	64	12727	23614
2038-39	9019	369	527	752	444	2106	66	13283	24516
2039-40	9470	378	540	775	457	2175	68	13863	25447
2040-41	9923	387	553	797	470	2243	70	14443	26372
2041-42	10398	396	566	820	483	2312	72	15047	27327
2042-43	10895	405	580	843	497	2384	74	15678	28324
2043-44	11415	414	594	867	511	2458	76	16335	29355
2044-45	11960	424	608	892	525	2535	78	17022	30430
2045-46	12506	433	622	915	539	2609	80	17704	31484
2046-47	13076	442	636	940	553	2685	82	18414	32578
2047-48	13672	451	651	965	567	2763	84	19153	33709
2048-49	14296	461	666	991	582	2843	86	19925	34885

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	4256	333	432	410	325	1060	60	6876	13297
2025-26	4573	351	454	433	344	1121	63	7339	14121
2026-27	4892	367	475	521	413	1348	75	8091	16073
2027-28	5207	382	494	545	433	1412	78	8551	16901
2028-29	5491	394	510	565	449	1465	81	8955	17611
2029-30	5790	406	526	585	466	1520	84	9377	18348
2030-31	6092	417	540	604	481	1574	87	9795	19067
2031-32	6411	429	554	623	496	1629	90	10232	19809
2032-33	6746	441	570	643	511	1686	93	10690	20585
2033-34	7097	453	586	663	527	1745	96	11167	21389
2034-35	7467	465	602	684	544	1807	99	11668	22232
2035-36	7840	477	618	704	560	1867	102	12168	23062
2036-37	8232	489	634	725	577	1929	105	12691	23927
2037-38	8644	501	651	747	595	1993	108	13239	24829
2038-39	9076	513	668	770	613	2059	112	13811	25768
2039-40	9529	526	685	793	632	2127	116	14408	26742
2040-41	9984	538	702	816	650	2193	120	15003	27704
2041-42	10460	550	719	839	669	2261	124	15622	28699
2042-43	10961	563	737	863	688	2331	128	16271	29735
2043-44	11485	576	755	887	708	2404	132	16947	30811
2044-45	12034	590	773	912	728	2479	136	17652	31926
2045-46	12583	603	791	936	748	2552	140	18353	33027
2046-47	13157	616	810	961	768	2627	144	19083	34168
2047-48	13758	629	829	986	789	2704	148	19843	35348
2048-49	14386	643	848	1012	810	2783	152	20634	36568

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	3587	353	144	446	372	1373	69	6344	13492
2025-26	3853	372	152	472	394	1452	73	6768	14328
2026-27	4119	389	159	568	474	1746	87	7542	16554
2027-28	4384	406	166	595	497	1829	91	7968	17407
2028-29	4622	418	171	617	516	1897	94	8335	18121
2029-30	4874	431	176	640	536	1968	97	8722	18869
2030-31	5128	443	181	661	554	2037	100	9104	19597
2031-32	5396	455	186	682	572	2109	103	9503	20353
2032-33	5677	467	191	704	591	2184	107	9921	21145
2033-34	5973	479	196	726	610	2261	111	10356	21962
2034-35	6284	492	201	749	630	2341	115	10812	22814
2035-36	6598	504	206	771	649	2419	119	11266	23653

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2036-37	6928	516	211	794	669	2499	123	11740	24523
2037-38	7274	529	216	818	689	2582	127	12235	25427
2038-39	7637	542	221	843	710	2668	131	12752	26368
2039-40	8019	555	226	869	732	2756	135	13292	27342
2040-41	8403	568	231	894	753	2842	139	13830	28304
2041-42	8805	581	236	920	775	2930	143	14390	29298
2042-43	9226	594	242	946	797	3022	147	14974	30333
2043-44	9667	607	248	973	820	3116	152	15583	31407
2044-45	10129	620	254	1001	843	3213	157	16217	32518
2045-46	10591	633	260	1028	865	3307	162	16846	33610
2046-47	11074	646	266	1055	888	3403	167	17499	34735
2047-48	11579	659	272	1083	912	3503	172	18180	35906
2048-49	12107	673	278	1112	936	3605	177	18888	37114

**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	4226	235	344	398	234	1084	33	6555	12534
2025-26	4520	246	359	418	247	1140	35	6965	13249
2026-27	4812	257	373	500	296	1365	42	7645	15036
2027-28	5099	267	386	522	309	1423	44	8050	15752
2028-29	5351	273	396	539	319	1470	45	8393	16340
2029-30	5615	279	406	556	329	1518	46	8749	16945
2030-31	5880	285	415	571	338	1564	47	9100	17529
2031-32	6159	291	425	587	347	1612	48	9469	18143
2032-33	6451	297	435	603	356	1661	49	9852	18774
2033-34	6756	303	445	620	366	1711	50	10251	19428
2034-35	7076	309	455	637	376	1763	51	10667	20107
2035-36	7394	315	465	653	385	1813	52	11077	20768
2036-37	7727	321	475	670	395	1864	53	11505	21455
2037-38	8075	327	485	687	405	1917	54	11950	22166
2038-39	8438	333	495	704	415	1971	55	12411	22897
2039-40	8817	339	506	721	425	2026	56	12890	23651
2040-41	9194	345	516	738	435	2079	57	13364	24391
2041-42	9587	351	526	755	445	2133	58	13855	25151
2042-43	9997	357	537	772	455	2189	59	14366	25941
2043-44	10425	363	548	790	465	2246	60	14897	26756
2044-45	10871	369	559	809	476	2305	62	15451	27608
2045-46	11313	375	570	826	486	2360	63	15993	28425
2046-47	11773	381	581	844	496	2417	64	16556	29272
2047-48	12252	387	592	863	506	2476	65	17141	30150
2048-49	12750	393	603	882	517	2536	67	17748	31059

**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	4256	333	432	410	325	1060	60	6876	13297
2025-26	4552	348	451	431	342	1115	63	7302	14047
2026-27	4845	363	469	516	409	1335	75	8012	15917
2027-28	5133	377	486	537	427	1391	78	8429	16659
2028-29	5387	387	499	555	440	1436	80	8784	17272
2029-30	5653	397	512	573	454	1482	83	9154	17908
2030-31	5919	405	524	588	466	1527	85	9514	18515
2031-32	6200	413	536	603	478	1573	88	9891	19145
2032-33	6493	421	548	619	491	1620	91	10283	19798
2033-34	6800	430	560	635	504	1669	94	10692	20476
2034-35	7121	440	573	653	517	1720	97	11121	21187
2035-36	7442	448	585	669	530	1768	100	11542	21872
2036-37	7777	456	597	685	543	1817	103	11978	22576
2037-38	8126	465	610	703	557	1869	106	12436	23321
2038-39	8492	475	623	721	571	1922	109	12913	24089
2039-40	8875	485	636	739	585	1976	112	13408	24879
2040-41	9255	493	649	757	599	2028	115	13896	25653
2041-42	9651	501	662	775	613	2081	118	14401	26448
2042-43	10064	510	675	793	627	2135	121	14925	27266
2043-44	10495	519	688	812	641	2191	124	15470	28114
2044-45	10944	529	702	831	656	2248	127	16037	28992
2045-46	11390	537	715	849	670	2302	130	16593	29842
2046-47	11852	545	728	867	684	2358	133	17167	30716
2047-48	12333	553	742	886	699	2415	136	17764	31623
2048-49	12834	562	756	905	714	2473	139	18383	32556

**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	3587	353	144	446	372	1373	69	6344	13492
2025-26	3835	371	151	469	392	1445	73	6736	14259
2026-27	4082	386	158	561	470	1730	87	7474	16405
2027-28	4324	400	164	584	490	1804	91	7857	17166
2028-29	4537	411	168	603	505	1863	94	8181	17788
2029-30	4761	422	172	623	521	1923	97	8519	18432
2030-31	4985	431	176	640	535	1981	100	8848	19049
2031-32	5220	441	180	657	549	2041	103	9191	19688
2032-33	5466	451	184	675	564	2103	106	9549	20352
2033-34	5723	461	188	694	579	2166	109	9920	21035
2034-35	5993	472	192	713	594	2232	112	10308	21746
2035-36	6262	482	196	731	609	2295	115	10690	22438

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2036-37	6544	492	200	750	624	2360	118	11088	23155
2037-38	6838	502	204	769	640	2427	121	11501	23896
2038-39	7145	513	208	789	656	2496	124	11931	24664
2039-40	7466	524	212	809	672	2566	127	12376	25450
2040-41	7785	534	216	828	688	2633	130	12814	26216
2041-42	8118	544	220	848	704	2702	133	13269	27008
2042-43	8465	554	224	868	720	2772	136	13739	27818
2043-44	8827	565	228	888	737	2844	140	14229	28662
2044-45	9205	576	232	909	754	2919	144	14739	29538
2045-46	9580	586	236	929	770	2989	147	15237	30376
2046-47	9969	596	240	949	786	3061	151	15752	31242
2047-48	10374	606	244	970	803	3135	155	16287	32139
2048-49	10795	616	248	991	820	3211	159	16840	33061

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	4226	235	344	398	234	1084	33	6555	12534
2025-26	4531	248	361	420	247	1144	35	6986	13293
2026-27	4835	259	376	504	296	1373	42	7685	15119
2027-28	5135	269	390	527	309	1434	44	8108	15868
2028-29	5402	277	401	546	319	1484	45	8474	16496
2029-30	5683	286	412	565	330	1536	47	8859	17157
2030-31	5966	292	422	582	340	1586	48	9236	17789
2031-32	6263	298	433	599	350	1638	50	9631	18452
2032-33	6575	305	444	616	360	1692	52	10044	19141
2033-34	6903	312	455	635	370	1747	54	10476	19856
2034-35	7247	319	466	654	381	1804	56	10927	20599
2035-36	7591	326	477	673	391	1859	58	11375	21330
2036-37	7951	333	488	692	402	1916	60	11842	22089
2037-38	8328	340	499	711	413	1975	62	12328	22874
2038-39	8723	347	511	731	424	2036	64	12836	23692
2039-40	9137	354	523	751	436	2098	66	13365	24536
2040-41	9550	361	535	771	447	2158	68	13890	25368
2041-42	9982	368	547	791	459	2220	70	14437	26230
2042-43	10435	375	559	811	471	2283	72	15006	27118
2043-44	10908	382	571	833	484	2349	74	15601	28049
2044-45	11402	390	584	855	497	2416	76	16220	29009
2045-46	11894	397	596	875	509	2481	78	16830	29945
2046-47	12407	404	609	897	522	2547	80	17466	30919
2047-48	12942	411	622	919	535	2615	82	18126	31923
2048-49	13500	418	635	941	548	2684	84	18810	32955

**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	4256	333	432	410	325	1060	60	6876	13297
2025-26	4562	349	453	432	343	1118	63	7320	14084
2026-27	4868	364	472	519	411	1341	75	8050	15992
2027-28	5170	378	490	542	430	1401	78	8489	16779
2028-29	5438	390	504	561	445	1449	81	8868	17438
2029-30	5721	402	518	580	460	1500	84	9265	18126
2030-31	6006	412	531	597	473	1549	87	9655	18789
2031-32	6305	422	544	615	487	1600	90	10063	19481
2032-33	6618	433	557	633	501	1653	93	10488	20198
2033-34	6948	444	571	652	516	1707	96	10934	20945
2034-35	7294	455	585	671	531	1763	99	11398	21717
2035-36	7640	466	599	690	545	1817	102	11859	22477
2036-37	8003	477	613	709	560	1873	105	12340	23266
2037-38	8383	488	627	728	575	1930	108	12839	24076
2038-39	8781	500	641	748	591	1989	111	13361	24921
2039-40	9198	512	656	768	607	2051	114	13906	25802
2040-41	9615	523	670	788	622	2109	117	14444	26657
2041-42	10050	534	685	808	638	2169	120	15004	27545
2042-43	10505	546	701	828	654	2232	123	15589	28471
2043-44	10980	558	717	849	671	2296	126	16197	29427
2044-45	11478	570	733	871	688	2362	130	16832	30423
2045-46	11974	581	749	891	704	2425	133	17457	31389
2046-47	12490	592	765	912	721	2490	136	18106	32389
2047-48	13029	604	782	934	738	2556	140	18783	33429
2048-49	13591	616	799	957	755	2624	144	19486	34504

**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	3587	353	144	446	372	1373	69	6344	13492
2025-26	3844	371	151	471	393	1449	73	6752	14295
2026-27	4101	388	158	565	472	1739	87	7510	16485
2027-28	4355	403	165	591	493	1817	91	7915	17293
2028-29	4581	415	170	612	511	1880	94	8263	17966
2029-30	4819	427	175	633	529	1946	97	8626	18664
2030-31	5058	438	179	652	544	2009	100	8980	19331
2031-32	5309	449	183	672	560	2075	103	9351	20029
2032-33	5572	460	187	692	576	2143	106	9736	20748
2033-34	5849	471	192	713	593	2213	109	10140	21499
2034-35	6140	483	197	734	611	2285	113	10563	22282
2035-36	6431	494	202	754	628	2355	116	10980	23044

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2036-37	6736	505	207	775	646	2427	120	11416	23839
2037-38	7055	517	212	796	664	2502	124	11870	24664
2038-39	7390	529	217	818	683	2579	128	12344	25519
2039-40	7741	541	222	840	702	2658	132	12836	26400
2040-41	8091	552	227	862	721	2734	136	13323	27264
2041-42	8456	564	232	884	740	2812	140	13828	28154
2042-43	8840	576	237	907	760	2892	144	14356	29078
2043-44	9240	588	242	930	780	2975	148	14903	30032
2044-45	9659	600	247	954	801	3060	152	15473	31019
2045-46	10076	612	252	977	821	3141	156	16035	31981
2046-47	10511	624	257	1000	841	3225	160	16618	32974
2047-48	10964	636	262	1024	862	3311	164	17223	34000
2048-49	11436	648	267	1049	883	3399	168	17850	35057

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 - 1st 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	14351	-35%	52%	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) 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.

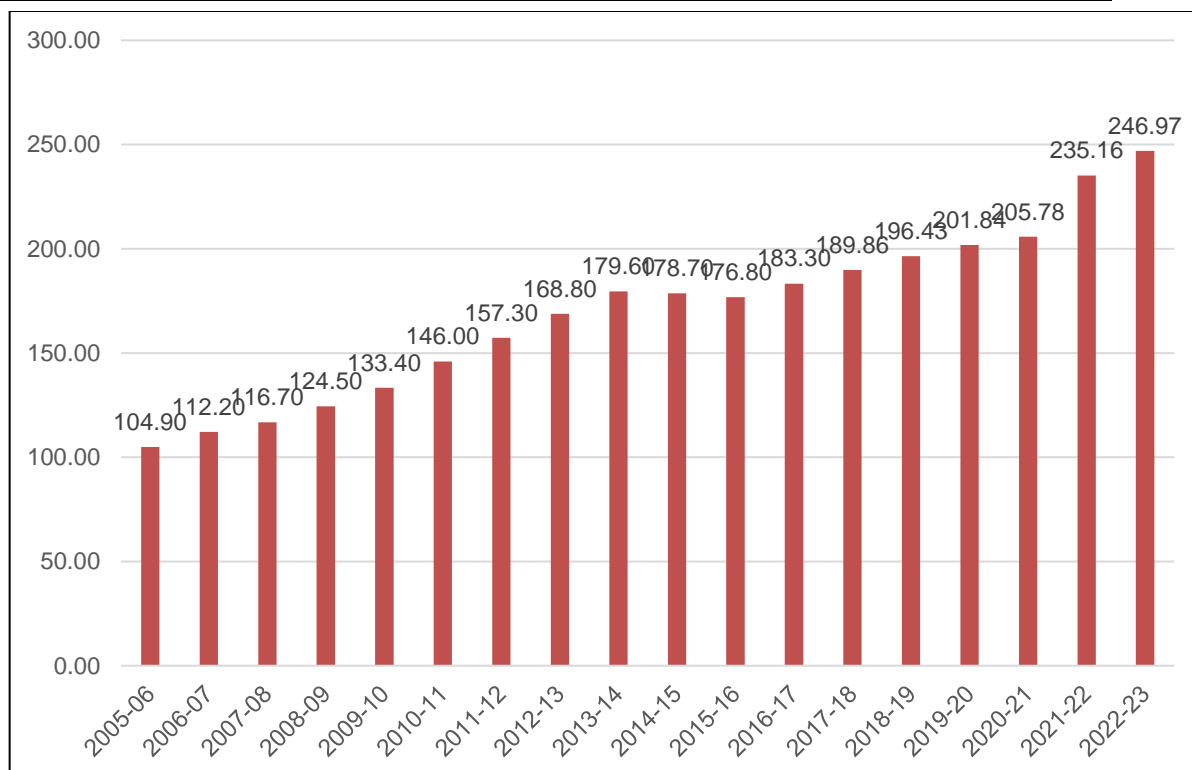


Figure 7-1 : Historical Rate of WPI Inflation in India

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	480	580
2025-26	95	150	315	315	345	495	600
2026-27	100	160	330	330	360	520	630
2027-28	105	165	350	350	380	545	665
2028-29	110	175	365	365	400	575	695
2029-30	115	185	385	385	420	600	735
2030-31	120	195	405	405	440	635	770
2031-32	125	200	425	425	465	665	810
2032-33	130	215	445	445	485	700	850
2033-34	140	225	470	470	510	735	895
2034-35	145	235	495	495	540	775	945
2035-36	155	250	520	520	565	815	990
2036-37	160	260	545	545	595	860	1045
2037-38	170	275	575	575	630	905	1100
2038-39	180	290	605	605	660	950	1155
2039-40	190	305	640	640	695	1000	1220
2040-41	200	320	675	675	735	1055	1285
2041-42	210	340	710	710	775	1110	1355
2042-43	220	355	745	745	815	1170	1425
2043-44	235	375	785	785	860	1235	1505
2044-45	245	395	830	830	905	1300	1585
2045-46	260	420	875	875	955	1375	1670
2046-47	275	440	925	925	1005	1450	1760
2047-48	290	465	975	975	1060	1525	1860
2048-49	305	490	1025	1025	1120	1610	1960

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	125	205	425	425	465	670	815
2026-27	130	215	445	445	490	700	855
2027-28	140	225	470	470	515	735	895
2028-29	145	235	495	495	540	775	945
2029-30	155	250	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	665	665	730	1045	1275
2035-36	210	335	700	700	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	410	865	865	940	1355	1650
2040-41	270	435	910	910	990	1425	1735

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2041-42	285	455	960	960	1045	1500	1830
2042-43	300	480	1010	1010	1100	1585	1930
2043-44	315	510	1065	1065	1160	1670	2030
2044-45	330	535	1120	1120	1225	1760	2140
2045-46	350	565	1185	1185	1290	1855	2260
2046-47	370	595	1250	1250	1360	1955	2380
2047-48	390	630	1315	1315	1435	2065	2515
2048-49	410	665	1390	1390	1515	2180	2650

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	245	245	270	385	470
2026-27	75	125	260	260	285	405	495
2027-28	80	130	270	270	295	425	520
2028-29	85	135	285	285	310	450	545
2029-30	90	145	300	300	330	470	575
2030-31	95	150	315	315	345	495	605
2031-32	100	160	330	330	365	520	635
2032-33	105	165	350	350	380	550	665
2033-34	110	175	370	370	400	575	700
2034-35	115	185	385	385	420	605	740
2035-36	120	195	405	405	445	640	775
2036-37	125	205	430	430	465	670	820
2037-38	135	215	450	450	490	705	860
2038-39	140	225	475	475	520	745	905
2039-40	150	240	500	500	545	785	955
2040-41	155	250	525	525	575	825	1005
2041-42	165	265	555	555	605	870	1060
2042-43	175	280	585	585	640	920	1115
2043-44	180	295	615	615	675	965	1175
2044-45	190	310	650	650	710	1020	1240
2045-46	205	325	685	685	750	1075	1310
2046-47	215	345	725	725	790	1135	1380
2047-48	225	365	765	765	830	1195	1455
2048-49	240	385	805	805	880	1260	1535

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	225	475	475	515	740	900
2026-27	145	235	495	495	540	780	950
2027-28	155	250	520	520	570	820	995
2028-29	160	260	550	550	600	860	1045
2029-30	170	275	575	575	630	905	1100
2030-31	180	290	605	605	660	950	1155
2031-32	190	305	635	635	695	1000	1215
2032-33	200	320	670	670	730	1050	1280
2033-34	210	335	705	705	770	1105	1345
2034-35	220	355	740	740	810	1160	1415
2035-36	230	370	780	780	850	1220	1490
2036-37	240	390	820	820	895	1285	1565
2037-38	255	410	865	865	940	1355	1650
2038-39	270	435	910	910	990	1425	1735
2039-40	285	455	960	960	1045	1500	1830
2040-41	300	480	1010	1010	1100	1580	1925
2041-42	315	505	1065	1065	1160	1665	2030
2042-43	330	535	1120	1120	1220	1755	2140
2043-44	350	565	1180	1180	1290	1850	2255
2044-45	370	595	1245	1245	1360	1950	2375
2045-46	390	625	1315	1315	1430	2060	2505
2046-47	410	660	1385	1385	1510	2170	2645
2047-48	430	695	1460	1460	1595	2290	2790
2048-49	455	735	1540	1540	1680	2415	2940

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	185	295	620	620	675	970	1180
2025-26	190	305	640	640	695	1000	1220
2026-27	200	320	670	670	730	1055	1280
2027-28	210	335	705	705	770	1105	1345
2028-29	220	355	740	740	810	1160	1415
2029-30	230	370	780	780	850	1220	1485
2030-31	240	390	820	820	895	1285	1560
2031-32	255	410	860	860	940	1350	1640
2032-33	265	430	905	905	985	1420	1725
2033-34	280	455	950	950	1040	1490	1815
2034-35	295	480	1000	1000	1090	1570	1910
2035-36	310	505	1055	1055	1150	1650	2010
2036-37	330	530	1110	1110	1210	1740	2115
2037-38	345	555	1165	1165	1275	1830	2230
2038-39	365	585	1230	1230	1340	1930	2345
2039-40	385	620	1295	1295	1410	2030	2470
2040-41	405	650	1365	1365	1490	2140	2605
2041-42	425	685	1435	1435	1570	2255	2745
2042-43	445	725	1515	1515	1650	2375	2890

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2043-44	470	760	1595	1595	1740	2505	3050
2044-45	495	805	1685	1685	1835	2640	3215
2045-46	525	845	1775	1775	1935	2785	3390
2046-47	555	895	1870	1870	2040	2935	3575
2047-48	585	940	1975	1975	2155	3095	3770
2048-49	615	995	2085	2085	2275	3265	3975

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	175	370	370	405	580	705
2026-27	115	185	390	390	425	610	745
2027-28	120	195	410	410	445	640	780
2028-29	125	205	430	430	470	675	820
2029-30	135	215	450	450	490	705	860
2030-31	140	225	475	475	515	745	905
2031-32	145	240	500	500	545	780	950
2032-33	155	250	525	525	570	820	1000
2033-34	165	265	550	550	600	865	1055
2034-35	170	275	580	580	635	910	1110
2035-36	180	290	610	610	665	955	1165
2036-37	190	305	645	645	700	1010	1225
2037-38	200	325	675	675	740	1060	1290
2038-39	210	340	710	710	775	1115	1360
2039-40	220	360	750	750	820	1175	1430
2040-41	235	375	790	790	860	1240	1510
2041-42	245	395	835	835	910	1305	1590
2042-43	260	420	880	880	955	1375	1675
2043-44	275	440	925	925	1010	1450	1765
2044-45	290	465	975	975	1065	1530	1860
2045-46	305	490	1030	1030	1120	1615	1965
2046-47	320	520	1085	1085	1185	1700	2070
2047-48	340	545	1145	1145	1250	1795	2185
2048-49	355	575	1205	1205	1315	1895	2305

Table 7-8 : Toll Rates for Monthly Pass Local @ Km 125.000

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470

Year	Car	Minibus /LCV
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875
2044-45	920	920
2045-46	970	970
2046-47	1025	1025
2047-48	1080	1080
2048-49	1140	1140

Table 7-9 : Toll Rates for Monthly Pass Local @ Km 171.000

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875
2044-45	920	920
2045-46	970	970
2046-47	1025	1025
2047-48	1080	1080
2048-49	1140	1140

Table 7-10 : Toll Rates for Monthly Pass Local @ Km 212.000

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875
2044-45	920	920
2045-46	970	970
2046-47	1025	1025
2047-48	1080	1080
2048-49	1140	1140

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	10155	10155	11080	15925	19385
2025-26	3105	5015	10505	10505	11460	16470	20055
2026-27	3260	5265	11030	11030	12035	17300	21060
2027-28	3425	5530	11590	11590	12645	18175	22125
2028-29	3600	5810	12175	12175	13285	19095	23245
2029-30	3780	6105	12795	12795	13960	20065	24430
2030-31	3975	6420	13450	13450	14675	21095	25680
2031-32	4180	6750	14140	14140	15430	22175	27000
2032-33	4395	7100	14870	14870	16225	23320	28390
2033-34	4620	7465	15645	15645	17065	24530	29865
2034-35	4860	7855	16455	16455	17955	25810	31420
2035-36	5115	8265	17320	17320	18890	27160	33060
2036-37	5385	8700	18230	18230	19885	28585	34800
2037-38	5670	9160	19190	19190	20935	30095	36635
2038-39	5970	9645	20205	20205	22045	31690	38575
2039-40	6290	10160	21280	21280	23215	33375	40630
2040-41	6625	10700	22420	22420	24460	35160	42800
2041-42	6980	11275	23625	23625	25770	37045	45100
2042-43	7355	11880	24895	24895	27160	39040	47530

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2043-44	7755	12525	26240	26240	28630	41155	50100
2044-45	8175	13205	27665	27665	30180	43385	52820
2045-46	8620	13925	29175	29175	31825	45750	55695
2046-47	9090	14685	30770	30770	33565	48250	58740
2047-48	9590	15490	32460	32460	35410	50900	61965
2048-49	10120	16345	34245	34245	37355	53700	65375

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	6555	13730	13730	14975	21530	26210
2025-26	4195	6780	14200	14200	15490	22270	27110
2026-27	4405	7120	14915	14915	16270	23390	28475
2027-28	4630	7480	15670	15670	17090	24570	29910
2028-29	4865	7855	16460	16460	17960	25815	31425
2029-30	5110	8255	17300	17300	18875	27130	33025
2030-31	5375	8680	18185	18185	19840	28515	34715
2031-32	5650	9125	19120	19120	20855	29980	36500
2032-33	5940	9595	20105	20105	21935	31530	38385
2033-34	6250	10095	21150	21150	23070	33165	40375
2034-35	6575	10620	22250	22250	24270	34890	42475
2035-36	6915	11175	23415	23415	25540	36715	44695
2036-37	7280	11760	24645	24645	26885	38645	47045
2037-38	7665	12380	25945	25945	28300	40685	49530
2038-39	8070	13040	27320	27320	29800	42840	52155
2039-40	8500	13730	28770	28770	31390	45120	54930
2040-41	8955	14465	30310	30310	33065	47530	57865
2041-42	9435	15245	31935	31935	34840	50085	60970
2042-43	9945	16065	33655	33655	36715	52780	64255
2043-44	10480	16935	35480	35480	38705	55635	67730
2044-45	11050	17850	37405	37405	40805	58655	71405
2045-46	11655	18825	39440	39440	43025	61850	75300
2046-47	12290	19855	41600	41600	45380	65235	79415
2047-48	12965	20945	43880	43880	47870	68815	83770
2048-49	13680	22095	46295	46295	50505	72600	88385

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	7955	7955	8680	12475	15190
2025-26	2430	3930	8230	8230	8975	12905	15710
2026-27	2555	4125	8645	8645	9430	13555	16500
2027-28	2685	4335	9080	9080	9905	14240	17335
2028-29	2820	4555	9540	9540	10405	14960	18210
2029-30	2960	4785	10025	10025	10935	15720	19140
2030-31	3115	5030	10540	10540	11495	16525	20120
2031-32	3275	5290	11080	11080	12085	17375	21150
2032-33	3440	5560	11650	11650	12710	18270	22245
2033-34	3620	5850	12255	12255	13370	19220	23395
2034-35	3810	6155	12895	12895	14065	20220	24615

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2035-36	4010	6475	13570	13570	14800	21275	25900
2036-37	4220	6815	14280	14280	15580	22395	27265
2037-38	4440	7175	15035	15035	16400	23575	28700
2038-39	4675	7555	15830	15830	17270	24825	30225
2039-40	4925	7960	16675	16675	18190	26145	31830
2040-41	5190	8385	17565	17565	19160	27545	33535
2041-42	5470	8835	18505	18505	20190	29025	35330
2042-43	5765	9310	19505	19505	21280	30585	37235
2043-44	6075	9810	20560	20560	22430	32240	39250
2044-45	6405	10345	21675	21675	23645	33990	41380
2045-46	6755	10910	22855	22855	24935	35845	43635
2046-47	7120	11505	24105	24105	26300	37805	46020
2047-48	7515	12135	25430	25430	27740	39875	48545
2048-49	7925	12805	26830	26830	29265	42070	51220

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
2024-25	41.53	59.62	36.57	137.72
2025-26	45.78	65.54	40.20	151.51
2026-27	55.11	78.80	48.96	182.88
2027-28	61.16	87.52	54.06	202.74
2028-29	66.68	95.42	59.18	221.28
2029-30	72.85	104.56	64.86	242.28
2030-31	79.74	113.62	70.73	264.08
2031-32	87.11	124.76	77.28	289.15
2032-33	94.77	135.81	84.42	315.00
2033-34	103.94	147.91	92.05	343.90
2034-35	113.39	161.62	100.16	375.18
2035-36	124.24	177.32	109.79	411.35
2036-37	134.72	193.34	119.09	447.15
2037-38	147.61	210.47	130.14	488.22
2038-39	161.30	229.66	141.99	532.96
2039-40	176.88	251.97	155.63	584.48
2040-41	192.55	273.99	168.73	635.28
2041-42	209.76	298.63	184.00	692.40
2042-43	228.34	325.70	201.24	755.28
2043-44	250.91	356.16	218.88	825.95

Year	TP-1	TP-2	TP-3	Total
2044-45	272.56	387.14	238.41	898.11
2045-46	297.87	422.60	260.24	980.71
2046-47	324.73	460.76	283.21	1068.71
2047-48	354.28	502.43	264.27	1120.98
2048-49	385.47	547.50	288.83	1221.81

Table 7-15 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	TP-1	TP-2	TP-3	Total
2024-25	41.53	59.62	36.57	137.72
2025-26	45.56	65.26	40.01	150.83
2026-27	54.60	78.16	48.53	181.30
2027-28	60.33	86.39	53.33	200.05
2028-29	65.47	93.72	58.10	217.29
2029-30	71.15	102.24	63.38	236.77
2030-31	77.51	110.55	68.75	256.81
2031-32	84.27	120.83	74.74	279.84
2032-33	91.22	130.90	81.26	303.38
2033-34	99.54	141.90	88.21	329.65
2034-35	108.03	154.32	95.49	357.83
2035-36	117.79	168.50	104.16	390.45
2036-37	127.12	182.85	112.43	422.40
2037-38	138.60	198.18	122.29	459.07
2038-39	150.63	215.23	132.81	498.67
2039-40	164.35	234.94	144.86	544.15
2040-41	177.96	254.24	156.30	588.50
2041-42	192.87	275.72	169.64	638.23
2042-43	208.94	299.19	184.64	692.77
2043-44	228.53	325.60	199.90	754.03
2044-45	247.15	352.26	216.68	816.10
2045-46	268.80	382.62	235.36	886.78
2046-47	291.67	415.12	254.92	961.71
2047-48	316.79	450.44	236.71	1003.94
2048-49	343.04	488.47	257.47	1088.98

Table 7-16 : Toll Revenue Most Likely Scenario
(Rs. Crores)

Year	TP-1	TP-2	TP-3	Total
2024-25	41.53	59.62	36.57	137.72
2025-26	45.70	65.41	40.09	151.20
2026-27	54.86	78.50	48.74	182.10
2027-28	60.73	86.99	53.70	201.42
2028-29	66.04	94.59	58.68	219.32
2029-30	71.96	103.44	64.16	239.57
2030-31	78.56	112.15	69.78	260.49

Year	TP-1	TP-2	TP-3	Total
2031-32	85.60	122.88	76.07	284.55
2032-33	92.88	133.40	82.87	309.14
2033-34	101.61	144.89	90.15	336.66
2034-35	110.62	157.90	97.84	366.36
2035-36	120.97	172.75	106.94	400.66
2036-37	130.92	187.90	115.74	434.56
2037-38	143.12	204.10	126.18	473.41
2038-39	156.01	222.25	137.36	515.62
2039-40	170.67	243.26	150.23	564.16
2040-41	185.32	263.85	162.50	611.67
2041-42	201.41	286.88	176.82	665.12
2042-43	218.72	312.14	193.02	723.89
2043-44	239.86	340.54	209.46	789.86
2044-45	260.03	369.32	227.59	856.93
2045-46	283.52	402.10	247.87	933.49
2046-47	308.37	437.37	269.11	1014.85
2047-48	335.83	475.76	250.50	1062.09
2048-49	364.50	517.16	273.11	1154.76

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)

JANUARY 2025



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**SOLAPUR TO YESDISHI SECTION OF NH 211
(KM 0.000 TO KM 100.000)
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**TRAFFIC STUDY & REVENUE
PROJECTION REPORT
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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highway Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- 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 21st January 2015. COD was achieved for part length of project on 15th 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.

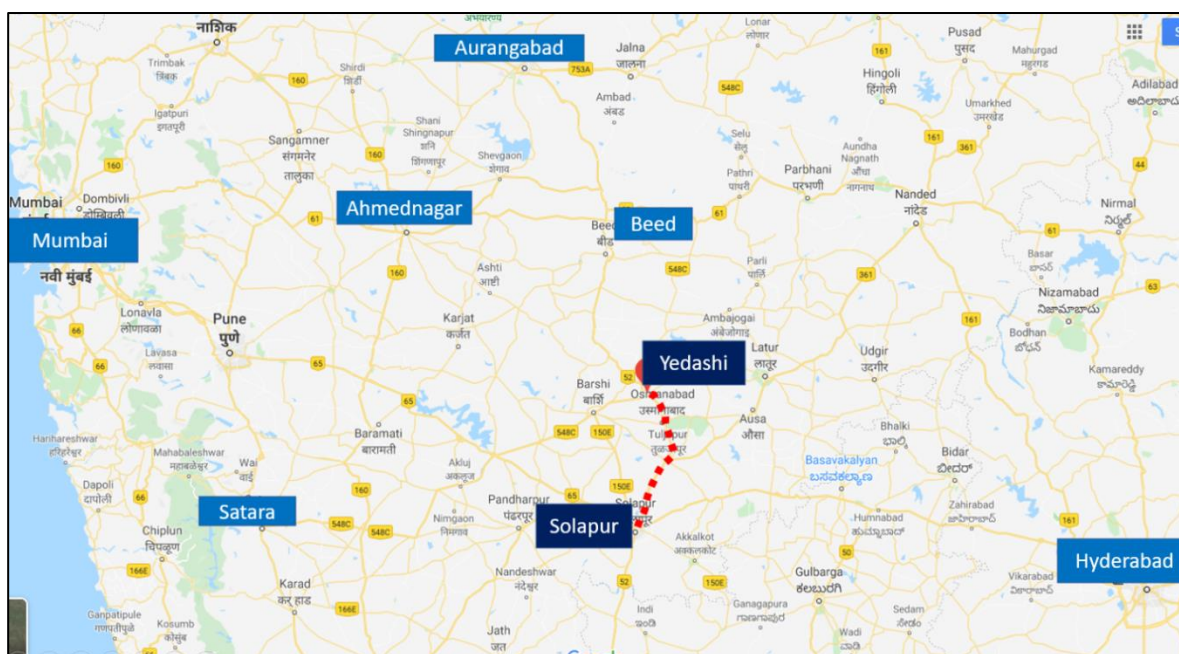


Figure 1-1: Alignment of Project Stretch

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.

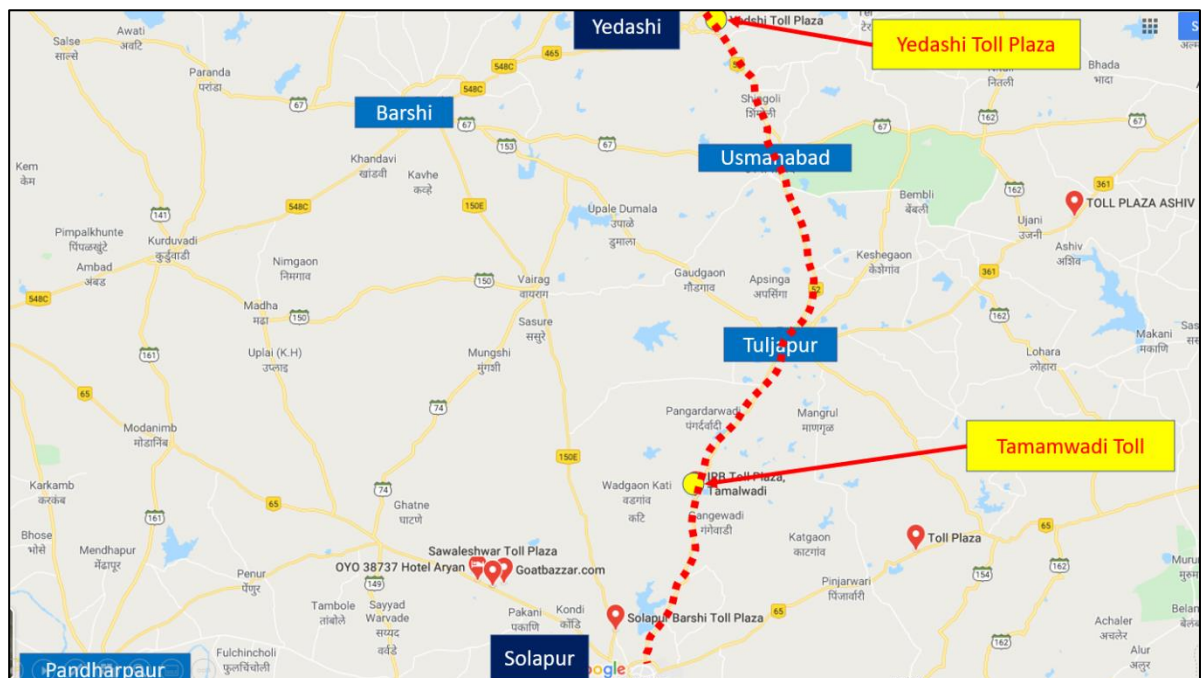


Figure 2-1: Project Alignment with Toll Plaza

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 November 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 & Eight month from April 2024 to November 2024	2023 to November 2023 & Eight month from April 2024 to November 2024	2023 to November 2023 & Eight month from April 2024 to November 2024	2023 to November 2023 & Eight month from April 2024 to November 2024	2023 to November 2023 & Eight month from April 2024 to November 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 & Eight month from April 2024 to November 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Period for Year 2018-19, 2019-2020, 2020-21, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & F Eight month from April 2024 to November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	9303
2	Minibus/LCV	1068	782	362	442	420	455
3	Bus	675	304	343	678	812	887
4	Truck	907	835	946	1149	1229	1277
5	3-Axle	861	783	823	953	903	881
6	Multi Axle	934	1074	1286	1889	1868	1587
7	Oversized Vehicles	4	1	1	6	11	9
Total		9413	7343	10070	12958	14326	14399

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	4570
2	Minibus/LCV	613	514	263	283	296	286
3	Bus	233	118	127	238	284	291
4	Truck	674	682	783	951	1042	1008
5	3-Axle	807	826	870	986	918	840

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	1527
7	Oversized Vehicles	0	1	1	6	12	10
Total		6269	5616	6967	8245	8850	8531

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

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2019-20	Tamalwadi Km 19.300	9413	18116	1.92
	Yedeshi Km 77.400	6269	13859	2.21
2020-21	Tamalwadi Km 19.300	7343	15339	2.09
	Yedeshi Km 77.400	5616	13829	2.46
2021-22	Tamalwadi Km 19.300	10070	18981	1.88
	Yedeshi Km 77.400	6967	16316	2.34
2022-23	Tamalwadi Km 19.300	12958	25377	1.96
	Yedeshi Km 77.400	8245	20222	2.45
2023-24	Tamalwadi Km 19.300	14326	27001	1.88
	Yedeshi Km 77.400	8850	20619	2.33
2024-25	Tamalwadi Km 19.300	14399	26302	1.83
	Yedeshi Km 77.400	8531	18329	2.15

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.

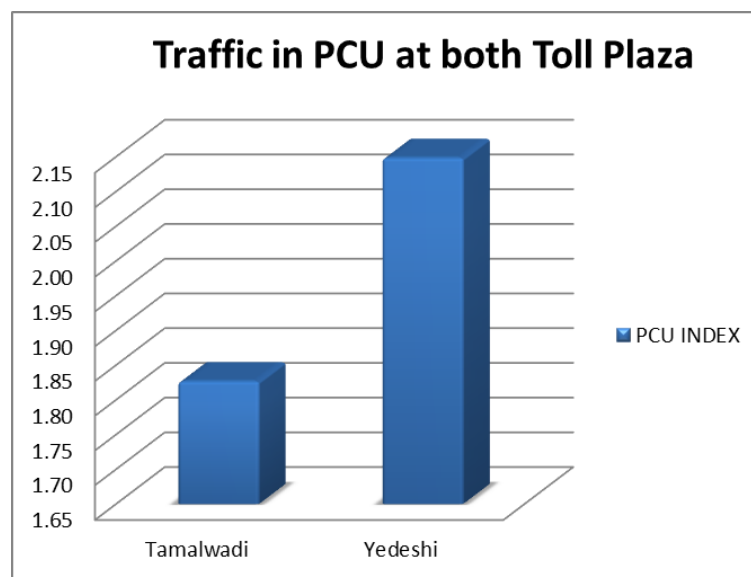


Figure 3-1: Comparison of PCU Index

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.

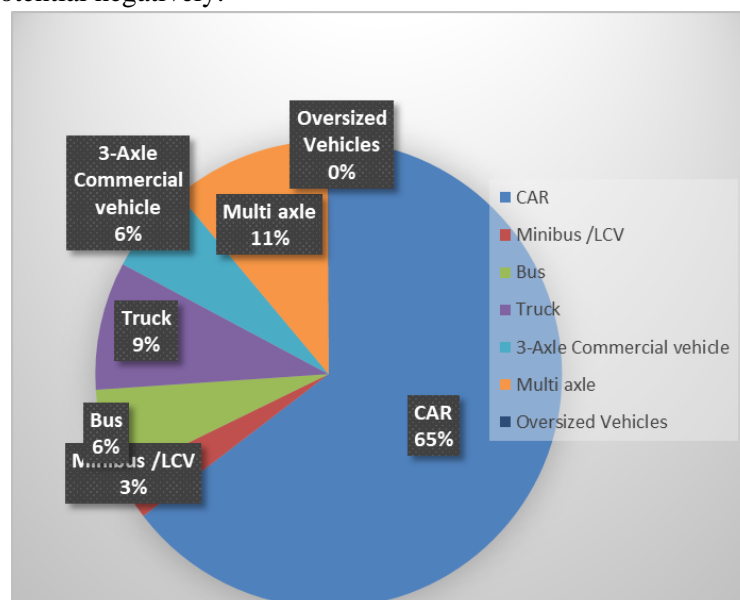


Figure 3-2: Model Split of Tollable Vehicle @TP-1

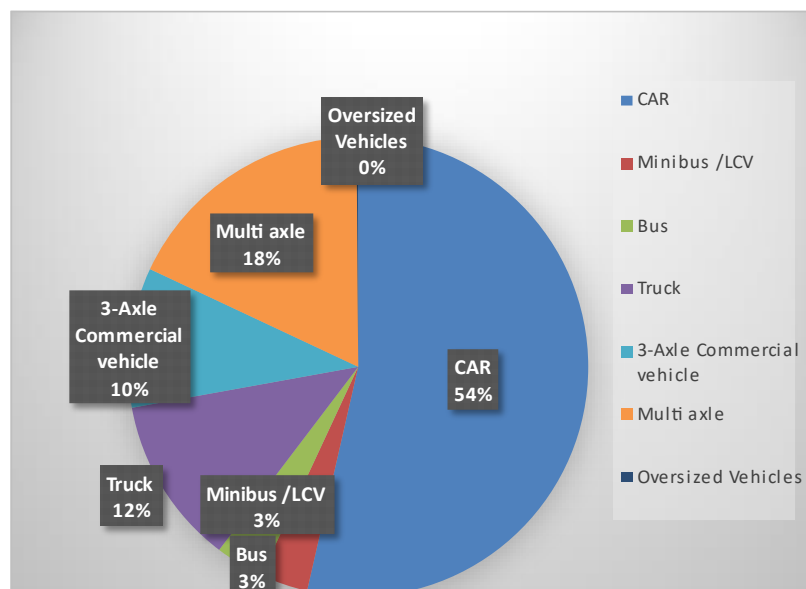


Figure 3-3: Model Split of Tollable Vehicle @TP-2

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	7327
2	Return Journey	6798
3	Local Commercial Single Journey	244
4	Monthly Pass Local	10
5	Monthly Pass	8
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 51%. Return journey component is 47%. The number of monthly pass local is 0% and Local commercial Single Journey 2% 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	5737
2	Return Journey	2640
3	Local Commercial Single Journey	121
4	Monthly Pass Local	17
5	Monthly Pass	10
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.

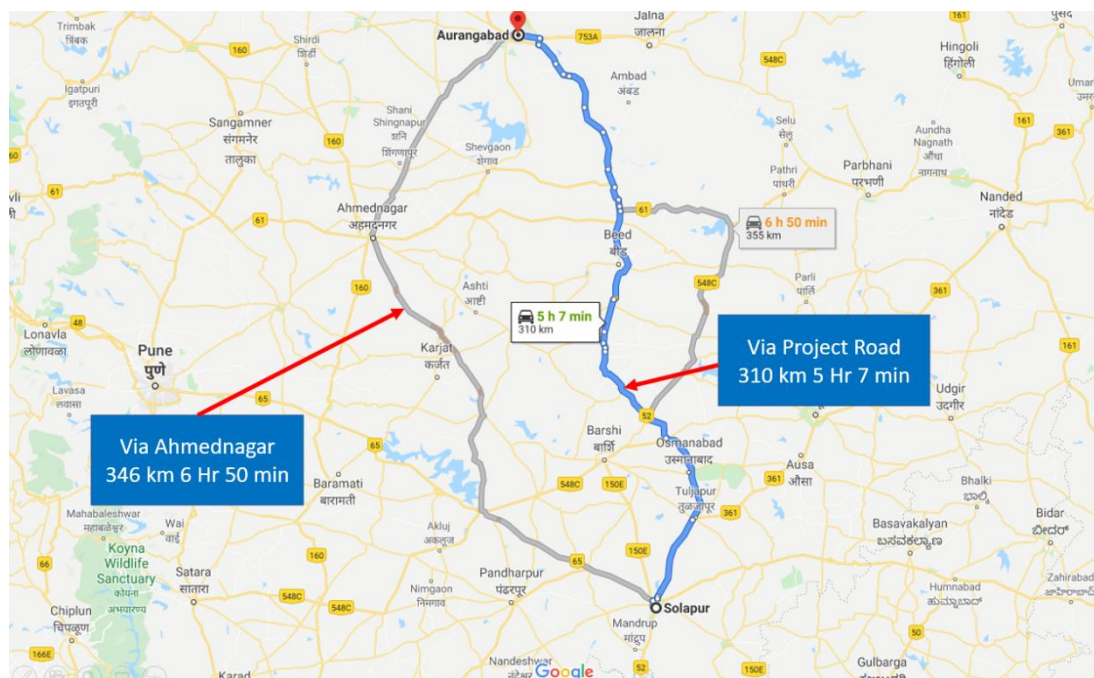


Figure 4-1: Alternate route at regional level.

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
Regional Level						
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.

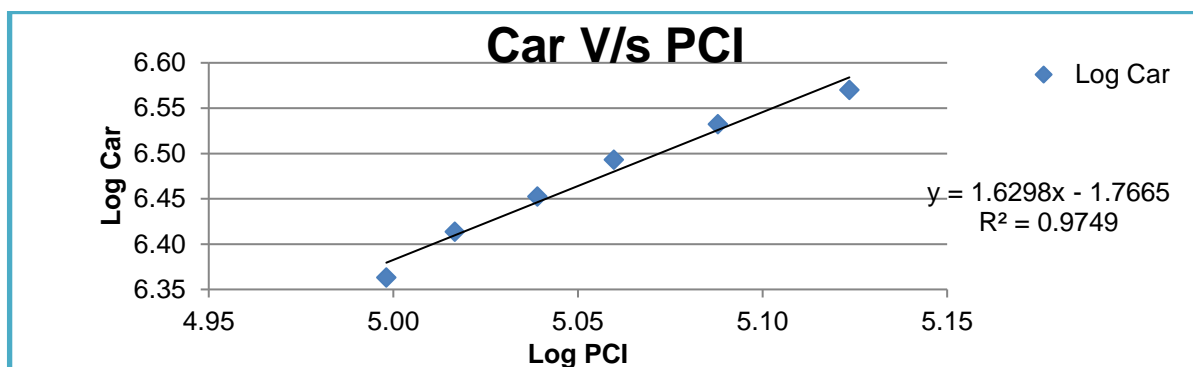


Figure 5-1: Regression and Elasticity PCI vs. Car–Extrapolation Maharashtra

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.

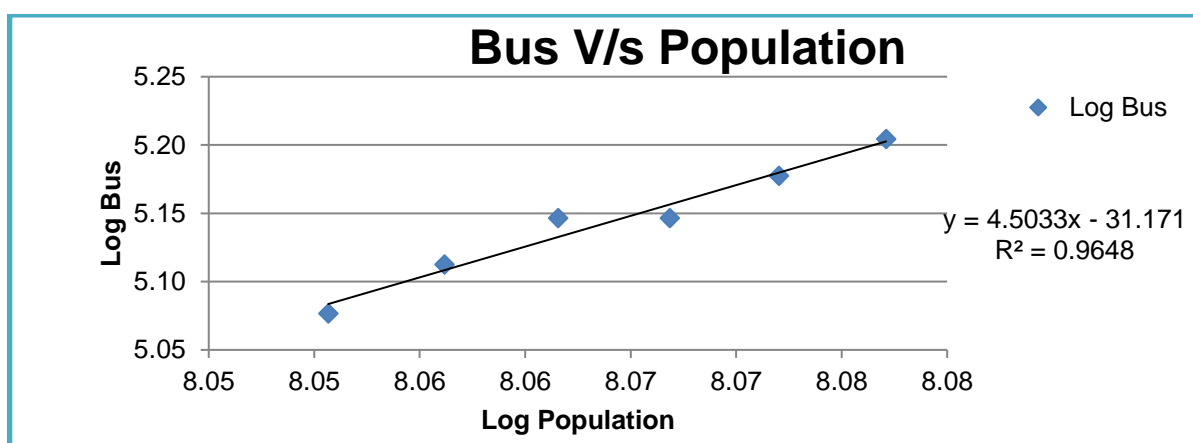


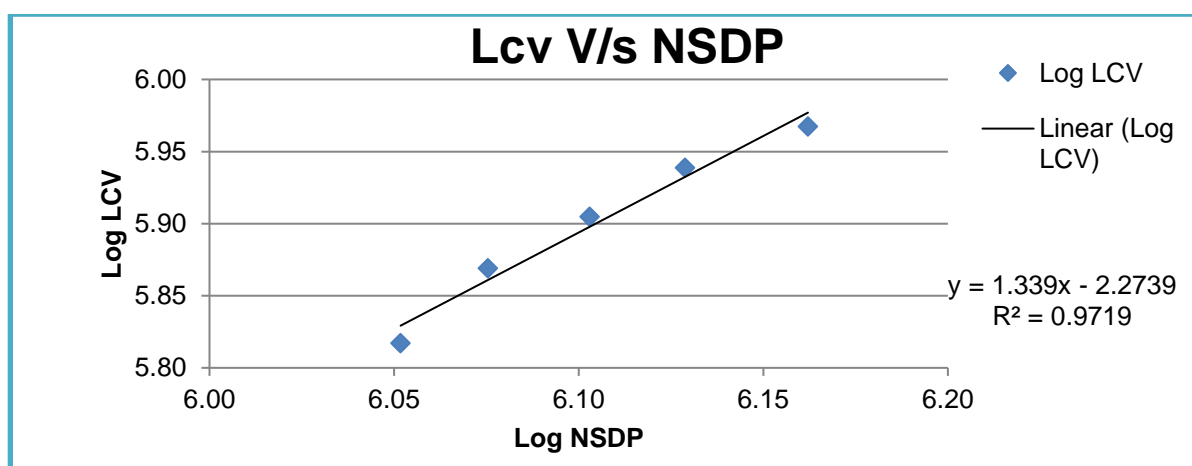
Figure 5-2: Regression and Elasticity Population vs. Bus – Extrapolation Maharashtra

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.

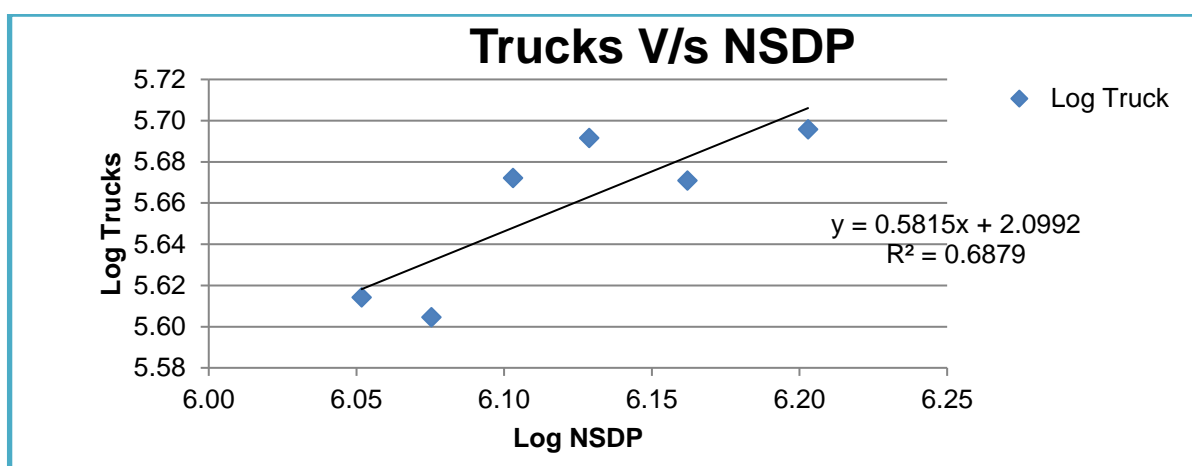


Figure 5-3: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation Maharashtra.

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 R² 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.

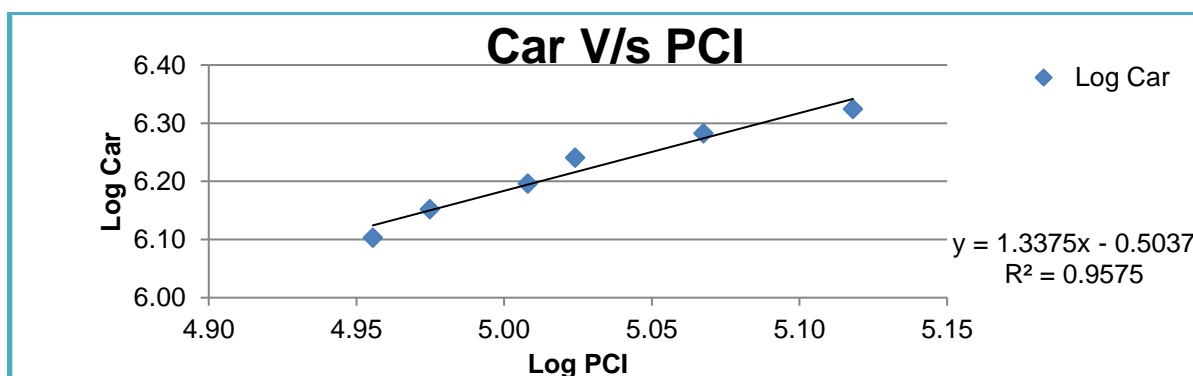


Figure 5-4: Regression and Elasticity PCI vs. Car–Extrapolation Karnataka

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.

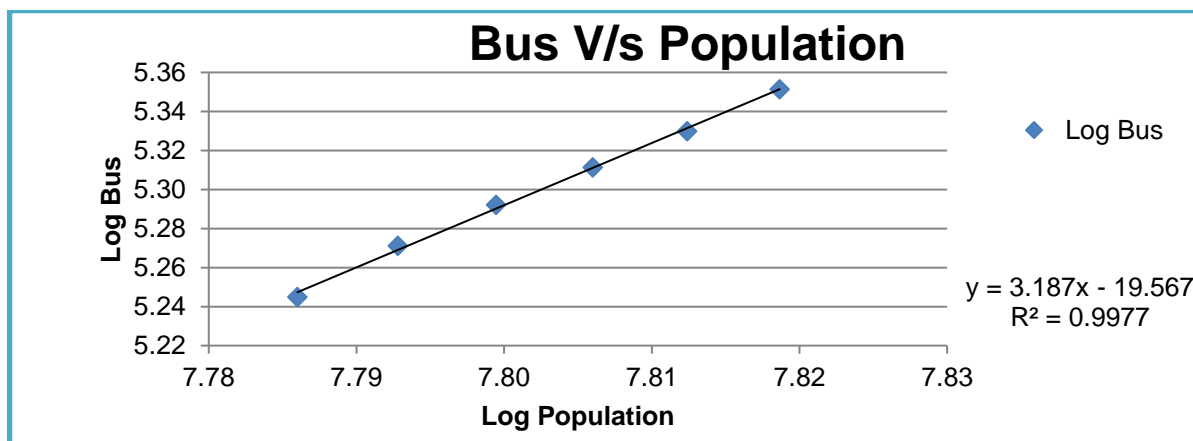


Figure 5-5: Regression and Elasticity Population vs. Bus – Extrapolation Karnataka

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.

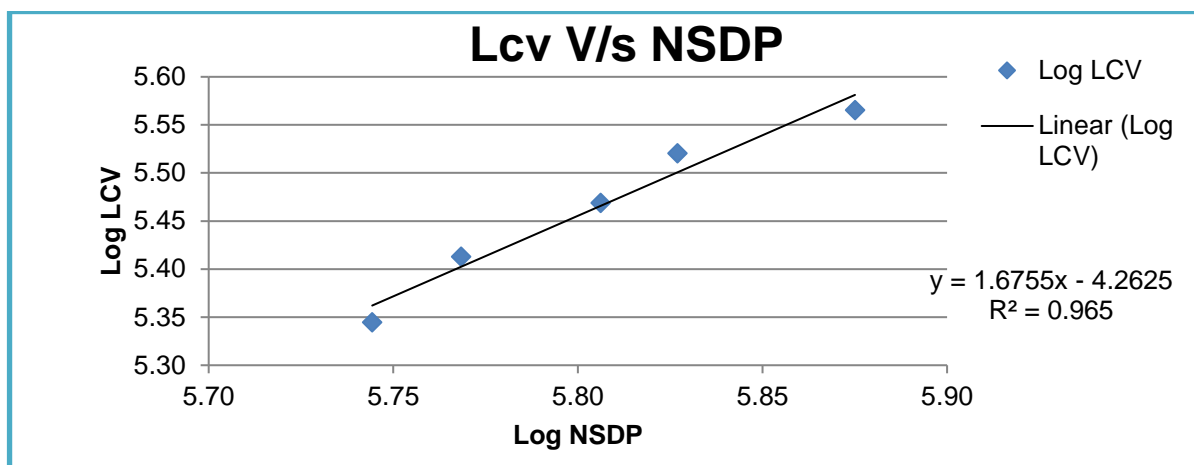


Table 5-4: Truck Traffic Vs NSDP Karnataka

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.

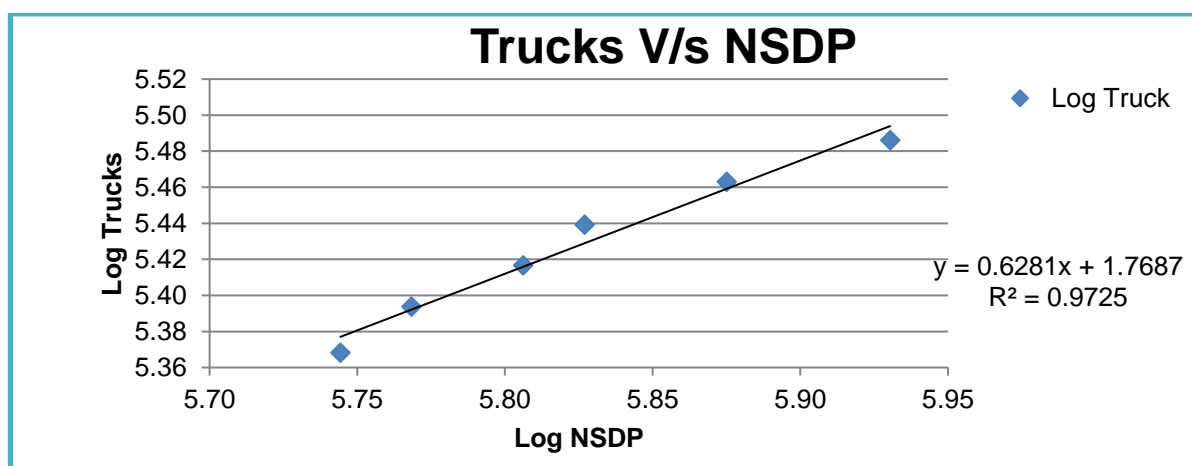


Figure 5-6: Regression and Elasticity NSDP vs. Goods Traffic – extrapolation Karnataka.

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. 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 5-8 : 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 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%

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.

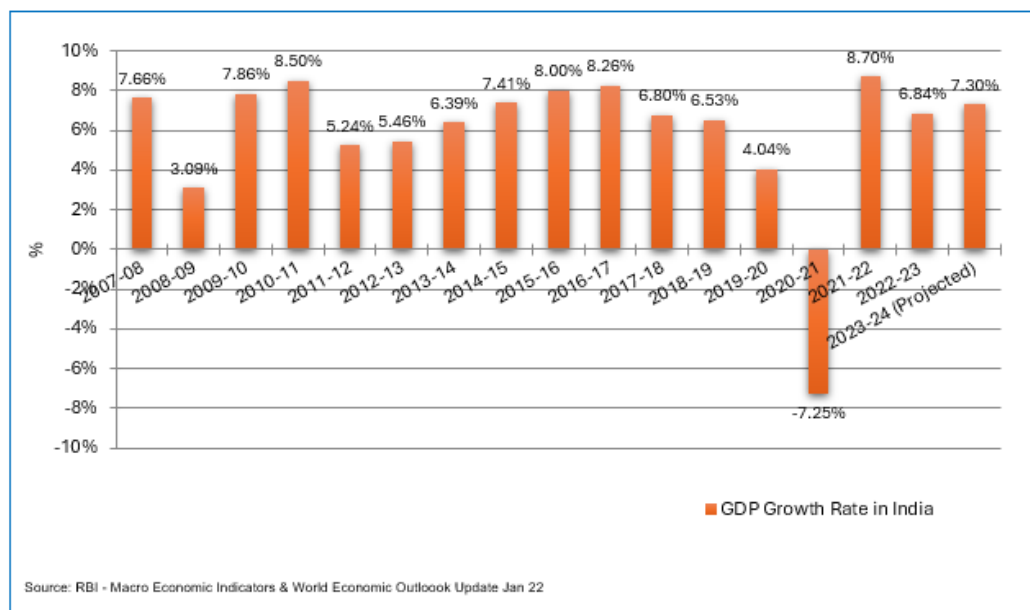


Figure 5-7 : Growth of GDP in India

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	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	8.92%	8.77%	8.47%	8.11%
Bus	5.50%	5.47%	5.41%	5.15%
LCV	4.02%	3.88%	3.61%	3.32%
2- Axle	4.56%	4.43%	4.15%	3.86%
3 - Axle	5.72%	5.55%	5.20%	4.82%
4 to 6 Axle	6.30%	6.11%	5.72%	5.30%
7 and Above Axle	6.30%	6.11%	5.72%	5.30%

Table 5-10 : Recommended Growth Rates Pessimistic

Category / Year	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	8.42%	8.27%	7.97%	7.61%
Bus	5.00%	4.97%	4.91%	4.65%
LCV	3.52%	3.38%	3.11%	2.82%
2- Axle	4.06%	3.93%	3.65%	3.36%
3 - Axle	5.22%	5.05%	4.70%	4.32%
4 to 6 Axle	5.80%	5.61%	5.22%	4.80%
7 and Above Axle	5.80%	5.61%	5.22%	4.80%

Table 5-11 : Recommended Growth Rates Most Likely

Category / Year	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	8.67%	8.52%	8.22%	7.86%
Bus	5.25%	5.22%	5.16%	4.90%
LCV	3.77%	3.63%	3.36%	3.07%
2- Axle	4.31%	4.18%	3.90%	3.61%
3 - Axle	5.47%	5.30%	4.95%	4.57%
4 to 6 Axle	6.05%	5.86%	5.47%	5.05%
7 and Above Axle	6.05%	5.86%	5.47%	5.05%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 directing NHAI to submit a plan for augmentation of the road, and till then movement of commercial vehicles is restricted on corresponding section of the road. It has negatively impacted on traffic on the project road. However, the matter is expected to be resolved during FY26, basis which it is anticipated that the diverted traffic would progressively come back on project stretch between FY26 and FY27.

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	9303	455	887	1277	881	1587	9	14399	26302
2025-26	10212	487	887	1552	1144	2484	13	16779	32928
2026-27	11277	514	949	1811	1350	2946	17	18863	37707
2027-28	12395	540	1011	1911	1441	3160	18	20476	40595
2028-29	13500	562	1066	1997	1524	3360	19	22028	43310
2029-30	14704	584	1124	2087	1611	3572	20	23702	46210
2030-31	15993	606	1185	2179	1700	3790	21	25474	49244
2031-32	17396	630	1249	2276	1794	4021	22	27388	52492
2032-33	18921	654	1317	2377	1894	4266	23	29452	55967
2033-34	20581	679	1388	2482	1999	4527	24	31680	59686
2034-35	22386	705	1464	2592	2110	4803	25	34085	63668
2035-36	24282	730	1543	2700	2219	5078	26	36578	67731
2036-37	26338	756	1626	2812	2335	5368	27	39262	72069
2037-38	28569	783	1714	2929	2456	5675	28	42154	76704
2038-39	30989	811	1806	3050	2583	6000	29	45268	81653
2039-40	33614	840	1903	3176	2717	6343	30	48623	86941
2040-41	36338	867	2001	3298	2848	6680	31	52063	92279
2041-42	39284	896	2104	3425	2985	7034	32	55760	97967
2042-43	42467	925	2213	3557	3129	7407	33	59731	104032
2043-44	45909	955	2326	3694	3280	7799	35	63998	110495
2044-45	49631	986	2445	3837	3439	8212	37	68587	117394

**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	4570	286	291	1008	840	1527	10	8531	18329
2025-26	4885	347	325	1331	1185	2718	14	10804	26220
2026-27	5394	366	347	1551	1397	3222	17	12293	30401
2027-28	5929	384	369	1637	1490	3457	18	13284	32631
2028-29	6457	399	389	1712	1575	3674	19	14225	34702
2029-30	7032	414	410	1790	1665	3905	20	15236	36911
2030-31	7648	429	432	1869	1757	4143	21	16299	39204
2031-32	8318	445	456	1951	1854	4396	22	17442	41650
2032-33	9047	462	481	2038	1957	4665	23	18673	44264
2033-34	9840	480	507	2128	2065	4950	24	19994	47043
2034-35	10702	498	535	2223	2179	5252	25	21414	50007
2035-36	11608	516	564	2315	2292	5553	26	22874	53001
2036-37	12591	534	595	2412	2411	5870	27	24440	56183
2037-38	13657	553	627	2512	2537	6206	28	26120	59568
2038-39	14813	573	661	2617	2669	6561	29	27923	63169
2039-40	16068	593	697	2726	2808	6937	30	29859	67002
2040-41	17370	612	733	2832	2944	7304	31	31826	70823
2041-42	18778	632	771	2941	3086	7692	32	33932	74878
2042-43	20300	652	810	3055	3234	8100	33	36184	79174
2043-44	21945	673	852	3173	3391	8530	34	38598	83741
2044-45	23725	695	895	3295	3554	8981	35	41180	88572

**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	9303	455	887	1277	881	1587	9	14399	26302
2025-26	10202	487	887	1551	1144	2482	13	16765	32903
2026-27	11215	511	944	1802	1343	2930	15	18761	37505
2027-28	12270	534	1000	1893	1426	3130	17	20270	40190
2028-29	13303	553	1050	1970	1501	3312	18	21707	42681
2029-30	14423	572	1103	2049	1580	3504	19	23250	45331
2030-31	15615	591	1158	2130	1660	3701	20	24875	48090
2031-32	16906	611	1215	2213	1744	3908	21	26618	51019
2032-33	18304	632	1275	2299	1832	4127	22	28491	54141

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2033-34	19818	653	1338	2389	1924	4358	23	30503	57465
2034-35	21457	675	1405	2482	2020	4602	24	32665	61008
2035-36	23168	696	1474	2572	2115	4842	25	34892	64597
2036-37	25015	718	1546	2665	2214	5095	26	37279	68412
2037-38	27009	740	1622	2763	2318	5361	27	39840	72474
2038-39	29161	763	1701	2864	2427	5640	28	42584	76788
2039-40	31485	787	1784	2969	2541	5935	29	45530	81386
2040-41	33880	809	1867	3070	2651	6220	30	48527	85983
2041-42	36457	832	1953	3173	2766	6520	31	51732	90861
2042-43	39230	856	2043	3279	2886	6834	32	55160	96035
2043-44	42214	880	2138	3389	3010	7162	33	58826	101523
2044-45	45425	904	2237	3503	3139	7506	34	62748	107348

**Table 6-4 : Total Tollable Traffic @ Toll Plaza 2- Yedashi77.400 KM
(Pessimistic Growth Scenario)**

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2024-25	4570	286	291	1008	840	1527	10	8531	18329
2025-26	4880	347	325	1330	1184	2716	14	10795	26201
2026-27	5364	365	346	1544	1389	3205	17	12231	30249
2027-28	5869	381	367	1622	1476	3423	18	13156	32320
2028-29	6363	394	385	1688	1553	3622	19	14024	34217
2029-30	6898	408	404	1756	1634	3832	20	14952	36226
2030-31	7468	422	424	1825	1717	4046	21	15923	38301
2031-32	8086	436	445	1896	1803	4273	22	16961	40500
2032-33	8754	450	467	1970	1893	4512	23	18069	42827
2033-34	9478	465	491	2047	1989	4765	24	19259	45307
2034-35	10261	480	515	2127	2090	5033	25	20531	47938
2035-36	11079	495	540	2204	2189	5296	26	21829	50570
2036-37	11961	510	567	2284	2292	5572	27	23213	53351
2037-38	12914	525	595	2367	2399	5863	28	24691	56294
2038-39	13943	541	624	2453	2511	6169	29	26270	59410
2039-40	15054	557	655	2542	2629	6491	30	27958	62712
2040-41	16198	572	686	2627	2742	6802	31	29658	65970
2041-42	17430	588	718	2715	2860	7129	32	31472	69416
2042-43	18755	604	751	2805	2984	7471	33	33403	73049

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2043-44	20181	620	786	2900	3113	7830	34	35464	76896
2044-45	21715	638	822	2998	3248	8206	35	37662	80961

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	9303	455	887	1277	881	1587	9	14399	26302
2025-26	10207	487	887	1551	1144	2483	13	16772	32915
2026-27	11246	513	947	1806	1346	2937	17	18812	37605
2027-28	12333	537	1005	1901	1433	3145	18	20372	40389
2028-29	13402	558	1058	1983	1512	3336	19	21868	42996
2029-30	14564	579	1113	2068	1595	3538	20	23477	45772
2030-31	15805	600	1171	2154	1679	3745	21	25175	48664
2031-32	17151	622	1232	2243	1767	3964	22	27001	51747
2032-33	18611	644	1296	2336	1860	4196	23	28966	55039
2033-34	20197	668	1364	2434	1958	4441	24	31086	58560
2034-35	21918	692	1435	2536	2062	4701	25	33369	62322
2035-36	23720	715	1509	2635	2164	4958	26	35727	66145
2036-37	25670	739	1586	2738	2272	5228	27	38260	70214
2037-38	27780	763	1668	2845	2385	5514	28	40983	74558
2038-39	30063	789	1753	2956	2503	5816	29	43909	79185
2039-40	32535	815	1843	3071	2627	6134	30	47055	84119
2040-41	35091	839	1933	3182	2747	6445	31	50268	89078
2041-42	37848	865	2028	3296	2872	6771	32	53712	94347
2042-43	40821	891	2127	3414	3003	7113	33	57402	99947
2043-44	44028	918	2231	3536	3140	7472	34	61359	105903
2044-45	47487	946	2340	3664	3284	7849	36	65606	112253

**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	4570	286	291	1008	840	1527	10	8531	18329
2025-26	4882	347	325	1330	1184	2717	14	10800	26210
2026-27	5379	365	347	1548	1394	3213	17	12262	30325

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU
2027-28	5899	382	368	1630	1484	3439	18	13220	32475
2028-29	6410	396	387	1700	1566	3647	19	14125	34460
2029-30	6965	410	407	1772	1652	3868	20	15094	36569
2030-31	7559	424	428	1846	1739	4095	21	16112	38756
2031-32	8202	439	450	1923	1830	4334	22	17200	41072
2032-33	8900	454	474	2003	1927	4588	23	18369	43543
2033-34	9658	470	499	2087	2030	4857	24	19625	46176
2034-35	10480	487	525	2175	2137	5141	25	20970	48969
2035-36	11341	503	552	2260	2243	5422	26	22347	51777
2036-37	12273	519	580	2349	2354	5719	27	23821	54758
2037-38	13282	537	609	2441	2471	6031	28	25399	57916
2038-39	14373	555	640	2537	2594	6361	29	27089	61274
2039-40	15554	573	673	2636	2722	6708	30	28896	64828
2040-41	16777	591	706	2732	2847	7047	31	30731	68370
2041-42	18096	609	741	2831	2977	7403	32	32689	72114
2042-43	19517	628	777	2933	3113	7777	33	34778	76073
2043-44	21050	647	815	3039	3255	8170	34	37010	80266
2044-45	22702	666	855	3148	3404	8582	35	39392	84699

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 - 1stOctober 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	22975	3%	-3%	-3%	29	-0.7

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 2/3rd 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) 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.

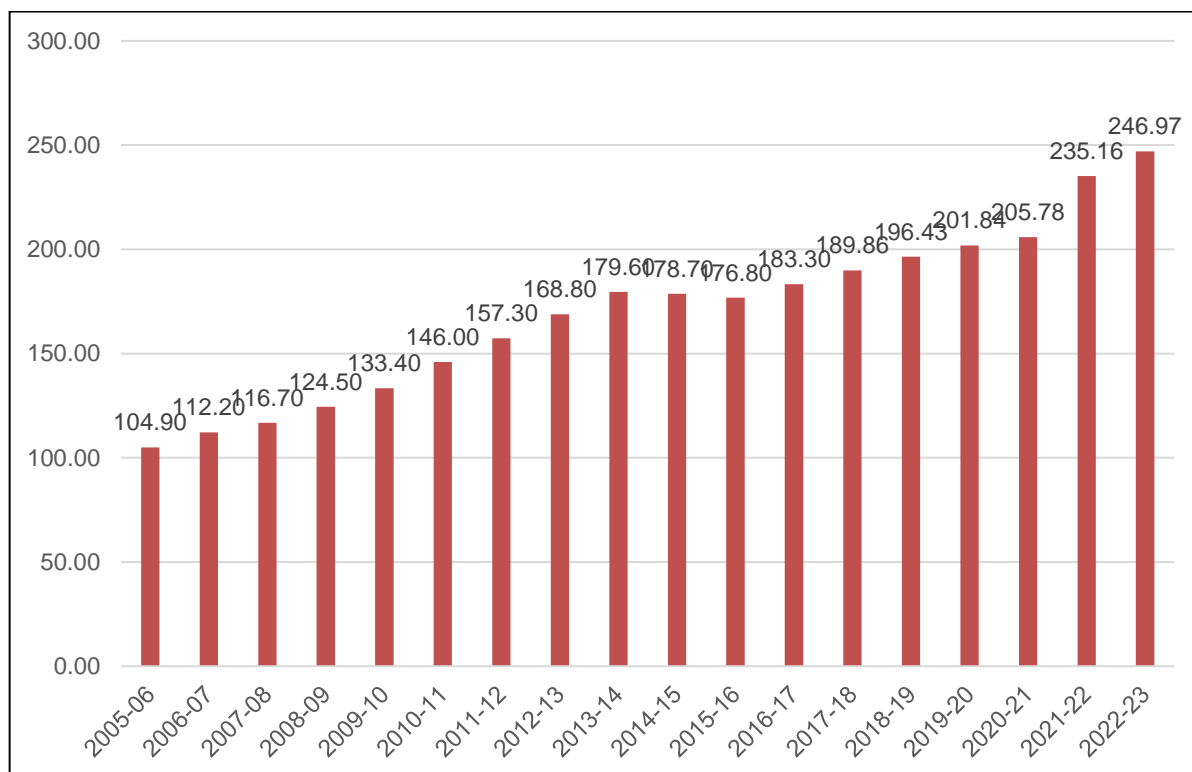


Figure 7-1 : Historical Rate of WPI Inflation in India

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
2024-25	75	125	260	260	285	410	495
2025-26	80	130	275	275	300	430	520
2026-27	85	135	285	285	315	450	550
2027-28	90	145	300	300	330	475	575
2028-29	95	150	315	315	345	495	605
2029-30	100	160	335	335	365	525	635
2030-31	105	165	350	350	380	550	670
2031-32	110	175	370	370	400	580	705
2032-33	115	185	390	390	425	610	740
2033-34	120	195	410	410	445	640	780
2034-35	125	205	430	430	470	675	820
2035-36	135	215	450	450	495	710	865
2036-37	140	225	475	475	520	745	910
2037-38	150	240	500	500	545	785	955
2038-39	155	250	530	530	575	825	1005
2039-40	165	265	555	555	605	870	1060
2040-41	175	280	585	585	640	920	1120
2041-42	180	295	615	615	675	970	1180
2042-43	190	310	650	650	710	1020	1240
2043-44	205	325	685	685	750	1075	1310
2044-45	215	345	725	725	790	1135	1380

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
2024-25	75	125	260	260	285	410	500

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2025-26	80	130	275	275	300	430	525
2026-27	85	135	290	290	315	450	550
2027-28	90	145	300	300	330	475	575
2028-29	95	150	320	320	345	500	605
2029-30	100	160	335	335	365	525	635
2030-31	105	170	350	350	385	550	670
2031-32	110	175	370	370	405	580	705
2032-33	115	185	390	390	425	610	740
2033-34	120	195	410	410	445	640	780
2034-35	125	205	430	430	470	675	820
2035-36	135	215	450	450	495	710	865
2036-37	140	225	475	475	520	745	910
2037-38	150	240	500	500	545	785	960
2038-39	155	250	530	530	575	830	1010
2039-40	165	265	555	555	605	875	1060
2040-41	175	280	585	585	640	920	1120
2041-42	185	295	620	620	675	970	1180
2042-43	190	310	650	650	710	1020	1245
2043-44	205	330	685	685	750	1075	1310
2044-45	215	345	725	725	790	1135	1385

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	380	380	410	590	720
2024-25	115	185	390	390	425	615	745
2025-26	120	195	410	410	450	645	785
2026-27	125	205	430	430	470	675	825
2027-28	135	215	455	455	495	710	865
2028-29	140	225	475	475	520	745	910
2029-30	150	240	500	500	545	785	955
2030-31	155	250	525	525	575	825	1005
2031-32	165	265	555	555	605	865	1055
2032-33	170	280	580	580	635	910	1110
2033-34	180	290	610	610	670	960	1170
2034-35	190	305	645	645	705	1010	1230
2035-36	200	325	680	680	740	1065	1295
2036-37	210	340	715	715	780	1120	1360
2037-38	220	360	750	750	820	1180	1435
2038-39	235	380	790	790	865	1240	1510
2039-40	245	400	835	835	910	1305	1590
2040-41	260	420	880	880	960	1380	1675

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2041-42	275	440	925	925	1010	1450	1765
2042-43	290	465	975	975	1065	1530	1865
2043-44	305	490	1030	1030	1120	1615	1965
2044-45	320	520	1085	1085	1185	1700	2070

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	595	720
2024-25	115	185	390	390	425	615	745
2025-26	120	195	410	410	450	645	785
2026-27	125	205	430	430	470	675	825
2027-28	135	215	455	455	495	710	865
2028-29	140	225	475	475	520	745	910
2029-30	150	240	500	500	545	785	955
2030-31	155	250	525	525	575	825	1005
2031-32	165	265	555	555	605	870	1055
2032-33	170	280	580	580	635	915	1110
2033-34	180	290	615	615	670	960	1170
2034-35	190	310	645	645	705	1010	1230
2035-36	200	325	680	680	740	1065	1295
2036-37	210	340	715	715	780	1120	1365
2037-38	220	360	750	750	820	1180	1435
2038-39	235	380	790	790	865	1245	1515
2039-40	245	400	835	835	910	1310	1595
2040-41	260	420	880	880	960	1380	1680
2041-42	275	440	925	925	1010	1455	1770
2042-43	290	465	975	975	1065	1530	1865
2043-44	305	490	1030	1030	1125	1615	1965
2044-45	320	520	1085	1085	1185	1705	2075

Table 7-6 : Toll Rates for Monthly Pass Local @ Toll Plaza 1- Tamalwadi 19.300 KM

Year	Car
2024-25	340
2024-25	350
2025-26	370
2026-27	385
2027-28	405
2028-29	425
2029-30	450
2030-31	470
2031-32	495
2032-33	520
2033-34	550

Year	Car
2034-35	575
2035-36	605
2036-37	640
2037-38	675
2038-39	710
2039-40	745
2040-41	785
2041-42	830
2042-43	875
2043-44	920
2044-45	970

Table 7-7 : Toll Rates for Monthly Pass Local @ Toll Plaza 2- Yedashi 77.400 KM

Year	Car
2024-25	340
2024-25	350
2025-26	370
2026-27	385
2027-28	405
2028-29	425
2029-30	450
2030-31	470
2031-32	495
2032-33	520
2033-34	550
2034-35	575
2035-36	605
2036-37	640
2037-38	675
2038-39	710
2039-40	745
2040-41	785
2041-42	830
2042-43	875
2043-44	920
2044-45	970

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	4005	8390	8390	9155	13160	16020
2024-25	2565	4145	8680	8680	9470	13610	16570
2025-26	2695	4350	9115	9115	9945	14295	17405
2026-27	2830	4570	9575	9575	10445	15020	18285

Year	Car	Minibus /LCV	Bus	Truck	3 - Axle	Multi axle	Oversized Vehicles
2027-28	2975	4800	10060	10060	10975	15780	19210
2028-29	3125	5045	10575	10575	11535	16585	20190
2029-30	3285	5305	11115	11115	12125	17430	21220
2030-31	3455	5580	11685	11685	12750	18325	22310
2031-32	3630	5865	12290	12290	13405	19270	23460
2032-33	3820	6170	12925	12925	14100	20270	24680
2033-34	4020	6490	13600	13600	14835	21325	25965
2034-35	4230	6830	14310	14310	15610	22445	27320
2035-36	4450	7190	15065	15065	16430	23620	28755
2036-37	4685	7570	15860	15860	17300	24870	30275
2037-38	4935	7970	16700	16700	18215	26185	31880
2038-39	5195	8395	17585	17585	19185	27580	33575
2039-40	5475	8845	18525	18525	20210	29055	35370
2040-41	5770	9315	19520	19520	21295	30615	37270
2041-42	6080	9820	20575	20575	22445	32260	39275
2042-43	6405	10350	21685	21685	23655	34005	41400
2043-44	6755	10910	22865	22865	24940	35855	43650
2044-45	7125	11505	24110	24110	26300	37805	46025

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	2485	4010	8405	8405	9165	13175	16040
2024-25	2570	4150	8690	8690	9480	13630	16590
2025-26	2695	4355	9130	9130	9960	14315	17425
2026-27	2835	4575	9590	9590	10460	15035	18305
2027-28	2975	4810	10075	10075	10990	15800	19235
2028-29	3130	5055	10590	10590	11550	16605	20215
2029-30	3290	5310	11130	11130	12140	17455	21245
2030-31	3455	5585	11700	11700	12765	18350	22340
2031-32	3635	5875	12305	12305	13425	19295	23490
2032-33	3825	6175	12945	12945	14120	20295	24710
2033-34	4025	6500	13615	13615	14855	21355	25995
2034-35	4235	6840	14330	14330	15630	22470	27355
2035-36	4455	7200	15080	15080	16455	23650	28795
2036-37	4690	7580	15880	15880	17320	24900	30310
2037-38	4940	7980	16720	16720	18240	26220	31920
2038-39	5205	8405	17610	17610	19210	27615	33620
2039-40	5480	8855	18550	18550	20235	29090	35415
2040-41	5775	9330	19545	19545	21325	30650	37315
2041-42	6085	9830	20600	20600	22470	32305	39325
2042-43	6415	10365	21715	21715	23685	34050	41450
2043-44	6765	10925	22890	22890	24975	35900	43700
2044-45	7130	11520	24140	24140	26335	37855	46085

7.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on the 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)

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2024-25	70.72	53.03	123.75
2025-26	93.94	80.39	174.33
2026-27	113.69	98.44	212.13
2027-28	128.36	111.09	239.45
2028-29	144.33	123.99	268.32
2029-30	160.76	138.70	299.46
2030-31	181.37	154.93	336.30
2031-32	202.41	172.81	375.22
2032-33	226.81	192.89	419.70
2033-34	253.27	214.92	468.20
2034-35	283.33	239.57	522.91
2035-36	317.59	267.69	585.28

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2036-37	355.38	298.06	653.44
2037-38	396.01	331.15	727.17
2038-39	444.07	369.85	813.92
2039-40	498.07	414.50	912.57
2040-41	554.51	459.73	1014.24
2041-42	621.82	511.96	1133.78
2042-43	691.91	570.67	1262.58
2043-44	775.26	633.68	1408.94
2044-45	868.05	706.01	1574.06

Table 7-11 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2024-25	70.72	53.03	123.75
2025-26	93.87	80.33	174.20
2026-27	113.09	97.87	210.96
2027-28	127.11	109.96	237.07
2028-29	142.25	122.15	264.40
2029-30	157.73	135.98	293.71
2030-31	177.12	151.16	328.28
2031-32	196.74	167.79	364.53
2032-33	219.44	186.39	405.82
2033-34	243.91	206.75	450.65

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2034-35	271.57	229.41	500.98
2035-36	302.98	255.12	558.10
2036-37	337.46	282.71	620.17
2037-38	374.27	312.58	686.85
2038-39	417.69	347.47	765.16
2039-40	466.29	387.52	853.81
2040-41	516.72	427.79	944.52
2041-42	576.75	474.13	1050.88
2042-43	638.82	526.03	1164.85
2043-44	712.32	581.34	1293.65
2044-45	793.87	644.73	1438.59

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

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2024-25	70.72	53.03	123.75
2025-26	93.90	80.36	174.27
2026-27	113.39	98.14	211.53
2027-28	127.72	110.52	238.24
2028-29	143.30	123.08	266.38
2029-30	159.26	137.34	296.60
2030-31	179.23	153.05	332.27
2031-32	199.55	170.32	369.87
2032-33	223.06	189.68	412.74
2033-34	248.50	210.89	459.39
2034-35	277.33	234.49	511.81
2035-36	310.15	261.39	571.53
2036-37	346.26	290.34	636.59

Year	Toll Plaza Km 19.300	Toll Plaza Km 77.400	Total
2037-38	384.95	321.83	706.78
2038-39	430.67	358.61	789.28
2039-40	481.94	400.88	882.82
2040-41	535.32	443.61	978.94
2041-42	598.94	492.84	1091.79
2042-43	664.84	548.10	1212.94
2043-44	743.09	607.14	1350.23
2044-45	830.12	674.82	1504.95

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



JANUARY 2025



**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)**

JANUARY 2025



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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highway Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- 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 3rd 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 113.800 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.

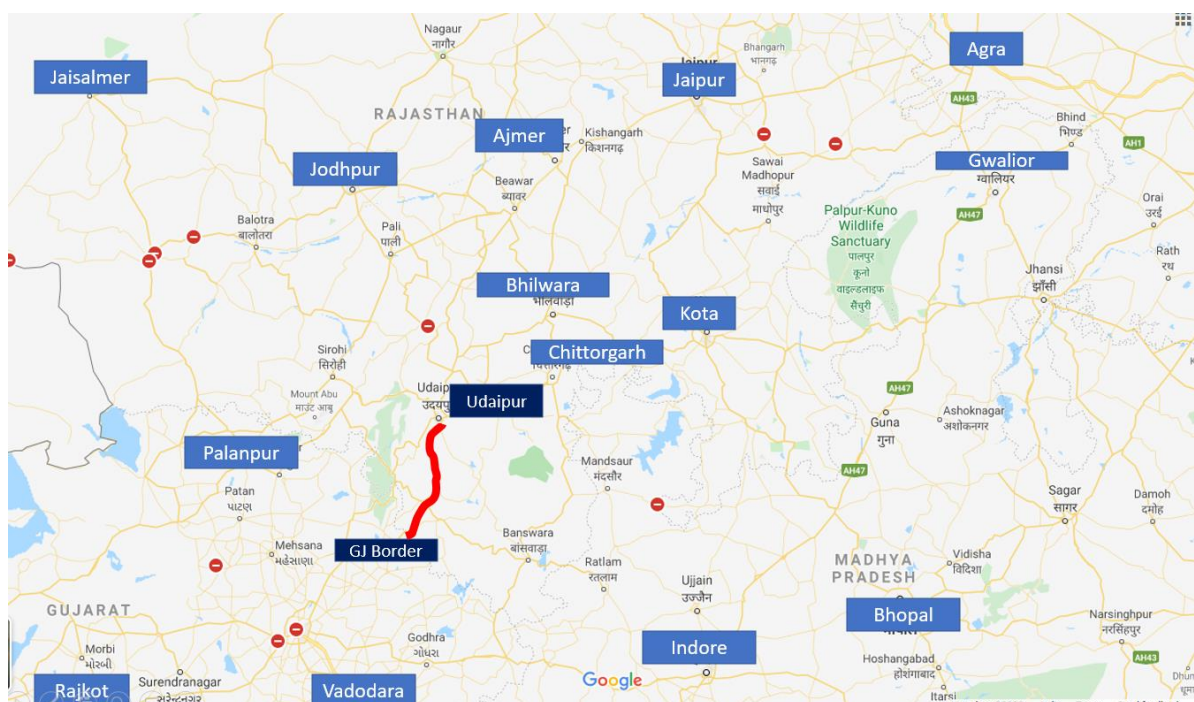


Figure 1-1 : Alignment of Project Stretch

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.

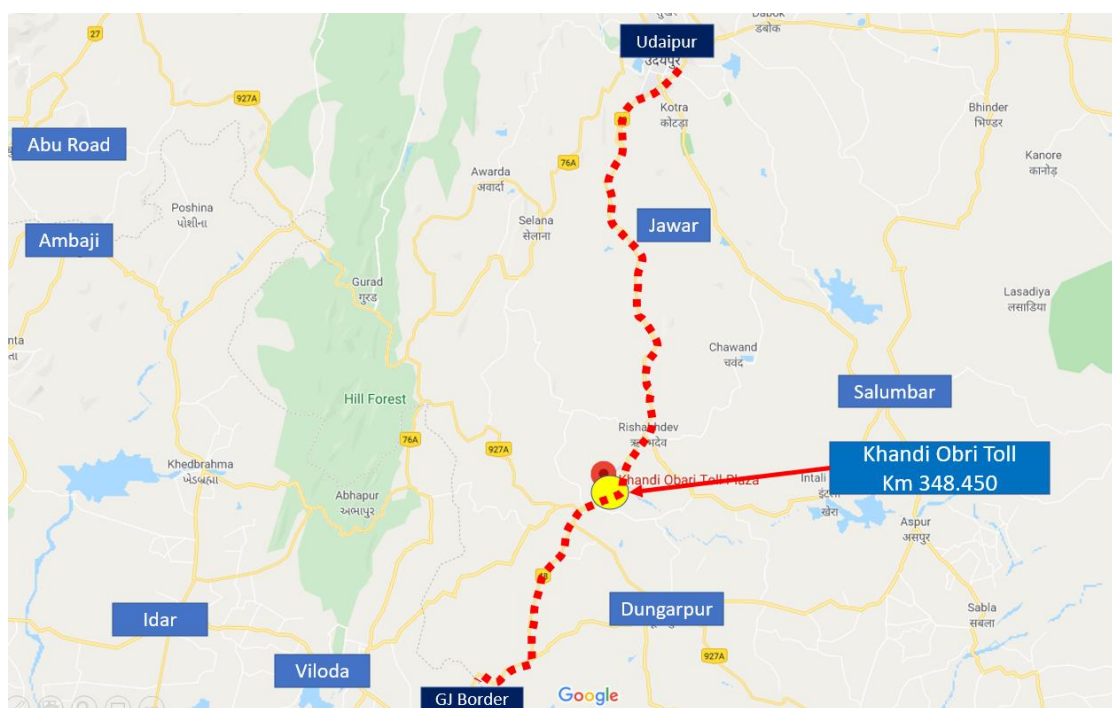


Figure 2-1 : Project Alignment with Toll Plaza

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 November 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 & Eight month from April 2024 to November 2024	to November 2023 & Eight month from April 2024 to November 2024	2023 to November 2023 & Eight month from April 2024 to November 2024	to November 2023 & Eight month from April 2024 to November 2024	2023 to November 2023 & Eight month from April 2024 to November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	7069
2	LCV	934	737	619	672	777	813
3	Bus	800	472	661	781	894	816
4	Truck	1448	1402	1703	1864	2213	2298
5	3-Axle	1806	1548	1691	1724	1934	1811
6	Multi Axle	3717	3367	3887	4157	4868	4822

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
	Total	13248	11113	13355	14545	16919	17638

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

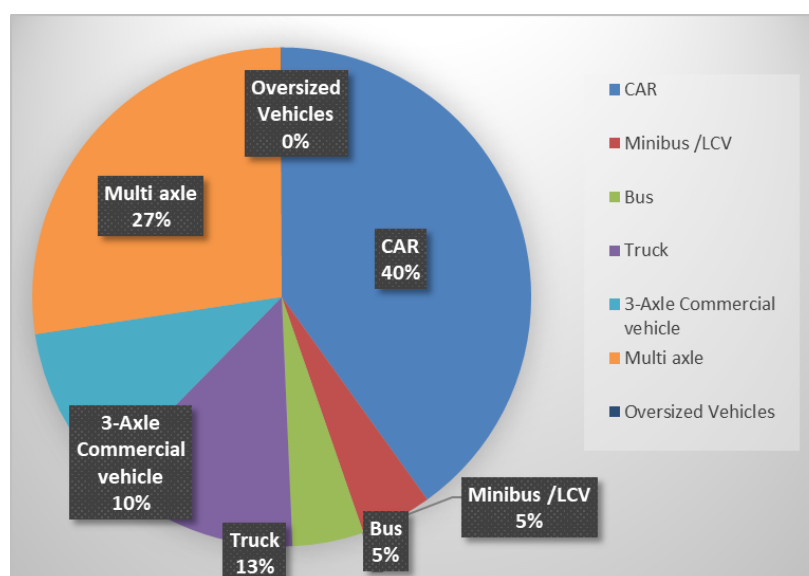
Table 3-5 : Traffic in PCU at Project Stretch Base Year 2023-24

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	17638	44803	2.54

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 40% of total traffic at toll plaza locations while multi axle commercial vehicles are about 37% 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	14174
2	Return Journey	3236
3	Local Commercial Single Journey	153
4	Monthly Pass Local	75
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.

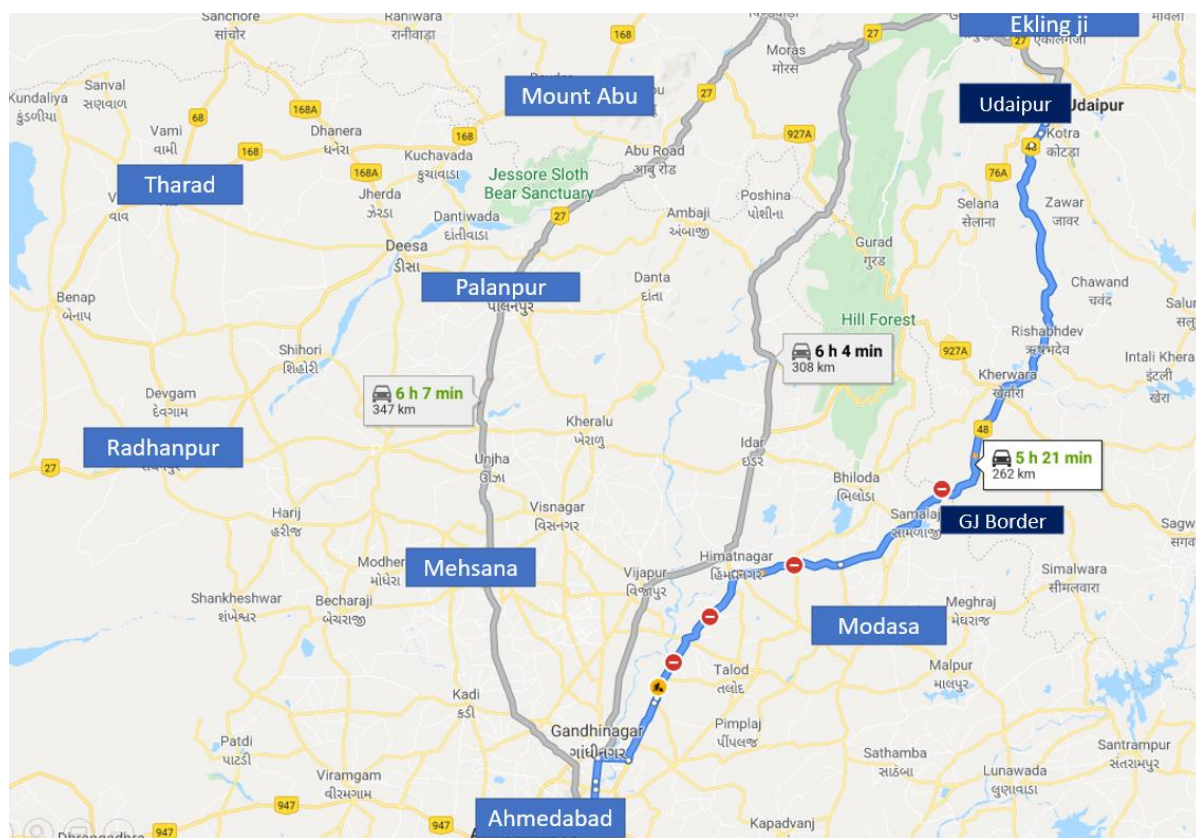


Figure 4-1 : Alternate route at regional level Udaipur - Ahmedabad

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.

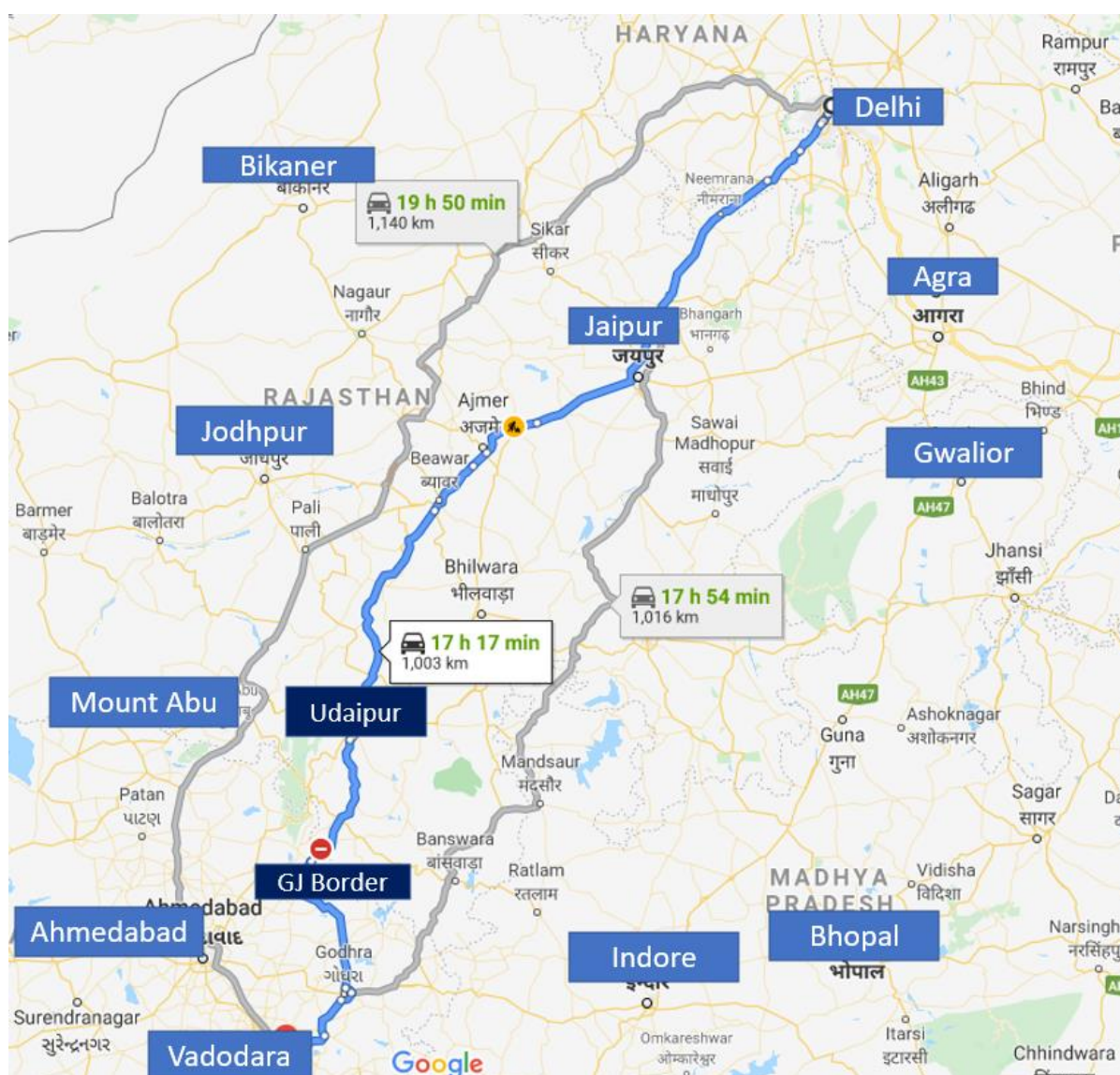


Figure 4-2 : Alternate route at regional level Delhi - Vadodara

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
Regional Level						
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.

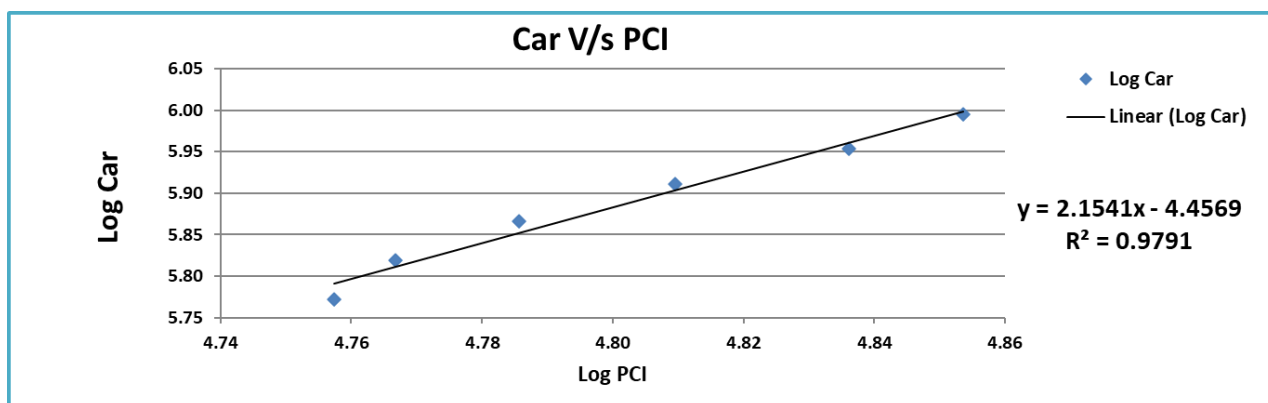


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan

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.

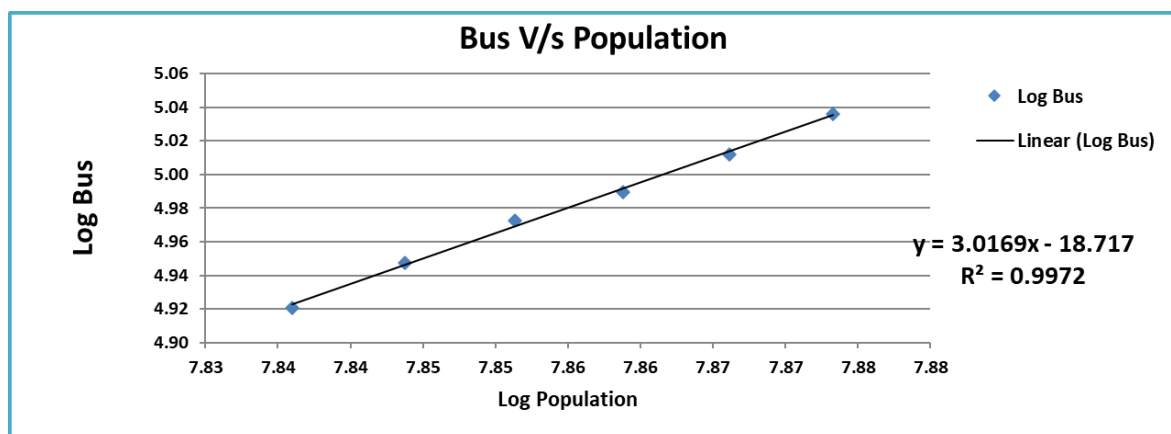


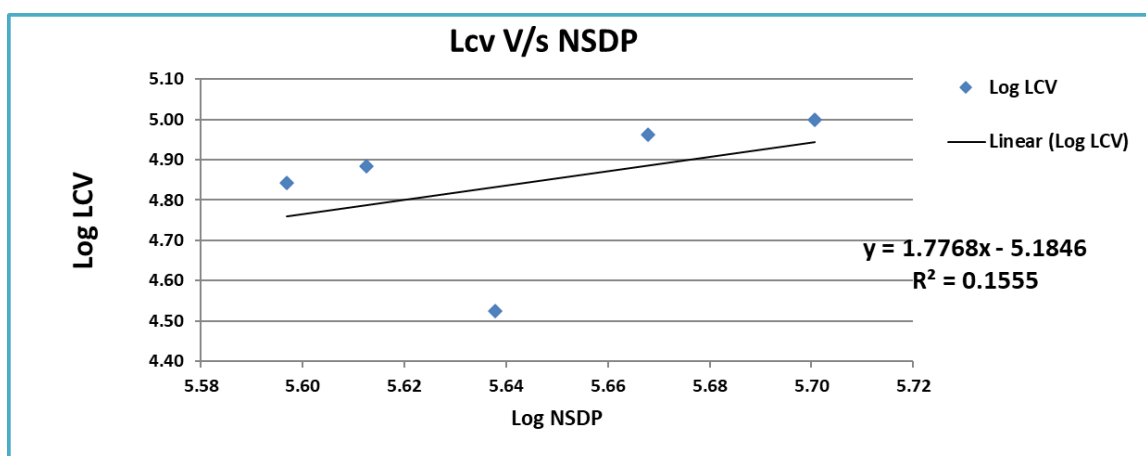
Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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.

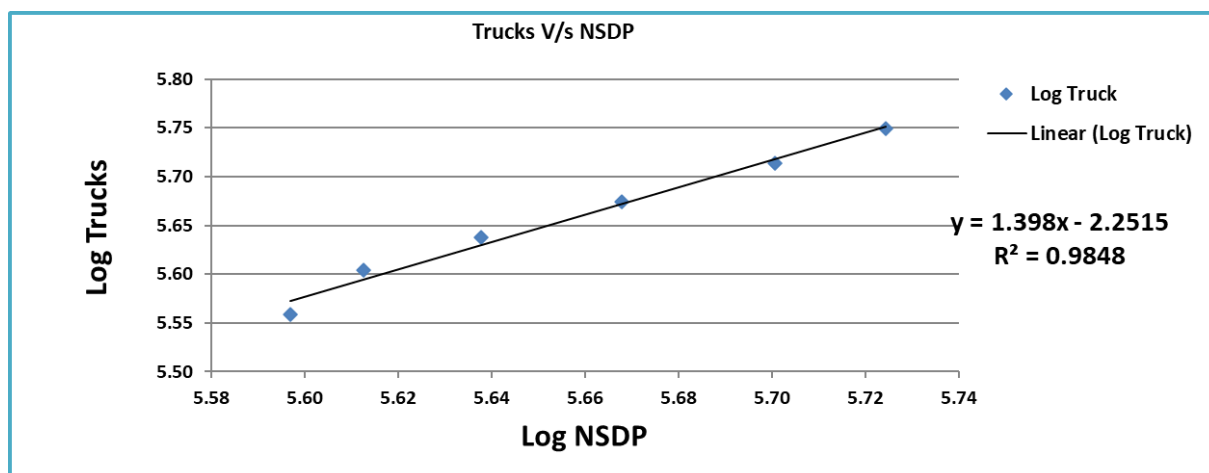


Figure 5-4 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Rajasthan.

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. 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

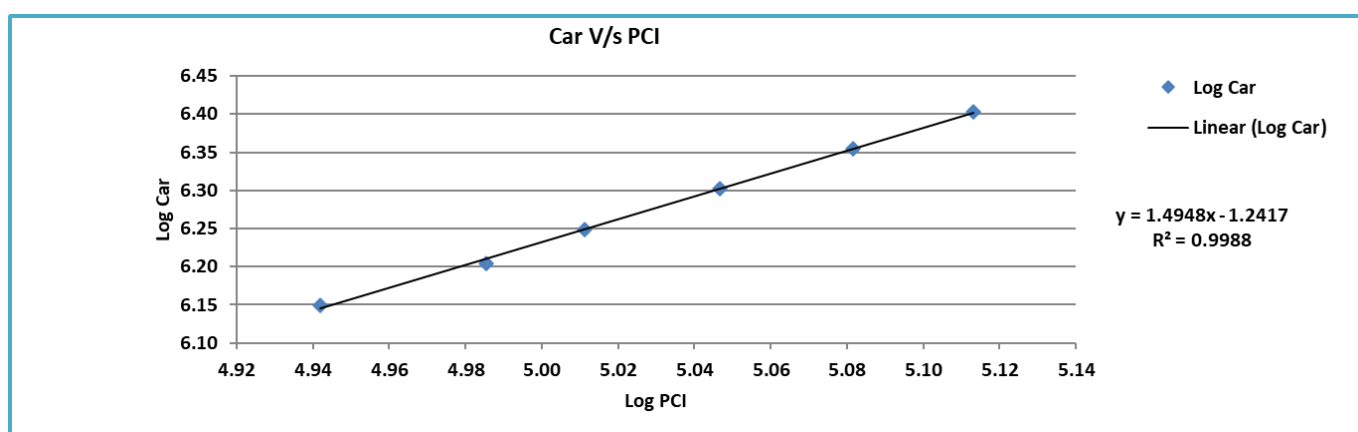
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
Rajasthan	Car/Jeep	PCI	$y = 2.1541x - 4.4569$	$R^2 = 0.9791$	2.1541	4.55%	9.79%	Good Regression
	Bus	Population	$y = 3.0169x - 18.7174$	$R^2 = 0.9972$	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

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.

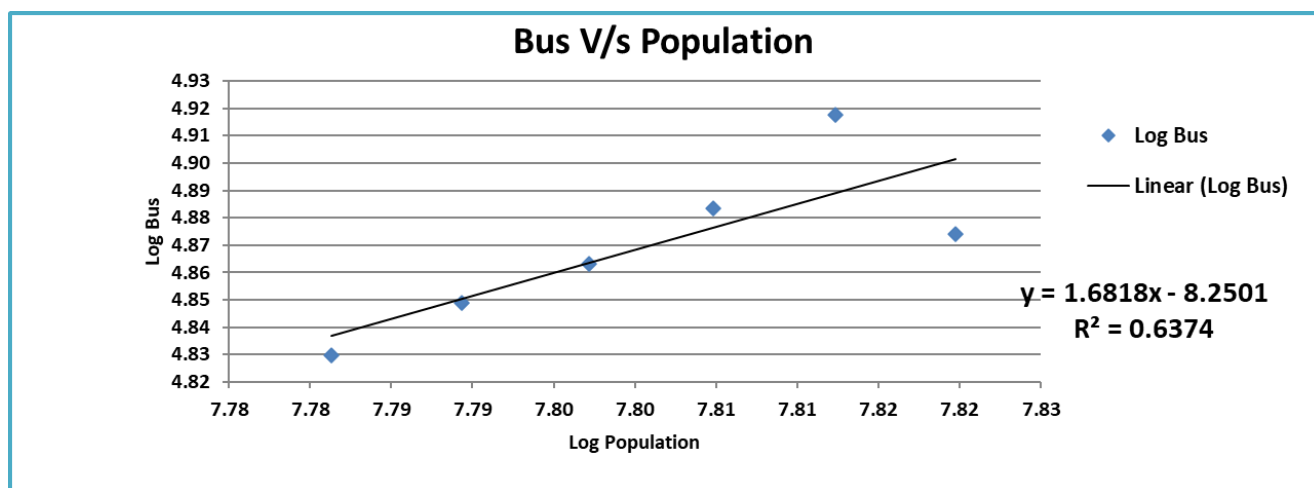


Figure 5-6 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat

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.

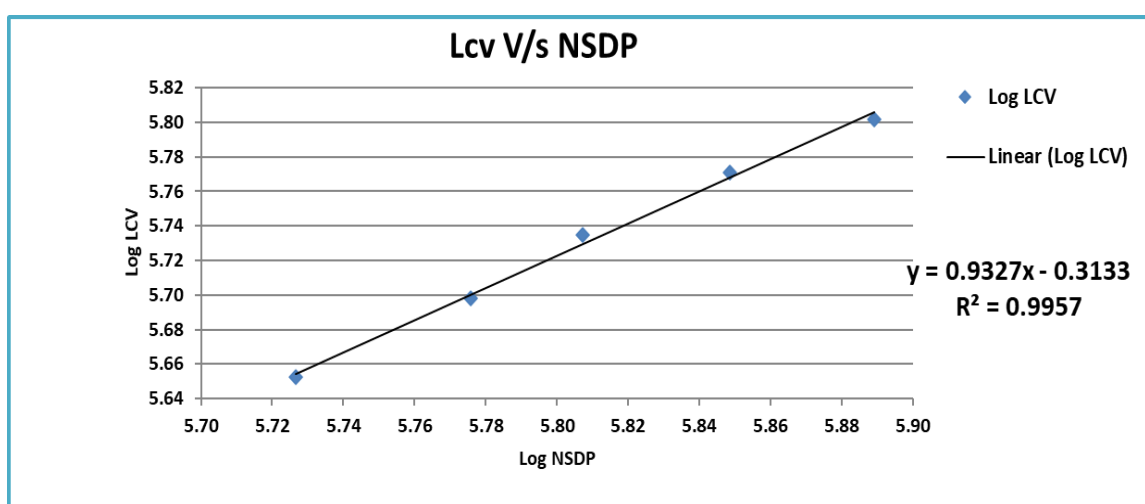


Figure 5-7 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Gujarat.

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.

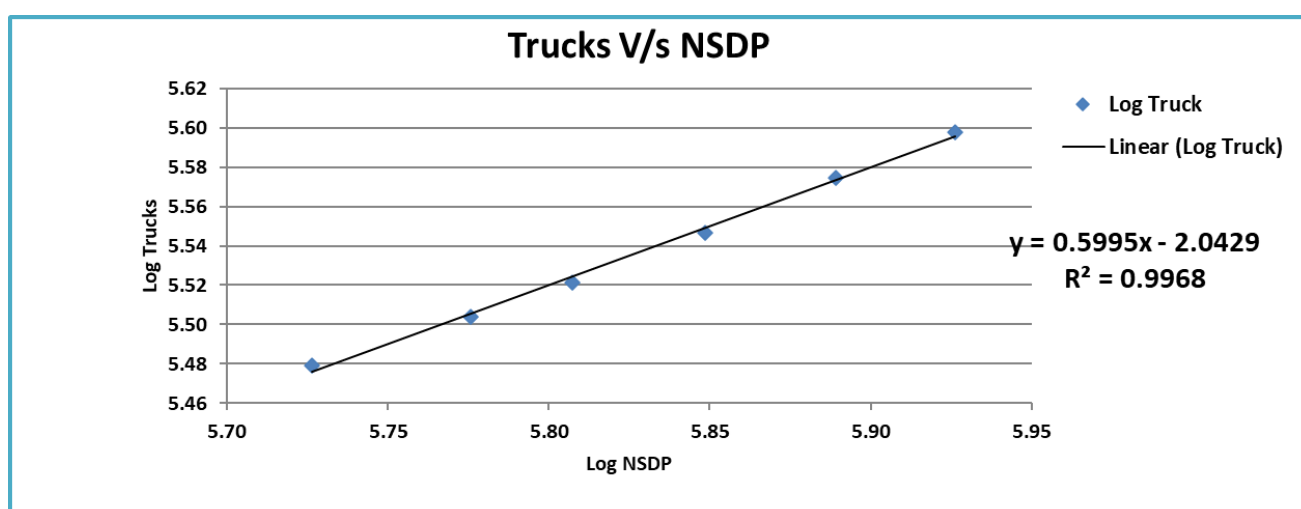


Figure 5-8 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Gujarat.

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 R² 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.

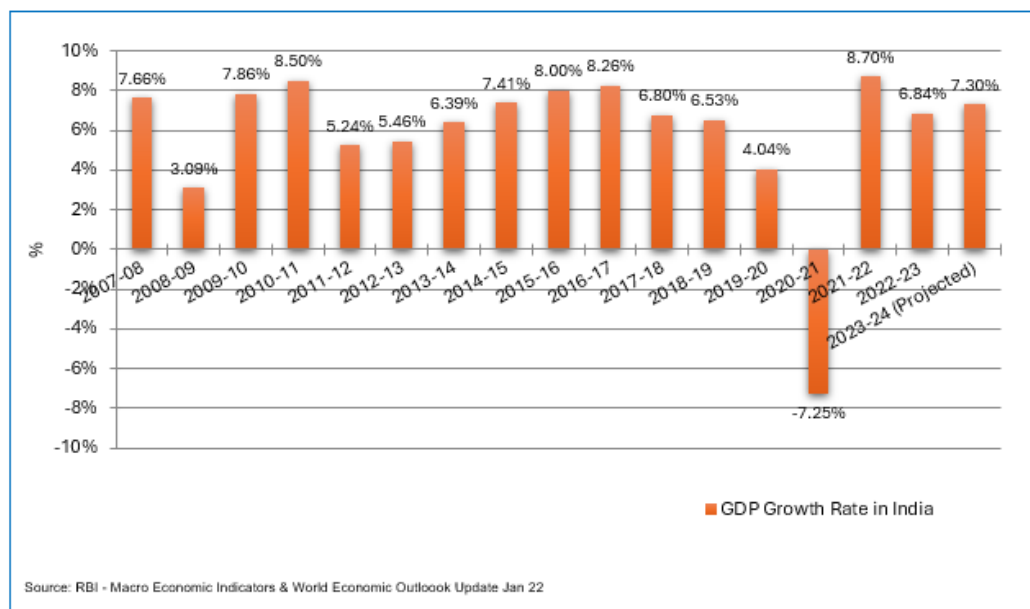


Figure 5-9 : Growth of GDP in India

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	2025-2026	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	2025-2026	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	2025-2026	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	2025-2026	2026-2031	2031-2036	2036-2041	2041-2046	2046-2051
3 - Axle	5.57%	4.95%	4.34%	3.74%	3.14%	2.55%
4 to 6 Axle	6.27%	5.57%	4.88%	4.20%	3.53%	2.87%
7 and Above Axle	6.27%	5.57%	4.88%	4.20%	3.53%	2.87%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

There are ROBs which are under construction in Ahmedabad – Shamlaji section. Due to this some traffic is temporarily diverted to alternate roads. It is expected that construction of these ROBs would be completed by FY25 end and stretch would be open for seamless traffic flow subsequently. The said diverted traffic is expected to come back on project stretch considering from Financial Year 2026.

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 - 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	7069	813	816	2298	1811	4822	9	17638	44803
2025-26	8187	895	914	2536	2032	5440	10	20014	50501
2026-27	9031	937	974	2659	2168	5839	11	21619	54165
2027-28	9917	974	1032	2774	2303	6238	12	23250	57830
2028-29	10790	1004	1082	2867	2423	6601	13	24780	61175
2029-30	11740	1035	1136	2962	2549	6985	14	26421	64729
2030-31	12703	1063	1189	3050	2666	7344	15	28030	68128
2031-32	13746	1091	1245	3140	2788	7721	16	29747	71718
2032-33	14874	1120	1303	3233	2916	8118	17	31581	75518
2033-34	16095	1149	1364	3328	3050	8535	18	33539	79533
2034-35	17415	1179	1428	3427	3190	8973	19	35631	83783
2035-36	18739	1206	1490	3516	3317	9373	20	37661	87786
2036-37	20164	1233	1555	3607	3450	9790	21	39820	91999
2037-38	21697	1260	1623	3700	3588	10226	22	42116	96436
2038-39	23348	1288	1694	3795	3731	10681	23	44560	101108
2039-40	25125	1316	1767	3893	3879	11156	24	47160	106026
2040-41	26888	1339	1839	3979	4011	11578	25	49659	110597
2041-42	28774	1363	1914	4067	4147	12016	26	52307	115392
2042-43	30792	1387	1991	4157	4288	12470	27	55112	120417

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	7069	813	816	2298	1811	4822	9	17638	44803
2025-26	8152	891	910	2525	2022	5416	10	19926	50277
2026-27	8952	927	964	2635	2147	5786	10	21421	53663
2027-28	9786	960	1017	2736	2269	6152	10	22930	57021
2028-29	10600	985	1062	2814	2376	6480	10	24327	60039
2029-30	11480	1011	1108	2894	2488	6824	10	25815	63220
2030-31	12363	1032	1153	2965	2591	7140	10	27254	66213
2031-32	13315	1054	1201	3038	2698	7471	10	28787	69372
2032-33	14342	1076	1250	3112	2809	7816	10	30415	72686
2033-34	15447	1098	1302	3188	2924	8177	10	32146	76178
2034-35	16638	1121	1355	3267	3044	8556	10	33991	79865
2035-36	17820	1140	1407	3335	3151	8894	10	35757	83277
2036-37	19086	1159	1460	3405	3261	9245	10	37626	86850
2037-38	20442	1179	1517	3476	3375	9610	10	39609	90605
2038-39	21895	1199	1575	3548	3493	9990	10	41710	94542
2039-40	23450	1219	1636	3622	3615	10385	10	43937	98675
2040-41	24976	1234	1694	3684	3720	10725	10	46043	102429
2041-42	26603	1249	1755	3747	3828	11077	10	48269	106358
2042-43	28337	1264	1818	3811	3939	11440	10	50619	110462

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	7069	813	816	2298	1811	4822	9	17638	44803
2025-26	8170	893	912	2531	2028	5428	10	19972	50394
2026-27	8992	931	969	2647	2159	5812	10	21520	53913
2027-28	9851	966	1025	2756	2288	6194	10	23090	57425
2028-29	10695	994	1073	2841	2402	6538	10	24553	60600
2029-30	11611	1022	1123	2929	2521	6902	10	26118	63967
2030-31	12534	1046	1172	3008	2631	7239	10	27640	67157
2031-32	13531	1071	1223	3089	2745	7592	10	29261	70518
2032-33	14608	1097	1276	3172	2864	7964	10	30991	74073
2033-34	15770	1124	1333	3257	2988	8354	10	32836	77828
2034-35	17024	1151	1391	3346	3118	8762	10	34802	81790
2035-36	18275	1173	1448	3424	3235	9131	10	36696	85490
2036-37	19619	1195	1508	3504	3356	9515	10	38707	89378
2037-38	21061	1217	1570	3586	3481	9915	10	40840	93460
2038-39	22609	1241	1635	3669	3611	10332	10	43107	97755
2039-40	24273	1265	1702	3754	3746	10766	10	45516	102269
2040-41	25915	1284	1767	3827	3864	11146	10	47813	106417
2041-42	27669	1303	1835	3902	3985	11540	10	50244	110765
2042-43	29541	1323	1905	3978	4110	11947	10	52814	115311

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 – 21st 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	53910	-12%	18%	18%	21	3.9

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	54165	-12%	18%	18%	21	3.7

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	53653	-13%	19%	19%	21	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 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) 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.

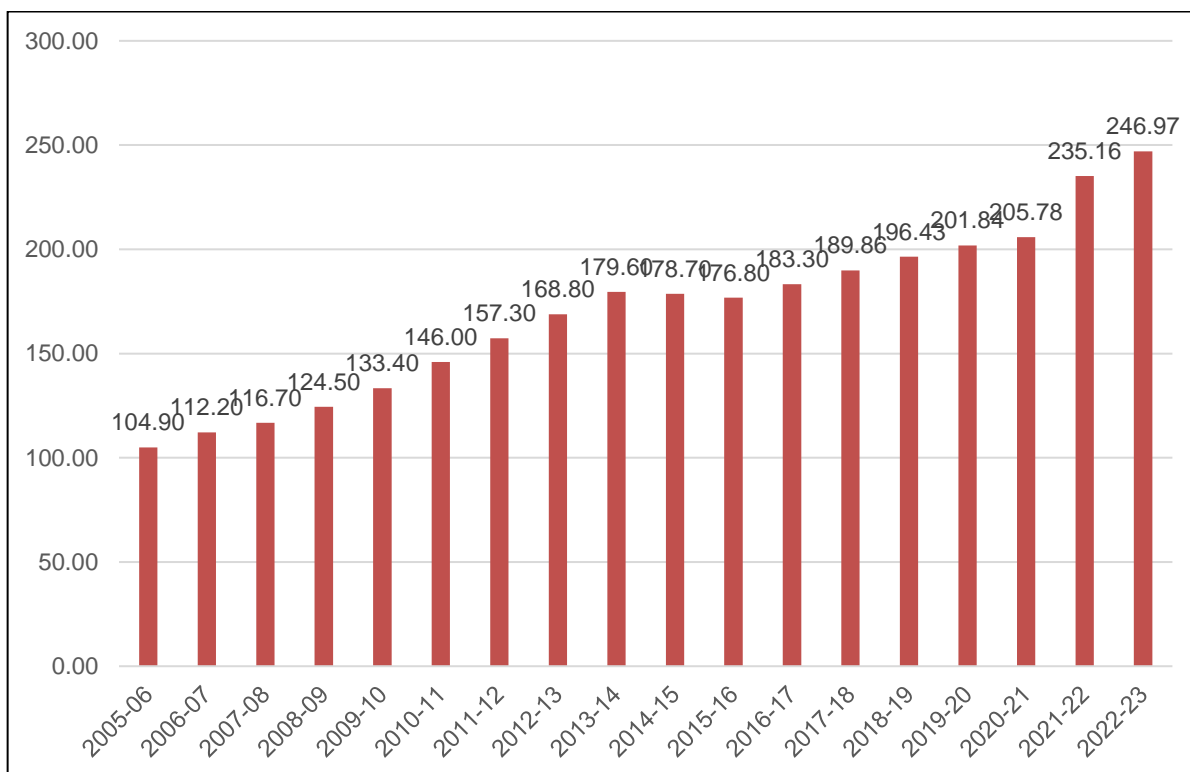


Figure 7-1 : Historical Rate of WPI Inflation in India

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	295	620	620	675	970	1185
2026-27	190	310	650	650	710	1020	1240
2027-28	200	325	685	685	745	1070	1305
2028-29	210	345	720	720	785	1125	1370
2029-30	225	360	755	755	825	1185	1440
2030-31	235	380	795	795	865	1245	1515
2031-32	245	400	835	835	910	1310	1590
2032-33	260	420	875	875	955	1375	1675
2033-34	275	440	925	925	1005	1445	1760
2034-35	285	465	970	970	1060	1520	1855
2035-36	300	490	1020	1020	1115	1600	1950
2036-37	320	515	1075	1075	1175	1685	2050
2037-38	335	540	1130	1130	1235	1775	2160
2038-39	350	570	1190	1190	1300	1870	2275
2039-40	370	600	1255	1255	1370	1970	2395
2040-41	390	630	1320	1320	1445	2075	2525
2041-42	410	665	1395	1395	1520	2185	2660
2042-43	435	700	1470	1470	1600	2305	2805

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	275	445	930	930	1015	1455	1775
2026-27	290	465	975	975	1065	1530	1865
2027-28	305	490	1025	1025	1120	1610	1955
2028-29	320	515	1075	1075	1175	1690	2055
2029-30	335	540	1130	1130	1235	1775	2160
2030-31	350	570	1190	1190	1300	1865	2270
2031-32	370	595	1250	1250	1365	1960	2390
2032-33	390	630	1315	1315	1435	2065	2510
2033-34	410	660	1385	1385	1510	2170	2640
2034-35	430	695	1455	1455	1590	2285	2780
2035-36	455	730	1530	1530	1670	2405	2925
2036-37	475	770	1615	1615	1760	2530	3080
2037-38	500	810	1700	1700	1850	2660	3240
2038-39	530	855	1790	1790	1950	2805	3415
2039-40	555	900	1885	1885	2055	2955	3595
2040-41	585	945	1985	1985	2165	3110	3785
2041-42	615	995	2090	2090	2280	3275	3990
2042-43	650	1050	2205	2205	2405	3455	4205

Table 7-4 : Toll Rates for Monthly Pass Local @ TP-348.450 KM

Year	Car
2024-25	340
2025-26	350
2026-27	370
2027-28	385
2028-29	405
2029-30	425
2030-31	450
2031-32	470
2032-33	495
2033-34	520
2034-35	550
2035-36	575
2036-37	605
2037-38	640
2038-39	675
2039-40	710
2040-41	745
2041-42	785
2042-43	830

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	5900	9530	19965	19965	21780	31310	38115
2025-26	6100	9855	20650	20650	22530	32385	39425
2026-27	6410	10350	21690	21690	23660	34015	41405
2027-28	6730	10875	22785	22785	24855	35730	43500
2028-29	7075	11425	23940	23940	26115	37540	45705
2029-30	7435	12005	25160	25160	27445	39455	48030
2030-31	7815	12620	26445	26445	28850	41470	50485
2031-32	8215	13270	27805	27805	30330	43600	53080
2032-33	8640	13955	29240	29240	31895	45850	55820
2033-34	9085	14680	30755	30755	33550	48230	58715
2034-35	9560	15445	32355	32355	35295	50740	61770
2035-36	10060	16250	34050	34050	37145	53395	65000
2036-37	10590	17105	35835	35835	39095	56200	68415
2037-38	11145	18005	37730	37730	41160	59165	72025
2038-39	11740	18960	39730	39730	43340	62300	75845
2039-40	12360	19970	41840	41840	45645	65615	79880
2040-41	13025	21035	44080	44080	48085	69125	84150
2041-42	13720	22165	46445	46445	50665	72835	88665
2042-43	14460	23360	48945	48945	53395	76755	93445

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 2024-25 are shown in tables below.

Table 7-6 : Toll Revenue Optimistic Scenario
(Rs. Crores)

Year	TP-1	Total
2024-25	318.74	318.74
2025-26	371.62	371.62
2026-27	417.60	417.60
2027-28	469.34	469.34
2028-29	520.26	520.26
2029-30	579.66	579.66
2030-31	640.07	640.07
2031-32	709.32	709.32
2032-33	782.35	782.35
2033-34	866.64	866.64
2034-35	957.38	957.38
2035-36	1057.66	1057.66
2036-37	1164.71	1164.71
2037-38	1282.70	1282.70
2038-39	1413.74	1413.74
2039-40	1564.87	1564.87
2040-41	1712.56	1712.56
2041-42	1879.08	1879.08
2042-43	2067.28	2067.28

Table 7-7 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Year	TP-1	Total
2024-25	318.74	318.74
2025-26	369.92	369.92
2026-27	413.63	413.63
2027-28	462.63	462.63
2028-29	510.37	510.37
2029-30	565.92	565.92
2030-31	621.85	621.85
2031-32	685.92	685.92

Year	TP-1	Total
2032-33	752.81	752.81
2033-34	829.95	829.95
2034-35	912.47	912.47
2035-36	1003.17	1003.17
2036-37	1099.30	1099.30
2037-38	1204.83	1204.83
2038-39	1321.60	1321.60
2039-40	1456.01	1456.01
2040-41	1585.78	1585.78
2041-42	1731.63	1731.63
2042-43	1896.06	1896.06

Table 7-8 : Toll Revenue Most Likely Scenario
(Rs. Crores)

Year	TP-1	Total
2024-25	318.74	318.74
2025-26	370.73	370.73
2026-27	415.54	415.54
2027-28	465.85	465.85
2028-29	515.10	515.10
2029-30	572.53	572.53
2030-31	630.58	630.58
2031-32	697.06	697.06
2032-33	766.88	766.88
2033-34	847.49	847.49
2034-35	934.01	934.01
2035-36	1029.35	1029.35
2036-37	1130.90	1130.90
2037-38	1242.35	1242.35
2038-39	1366.01	1366.01
2039-40	1508.44	1508.44
2040-41	1646.87	1646.87
2041-42	1802.66	1802.66
2042-43	1978.55	1978.55

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)**



JANUARY 2025

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JANUARY 2025



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ABBREVIATIONS

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

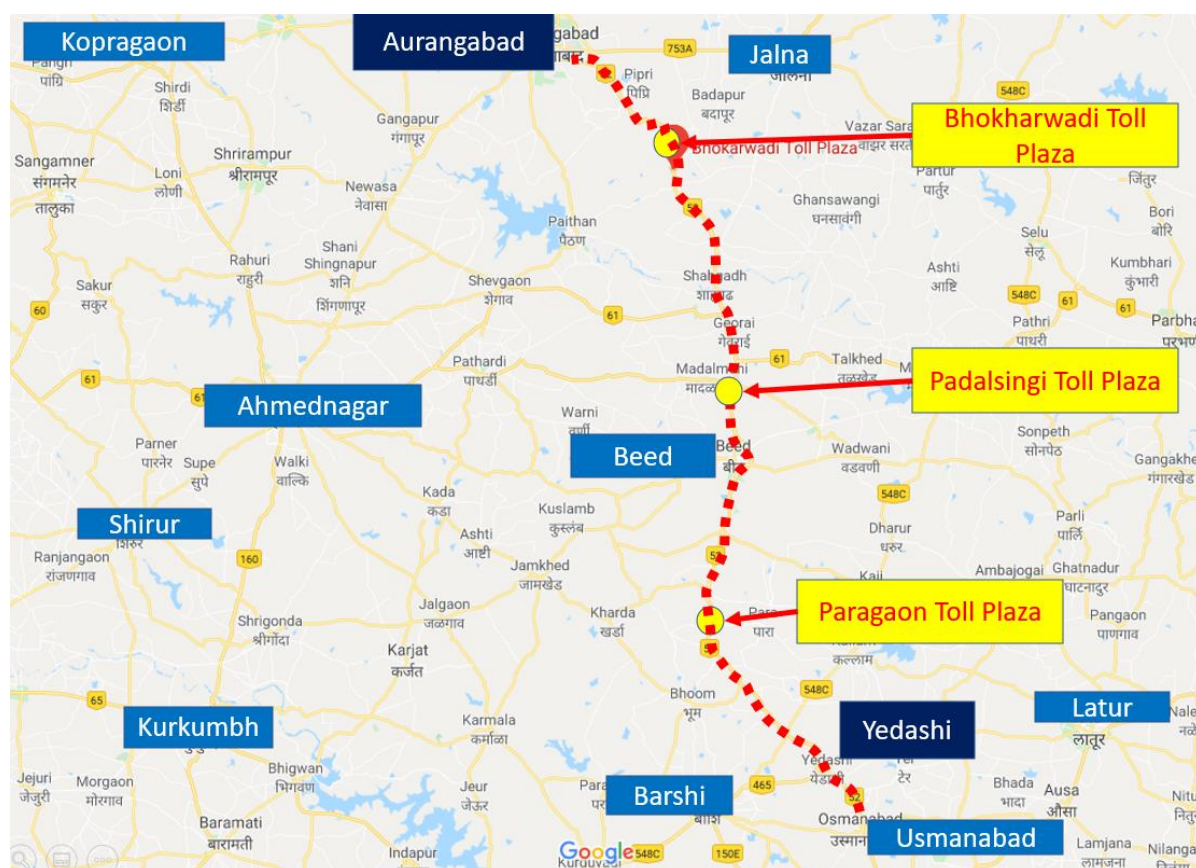


Figure 2-1 : Project Alignment with Toll Plaza

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 the 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 November 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 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 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 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	For Year 2019-20 ,2020-2021, 2021-22, 2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024
3	Km 254.000 Toll Plaza at Maliwadi	AADT for Year 2019-20, 2020-2021, 2021- 22, 2022-2023,	For Year 2019-20 ,2020-2021, 2021-22,	For Year 2019-20 ,2020-2021, 2021-22,	For Year 2019-20 ,2020-2021, 2021-22,	For Year 2019-20 ,2020-2021, 2021-22,

Sr. No	Location	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 2024	2022-2023, Eight month from April 2023 to November 2023 & Eight month from April 2024 to November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	3543
2	Minibus /LCV	658	482	257	317	332	334

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	199	109	110	215	244	243
4	Truck	635	704	786	988	1078	1049
5	3-Axle Commercial vehicle	793	845	876	967	924	862
6	Multi axle	1081	1284	1567	2164	2089	1578
7	Oversize Vehicle	0	50	74	31	29	27
	Total	5007	4913	6096	7544	8084	7636

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	7347
2	Minibus /LCV	1095	883	383	451	483	518
3	Bus	473	260	252	478	547	598
4	Truck	788	839	891	1159	1324	1387
5	3-Axle Commercial vehicle	944	1049	1098	1119	1145	1135
6	Multi axle	1134	1363	1641	2290	2270	1839
7	Oversize Vehicle	1	60	65	29	28	27
	Total	8549	7620	9299	10985	12357	12851

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	6236
2	Minibus /LCV	687	546	192	295	353	376
3	Bus	347	177	177	341	388	417
4	Truck	547	579	567	892	1075	977
5	3-Axle Commercial vehicle	679	737	718	841	928	840
6	Multi axle	866	1046	1164	1914	1918	1330
7	Oversize Vehicle	1	47	52	23	21	20
	Total	6216	5623	6862	9023	10484	10196

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
2019-2020	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
2020-2021	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
2021-2022	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
2022-2023	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
2023-2024	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
2024-2025	Km 134.000 Toll Plaza at Pargaon	7636	17729	2.32
	Km 194.000 Toll Plaza at Padalshingi	12851	25881	2.01
	Km 254.000	10196	19575	1.92

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.

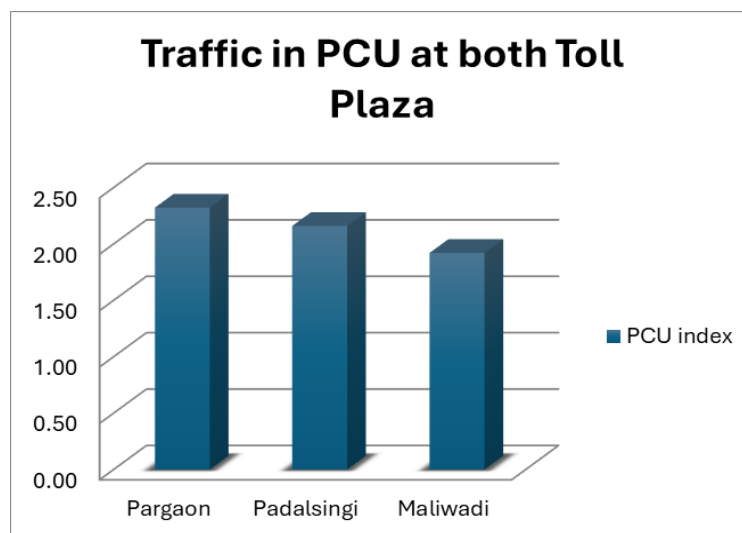


Figure 3-1 : Comparison of PCU Index

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.

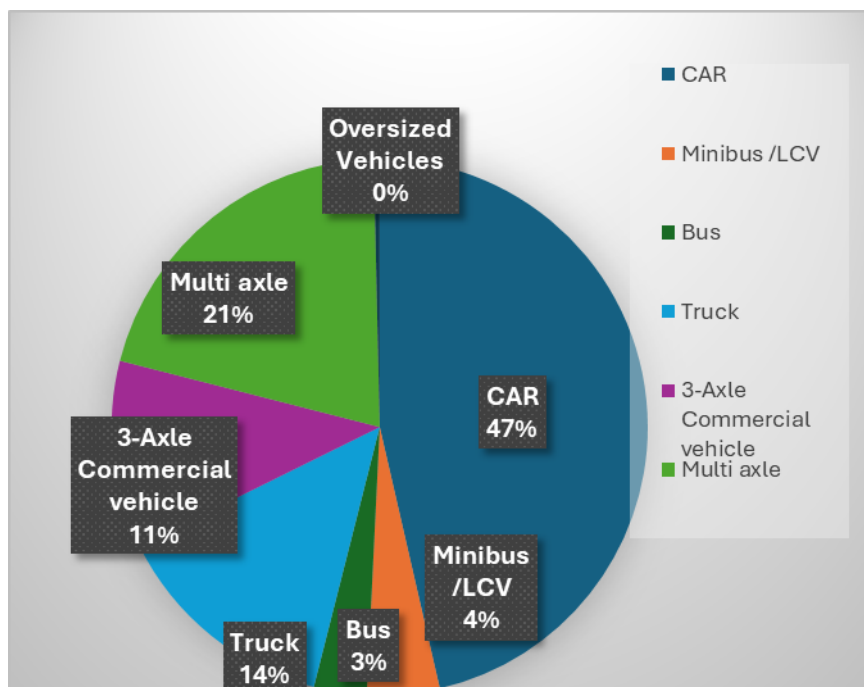


Figure 3-2: Model split of tollable vehicle @ Km 134.000

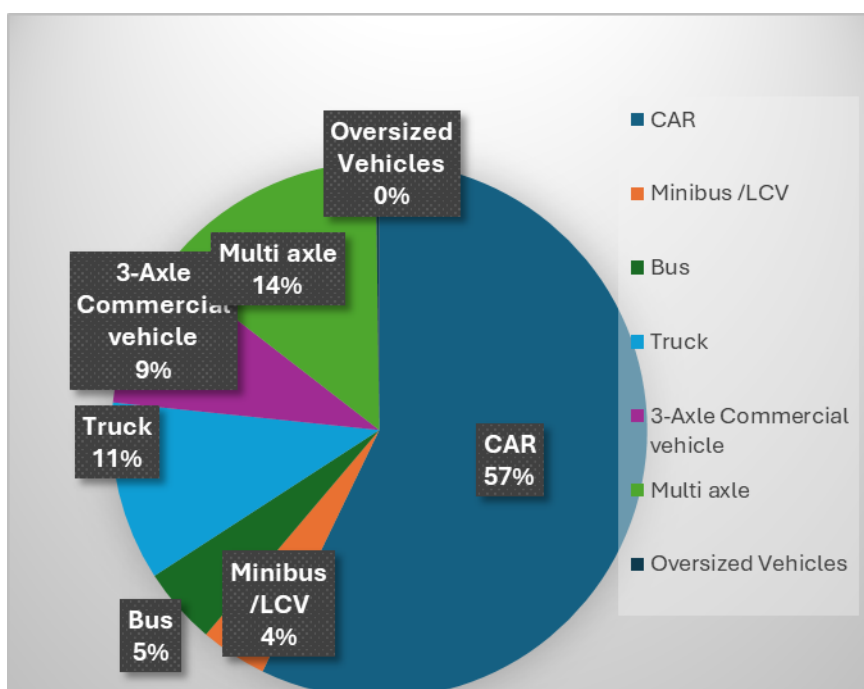


Figure 3-3: Model split of tollable vehicle @ Km 194.000

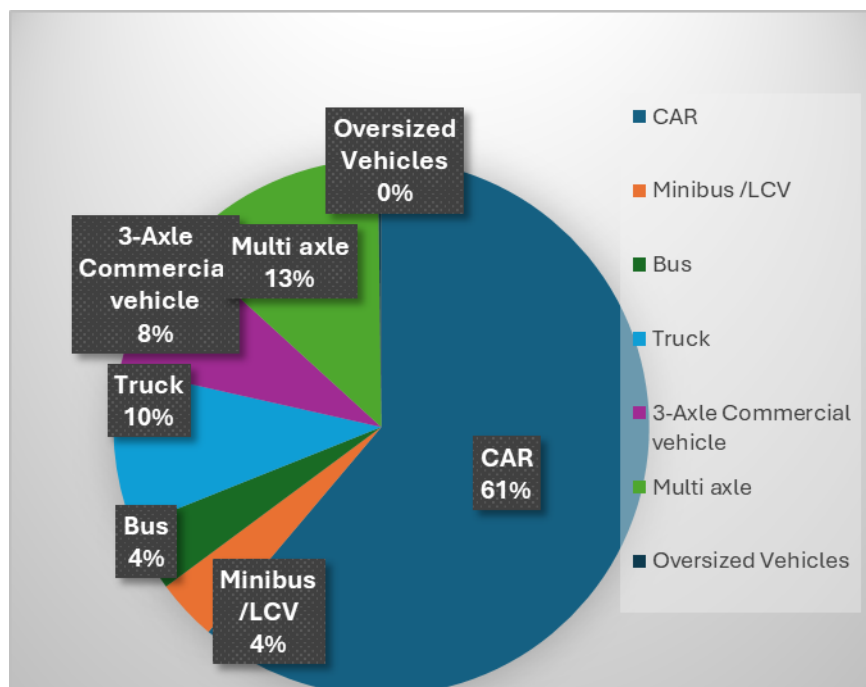


Figure 3-3: Model split of tollable vehicle @ Km 254.000

It is observed that car traffic forms about 47% of total traffic at toll plaza location KM 134.000 while multi axle commercial vehicles are about 33% of total traffic. Truck / Bus and LCV share about 17% and 3% of traffic volume respectively.

It is observed that car traffic forms about 57% of total traffic at toll plaza location KM 194.000 while multi axle commercial vehicles are about 23% of total traffic. Truck / Bus and LCV share about 16% and 4% of traffic volume respectively.

It is observed that car traffic forms about 61% of total traffic at toll plaza location KM 254.000 while multi axle commercial vehicles are about 21% of total traffic. Truck / Bus and LCV share about 14% 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 to 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 the 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	5426
2	Return Journey	2142
3	Local Commercial Single Journey	58
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	7273
2	Return Journey	5008
3	Local Commercial Single Journey	462
4	Monthly Pass Local	107
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	5868
2	Return Journey	4260
3	Local Commercial Single Journey	26
4	Monthly Pass Local	37
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.

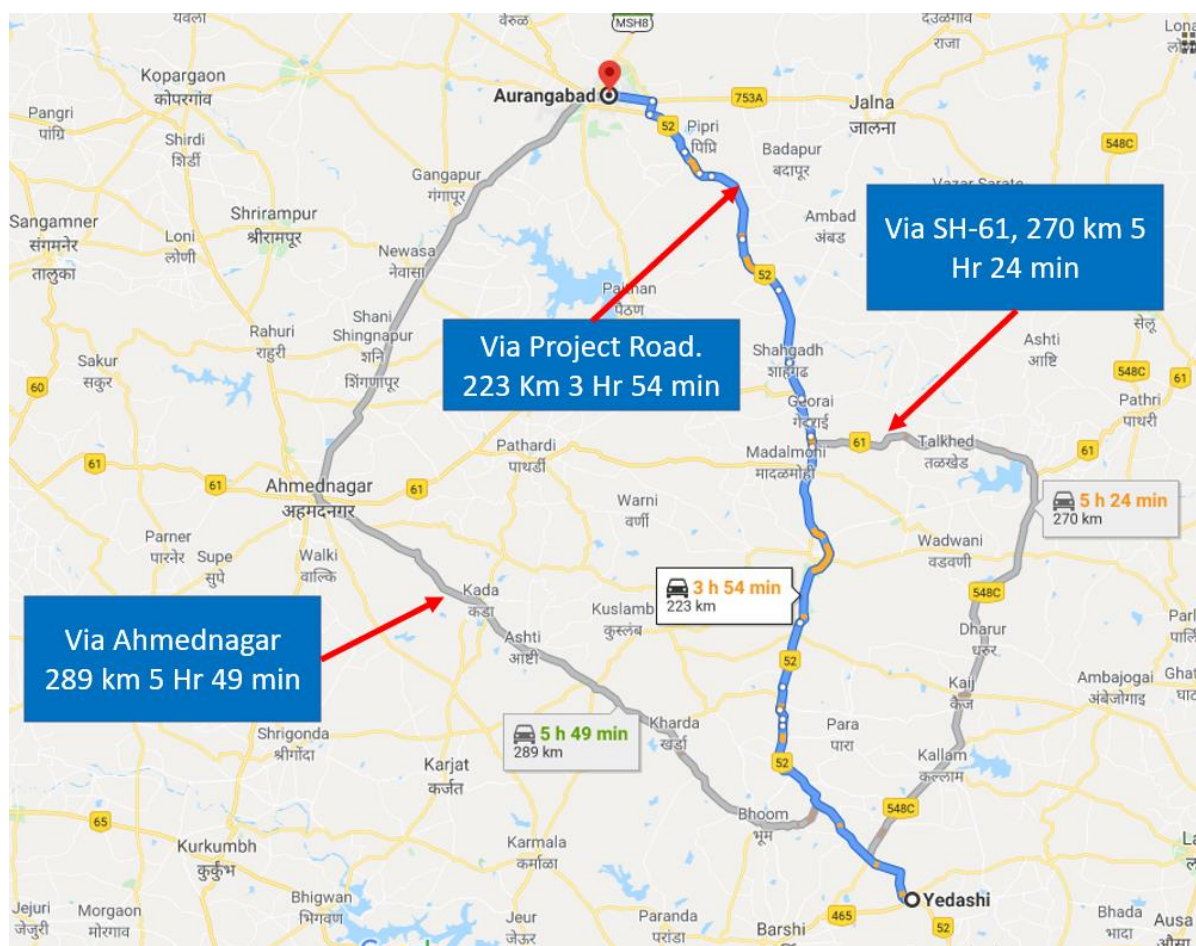


Figure 4-1 : Alternate routes – Yedashi- Aurangabad

It can be observed that alternate routes are quite long and take more time to travel. Hence the 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.

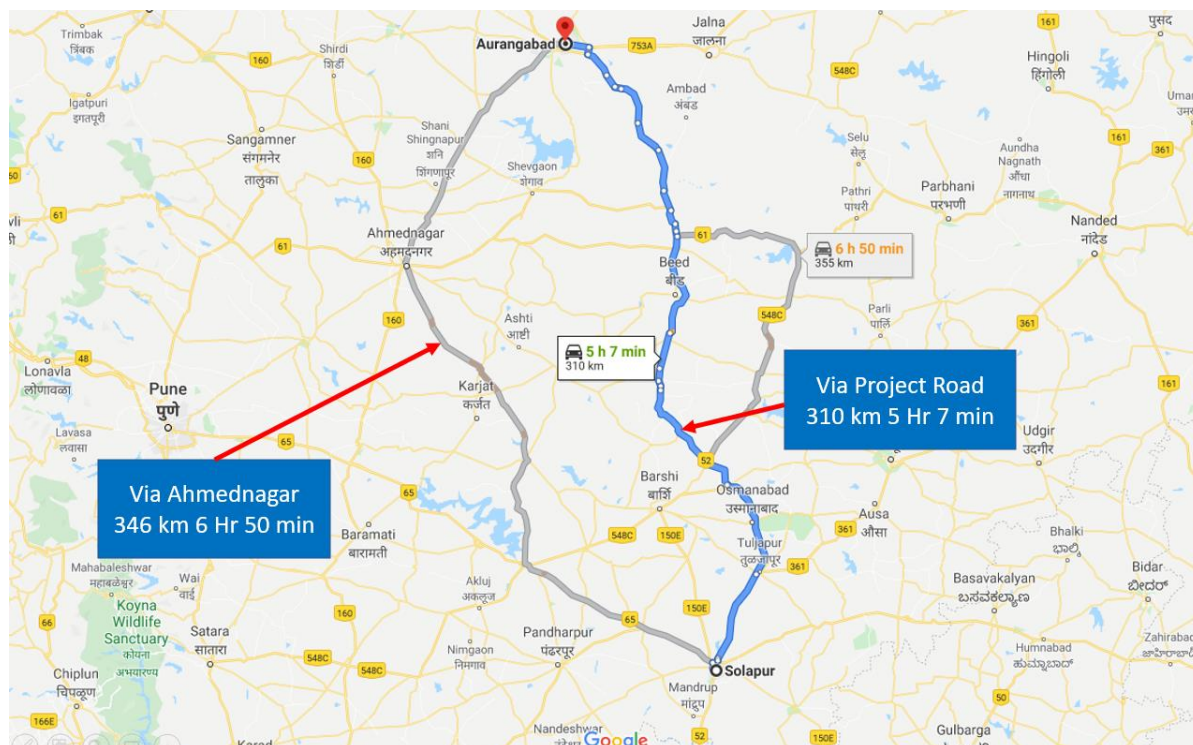


Figure 4-2 : Alternate route Between Solapur and Aurangabad

For travel between Solapur and Aurangabad as well project road is the 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 a 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	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.

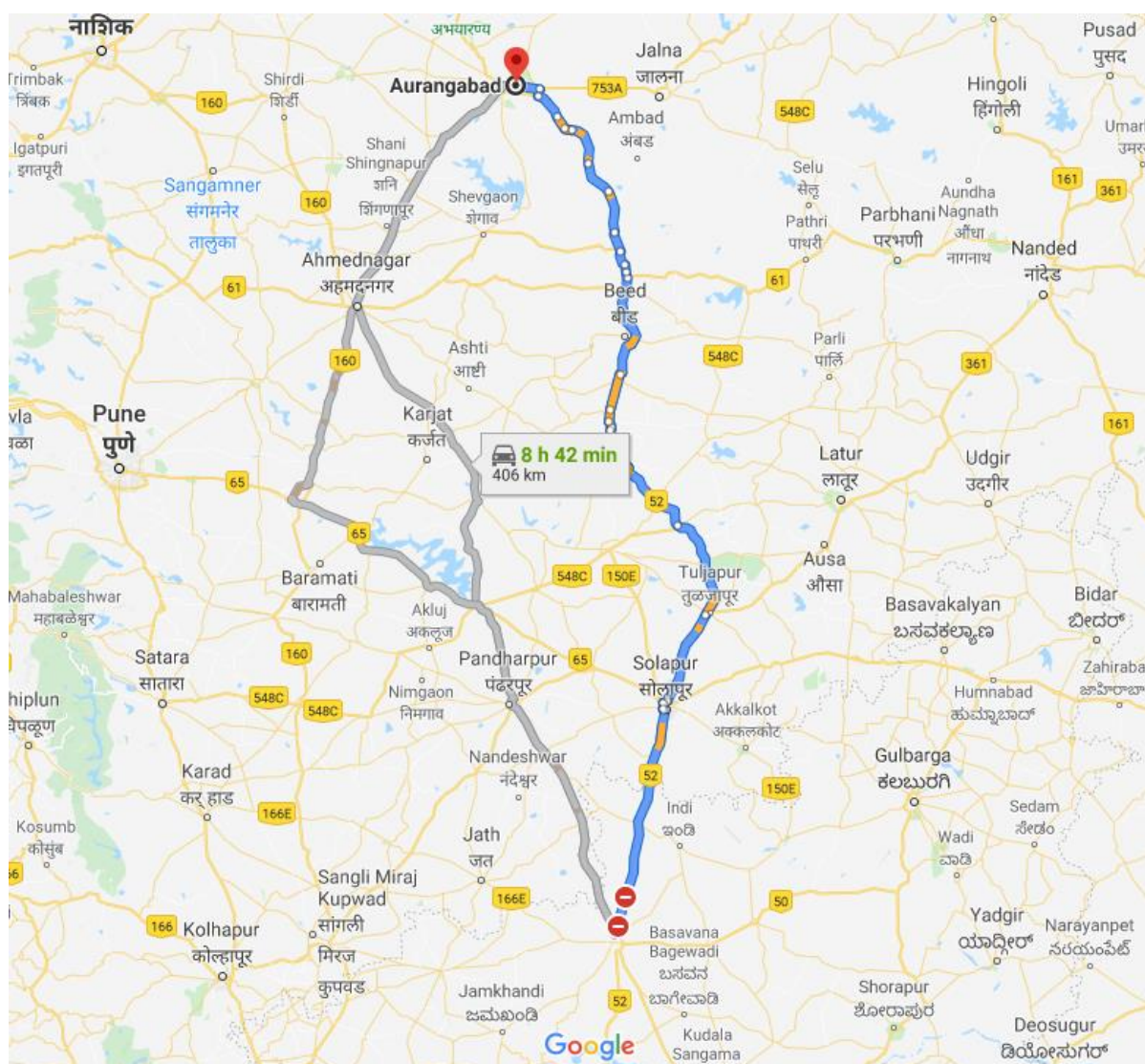


Figure 4-3 : Project Road in regional network.

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 forecasts. 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

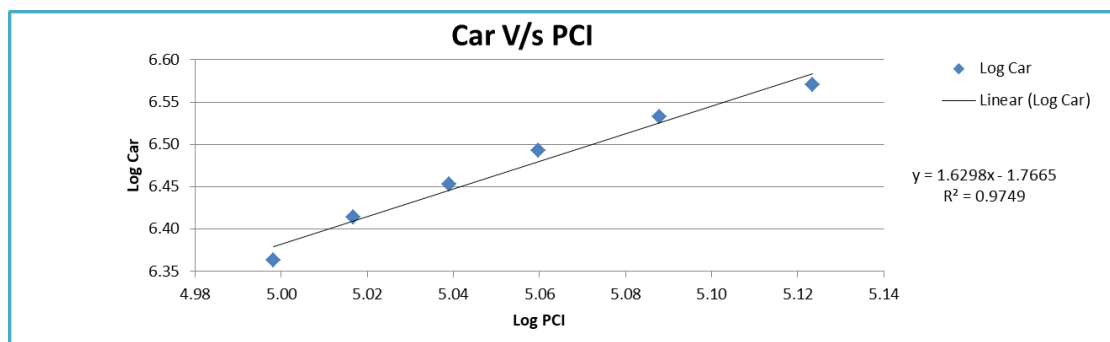


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Maharashtra

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

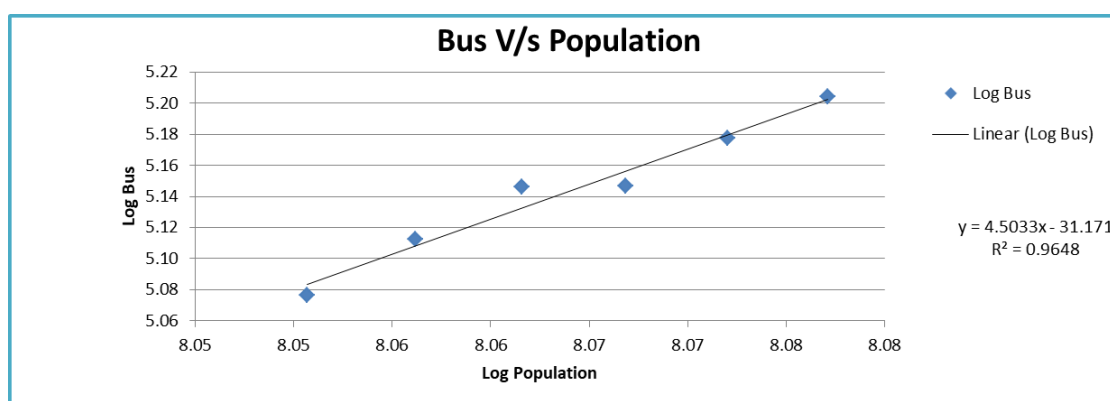


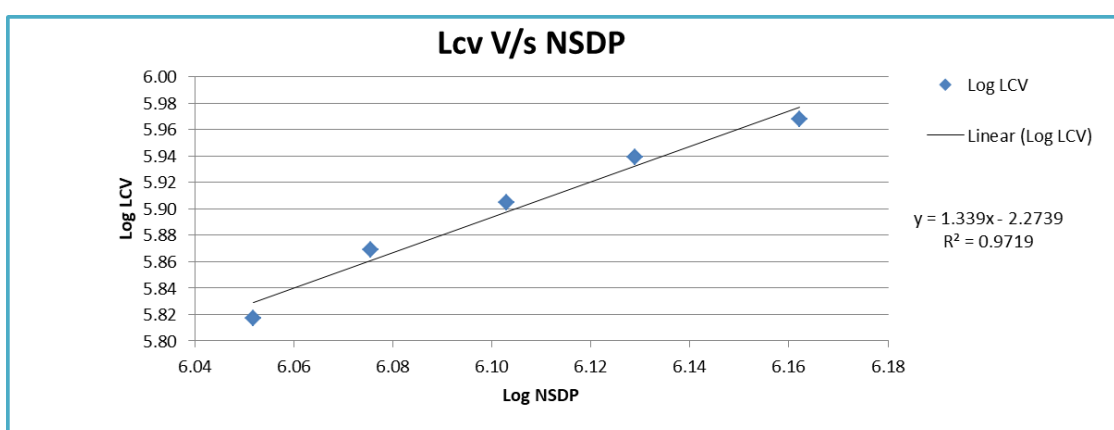
Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Maharashtra

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

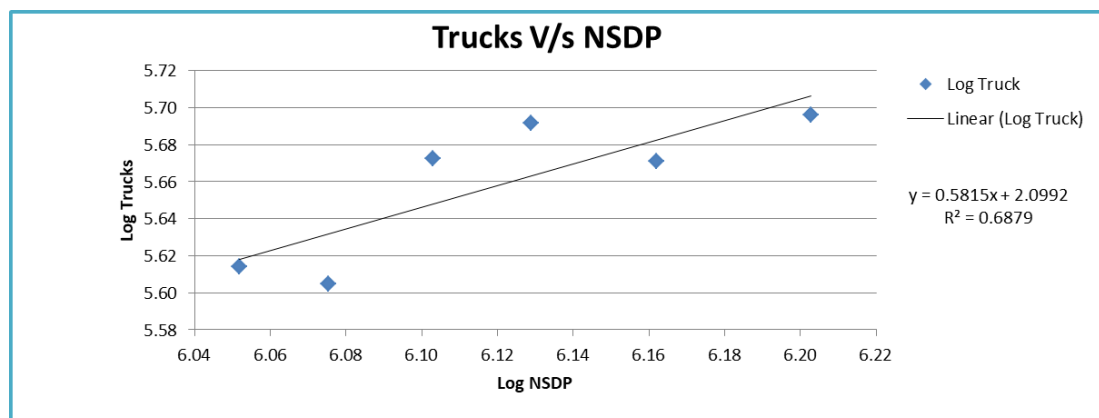


Figure 5-3 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Maharashtra.

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 R² 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

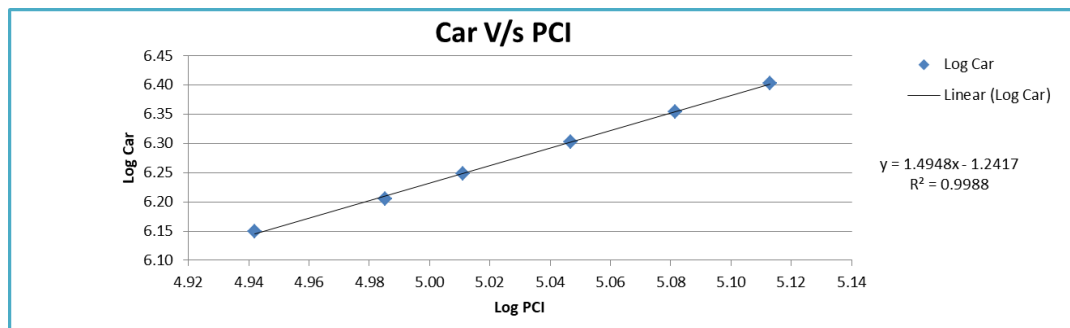


Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh

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

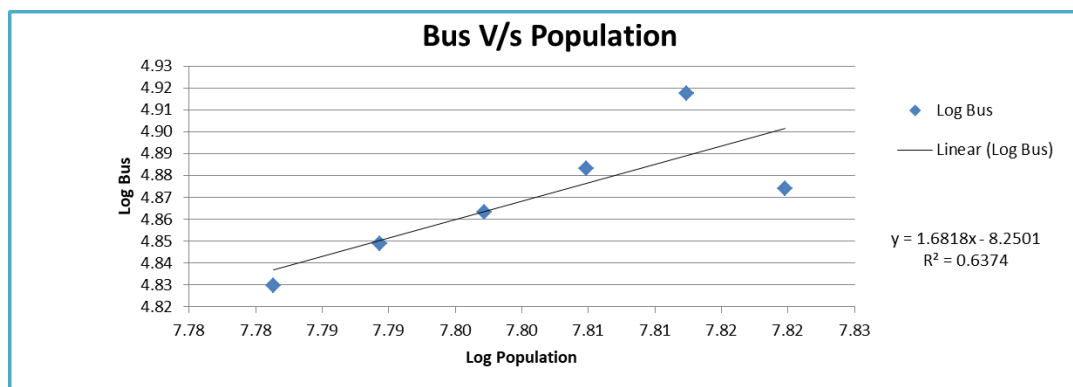


Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Gujarat

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.

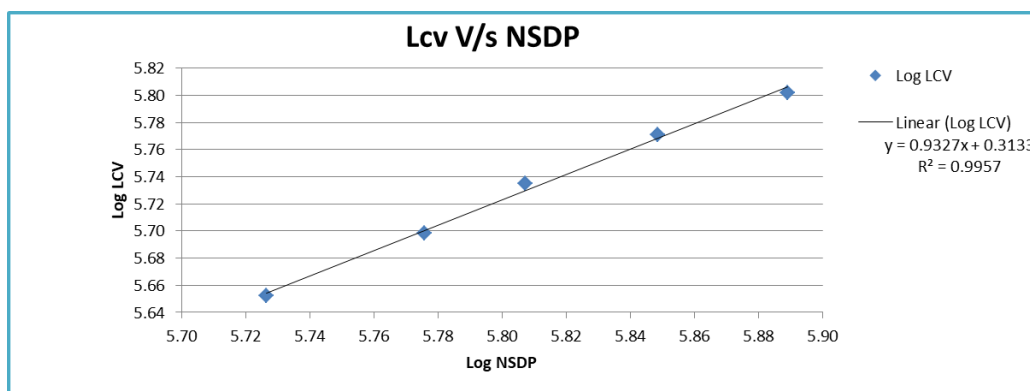
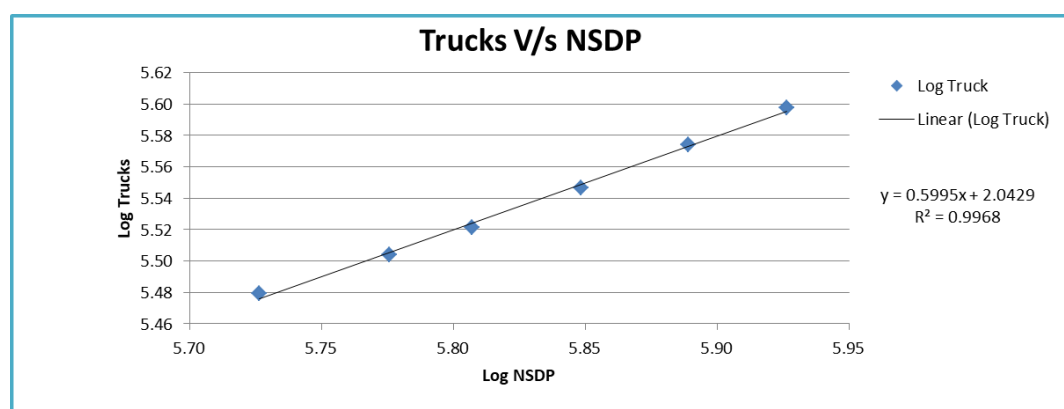


Table 5-9 : Truck Traffic Vs NSDP Gujarat

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

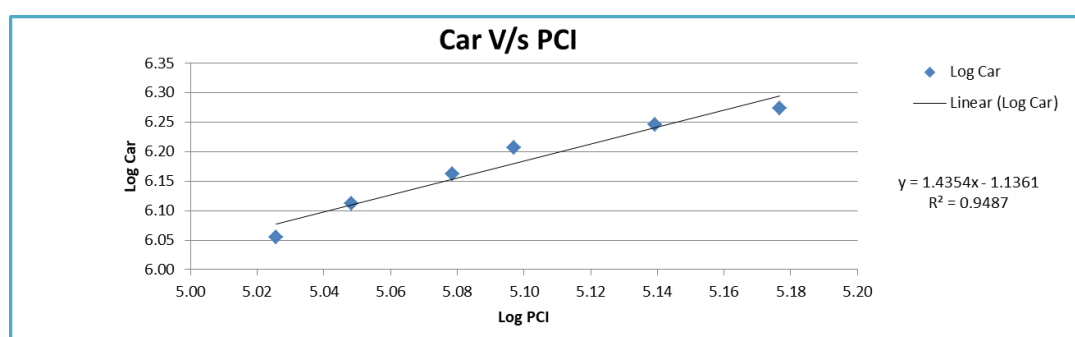
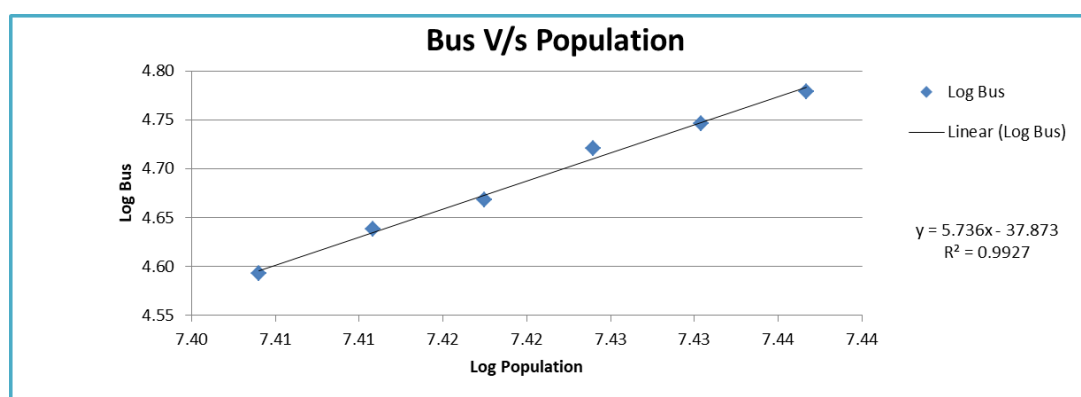
**Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana**

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.

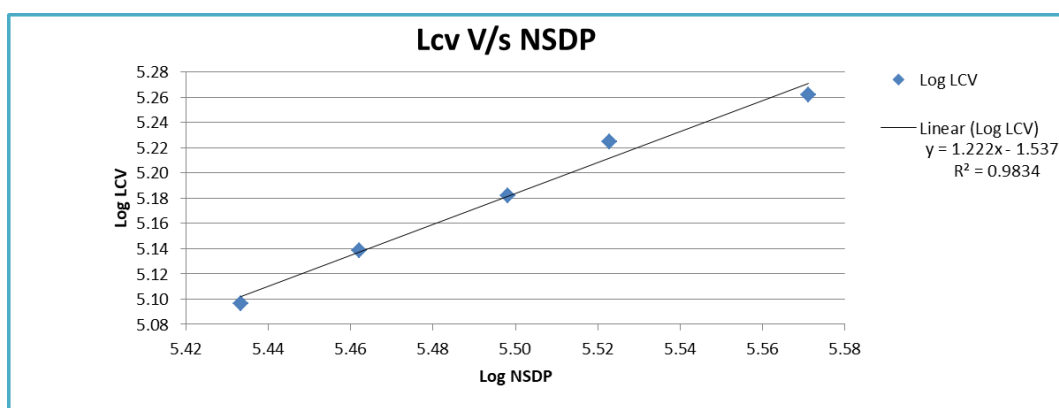


Figure 5-9 : Regression and Elasticity NSDP vs. Lcv – Extrapolation Haryana

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

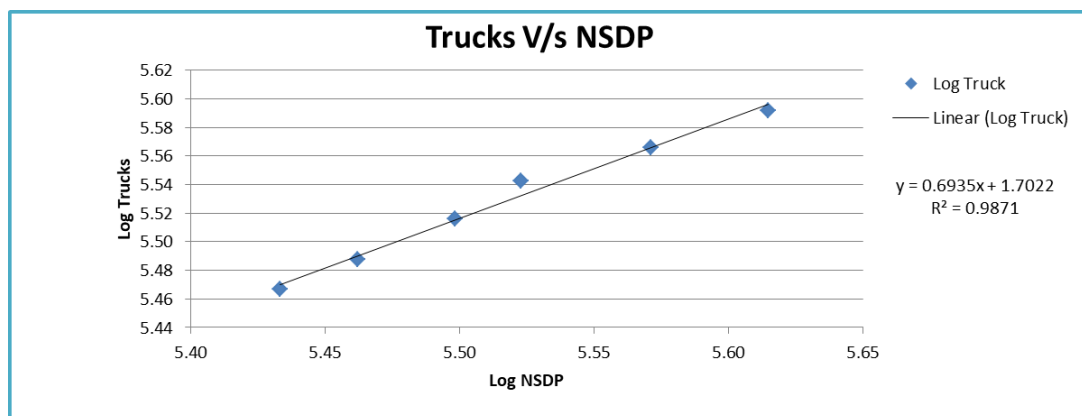


Figure 5-10 : Regression and Elasticity NSDP vs. Goods Traffic - extrapolation Haryana.

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 R² 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 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%

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

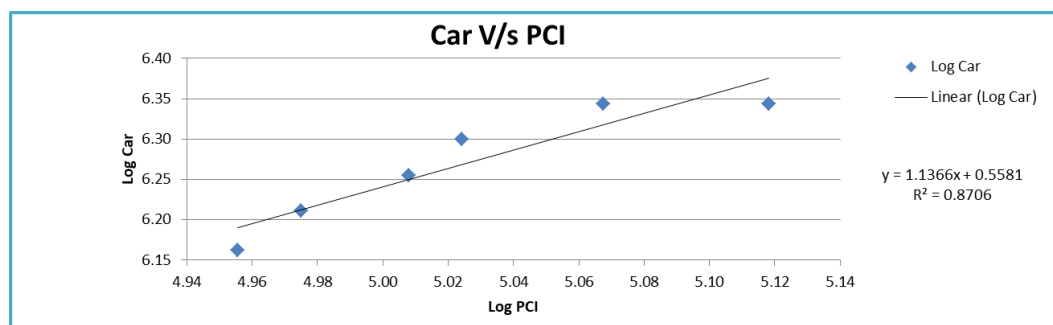


Figure 5-11 : Regression and Elasticity PCI vs. Car – Extrapolation Karnataka

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

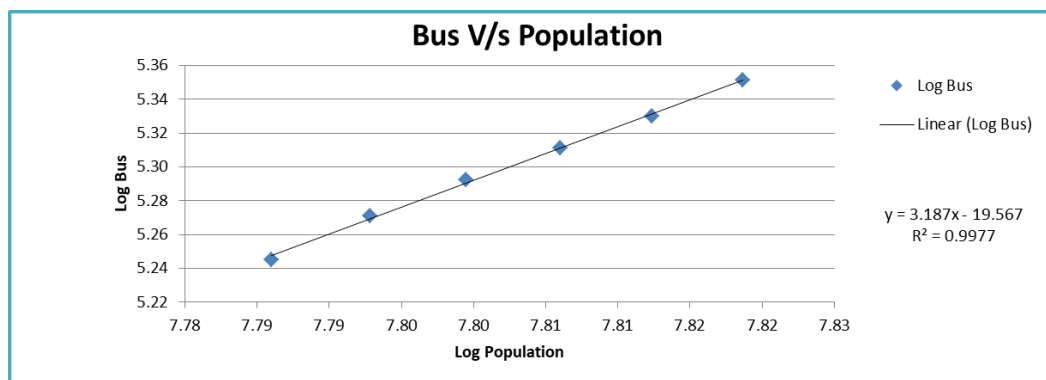


Figure 5-12 : Regression and Elasticity Population vs. Bus – Extrapolation Karnataka

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.

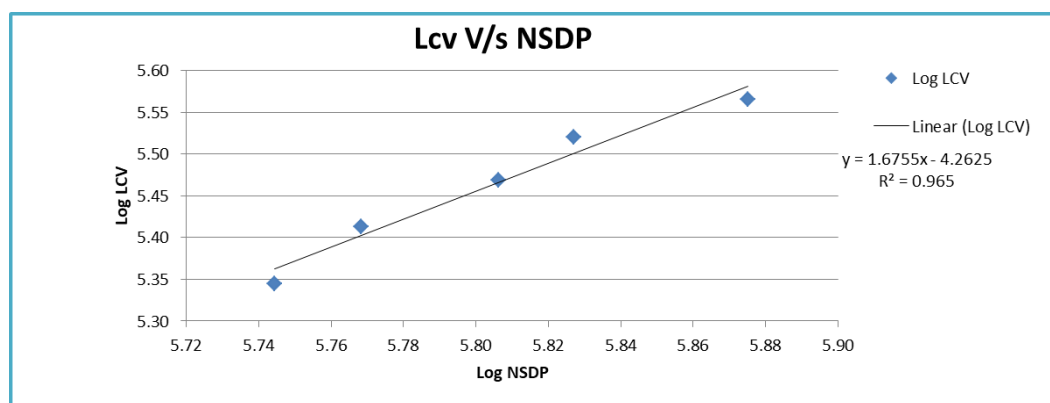
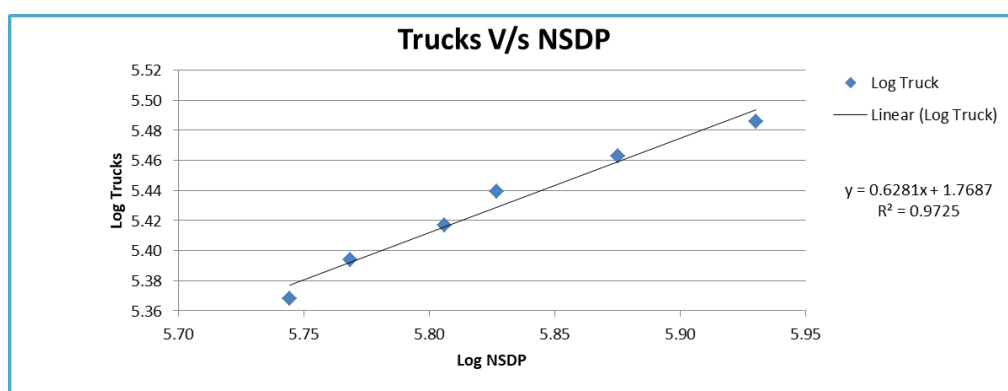


Figure 5-13 : Regression and Elasticity NSDP vs. LCV – Extrapolation Karnataka

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.

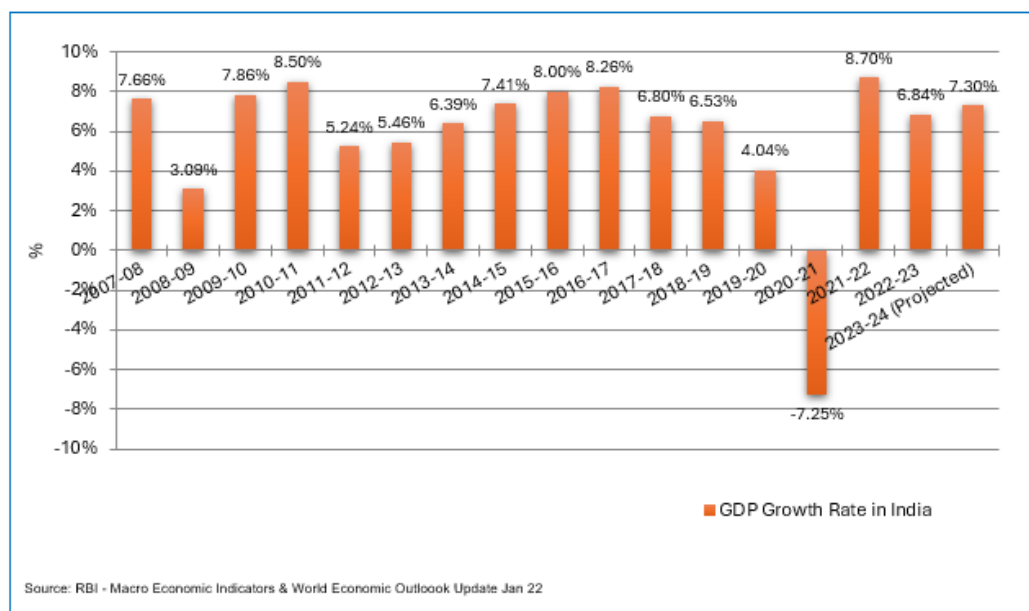


Figure 5-15 : Growth of GDP in India

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	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	7.71%	7.08%	6.77%	6.72%
Bus	4.79%	4.27%	4.01%	4.01%
Minibus	4.79%	4.27%	4.01%	4.01%
LCV	4.10%	3.41%	3.07%	3.00%
2- Axle	3.69%	3.17%	2.91%	2.86%
3 - Axle	4.75%	4.05%	3.71%	3.65%
4 to6 Axle	4.75%	4.05%	3.71%	3.65%
7 and Above Axle	4.75%	4.05%	3.71%	3.65%

Table 5-22 : Recommended Growth Rates Pessimistic

Category / Year	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	7.21%	6.58%	6.27%	6.22%
Bus	4.29%	3.77%	3.51%	3.51%
Minibus	4.29%	3.77%	3.51%	3.51%
LCV	3.60%	2.91%	2.57%	2.50%
2- Axle	3.19%	2.67%	2.41%	2.36%
3 - Axle	4.25%	3.55%	3.21%	3.15%
4 to6 Axle	4.25%	3.55%	3.21%	3.15%
7 and Above Axle	4.25%	3.55%	3.21%	3.15%

Table 5-23 : Recommended Growth Rates Most Likely

Category / Year	2025-2030	2031-2035	2036-2040	2041-2045
Car/Jeep/Van	7.46%	6.83%	6.52%	6.47%
Bus	4.54%	4.02%	3.76%	3.76%
Minibus	4.54%	4.02%	3.76%	3.76%
LCV	3.85%	3.16%	2.82%	2.75%
2- Axle	3.44%	2.92%	2.66%	2.61%
3 - Axle	4.50%	3.80%	3.46%	3.40%
4 to6 Axle	4.50%	3.80%	3.46%	3.40%
7 and Above Axle	4.50%	3.80%	3.46%	3.40%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of the economy to a certain extent. It is expected that the economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in financial year 2026 - 2028.

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 directing NHAI to submit a plan for augmentation of the road, and till then movement of commercial vehicles is restricted on corresponding section of the road. It has negatively impacted traffic on the project road. However, the matter is expected to be resolved during FY26, basis which it is anticipated that the diverted traffic would progressively come back on project stretch between FY26 and FY27.

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

The 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 the 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	3543	334	243	1049	862	1578	27	7636	17729
2025-26	3789	385	282	1359	1172	2775	31	9793	25431
2026-27	4137	407	299	1573	1370	3243	36	11065	29228
2027-28	4497	427	316	1646	1448	3429	38	11801	30969
2028-29	4843	444	331	1707	1516	3592	40	12473	32515
2029-30	5216	462	347	1770	1587	3762	42	13186	34139
2030-31	5585	477	361	1826	1651	3914	44	13858	35626
2031-32	5980	493	377	1883	1718	4073	46	14570	37189
2032-33	6403	509	393	1943	1787	4238	48	15321	38823
2033-34	6855	526	410	2004	1859	4410	50	16114	40533
2034-35	7339	544	427	2067	1934	4588	52	16951	42319
2035-36	7836	560	444	2127	2005	4758	54	17784	44058
2036-37	8366	577	462	2189	2079	4934	56	18663	45877
2037-38	8932	595	480	2252	2155	5117	58	19589	47773
2038-39	9536	613	500	2317	2235	5307	60	20568	49763
2039-40	10181	632	520	2384	2318	5504	62	21601	51842
2040-41	10865	651	541	2452	2402	5705	64	22680	53987

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2041-42	11595	670	562	2522	2489	5913	66	23817	56225
2042-43	12373	690	585	2594	2579	6128	68	25017	58564
2043-44	13203	710	609	2668	2672	6352	70	26284	61014
2044-45	14090	731	633	2744	2770	6584	72	27624	63580
2045-46	15002	750	658	2816	2862	6802	74	28964	66077

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	7347	518	598	1387	1135	1839	27	12851	25881
2025-26	7164	559	627	1645	1360	2948	29	14332	32294
2026-27	7824	590	666	1904	1588	3446	34	16053	36846
2027-28	8505	619	705	1994	1680	3645	36	17184	39135
2028-29	9160	644	739	2068	1760	3819	38	18228	41184
2029-30	9866	670	775	2144	1843	4001	40	19339	43342
2030-31	10564	693	808	2212	1918	4163	42	20400	45340
2031-32	11312	717	842	2283	1996	4333	44	21527	47447
2032-33	12113	742	879	2356	2077	4509	46	22722	49660
2033-34	12970	767	917	2430	2161	4692	48	23985	51975
2034-35	13889	793	956	2507	2248	4882	50	25325	54406
2035-36	14829	818	994	2580	2331	5063	52	26667	56789
2036-37	15832	843	1034	2655	2417	5251	54	28086	59287
2037-38	16904	869	1075	2733	2506	5447	56	29590	61913
2038-39	18048	895	1118	2813	2599	5650	58	31181	64667
2039-40	19269	923	1162	2895	2696	5860	60	32865	67553
2040-41	20563	951	1209	2977	2795	6074	62	34631	70545
2041-42	21944	979	1258	3062	2897	6295	64	36499	73679
2042-43	23418	1008	1309	3149	3002	6525	66	38477	76970
2043-44	24991	1037	1361	3238	3111	6763	68	40569	80416
2044-45	26670	1068	1415	3331	3224	7009	70	42787	84038
2045-46	28394	1096	1471	3418	3331	7242	72	45024	87611

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	6236	376	417	977	840	1330	20	10196	19575
2025-26	6248	392	450	1335	1129	2542	18	12114	27099
2026-27	6823	414	479	1544	1319	2971	21	13571	30934
2027-28	7417	435	507	1617	1395	3142	22	14535	32865
2028-29	7989	453	531	1677	1461	3291	23	15425	34589
2029-30	8605	472	556	1739	1531	3448	24	16375	36415
2030-31	9213	488	580	1794	1593	3588	25	17281	38105
2031-32	9864	504	604	1851	1658	3733	26	18240	39875
2032-33	10562	521	629	1910	1725	3884	27	19258	41735
2033-34	11309	539	656	1970	1795	4042	28	20339	43696
2034-35	12108	558	684	2032	1868	4206	29	21485	45755
2035-36	12928	575	712	2091	1938	4362	30	22636	47778
2036-37	13803	592	741	2152	2010	4524	31	23853	49898
2037-38	14737	610	771	2214	2085	4692	32	25141	52120
2038-39	15735	629	802	2278	2162	4866	33	26505	54450
2039-40	16799	648	835	2345	2243	5046	34	27950	56900
2040-41	17926	667	869	2412	2325	5230	35	29464	59437
2041-42	19130	687	904	2481	2410	5420	36	31068	62098
2042-43	20415	707	940	2552	2497	5618	37	32766	64890
2043-44	21786	729	978	2625	2588	5823	38	34567	67827
2044-45	23249	751	1017	2700	2682	6035	39	36473	70906
2045-46	24753	771	1057	2771	2772	6236	40	38400	73952

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	3543	334	243	1049	862	1578	27	7636	17729
2025-26	3785	385	282	1358	1171	2773	31	9785	25414
2026-27	4114	406	298	1564	1363	3225	36	11007	29075
2027-28	4451	424	314	1630	1435	3394	38	11686	30668
2028-29	4772	439	327	1682	1496	3538	39	12293	32042
2029-30	5116	454	341	1735	1560	3688	41	12935	33486
2030-31	5453	467	354	1781	1615	3819	42	13531	34778
2031-32	5812	480	367	1828	1672	3955	43	14157	36124
2032-33	6194	494	381	1877	1732	4095	44	14817	37531
2033-34	6601	508	395	1927	1794	4240	45	15510	38994
2034-35	7035	522	409	1978	1858	4390	46	16238	40515
2035-36	7476	535	423	2026	1918	4531	47	16956	41981
2036-37	7944	549	437	2075	1980	4676	48	17709	43502
2037-38	8442	563	453	2125	2044	4826	49	18502	45090
2038-39	8972	577	469	2176	2109	4980	50	19333	46735

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2039-40	9534	591	486	2228	2176	5140	52	20207	48455
2040-41	10126	605	503	2280	2244	5302	54	21114	50217
2041-42	10755	620	520	2334	2314	5469	56	22068	52052
2042-43	11423	635	538	2389	2386	5641	58	23070	53960
2043-44	12133	650	557	2445	2461	5818	60	24124	55948
2044-45	12888	666	577	2502	2539	6001	62	25235	58025
2045-46	13657	680	597	2555	2610	6171	64	26334	60021

**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	7347	518	598	1387	1135	1839	27	12851	25881
2025-26	7158	559	627	1644	1359	2947	28	14321	32272
2026-27	7781	587	663	1893	1581	3428	34	15967	36650
2027-28	8419	613	699	1972	1664	3609	35	17011	38742
2028-29	9026	635	729	2035	1735	3763	36	17959	40571
2029-30	9676	658	760	2099	1809	3923	37	18962	42487
2030-31	10312	677	789	2155	1873	4062	38	19906	44229
2031-32	10990	697	819	2212	1939	4206	39	20902	46048
2032-33	11712	718	850	2270	2008	4355	40	21953	47951
2033-34	12482	739	882	2330	2079	4509	41	23062	49939
2034-35	13302	761	915	2392	2154	4668	42	24234	52022
2035-36	14136	780	947	2449	2223	4817	43	25395	54033
2036-37	15021	801	980	2508	2294	4971	44	26619	56136
2037-38	15963	822	1014	2568	2368	5130	45	27910	58334
2038-39	16964	843	1050	2630	2444	5295	46	29272	60635
2039-40	18027	865	1087	2693	2523	5465	47	30707	63038
2040-41	19148	887	1125	2756	2602	5637	48	32203	65510
2041-42	20339	909	1164	2821	2684	5814	49	33780	68093
2042-43	21604	931	1204	2887	2768	5996	50	35440	70785
2043-44	22947	954	1246	2954	2855	6184	51	37191	73601
2044-45	24374	978	1290	3025	2945	6379	53	39044	76565
2045-46	25828	1000	1334	3089	3028	6559	54	40892	79440

**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	6236	376	417	977	840	1330	20	10196	19575
2025-26	6242	391	450	1335	1129	2541	18	12105	27081
2026-27	6785	411	476	1536	1311	2956	21	13495	30764

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2027-28	7342	430	501	1600	1380	3111	22	14386	32529
2028-29	7871	446	523	1651	1439	3243	23	15196	34076
2029-30	8439	462	546	1704	1501	3381	24	16057	35708
2030-31	8994	475	567	1749	1555	3501	25	16866	37187
2031-32	9586	488	589	1795	1610	3625	26	17719	38730
2032-33	10216	502	611	1843	1668	3754	27	18621	40350
2033-34	10887	517	634	1892	1728	3887	28	19573	42042
2034-35	11603	532	658	1943	1790	4025	29	20580	43817
2035-36	12330	545	681	1989	1848	4154	30	21577	45530
2036-37	13103	559	705	2037	1908	4287	31	22630	47323
2037-38	13925	573	729	2086	1970	4424	32	23739	49192
2038-39	14797	588	754	2136	2033	4566	33	24907	51144
2039-40	15724	603	781	2187	2098	4712	34	26139	53184
2040-41	16702	618	809	2239	2164	4860	35	27427	55293
2041-42	17740	634	837	2292	2233	5013	36	28785	57498
2042-43	18843	650	866	2346	2304	5171	37	30217	59802
2043-44	20015	666	896	2401	2377	5334	38	31727	62210
2044-45	21260	682	927	2458	2452	5502	39	33320	64729
2045-46	22529	697	960	2510	2522	5658	40	34916	67192

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	3543	334	243	1049	862	1578	27	7636	17729
2025-26	3787	385	282	1359	1172	2774	31	9789	25423
2026-27	4126	406	299	1568	1366	3235	36	11036	29154
2027-28	4475	425	316	1637	1442	3413	38	11746	30827
2028-29	4809	441	330	1693	1507	3567	40	12387	32292
2029-30	5168	458	345	1751	1575	3728	42	13067	33833
2030-31	5521	472	359	1802	1635	3869	43	13701	35221
2031-32	5898	486	373	1854	1697	4016	45	14369	36674
2032-33	6300	501	388	1908	1761	4168	47	15073	38190
2033-34	6730	516	404	1963	1828	4327	49	15817	39781
2034-35	7189	532	420	2020	1897	4492	51	16601	41442
2035-36	7657	547	436	2073	1963	4648	53	17377	43048
2036-37	8156	562	453	2128	2031	4809	55	18194	44723
2037-38	8688	577	470	2184	2101	4975	57	19052	46463
2038-39	9254	593	487	2241	2173	5147	59	19954	48274
2039-40	9857	609	505	2301	2248	5325	61	20906	50170
2040-41	10494	625	524	2361	2325	5505	63	21897	52118
2041-42	11172	642	544	2423	2404	5692	65	22942	54155

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2042-43	11895	660	564	2486	2486	5885	67	24043	56277
2043-44	12664	678	585	2551	2570	6085	69	25202	58492
2044-45	13483	697	607	2617	2657	6291	71	26423	60801
2045-46	14320	714	630	2679	2739	6485	73	27640	63046

**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	7347	518	598	1387	1135	1839	27	12851	25881
2025-26	7161	559	627	1644	1359	2948	29	14326	32282
2026-27	7803	589	664	1899	1585	3438	34	16011	36752
2027-28	8462	617	701	1983	1673	3627	35	17098	38938
2028-29	9093	641	732	2051	1749	3791	36	18093	40872
2029-30	9771	666	765	2122	1828	3962	37	19151	42911
2030-31	10438	687	796	2184	1898	4113	38	20154	44782
2031-32	11150	709	828	2247	1970	4270	39	21213	46739
2032-33	11911	731	861	2312	2046	4433	40	22334	48793
2033-34	12724	754	896	2380	2124	4602	41	23521	50949
2034-35	13593	778	933	2450	2205	4777	42	24778	53210
2035-36	14478	800	968	2515	2282	4943	43	26029	55410
2036-37	15421	822	1005	2582	2361	5115	44	27350	57714
2037-38	16426	845	1043	2652	2443	5292	45	28746	60124
2038-39	17496	869	1082	2723	2527	5475	46	30218	62640
2039-40	18636	894	1122	2796	2614	5664	47	31773	65273
2040-41	19841	919	1164	2869	2703	5857	48	33401	68000
2041-42	21124	944	1208	2944	2795	6056	50	35121	70858
2042-43	22491	970	1253	3021	2891	6262	52	36940	73854
2043-44	23945	996	1299	3100	2989	6475	54	38858	76984
2044-45	25495	1023	1349	3181	3090	6696	56	40890	80274
2045-46	27080	1048	1400	3256	3186	6902	58	42930	83498

**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	6236	376	417	977	840	1330	20	10196	19575
2025-26	6245	392	450	1335	1129	2541	18	12109	27090
2026-27	6803	412	478	1541	1316	2963	21	13534	30854
2027-28	7378	432	505	1609	1388	3126	22	14460	32698
2028-29	7929	448	528	1664	1451	3266	23	15309	34331
2029-30	8520	465	552	1722	1516	3413	24	16212	36054
2030-31	9102	480	574	1772	1574	3543	25	17070	37638
2031-32	9723	495	597	1824	1634	3678	26	17977	39299

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2032-33	10386	511	621	1877	1696	3818	27	18936	41037
2033-34	11095	527	646	1931	1761	3963	28	19951	42859
2034-35	11852	543	672	1988	1829	4113	29	21026	44773
2035-36	12624	559	697	2041	1892	4255	30	22098	46635
2036-37	13448	575	724	2095	1957	4402	31	23232	48587
2037-38	14325	591	751	2150	2025	4554	32	24428	50627
2038-39	15258	607	779	2208	2095	4712	33	25692	52767
2039-40	16252	624	808	2267	2168	4875	34	27028	55008
2040-41	17303	641	838	2326	2242	5041	35	28426	57325
2041-42	18421	658	870	2387	2318	5212	36	29902	59749
2042-43	19612	676	903	2449	2397	5389	37	31463	62290
2043-44	20881	695	937	2512	2479	5572	38	33114	64953
2044-45	22231	714	972	2578	2563	5761	39	34858	67741
2045-46	23612	731	1008	2639	2642	5938	40	36610	70477

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 - 1st 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	21879	-10%	16%	16%	26	4.0

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 2/3rd 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) 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 the year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

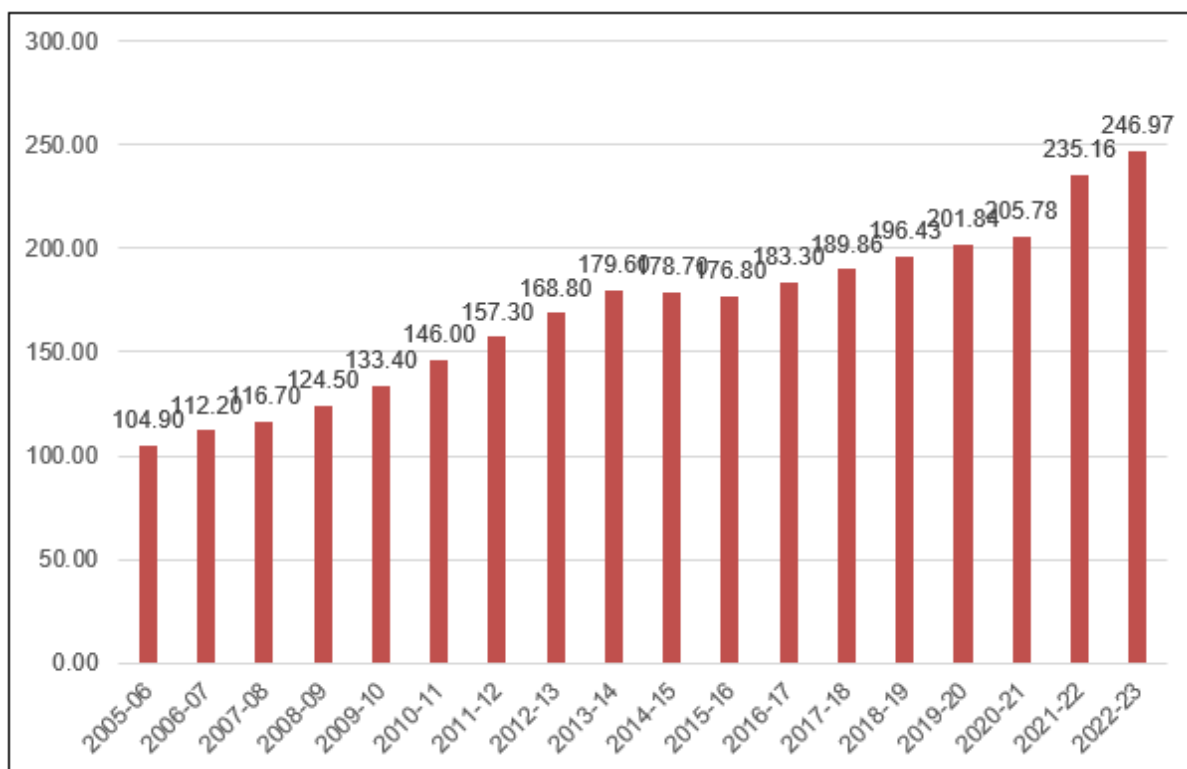


Figure 7-1 : Historical Rate of WPI Inflation in India

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
2024-25	85	135	280	280	305	440	535
2025-26	85	140	295	295	320	460	560
2026-27	90	145	310	310	335	485	590
2027-28	95	155	325	325	355	510	620
2028-29	100	160	340	340	370	535	650
2029-30	105	170	360	360	390	560	685
2030-31	110	180	375	375	410	590	720
2031-32	115	190	395	395	430	620	755
2032-33	125	200	415	415	455	650	795
2033-34	130	210	440	440	475	685	835
2034-35	135	220	460	460	500	720	880
2035-36	145	230	485	485	530	760	925
2036-37	150	245	510	510	555	800	975
2037-38	160	255	535	535	585	845	1025
2038-39	165	270	565	565	615	885	1080
2039-40	175	285	595	595	650	935	1140
2040-41	185	300	630	630	685	985	1200
2041-42	195	315	660	660	720	1040	1265
2042-43	205	335	700	700	760	1095	1330
2043-44	215	350	735	735	805	1155	1405
2044-45	230	370	775	775	845	1215	1480
2045-46	240	390	820	820	895	1285	1560

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	385	385	420	605	740
2025-26	120	195	405	405	445	635	775
2026-27	125	205	425	425	465	670	815
2027-28	130	215	450	450	490	700	855
2028-29	140	225	470	470	515	740	900

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2029-30	145	235	495	495	540	775	945
2030-31	155	250	520	520	565	815	995
2031-32	160	260	545	545	595	860	1045
2032-33	170	275	575	575	630	900	1100
2033-34	180	290	605	605	660	950	1155
2034-35	190	305	635	635	695	1000	1215
2035-36	200	320	670	670	730	1050	1280
2036-37	210	335	705	705	770	1105	1350
2037-38	220	355	745	745	810	1165	1420
2038-39	230	375	785	785	855	1230	1495
2039-40	245	395	825	825	900	1295	1575
2040-41	255	415	870	870	950	1365	1660
2041-42	270	435	915	915	1000	1435	1750
2042-43	285	460	965	965	1055	1515	1845
2043-44	300	485	1020	1020	1110	1595	1945
2044-45	315	510	1075	1075	1170	1685	2050
2045-46	335	540	1130	1130	1235	1775	2160

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	575	695
2024-25	110	180	380	380	410	590	720
2025-26	115	190	395	395	435	620	755
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	880	1075
2033-34	175	280	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	1080	1320
2037-38	215	345	725	725	795	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	2005
2045-46	325	530	1105	1105	1205	1735	2115

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
2024-25	125	200	420	420	455	655	800
2025-26	130	210	440	440	480	690	840
2026-27	135	220	460	460	505	725	880
2027-28	145	230	485	485	530	760	925
2028-29	150	245	510	510	555	800	975
2029-30	160	255	535	535	585	840	1025
2030-31	165	270	565	565	615	885	1075
2031-32	175	285	595	595	645	930	1130
2032-33	185	300	625	625	680	980	1190
2033-34	195	315	655	655	715	1030	1255
2034-35	205	330	690	690	755	1085	1320
2035-36	215	345	725	725	795	1140	1390
2036-37	225	365	765	765	835	1200	1460
2037-38	240	385	805	805	880	1265	1540
2038-39	250	405	850	850	925	1330	1620
2039-40	265	425	895	895	975	1400	1705
2040-41	280	450	940	940	1030	1480	1800
2041-42	295	475	995	995	1085	1555	1895
2042-43	310	500	1045	1045	1140	1640	2000
2043-44	325	525	1105	1105	1205	1730	2105
2044-45	345	555	1165	1165	1270	1825	2220
2045-46	365	585	1225	1225	1340	1925	2345

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
2024-25	170	275	580	580	630	910	1105
2025-26	180	290	610	610	665	955	1160
2026-27	190	305	640	640	700	1005	1220
2027-28	200	320	670	670	735	1055	1285
2028-29	210	335	705	705	770	1105	1350
2029-30	220	355	740	740	810	1165	1415
2030-31	230	370	780	780	850	1225	1490
2031-32	240	390	820	820	895	1285	1565
2032-33	255	410	865	865	940	1355	1650
2033-34	270	435	910	910	990	1425	1735
2034-35	280	455	955	955	1040	1500	1825
2035-36	295	480	1005	1005	1095	1575	1920
2036-37	315	505	1060	1060	1155	1660	2020
2037-38	330	530	1115	1115	1215	1750	2130
2038-39	345	560	1175	1175	1280	1840	2240
2039-40	365	590	1235	1235	1350	1940	2360

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2040-41	385	620	1305	1305	1420	2045	2490
2041-42	405	655	1375	1375	1500	2155	2620
2042-43	430	690	1450	1450	1580	2270	2765
2043-44	450	730	1525	1525	1665	2395	2915
2044-45	475	770	1610	1610	1755	2525	3075
2045-46	500	810	1700	1700	1850	2660	3240

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	550	550	600	860	1045
2024-25	165	270	565	565	620	890	1080
2025-26	175	285	595	595	650	935	1135
2026-27	185	300	625	625	680	980	1195
2027-28	195	315	655	655	715	1030	1255
2028-29	205	330	690	690	755	1085	1320
2029-30	215	345	725	725	790	1140	1385
2030-31	225	365	765	765	830	1195	1455
2031-32	235	385	800	800	875	1260	1530
2032-33	250	405	845	845	920	1325	1610
2033-34	260	425	890	890	970	1390	1695
2034-35	275	445	935	935	1020	1465	1785
2035-36	290	470	985	985	1075	1540	1875
2036-37	305	495	1035	1035	1130	1625	1975
2037-38	320	520	1090	1090	1190	1710	2080
2038-39	340	550	1150	1150	1250	1800	2190
2039-40	355	575	1210	1210	1320	1895	2310
2040-41	375	610	1275	1275	1390	2000	2435
2041-42	395	640	1345	1345	1465	2105	2565
2042-43	420	675	1415	1415	1545	2220	2705
2024-25	160	260	550	550	600	860	1045
2043-44	440	710	1495	1495	1630	2340	2850
2044-45	465	750	1575	1575	1715	2470	3005
2045-46	490	790	1660	1660	1810	2605	3170

Table 7-8 : Toll Rates for Monthly Pass Local @ all Toll Plaza

Year	Car	Minibus /LCV
2024-25	340	340
2024-25	350	350
2025-26	370	370
2026-27	385	385
2027-28	405	405

Year	Car	Minibus /LCV
2028-29	425	425
2029-30	450	450
2030-31	470	470
2031-32	495	495
2032-33	520	520
2033-34	550	550
2034-35	575	575
2035-36	605	605
2036-37	640	640
2037-38	675	675
2038-39	710	710
2039-40	745	745
2040-41	785	785
2041-42	830	830
2042-43	875	875
2043-44	920	920
2044-45	970	970
2045-46	1025	1025

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	2660	4295	9000	9000	9820	14115	17185
2024-25	2750	4445	9310	9310	10155	14600	17775
2025-26	2890	4665	9780	9780	10665	15335	18670
2026-27	3035	4905	10270	10270	11205	16110	19610
2027-28	3190	5150	10795	10795	11775	16925	20605
2028-29	3350	5415	11340	11340	12375	17785	21655
2029-30	3525	5690	11920	11920	13005	18695	22760
2030-31	3705	5985	12535	12535	13675	19655	23930
2031-32	3895	6290	13180	13180	14380	20670	25165
2032-33	4095	6615	13865	13865	15125	21745	26470
2033-34	4310	6960	14585	14585	15915	22875	27850
2034-35	4535	7325	15350	15350	16745	24070	29305
2035-36	4775	7710	16155	16155	17625	25335	30845
2036-37	5025	8120	17010	17010	18555	26675	32470
2037-38	5290	8550	17910	17910	19540	28085	34195
2038-39	5575	9005	18865	18865	20580	29580	36015
2039-40	5870	9485	19870	19870	21680	31165	37935
2040-41	6185	9995	20940	20940	22840	32835	39975
2041-42	6520	10530	22065	22065	24075	34605	42125
2042-43	6870	11100	23260	23260	25375	36475	44405
2043-44	7245	11705	24525	24525	26750	38455	46815
2044-45	7640	12340	25860	25860	28210	40550	49365
2045-46	8060	13015	27275	27275	29750	42770	52065

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	3680	5945	12450	12450	13585	19525	23770
2024-25	3805	6145	12880	12880	14050	20195	24585
2025-26	3995	6455	13525	13525	14755	21210	25825
2026-27	4200	6780	14210	14210	15500	22280	27125
2027-28	4410	7125	14930	14930	16285	23410	28500
2028-29	4635	7490	15690	15690	17115	24605	29955
2029-30	4875	7870	16490	16490	17990	25860	31485
2030-31	5125	8275	17340	17340	18915	27190	33100
2031-32	5385	8705	18235	18235	19890	28595	34810
2032-33	5665	9155	19180	19180	20925	30075	36615
2033-34	5960	9630	20180	20180	22010	31645	38520
2034-35	6275	10135	21235	21235	23165	33300	40535
2035-36	6605	10665	22350	22350	24380	35045	42665
2036-37	6950	11230	23530	23530	25665	36895	44920
2037-38	7320	11825	24775	24775	27030	38850	47300
2038-39	7710	12455	26095	26095	28465	40920	49815
2039-40	8120	13120	27490	27490	29990	43105	52480
2040-41	8555	13825	28965	28965	31595	45420	55295
2041-42	9020	14570	30525	30525	33300	47865	58275
2042-43	9505	15355	32175	32175	35100	50455	61425
2043-44	10020	16190	33920	33920	37005	53195	64760
2044-45	10570	17070	35770	35770	39020	56095	68290
2045-46	11145	18005	37725	37725	41155	59160	72020

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	5810	12175	12175	13280	19090	23240
2024-25	3720	6010	12590	12590	13735	19745	24040
2025-26	3910	6310	13225	13225	14430	20740	25250
2026-27	4105	6630	13895	13895	15155	21785	26525
2027-28	4315	6965	14595	14595	15925	22890	27870
2028-29	4530	7320	15340	15340	16735	24055	29285
2029-30	4765	7695	16125	16125	17590	25285	30785
2030-31	5010	8090	16955	16955	18495	26585	32365
2031-32	5270	8510	17830	17830	19450	27960	34035
2032-33	5540	8950	18755	18755	20460	29410	35800
2033-34	5830	9415	19730	19730	21525	30940	37665
2034-35	6135	9910	20760	20760	22650	32555	39635
2035-36	6455	10430	21850	21850	23840	34270	41720
2036-37	6795	10980	23005	23005	25095	36075	43920
2037-38	7155	11560	24225	24225	26425	37990	46245
2038-39	7540	12175	25515	25515	27835	40010	48710
2039-40	7940	12830	26875	26875	29320	42150	51310
2040-41	8365	13515	28320	28320	30895	44410	54065

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2041-42	8820	14245	29845	29845	32560	46805	56980
2042-43	9295	15015	31460	31460	34320	49335	60060
2043-44	9800	15830	33170	33170	36185	52015	63320
2044-45	10335	16690	34975	34975	38155	54845	66770
2045-46	10900	17605	36885	36885	40240	57845	70420

1.4 Toll Revenue

As indicated earlier, toll revenue on the Project Road has been calculated in all three scenarios based on the 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 2044-46 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	56.34	106.66	80.10	243.10
2025-26	85.60	142.52	118.13	346.26
2026-27	102.97	171.75	142.29	417.01
2027-28	114.97	192.11	159.91	467.00
2028-29	126.73	211.12	175.94	513.80
2029-30	139.22	234.10	193.85	567.16
2030-31	152.62	256.22	214.06	622.89
2031-32	167.59	282.41	235.43	685.43
2032-33	183.22	309.06	258.04	750.33
2033-34	201.43	340.16	283.11	824.70
2034-35	221.05	374.91	311.51	907.46
2035-36	241.94	411.70	342.79	996.42
2036-37	265.24	450.02	375.74	1091.00
2037-38	289.74	494.61	411.81	1196.16
2038-39	318.40	542.92	452.24	1313.55
2039-40	348.09	597.84	498.23	1444.16
2040-41	381.47	655.45	546.27	1583.19
2041-42	418.60	719.66	599.02	1737.28
2042-43	458.89	789.98	659.55	1908.42
2043-44	504.66	872.61	728.46	2105.73
2044-45	551.90	955.36	798.34	2305.61
2045-46	604.24	1048.53	876.26	2529.04

Table 7-13 : Toll Revenue Pessimistic Scenario**(Rs. Crores)**

Year	TP-1	TP-2	TP-3	Total
2024-25	56.34	106.66	80.10	243.10
2025-26	85.55	142.42	118.05	346.03
2026-27	102.43	170.85	141.49	414.77
2027-28	113.87	190.16	158.29	462.32
2028-29	124.93	207.96	173.35	506.24
2029-30	136.62	229.44	190.11	556.17
2030-31	149.05	249.86	208.91	607.82
2031-32	162.88	274.04	228.66	665.58
2032-33	177.19	298.45	249.41	725.05
2033-34	193.84	326.89	272.36	793.10
2034-35	211.65	358.57	298.27	868.49
2035-36	230.54	391.83	326.69	949.06
2036-37	251.52	426.28	356.42	1034.22
2037-38	273.40	466.26	388.78	1128.44
2038-39	298.95	509.35	424.85	1233.15
2039-40	325.23	558.15	465.81	1349.20
2040-41	354.69	608.97	508.30	1471.95
2041-42	387.33	665.34	554.75	1607.42
2042-43	422.57	726.80	607.94	1757.32
2043-44	462.60	798.90	668.32	1929.82
2044-45	503.55	870.55	728.97	2103.08
2045-46	548.66	950.86	796.30	2295.82

Table 7-14 : Toll Revenue Most Likely Scenario**(Rs. Crores)**

Year	TP-1	TP-2	TP-3	Total
2024-25	56.34	106.66	80.10	243.10
2025-26	85.58	142.47	118.09	346.14
2026-27	102.68	171.30	141.90	415.88
2027-28	114.41	191.12	159.12	464.65
2028-29	125.85	209.49	174.64	509.98
2029-30	137.95	231.67	191.96	561.58
2030-31	150.82	252.96	211.47	615.25
2031-32	165.21	278.11	232.04	675.36
2032-33	180.18	303.61	253.72	737.51
2033-34	197.63	333.34	277.72	808.70
2034-35	216.39	366.50	304.85	887.74
2035-36	236.34	401.47	334.68	972.48
2036-37	258.54	437.81	366.01	1062.36
2037-38	281.73	480.00	400.17	1161.89
2038-39	308.82	525.53	438.38	1272.73
2039-40	336.79	577.23	481.77	1395.79

Year	TP-1	TP-2	TP-3	Total
2040-41	368.25	631.25	526.90	1526.40
2041-42	403.13	691.39	576.44	1670.97
2042-43	440.88	757.27	633.25	1831.40
2043-44	483.70	834.55	697.84	2016.09
2044-45	527.69	911.72	762.97	2202.38
2045-46	576.41	998.36	835.37	2410.14

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)



JANUARY 2025

TTRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)



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**PALSIT TO DANKUNI SECTION OF NH 19
IN THE STATE OF WEST BENGAL
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**TRAFFIC STUDY & REVENUE
PROJECTION REPORT
(FINAL)**

JANUARY 2025



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ABBREVIATIONS

AADT	- Annual Average Daily Traffic	NHAI	- National Highway Authority of India
BOT	- Build Operate Transfer	NHDP	- National Highways Development Project
CAGR	- Compound Annual Growth Rate	NSDP	- Net State Domestic Product
CTV	- Classified traffic volume	O&M	- Operation & Maintenance
DBFOT	- Design, Build, Finance, Operate & Transfer	PCDP	- Per Capita Domestic Product
EME	- Earth Moving Equipment	PCI	- Per Capita Income
GDP	- Gross Domestic Product	PCU	- Passenger Car Unit
GSDP	- Gross State Domestic Product	PSC	- Pre-stressed Concrete
HCM	- Heavy Construction Machinery	RCC	- Reinforced cement concrete
HCV	- Heavy Commercial Vehicle	RHS	- Right Hand Side
HTMS	- Highway Traffic Management System	SH	- State Highway
IRC	- Indian Road Congress	TP	- Toll Plaza
IRR	- Internal Rate of Return	WPI	- Wholesale Price Index
LCV	- Light Commercial Vehicle	SIR	- Special Investment Region
LHS	- Left Hand Side	c.	- Circa
LGV	- Light Goods Vehicle	ROB	- Railway Over Bridge
MAV	- Multi Axle Vehicle	MDR	- Major District Road
MORTH	- Ministry of Road Transport and Highways	ODR	- Other District Road
NH	- National Highway	CA	- Concession Agreement
PCC	- Plain Cement Concrete	RMT	- Running Meter
CR	- 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 2nd 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.

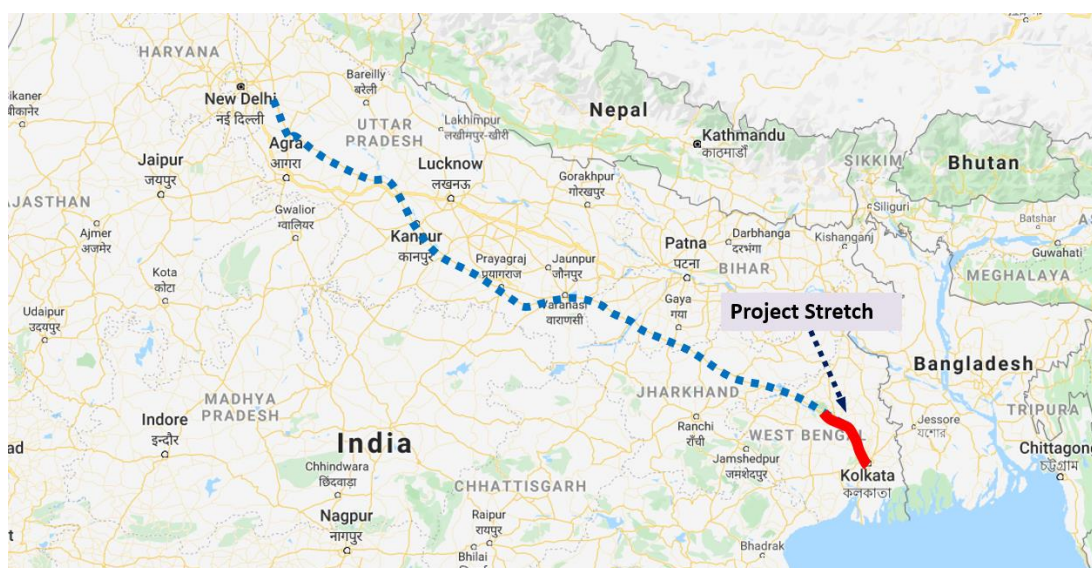


Figure 1-1: Alignment of Project Stretch

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.

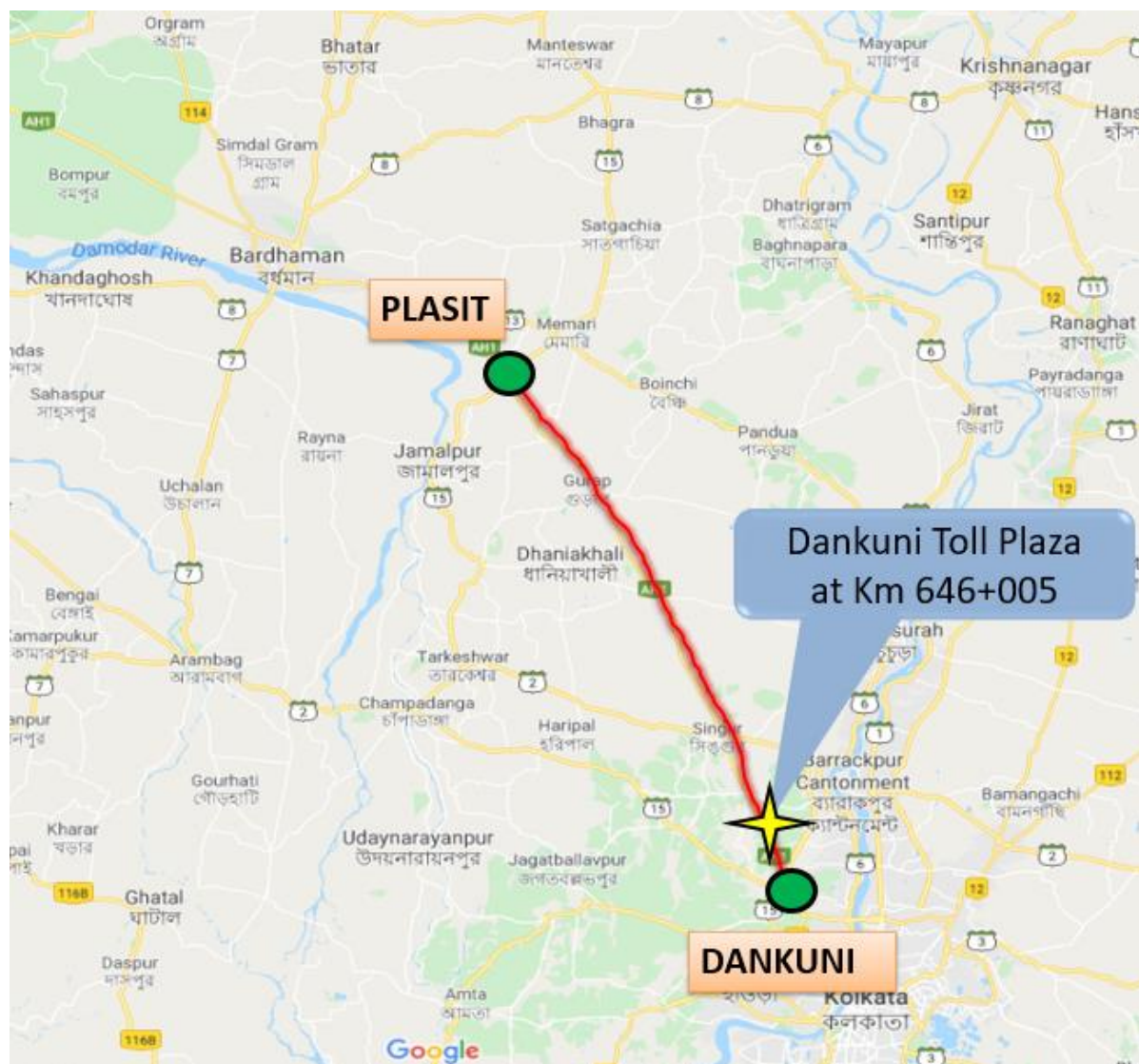


Figure 2-1: Project Alignment with Toll Plaza

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 November 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 & Eight month from April 2024 to	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Eight	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Eight	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Eight	AADT for Yr. 2022-23, Eight month from April 2023 to November 2023 & Eight

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
		November 2024	month from April 2024 to November 2024	month from April 2024 to November 2024	month from April 2024 to November 2024	month from April 2024 to November 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 and traffic data from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	11057
2	LCV	1398	1031	977
3	Bus	789	788	706
4	Truck	3707	2542	2183
5	3-Axle	3061	2018	1574
6	Multi Axle	8974	8799	7975
7	Oversize Vehicle	8	9	9
	Total	28451	26121	24481

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	24481	61839	2.53

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.

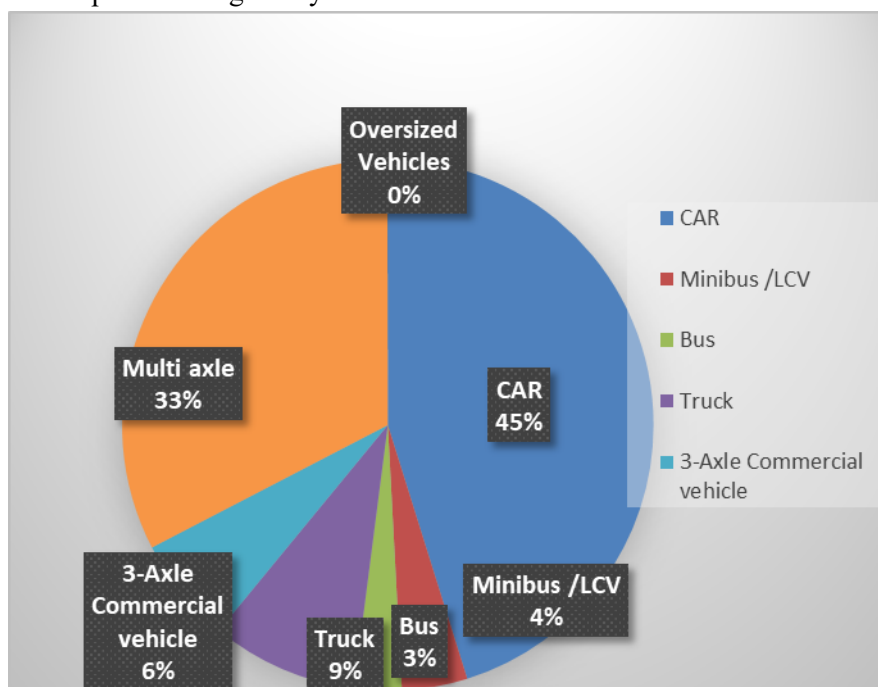


Figure 3-1 :Model Split of Tollable Vehicle-Dankuni Km 646.005

It is observed that car traffic forms about 45% of total traffic at Dankuni toll plaza location while multi axle commercial vehicles and trucks are about 55% of total traffic.

Another important bifurcation of traffic is components of traffic with respect to 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 the 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	11798

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
2	Return Journey	12666
3	Local Commercial Single Journey	0
4	Monthly Pass Local	13
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 48%. Return journey component is 52%. 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 dominating 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.

The 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.

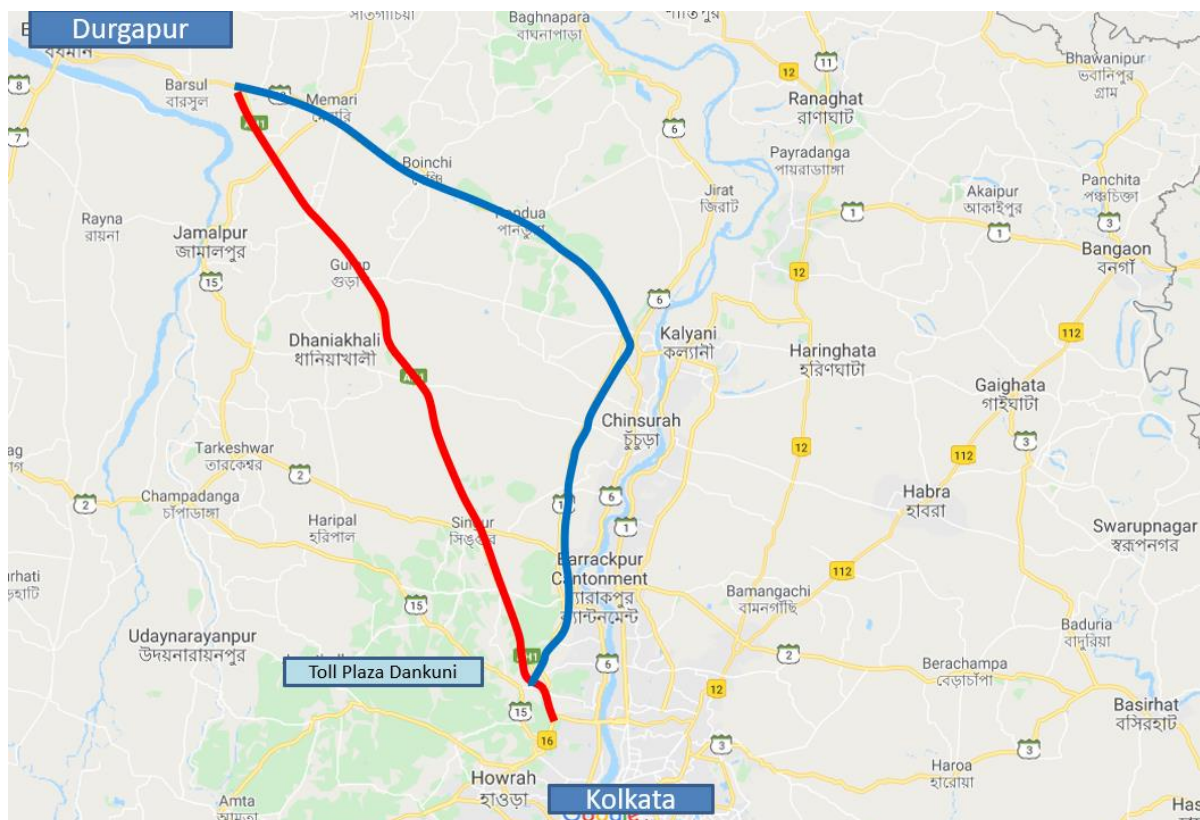


Figure 4-1 Project stretch and alternate GT Road

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.

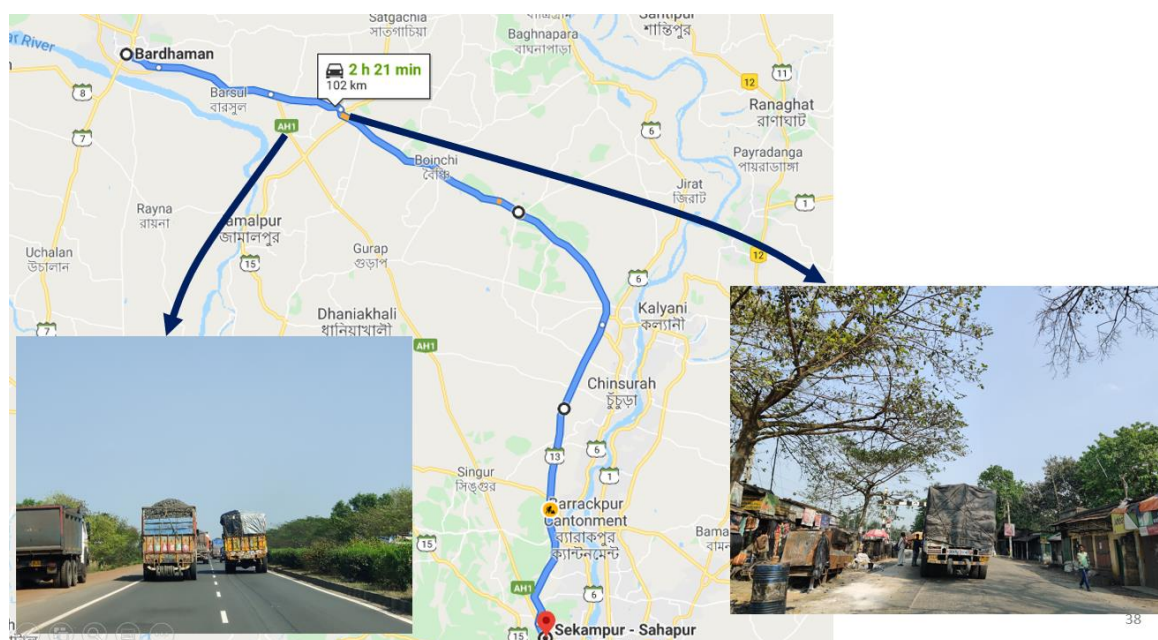


Figure 4-2 Project stretch and alternate GT Road Condition

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.
Bardhaman -Kolkata Via Project Road	84	79	Preferred Route

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.

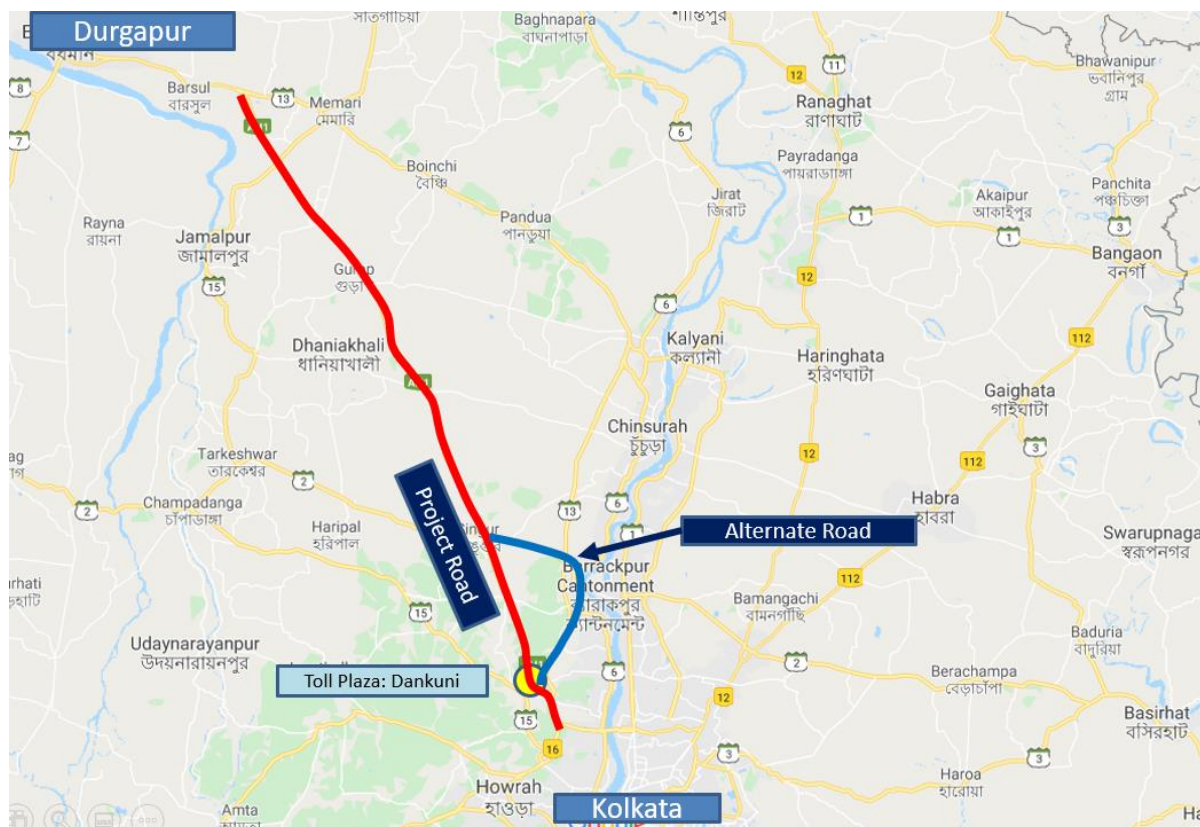


Figure 4-4 Local roads bypassing toll plaza.

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
Via Project Road (Dankuni)	21.4	24	Preferred Route

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 a 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.

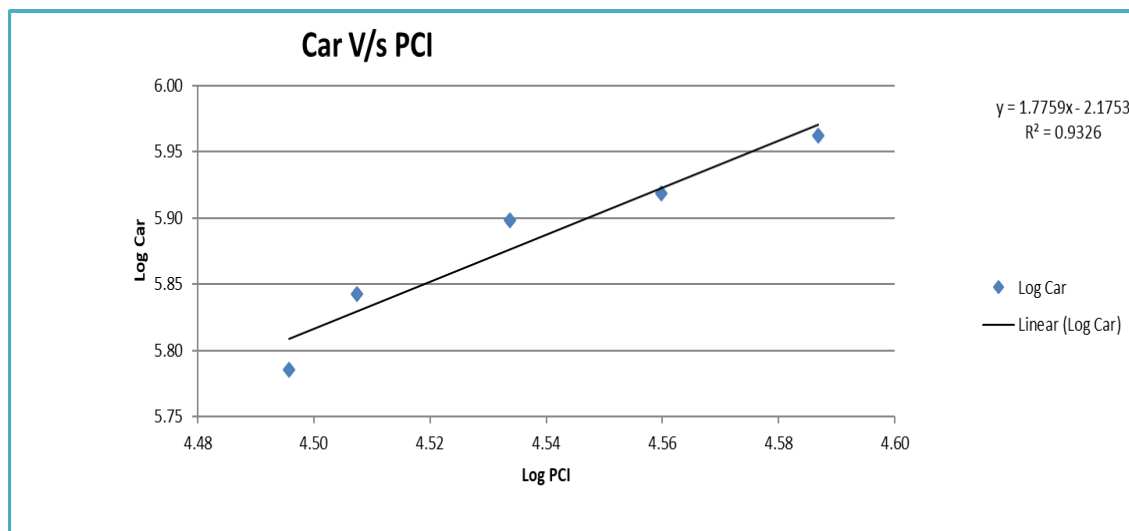


Figure 5-1 : Regression Analysis Car Vs. PCI West Bengal

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%

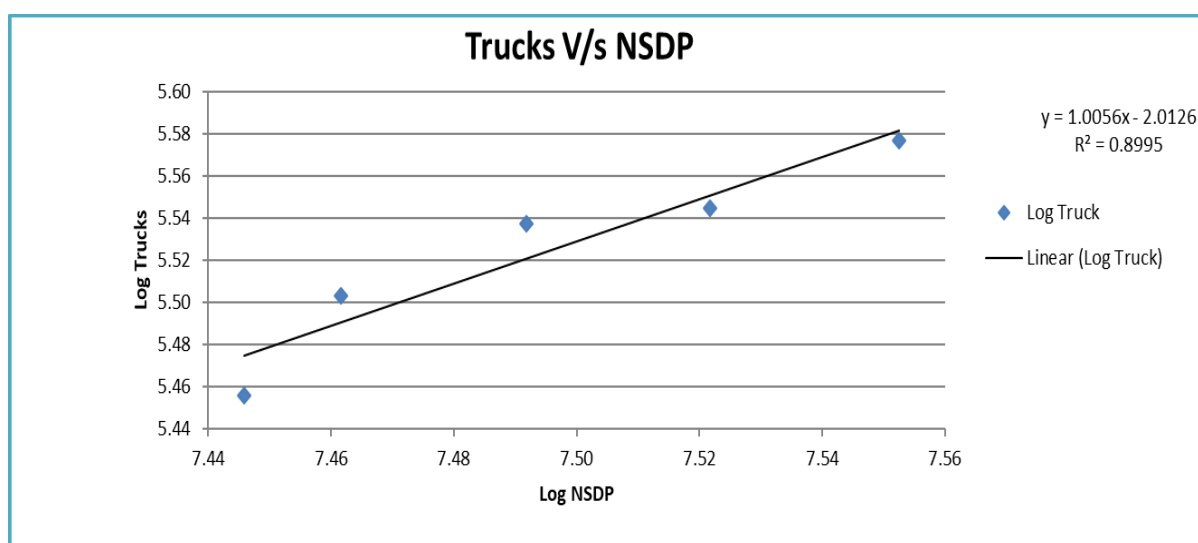


Figure 5-2 : Regression Analysis NSDP Vs. Truck West Bengal

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

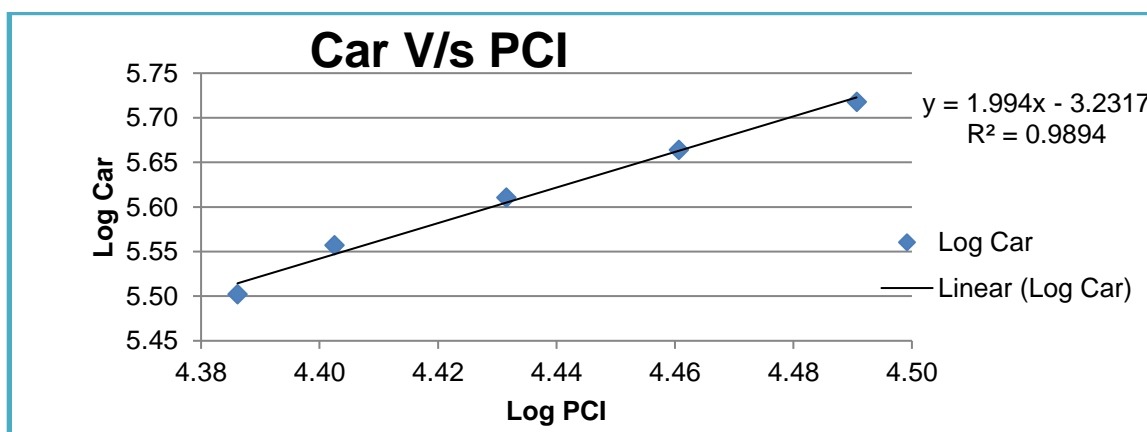
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient (y)	Average IV Growth (5yrs)	Growth Elastic Model	Remarks
West Bengal	Car/Jeep	PCI	$y = 1.7759x - 2.1753$	$R^2 = 0.9326$	1.7759	5.40%	9.58%	Good Regression
	Bus	Population	$y = 0.5092x - 0.5636$	$R^2 = 0.0364$	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%

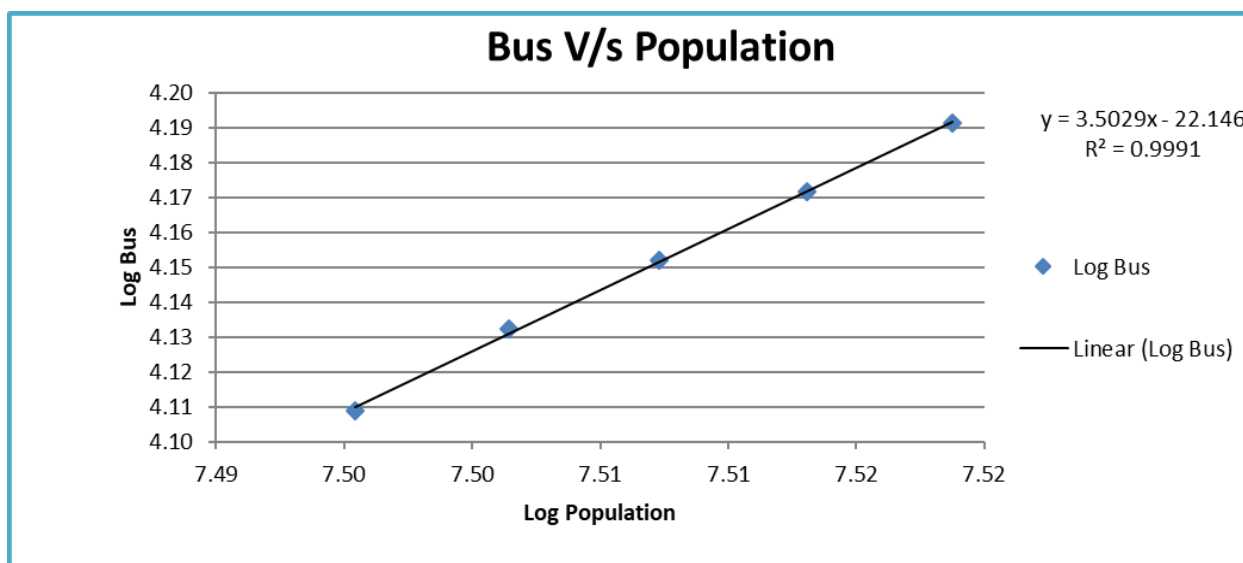


Figure 5-4 : Regression Analysis Population Vs. Bus Jharkhand

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%

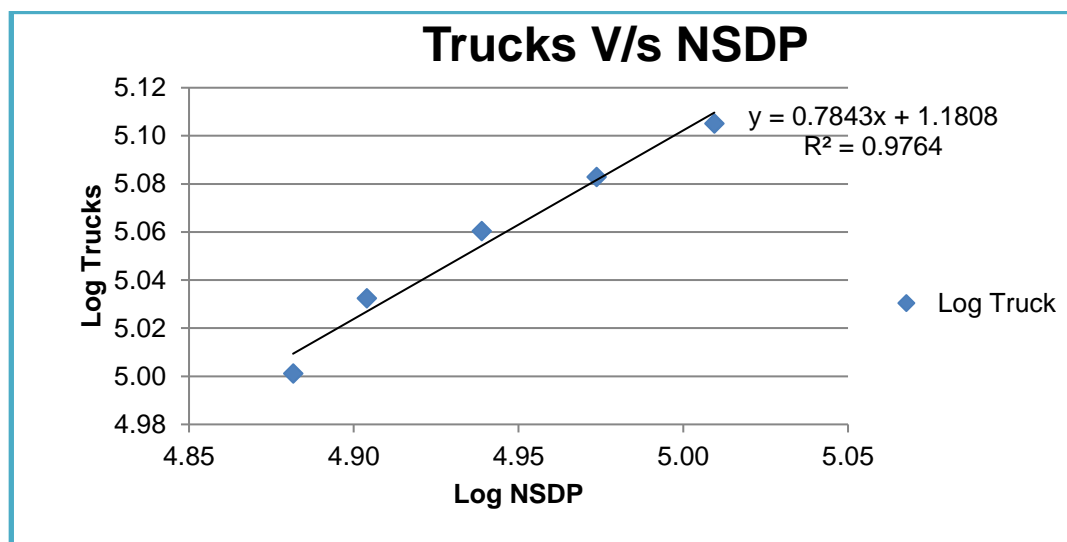


Figure 5-5 : Regression Analysis NSDP Vs. Jharkhand

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.

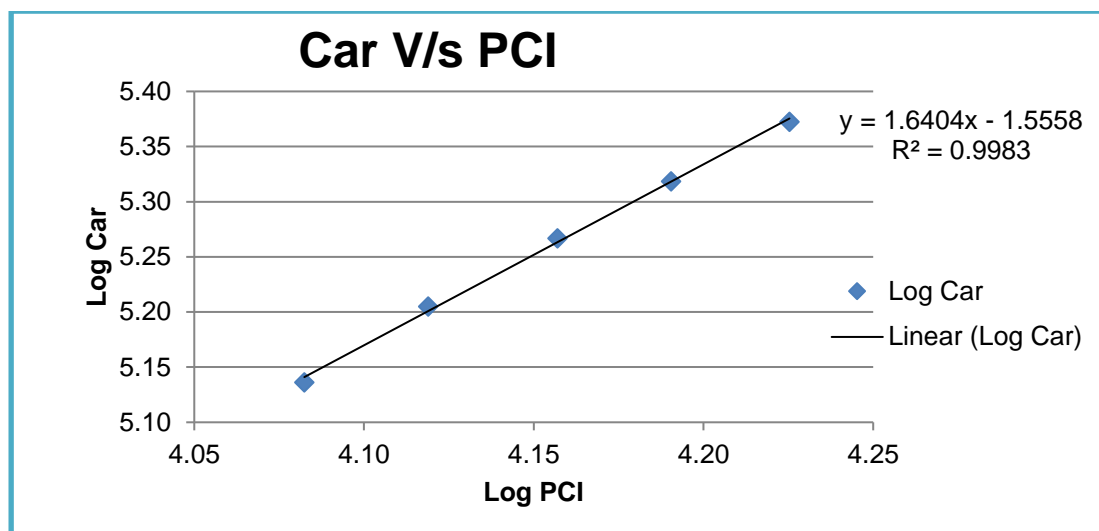


Figure 5-6 : Regression Analysis Car Vs. PCI Bihar

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%

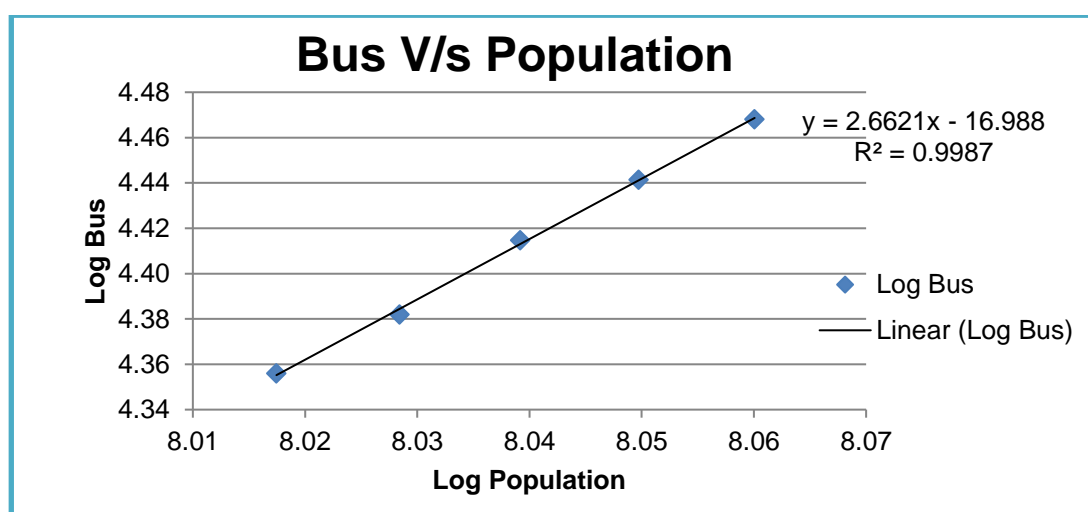


Figure 5-7 : Regression Analysis Population Vs. Bus Bihar

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%

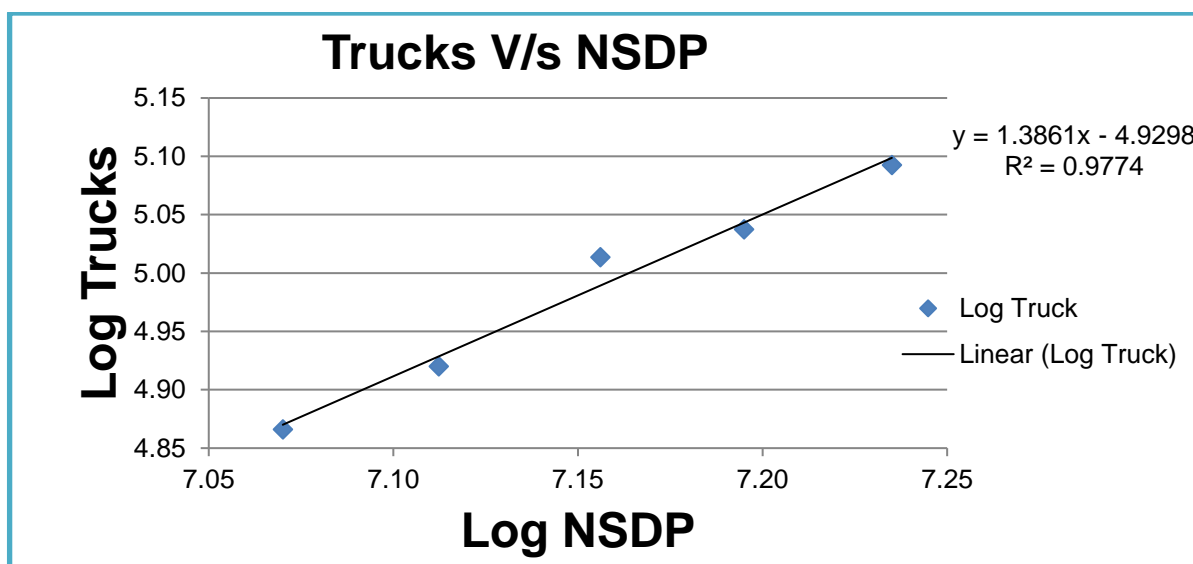


Figure 5-8 : Regression Analysis NSDP Vs. Truck Bihar

Summary of regression analysis for elasticity and growth estimation for Biharis given in following table

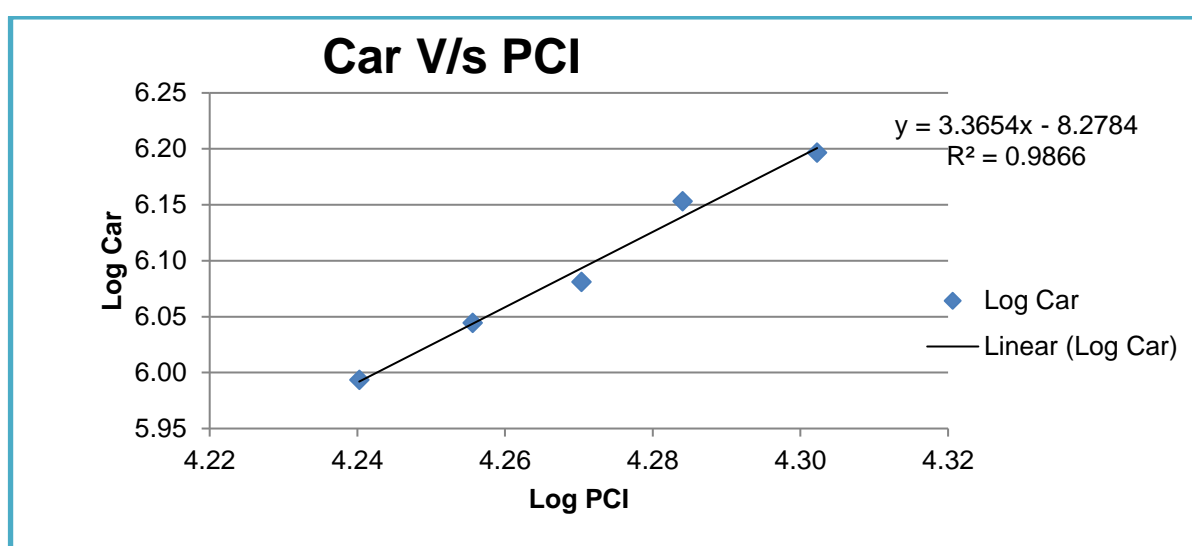
Table 5-11 : Summary Regression Analysis- Bihar

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%

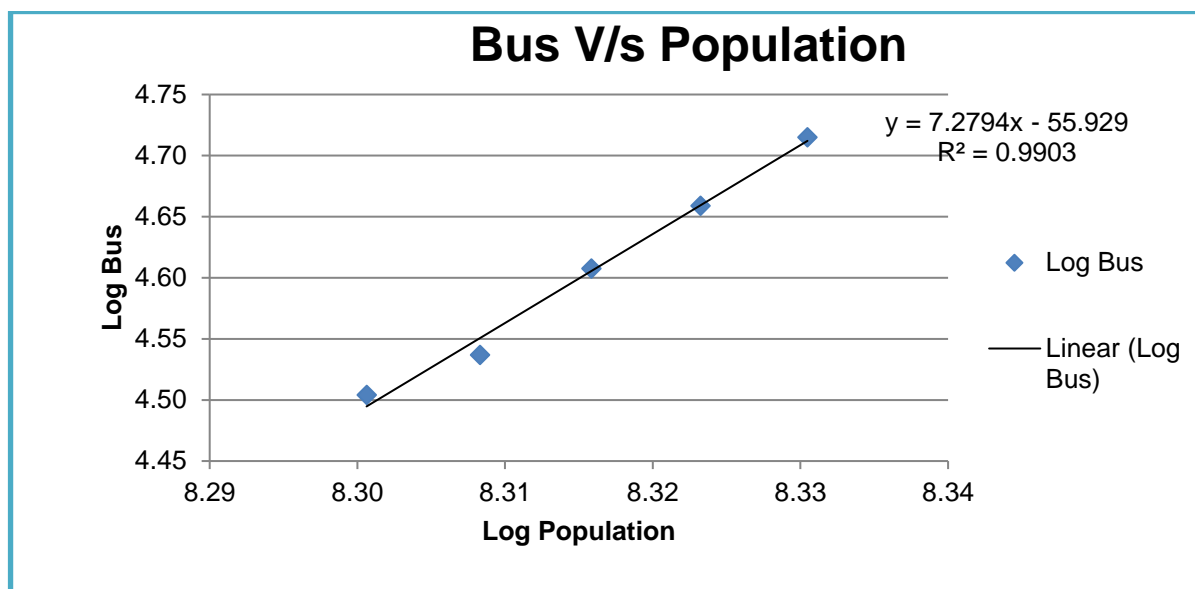


Figure 5-10 : Regression Analysis Population Vs. Bus Uttar Pradesh

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%

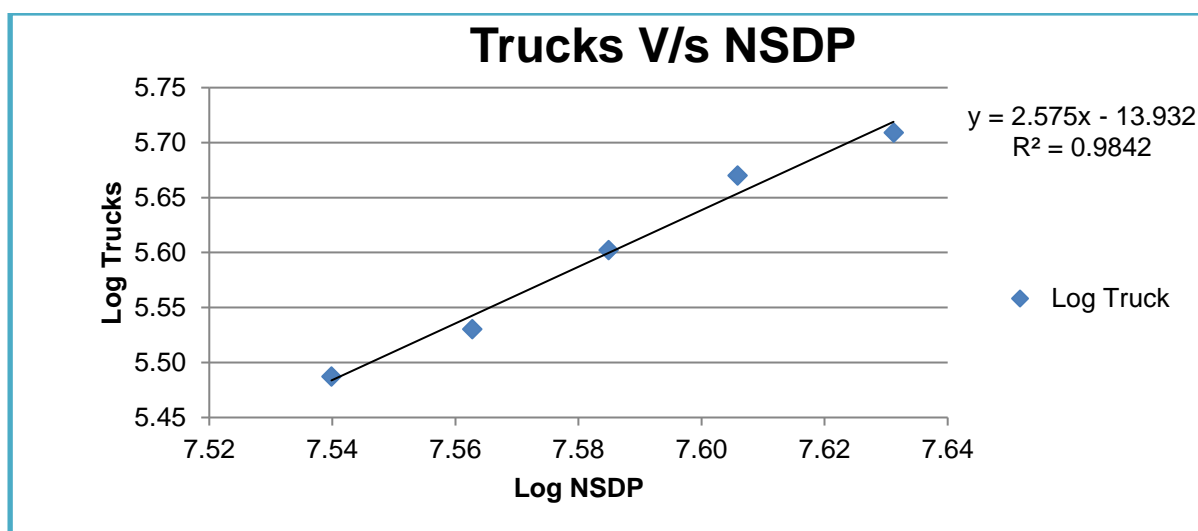


Figure 5-11 : Regression Analysis NSDP Vs. Truck Uttar Pradesh

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.

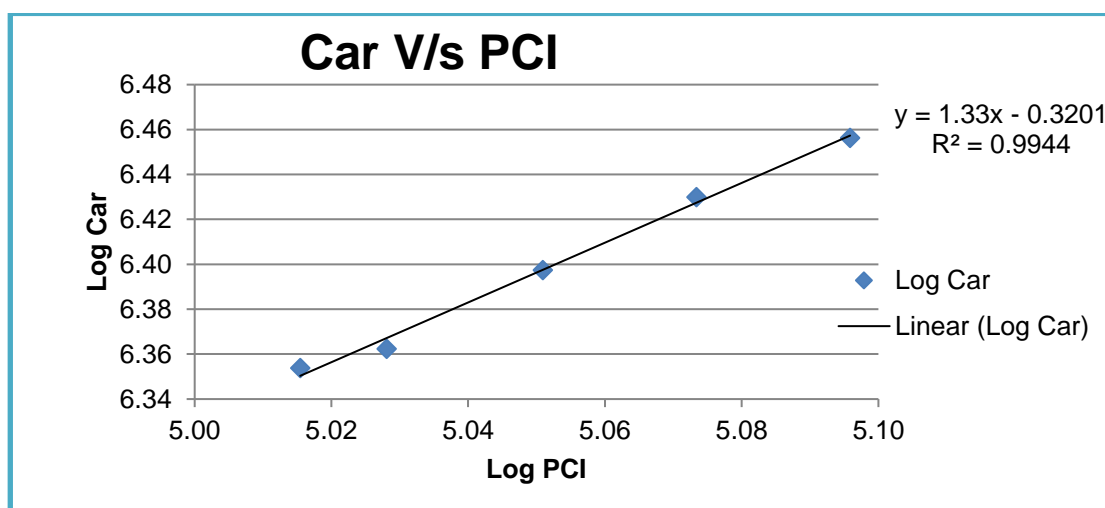


Figure 5-12 : Regression Analysis Car Vs. PCI Delhi

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%

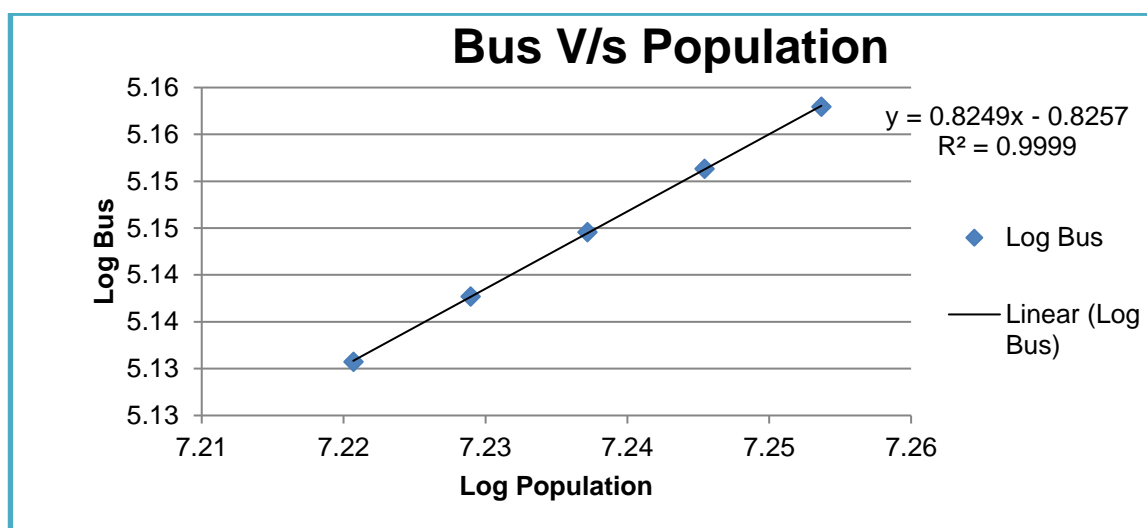


Figure 5-13 : Regression Analysis Population Vs. Bus Delhi

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%

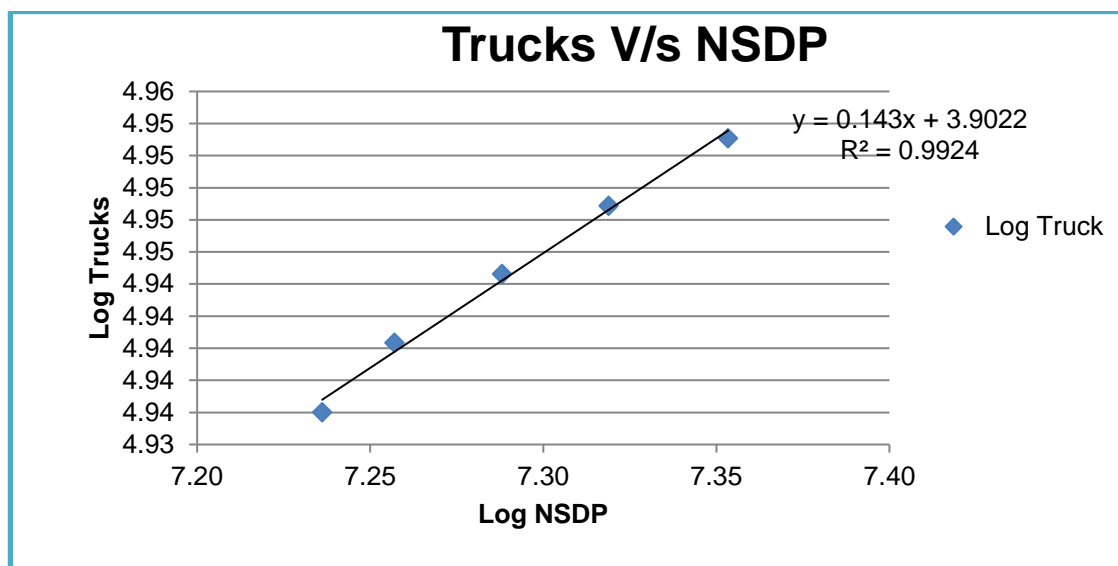


Figure 5-14 : Regression Analysis NSDP Vs. Truck Delhi

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.

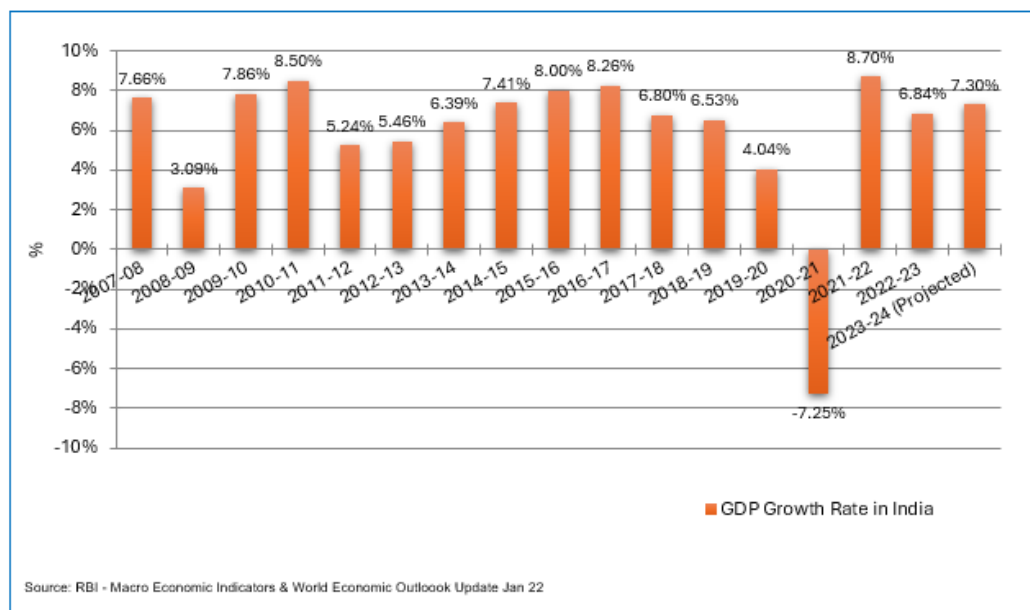


Figure 5-15 : Growth of GDP in India

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	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
Car/Jeep/Van	8.58%	5.99%	6.35%	5.18%	4.05%
Bus	5.26%	4.81%	4.53%	4.21%	3.93%
Minibus	5.26%	4.81%	4.53%	4.21%	3.93%
LCV	2.11%	1.71%	1.32%	0.93%	0.55%
2- Axle	3.34%	2.68%	2.03%	1.38%	0.75%
3 - Axle	4.89%	3.89%	2.91%	1.95%	0.99%
4 to 6 Axle	5.82%	4.62%	3.45%	2.29%	1.14%
7 and Above Axle	5.82%	4.62%	3.45%	2.29%	1.14%

Table 5-21 : Recommended Growth Rates Pessimistic

Category / Year	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
Car/Jeep/Van	8.08%	5.49%	5.85%	4.68%	3.55%
Bus	4.76%	4.31%	4.03%	3.71%	3.43%
Minibus	4.76%	4.31%	4.03%	3.71%	3.43%
LCV	1.61%	1.21%	0.82%	0.43%	0.05%
2- Axle	2.84%	2.18%	1.53%	0.88%	0.25%
3 - Axle	4.39%	3.39%	2.41%	1.45%	0.49%
4 to 6 Axle	5.32%	4.12%	2.95%	1.79%	0.64%
7 and Above Axle	5.32%	4.12%	2.95%	1.79%	0.64%

Table 5-22 : Recommended Growth Rates Most Likely

Category / Year	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
Car/Jeep/Van	8.33%	5.74%	6.10%	4.93%	3.80%
Bus	5.01%	4.56%	4.28%	3.96%	3.68%
Minibus	5.01%	4.56%	4.28%	3.96%	3.68%
LCV	1.86%	1.46%	1.07%	0.68%	0.30%

Category / Year	2025-2030	2030-2035	2035-2040	2039-2044	2044-2049
2- Axle	3.09%	2.43%	1.78%	1.13%	0.50%
3 - Axle	4.64%	3.64%	2.66%	1.70%	0.74%
4 to 6 Axle	5.57%	4.37%	3.20%	2.04%	0.89%
7 and Above Axle	5.57%	4.37%	3.20%	2.04%	0.89%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 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	11057	977	706	2183	1574	7975	9	24481	61839
2025-26	12227	1018	757	2300	1683	8598	9	26592	66706
2026-27	13460	1055	808	2412	1790	9227	9	28761	71635
2027-28	14749	1088	859	2517	1895	9856	9	30973	76587
2028-29	16015	1111	905	2601	1988	10430	9	33059	81139
2029-30	17389	1134	952	2688	2085	11037	9	35294	85972
2030-31	18431	1153	998	2760	2166	11547	9	37064	89935
2031-32	19534	1173	1046	2834	2250	12081	9	38927	94089
2032-33	20703	1193	1096	2910	2338	12640	9	40889	98445
2033-34	21944	1213	1148	2988	2429	13225	9	42956	103012
2034-35	23259	1234	1203	3068	2523	13836	9	45132	107795
2035-36	24736	1250	1258	3130	2596	14312	9	47291	112008
2036-37	26306	1266	1315	3193	2672	14805	9	49566	116408
2037-38	27977	1283	1375	3258	2749	15315	9	51966	121006
2038-39	29753	1300	1438	3324	2829	15842	9	54495	125806

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	11057	977	706	2183	1574	7975	9	24481	61839
2025-26	12172	1012	754	2289	1675	8558	9	26469	66396
2026-27	13338	1043	801	2388	1773	9141	9	28493	70964
2027-28	14548	1070	847	2479	1869	9719	9	30541	75514
2028-29	15723	1087	887	2550	1951	10236	9	32443	79620
2029-30	16992	1105	929	2622	2036	10781	9	34474	83966

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2030-31	17925	1119	969	2679	2105	11226	9	36032	87420
2031-32	18909	1133	1011	2737	2177	11689	9	37665	91025
2032-33	19947	1147	1054	2797	2250	12171	9	39375	94781
2033-34	21042	1161	1100	2858	2326	12673	9	41169	98705
2034-35	22197	1175	1147	2921	2405	13195	9	43049	102797
2035-36	23495	1185	1193	2965	2463	13584	9	44894	106304
2036-37	24869	1195	1241	3010	2522	13984	9	46830	109949
2037-38	26324	1205	1291	3056	2582	14396	9	48863	113741
2038-39	27864	1215	1343	3103	2645	14820	9	50999	117690

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	11057	977	706	2183	1574	7975	9	24481	61839
2025-26	12199	1014	756	2295	1679	8579	9	26531	66556
2026-27	13398	1048	806	2400	1782	9185	9	28628	71307
2027-28	14647	1078	854	2498	1883	9789	9	30758	76060
2028-29	15866	1098	897	2575	1971	10334	9	32750	80386
2029-30	17187	1118	942	2655	2063	10910	9	34884	84980
2030-31	18174	1134	985	2720	2138	11388	9	36548	88691
2031-32	19217	1150	1030	2786	2215	11886	9	38293	92563
2032-33	20320	1167	1077	2854	2296	12406	9	40129	96619
2033-34	21486	1184	1127	2923	2380	12949	9	42058	100863
2034-35	22719	1201	1178	2994	2467	13515	9	44083	105296
2035-36	24104	1214	1228	3047	2533	13947	9	46082	109151
2036-37	25575	1227	1280	3101	2600	14393	9	48185	113168
2037-38	27136	1240	1335	3156	2669	14853	9	50398	117355
2038-39	28791	1253	1392	3212	2740	15328	9	52725	121719

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	66396	0.00%	0	0.0
2	01-May-31	84018	87420	0.00%	0	
3	01-May-36	107270	106304	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	66706	0.00%	0	-0.2
2	01-May-31	84018	89935	-2.04%	-59	
3	01-May-36	109461	112008	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	66556	0.00%	0	0.0
2	01-May-31	84018	88691	-0.56%	-16	
3	01-May-36	107873	109151	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 2/3rd 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). 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.

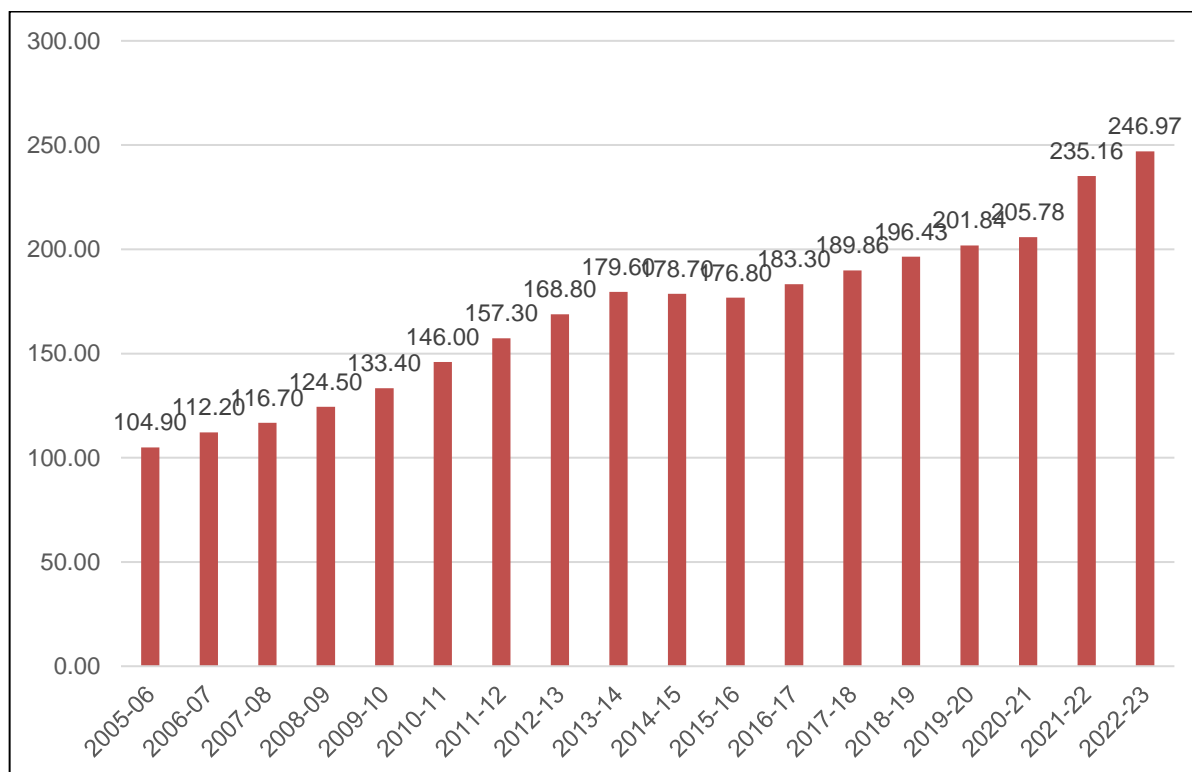


Figure 7-1 : Historical Rate of WPI Inflation in India

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 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	75	120	250	250	270	390	475
2025-26	75	120	250	250	270	390	475
2026-27	115	185	390	390	425	605	740
2027-28	120	195	410	410	445	640	775
2028-29	130	205	430	430	465	670	815
2029-30	135	215	450	450	490	705	855
2030-31	140	225	475	475	515	740	900
2031-32	150	240	500	500	545	780	950
2032-33	155	250	525	525	570	820	995
2033-34	165	265	550	550	600	860	1050
2034-35	175	280	580	580	630	905	1105
2035-36	180	290	610	610	665	955	1160
2036-37	190	310	640	640	700	1005	1220
2037-38	200	325	675	675	735	1055	1285
2038-39	210	340	710	710	775	1115	1355

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	110	175	370	370	405	585	710
2025-26	110	175	370	370	405	585	710
2026-27	175	280	580	580	635	910	1110
2027-28	185	295	610	610	665	955	1165
2028-29	190	310	645	645	700	1005	1225
2029-30	200	325	675	675	735	1055	1285
2030-31	210	340	710	710	775	1110	1350
2031-32	225	360	745	745	815	1170	1420
2032-33	235	375	785	785	855	1230	1495
2033-34	245	395	825	825	900	1290	1570
2034-35	260	415	870	870	945	1360	1655
2035-36	275	440	915	915	995	1430	1740
2036-37	290	460	960	960	1050	1505	1830
2037-38	305	485	1015	1015	1105	1585	1930
2038-39	320	510	1065	1065	1165	1670	2030

Table 7-4: Toll Rates for Monthly pass Local Dankuni @ Km 646.005

Year	Car	Minibus /LCV
2024-25	315	315
2024-25	315	315
2025-26	315	315
2026-27	345	345
2027-28	360	360
2028-29	380	380
2029-30	400	400
2030-31	420	420
2031-32	440	440
2032-33	465	465
2033-34	485	485
2034-35	515	515
2035-36	540	540
2036-37	570	570
2037-38	600	600
2038-39	630	630

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	2440	3945	8265	8265	9015	12960	15775
2025-26	2440	3945	8265	8265	9015	12960	15775
2026-27	3875	6215	12940	12940	14110	20245	24630
2027-28	4070	6530	13590	13590	14820	21270	25880
2028-29	4275	6860	14280	14280	15575	22350	27195
2029-30	4495	7205	15010	15010	16365	23490	28580
2030-31	4720	7575	15780	15780	17205	24695	30045
2031-32	4965	7965	16590	16590	18090	25965	31590
2032-33	5220	8375	17445	17445	19020	27305	33220
2033-34	5490	8805	18350	18350	20010	28720	34945
2034-35	5770	9265	19305	19305	21050	30215	36765
2035-36	6075	9750	20315	20315	22150	31800	38690
2036-37	6390	10260	21380	21380	23315	33470	40720
2037-38	6725	10800	22510	22510	24545	35235	42870
2038-39	7080	11370	23700	23700	25845	37100	45145

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	168.07	168.07
2025-26	257.06	257.06
2026-27	318.95	318.95
2027-28	358.50	358.50
2028-29	397.33	397.33
2029-30	441.62	441.62
2030-31	488.10	488.10
2031-32	536.67	536.67
2032-33	587.58	587.58
2033-34	647.92	647.92
2034-35	712.91	712.91
2035-36	781.10	781.10
2036-37	850.61	850.61
2037-38	930.67	930.67
2038-39	1017.74	1017.74

Table 7-4 : Toll Revenue Pessimistic Scenario

(Rs. Crores)

Year	TP-1	Total
2024-25	168.07	168.07
2025-26	255.83	255.83
2026-27	315.93	315.93
2027-28	353.49	353.49
2028-29	389.93	389.93
2029-30	431.36	431.36
2030-31	474.45	474.45
2031-32	519.20	519.20
2032-33	565.72	565.72
2033-34	620.89	620.89
2034-35	679.87	679.87
2035-36	741.33	741.33
2036-37	803.32	803.32

Year	TP-1	Total
2037-38	874.67	874.67
2038-39	951.93	951.93

Table 7-5 : Toll Revenue Most Likely Scenario

(Rs. Crores)

Year	TP-1	Total
2024-25	168.07	168.07
2025-26	255.83	255.83
2026-27	315.93	315.93
2027-28	353.49	353.49
2028-29	389.93	389.93
2029-30	431.36	431.36
2030-31	474.45	474.45
2031-32	519.20	519.20
2032-33	565.72	565.72
2033-34	620.89	620.89
2034-35	679.87	679.87
2035-36	741.33	741.33
2036-37	803.32	803.32
2037-38	902.55	902.55
2038-39	984.64	984.64

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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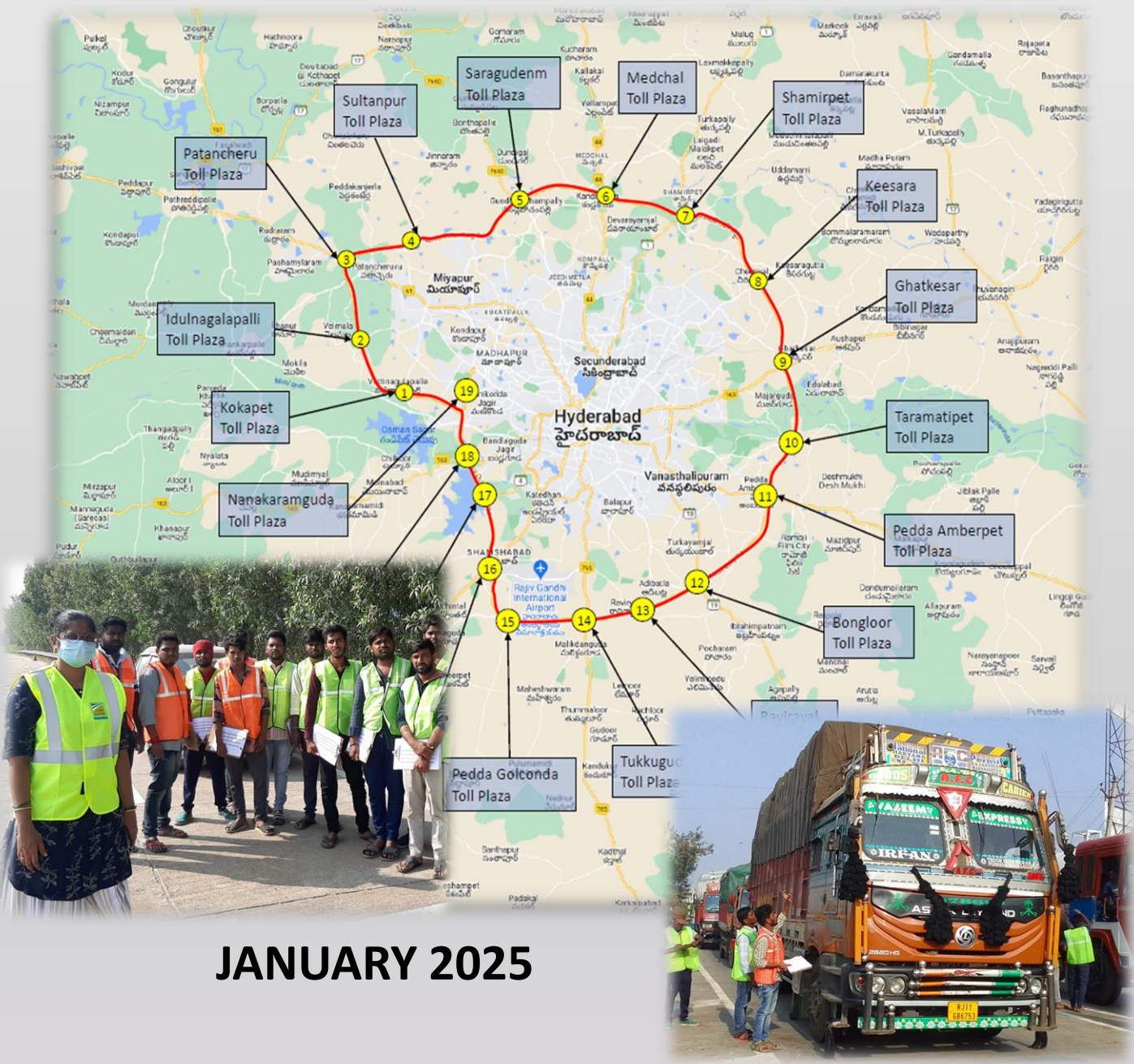
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Nehru Outer Ring Road in Hyderabad from Km 0.000 to Km 158.000 in State of Telangana on TOT mode



JANUARY 2025

TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)



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

JANUARY 2025



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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 Shamshabad) from various parts of city. Following figure shows positioning of ORR in city context.

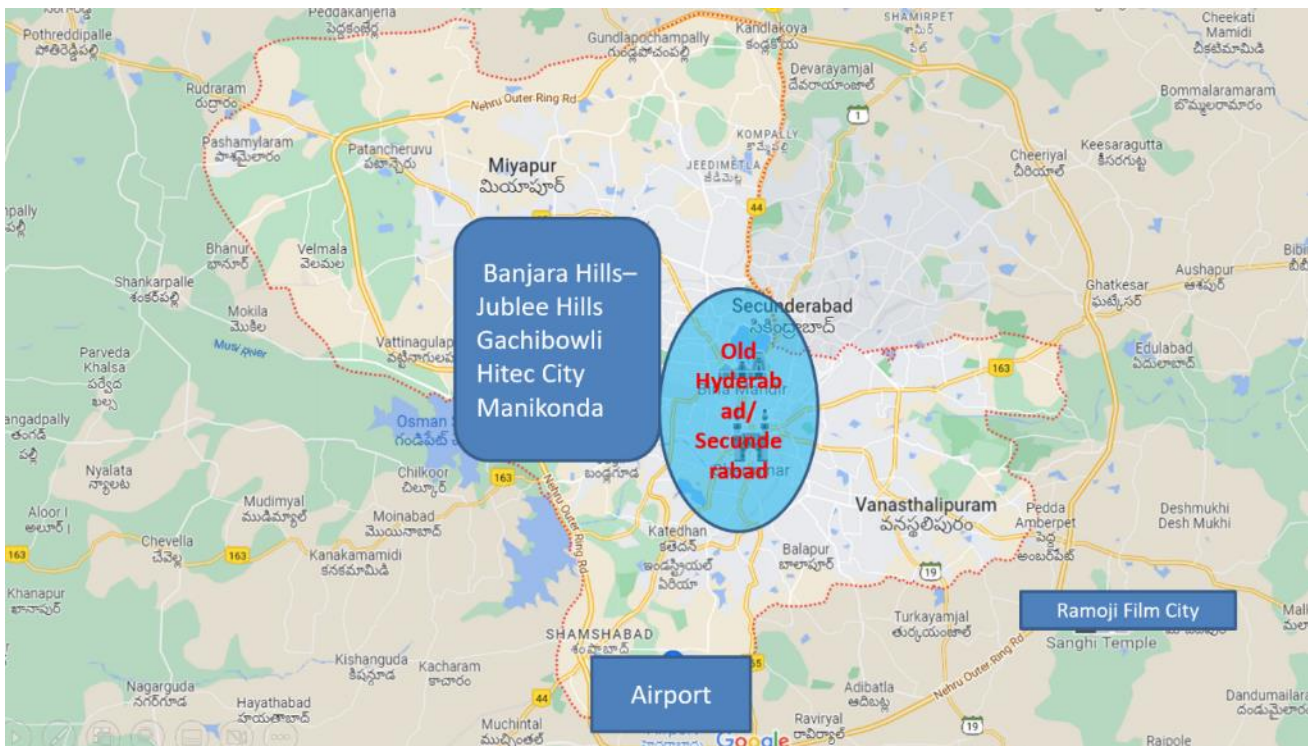


Figure 2-1: Positioning of ORR in city context.

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, Wanaparthi 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.

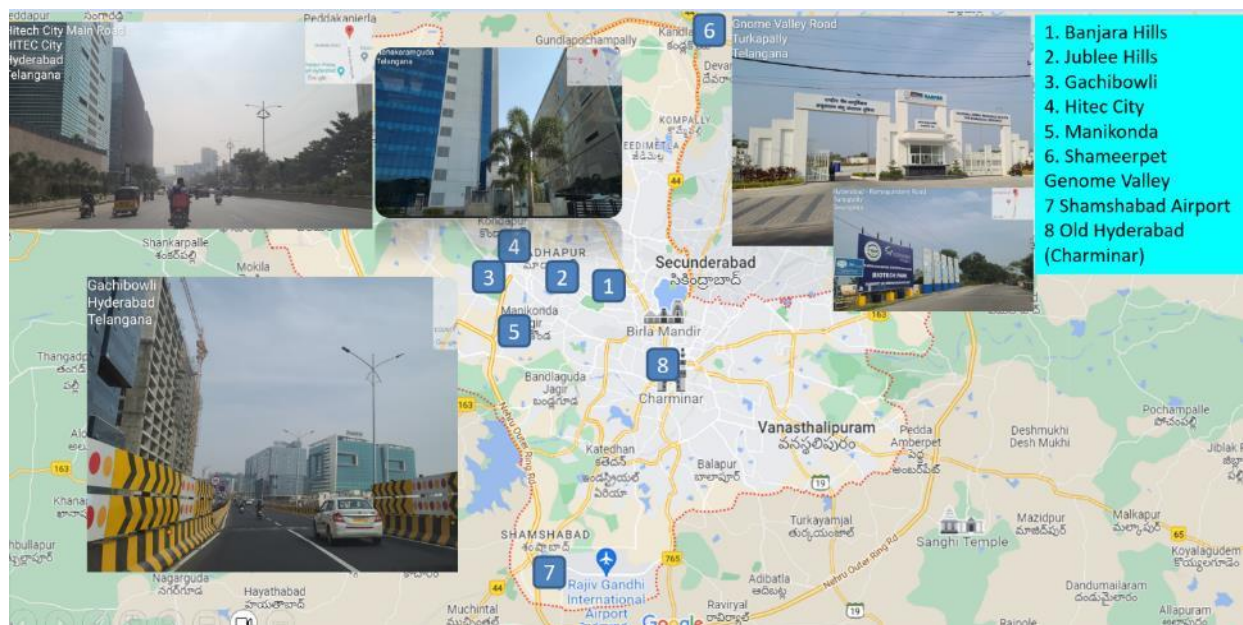


Figure 2-2: Major urban & commercial hubs.

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.

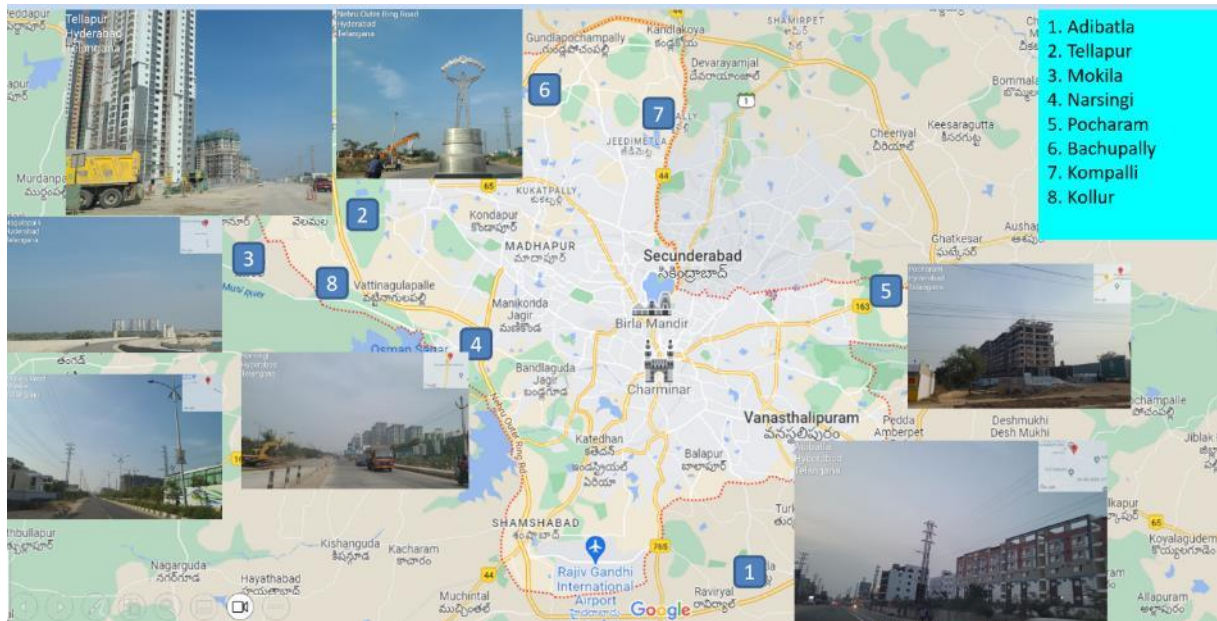


Figure 2-3: Upcoming Development Locations in context of ORR.

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.

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.

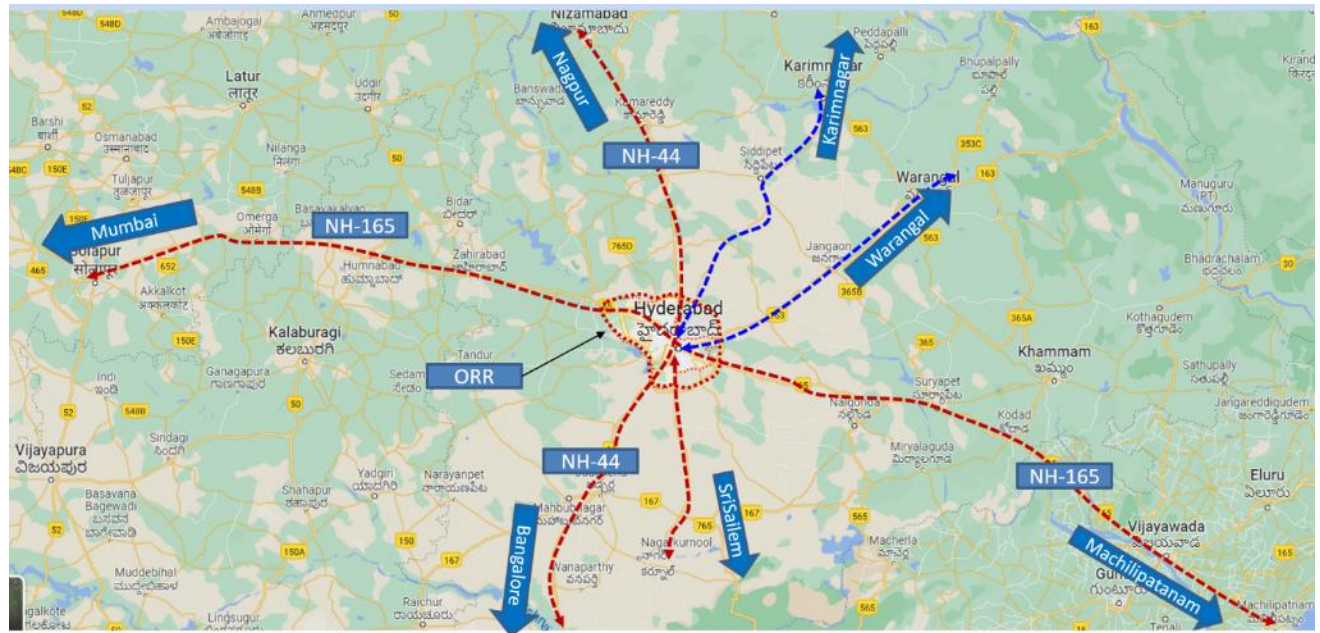


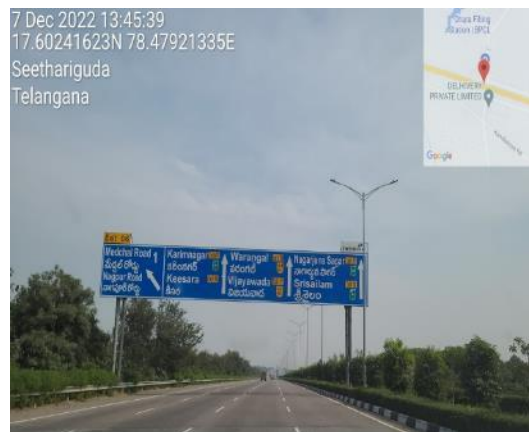
Figure 2-4: Regional context of ORR.

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 Tokapalle. 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.

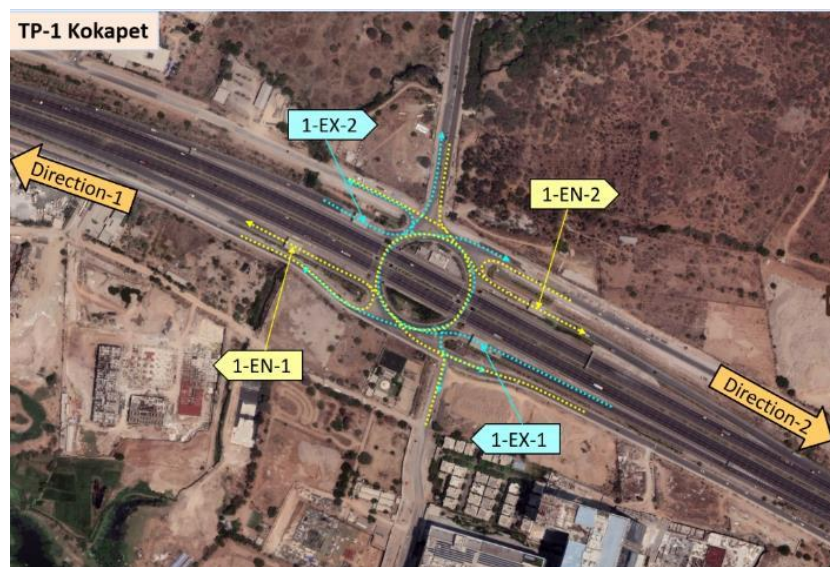


Figure 2-5 : Rotary Type Interchange with 4 toll booths.

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.

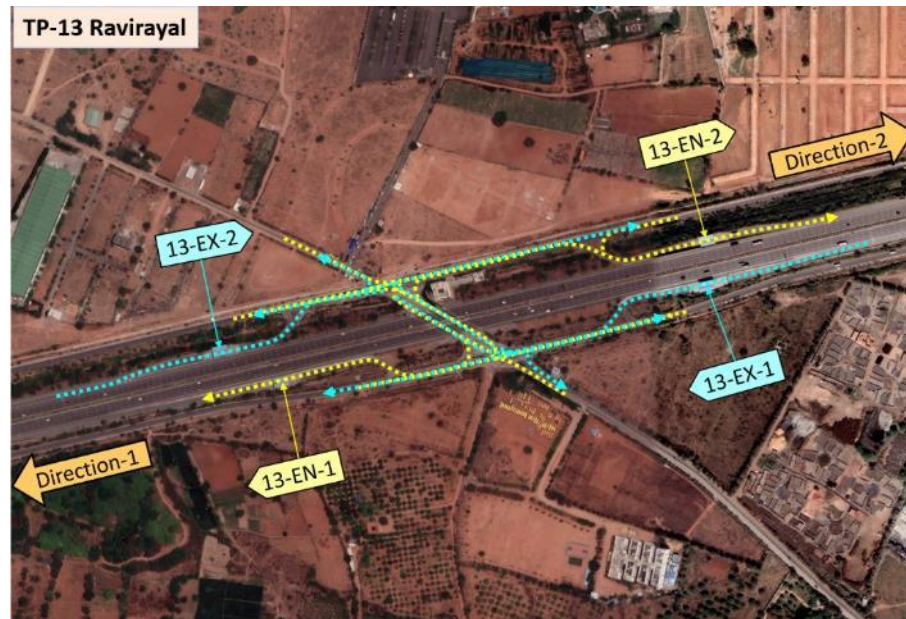


Figure 2-6 : Diamond Type Interchange with 4 toll booths.

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.

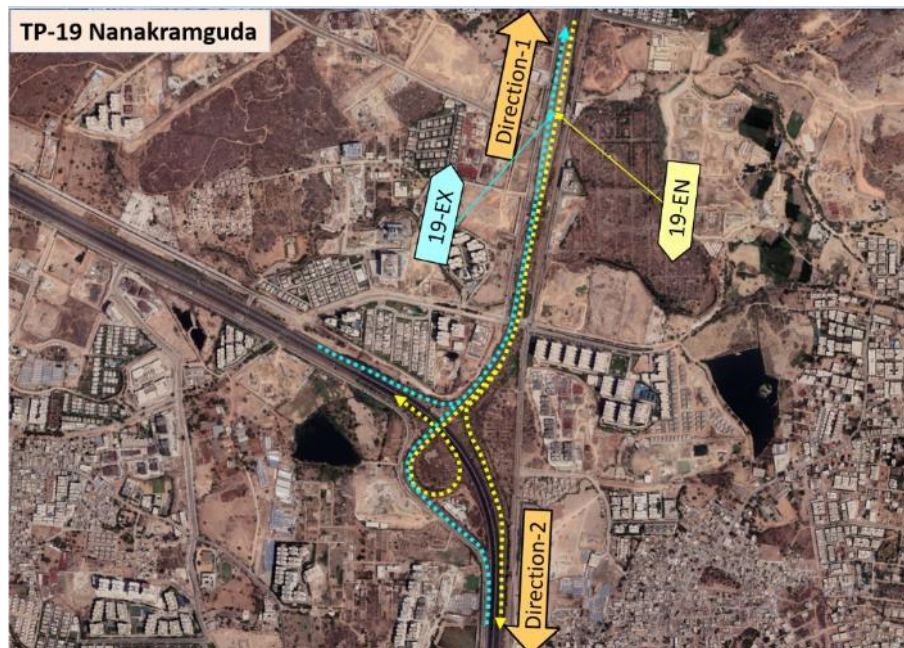


Figure 2-9 : Toll Plaza Nanakramguda and movements.

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.

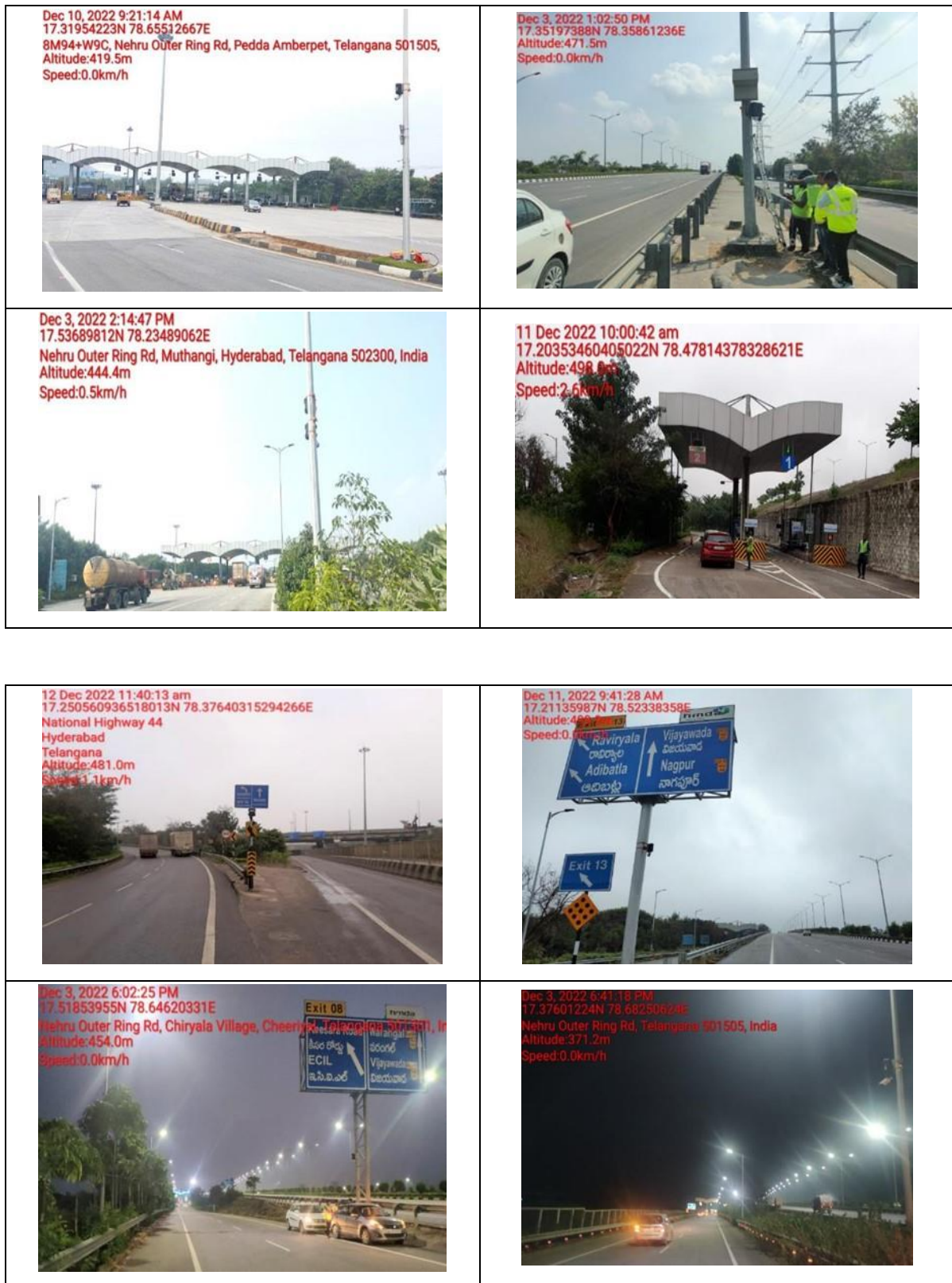


Figure 2-10 : Photographs showing Project Corridor

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 2024 to November 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 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 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 2024	2023 & Eight month from April 2024 to November 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 November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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	441	830	99	220	180	289	259	48	93	15	252	178	55	152	58	1845	772	727	2	1175
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	373	0	0	701	88	128	361	223	199	61	103	5	82	49	21	47	18	333	365	168	0	812
3	738	0	549	5	283	412	669	838	392	210	325	39	271	121	36	157	27	901	1101	692	0	1664
4	141	0	94	292	0	217	396	386	591	127	262	27	179	21	7	25	7	134	56	51	0	146
4A	233	0	155	609	176	0	270	438	659	161	400	31	313	33	7	28	10	204	33	67	0	196
5	173	0	160	786	286	185	0	574	859	235	576	62	541	78	10	44	14	275	65	82	0	151
6	313	0	232	730	331	408	573	0	619	265	644	113	598	133	24	122	32	578	102	130	0	316
7	256	0	190	438	286	554	723	486	0	253	742	171	507	148	25	355	107	153	40	109	1	281
8	66	0	60	246	106	132	232	305	343	0	355	101	421	108	23	220	90	61	6	31	6	64
9	82	0	95	318	210	335	531	594	841	425	0	260	926	313	59	557	260	196	30	168	108	371
10	14	0	4	49	25	38	75	149	255	136	477	0	87	56	12	50	33	21	3	17	12	45
11	208	0	85	252	156	310	529	561	542	405	1054	95	0	250	77	616	253	301	42	236	269	1657
12	147	0	46	124	14	27	70	129	165	211	330	52	278	0	114	1022	484	257	36	193	145	702
13	41	0	15	28	5	4	6	14	19	15	361	8	63	75	0	112	96	124	19	68	50	284
14	117	0	44	109	17	21	36	93	255	157	373	93	479	840	108	0	377	468	57	184	151	785
15	49	0	18	33	5	8	10	20	108	78	270	31	738	466	119	254	0	680	51	99	226	315
16	1498	0	242	620	90	126	210	406	137	59	218	25	315	494	150	502	527	0	164	1345	1214	8100
17	808	0	329	1400	51	29	72	115	50	6	30	3	36	29	64	34	32	108	2	1347	590	1773
18	700	0	171	744	39	49	85	120	109	33	216	22	265	233	96	457	118	1761	896	0	252	4280
18A	1	0	0	1	75	0	0	1	2	9	138	16	297	178	65	180	211	1632	454	148	0	5
19	1738	0	708	1420	90	74	133	240	250	51	316	46	1473	692	274	863	325	10702	1633	4042	4	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	14	35	4	6	5	13	3	1	1	0	2	3	3	2	1	16	17	11	0	14
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	40	4	2	24	10	2	1	1	0	2	2	1	1	1	11	12	5	0	8
3	34	0	35	0	46	25	136	174	48	31	34	4	101	20	5	19	8	129	76	22	0	21
4	4	0	4	44	0	4	17	16	20	4	3	1	7	1	3	1	1	17	6	1	0	1
4A	2	0	2	23	3	0	12	25	16	5	6	1	10	3	0	1	0	7	1	1	0	0
5	5	0	7	159	22	10	0	63	52	16	24	4	46	11	1	7	3	63	13	6	0	3
6	14	0	13	152	20	38	65	0	33	35	58	9	151	21	3	30	10	197	31	11	0	14
7	4	0	3	35	6	14	26	20	0	14	34	10	60	16	2	26	27	13	3	6	0	2
8	1	0	1	32	7	6	18	39	25	0	10	4	20	5	1	5	9	5	0	1	0	0
9	1	0	1	34	4	5	16	51	36	13	0	17	71	19	4	20	36	14	1	3	1	1
10	0	0	0	6	1	2	3	14	13	5	10	0	3	2	0	3	3	2	0	1	1	1
11	3	0	3	94	5	9	47	152	63	19	65	4	0	16	5	42	50	35	3	11	4	10
12	2	0	2	18	1	2	7	20	18	15	19	1	24	0	2	35	45	12	1	10	3	16
13	4	0	1	4	0	0	1	2	1	0	19	0	3	1	0	2	6	6	1	2	2	18
14	2	0	1	16	1	1	5	25	21	4	19	5	44	25	3	0	32	16	1	6	3	10
15	1	0	1	4	0	0	1	5	18	7	25	2	76	35	6	20	0	9	2	2	3	5
16	20	0	9	98	16	6	50	178	16	5	17	2	35	25	7	17	12	0	7	31	18	140
17	27	0	10	81	6	1	12	30	4	0	1	0	3	2	3	2	2	6	0	43	15	43
18	7	0	3	43	1	1	4	9	4	1	3	1	8	8	4	19	4	34	21	0	3	56
18A	0	0	0	0	5	0	0	0	0	0	1	1	2	3	3	2	13	13	8	2	0	0
19	25	0	6	26	1	0	3	9	2	0	1	1	9	11	26	15	9	142	40	79	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	5	10	1	5	4	4	1	0	1	0	4	3	2	2	1	10	8	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	8	0	0	16	2	2	23	4	1	0	1	0	1	1	0	2	0	4	10	2	0	6
3	18	0	16	0	41	15	135	293	43	37	44	9	283	29	3	35	14	207	108	21	0	42
4	3	0	3	37	0	2	19	12	19	2	2	1	11	1	1	1	1	15	3	1	0	1
4A	1	0	6	18	2	0	11	23	19	2	11	1	16	2	0	0	0	4	1	1	0	0
5	3	0	5	128	15	9	0	66	35	18	17	4	74	6	0	4	2	65	5	3	0	2
6	5	0	7	247	13	23	76	0	20	56	59	8	297	22	4	51	18	553	18	9	0	4
7	1	0	1	38	4	8	20	30	0	11	22	3	50	10	2	17	24	20	1	1	0	2
8	0	0	1	40	3	4	18	59	19	0	11	5	18	2	1	4	9	7	0	0	0	0
9	1	0	1	49	2	6	19	60	31	11	0	15	92	28	3	25	55	19	1	8	1	1
10	0	0	1	9	1	2	5	12	7	5	12	0	7	4	1	5	2	3	1	1	0	1
11	3	0	3	248	6	15	72	314	60	23	74	5	0	22	8	63	74	55	4	10	4	10
12	1	0	1	27	1	1	4	18	9	13	16	2	23	0	2	23	40	14	2	6	2	11
13	2	0	0	3	0	0	0	3	1	0	21	0	4	1	0	2	6	5	1	4	1	7
14	1	0	1	39	1	0	4	34	11	4	14	6	53	23	4	0	18	17	1	5	2	3
15	0	0	1	13	1	0	1	11	23	7	30	3	98	31	11	18	0	16	1	6	3	3
16	14	0	5	192	12	3	57	499	27	7	18	3	64	29	8	19	16	0	7	22	10	235
17	7	0	5	69	3	1	5	15	3	0	1	0	4	3	4	1	4	8	0	20	6	21
18	3	0	1	75	1	0	3	6	1	1	3	0	9	5	4	19	5	18	15	0	2	29
18A	0	0	0	0	5	0	0	0	0	0	1	0	2	1	1	2	17	7	7	1	0	0
19	7	0	2	13	0	0	2	3	1	0	1	0	12	20	12	6	3	227	43	34	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	17	4	2	1	1	0	0	0	0	1	1	0	2	3	15	30	21	0	8
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	20	0	0	95	8	1	13	1	0	0	1	0	0	0	0	1	1	2	8	8	0	10
3	35	0	198	0	32	7	75	160	23	18	32	2	139	13	1	18	6	96	60	8	0	24
4	6	0	17	27	0	2	10	7	9	1	1	0	4	0	0	1	0	6	1	1	0	4
4A	0	0	1	8	1	0	5	13	3	6	2	1	4	0	0	0	0	2	0	0	0	1
5	1	0	4	79	12	4	0	52	17	8	10	2	29	1	0	2	1	26	3	1	0	1
6	1	0	2	103	6	16	65	0	9	29	37	3	179	8	2	10	7	364	20	2	0	0
7	0	0	1	25	3	6	23	11	0	4	10	2	22	5	1	6	13	7	1	1	0	0
8	0	0	1	22	2	2	10	33	8	0	17	3	10	2	0	1	3	3	0	0	0	0
9	0	0	1	41	2	2	13	30	12	8	0	6	38	7	1	16	27	17	1	4	0	0
10	0	0	0	3	0	0	2	6	3	3	6	0	6	6	2	3	2	3	0	1	1	0
11	1	0	1	145	2	4	26	183	29	10	45	3	0	15	10	29	43	30	1	4	1	2
12	0	0	0	17	0	0	1	13	3	8	7	1	12	0	1	7	14	6	0	2	0	0
13	0	0	0	1	0	0	0	1	0	0	11	1	3	4	0	6	4	2	1	1	1	0
14	2	0	1	21	1	1	1	8	5	1	9	3	17	9	3	0	12	23	5	3	3	3
15	1	0	0	6	0	0	0	2	5	3	9	1	48	12	3	6	0	10	3	1	2	1
16	9	0	2	85	6	1	27	346	7	6	15	2	48	15	2	18	10	0	6	11	11	51
17	33	0	6	40	2	1	4	9	1	0	1	0	2	1	2	4	5	5	0	31	43	54
18	14	0	3	42	1	0	1	1	0	0	2	0	3	2	0	9	1	6	14	0	4	30
18A	0	0	0	0	3	0	0	0	0	0	0	0	0	0	0	3	9	10	16	2	0	0
19	35	0	4	8	12	0	1	0	0	0	0	0	1	2	0	2	3	43	63	39	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	46	8	7	3	5	7	0	3	2	28	3	0	2	3	27	8	20	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	86	9	1	35	5	9	3	5	0	20	2	0	2	3	14	12	3	0	1
3	71	0	173	0	72	15	172	263	97	42	92	14	566	56	5	32	9	261	72	22	0	20
4	15	0	21	43	0	2	18	12	49	2	9	0	23	1	0	1	1	15	1	1	0	7
4A	0	0	1	12	1	0	6	7	22	3	9	0	10	1	0	0	0	4	0	0	0	0
5	1	0	2	137	7	4	0	58	60	24	41	6	81	6	0	3	3	60	3	2	0	0
6	7	0	10	176	8	16	65	0	25	23	93	4	190	16	2	11	14	607	6	8	0	1
7	5	0	11	91	17	37	58	17	0	16	40	4	46	14	2	8	83	68	3	4	0	2
8	1	0	2	28	1	4	28	20	14	0	13	2	21	2	0	2	8	7	0	0	0	3
9	1	0	6	91	13	23	55	80	50	9	0	15	292	27	12	46	92	37	3	13	1	1
10	4	0	0	7	0	0	11	9	13	2	20	0	35	19	7	6	5	15	3	9	7	12
11	39	0	31	501	29	15	123	280	72	25	271	16	0	51	35	78	122	110	16	40	16	26
12	1	0	1	40	1	1	4	14	13	13	20	5	29	0	1	12	34	14	2	6	1	1
13	0	0	0	3	0	0	0	1	1	0	41	1	8	1	0	1	4	4	0	2	0	0
14	6	0	1	26	0	0	2	10	8	2	25	6	43	14	4	0	14	19	25	7	5	6
15	0	0	1	8	0	0	1	5	25	4	49	3	158	28	4	10	0	6	1	2	4	0
16	47	0	27	226	19	4	70	683	102	8	61	12	130	56	4	20	11	0	10	30	23	77
17	7	0	10	28	1	0	2	5	6	0	2	3	9	3	3	7	1	8	0	43	13	9
18	23	0	4	135	1	0	2	5	6	1	13	2	30	10	3	23	1	21	38	0	5	69
18A	0	0	0	0	9	0	0	0	0	0	2	1	7	2	0	4	27	8	7	1	0	0
19	5	0	1	12	0	0	2	1	3	1	2	2	13	2	0	2	1	93	9	39	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	101	211	42	108	49	84	51	20	17	3	21	54	8	23	5	257	367	301	0	323
1A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
2	146	0	0	139	22	52	43	63	39	15	15	0	8	10	2	6	2	33	90	45	0	224
3	205	0	285	0	93	258	303	267	126	87	85	12	37	35	4	13	2	141	526	105	0	430
4	27	0	30	52	0	60	94	80	50	29	31	6	12	1	1	2	0	9	16	7	0	26
4A	25	0	35	80	51	0	41	91	110	29	51	7	24	3	0	1	1	11	8	9	0	13
5	53	0	76	177	158	81	0	171	189	80	119	21	69	14	0	5	1	33	24	24	0	40
6	63	0	65	145	125	135	205	0	101	100	158	46	121	29	1	13	3	51	35	24	0	52
7	63	0	64	95	129	216	329	216	0	109	256	92	138	44	1	27	29	10	12	25	0	56
8	8	0	16	43	37	47	73	68	51	0	143	46	86	24	2	15	11	5	1	5	1	9
9	14	0	34	91	93	136	200	208	205	93	0	167	324	103	5	57	77	33	8	56	35	70
10	1	0	1	5	5	6	12	20	28	25	57	0	16	11	1	6	3	3	1	2	2	5
11	26	0	10	57	29	41	91	135	120	105	262	12	0	50	8	85	117	33	8	42	38	188
12	28	0	10	22	3	7	18	33	34	38	95	12	35	0	9	187	99	56	7	51	41	165
13	15	0	7	11	2	2	3	8	6	8	22	2	19	31	0	26	37	39	4	33	23	110
14	42	0	12	29	4	6	10	28	90	61	202	11	200	391	21	0	54	134	9	78	59	344
15	14	0	4	5	1	2	2	3	15	22	52	6	49	156	14	89	0	140	8	37	30	129
16	477	0	87	309	28	42	62	136	20	11	29	3	41	64	15	98	192	2	30	544	432	4055
17	135	0	43	278	8	6	10	15	4	1	2	0	3	4	1	3	2	14	0	216	103	282
18	171	0	45	70	11	18	18	27	18	6	30	3	32	54	11	35	15	316	441	0	13	1554
18A	0	0	0	0	0	0	0	0	0	0	13	1	20	28	6	20	8	160	140	15	0	0
19	381	0	292	482	36	72	34	64	40	13	68	7	182	207	68	164	34	1773	643	1877	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	17	1	1	2	6	2	0	0	0	1	0	0	0	0	6	15	2	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	6	0	0	17	1	0	2	6	1	0	0	0	0	0	0	0	0	2	2	1	0	2
3	11	0	17	0	15	7	60	56	10	10	7	1	15	7	1	4	1	25	31	2	0	8
4	1	0	0	20	0	1	7	7	1	4	1	0	1	0	0	0	0	4	2	0	0	0
4A	0	0	0	6	0	0	2	14	4	2	1	0	2	0	0	0	0	1	0	0	0	0
5	0	0	1	46	3	2	0	18	6	6	3	1	10	2	0	1	0	9	4	1	0	0
6	2	0	2	53	2	7	19	0	4	13	11	4	38	6	0	9	0	29	11	1	0	1
7	0	0	0	22	2	9	31	16	0	12	13	4	19	6	0	9	4	1	1	1	0	0
8	0	0	0	9	1	2	5	11	3	0	5	1	4	2	0	1	1	1	0	0	0	0
9	0	0	0	13	1	3	10	22	12	2	0	4	21	9	0	7	7	3	0	0	0	0
10	0	0	0	1	0	0	1	2	2	1	2	0	1	0	0	0	0	0	0	0	0	0
11	0	0	1	14	1	2	9	29	16	3	16	1	0	4	0	10	12	5	0	1	0	1
12	0	0	1	8	0	0	4	7	5	2	7	0	3	0	0	8	11	3	0	2	0	3
13	1	0	0	1	1	0	0	1	1	0	2	0	1	0	0	0	2	3	0	1	2	13
14	0	0	0	7	0	0	3	8	6	1	8	1	11	14	0	0	3	5	0	4	0	8
15	0	0	0	2	0	0	0	0	4	2	8	1	14	15	1	7	0	3	0	0	0	2
16	3	0	4	30	2	1	14	24	1	0	1	0	11	2	1	3	1	0	1	10	4	36
17	2	0	1	26	1	0	4	8	1	0	0	0	0	0	0	0	0	1	0	4	1	8
18	3	0	2	5	0	0	1	4	1	0	1	0	3	4	0	1	0	7	12	0	0	38
18A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	2	0	0	0
19	3	0	3	5	0	0	1	4	0	0	0	0	1	3	6	2	1	33	16	17	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	0	1	2	0	0	0	0	0	0	0	1	0	6	4	1	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	6	2	5	2	3	0	0	1	0	0	0	0	0	0	1	1	0	0	0
3	1	0	2	0	11	3	29	43	6	14	10	2	18	4	0	1	1	25	23	1	0	2
4	0	0	0	16	0	1	6	4	1	2	1	0	1	0	0	0	0	2	1	0	0	0
4A	0	0	1	3	0	0	3	5	1	1	1	0	2	0	0	0	0	0	0	0	0	0
5	0	0	1	44	8	2	0	18	5	9	8	1	18	1	0	0	0	11	1	0	0	0
6	0	0	1	61	1	8	14	0	8	31	22	3	34	4	0	2	1	27	4	2	0	0
7	0	0	0	14	1	11	21	7	0	10	14	2	7	2	0	3	4	1	0	0	0	0
8	0	0	0	9	0	0	7	25	3	0	2	1	4	1	0	1	1	1	0	0	0	0
9	0	0	1	11	0	7	6	22	7	2	0	3	31	6	0	4	12	2	0	0	0	0
10	0	0	0	2	0	0	1	1	1	2	3	0	1	0	0	2	1	0	0	0	0	0
11	0	0	0	14	1	3	4	22	10	2	43	0	0	2	0	5	8	3	1	1	0	1
12	0	0	0	5	0	0	2	6	3	0	14	1	6	0	0	9	11	2	0	1	0	3
13	0	0	0	1	0	0	0	0	0	0	1	0	2	0	0	1	6	5	0	1	0	5
14	0	0	0	11	0	0	1	12	6	1	12	2	18	9	0	0	8	3	0	2	0	2
15	0	0	0	2	0	0	0	1	2	2	20	0	15	9	1	4	0	1	0	0	0	0
16	2	0	1	28	1	0	9	28	1	0	1	1	5	2	1	3	3	0	1	3	1	103
17	0	0	1	17	0	0	1	3	0	0	0	0	0	0	0	0	0	1	0	3	1	1
18	1	0	1	3	0	0	1	4	0	0	4	0	2	1	1	1	1	8	6	0	0	19
18A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	2	1	0	0	0
19	4	0	2	4	0	0	1	1	0	0	0	0	1	2	2	1	0	132	6	14	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	13	20	3	0	0	0	0	0	0	0	0	0	0	1	0	4	18	5	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	155	10	0	1	0	0	1	0	0	0	0	0	0	0	0	2	0	0	0
3	4	0	50	0	8	1	21	13	5	10	9	1	5	8	0	2	1	10	10	0	0	2
4	2	0	2	18	0	0	8	2	1	1	1	0	0	0	0	0	0	1	0	0	0	1
4A	0	0	0	2	1	0	1	4	2	1	1	0	1	0	0	1	0	0	0	0	0	0
5	0	0	0	24	2	0	0	22	6	5	6	1	2	0	0	0	0	4	1	0	0	0
6	0	0	0	29	1	5	18	0	2	18	10	2	11	1	0	0	0	8	3	0	0	0
7	0	0	0	7	0	1	6	3	0	3	3	0	3	0	0	2	1	0	0	0	0	0
8	0	0	0	4	0	3	3	14	1	0	2	1	2	1	0	0	0	0	0	0	0	0
9	0	0	0	13	0	1	2	6	3	9	0	3	20	2	0	4	3	2	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	5	0	0	3	7	4	1	16	1	0	2	1	3	3	2	0	0	0	0
12	0	0	0	2	0	0	0	2	2	0	3	2	4	0	3	4	2	1	0	0	0	0
13	0	0	0	0	0	0	0	0	0	0	1	1	5	0	0	1	1	0	0	0	0	0
14	0	0	0	10	0	0	1	1	1	0	10	2	10	2	3	0	2	4	2	1	1	0
15	1	0	0	1	0	0	0	0	1	0	8	0	7	4	1	6	0	3	3	0	0	2
16	5	0	0	12	0	0	3	7	0	0	1	2	2	1	1	12	3	0	2	1	4	4
17	10	0	1	9	0	0	0	1	0	0	0	0	0	0	0	2	0	1	0	1	5	24
18	9	0	5	3	0	0	1	0	0	0	2	0	1	1	0	1	0	4	3	0	0	18
18A	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	4	12	0	0	0
19	2	0	6	5	1	0	0	0	0	0	0	0	1	0	0	1	0	24	34	19	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	10	0	0	1	2	0	0	2	16	0	0	5	0	15	4	10	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	0	0	0	138	17	0	0	5	6	1	3	0	12	0	0	1	0	8	2	1	0	0
3	15	0	40	0	4	2	16	21	15	6	7	1	33	2	1	2	1	30	14	3	0	4
4	4	0	3	35	0	0	2	2	8	0	5	0	9	0	0	0	0	4	0	0	0	0
4A	0	0	0	4	0	0	1	4	12	3	3	0	3	0	0	0	0	0	0	0	0	0
5	0	0	0	53	3	0	0	22	23	19	21	8	28	0	0	0	0	13	0	0	0	0
6	0	0	0	46	1	0	20	0	4	4	7	3	41	1	0	0	0	15	0	0	0	0
7	0	0	0	13	1	4	11	1	0	1	6	2	14	1	0	0	2	1	0	0	0	0
8	0	0	1	11	0	1	15	4	4	0	2	0	6	0	0	0	1	0	0	0	0	0
9	0	0	2	19	0	1	4	8	8	4	0	3	50	3	0	13	15	4	0	1	1	1
10	1	0	0	3	0	0	4	1	1	0	5	0	7	2	0	0	1	6	2	1	0	1
11	1	0	0	20	1	0	3	6	8	2	70	6	0	3	2	4	7	5	3	1	0	0
12	0	0	0	4	0	0	0	2	2	0	7	10	15	0	0	1	3	2	1	1	0	0
13	0	0	0	1	0	0	0	0	1	0	9	2	20	0	0	3	1	0	0	1	0	0
14	0	0	0	7	0	0	0	1	2	0	28	3	34	2	1	0	3	4	7	2	1	0
15	0	0	0	1	0	0	0	1	2	0	15	1	19	4	1	3	0	1	0	0	0	0
16	1	0	1	22	0	0	3	9	2	0	1	9	18	2	0	5	0	0	2	4	1	2
17	2	0	0	12	0	0	0	0	2	0	1	1	10	0	0	24	0	1	0	6	2	2
18	8	0	0	3	0	0	0	1	1	0	1	2	9	1	0	1	0	8	8	0	0	24
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	4	1	0	0	0	0	3	0	5	11	0	0	3	0	16	3	45	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	222491	307796	1.38

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.

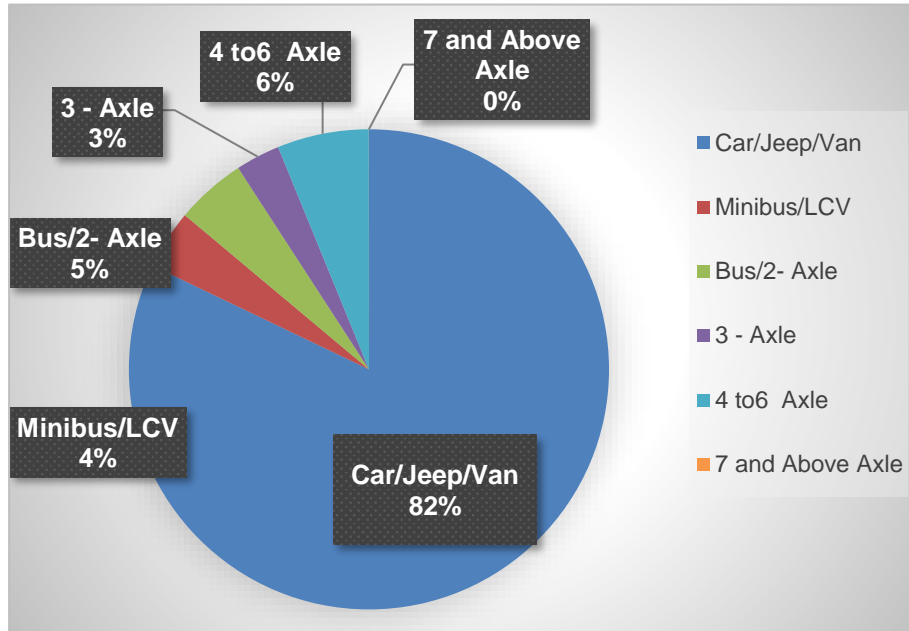


Figure 3-1 : Model Split of Tollable Vehicle

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 /Mancherial. 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.

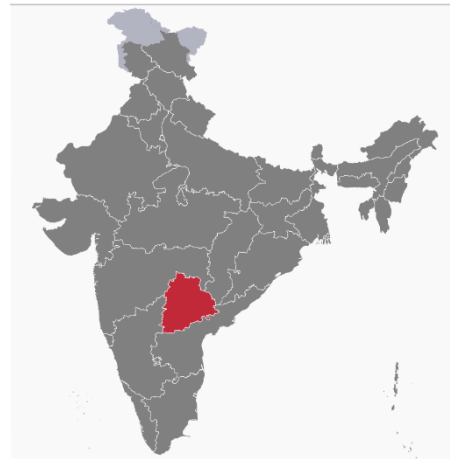
Telangana State



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.

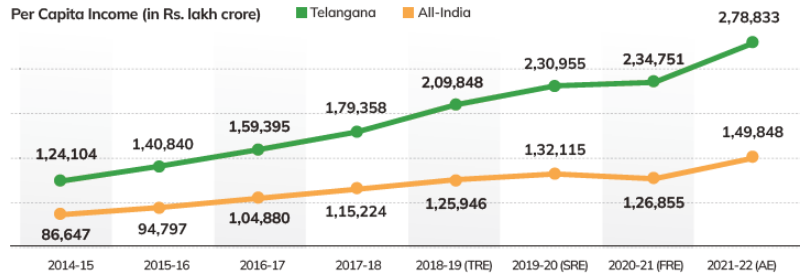


Growth of IT Sector

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 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.

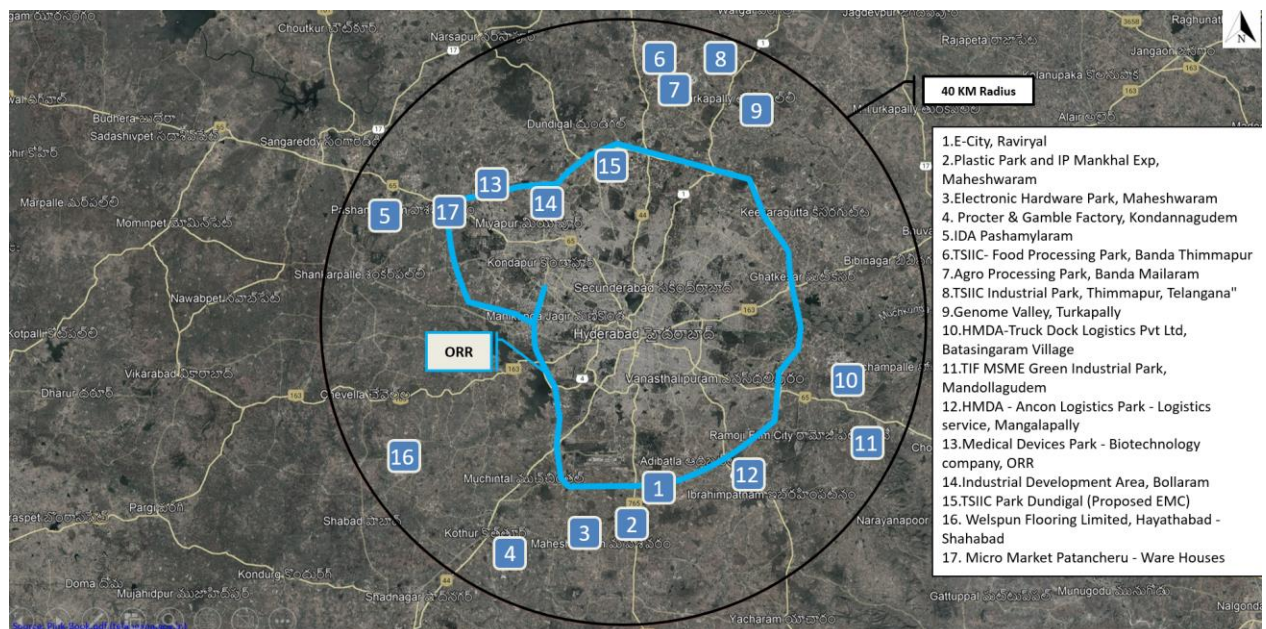
Telangana is the leading contributor of Pharma Exports from the Country since 2015-16 (28% share in FY 2020-21)

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

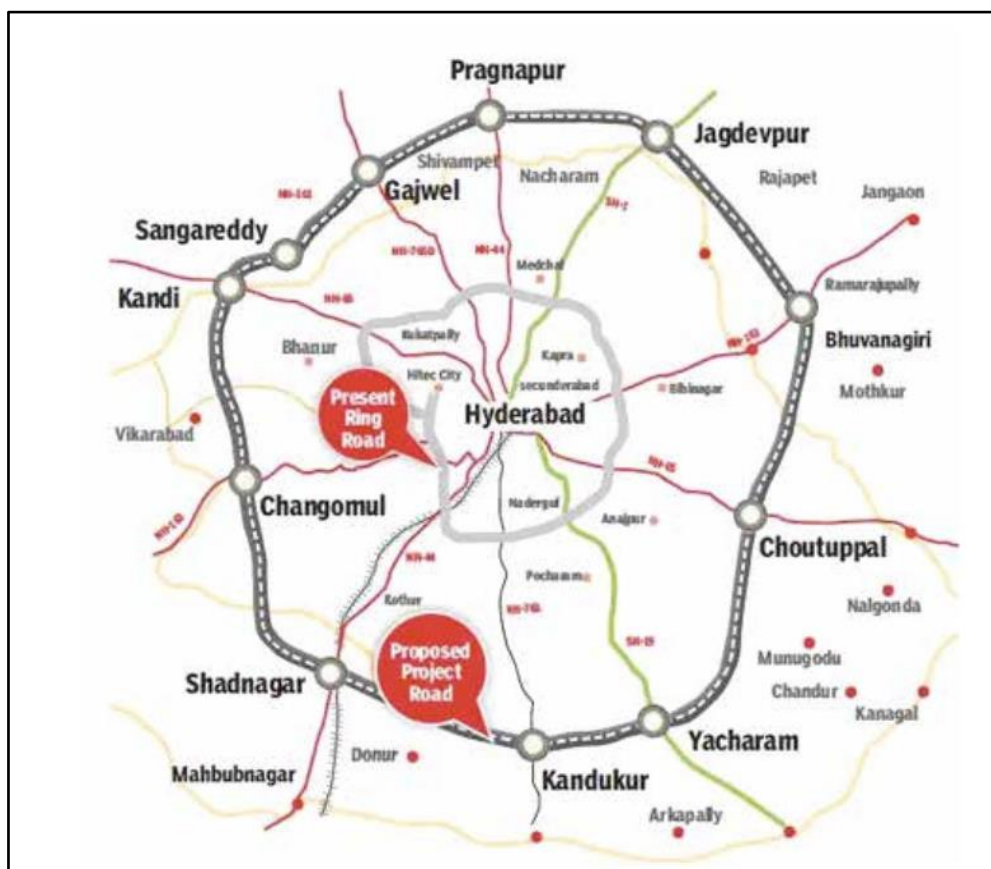
There is considerable industrial development on peripheries of Hyderabad as well. ORR being a fast connectivity has provided boost to such development. Following figure marks such developments on periphery of Hyderabad.



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)

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:

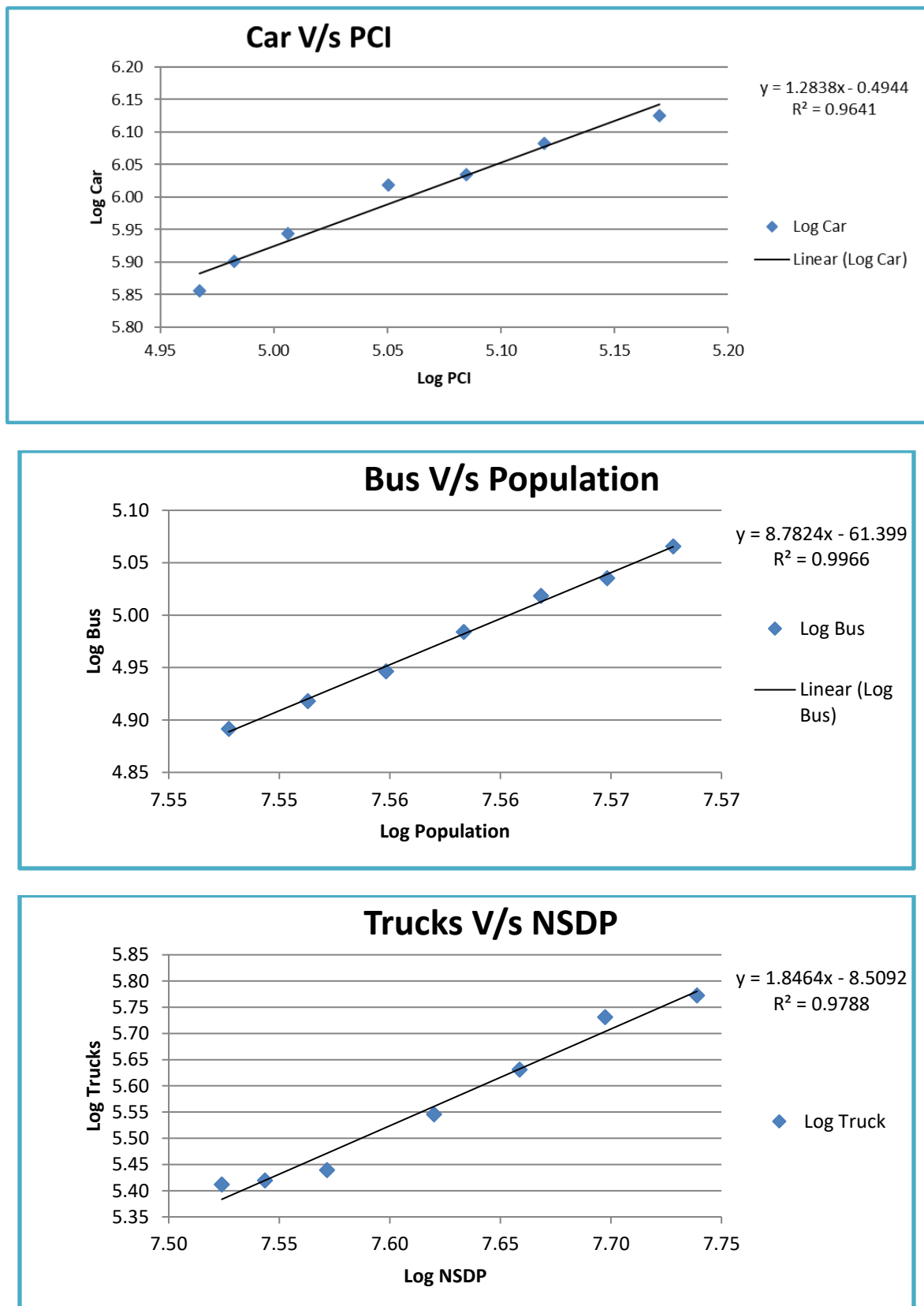


Figure 4-1: Elasticity by Graphical Extrapolation for Telangana

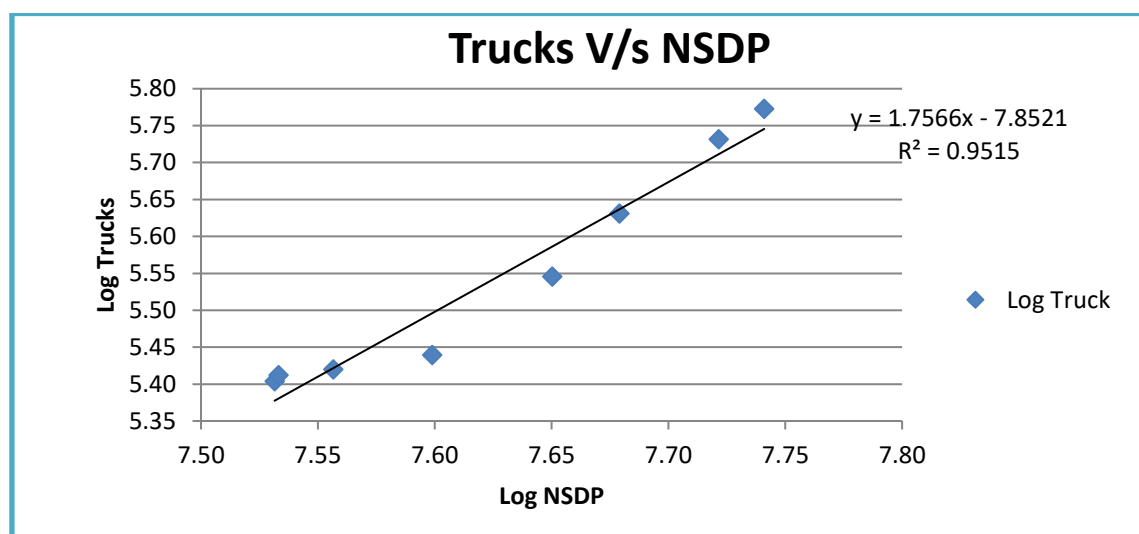
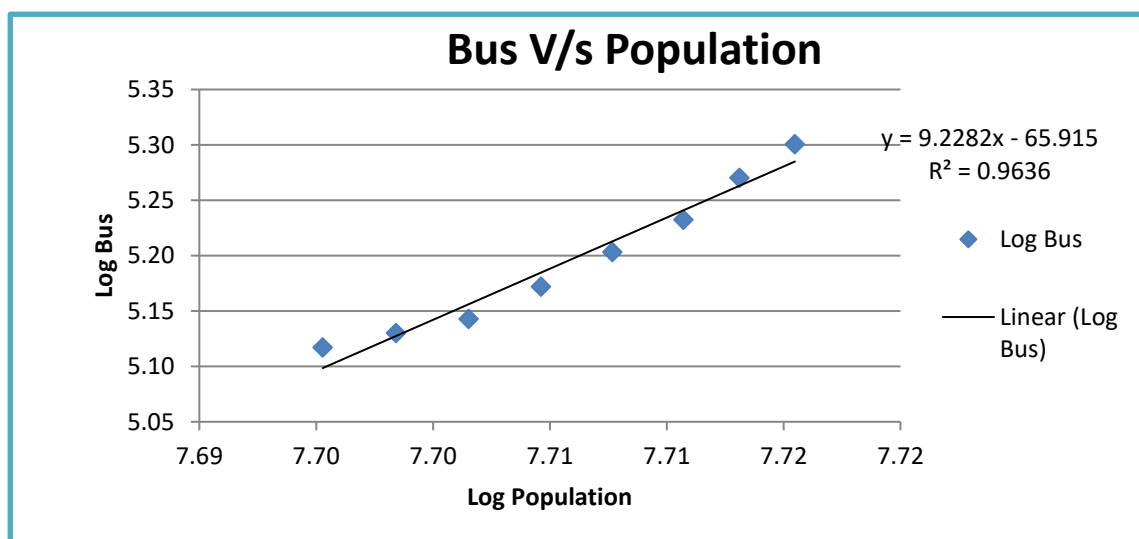
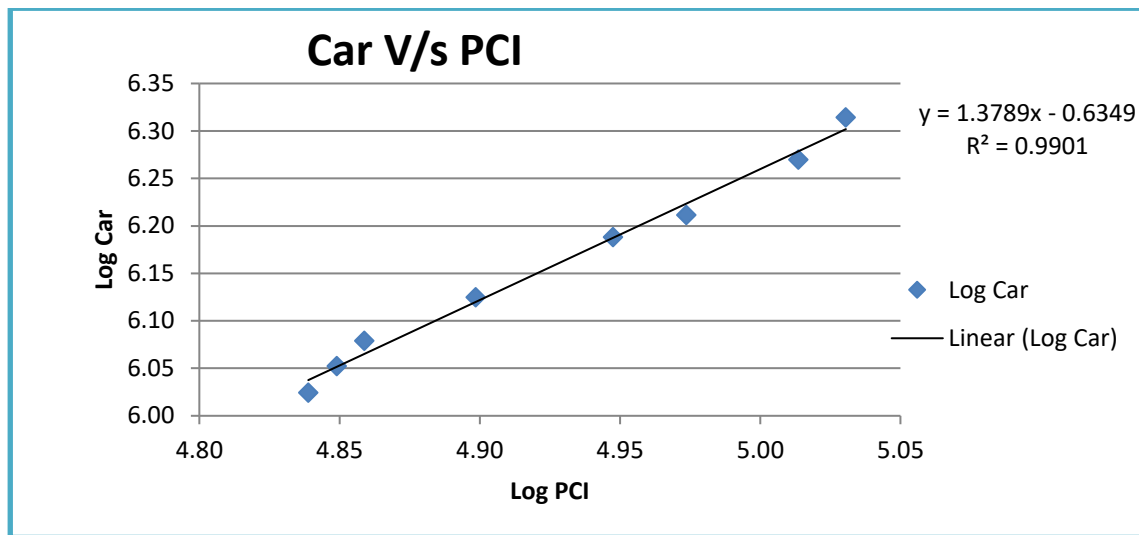


Figure 4-2: Elasticity by Graphical Extrapolation for Andhra Pradesh

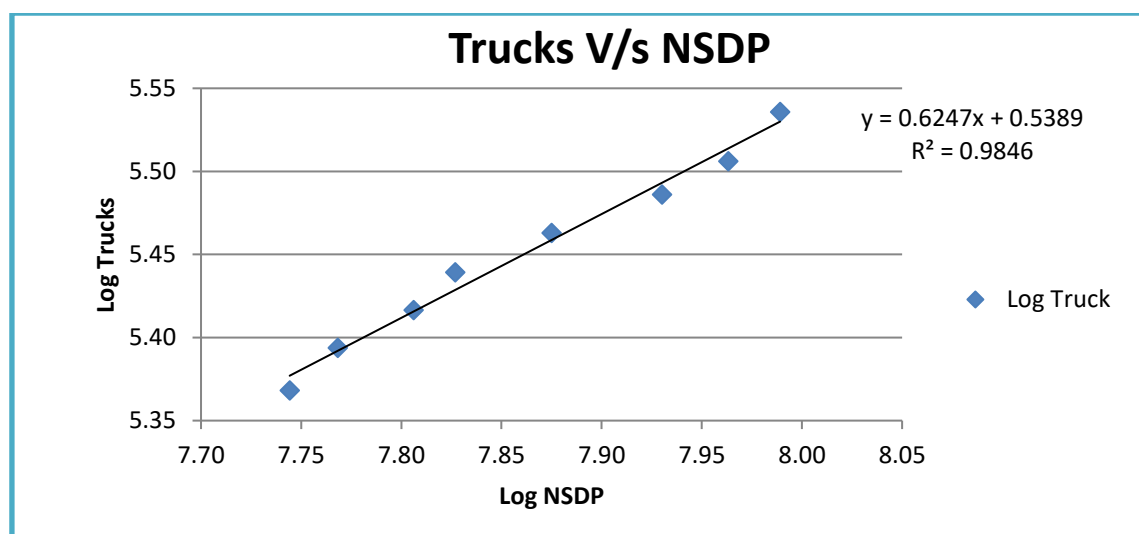
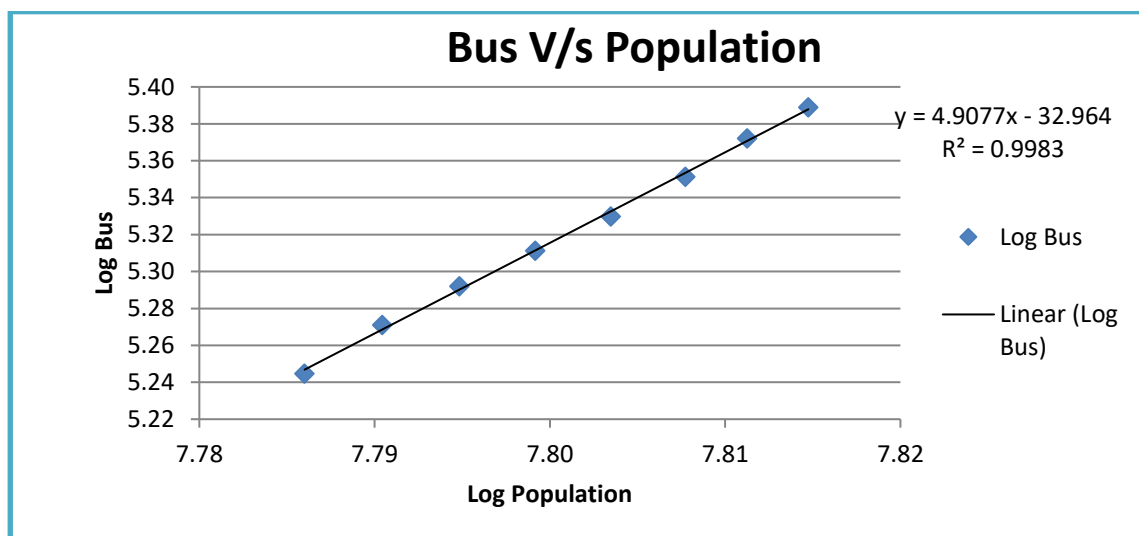
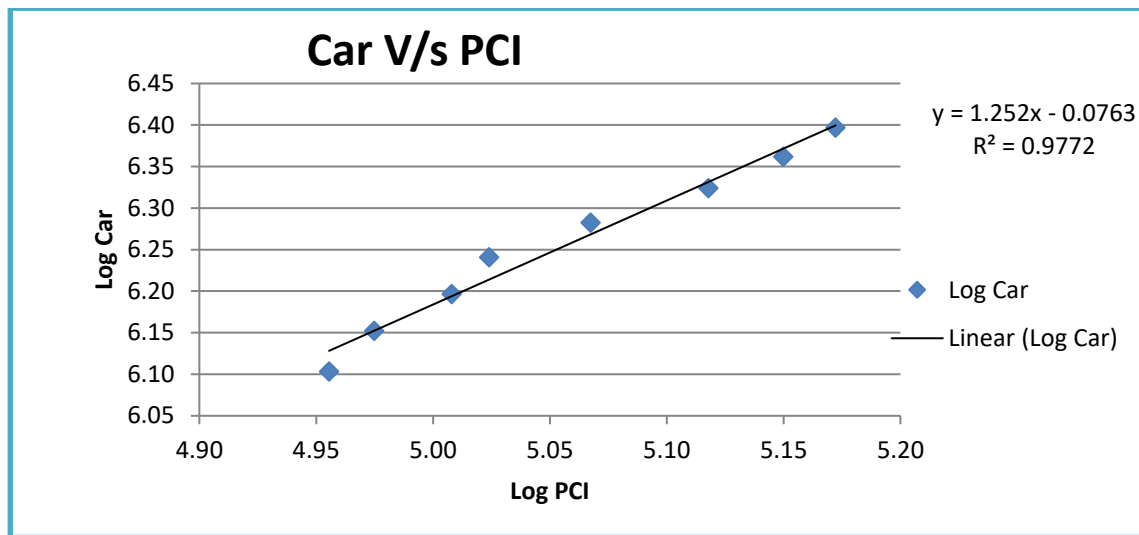


Figure 4-3: Elasticity by Graphical Extrapolation for Karnataka

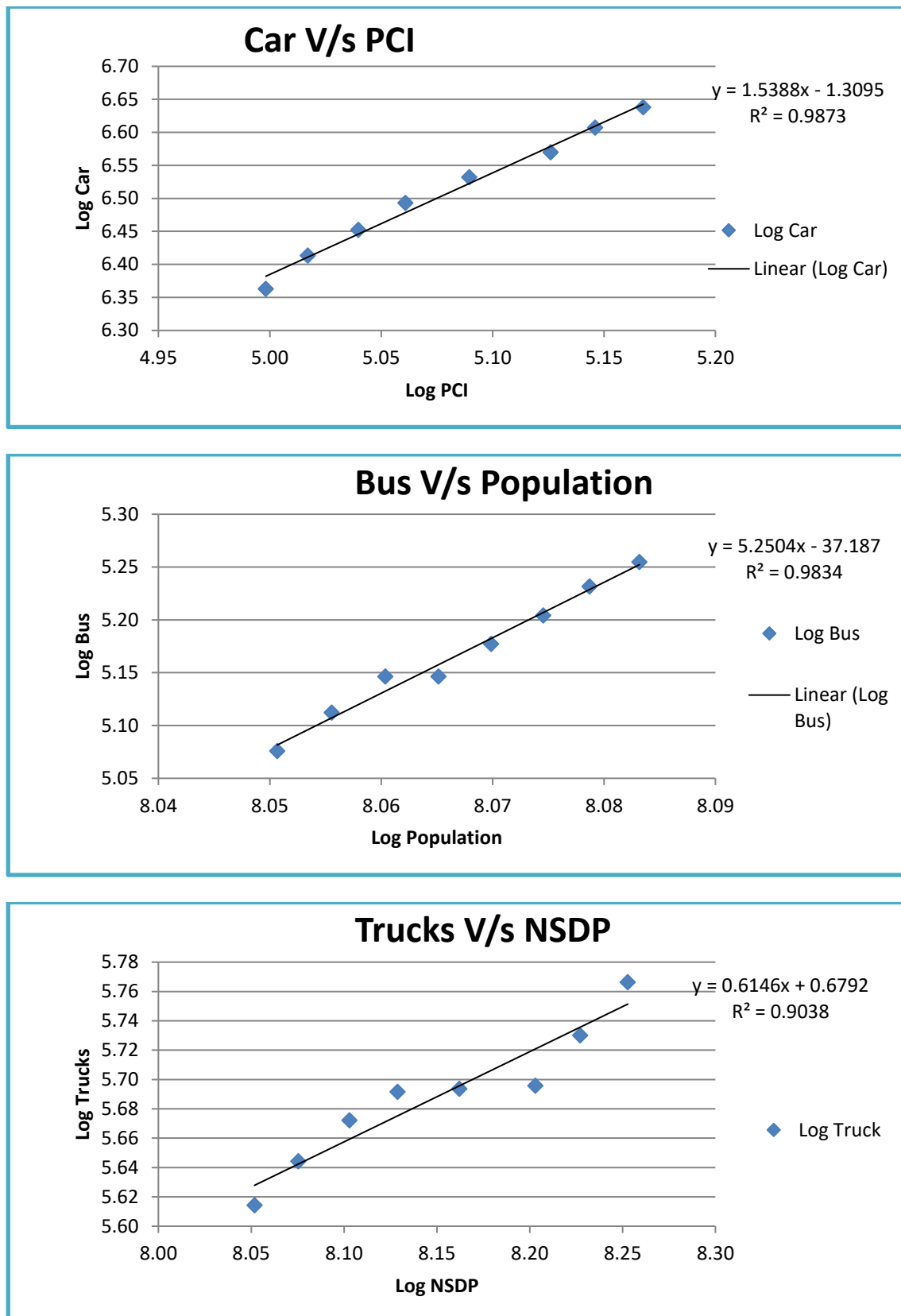


Figure 4-4: Elasticity by Graphical Extrapolation for Maharashtra

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.

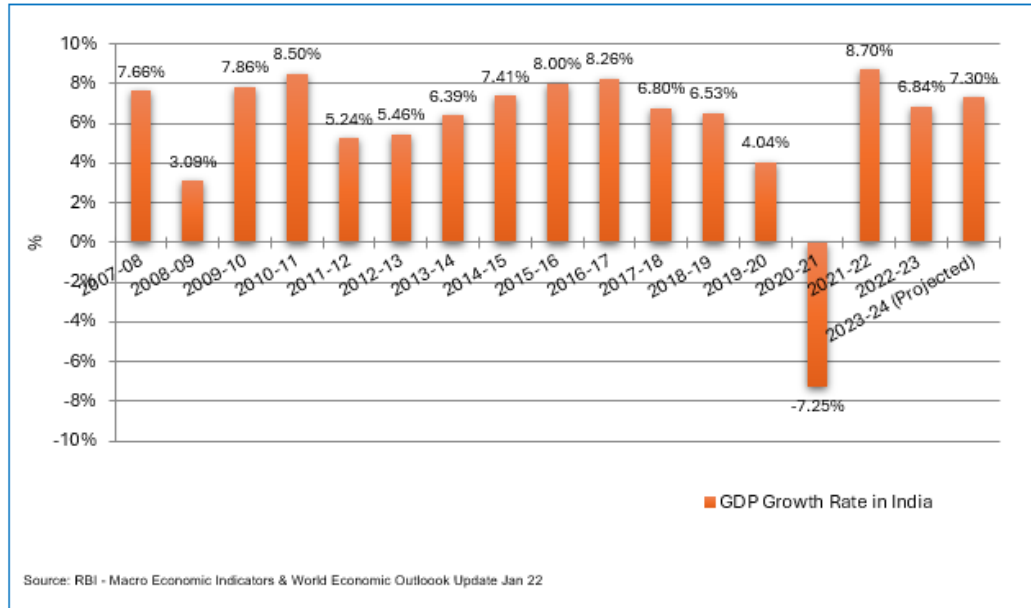


Figure 4-5 : Growth of GDP in India

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	2025-2028	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	2025-2028	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	2025-2028	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%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 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 12th 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 2/3rd 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 12th 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	Taramtipet	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
Taramtipet	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
1	0	10	40	80	110	130	150	190	220	270	280	250	220	180	150	130	100	70	40	30	10	30
1A	10	0	40	70	100	130	150	180	220	260	290	250	230	180	160	140	100	80	50	40	20	30
2	40	40	0	30	60	90	110	140	180	220	260	290	270	220	190	170	140	120	90	70	60	70
3	80	70	30	0	30	50	80	110	150	190	220	250	280	250	230	210	170	150	120	110	90	100
4	110	100	60	30	0	20	40	80	110	160	190	220	250	290	260	240	210	180	150	140	120	140
4A	130	130	90	50	20	0	20	60	90	140	170	200	230	270	280	260	230	210	170	160	150	160
5	150	150	110	80	40	20	0	40	70	110	150	180	200	250	280	280	250	230	200	180	170	180
6	190	180	140	110	80	60	40	0	30	80	110	140	170	210	240	260	290	260	230	220	200	220
7	220	220	180	150	110	90	70	30	0	40	80	110	130	180	210	230	260	280	270	250	240	250
8	270	260	220	190	160	140	110	80	40	0	30	60	90	140	160	180	210	240	270	280	280	300
9	280	290	260	220	190	170	150	110	80	30	0	30	60	100	130	150	180	210	240	250	270	290
10	250	250	290	250	220	200	180	140	110	60	30	0	30	70	100	120	150	170	210	220	230	260
11	220	230	270	280	250	230	200	170	130	90	60	30	0	50	70	90	120	150	180	190	210	230
12	180	180	220	250	290	270	250	210	180	140	100	70	50	0	30	50	80	100	130	150	160	190
13	150	160	190	230	260	280	280	240	210	160	130	100	70	30	0	20	50	80	110	120	140	160
14	130	140	170	210	240	260	280	260	230	180	150	120	90	50	20	0	30	60	90	100	120	140
15	100	100	140	170	210	230	250	290	260	210	180	150	120	80	50	30	0	20	60	70	80	110
16	70	80	120	150	180	210	230	260	280	240	210	170	150	100	80	60	20	0	30	40	60	80
17	40	50	90	120	150	170	200	230	270	270	240	210	180	130	110	90	60	30	0	10	30	50
18	30	40	70	110	140	160	180	220	250	280	250	220	190	150	120	100	70	40	10	0	20	40
18A	10	20	60	90	120	150	170	200	240	280	270	230	210	160	140	120	80	60	30	20	0	20
19	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
1	0	10	50	80	120	140	160	200	240	280	300	260	240	190	160	140	100	80	50	30	10	30
1A	10	0	40	80	110	130	160	190	230	280	300	270	240	190	170	140	110	80	50	40	20	40
2	50	40	0	30	70	90	120	150	190	240	270	300	280	230	210	180	150	130	90	80	60	80
3	80	80	30	0	30	60	80	120	150	200	240	270	300	270	240	220	190	160	130	110	100	110
4	120	110	70	30	0	20	50	80	120	170	200	240	260	300	270	250	220	190	160	150	130	150
4A	140	130	90	60	20	0	20	60	100	140	180	210	240	290	300	280	240	220	190	170	150	170
5	160	160	120	80	50	20	0	40	70	120	160	190	220	260	290	300	270	240	210	190	180	190
6	200	190	150	120	80	60	40	0	40	80	120	150	180	230	260	280	300	280	250	230	220	230
7	240	230	190	150	120	100	70	40	0	50	80	110	140	190	220	240	270	300	280	270	250	270
8	280	280	240	200	170	140	120	80	50	0	30	70	90	140	170	190	230	250	290	300	300	310
9	300	300	270	240	200	180	160	120	80	30	0	30	60	110	140	160	190	220	250	260	280	310
10	260	270	300	270	240	210	190	150	110	70	30	0	30	80	110	130	160	190	220	230	250	270
11	240	240	280	300	260	240	220	180	140	90	60	30	0	50	80	100	130	160	190	200	220	250
12	190	190	230	270	300	290	260	230	190	140	110	80	50	0	30	50	80	110	140	160	170	200
13	160	170	210	240	270	300	290	260	220	170	140	110	80	30	0	20	60	80	110	130	140	170
14	140	140	180	220	250	280	300	280	240	190	160	130	100	50	20	0	30	60	90	100	120	150
15	100	110	150	190	220	240	270	300	270	230	190	160	130	80	60	30	0	30	60	70	90	110
16	80	80	130	160	190	220	240	280	300	250	220	190	160	110	80	60	30	0	30	50	60	90
17	50	50	90	130	160	190	210	250	280	290	250	220	190	140	110	90	60	30	0	10	30	60
18	30	40	80	110	150	170	190	230	270	300	260	230	200	160	130	100	70	50	10	0	20	40
18A	10	20	60	100	130	150	180	220	250	300	280	250	220	170	140	120	90	60	30	20	0	20
19	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
1	0	10	55	95	135	160	185	230	270	325	340	300	270	215	180	155	120	90	50	35	15	35
1A	10	0	45	85	125	150	180	220	260	315	345	310	275	220	190	165	125	95	60	45	25	40
2	55	45	0	40	80	105	130	175	215	270	310	345	325	270	235	210	175	145	105	90	70	90
3	95	85	40	0	40	65	90	135	175	230	270	305	340	305	275	250	210	185	145	130	110	125
4	135	125	80	40	0	25	55	95	140	190	230	270	300	345	315	290	250	220	185	170	150	165
4A	160	150	105	65	25	0	25	70	110	165	205	240	275	330	340	315	280	250	210	195	175	195
5	185	180	130	90	55	25	0	45	85	140	180	215	245	305	335	340	305	275	240	220	205	220
6	230	220	175	135	95	70	45	0	40	95	135	170	205	260	290	315	350	320	280	265	245	265
7	270	260	215	175	140	110	85	40	0	55	95	130	165	220	250	275	315	345	320	305	285	305
8	325	315	270	230	190	165	140	95	55	0	40	75	110	165	195	220	260	290	325	340	340	360
9	340	345	310	270	230	205	180	135	95	40	0	35	70	125	160	185	220	250	285	300	320	350
10	300	310	345	305	270	240	215	170	130	75	35	0	30	90	120	145	185	210	250	265	285	315
11	270	275	325	340	300	275	245	205	165	110	70	30	0	55	90	115	150	180	220	235	255	280
12	215	220	270	305	345	330	305	260	220	165	125	90	55	0	30	60	95	125	160	175	195	225
13	180	190	235	275	315	340	335	290	250	195	160	120	90	30	0	25	65	90	130	145	165	195
14	155	165	210	250	290	315	340	315	275	220	185	145	115	60	25	0	40	65	105	120	140	170
15	120	125	175	210	250	280	305	350	315	260	220	185	150	95	65	40	0	30	65	80	100	130
16	90	95	145	185	220	250	275	320	345	290	250	210	180	125	90	65	30	0	40	55	75	100
17	50	60	105	145	185	210	240	280	320	325	285	250	220	160	130	105	65	40	0	15	35	65
18	35	45	90	130	170	195	220	265	305	340	300	265	235	175	145	120	80	55	15	0	20	50
18A	15	25	70	110	150	175	205	245	285	340	320	285	255	195	165	140	100	75	35	20	0	30
19	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)
2024-25	183173	8933	10448	6560	13369	8	222491	307796
2025-26	199312	9523	10974	6954	14176	0	240939	331173
2026-27	215872	10079	11434	7326	14960	0	259671	354591
2027-28	233800	10662	11917	7711	15783	0	279873	379701
2028-29	246486	11097	12136	7907	16203	0	293829	396174
2029-30	259861	11545	12358	8105	16633	0	308502	413416
2030-31	273958	12007	12580	8310	17074	0	323929	431472
2031-32	288820	12490	12803	8516	17524	0	340153	450370
2032-33	304484	12994	13031	8726	17981	0	357216	470161
2033-34	315534	13473	13151	8844	18251	0	369253	483858
2034-35	326980	13971	13271	8962	18526	0	381710	498003
2035-36	338847	14482	13393	9081	18804	0	394607	512610
2036-37	351163	15014	13516	9201	19085	0	407979	527718
2037-38	363915	15562	13640	9322	19367	0	421806	543296

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	374005	16082	13715	9398	19544	0	432744	555415
2039-40	384369	16615	13790	9475	19721	0	443970	567831
2040-41	395017	17163	13865	9552	19901	0	455498	580567
2041-42	405965	17725	13940	9631	20083	0	467344	593639
2042-43	417204	18308	14015	9710	20267	0	479504	607043
2043-44	425619	18856	14043	9739	20356	0	488613	616851
2044-45	434203	19411	14071	9769	20445	0	497899	626842
2045-46	442958	19978	14099	9799	20535	0	507369	637027
2046-47	451882	20559	14127	9829	20626	0	517023	647406
2047-48	460984	21157	14155	9859	20717	0	526872	657988
2048-49	467280	21715	14155	9863	20727	0	533740	665178
2049-50	473654	22280	14155	9867	20737	0	540693	672457
2050-51	480109	22860	14155	9871	20747	0	547742	679839
2051-52	486648	23448	14155	9875	20757	0	554883	687317
2052-53	493277	24051	14155	9879	20767	0	562129	694907
2053-54	499775	24669	14155	9883	20777	0	569259	702389

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	183173	8933	10448	6560	13369	8	222491	307796
2025-26	199776	9543	10998	6970	14220	0	241507	331985
2026-27	216882	10135	11498	7354	15040	0	260909	356321
2027-28	235438	10760	12023	7754	15903	0	281878	382473
2028-29	248811	11217	12274	7967	16366	0	296635	400007

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	262937	11697	12528	8186	16842	0	312190	418414
2030-31	277857	12195	12785	8410	17325	0	328572	437697
2031-32	293621	12714	13047	8638	17816	0	345836	457919
2032-33	310283	13254	13316	8867	18320	0	364040	479153
2033-34	322328	13773	13469	9012	18644	0	377226	494329
2034-35	334845	14311	13624	9161	18975	0	390916	510054
2035-36	347852	14861	13779	9311	19308	0	405111	526300
2036-37	361347	15438	13937	9461	19644	0	419827	543096
2037-38	375377	16035	14097	9611	19984	0	435104	560482
2038-39	386715	16604	14210	9718	20232	0	447479	574449
2039-40	398397	17190	14324	9826	20481	0	460218	588797
2040-41	410432	17789	14438	9936	20736	0	473331	603550
2041-42	422835	18407	14552	10046	20991	0	486831	618699
2042-43	435611	19047	14666	10156	21247	0	500727	634259
2043-44	445482	19652	14731	10214	21388	0	511467	646041
2044-45	455585	20270	14796	10274	21529	0	522454	658081
2045-46	465893	20907	14861	10334	21671	0	533666	670358
2046-47	476434	21566	14926	10394	21816	0	545136	682915
2047-48	487223	22251	14991	10454	21962	0	556881	695764
2048-49	495082	22881	15012	10475	22026	0	565476	704982
2049-50	503073	23528	15033	10496	22090	0	574220	714357
2050-51	511199	24193	15054	10517	22156	0	583119	723904
2051-52	519454	24882	15075	10538	22222	0	592171	733615
2052-53	527838	25586	15096	10559	22288	0	601367	743478
2053-54	536072	26311	15117	10580	22354	0	610434	753223

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	183173	8933	10448	6560	13369	8	222491	307796
2025-26	200232	9570	11028	6985	14254	0	242069	332769
2026-27	217865	10187	11561	7382	15105	0	262100	357947
2027-28	237060	10834	12115	7799	16000	0	283808	385053
2028-29	251116	11332	12406	8033	16503	0	299390	403695
2029-30	265999	11846	12702	8272	17020	0	315839	423280
2030-31	281754	12383	13005	8515	17551	0	333208	443868
2031-32	298447	12945	13318	8765	18101	0	351576	465568
2032-33	316112	13534	13637	9019	18668	0	370970	488387
2033-34	329183	14097	13840	9188	19044	0	385352	505111
2034-35	342792	14686	14048	9360	19428	0	400314	522471
2035-36	356955	15289	14258	9535	19819	0	415856	540453
2036-37	371712	15915	14469	9713	20214	0	432023	559094
2037-38	387060	16565	14681	9893	20619	0	448818	578415
2038-39	399728	17191	14829	10026	20920	0	462694	594220
2039-40	412803	17834	14979	10160	21223	0	476999	610475
2040-41	426308	18503	15130	10294	21533	0	491768	627233
2041-42	440263	19198	15284	10429	21844	0	507018	644497
2042-43	454656	19918	15440	10564	22162	0	522740	662274
2043-44	466085	20603	15545	10658	22374	0	535265	676282
2044-45	477806	21304	15650	10752	22586	0	548098	690605
2045-46	489830	22032	15755	10847	22802	0	561266	705293
2046-47	502161	22779	15862	10944	23020	0	574766	720338
2047-48	514804	23567	15972	11044	23240	0	588627	735783
2048-49	524405	24295	16034	11096	23359	0	599189	747353
2049-50	534187	25042	16096	11148	23478	0	609951	759133

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	544147	25830	16158	11200	23597	0	620932	771153
2051-52	554292	26631	16220	11252	23716	0	632111	783377
2052-53	564627	27460	16282	11304	23835	0	643508	795833
2053-54	574794	28306	16344	11357	23954	0	654755	808149

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	21.57	0.00	14.15	94.63	11.86	13.33	33.92	90.73	38.06	16.05	45.38	6.82	98.77	24.00	5.88	26.51	22.06	113.19	18.29	20.98	8.23	65.71	790.10
2025-26	23.67	0.00	16.26	105.22	13.16	15.27	37.39	100.11	42.39	17.83	50.82	7.52	109.75	26.94	6.52	29.75	24.76	125.34	20.95	25.03	9.17	75.89	883.73
2026-27	26.51	0.00	18.02	117.48	15.03	17.05	42.50	112.96	47.94	20.02	57.40	8.34	123.24	30.16	7.35	33.34	27.87	144.11	23.89	27.93	10.18	89.46	1,000.76
2027-28	29.98	0.00	20.49	134.11	17.11	19.55	48.79	127.22	54.89	22.78	65.37	9.43	139.28	34.57	8.47	38.15	31.58	160.92	27.00	31.44	11.37	101.11	1,133.60
2028-29	33.44	0.00	23.07	146.61	18.75	21.37	53.11	139.30	60.09	25.14	71.75	10.26	153.17	38.27	9.17	42.79	34.41	175.63	29.25	34.00	13.19	109.22	1,241.98
2029-30	35.84	0.00	25.59	161.32	20.97	23.68	58.98	152.80	66.59	27.85	79.86	11.41	168.50	41.85	10.08	46.99	37.84	196.59	31.72	37.30	14.34	123.78	1,373.89
2030-31	40.18	0.00	28.08	177.36	23.28	26.98	64.97	167.91	74.14	31.16	88.45	12.35	185.61	46.68	11.19	51.98	41.67	213.14	36.18	41.01	15.98	135.07	1,513.39
2031-32	46.00	0.00	31.33	196.14	25.59	29.51	71.42	183.50	81.48	34.38	98.00	13.66	205.59	51.87	12.41	57.67	45.90	240.21	39.82	47.70	18.67	158.84	1,689.70
2032-33	50.48	0.00	34.40	215.61	28.06	32.96	79.21	202.16	90.52	37.71	108.50	15.08	225.77	57.54	13.68	64.31	50.23	260.03	43.80	51.98	20.25	171.63	1,853.91
2033-34	55.44	0.00	37.88	234.68	30.67	36.54	86.12	220.15	99.03	41.18	117.95	16.36	245.19	63.20	15.01	70.30	54.76	289.25	47.30	56.31	21.85	190.83	2,030.00
2034-35	60.58	0.00	41.55	256.21	33.86	39.53	94.65	238.43	108.80	45.43	128.87	17.70	267.51	68.62	16.32	75.87	59.80	310.07	52.33	60.81	24.35	206.04	2,207.34
2035-36	67.09	0.00	45.66	278.96	37.32	44.20	103.13	260.03	118.78	50.02	141.82	19.64	293.59	75.46	17.96	85.12	65.56	343.61	56.76	69.49	26.45	232.56	2,433.20

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
2036-37	72.51	0.00	49.93	304.15	40.31	48.10	114.23	282.49	130.25	54.26	154.76	21.26	319.35	82.66	19.73	92.63	71.32	377.32	63.78	76.80	30.10	258.04	2,663.99
2037-38	81.17	0.00	54.94	331.08	44.32	52.70	124.16	308.69	141.45	59.66	169.72	23.25	348.55	90.07	21.72	100.81	77.74	405.71	69.48	82.43	32.02	277.07	2,896.74
2038-39	88.71	0.00	60.18	360.76	48.29	57.40	134.47	333.62	154.59	65.56	184.61	25.18	378.74	98.86	23.66	111.16	84.24	444.80	76.13	91.77	35.58	308.79	3,167.11
2039-40	96.53	0.00	65.59	393.14	52.62	62.94	147.94	363.34	170.10	71.15	202.53	27.66	412.67	107.74	25.88	120.62	92.02	486.41	83.63	100.30	38.22	338.52	3,459.55
2040-41	106.59	0.00	70.95	425.78	57.19	68.69	160.05	393.33	184.48	76.83	219.58	29.83	446.74	117.75	28.09	131.58	99.71	528.95	90.89	110.41	42.71	373.78	3,763.90
2041-42	116.49	0.00	78.02	462.49	62.46	75.43	173.91	427.03	201.20	84.58	240.65	32.49	486.58	128.07	30.71	143.29	108.08	577.16	98.08	119.14	46.79	406.70	4,099.37
2042-43	127.66	0.00	85.09	502.94	67.83	82.16	190.15	464.27	218.67	92.35	262.95	35.66	529.48	139.95	33.69	157.10	118.09	627.57	107.74	127.96	50.06	445.88	4,467.24
2043-44	140.51	0.00	93.68	545.71	74.16	89.88	206.76	503.65	239.12	100.27	286.34	38.67	574.66	153.50	36.51	171.42	128.06	682.38	118.82	143.24	55.24	489.77	4,872.35
2044-45	151.32	0.00	101.06	589.77	80.63	97.81	224.11	542.53	259.16	108.56	308.81	42.07	619.62	164.94	39.64	185.66	138.11	736.19	127.26	155.90	60.05	530.75	5,263.95
2045-46	164.36	0.00	109.63	639.99	86.55	106.27	243.21	587.57	281.63	117.66	336.23	45.55	672.59	180.05	43.57	202.49	150.10	796.74	139.25	167.99	65.81	573.85	5,711.08
2046-47	179.18	0.00	119.53	692.77	94.78	116.49	263.57	636.28	305.33	128.03	364.70	49.56	727.45	195.35	47.25	219.16	162.64	870.93	152.08	184.22	71.55	633.39	6,214.23
2047-48	196.38	0.00	130.18	753.98	103.60	126.78	287.98	691.02	332.86	140.45	397.38	53.91	792.20	213.23	51.61	240.56	176.50	945.22	165.05	202.27	78.23	691.14	6,770.51
2048-49	212.88	0.00	141.13	810.68	111.47	136.98	311.48	743.43	360.59	151.11	429.44	58.20	852.72	230.75	55.82	259.92	190.72	1021.76	178.98	216.13	84.35	748.63	7,307.18
2049-50	229.15	0.00	152.70	876.22	120.93	148.66	335.93	802.39	390.54	163.67	465.28	62.90	921.39	249.42	60.18	280.26	205.73	1095.54	194.54	234.85	91.57	806.75	7,888.60
2050-51	249.65	0.00	165.88	944.53	130.56	161.21	364.27	867.05	423.42	177.61	503.85	68.15	996.80	272.06	65.58	304.63	222.81	1189.04	209.23	255.03	99.46	878.39	8,549.20
2051-52	272.58	0.00	179.61	1024.88	142.33	175.40	394.77	939.53	459.52	193.03	547.49	74.28	1078.13	294.83	71.35	332.23	241.77	1290.83	227.05	277.81	107.92	957.74	9,283.05
2052-53	293.71	0.00	194.24	1104.58	154.29	190.29	426.98	1012.23	496.86	209.20	591.84	80.39	1162.83	319.09	77.11	358.81	260.74	1393.77	247.59	300.33	117.97	1035.85	10,028.68
2053-54	319.21	0.00	210.39	1193.85	167.08	206.22	462.39	1092.94	539.25	226.53	641.85	86.95	1259.30	345.65	83.46	389.29	282.26	1517.77	266.96	327.04	127.17	1133.66	10879.22

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
2024-25	21.57	0.00	14.15	94.63	11.86	13.33	33.92	90.73	38.06	16.05	45.38	6.82	98.77	24.00	5.88	26.51	22.06	113.19	18.29	20.98	8.23	65.71	790.10
2025-26	23.75	0.00	16.30	105.54	13.17	15.31	37.48	100.36	42.46	17.88	50.91	7.53	109.97	26.98	6.53	29.84	24.90	125.63	20.99	25.07	9.21	76.04	885.85
2026-27	26.64	0.00	18.10	118.13	15.10	17.13	42.74	113.51	48.12	20.13	57.70	8.38	123.81	30.30	7.37	33.52	28.08	144.73	24.00	28.07	10.26	89.82	1,005.64
2027-28	30.23	0.00	20.64	135.21	17.24	19.68	49.19	128.11	55.27	22.94	65.86	9.50	140.21	34.81	8.52	38.40	31.88	161.95	27.18	31.69	11.50	101.77	1,141.76
2028-29	33.79	0.00	23.27	148.11	18.92	21.56	53.71	140.67	60.70	25.37	72.44	10.39	154.51	38.67	9.25	43.15	34.82	177.21	29.52	34.32	13.37	110.18	1,253.94
2029-30	36.29	0.00	25.87	163.27	21.19	23.96	59.84	154.66	67.48	28.20	80.81	11.62	170.40	42.38	10.18	47.49	38.42	198.92	32.11	37.76	14.55	125.16	1,390.56
2030-31	40.78	0.00	28.45	179.90	23.54	27.34	66.12	170.38	75.32	31.65	89.76	12.65	188.16	47.40	11.32	52.63	42.49	216.32	36.70	41.65	16.26	136.89	1,535.69
2031-32	46.82	0.00	31.79	199.43	25.93	29.97	72.90	186.68	82.93	34.98	99.76	14.07	208.88	52.80	12.59	58.51	46.95	244.48	40.48	48.56	19.02	161.35	1,718.90
2032-33	51.51	0.00	34.98	219.81	28.47	33.55	81.07	206.09	92.32	38.45	110.81	15.59	229.92	58.73	13.89	65.36	51.55	265.36	44.62	53.08	20.68	174.75	1,890.58

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
2033-34	56.67	0.00	38.59	239.83	31.22	37.25	88.28	224.97	101.26	42.05	120.74	16.93	250.41	64.67	15.28	71.61	56.23	296.01	48.35	57.61	22.36	194.79	2,075.13
2034-35	62.05	0.00	42.42	262.47	34.55	40.40	97.17	244.28	111.52	46.48	132.23	18.35	273.89	70.39	16.65	77.39	61.43	318.19	53.65	62.36	24.94	210.79	2,261.62
2035-36	68.85	0.00	46.71	286.47	38.18	45.29	106.06	267.04	122.08	51.28	145.86	20.39	301.33	77.67	18.37	86.99	67.38	353.46	58.34	71.43	27.17	238.47	2,498.83
2036-37	74.56	0.00	51.18	313.20	41.35	49.39	117.69	290.83	134.24	55.75	159.60	22.12	328.51	85.38	20.23	94.82	73.40	389.07	65.73	79.09	30.99	265.23	2,742.34
2037-38	83.65	0.00	56.44	341.84	45.58	54.25	128.23	318.61	146.18	61.44	175.51	24.22	359.45	93.41	22.32	103.39	80.12	419.36	71.79	85.03	33.03	285.42	2,989.30
2038-39	91.61	0.00	62.08	373.69	49.84	59.25	139.16	345.19	160.16	67.70	191.37	26.32	391.62	102.71	24.37	114.32	87.09	460.93	78.84	94.86	36.78	318.98	3,276.85
2039-40	99.85	0.00	67.89	408.54	54.49	65.12	153.47	376.84	176.69	73.67	210.47	28.95	427.78	112.15	26.73	124.40	95.43	505.24	86.80	103.92	39.59	350.59	3,588.59
2040-41	110.46	0.00	73.70	443.85	59.42	71.22	166.43	408.84	192.06	79.77	228.72	31.28	464.37	122.79	29.07	136.08	103.74	550.81	94.56	114.61	44.36	388.13	3,914.27
2041-42	120.94	0.00	81.30	483.60	65.11	78.39	181.36	444.88	210.00	88.03	251.28	34.14	507.10	133.79	31.85	148.59	112.80	602.34	102.34	123.95	48.68	423.36	4,273.83
2042-43	132.79	0.00	88.96	527.59	70.89	85.56	198.82	484.71	228.85	96.34	275.31	37.52	553.44	146.46	35.03	163.37	123.62	656.43	112.77	133.45	52.19	465.40	4,669.49
2043-44	146.56	0.00	98.12	573.96	77.64	93.84	216.81	527.08	250.77	104.90	300.60	40.75	602.19	161.07	38.01	178.62	134.32	715.40	124.57	149.78	57.71	512.39	5,105.12
2044-45	158.26	0.00	106.07	621.97	84.60	102.33	235.68	569.19	272.38	113.89	325.06	44.41	650.95	173.56	41.31	193.92	145.15	773.55	133.65	163.46	62.87	556.54	5,528.79
2045-46	172.42	0.00	115.28	676.80	90.98	111.43	256.46	617.95	296.63	123.78	354.90	48.20	708.40	189.94	45.44	211.98	158.02	839.11	146.50	176.59	69.05	603.15	6,013.02
2046-47	188.53	0.00	125.91	734.75	99.79	122.45	278.62	670.77	322.27	135.03	385.98	52.59	768.21	206.60	49.33	229.95	171.55	919.33	160.26	194.21	75.24	667.32	6,558.68
2047-48	207.21	0.00	137.42	801.96	109.30	133.58	305.16	730.27	352.00	148.58	421.66	57.35	838.83	226.12	53.95	253.02	186.50	999.91	174.28	213.82	82.49	729.97	7,163.39
2048-49	225.10	0.00	149.34	864.47	117.85	144.60	330.90	787.44	382.15	160.13	456.70	62.02	905.29	245.06	58.54	273.91	202.10	1083.48	189.34	228.93	89.17	792.54	7,749.07
2049-50	242.83	0.00	161.97	936.64	128.12	157.27	357.69	851.75	414.78	173.78	495.82	67.13	980.73	265.32	63.29	295.95	218.59	1164.47	206.21	249.22	97.08	856.09	8,384.73
2050-51	265.14	0.00	176.33	1012.22	138.61	170.93	388.70	922.41	450.65	188.96	538.09	72.85	1063.76	289.89	69.17	322.30	237.41	1266.86	222.20	271.17	105.74	934.33	9,107.71
2051-52	290.19	0.00	191.33	1101.11	151.35	186.37	422.15	1001.68	490.14	205.71	585.93	79.55	1153.47	314.64	75.46	352.22	258.32	1378.48	241.71	296.03	115.05	1021.31	9,912.21
2052-53	313.37	0.00	207.37	1189.79	164.36	202.58	457.58	1081.61	531.17	223.41	634.74	86.23	1247.14	341.14	81.82	381.17	279.36	1491.85	264.21	320.74	126.10	1107.39	10,733.14
2053-54	341.33	0.00	225.10	1289.21	178.27	219.97	496.53	1170.22	577.79	242.37	689.76	93.44	1353.84	370.15	88.85	414.36	303.22	1628.48	285.55	350.03	136.29	1214.88	11669.63

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
2024-25	21.57	0.00	14.15	94.63	11.86	13.33	33.92	90.73	38.06	16.05	45.38	6.82	98.77	24.00	5.88	26.51	22.06	113.19	18.29	20.98	8.23	65.71	790.10
2025-26	23.81	0.00	16.34	105.78	13.22	15.35	37.55	100.64	42.51	17.93	51.01	7.55	110.25	27.05	6.54	29.91	24.91	125.88	21.03	25.13	9.24	76.22	887.83
2026-27	26.79	0.00	18.16	118.72	15.16	17.21	42.93	114.07	48.30	20.23	57.92	8.42	124.37	30.46	7.38	33.65	28.15	145.35	24.09	28.21	10.30	90.25	1,010.15
2027-28	30.46	0.00	20.74	136.15	17.33	19.84	49.50	129.10	55.59	23.09	66.22	9.58	141.22	35.11	8.55	38.63	31.99	163.06	27.32	31.95	11.57	102.50	1,149.48
2028-29	34.15	0.00	23.44	149.57	19.08	21.78	54.19	142.14	61.18	25.60	73.11	10.49	156.02	39.07	9.29	43.55	35.11	178.89	29.73	34.73	13.48	111.22	1,265.82
2029-30	36.79	0.00	26.11	165.35	21.43	24.24	60.48	156.72	68.15	28.52	81.83	11.74	172.49	42.94	10.25	48.07	38.90	201.31	32.42	38.35	14.70	126.65	1,407.44
2030-31	41.47	0.00	28.75	182.68	23.87	27.74	66.93	173.13	76.21	32.06	91.18	12.80	190.94	48.13	11.41	53.44	43.13	219.44	37.17	42.44	16.45	138.83	1,558.17
2031-32	47.71	0.00	32.21	202.92	26.37	30.49	73.92	190.17	84.10	35.49	101.64	14.25	212.48	53.73	12.71	59.55	47.83	248.61	41.10	49.61	19.30	164.00	1,748.19
2032-33	52.58	0.00	35.49	224.15	29.05	34.22	82.35	210.51	93.87	39.07	113.16	15.83	234.44	59.95	14.03	66.70	52.70	270.52	45.40	54.38	21.02	178.01	1,927.44
2033-34	57.98	0.00	39.23	245.15	31.92	38.12	89.93	230.32	103.17	42.84	123.58	17.23	255.87	66.24	15.49	73.28	57.64	302.41	49.31	59.13	22.82	198.87	2,120.53
2034-35	63.61	0.00	43.21	268.97	35.42	41.44	99.29	250.75	113.90	47.51	135.61	18.69	280.46	72.38	16.91	79.41	63.22	325.75	54.86	64.13	25.57	215.73	2,316.81
2035-36	70.73	0.00	47.69	294.31	39.24	46.57	108.67	274.84	124.91	52.57	149.89	20.80	309.23	80.06	18.68	89.47	69.59	362.68	59.80	73.54	27.95	244.63	2,565.87
2036-37	76.76	0.00	52.40	322.57	42.59	50.91	120.92	300.08	137.72	57.33	164.32	22.60	338.05	88.25	20.60	97.81	76.03	400.18	67.55	81.59	31.99	272.73	2,822.98
2037-38	86.28	0.00	57.90	352.88	47.05	56.01	132.04	329.50	150.31	63.33	181.04	24.81	370.85	96.76	22.76	106.90	83.25	432.33	73.95	87.91	34.22	294.19	3,084.29
2038-39	94.72	0.00	63.82	386.57	51.51	61.34	143.69	357.90	165.03	69.96	197.85	26.99	405.09	106.66	24.90	118.46	90.59	476.31	81.44	98.33	38.18	329.62	3,388.96
2039-40	103.50	0.00	69.94	423.55	56.41	67.59	158.88	391.80	182.47	76.33	218.13	29.74	443.65	116.77	27.38	129.19	99.39	523.34	89.92	108.00	41.20	363.19	3,720.37
2040-41	114.77	0.00	76.06	461.19	61.63	74.14	172.71	426.22	198.90	82.88	237.65	32.19	482.84	128.18	29.84	141.63	108.18	571.95	98.26	119.40	46.26	403.09	4,067.98
2041-42	125.99	0.00	84.08	503.78	67.68	81.84	188.59	464.95	218.04	91.74	261.72	35.16	528.70	140.09	32.78	155.04	117.76	626.97	106.65	129.45	50.92	440.80	4,452.71
2042-43	138.65	0.00	92.17	550.89	73.79	89.54	207.16	507.94	238.19	100.71	287.31	38.68	578.43	153.81	36.12	170.86	129.17	685.08	117.80	139.68	54.70	485.72	4,876.41
2043-44	153.41	0.00	102.04	601.12	81.12	98.44	226.38	553.67	261.63	109.87	314.54	42.12	631.08	169.56	39.29	187.36	140.76	748.46	130.35	157.14	60.60	536.06	5,345.00
2044-45	166.02	0.00	110.69	653.26	88.66	107.61	246.59	599.28	284.85	119.53	341.02	46.05	683.94	183.11	42.85	203.97	152.53	811.44	140.15	171.87	66.15	583.68	5,803.25
2045-46	181.26	0.00	120.68	712.76	95.67	117.48	268.95	652.22	311.00	130.18	373.24	50.09	746.32	200.88	47.29	223.59	166.63	882.50	153.97	186.15	72.81	634.12	6,327.82
2046-47	198.66	0.00	132.28	775.82	105.31	129.42	292.84	709.62	338.66	142.36	406.88	54.75	811.45	219.02	51.51	243.24	181.47	969.37	168.83	205.19	79.53	703.26	6,919.48
2047-48	218.87	0.00	144.85	849.02	115.71	141.54	321.48	774.47	370.84	156.97	445.64	59.79	888.33	240.21	56.54	268.36	197.99	1057.03	183.94	226.47	87.36	771.09	7,576.50
2048-49	238.31	0.00	157.69	917.29	125.00	153.59	349.50	837.38	403.55	169.56	483.73	64.79	960.80	261.07	61.47	291.19	214.88	1148.24	200.47	243.01	94.65	839.23	8,215.39
2049-50	257.66	0.00	171.34	996.18	136.15	167.43	378.81	908.24	439.06	184.41	526.39	70.27	1043.20	283.51	66.59	315.33	232.79	1237.18	218.99	265.17	103.23	908.72	8,910.67
2050-51	282.04	0.00	186.88	1079.08	147.59	182.35	412.79	986.17	478.27	200.96	572.68	76.41	1134.13	310.72	72.95	344.31	253.26	1349.28	236.72	289.18	112.67	994.17	9,702.60
2051-52	309.42	0.00	203.16	1176.58	161.49	199.25	449.55	1073.76	521.41	219.24	625.10	83.57	1232.62	338.28	79.81	377.20	276.07	1471.78	258.19	316.30	122.83	1089.34	10,584.95

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
2052-53	335.04	0.00	220.66	1274.40	175.73	217.10	488.61	1162.57	566.40	238.55	678.95	90.77	1335.93	367.90	86.73	409.26	299.12	1596.86	282.99	343.39	134.90	1184.04	11,489.90
2053-54	365.84	0.00	240.03	1384.34	190.98	236.33	531.59	1260.94	617.68	259.28	739.83	98.65	1453.63	400.36	94.40	446.04	325.25	1747.38	306.63	375.58	146.11	1302.13	12523.00

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	169.20	-2.30%	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	405.65	-9.50%	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	172.98	-0.11%	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	425.09	-5.17%	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	176.80	2.09%	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	432.40	-3.54%	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)	169.20	405.65	172.98	425.09	176.80	432.40
Difference %	-2.30%	-9.50%	-0.11%	-5.17%	2.09%	-3.54%
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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Six Laning of Santalpur – Samakhiyali Section of NH-27 from Km 339.200 to km 430.100 in State of Gujarat



JANUARY 2025

TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)



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ABBREVIATIONS

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

CHAPTER 1

INTRODUCTION

1.1 Background

Project stretch from Santalpur to Samakhiyali (Km 339.200 to km 430.100) is a 90.90 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.

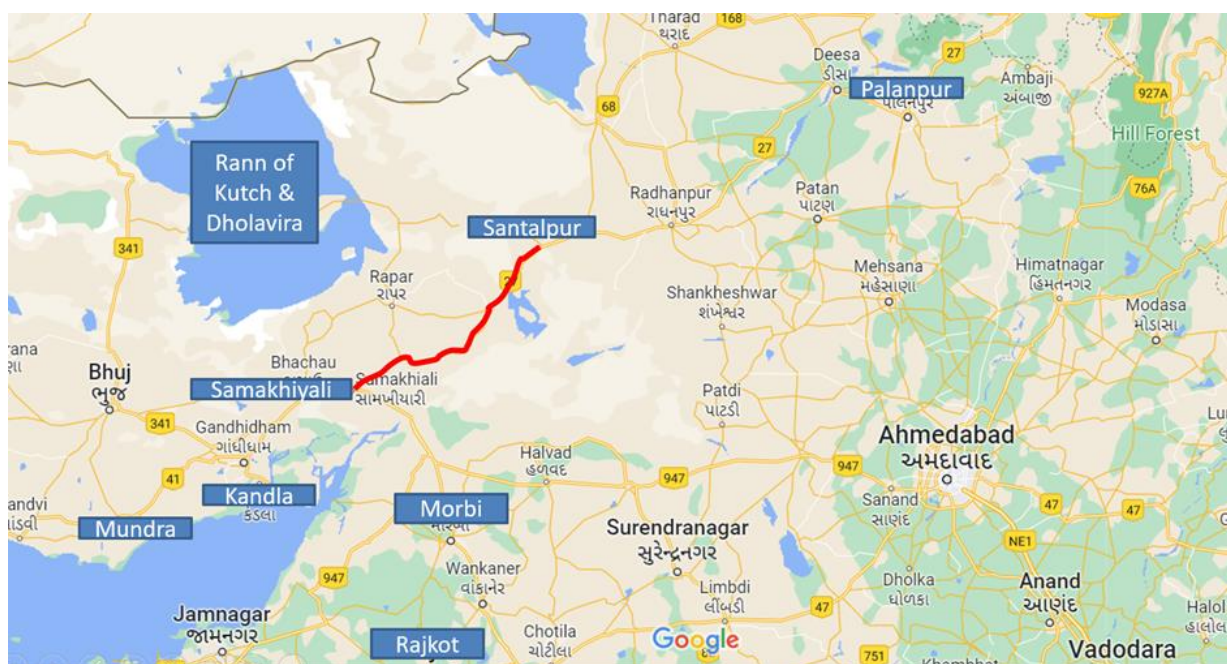


Figure 1-1 : Alignment of Project Stretch

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.

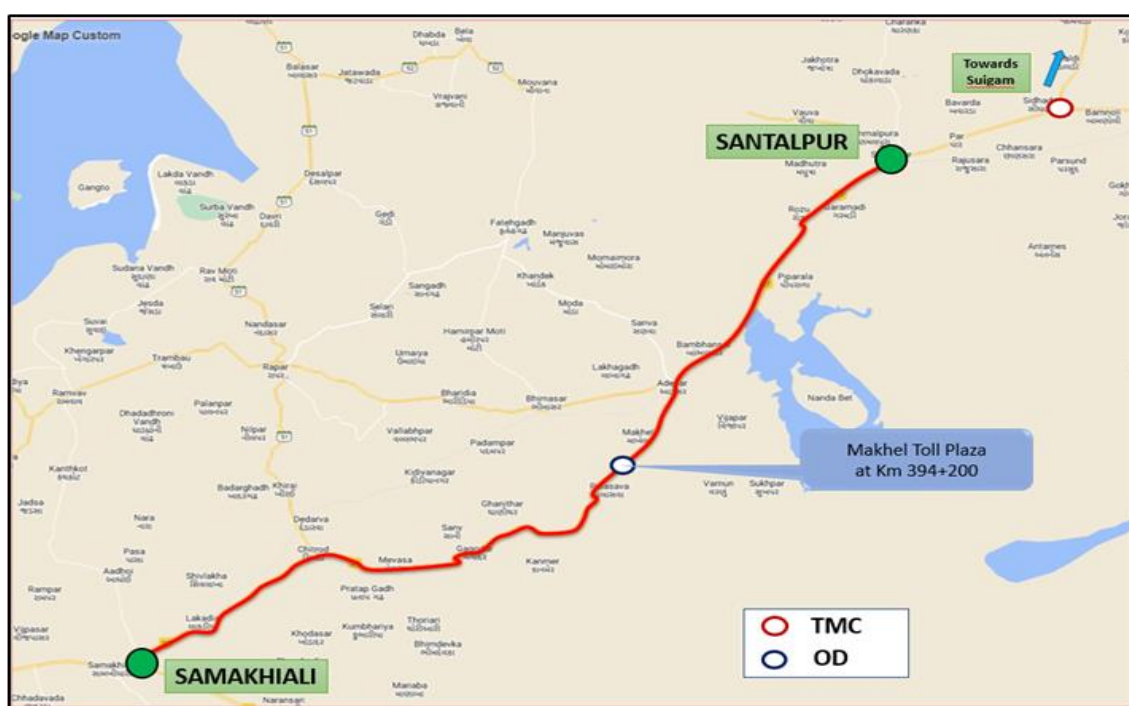


Figure 2-1 : Project Alignment with Toll Plaza

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 (Eight months data from April 2024 to November 2024)	AADT for Year 2024- 2025 (Eight months data from April 2024 to November 2024)	AADT for Year 2024- 2025 (Eight months data from April 2024 to November 2024)	AADT for Year 2024- 2025 (Eight months data from April 2024 to November 2024)	AADT for Year 2024- 2025 (Eight months data from April 2024 to November 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 November 2024).

Since the traffic data available for this update is for only eight 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. Thus, 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	1635
2	LCV	86
3	Bus	217
4	Truck	250
5	3-Axle	205
6	Multi Axle	7026
7	Oversized Vehicle	10
	Total	9429

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	9429	35442	3.76

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.

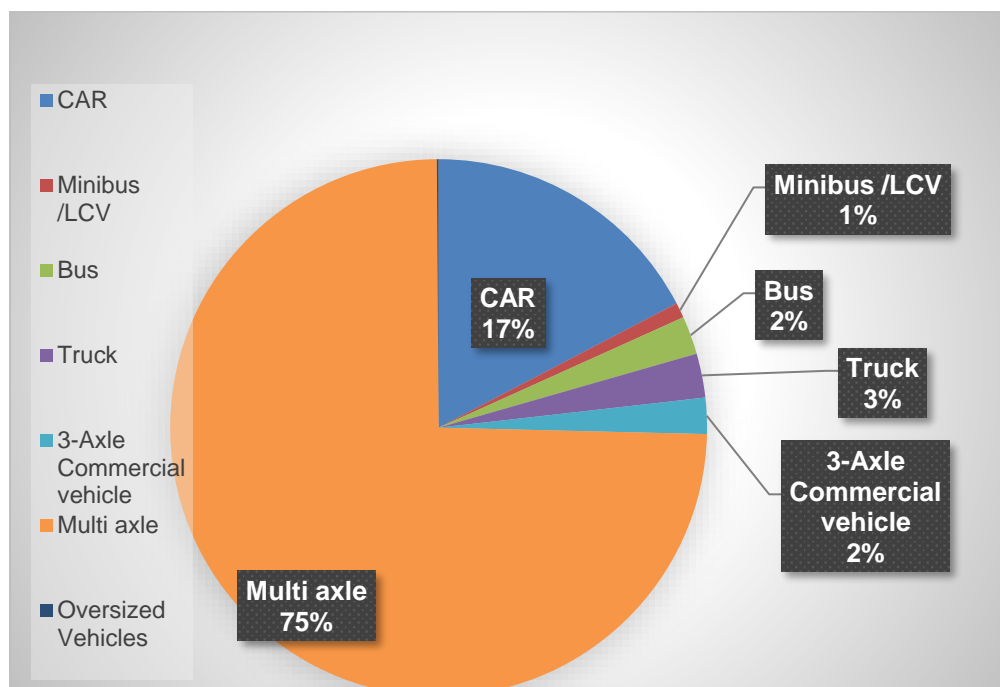


Figure 3-1 : Model Split of Tollable Vehicle

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	7925
2	Return Journey	1342
3	Local Commercial Single Journey	159
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 84%. Return journey component is 14%. The number of monthly pass Local is 0% and Local Commercial Single journey is 2% 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

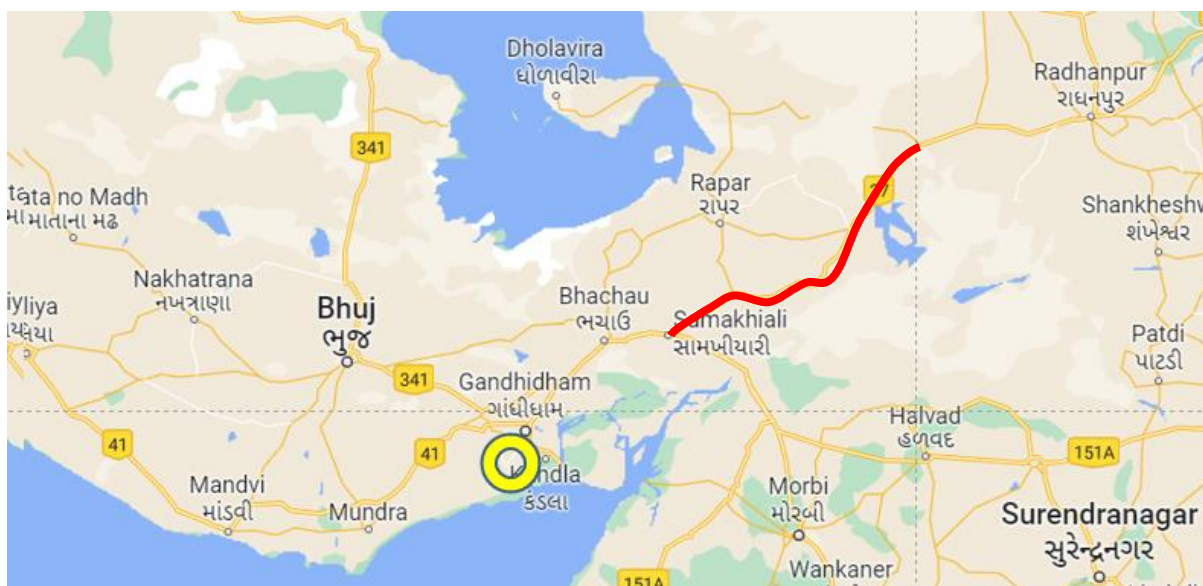
Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

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 has 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 an 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.

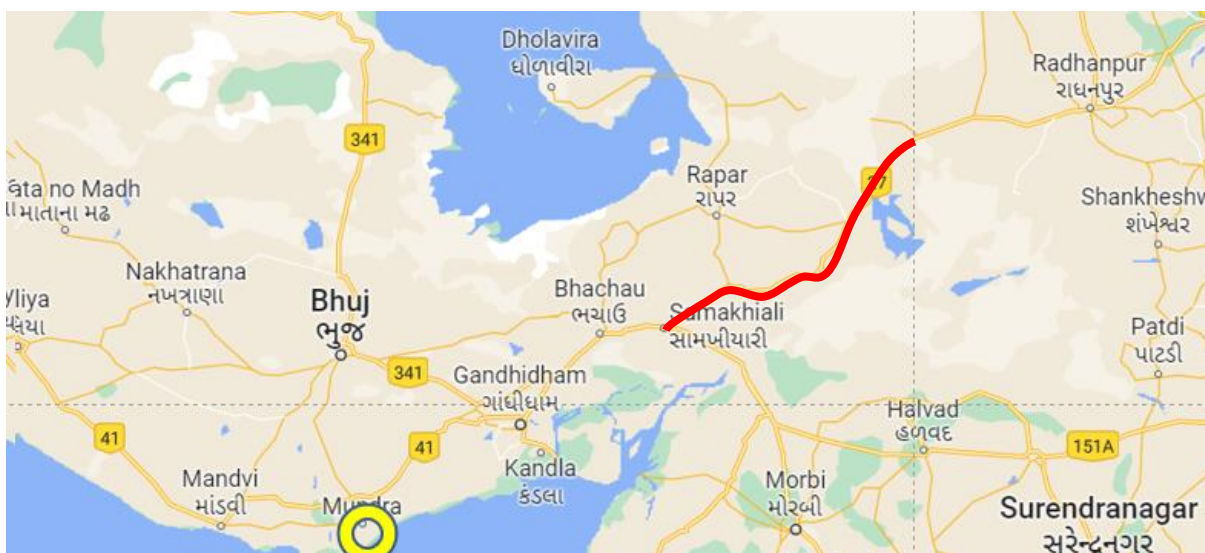


6000 Cr. The development of the two mega terminals of Container & Multipurpose Cargo is expected to induce migration of some of the traffic from JNPT, Mumbai to Kandla and Mundra port in Gujarat.

- The above development of two major terminals 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.

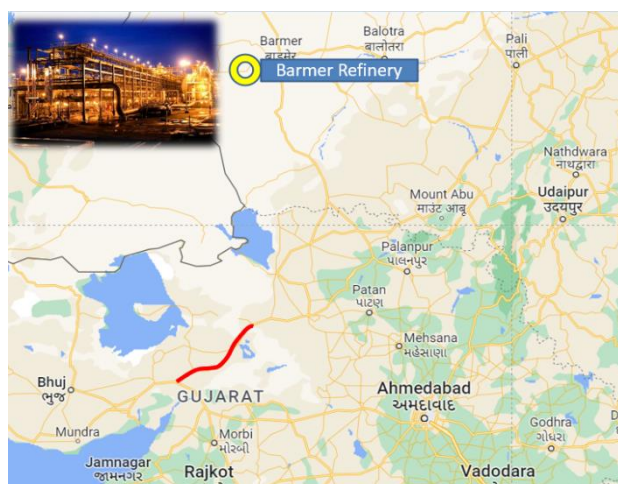
- Mundra port is coming up with expansion of Container Terminal of 1.2 MTEU at estimated expense of R. 1239 Cr. The expansion work of Container Terminal is under progress and is expected to be operational by FY24.
- Other growth drivers in long term at ports of Kandla and Mundra Ports will be increasingly 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%.

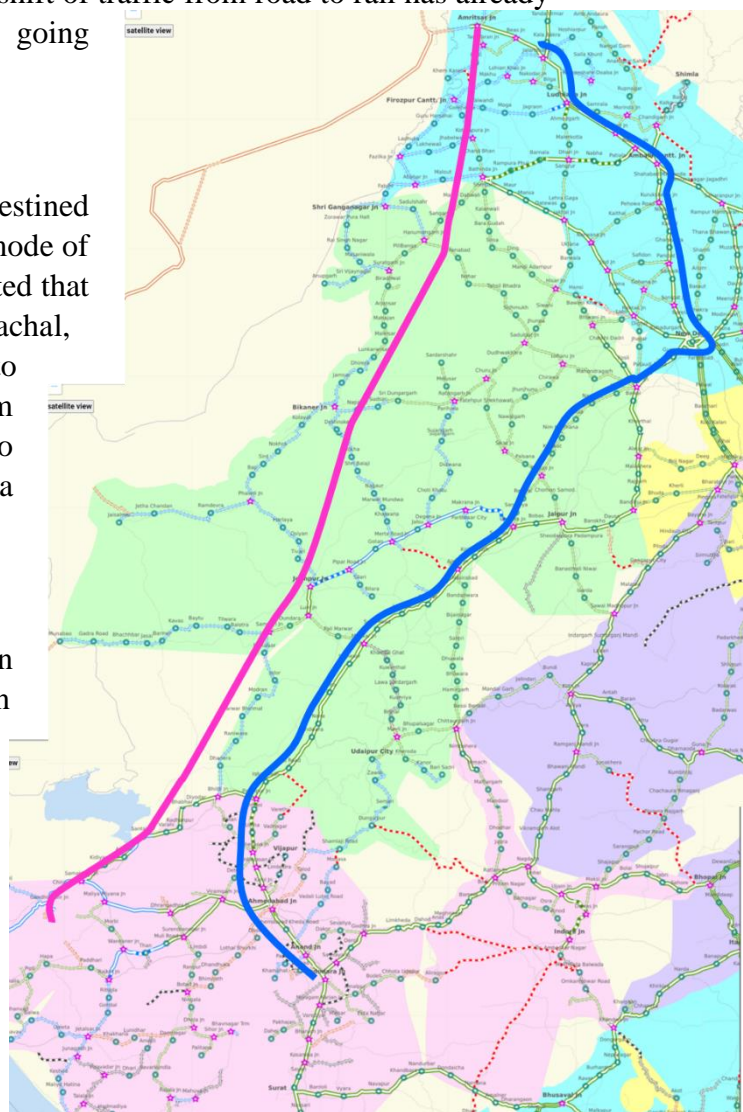
Western DFCC -

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-Makarpura-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.



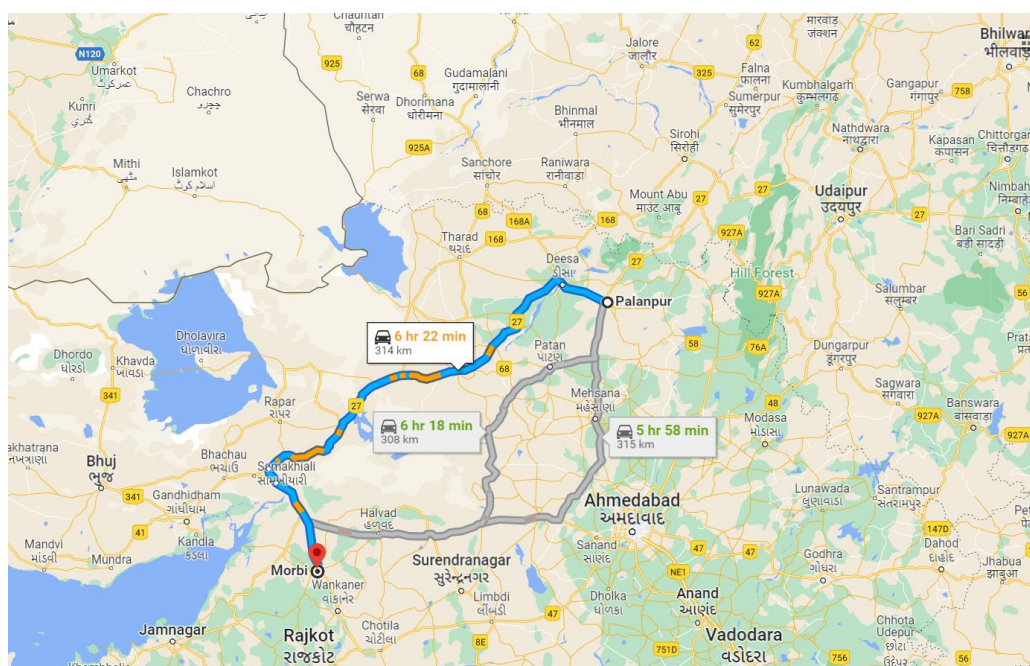
Thus, we do not see the material impact of DFC on the Project and no further diversion of good traffic to DFCC is envisaged.

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.

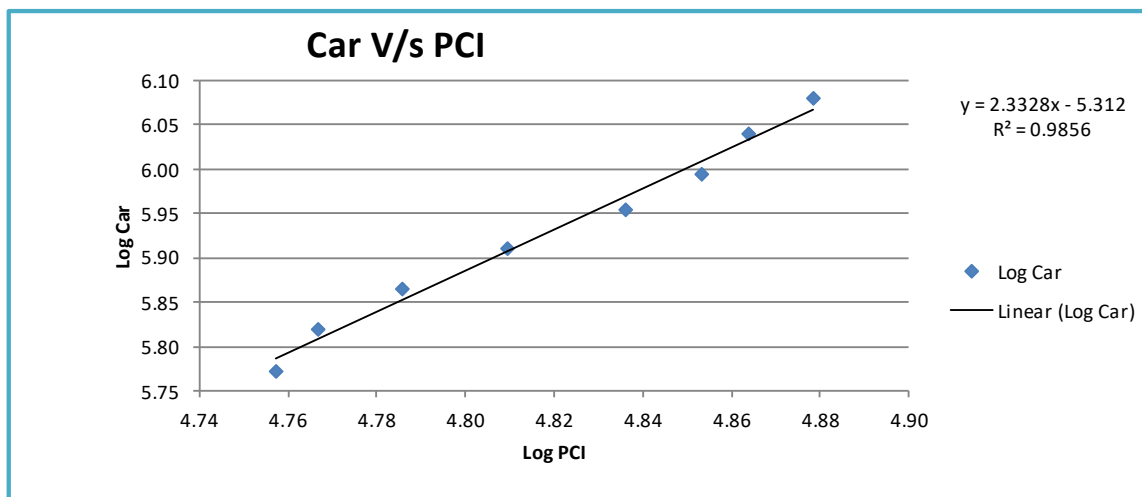


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan

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.

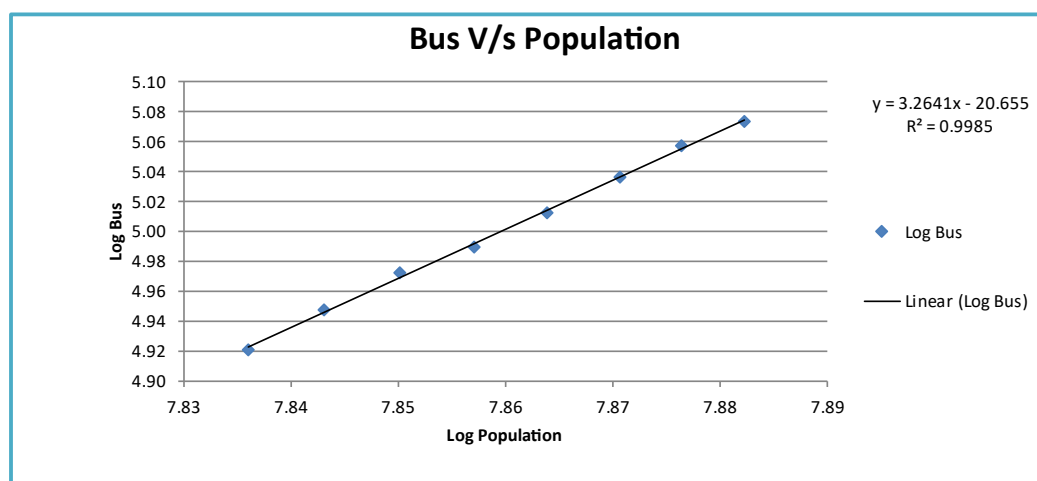


Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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.

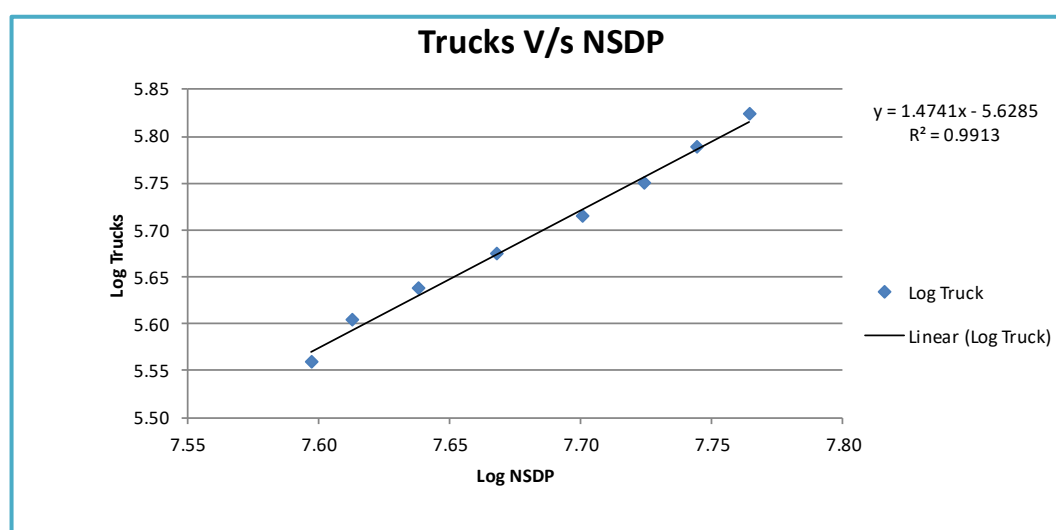


Figure 5-3 : Regression and Elasticity NSDP vs. LCV Traffic - extrapolation Rajasthan.

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.

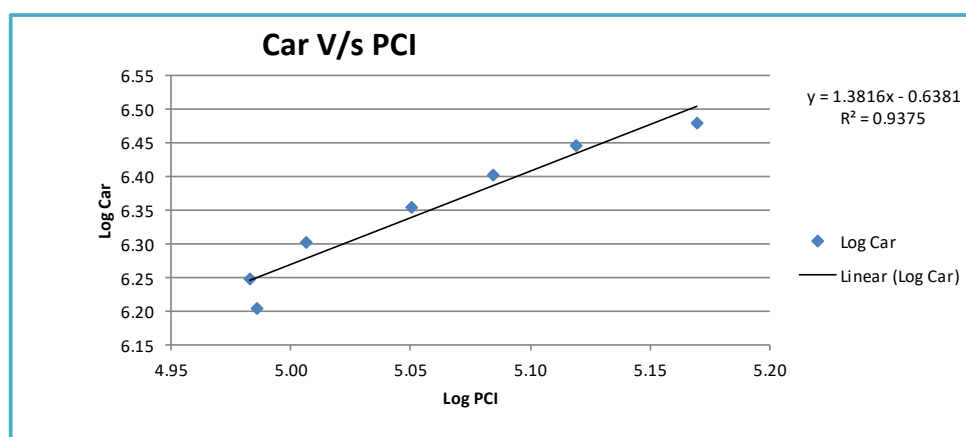
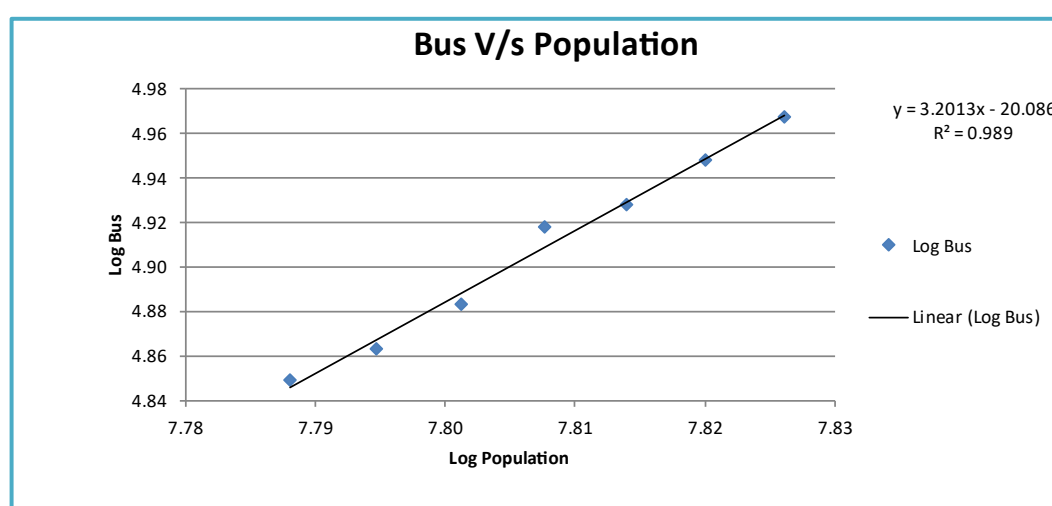
**Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat**

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.

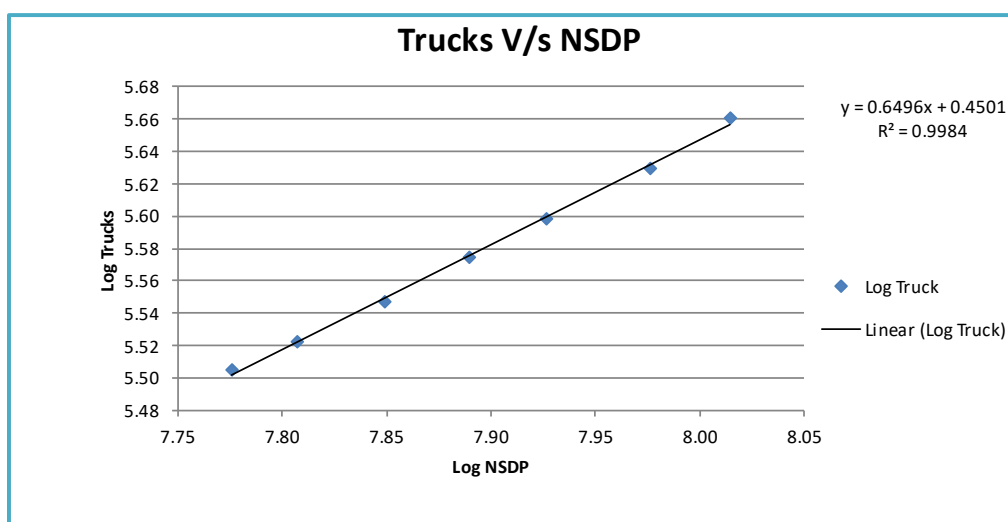


Figure 5-6 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Gujarat.

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 R² 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.

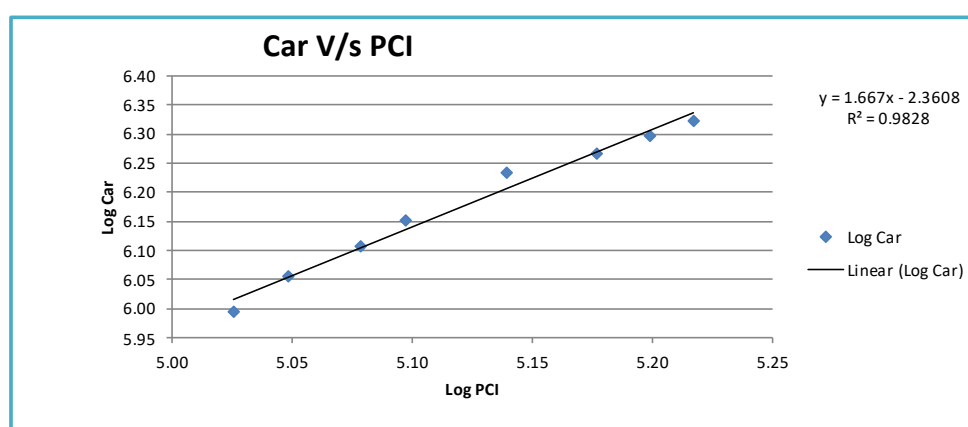


Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana & Punjab

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.

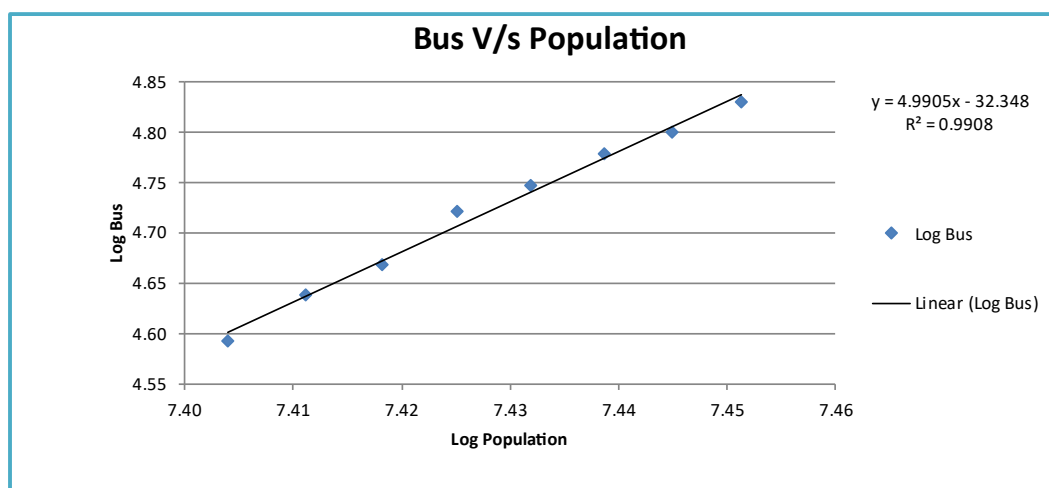


Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Haryana & Punjab

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.

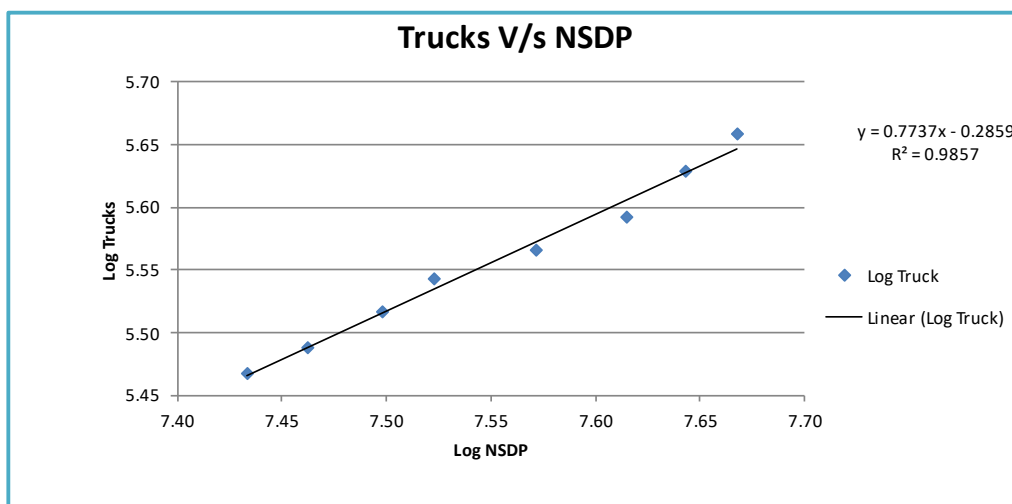


Figure 5-9 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Haryana & Punjab.

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.

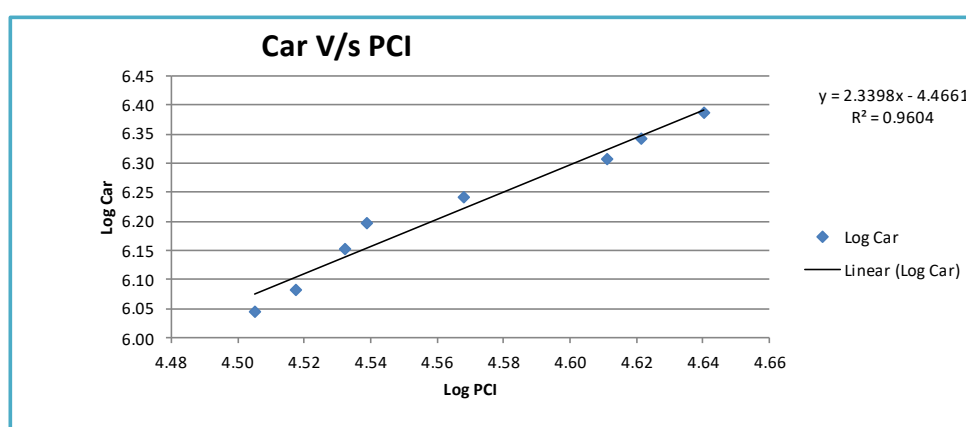


Figure 5-10 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh

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.

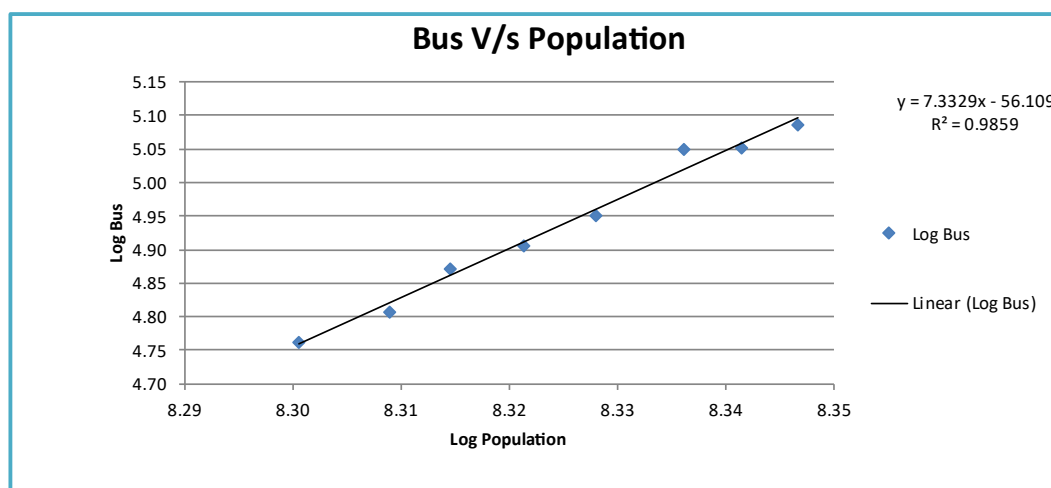


Figure 5-11 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh

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.

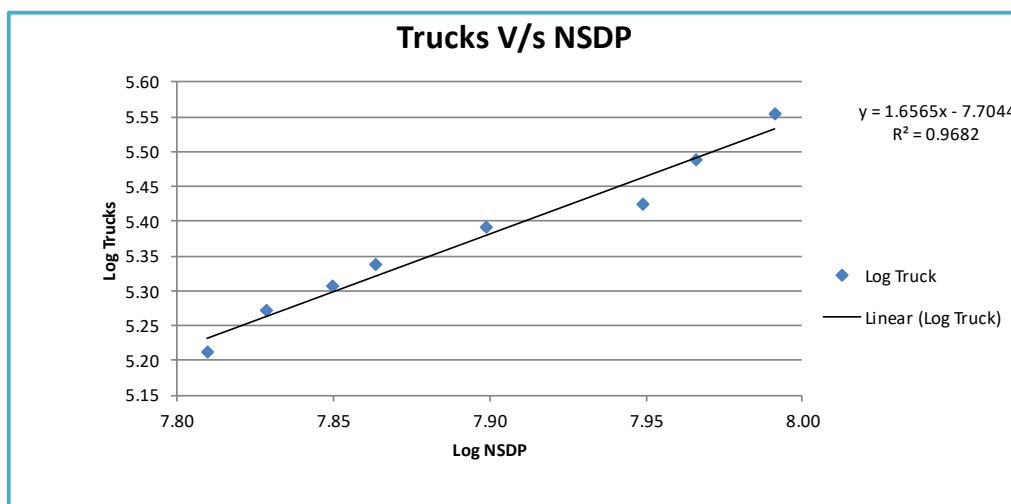


Figure 5-12 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Uttar Pradesh.

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. 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 5-16 : 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

Results of Regression Analysis					
State	Vehicle Category	Independent Variable	Regression Equation	R Square	Elasticity Coefficient
GUJRAT	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
UTTAR PRADESH	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
RAJASTHAN	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
HARYANA & PUNJAB	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.

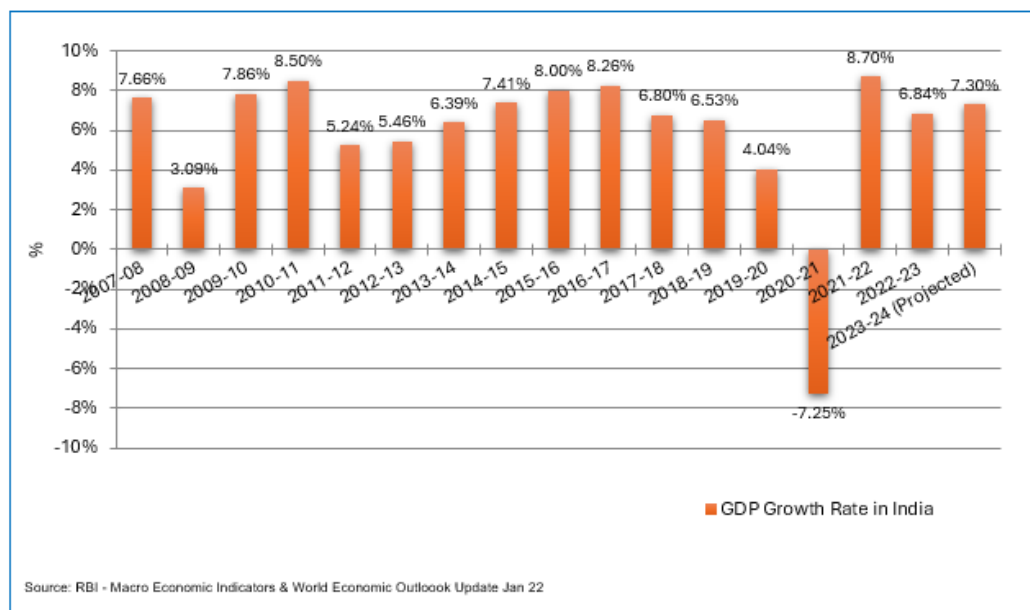


Figure 5-13 : Growth of GDP in India

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
4 to 6 Axle	7.61%	6.68%	5.75%	5.18%	5.18%	5.18%
7 and Above Axle	6.81%	6.03%	5.20%	4.56%	4.56%	4.56%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 – 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	1635	86	217	250	205	7026	10	9429	35442
2025-26	1800	91	228	263	223	7719	11	10335	38864
2026-27	1972	96	239	274	242	8442	12	11277	42424
2027-28	2151	100	249	284	261	9190	13	12248	46097
2028-29	2305	103	256	291	277	9827	14	13073	49216
2029-30	2469	106	263	299	294	10509	15	13955	52554
2030-31	2645	109	271	307	313	11238	16	14899	56125
2031-32	2834	112	279	315	332	12018	17	15907	59938
2032-33	3037	115	287	323	352	12852	18	16984	64011
2033-34	3223	118	294	331	371	13623	19	17979	67777
2034-35	3402	121	301	338	389	14362	20	18933	71387
2035-36	3591	124	308	346	408	15142	21	19940	75197
2036-37	3791	127	315	354	427	15964	22	21000	79207
2037-38	4002	130	322	362	447	16830	23	22116	83429
2038-39	4225	133	329	370	468	17743	24	23292	87877
2039-40	4460	136	336	378	491	18706	25	24532	92569
2040-41	4708	139	344	386	515	19720	26	25838	97509
2041-42	4970	142	352	394	540	20789	27	27214	102713
2042-43	5246	145	360	403	565	21916	28	28663	108196
2043-44	5537	148	368	412	591	23106	29	30191	113980
2044-45	5845	151	376	421	619	24360	30	31802	120075
2045-46	6170	154	384	430	649	25682	31	33500	126499

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	1635	86	217	250	205	7026	10	9429	35442

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2025-26	1792	90	227	261	222	7683	11	10286	38680
2026-27	1954	94	237	271	239	8364	12	11171	42028
2027-28	2121	97	246	280	256	9063	13	12076	45455
2028-29	2262	100	252	285	271	9646	14	12830	48306
2029-30	2413	103	258	290	286	10267	15	13632	51339
2030-31	2574	106	264	295	302	10926	16	14483	54555
2031-32	2745	109	270	300	319	11628	17	15388	57978
2032-33	2928	112	277	305	338	12376	18	16354	61629
2033-34	3092	115	283	310	354	13057	19	17230	64948
2034-35	3249	117	288	314	369	13700	20	18057	68078
2035-36	3413	119	293	319	385	14375	21	18925	71365
2036-37	3586	121	298	324	401	15083	22	19835	74809
2037-38	3768	123	303	329	418	15826	23	20790	78423
2038-39	3959	125	308	334	435	16606	24	21791	82213
2039-40	4160	127	314	339	454	17423	25	22842	86188
2040-41	4371	129	320	344	474	18281	26	23945	90360
2041-42	4593	131	326	349	494	19181	27	25101	94733
2042-43	4825	133	332	354	515	20126	28	26313	99321
2043-44	5069	135	338	359	537	21118	29	27585	104135
2044-45	5326	137	344	364	559	22159	30	28919	109183
2045-46	5595	139	350	369	583	23251	31	30318	114479

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	1635	86	217	250	205	7026	10	9429	35442
2025-26	1796	91	228	261	223	7701	11	10311	38773
2026-27	1963	95	238	272	241	8402	12	11223	42222
2027-28	2136	99	247	282	260	9126	13	12163	45777
2028-29	2284	102	254	287	275	9737	14	12953	48765
2029-30	2442	105	261	292	291	10388	15	13794	51945
2030-31	2611	108	268	298	308	11082	16	14691	55336
2031-32	2791	111	275	304	327	11823	17	15648	58956
2032-33	2983	114	282	310	346	12614	18	16667	62812
2033-34	3158	117	288	315	364	13339	19	17600	66346
2034-35	3325	119	294	320	380	14030	20	18488	69711
2035-36	3501	121	300	325	397	14756	21	19421	73245
2036-37	3687	123	306	330	415	15520	22	20403	76964
2037-38	3882	125	312	335	434	16324	23	21435	80874
2038-39	4088	127	318	340	454	17169	24	22520	84983
2039-40	4305	130	324	345	474	18058	25	23661	89303
2040-41	4534	133	331	351	495	18993	26	24863	93850
2041-42	4775	136	338	357	518	19976	27	26127	98632
2042-43	5029	139	345	363	542	21011	28	27457	103663
2043-44	5296	142	352	369	567	22099	29	28854	108949
2044-45	5577	145	359	375	592	23244	30	30322	114506

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2045-46	5873	148	366	381	618	24448	31	31865	120346

6.2 Modification in Concession Period

Modification is a 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 – 28th December 2023
- Concession Period (Days) – 7300 (For 20 Years)
- Hence, Original Concession end date is – 22nd 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	48306	12.76%	710	1.9
2	01-Oct-33	65401	64948	0.00%	0	
3	01-Oct-38	83468	82213	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	49216	11.22%	624	1.7
2	01-Oct-33	66563	67777	0.00%	0	
3	01-Oct-38	84950	87877	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	48765	11.98%	666	1.8
2	01-Oct-33	65987	66346	0.00%	0	
3	01-Oct-38	84216	84983	0.00%	0	

Hence a variation of about **710 days** in the concession period is expected as per traffic projections in *Pessimistic case*.

624 days in concession period are expected as per traffic projections in *Optimistic case* and **666 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 toll 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 the Fee Notification concessionaire has declared special category rates also. Salient features of toll rate structure are given as below

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) 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 the year 2016-17 for both series is used for conversion of WPI in 2004-05 series.

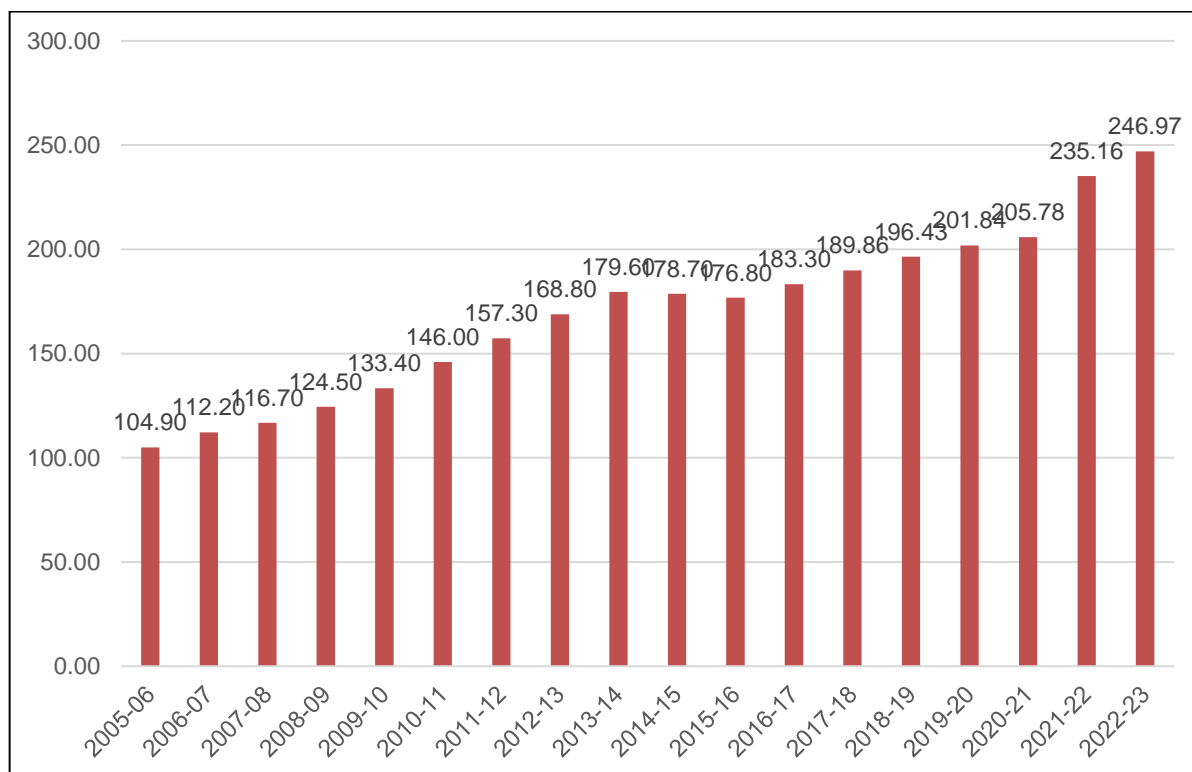


Figure 7-1 : Historical Rate of WPI Inflation in India

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 vehicles 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	100	160	335	335	365	520	635
2027-28	150	240	500	500	545	785	955
2028-29	155	250	525	525	575	825	1005
2029-30	165	265	555	555	605	865	1055
2030-31	170	275	580	580	635	910	1110
2031-32	180	290	610	610	665	955	1165
2032-33	190	305	640	640	700	1005	1225
2033-34	200	320	675	675	735	1060	1290
2034-35	210	340	710	710	775	1115	1355
2035-36	220	355	745	745	815	1170	1425
2036-37	230	375	785	785	855	1230	1500
2037-38	245	395	825	825	900	1295	1580
2038-39	255	415	870	870	950	1365	1665
2039-40	270	440	915	915	1000	1440	1750
2040-41	285	460	965	965	1055	1515	1845
2041-42	300	485	1015	1015	1110	1595	1940
2042-43	315	510	1070	1070	1170	1680	2045
2043-44	335	540	1130	1130	1235	1770	2155
2044-45	350	570	1190	1190	1300	1870	2275
2045-46	370	600	1255	1255	1370	1970	2395

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	980
2025-26	150	245	510	510	560	805	980
2026-27	150	245	510	510	560	805	980
2027-28	220	360	750	750	820	1180	1435
2028-29	235	375	790	790	860	1235	1505
2029-30	245	395	830	830	905	1300	1580
2030-31	255	415	870	870	950	1365	1665
2031-32	270	435	915	915	1000	1435	1750
2032-33	285	460	965	965	1050	1510	1840
2033-34	300	485	1010	1010	1105	1590	1935
2034-35	315	510	1065	1065	1160	1670	2035
2035-36	330	535	1120	1120	1220	1755	2140
2036-37	350	565	1180	1180	1285	1850	2250
2037-38	365	590	1240	1240	1355	1945	2370

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2038-39	385	625	1305	1305	1425	2050	2495
2039-40	405	655	1375	1375	1500	2155	2625
2040-41	430	690	1450	1450	1580	2270	2765
2041-42	450	730	1525	1525	1665	2395	2915
2042-43	475	765	1610	1610	1755	2520	3070
2043-44	500	810	1695	1695	1850	2660	3235
2044-45	530	855	1785	1785	1950	2800	3410
2045-46	555	900	1885	1885	2055	2955	3595

Table 7-4 : Toll Rates for Monthly Pass Local @ TP-394+200 KM

Year	Car
2024-25	330
2025-26	330
2026-27	370
2027-28	385
2028-29	405
2029-30	425
2030-31	450
2031-32	470
2032-33	495
2033-34	520
2034-35	550
2035-36	575
2036-37	605
2037-38	640
2038-39	675
2039-40	710
2040-41	745
2041-42	785
2042-43	830
2043-44	875
2044-45	920
2045-46	970

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	3280	5300	11105	11105	12115	17410	21200
2027-28	4930	7965	16690	16690	18205	26170	31860
2028-29	5180	8365	17530	17530	19125	27490	33470
2029-30	5440	8790	18420	18420	20095	28885	35165
2030-31	5720	9240	19360	19360	21115	30355	36955
2031-32	6010	9710	20350	20350	22200	31910	38845
2032-33	6320	10210	21395	21395	23340	33550	40840

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial Vehicle	Multi Axle	Oversized Vehicle
2033-34	6645	10735	22495	22495	24540	35280	42950
2034-35	6990	11295	23665	23665	25815	37110	45175
2035-36	7355	11880	24895	24895	27160	39040	47530
2036-37	7740	12505	26200	26200	28580	41085	50015
2037-38	8145	13160	27575	27575	30080	43240	52640
2038-39	8575	13855	29030	29030	31670	45525	55420
2039-40	9030	14590	30570	30570	33345	47935	58355
2040-41	9510	15365	32195	32195	35120	50485	61465
2041-42	10020	16185	33915	33915	37000	53185	64745
2042-43	10560	17055	35735	35735	38985	56040	68220
2043-44	11125	17975	37660	37660	41085	59060	71900
2044-45	11730	18945	39700	39700	43305	62255	75785
2045-46	12365	19975	41855	41855	45655	65635	79900

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	143.57	143.57
2025-26	157.45	157.45
2026-27	258.79	258.79
2027-28	296.24	296.24
2028-29	331.10	331.10
2029-30	371.68	371.68
2030-31	416.88	416.88
2031-32	469.88	469.88
2032-33	527.68	527.68
2033-34	587.75	587.75
2034-35	649.78	649.78
2035-36	721.68	721.68
2036-37	798.36	798.36
2037-38	886.15	886.15
2038-39	984.62	984.62
2039-40	1094.64	1094.64

Location / Year	Makhel Toll	Total
2040-41	1210.86	1210.86
2041-42	1343.36	1343.36
2042-43	1491.73	1491.73
2043-44	1664.01	1664.01
2044-45	1842.14	1842.14
2045-46	2044.60	2044.60

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

Location / Year	Makhel Toll	Total
2024-25	143.57	143.57
2025-26	156.76	156.76
2026-27	256.48	256.48
2027-28	292.28	292.28
2028-29	325.23	325.23
2029-30	363.36	363.36
2030-31	405.58	405.58
2031-32	455.06	455.06
2032-33	508.67	508.67
2033-34	563.91	563.91
2034-35	620.44	620.44
2035-36	685.84	685.84
2036-37	755.10	755.10
2037-38	834.18	834.18
2038-39	922.40	922.40
2039-40	1020.57	1020.57
2040-41	1123.56	1123.56
2041-42	1240.67	1240.67
2042-43	1371.08	1371.08
2043-44	1522.09	1522.09
2044-45	1677.01	1677.01
2045-46	1852.44	1852.44

Table 7-8 : Toll Revenue Most Likely Scenario**(Rs. Crores)**

Location / Year	Makhel Toll	Total
2024-25	143.57	143.57
2025-26	157.12	157.12
2026-27	257.68	257.68
2027-28	294.30	294.30
2028-29	328.18	328.18
2029-30	367.52	367.52
2030-31	411.18	411.18

Location / Year	Makhel Toll	Total
2031-32	462.44	462.44
2032-33	518.16	518.16
2033-34	575.73	575.73
2034-35	634.93	634.93
2035-36	703.47	703.47
2036-37	776.39	776.39
2037-38	859.75	859.75
2038-39	953.07	953.07
2039-40	1057.00	1057.00
2040-41	1166.50	1166.50
2041-42	1291.18	1291.18
2042-43	1430.39	1430.39
2043-44	1591.82	1591.82
2044-45	1758.10	1758.10
2045-46	1946.67	1946.67

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)**



JANUARY 2025

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



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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)**

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

JANUARY 2025



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ABBREVIATIONS

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

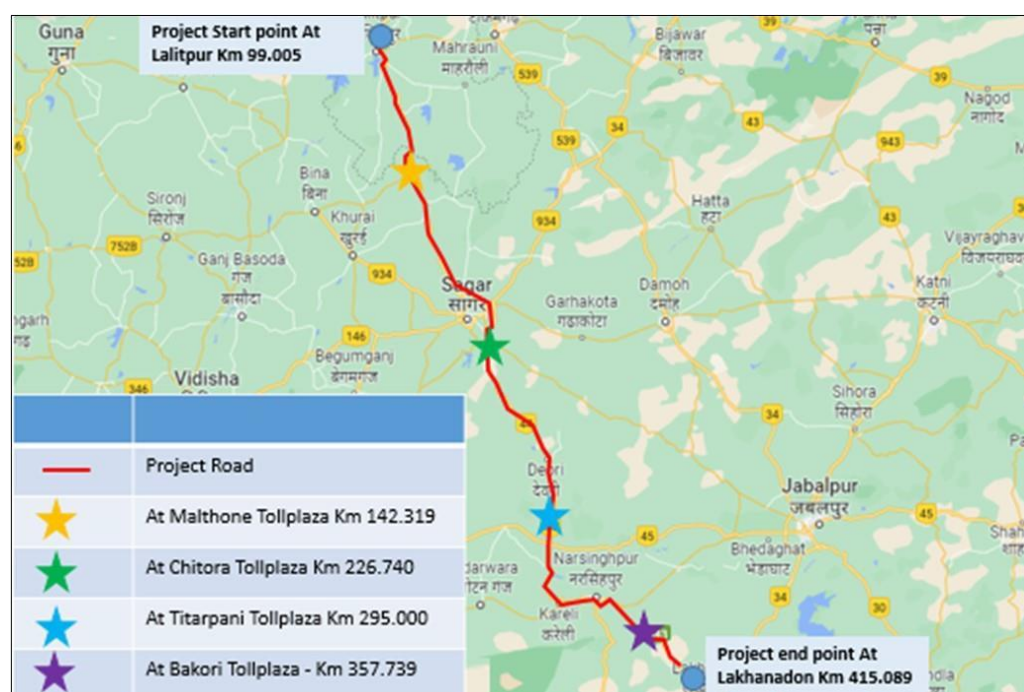


Figure 1-1: Project Stretch of TOT Bundle 12

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.

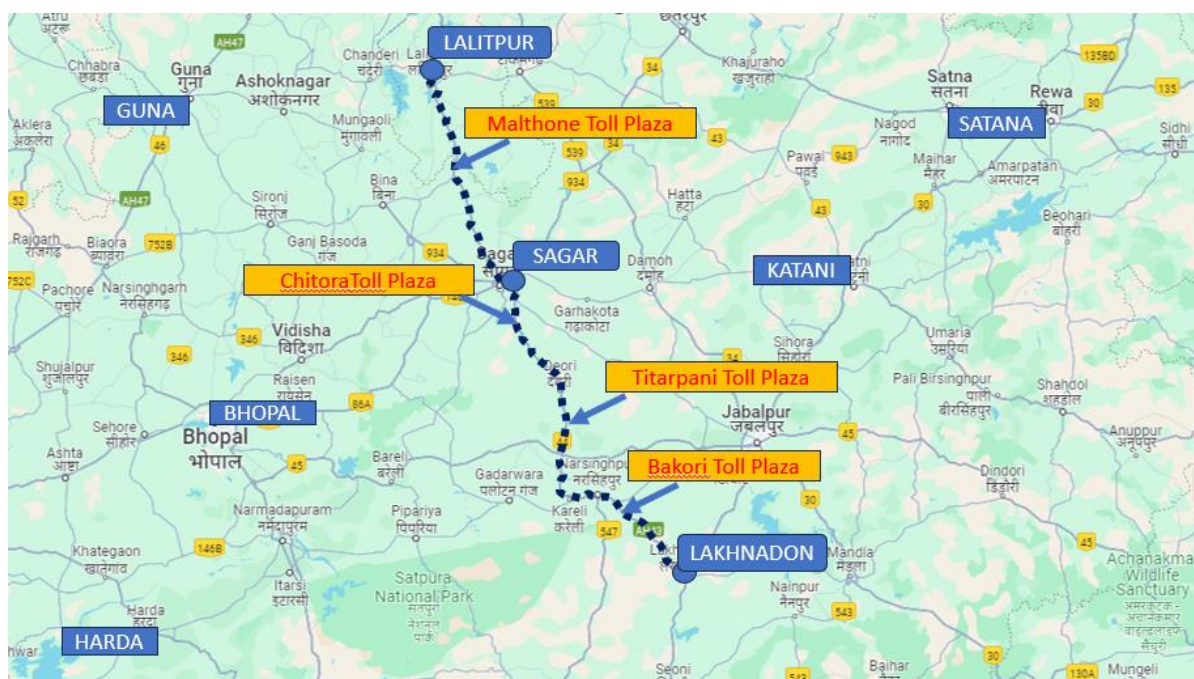


Figure 2-1 : Project Alignment with Toll Plaza

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 November 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 142.319 Toll Plaza at Malthone	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)
2	Km 226.740 Toll Plaza at Chitora	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)
3	Km 295.000 Toll Plaza at Titarpani	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)

SR. NO	LOCATION	CTV	Single Journey Traffic	Daily Return Journey	Monthly Pass	Local Pass
4	Km 357.739 Toll Plaza at Bakori	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 2024)	AADT from previous traffic study report for year 2024-25 (Eight month from April 2024 to November 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 for the year 2024-2025(traffic data from April 2024 to November 2024).

Since the traffic data available for this update is for only eight 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. Thus, 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 Malthone Toll Plaza at Km 142.319

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
1	Car	1340
2	Minibus /LCV	279
3	Bus	116

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) 2024-25
4	Truck	1306
5	3-Axle Commercial vehicle	1328
6	Multi axle	1609
7	Oversize Vehicle	4
	Total	5982

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	1463
2	Minibus /LCV	410
3	Bus	102
4	Truck	1443
5	3-Axle Commercial vehicle	1394
6	Multi axle	1831
7	Oversize Vehicle	5
	Total	6648

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	1533
2	Minibus /LCV	374
3	Bus	108
4	Truck	1475
5	3-Axle Commercial vehicle	1458
6	Multi axle	2140
7	Oversize Vehicle	6
	Total	7094

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	874
2	Minibus /LCV	325
3	Bus	90
4	Truck	1287
5	3-Axle Commercial vehicle	1247
6	Multi axle	1594
7	Oversize Vehicle	6
	Total	5423

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	5982	17267	2.89

Year	Toll Plaza Location (Km)	Traffic No	PCU	PCU Index
2024 – 2025 (Base Year)	Toll Plaza at Malthone			
	Km 226.740 Toll Plaza at Chitora	6648	19157	2.88
	Km 295.000 Toll Plaza at Titarpani	7094	20874	2.94
	Km 357.739 Toll Plaza at Bakori	5423	16434	3.03

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.

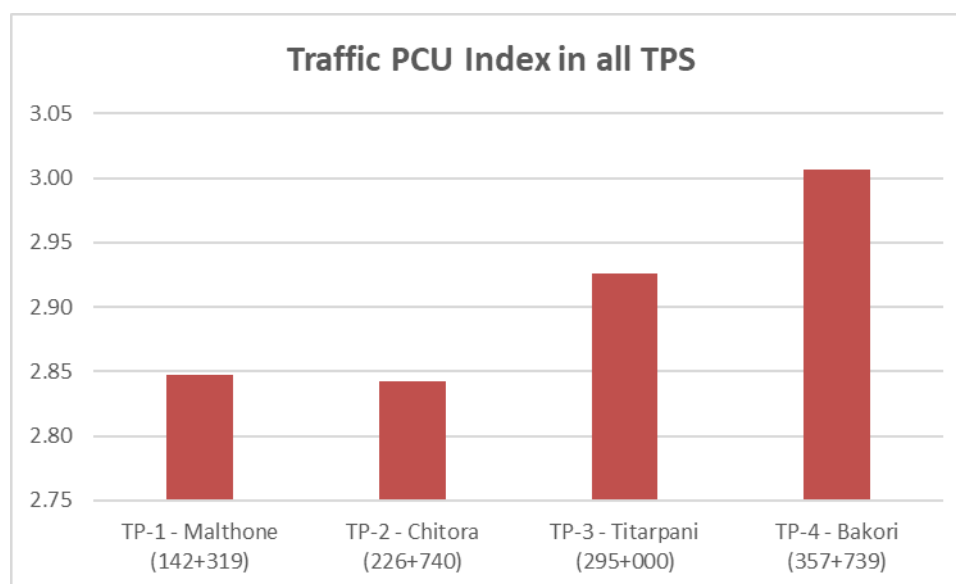


Figure 3-1 : Comparison of PCU Index

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.

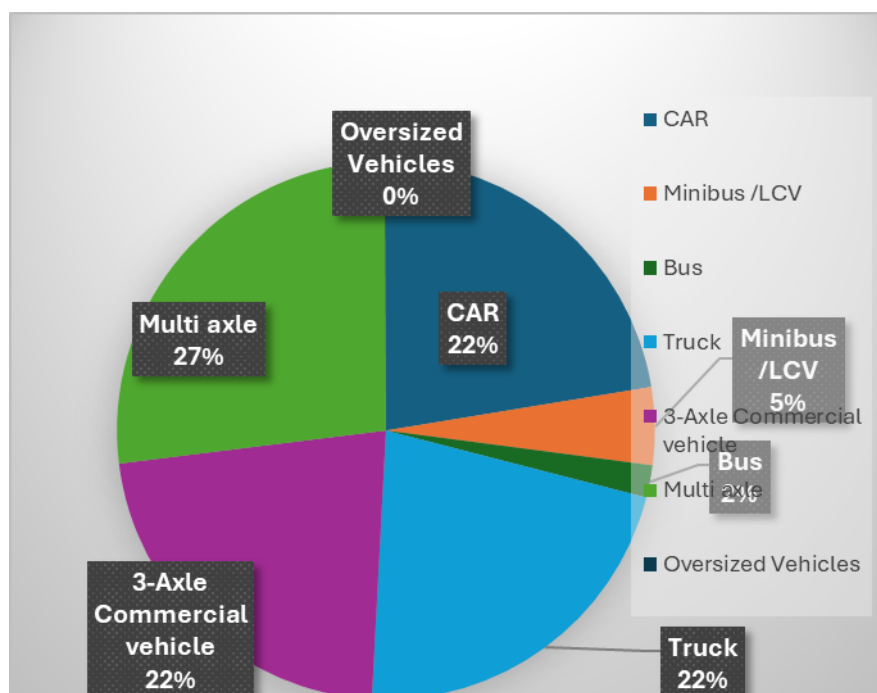


Figure 3-2: Model split of tollable vehicle @ Km 142.319

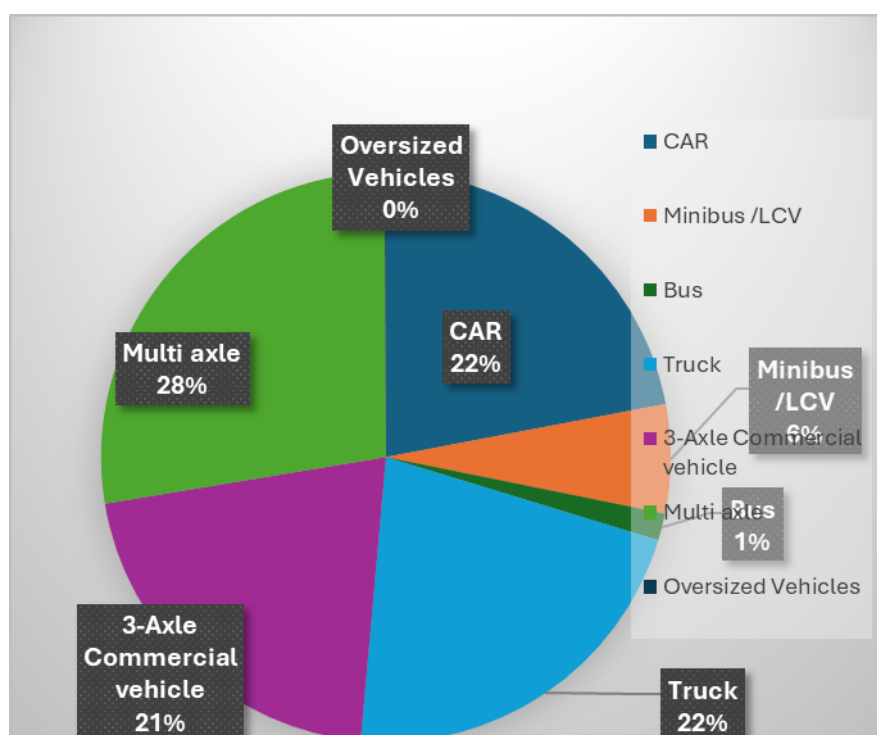


Figure 3-3: Model split of tollable vehicle @ Km 226.740

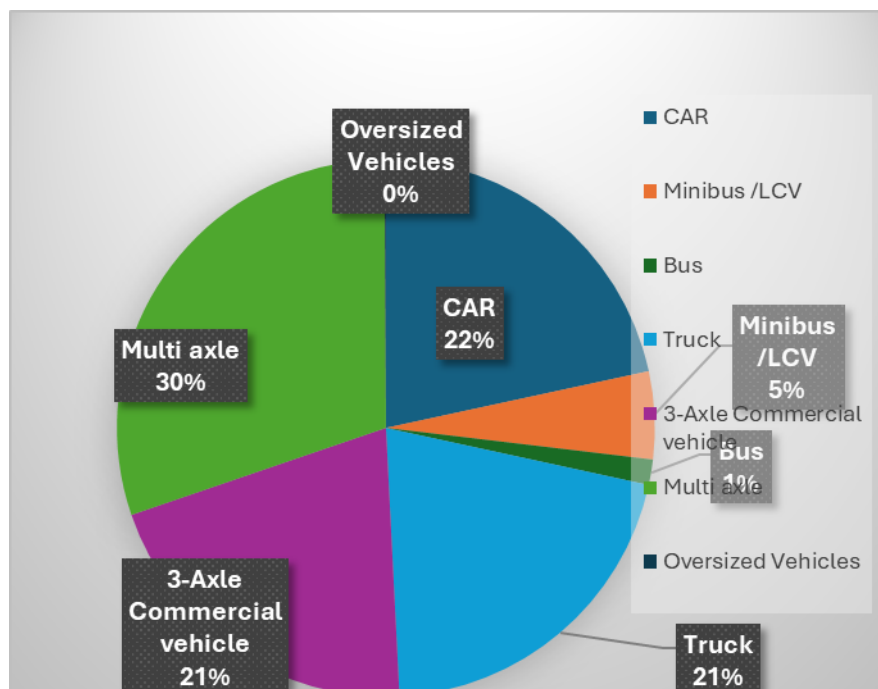


Figure 3-4: Model split of tollable vehicle @ Km 295.000

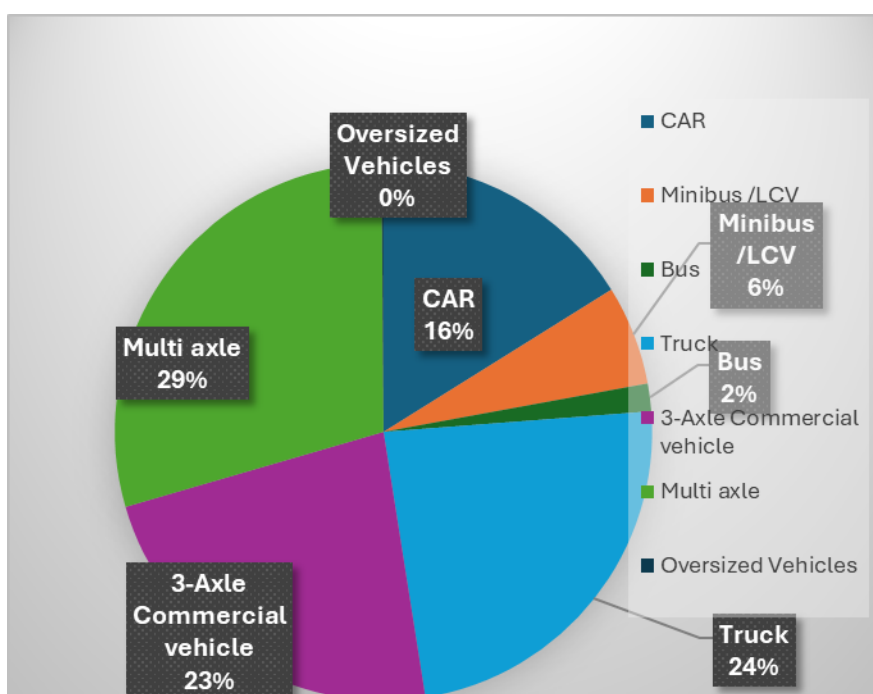


Figure 3-5: Model split of tollable vehicle @ Km 357+739

It is observed that car traffic forms about 22% of total traffic at toll plaza location KM 142.319 while multi axle commercial vehicles are about 49% of total traffic. Truck / Bus and LCV share about 24% and 5% of traffic volume respectively.

It is observed that car traffic forms about 22% of total traffic at toll plaza location KM 226.740 while multi axle commercial vehicles are about 49% of total traffic. Truck / Bus and LCV share about 23% and 6% of traffic volume respectively.

It is observed that car traffic forms about 22% 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 22% and 5% of traffic volume respectively.

It is observed that car traffic forms about 16% 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 26% 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	5381
2	Return Journey	574
3	Local Commercial Single Journey	24
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	5567
2	Return Journey	878
3	Local Commercial Single Journey	180
4	Monthly Pass Local	23
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	5892
2	Return Journey	1064
3	Local Commercial Single Journey	133
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	4947
2	Return Journey	406

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
3	Local Commercial Single Journey	62
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

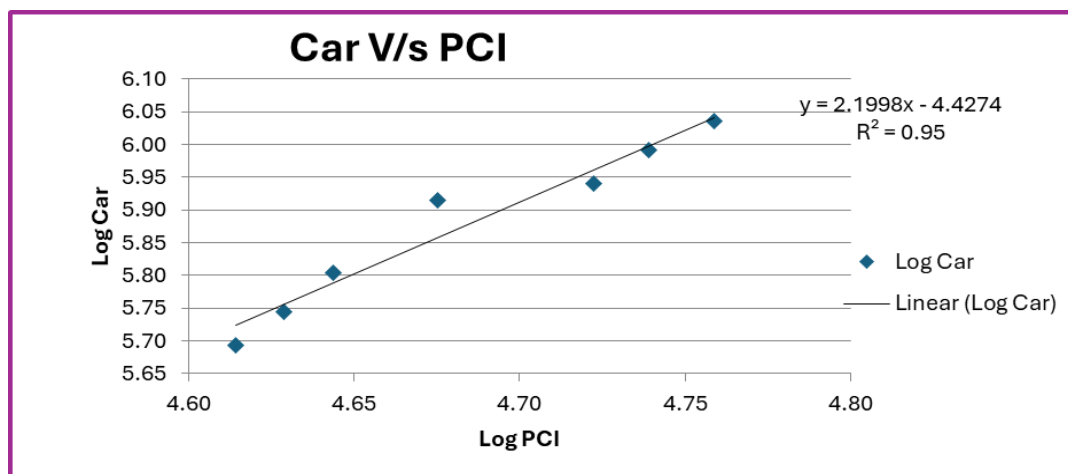


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Madhya Pradesh

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

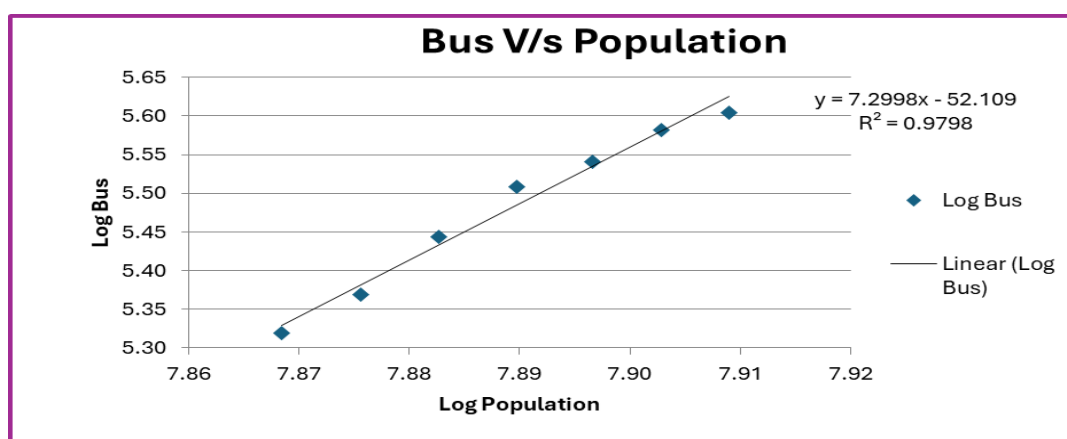


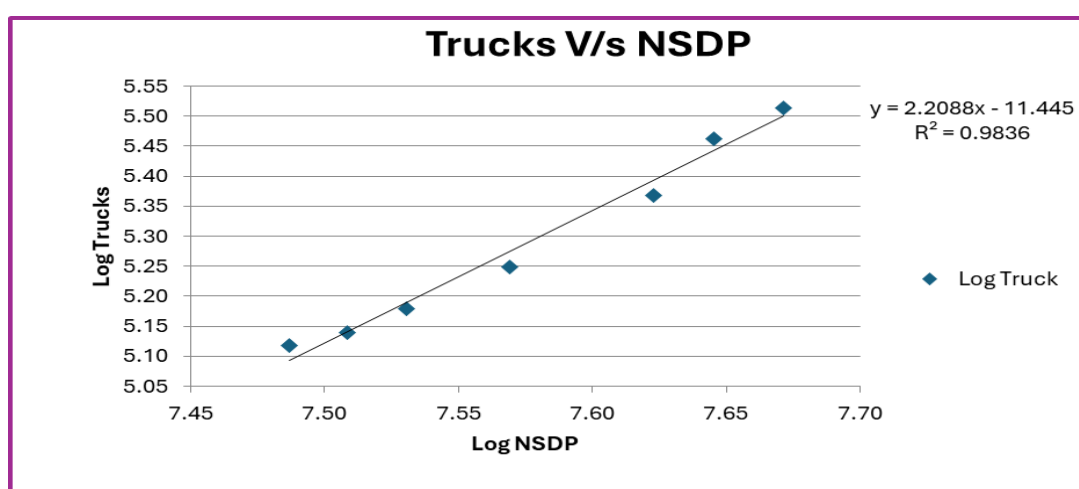
Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Madhya Pradesh

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. 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 R² 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
MADHYA PRADESH	Car/Jeep	PCI	$y = 2.2965x - 4.8829$	$R^2 = 0.9634$	2.3	6%	13.57%	Good Regression
	Bus	Population	$y = 7.4978x - 53.6722$	$R^2 = 0.9862$	7.5	2%	11.90%	Good Regression
	Truck	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

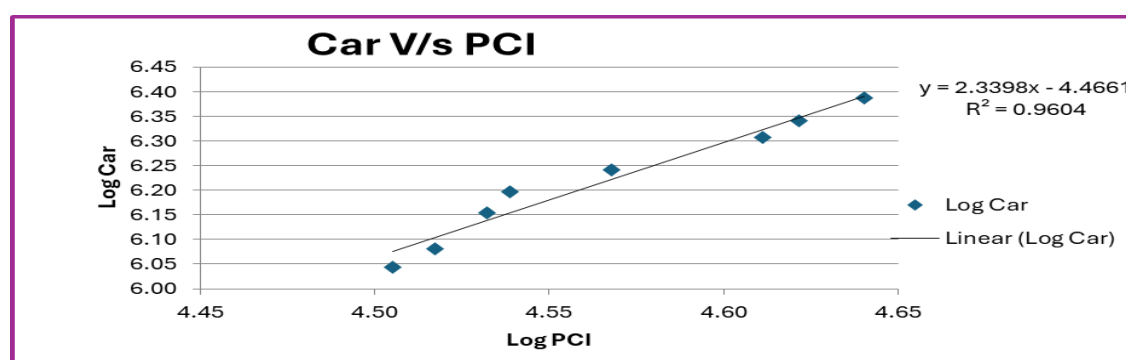
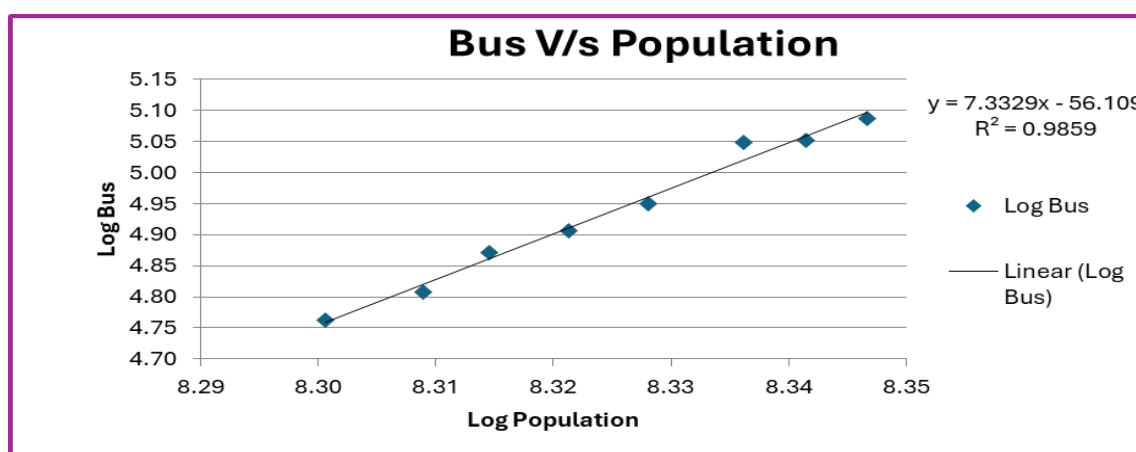


Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh**Table 5-6 : Population Vs Bus Uttar Pradesh**

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.

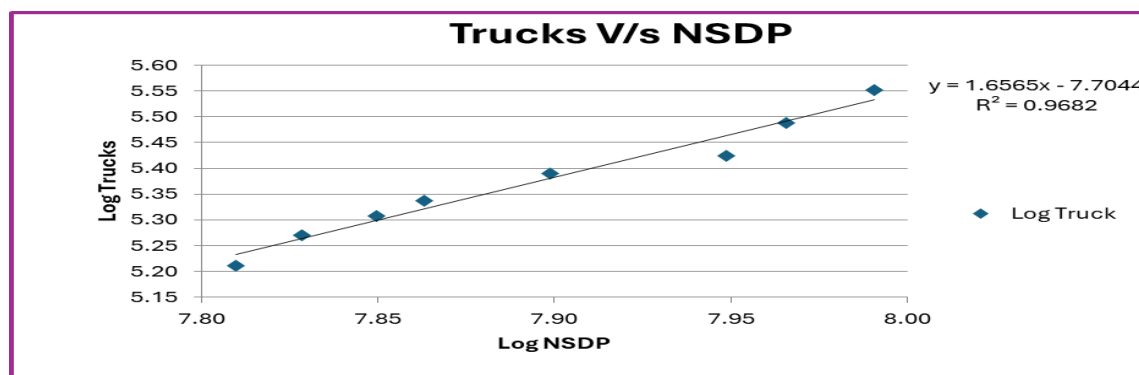


Figure 5-6 : Regression and Elasticity NSDP vs. Truck Traffic - extrapolation Uttar Pradesh.

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 R² 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

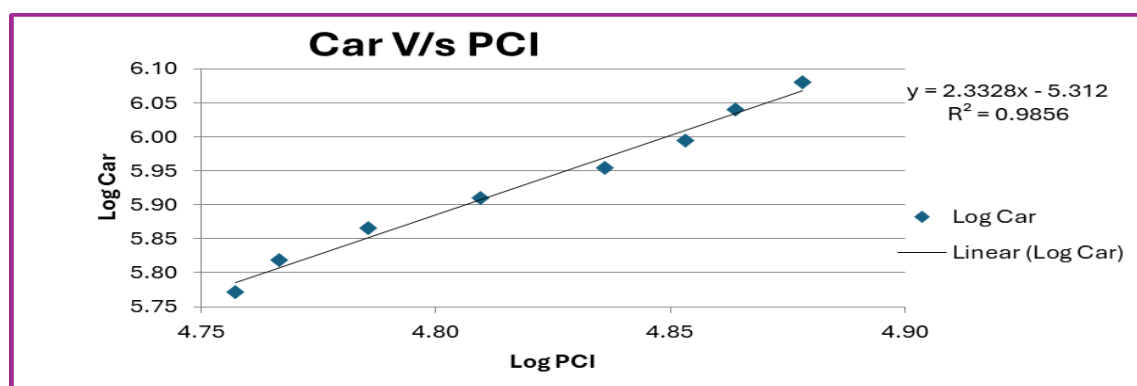


Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan

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

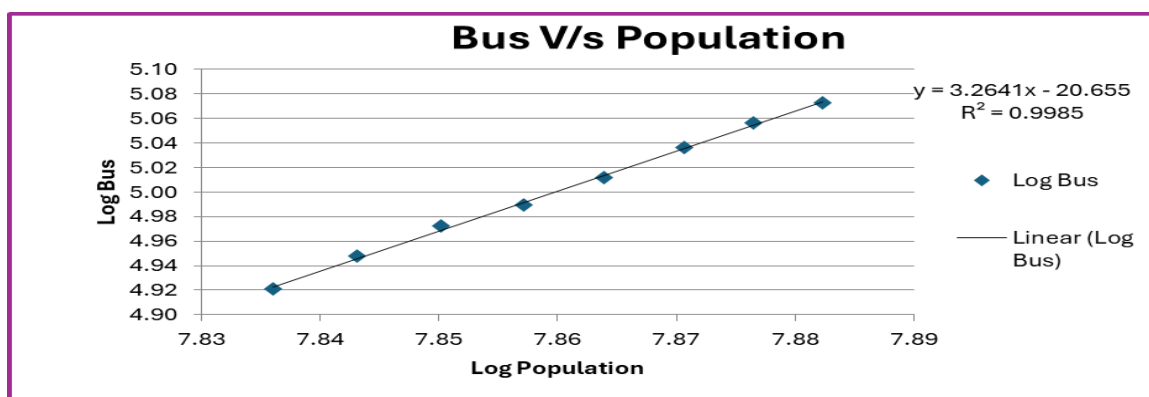


Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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.

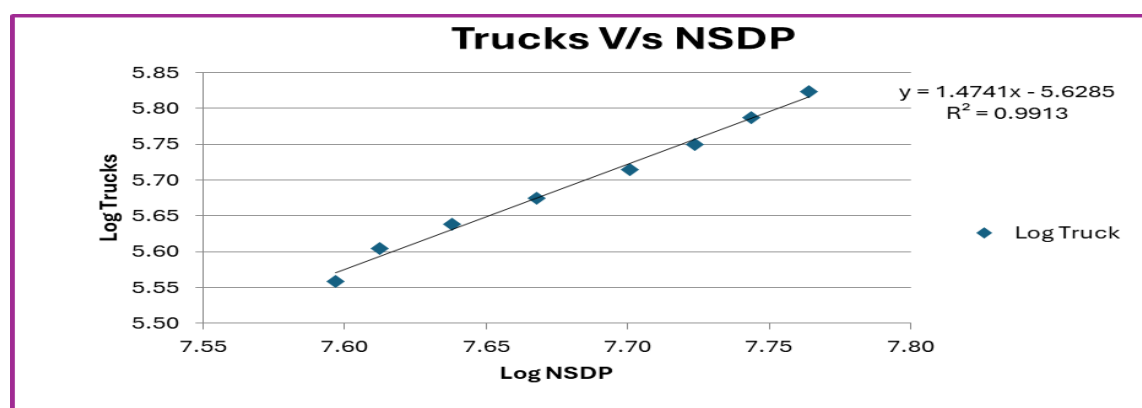


Figure 5-9 : Regression and Elasticity NSDP vs. Trucks – Extrapolation Rajasthan

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. 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 R² 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 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 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.

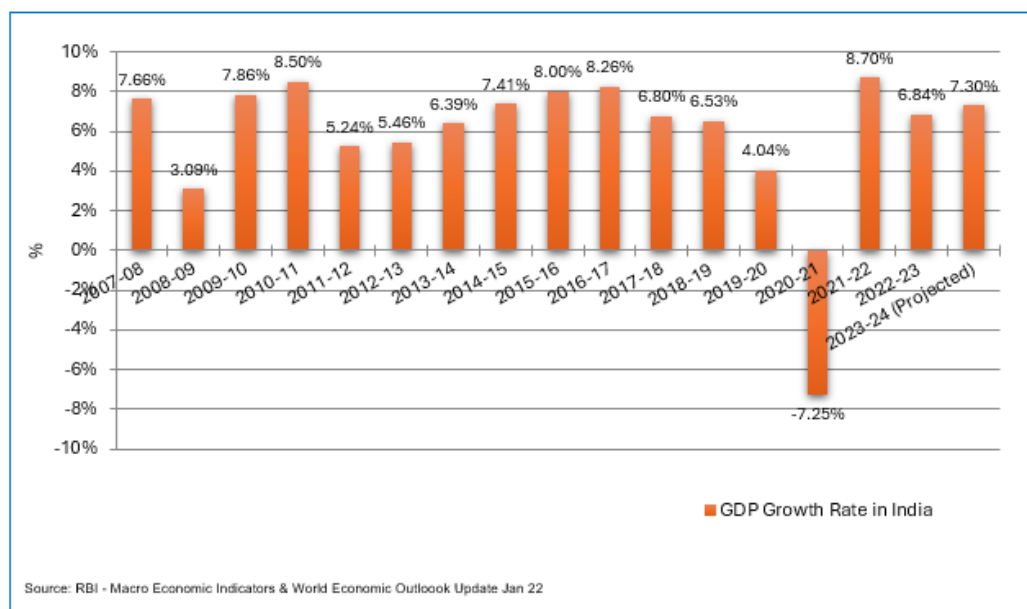


Figure 5-10 : Growth of GDP in India

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%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 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	1340	279	116	1306	1328	1609	4	5982	17267
2025-26	1457	298	123	1396	1419	1713	4	6410	18445
2026-27	1576	317	130	1485	1510	1816	4	6838	19617
2027-28	1697	336	137	1573	1599	1916	4	7262	20768
2028-29	1810	353	143	1650	1677	2003	4	7640	21781
2029-30	1911	368	147	1726	1754	2090	4	8000	22767
2030-31	2018	383	151	1806	1835	2181	4	8378	23801
2031-32	2131	399	156	1890	1920	2275	4	8775	24883
2032-33	2250	415	162	1977	2009	2373	4	9190	26013
2033-34	2375	432	168	2068	2102	2476	4	9625	27197
2034-35	2499	442	172	2136	2170	2553	4	9976	28103
2035-36	2630	452	176	2206	2241	2632	4	10341	29039
2036-37	2768	462	181	2278	2314	2713	4	10720	30007
2037-38	2913	472	186	2352	2389	2797	4	11113	31007
2038-39	3066	483	192	2429	2467	2883	4	11524	32046
2039-40	3219	492	197	2496	2535	2958	4	11901	32970
2040-41	3380	501	202	2565	2605	3035	4	12292	33923

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2041-42	3549	511	207	2636	2676	3114	4	12697	34904
2042-43	3727	521	213	2708	2749	3195	4	13117	35914
2043-44	3914	531	219	2782	2824	3278	4	13552	36955

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	1463	410	102	1443	1394	1831	5	6648	19157
2025-26	1590	437	109	1543	1490	1950	5	7124	20469
2026-27	1719	464	116	1642	1585	2068	5	7599	21773
2027-28	1850	491	122	1739	1679	2182	5	8068	23048
2028-29	1973	516	128	1825	1762	2281	5	8490	24179
2029-30	2083	537	133	1910	1844	2380	5	8892	25282
2030-31	2200	559	138	1999	1930	2483	5	9314	26436
2031-32	2323	582	143	2092	2019	2591	5	9755	27640
2032-33	2452	605	149	2189	2112	2704	5	10216	28900
2033-34	2589	630	155	2290	2210	2821	5	10700	30216
2034-35	2724	645	160	2366	2283	2908	5	11091	31227
2035-36	2867	661	165	2444	2358	2998	5	11498	32273
2036-37	3017	677	170	2524	2435	3091	5	11919	33352
2037-38	3175	693	176	2607	2515	3186	5	12357	34468
2038-39	3342	709	182	2692	2597	3284	5	12811	35619
2039-40	3510	724	187	2767	2669	3370	5	13232	36653
2040-41	3686	739	192	2844	2743	3458	5	13667	37715
2041-42	3872	754	198	2923	2819	3548	5	14119	38812
2042-43	4067	769	204	3004	2897	3640	5	14586	39938
2043-44	4271	785	210	3087	2977	3735	5	15070	41101

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	1533	374	108	1475	1458	2140	6	7094	20874
2025-26	1665	400	115	1577	1559	2279	6	7601	22301
2026-27	1800	425	122	1678	1659	2416	6	8106	23714
2027-28	1937	450	128	1777	1757	2549	6	8604	25096
2028-29	2065	473	133	1865	1844	2665	6	9051	26320
2029-30	2180	492	137	1952	1930	2781	6	9478	27517
2030-31	2301	511	141	2043	2020	2902	6	9924	28766
2031-32	2429	531	146	2138	2114	3028	6	10392	30073
2032-33	2564	553	151	2237	2212	3160	6	10883	31441
2033-34	2706	576	156	2340	2314	3297	6	11395	32864
2034-35	2847	589	160	2417	2389	3399	6	11807	33951
2035-36	2996	603	164	2496	2467	3504	6	12236	35077
2036-37	3153	617	168	2578	2548	3612	6	12682	36242
2037-38	3318	631	173	2663	2632	3724	6	13147	37454
2038-39	3493	645	178	2750	2718	3839	6	13629	38701
2039-40	3668	658	182	2826	2792	3939	6	14071	39808
2040-41	3852	671	187	2904	2868	4041	6	14529	40947
2041-42	4046	684	192	2984	2946	4146	6	15004	42122
2042-43	4249	697	197	3066	3027	4253	6	15495	43330
2043-44	4463	711	202	3151	3111	4363	6	16007	44582

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	874	325	90	1287	1247	1594	6	5423	16434
2025-26	950	347	95	1376	1334	1698	6	5806	17554
2026-27	1028	369	100	1464	1420	1801	6	6188	18665
2027-28	1107	391	105	1550	1504	1901	6	6564	19752
2028-29	1181	410	109	1626	1578	1987	6	6897	20704
2029-30	1247	427	113	1701	1651	2073	6	7218	21638
2030-31	1317	444	117	1780	1728	2163	6	7555	22619
2031-32	1391	462	121	1862	1808	2256	6	7906	23636
2032-33	1469	480	125	1948	1892	2353	6	8273	24700
2033-34	1551	499	129	2038	1980	2456	6	8659	25820
2034-35	1633	511	133	2105	2045	2532	6	8965	26670
2035-36	1719	523	137	2174	2112	2610	6	9281	27545
2036-37	1809	535	141	2245	2181	2690	6	9607	28445
2037-38	1903	548	145	2318	2253	2773	6	9946	29379
2038-39	2002	562	149	2394	2327	2858	6	10298	30343
2039-40	2103	573	153	2460	2391	2932	6	10618	31196
2040-41	2208	584	157	2528	2457	3008	6	10948	32073
2041-42	2318	596	161	2597	2525	3086	6	11289	32975
2042-43	2434	608	165	2668	2595	3166	6	11642	33904
2043-44	2555	620	169	2741	2667	3248	6	12006	34859

**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	1340	279	116	1306	1328	1609	4	5982	17267
2025-26	1451	297	122	1390	1413	1705	4	6382	18362
2026-27	1562	315	128	1472	1496	1799	4	6776	19436
2027-28	1673	332	134	1552	1577	1889	4	7161	20479
2028-29	1776	347	138	1621	1646	1965	4	7497	21372
2029-30	1866	360	142	1688	1714	2041	4	7815	22241
2030-31	1960	373	146	1758	1785	2119	4	8145	23140
2031-32	2059	387	150	1831	1859	2200	4	8490	24078
2032-33	2164	401	154	1907	1936	2284	4	8850	25053
2033-34	2274	416	158	1986	2016	2372	4	9226	26070
2034-35	2382	423	162	2041	2072	2433	4	9517	26808
2035-36	2495	431	166	2098	2129	2495	4	9818	27566
2036-37	2614	439	170	2156	2188	2559	4	10130	28348
2037-38	2738	447	174	2216	2248	2625	4	10452	29153
2038-39	2868	455	178	2277	2310	2692	4	10784	29978
2039-40	2998	462	182	2328	2362	2748	4	11084	30691
2040-41	3134	469	186	2381	2415	2805	4	11394	31424
2041-42	3276	476	190	2435	2469	2864	4	11714	32178
2042-43	3424	483	194	2490	2524	2924	4	12043	32949
2043-44	3579	490	198	2546	2581	2985	4	12383	33740

**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	1463	410	102	1443	1394	1831	5	6648	19157
2025-26	1582	436	108	1536	1483	1942	5	7092	20379
2026-27	1703	462	114	1627	1571	2050	5	7532	21580
2027-28	1826	487	120	1716	1656	2153	5	7963	22744
2028-29	1938	509	125	1793	1729	2240	5	8339	23745
2029-30	2036	526	129	1868	1801	2326	5	8691	24709
2030-31	2140	545	133	1946	1876	2416	5	9061	25717
2031-32	2248	564	137	2027	1954	2509	5	9444	26761
2032-33	2362	584	141	2111	2035	2605	5	9843	27844
2033-34	2483	604	145	2199	2119	2705	5	10260	28973
2034-35	2602	615	149	2260	2178	2775	5	10584	29796
2035-36	2725	626	153	2323	2239	2847	5	10918	30643
2036-37	2854	637	157	2387	2301	2921	5	11262	31512
2037-38	2989	648	161	2453	2365	2996	5	11617	32403
2038-39	3130	659	165	2521	2431	3074	5	11985	33325
2039-40	3271	669	169	2578	2486	3139	5	12317	34122

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2040-41	3418	679	173	2636	2542	3205	5	12658	34935
2041-42	3572	689	177	2695	2600	3272	5	13010	35768
2042-43	3734	699	181	2756	2659	3341	5	13375	36628
2043-44	3903	709	185	2818	2719	3411	5	13750	37505

**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	1533	374	108	1475	1458	2140	6	7094	20874
2025-26	1657	398	113	1570	1552	2269	6	7565	22197
2026-27	1783	422	118	1663	1644	2395	6	8031	23496
2027-28	1910	445	123	1753	1733	2516	6	8486	24754
2028-29	2027	464	127	1831	1809	2617	6	8881	25828
2029-30	2130	480	131	1907	1883	2718	6	9255	26871
2030-31	2238	497	135	1986	1960	2822	6	9644	27953
2031-32	2351	514	139	2069	2041	2930	6	10050	29081
2032-33	2470	532	143	2155	2125	3043	6	10474	30258
2033-34	2594	550	147	2244	2213	3160	6	10914	31478
2034-35	2717	561	151	2305	2274	3242	6	11256	32365
2035-36	2846	572	155	2369	2337	3326	6	11611	33281
2036-37	2981	583	159	2434	2402	3412	6	11977	34222
2037-38	3122	594	163	2501	2468	3500	6	12354	35186
2038-39	3270	605	167	2570	2536	3590	6	12744	36179
2039-40	3418	615	171	2627	2593	3665	6	13095	37033
2040-41	3572	625	175	2685	2652	3743	6	13458	37916
2041-42	3733	635	179	2744	2712	3822	6	13831	38817
2042-43	3902	645	183	2805	2773	3903	6	14217	39743
2043-44	4079	655	187	2868	2835	3985	6	14615	40691

**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	874	325	90	1287	1247	1594	6	5423	16434
2025-26	946	346	95	1369	1327	1689	6	5778	17466
2026-27	1019	367	100	1450	1406	1782	6	6130	18484
2027-28	1092	386	105	1528	1482	1871	6	6470	19463
2028-29	1159	403	109	1595	1547	1946	6	6765	20301
2029-30	1218	418	113	1661	1610	2021	6	7047	21119
2030-31	1280	433	117	1730	1676	2098	6	7340	21967
2031-32	1345	449	121	1801	1745	2178	6	7645	22848
2032-33	1414	465	125	1875	1817	2261	6	7963	23764

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2033-34	1486	481	129	1952	1892	2348	6	8294	24720
2034-35	1557	490	132	2006	1944	2409	6	8544	25406
2035-36	1631	499	135	2062	1997	2471	6	8801	26108
2036-37	1709	509	139	2119	2052	2535	6	9069	26837
2037-38	1790	519	143	2178	2108	2601	6	9345	27587
2038-39	1875	529	147	2238	2166	2668	6	9629	28355
2039-40	1960	538	150	2289	2214	2724	6	9881	29011
2040-41	2049	547	153	2341	2263	2781	6	10140	29682
2041-42	2142	556	157	2394	2314	2840	6	10409	30378
2042-43	2239	565	161	2448	2366	2900	6	10685	31089
2043-44	2340	574	165	2503	2419	2961	6	10968	31814

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	1340	279	116	1306	1328	1609	4	5982	17267
2025-26	1454	298	123	1393	1416	1709	4	6397	18406
2026-27	1569	317	129	1479	1503	1807	4	6808	19527
2027-28	1685	335	135	1563	1588	1902	4	7212	20623
2028-29	1793	351	140	1636	1662	1983	4	7569	21575
2029-30	1889	365	144	1708	1735	2064	4	7909	22504
2030-31	1990	379	148	1783	1811	2148	4	8263	23469
2031-32	2095	394	152	1861	1890	2236	4	8632	24475
2032-33	2206	409	156	1942	1973	2327	4	9017	25522
2033-34	2323	425	160	2027	2059	2422	4	9420	26616
2034-35	2439	434	164	2088	2121	2490	4	9740	27432
2035-36	2561	443	168	2151	2185	2561	4	10073	28280
2036-37	2689	452	172	2216	2251	2634	4	10418	29155
2037-38	2823	461	176	2283	2319	2709	4	10775	30057
2038-39	2964	470	180	2352	2389	2786	4	11145	30987
2039-40	3105	478	184	2411	2449	2851	4	11482	31802
2040-41	3253	486	188	2471	2510	2917	4	11829	32634
2041-42	3408	494	192	2533	2573	2985	4	12189	33494
2042-43	3571	502	196	2596	2637	3055	4	12561	34377
2043-44	3741	510	200	2661	2703	3127	4	12946	35288

**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	1463	410	102	1443	1394	1831	5	6648	19157
2025-26	1586	437	108	1539	1487	1946	5	7108	20423
2026-27	1711	463	114	1634	1579	2059	5	7565	21675
2027-28	1838	489	120	1727	1668	2168	5	8015	22895
2028-29	1957	512	125	1808	1746	2261	5	8414	23959
2029-30	2061	531	129	1888	1823	2354	5	8791	24993
2030-31	2171	551	133	1971	1903	2450	5	9184	26066
2031-32	2288	572	137	2058	1987	2550	5	9597	27190
2032-33	2409	594	141	2148	2074	2654	5	10025	28355
2033-34	2538	617	145	2242	2165	2763	5	10475	29576
2034-35	2665	631	149	2311	2231	2842	5	10834	30496
2035-36	2798	645	153	2382	2299	2923	5	11205	31444
2036-37	2937	659	157	2455	2369	3006	5	11588	32418
2037-38	3083	674	161	2530	2441	3092	5	11986	33427
2038-39	3237	689	165	2607	2515	3180	5	12398	34464
2039-40	3391	700	169	2672	2578	3255	5	12770	35368
2040-41	3554	712	173	2740	2643	3332	5	13159	36307
2041-42	3724	725	177	2809	2709	3411	5	13560	37269
2042-43	3902	738	181	2880	2777	3492	5	13975	38260
2043-44	4089	751	185	2953	2847	3574	5	14404	39276

**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	1533	374	108	1475	1458	2140	6	7094	20874
2025-26	1661	399	115	1573	1555	2274	6	7583	22249
2026-27	1792	424	121	1670	1651	2405	6	8069	23604
2027-28	1924	448	126	1765	1745	2532	6	8546	24925
2028-29	2046	470	130	1848	1826	2640	6	8966	26070
2029-30	2155	487	134	1930	1906	2748	6	9366	27189
2030-31	2270	505	138	2015	1989	2861	6	9784	28355
2031-32	2390	524	142	2104	2077	2978	6	10221	29573
2032-33	2517	543	146	2196	2168	3101	6	10677	30843
2033-34	2650	563	150	2292	2263	3228	6	11152	32163
2034-35	2782	575	154	2362	2331	3319	6	11529	33148
2035-36	2921	587	158	2434	2401	3413	6	11920	34166
2036-37	3067	599	162	2508	2473	3509	6	12324	35212
2037-38	3220	612	166	2584	2547	3609	6	12744	36297
2038-39	3381	625	170	2662	2623	3711	6	13178	37410
2039-40	3542	636	174	2729	2689	3798	6	13574	38390
2040-41	3711	648	178	2798	2756	3887	6	13984	39398
2041-42	3888	660	182	2869	2825	3978	6	14408	40434
2042-43	4074	672	186	2941	2895	4071	6	14845	41495

Year	Car	Minibus /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversize d Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2043-44	4269	684	190	3015	2967	4166	6	15297	42585

**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	874	325	90	1287	1247	1594	6	5423	16434
2025-26	948	347	95	1372	1330	1694	6	5792	17510
2026-27	1023	368	100	1456	1412	1792	6	6157	18570
2027-28	1100	389	105	1538	1492	1886	6	6516	19603
2028-29	1171	407	109	1610	1562	1966	6	6831	20499
2029-30	1234	423	113	1681	1631	2046	6	7134	21378
2030-31	1300	439	117	1755	1703	2129	6	7449	22291
2031-32	1369	456	121	1832	1778	2216	6	7778	23245
2032-33	1442	473	125	1912	1856	2306	6	8120	24235
2033-34	1519	491	129	1996	1938	2400	6	8479	25272
2034-35	1596	502	133	2056	1997	2468	6	8758	26040
2035-36	1676	513	137	2118	2058	2538	6	9046	26833
2036-37	1759	524	141	2182	2120	2610	6	9342	27646
2037-38	1847	535	145	2248	2184	2684	6	9649	28486
2038-39	1940	546	149	2316	2250	2760	6	9967	29351
2039-40	2033	556	153	2374	2307	2825	6	10254	30109
2040-41	2130	566	157	2433	2365	2891	6	10548	30881
2041-42	2231	576	161	2494	2424	2959	6	10851	31675
2042-43	2337	586	165	2556	2485	3028	6	11163	32487
2043-44	2449	596	169	2620	2547	3099	6	11486	33324

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 2/3rd 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) 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.

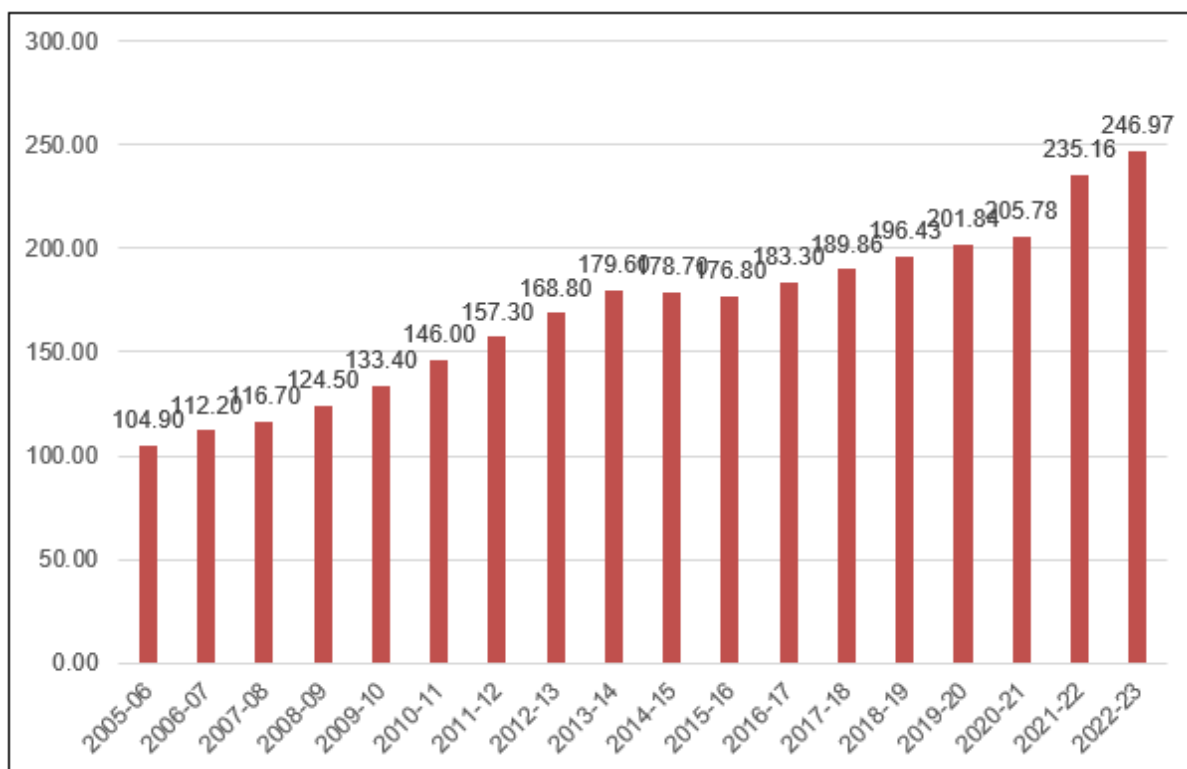


Figure 7-1 : Historical Rate of WPI Inflation in India

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	435	435	475	685	830
2026-27	135	220	460	460	500	715	875
2027-28	140	230	480	480	525	755	920
2028-29	150	240	505	505	550	790	965
2029-30	155	255	530	530	580	830	1015
2030-31	165	265	560	560	610	875	1065
2031-32	175	280	585	585	640	920	1120
2032-33	180	295	615	615	675	965	1175
2033-34	190	310	650	650	710	1015	1240
2034-35	200	325	685	685	745	1070	1305
2035-36	210	345	720	720	785	1125	1370
2036-37	225	360	755	755	825	1185	1445
2037-38	235	380	795	795	870	1250	1520
2038-39	250	400	840	840	915	1315	1600
2039-40	260	420	885	885	965	1385	1685
2040-41	275	445	930	930	1015	1460	1775
2041-42	290	470	980	980	1070	1535	1870
2042-43	305	495	1030	1030	1125	1620	1970
2043-44	320	520	1090	1090	1185	1705	2080

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	270	570	570	620	895	1085
2026-27	175	285	600	600	650	940	1140
2027-28	185	300	630	630	685	985	1200
2028-29	195	315	660	660	720	1035	1260
2029-30	205	330	695	695	755	1090	1325
2030-31	215	350	730	730	795	1145	1390
2031-32	225	365	765	765	835	1200	1465
2032-33	240	385	805	805	880	1265	1540
2033-34	250	405	850	850	925	1330	1620
2034-35	265	425	890	890	975	1400	1705
2035-36	275	450	940	940	1025	1470	1790
2036-37	290	470	990	990	1080	1550	1885
2037-38	305	495	1040	1040	1135	1630	1985
2038-39	325	525	1095	1095	1195	1720	2090
2039-40	340	550	1155	1155	1260	1810	2205
2040-41	360	580	1215	1215	1325	1905	2320
2041-42	380	610	1280	1280	1395	2010	2445
2042-43	400	645	1350	1350	1470	2115	2575
2043-44	420	680	1425	1425	1550	2230	2715

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	125	205	430	430	470	675	825
2026-27	135	215	455	455	495	710	865
2027-28	140	225	475	475	520	745	910
2028-29	150	240	500	500	545	785	955
2029-30	155	250	525	525	575	825	1005
2030-31	165	265	550	550	600	865	1055
2031-32	170	275	580	580	635	910	1110
2032-33	180	290	610	610	665	960	1165
2033-34	190	305	640	640	700	1005	1225
2034-35	200	320	675	675	735	1060	1290
2035-36	210	340	710	710	775	1115	1355
2036-37	220	355	750	750	815	1175	1430
2037-38	235	375	790	790	860	1235	1505

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2038-39	245	395	830	830	905	1300	1585
2039-40	260	415	875	875	955	1370	1670
2040-41	270	440	920	920	1005	1445	1755
2041-42	285	465	970	970	1060	1520	1850
2042-43	300	490	1020	1020	1115	1605	1950
2043-44	320	515	1075	1075	1175	1690	2055

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	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	190	310	650	650	710	1020	1245
2030-31	200	325	685	685	745	1075	1305
2031-32	215	345	720	720	785	1130	1375
2032-33	225	360	755	755	825	1185	1445
2033-34	235	380	795	795	870	1250	1520
2034-35	245	400	835	835	915	1315	1600
2035-36	260	420	880	880	960	1380	1680
2036-37	275	445	925	925	1010	1455	1770
2037-38	290	465	975	975	1065	1530	1865
2038-39	305	490	1030	1030	1120	1610	1965
2039-40	320	515	1085	1085	1180	1700	2065
2040-41	335	545	1140	1140	1245	1790	2180
2041-42	355	575	1200	1200	1310	1885	2295
2042-43	375	605	1265	1265	1380	1985	2420
2043-44	395	635	1335	1335	1455	2095	2550

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	310	655	655	715	1025	1245
2026-27	205	330	685	685	750	1075	1310
2027-28	215	345	720	720	785	1130	1375
2028-29	225	360	755	755	825	1190	1445
2029-30	235	380	795	795	870	1250	1520
2030-31	245	400	835	835	915	1310	1595
2031-32	260	420	880	880	960	1380	1680
2032-33	275	440	925	925	1010	1450	1765
2033-34	290	465	975	975	1060	1525	1860
2034-35	300	490	1025	1025	1115	1605	1955
2035-36	320	515	1075	1075	1175	1690	2055
2036-37	335	540	1135	1135	1235	1780	2165
2037-38	355	570	1195	1195	1300	1870	2280
2038-39	370	600	1255	1255	1370	1970	2400
2039-40	390	630	1325	1325	1445	2075	2530
2040-41	410	665	1395	1395	1520	2185	2665
2041-42	435	700	1470	1470	1605	2305	2805
2042-43	460	740	1550	1550	1690	2430	2955
2043-44	480	780	1630	1630	1780	2560	3115

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	865	1240	1510
2025-26	250	410	855	855	930	1340	1630
2026-27	265	430	895	895	980	1405	1715
2027-28	280	450	940	940	1030	1480	1800
2028-29	295	475	990	990	1080	1555	1890
2029-30	305	495	1040	1040	1135	1630	1985
2030-31	325	520	1095	1095	1195	1715	2090
2031-32	340	550	1150	1150	1255	1805	2195
2032-33	355	575	1210	1210	1320	1895	2310
2033-34	375	605	1270	1270	1390	1995	2430
2034-35	395	640	1340	1340	1460	2100	2555
2035-36	415	670	1410	1410	1535	2210	2690
2036-37	440	705	1480	1480	1615	2325	2830
2037-38	460	745	1560	1560	1700	2445	2980
2038-39	485	785	1645	1645	1790	2575	3135

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2039-40	510	825	1730	1730	1890	2715	3305
2040-41	540	870	1825	1825	1990	2860	3480
2041-42	570	915	1920	1920	2095	3010	3665
2042-43	600	965	2025	2025	2210	3175	3865
2043-44	630	1020	2135	2135	2330	3345	4075

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	190	310	645	645	705	1015	1235
2026-27	200	325	680	680	740	1065	1295
2027-28	210	340	715	715	780	1120	1365
2028-29	220	360	750	750	820	1175	1430
2029-30	235	375	790	790	860	1235	1505
2030-31	245	395	830	830	905	1300	1580
2031-32	255	415	870	870	950	1365	1665
2032-33	270	435	915	915	1000	1435	1750
2033-34	285	460	965	965	1050	1510	1840
2034-35	300	485	1015	1015	1105	1590	1935
2035-36	315	510	1065	1065	1165	1675	2035
2036-37	330	535	1125	1125	1225	1760	2145
2037-38	350	565	1180	1180	1290	1855	2255
2038-39	370	595	1245	1245	1360	1950	2375
2039-40	385	625	1310	1310	1430	2055	2500
2040-41	410	660	1380	1380	1505	2165	2635
2041-42	430	695	1455	1455	1585	2280	2775
2042-43	455	730	1535	1535	1675	2405	2925
2043-44	480	770	1615	1615	1765	2535	3085

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	235	385	800	800	875	1255	1530

Year	Car	Minibus /LCV	Bus	Truck	3 axle	Multi axle	Oversized Vehicles
2026-27	250	400	840	840	920	1320	1605
2027-28	260	420	885	885	965	1385	1690
2028-29	275	445	930	930	1015	1455	1775
2029-30	290	465	975	975	1065	1530	1865
2030-31	305	490	1025	1025	1120	1610	1960
2031-32	320	515	1080	1080	1175	1695	2060
2032-33	335	540	1135	1135	1240	1780	2165
2033-34	355	570	1195	1195	1300	1870	2280
2034-35	370	600	1255	1255	1370	1970	2400
2035-36	390	630	1320	1320	1440	2075	2525
2036-37	410	665	1390	1390	1520	2180	2655
2037-38	435	700	1465	1465	1600	2295	2795
2038-39	455	735	1540	1540	1680	2420	2945
2039-40	480	775	1625	1625	1770	2545	3100
2040-41	505	815	1710	1710	1865	2685	3265
2041-42	535	860	1805	1805	1965	2825	3440
2042-43	560	905	1900	1900	2075	2980	3625
2043-44	590	955	2005	2005	2185	3140	3825

Table 7-10 : Toll Rates for Monthly Pass Local@ Km 142.319

Year	Car	Minibus /LCV
2024-25	350	350
2025-26	370	370
2026-27	385	385
2027-28	405	405
2028-29	425	425
2029-30	450	450
2030-31	470	470
2031-32	495	495
2032-33	520	520
2033-34	550	550
2034-35	575	575
2035-36	605	605
2036-37	640	640
2037-38	675	675
2038-39	710	710
2039-40	745	745
2040-41	785	785
2041-42	830	830
2042-43	875	875
2043-44	920	920

Table 7-11 : Toll Rates for Monthly Pass Local@ Km 226.740

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875

Table 7-12 : Toll Rates for Monthly Pass Local@ Km 295.000

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875

Table 7-13 : Toll Rates for Monthly Pass Local@ Km 357.739

Year	Car	Minibus /LCV
2024-25	340	340
2025-26	350	350
2026-27	370	370
2027-28	385	385
2028-29	405	405
2029-30	425	425
2030-31	450	450
2031-32	470	470
2032-33	495	495
2033-34	520	520
2034-35	550	550
2035-36	575	575
2036-37	605	605
2037-38	640	640
2038-39	675	675
2039-40	710	710
2040-41	745	745
2041-42	785	785
2042-43	830	830
2043-44	875	875

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	4150	6700	14040	14040	15315	22015	26800
2025-26	4290	6930	14520	14520	15840	22770	27720
2026-27	4505	7280	15250	15250	16635	23915	29115
2027-28	4735	7645	16020	16020	17475	25125	30585
2028-29	4975	8035	16835	16835	18365	26395	32135
2029-30	5225	8445	17690	17690	19300	27740	33770
2030-31	5495	8875	18595	18595	20285	29160	35500
2031-32	5775	9330	19550	19550	21325	30660	37320
2032-33	6075	9810	20560	20560	22430	32240	39250
2033-34	6390	10320	21625	21625	23590	33910	41285
2034-35	6720	10860	22750	22750	24820	35675	43435
2035-36	7075	11425	23940	23940	26115	37545	45705
2036-37	7445	12025	25200	25200	27490	39515	48105
2037-38	7840	12660	26530	26530	28940	41600	50645
2038-39	8255	13330	27935	27935	30475	43805	53330
2039-40	8690	14040	29420	29420	32095	46135	56165
2040-41	9155	14790	30995	30995	33810	48605	59170
2041-42	9650	15585	32655	32655	35625	51210	62345

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2042-43	10170	16425	34415	34415	37545	53970	65705
2043-44	10720	17315	36275	36275	39575	56890	69255

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	4150	6700	14040	14040	15315	22015	26800
2025-26	4290	6930	14520	14520	15840	22770	27720
2026-27	4505	7280	15250	15250	16635	23915	29115
2027-28	4735	7645	16020	16020	17475	25125	30585
2028-29	4975	8035	16835	16835	18365	26395	32135
2029-30	5225	8445	17690	17690	19300	27740	33770
2030-31	5495	8875	18595	18595	20285	29160	35500
2031-32	5775	9330	19550	19550	21325	30660	37320
2032-33	6075	9810	20560	20560	22430	32240	39250
2033-34	6390	10320	21625	21625	23590	33910	41285
2034-35	6720	10860	22750	22750	24820	35675	43435
2035-36	7075	11425	23940	23940	26115	37545	45705
2036-37	7445	12025	25200	25200	27490	39515	48105
2037-38	7840	12660	26530	26530	28940	41600	50645
2038-39	8255	13330	27935	27935	30475	43805	53330
2039-40	8690	14040	29420	29420	32095	46135	56165
2040-41	9155	14790	30995	30995	33810	48605	59170
2041-42	9650	15585	32655	32655	35625	51210	62345
2042-43	10170	16425	34415	34415	37545	53970	65705
2043-44	10720	17315	36275	36275	39575	56890	69255

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	6635	13900	13900	15160	21795	26535
2025-26	4245	6860	14375	14375	15685	22545	27445
2026-27	4460	7205	15100	15100	16470	23675	28825
2027-28	4685	7570	15860	15860	17300	24870	30280
2028-29	4925	7955	16665	16665	18180	26135	31815
2029-30	5175	8360	17515	17515	19105	27465	33435
2030-31	5440	8785	18410	18410	20080	28870	35145
2031-32	5720	9235	19355	19355	21115	30350	36950
2032-33	6015	9715	20355	20355	22205	31920	38855
2033-34	6325	10220	21410	21410	23355	33570	40870
2034-35	6655	10750	22525	22525	24570	35320	43000
2035-36	7005	11310	23700	23700	25855	37170	45250

Year	Car	Minibus /LCV	Bus	Truck	3 -Axle	Multi axle	Oversized Vehicles
2036-37	7370	11905	24945	24945	27215	39120	47625
2037-38	7760	12535	26265	26265	28650	41185	50140
2038-39	8170	13200	27655	27655	30170	43370	52795
2039-40	8605	13900	29125	29125	31775	45675	55605
2040-41	9065	14645	30685	30685	33475	48115	58580
2041-42	9550	15430	32330	32330	35270	50700	61720
2042-43	10065	16260	34070	34070	37170	53430	65045
2043-44	10610	17140	35915	35915	39180	56320	68565

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	5090	8220	17225	17225	18790	27010	32880
2025-26	5265	8505	17815	17815	19435	27940	34010
2026-27	5530	8930	18710	18710	20410	29340	35720
2027-28	5805	9380	19655	19655	21440	30825	37525
2028-29	6100	9855	20650	20650	22530	32385	39425
2029-30	6410	10360	21705	21705	23675	34035	41435
2030-31	6740	10890	22815	22815	24890	35775	43555
2031-32	7085	11450	23985	23985	26165	37615	45790
2032-33	7450	12040	25225	25225	27515	39555	48155
2033-34	7840	12660	26530	26530	28945	41605	50650
2034-35	8245	13320	27910	27910	30450	43770	53285
2035-36	8680	14020	29375	29375	32045	46060	56075
2036-37	9135	14755	30915	30915	33725	48480	59020
2037-38	9615	15535	32545	32545	35505	51040	62135
2038-39	10125	16355	34270	34270	37390	53745	65430
2039-40	10665	17230	36095	36095	39380	56605	68910
2040-41	11235	18150	38025	38025	41480	59630	72595
2041-42	11840	19120	40065	40065	43710	62830	76490
2042-43	12475	20155	42225	42225	46065	66215	80610
2043-44	13150	21245	44510	44510	48555	69795	84970

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	89.94	123.09	106.20	105.51	424.74
2025-26	99.58	142.38	117.00	116.81	475.77
2026-27	111.11	158.95	131.11	129.92	531.09
2027-28	123.86	177.15	145.79	145.12	591.91
2028-29	135.88	194.59	160.49	159.14	650.10
2029-30	149.23	213.79	176.42	174.66	714.10
2030-31	164.44	235.03	193.27	192.18	784.92
2031-32	181.02	258.25	213.25	211.97	864.48
2032-33	198.18	283.62	234.01	231.75	947.56
2033-34	218.21	311.90	256.68	255.31	1042.11
2034-35	237.22	338.86	279.23	277.12	1132.42
2035-36	258.61	369.09	304.39	301.55	1233.64
2036-37	280.35	400.68	330.17	326.98	1338.19
2037-38	305.25	435.08	359.40	355.54	1455.26
2038-39	332.23	473.91	390.53	386.58	1583.24
2039-40	360.77	514.53	424.34	420.05	1719.69
2040-41	389.69	555.52	458.25	453.28	1856.74
2041-42	422.14	602.25	496.28	490.66	2011.32
2042-43	457.26	652.43	537.74	531.27	2178.70
2043-44	496.85	709.45	584.43	577.63	2368.35

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	89.94	123.09	106.20	105.51	424.74
2025-26	99.13	141.75	116.46	116.25	473.59
2026-27	110.09	157.53	129.92	128.70	526.23
2027-28	122.13	174.80	143.82	143.08	583.82
2028-29	133.34	190.99	157.49	156.16	637.99
2029-30	145.80	208.80	172.23	170.59	697.42
2030-31	159.89	228.44	187.72	186.76	762.81
2031-32	175.18	249.81	206.10	205.05	836.13
2032-33	190.89	273.06	225.14	223.12	912.21
2033-34	209.21	298.91	245.82	244.63	998.58
2034-35	226.33	323.22	266.19	264.17	1079.90
2035-36	245.53	350.36	288.82	285.97	1170.68

Location / Year	TP-1 - Malthone (142+319)	TP-2 - Chitora (226+740)	TP-3 - Titarpani (295+000)	TP-4 - Bakori (357+739)	Total
2036-37	264.89	378.49	311.83	308.63	1263.85
2037-38	287.03	408.93	337.71	333.97	1367.64
2038-39	310.83	443.26	365.16	361.33	1480.59
2039-40	335.88	478.99	394.94	390.68	1600.49
2040-41	361.01	514.58	424.57	419.50	1719.66
2041-42	389.19	555.06	457.65	451.97	1853.87
2042-43	419.55	598.37	493.65	487.07	1998.64
2043-44	453.69	647.40	533.92	527.01	2162.02

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	89.94	123.09	106.20	105.51	424.74
2025-26	99.37	142.06	116.72	116.51	474.66
2026-27	110.60	158.23	130.49	129.24	528.57
2027-28	122.98	175.95	144.79	144.04	587.76
2028-29	134.60	192.76	158.94	157.59	643.90
2029-30	147.52	211.31	174.27	172.57	705.66
2030-31	162.15	231.72	190.47	189.39	773.73
2031-32	178.06	254.06	209.68	208.48	850.28
2032-33	194.48	278.33	229.54	227.39	929.74
2033-34	213.61	305.36	251.20	249.94	1020.11
2034-35	231.67	330.98	272.63	270.62	1105.90
2035-36	251.97	359.59	296.50	293.78	1201.84
2036-37	272.53	389.37	320.86	317.83	1300.59
2037-38	296.04	421.73	348.33	344.75	1410.85
2038-39	321.42	458.23	377.51	373.96	1531.13
2039-40	348.21	496.33	409.26	405.43	1659.23
2040-41	375.16	534.49	440.96	436.45	1787.06
2041-42	405.44	577.90	476.47	471.30	1931.11
2042-43	438.08	624.46	515.10	509.03	2086.68
2043-44	474.89	677.24	558.46	552.11	2262.71

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	63.79	-8.87%	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	114.22	-7.13%	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	64.71	-7.55%	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	117.85	-4.19%	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	65.65	-6.21%	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	121.57	- 1.16%	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)	63.79	114.22	64.71	117.85	65.65	121.57
Differences %	-8.87%	-7.13%	-7.55%	-4.19%	-6.21%	-1.16%
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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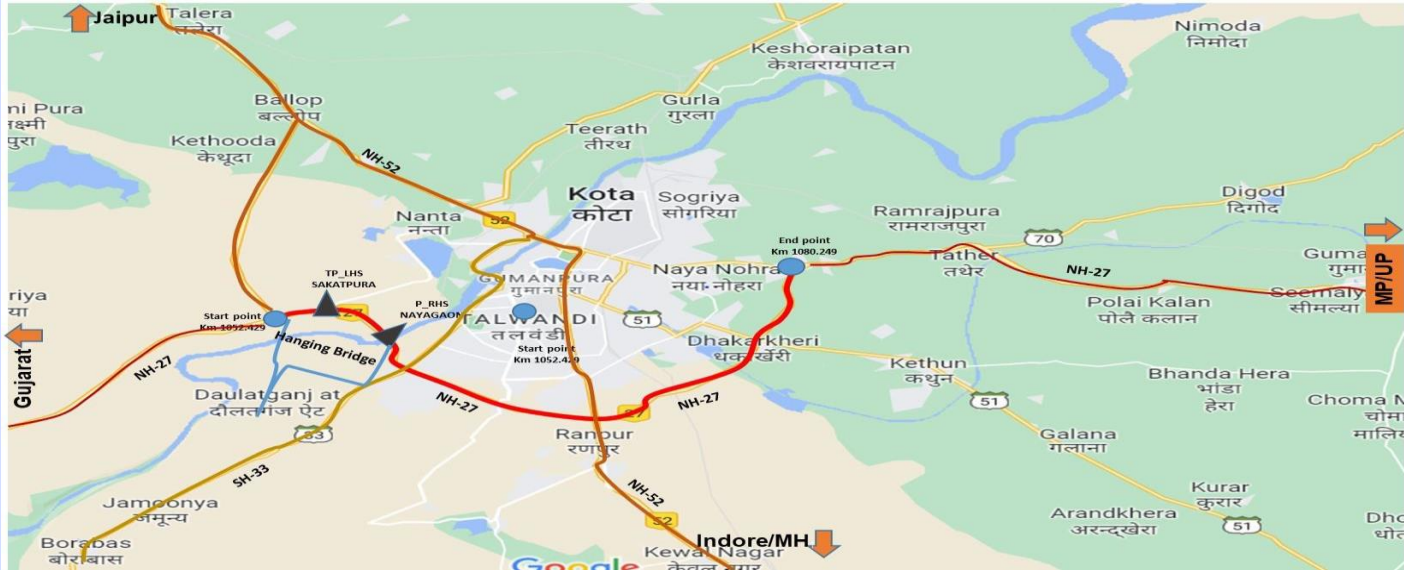
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KOTA BYPASS SECTION OF NH-76 (new NH-27) IN THE STATE OF RAJASTHAN UNDER (TOT Bundle-13)



TRAFFIC STUDY & REVENUE PROJECTION REPORT (FINAL)

JANUARY 2025



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JANUARY 2025



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ABBREVIATIONS

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

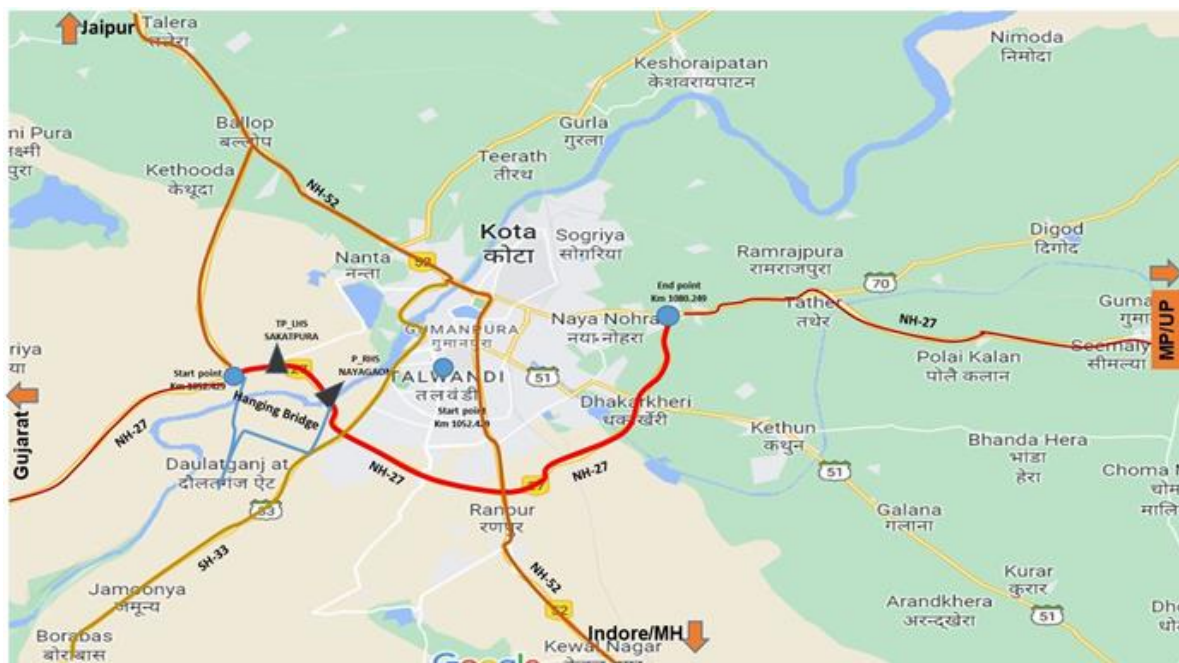


Figure 1-1: Project Stretch of ToT Bundle 13 (Part)

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.

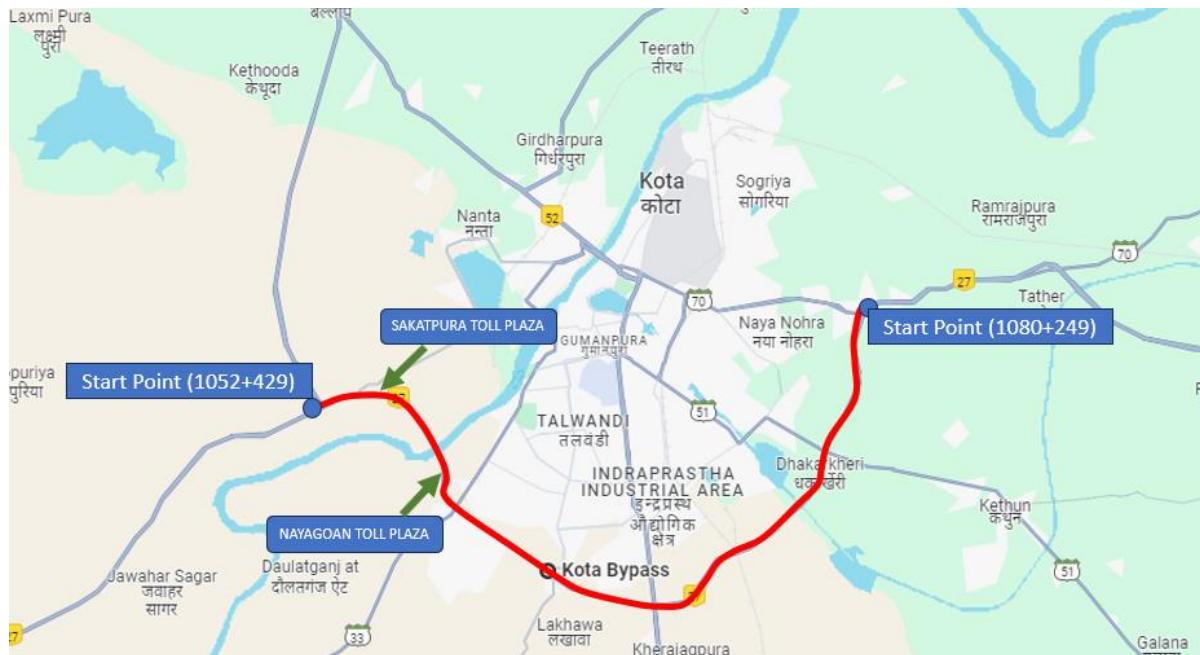


Figure 2-1 : Project Alignment with Toll Plaza

CHAPTER 3

TRAFFIC SURVEYS AND ANALYSIS

3.1 Traffic Surveys

The Consultants have collected the required information for the 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 November 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 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for Year 2023-24 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for Year 2023-24 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for Year 2023-24 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for Year 2023-24 & Eight month from April 2024 to November 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 from April 2024 to November 2024.

Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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 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	2550

Sr. No	Type of Vehicle	Annual Average Daily Traffic (Nos.) - 2023-24	Annual Average Daily Traffic (Nos.) - 2024-25
2	Minibus /LCV	68	664
3	Bus	513	91
4	Truck	538	1441
5	3-Axle Commercial vehicle	745	1129
6	Multi axle	2493	3071
7	Oversized Vehicles	0	5
	Total	8090	8951

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

Vehicle Type	PCUs
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 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	8951	25371	2.83
	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 corridors. 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.

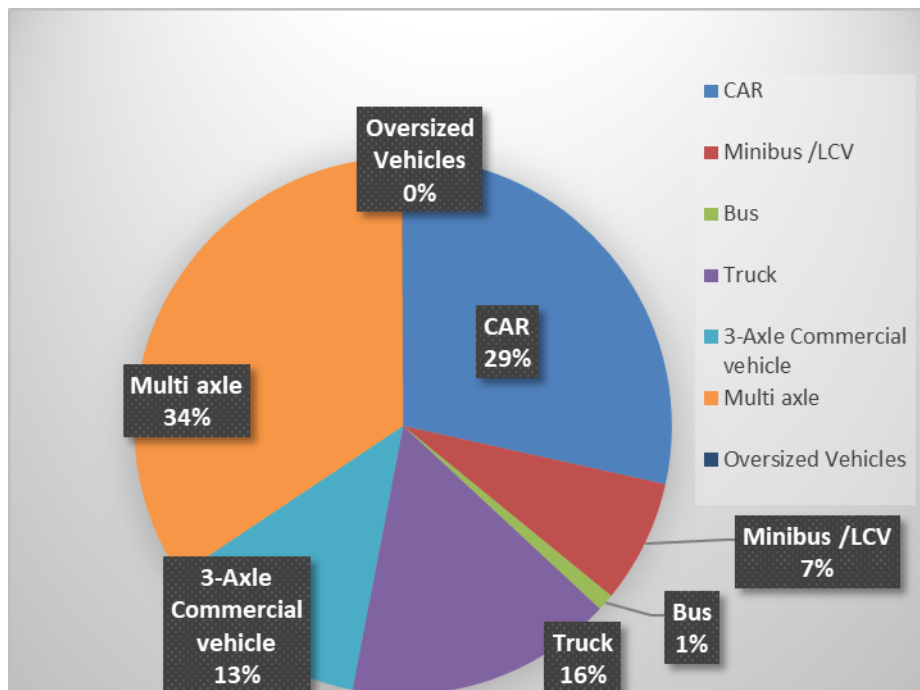


Figure 3-2: Model split of tollable vehicle @ Km 1055+217/ Km 1058+837

It is observed that car traffic forms about 29% of total traffic at toll plaza location KM 1055+217/ Km 1058+837 while multi axle commercial vehicles are about 66% 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 to various types 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 the 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	6714
2	Return Journey	2166
3	Local Commercial Single Journey	69

Sr. No	Type	Traffic Volume (Nos.)
		2024-25
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. The same is discussed in subsequent chapter.

CHAPTER 4

INFLUENCE ZONE TRANSPORT NETWORK ANALYSIS

4.1 Introduction

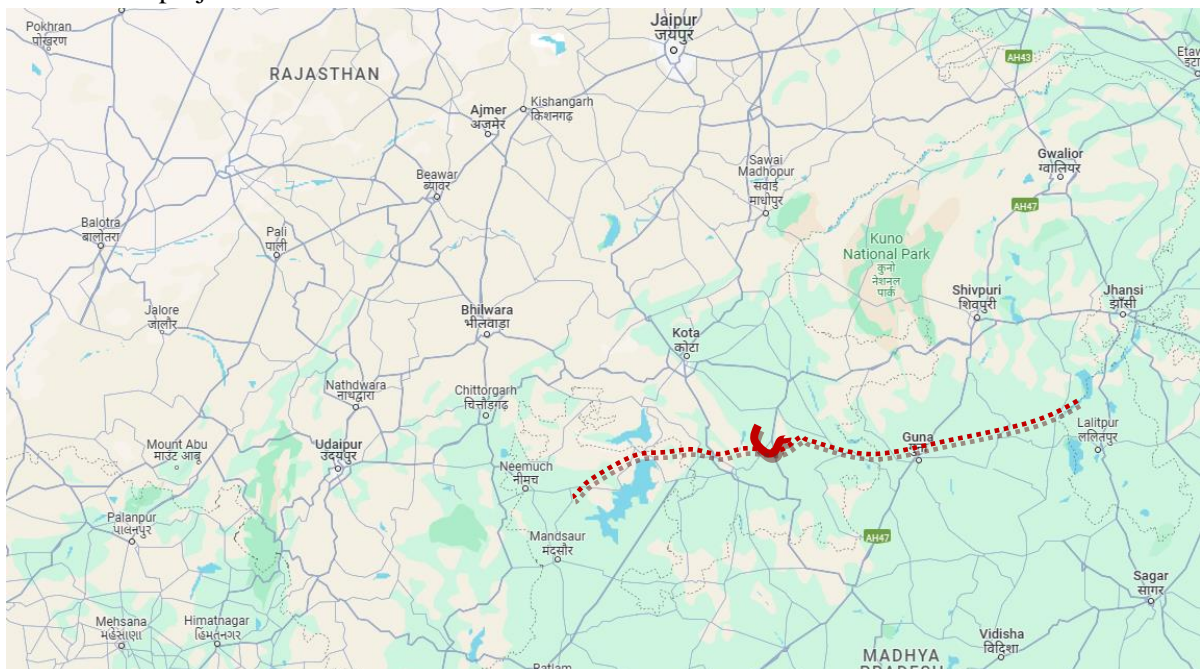
Highway corridors behave like integrated circuit networks and more often than not every road is connected to various networks having different origins and destinations. Traffic running on these networks behaves like fluid and flow on network on alignment of least friction.

The 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: 108-2015-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 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.

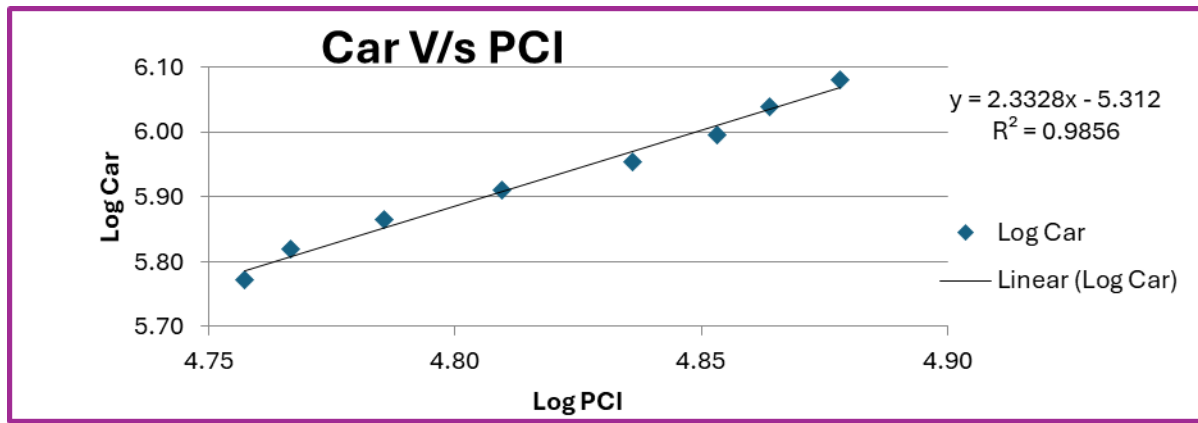


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan

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.

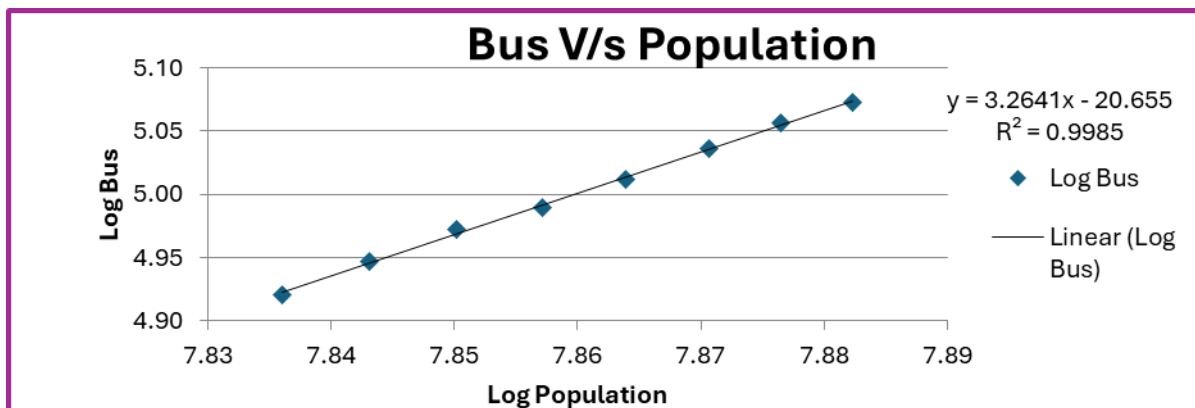


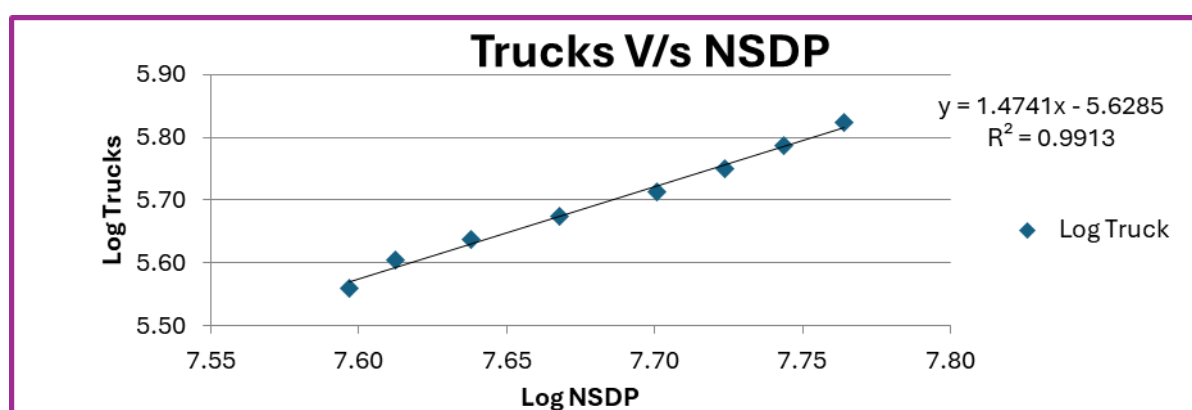
Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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 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%

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 R² 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
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 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.

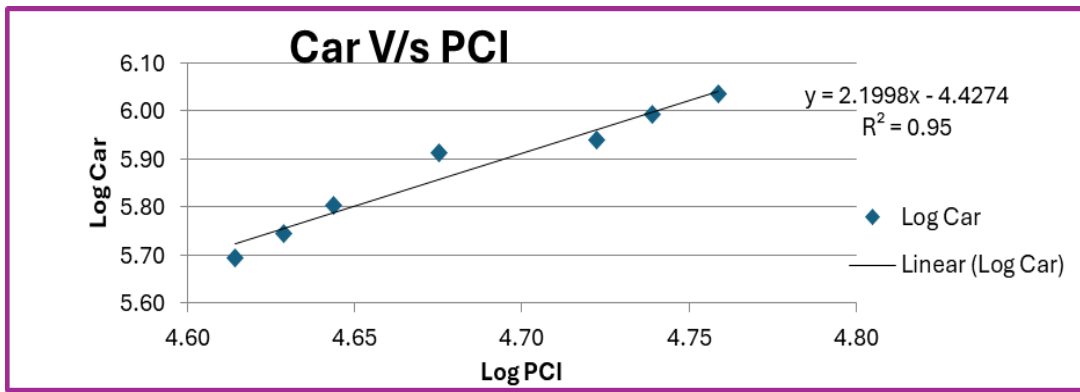


Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Madhya Pradesh

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.

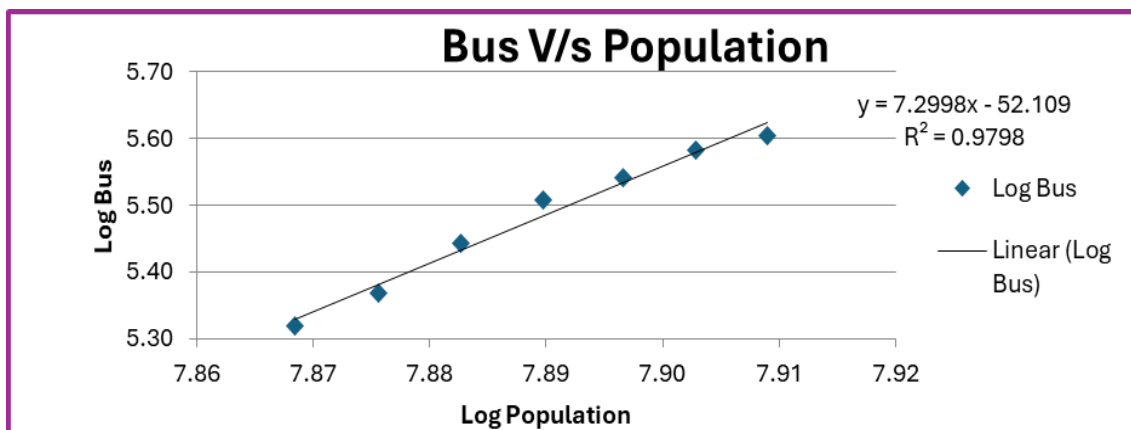


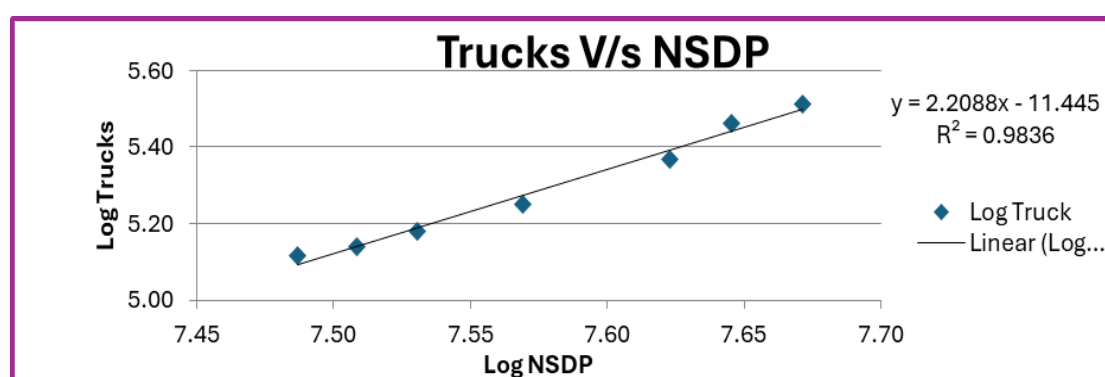
Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Madhya Pradesh

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
MADHYA PRADESH	Car/Jeep	PCI	$y = 2.2965x - 4.8829$	$R^2 = 0.9634$	2.3	6%	13.57%	Good Regression
	Bus	Population	$y = 7.4978x - 53.6722$	$R^2 = 0.9862$	7.5	2%	11.90%	Good Regression
	Truck	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.

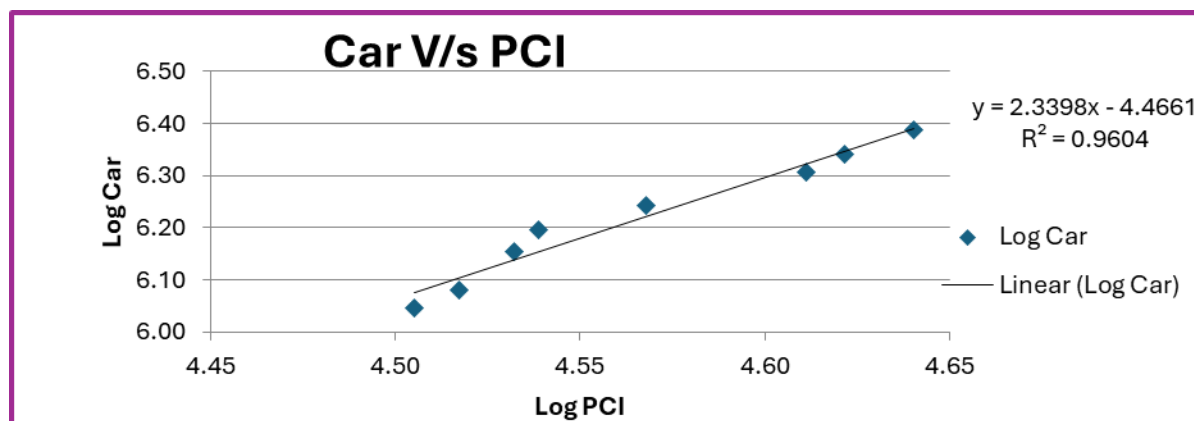


Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh

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.

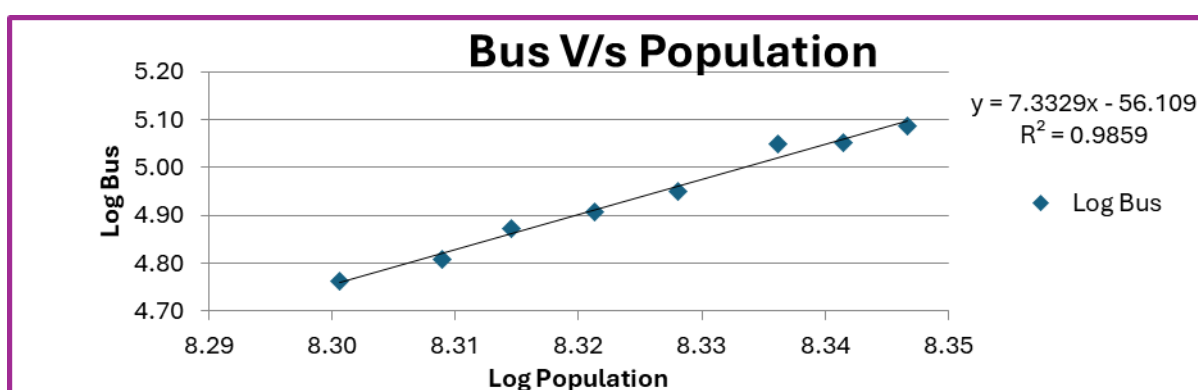


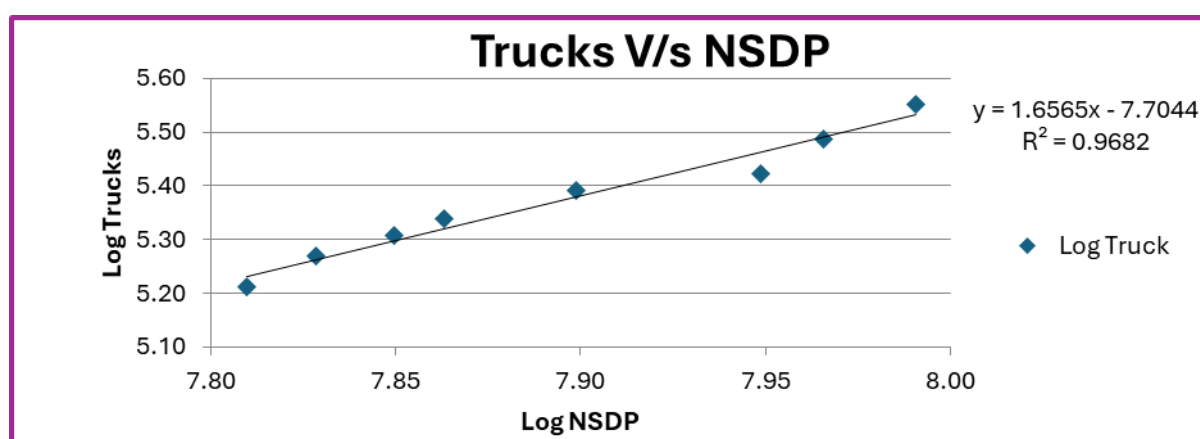
Figure 5-8 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh

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 Uutar 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 Gujarat State.

Table 5-13 : Per Capita Income Vs Car Gujarat

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.

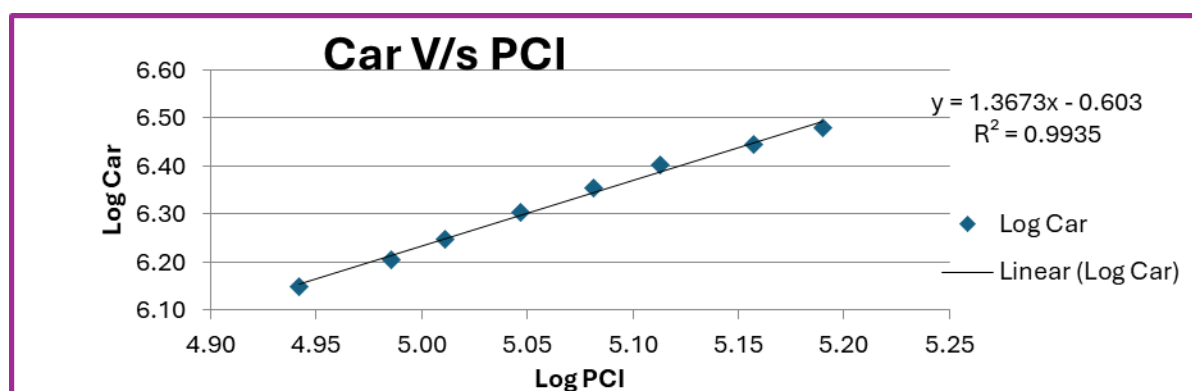
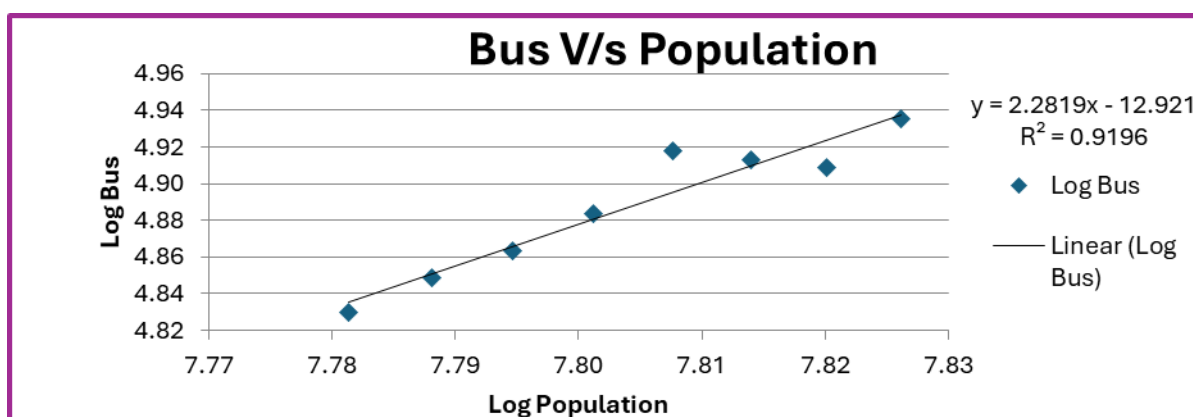


Figure 5-10 : Regression and Elasticity PCI vs. Car – Extrapolation Gujarat**Table 5-14 : Population Vs Bus Gujarat**

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.

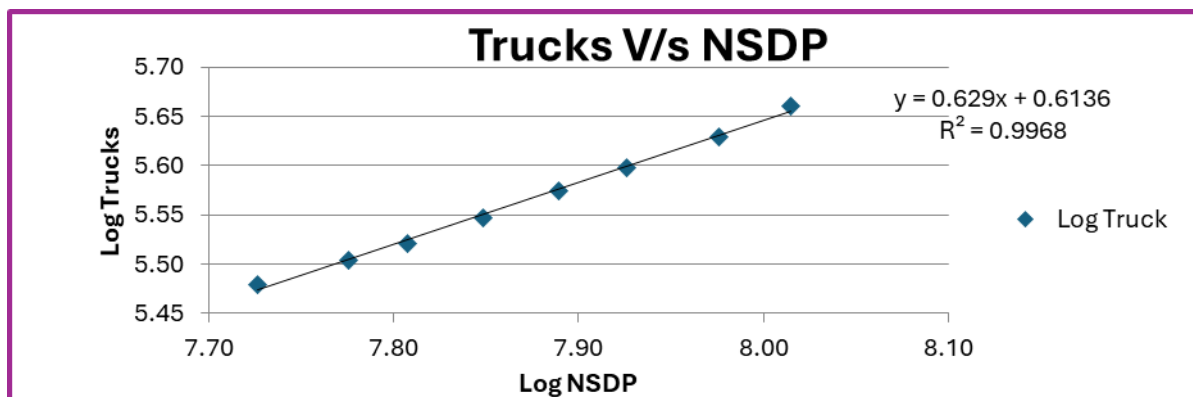


Figure 5-12 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Gujarat.

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
GUJRAT	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.

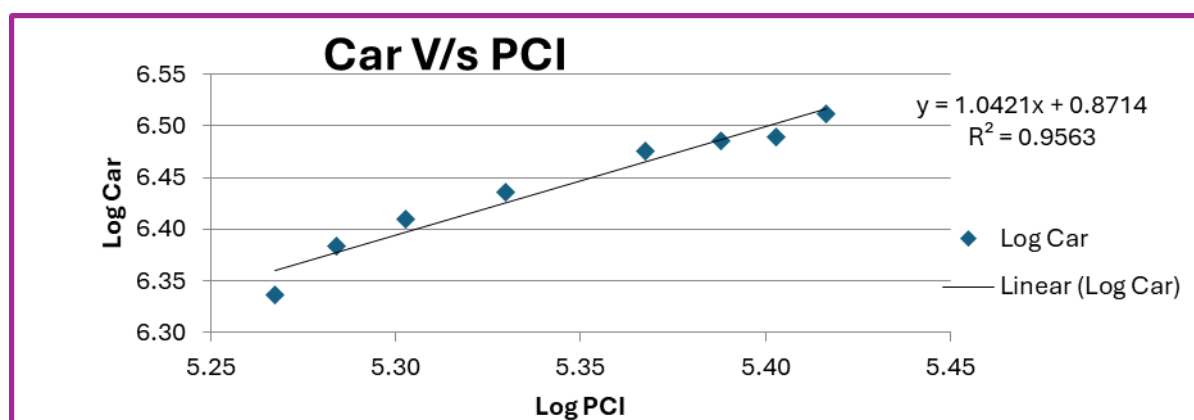


Figure 5-13 : Regression and Elasticity PCI vs. Car – Extrapolation Delhi

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.

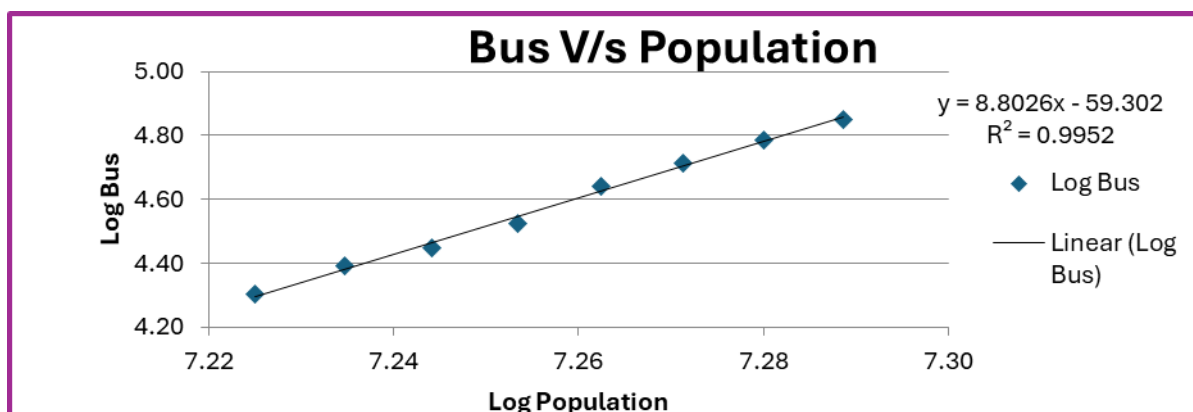


Figure 5-14 : Regression and Elasticity Population vs. Bus – Extrapolation Delhi

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.

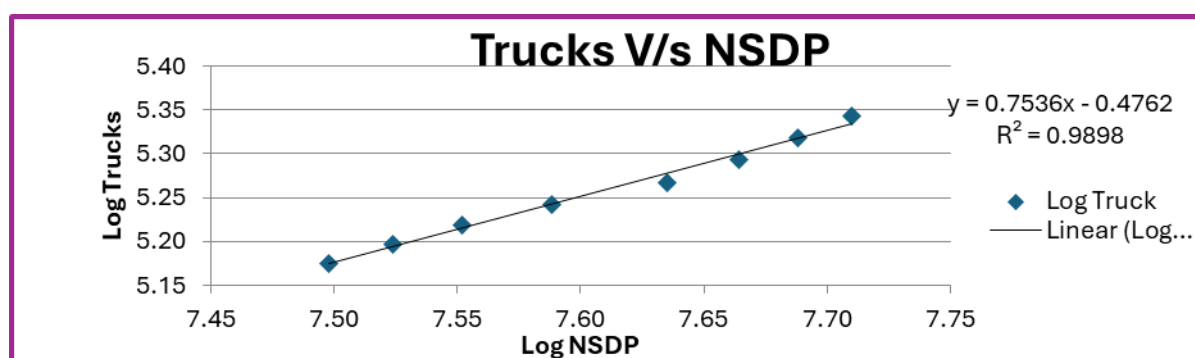


Figure 5-15 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Delhi.

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 R² 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.

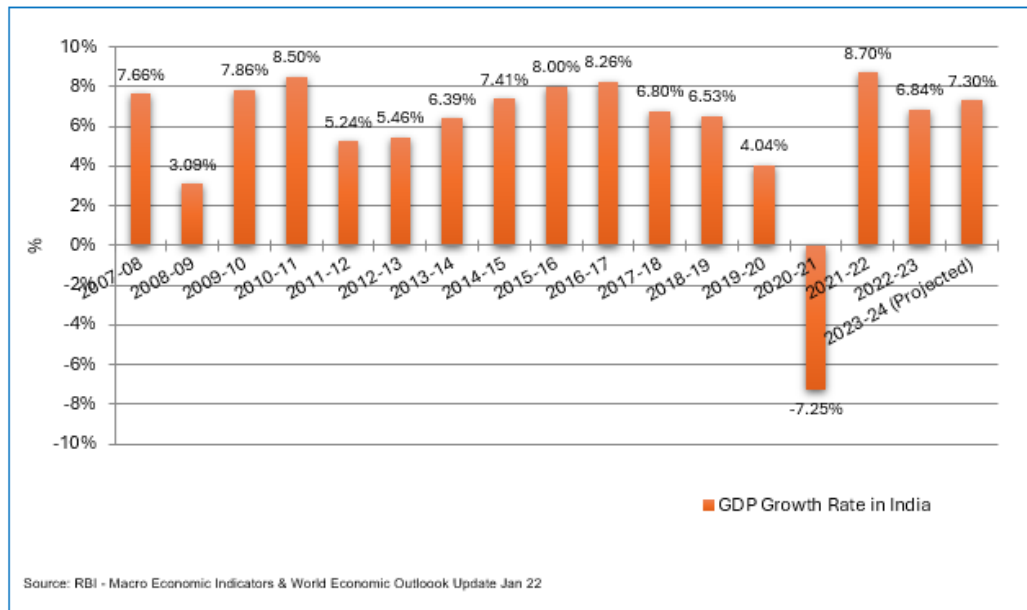


Figure 5-16 : Growth of GDP in India

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 11th 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
4 to6 Axle	5.32%	3.81%	2.59%	2.10%	1.84%
7 and Above Axle	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
Car/Jeep/Van	8.23%	7.23%	6.37%	6.14%	5.26%
Mini LCV	4.53%	3.04%	2.13%	1.76%	2.54%
Bus	3.84%	2.33%	2.11%	1.89%	1.69%
Mini - Bus	3.84%	2.33%	2.11%	1.89%	1.69%
LCV	4.53%	3.04%	2.13%	1.76%	1.57%
2- Axle	4.18%	3.04%	2.13%	1.76%	1.57%
3 - Axle	4.18%	3.04%	2.13%	1.76%	1.57%
4 to6 Axle	5.57%	4.06%	2.84%	2.35%	2.09%
7 and Above Axle	4.18%	3.04%	2.13%	1.76%	1.57%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

Traffic and revenue have been worked out on the basis of above growths and same is presented in subsequent chapter of report.

TRAFFIC FORECAST

6.1 Traffic Projections

The 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 the concession period.

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

Table 5-24 : 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	2550	664	91	1441	1129	3071	5	8951	25371
2025-26	2817	709	96	1534	1201	3311	5	9673	27296
2026-27	3098	754	101	1626	1272	3554	5	10410	29242
2027-28	3391	798	106	1714	1341	3797	5	11152	31180
2028-29	3678	836	111	1790	1401	4019	5	11840	32946
2029-30	3953	864	114	1849	1448	4193	5	12426	34373
2030-31	4249	892	117	1910	1496	4373	5	13042	35857
2031-32	4567	921	120	1972	1545	4561	5	13691	37407
2032-33	4908	952	123	2037	1596	4757	5	14378	39033
2033-34	5275	983	126	2104	1648	4961	5	15102	40731
2034-35	5624	1007	129	2154	1687	5114	5	15720	42080
2035-36	5996	1031	132	2205	1727	5273	5	16369	43486
2036-37	6392	1055	135	2258	1769	5436	5	17050	44945
2037-38	6815	1080	138	2312	1811	5604	5	17765	46459
2038-39	7266	1105	141	2367	1854	5777	5	18515	48029
2039-40	7729	1127	144	2415	1892	5928	5	19240	49471
2040-41	8222	1150	147	2463	1930	6083	5	20000	50963
2041-42	8747	1173	150	2512	1969	6242	5	20798	52511
2042-43	9305	1197	153	2562	2008	6405	5	21635	54115

Table 5-25 : 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	2550	664	91	1441	1129	3071	5	8951	25371
2025-26	2804	706	96	1527	1196	3296	5	9630	27175
2026-27	3069	747	101	1610	1261	3521	5	10314	28973
2027-28	3344	786	106	1690	1323	3743	5	10997	30746
2028-29	3611	820	109	1756	1375	3942	5	11618	32323
2029-30	3863	843	111	1805	1414	4093	5	12134	33559
2030-31	4132	867	113	1855	1453	4249	5	12674	34839
2031-32	4421	891	115	1906	1494	4411	5	13243	36175
2032-33	4729	916	117	1959	1536	4579	5	13841	37567
2033-34	5059	941	119	2014	1579	4754	5	14471	39022
2034-35	5368	959	121	2051	1609	4877	5	14990	40119
2035-36	5696	977	123	2089	1639	5003	5	15532	41251
2036-37	6044	995	125	2128	1670	5133	5	16100	42427
2037-38	6414	1013	127	2167	1702	5265	5	16693	43637
2038-39	6806	1032	129	2208	1735	5401	5	17316	44897
2039-40	7206	1047	131	2241	1762	5515	5	17907	46019
2040-41	7630	1063	133	2274	1789	5630	5	18524	47170
2041-42	8078	1079	135	2309	1817	5748	5	19171	48368
2042-43	8554	1096	137	2344	1845	5868	5	19849	49605

Traffic projections for Most Likely scenario is given as under

Table 5-26 : 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	2550	664	91	1441	1129	3071	5	8951	25371
2025-26	2810	708	96	1530	1199	3303	5	9651	27233
2026-27	3083	750	101	1617	1266	3537	5	10359	29099
2027-28	3367	791	106	1702	1331	3769	5	11071	30954
2028-29	3643	826	110	1774	1387	3979	5	11724	32623
2029-30	3907	851	113	1828	1430	4141	5	12275	33954
2030-31	4189	876	116	1883	1474	4309	5	12852	35335
2031-32	4491	903	119	1940	1519	4484	5	13461	36780
2032-33	4815	931	122	1999	1566	4666	5	14104	38292
2033-34	5163	959	125	2060	1614	4856	5	14782	39873

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2034-35	5491	979	128	2103	1648	4995	5	15349	41097
2035-36	5840	1000	131	2147	1683	5138	5	15944	42367
2036-37	6212	1021	134	2192	1720	5284	5	16568	43682
2037-38	6608	1042	137	2239	1757	5435	5	17223	45050
2038-39	7029	1064	140	2287	1795	5590	5	17910	46469
2039-40	7460	1082	143	2328	1827	5722	5	18567	47749
2040-41	7918	1102	146	2369	1860	5857	5	19257	49075
2041-42	8403	1122	149	2411	1893	5995	5	19978	50445
2042-43	8918	1142	152	2453	1927	6136	5	20733	51862

CHAPTER 6

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 2/3rd 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) 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.

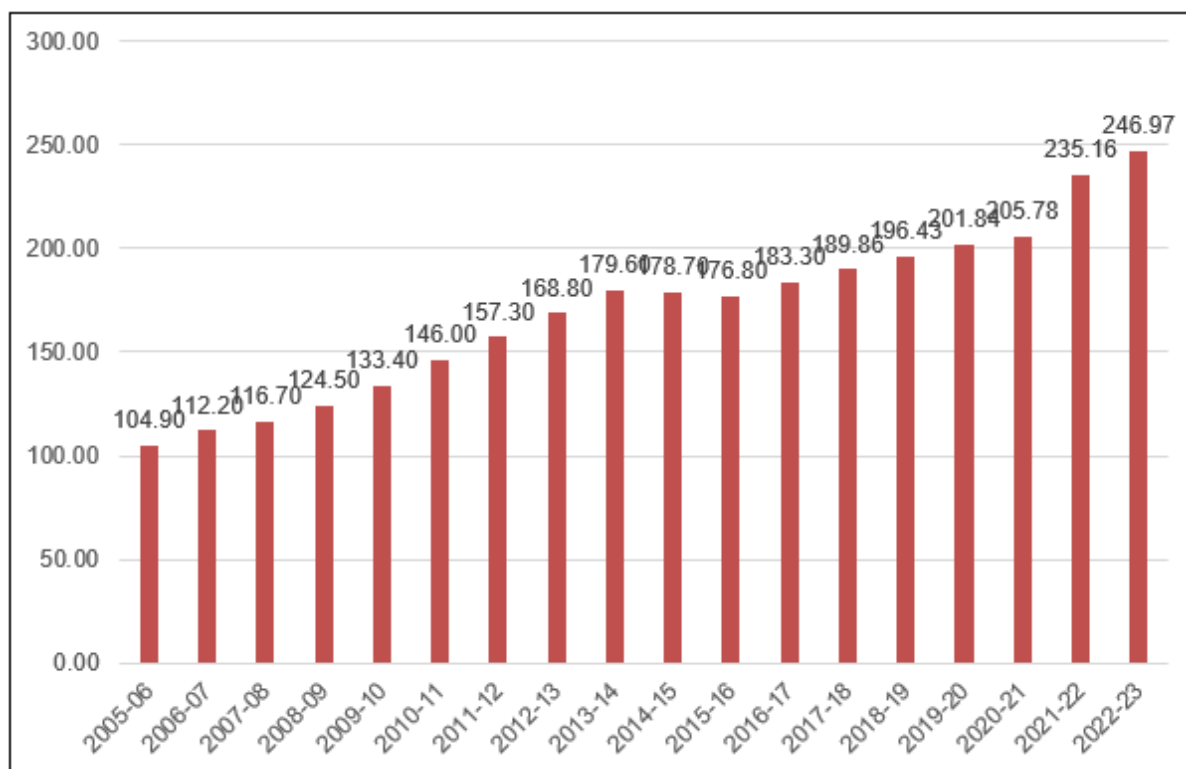


Figure 6-1 : Historical Rate of WPI Inflation in India

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	80	135	280	280	305	435	530
2026-27	85	140	290	290	320	460	560
2027-28	90	145	305	305	335	480	585
2028-29	95	155	325	325	350	505	615
2029-30	100	160	340	340	370	530	650
2030-31	105	170	355	355	390	560	680
2031-32	110	180	375	375	410	590	715
2032-33	115	190	395	395	430	620	755
2033-34	120	200	415	415	450	650	790
2034-35	130	210	435	435	475	685	835
2035-36	135	220	460	460	500	720	875
2036-37	145	230	485	485	525	760	920
2037-38	150	245	510	510	555	800	970
2038-39	160	255	535	535	585	840	1020
2039-40	165	270	565	565	615	885	1075
2040-41	175	285	595	595	650	930	1135
2041-42	185	300	625	625	685	980	1195
2042-43	195	315	660	660	720	1035	1260

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	420	420	455	655	795
2026-27	130	210	440	440	480	690	835
2027-28	135	220	460	460	505	725	880
2028-29	145	230	485	485	530	760	925
2029-30	150	245	510	510	555	800	970
2030-31	160	255	535	535	585	840	1020
2031-32	165	270	560	560	615	880	1075
2032-33	175	280	590	590	645	925	1130
2033-34	185	295	620	620	680	975	1185
2034-35	195	310	655	655	715	1025	1250
2035-36	205	330	690	690	750	1080	1315
2036-37	215	345	725	725	790	1135	1385
2037-38	225	365	765	765	830	1195	1455
2038-39	235	385	805	805	875	1260	1535
2039-40	250	405	845	845	925	1325	1615
2040-41	265	425	890	890	970	1400	1700
2041-42	275	450	940	940	1025	1475	1795
2042-43	290	470	990	990	1080	1550	1890

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	350
2025-26	370
2026-27	385
2027-28	405
2028-29	425
2029-30	450
2030-31	470
2031-32	495
2032-33	520
2033-34	550
2034-35	575
2035-36	605
2036-37	640
2037-38	675
2038-39	710

Year	Car
2039-40	745
2040-41	785
2041-42	830
2042-43	875

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	8970	8970	9790	14070	17130
2025-26	2740	4430	9280	9280	10125	14555	17715
2026-27	2880	4650	9745	9745	10635	15285	18610
2027-28	3025	4885	10240	10240	11170	16055	19545
2028-29	3180	5135	10760	10760	11735	16870	20540
2029-30	3340	5395	11305	11305	12335	17730	21585
2030-31	3510	5670	11885	11885	12965	18635	22690
2031-32	3690	5965	12495	12495	13630	19595	23855
2032-33	3880	6270	13140	13140	14335	20605	25085
2033-34	4085	6595	13820	13820	15075	21675	26385
2034-35	4295	6940	14540	14540	15860	22800	27760
2035-36	4520	7305	15300	15300	16690	23995	29210
2036-37	4760	7685	16105	16105	17570	25255	30745
2037-38	5010	8090	16955	16955	18495	26585	32365
2038-39	5275	8520	17855	17855	19475	27995	34085
2039-40	5555	8975	18805	18805	20510	29485	35895
2040-41	5850	9455	19810	19810	21610	31065	37815
2041-42	6165	9960	20870	20870	22770	32730	39845
2042-43	6500	10500	21995	21995	23995	34495	41990

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	79.64	79.64
2025-26	88.47	88.47
2026-27	99.62	99.62
2027-28	111.44	111.44
2028-29	123.69	123.69
2029-30	135.40	135.40
2030-31	148.72	148.72
2031-32	163.60	163.60
2032-33	178.80	178.80
2033-34	195.68	195.68
2034-35	213.23	213.23
2035-36	232.15	232.15
2036-37	252.32	252.32
2037-38	274.02	274.02
2038-39	297.92	297.92
2039-40	323.31	323.31
2040-41	349.73	349.73
2041-42	379.25	379.25
2042-43	411.71	411.71

Table 7-7 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	79.64	79.64
2025-26	88.06	88.06
2026-27	98.69	98.69
2027-28	109.92	109.92
2028-29	121.39	121.39
2029-30	132.22	132.22
2030-31	144.49	144.49
2031-32	158.13	158.13
2032-33	171.96	171.96
2033-34	187.29	187.29
2034-35	203.07	203.07
2035-36	219.98	219.98
2036-37	237.95	237.95

Location / Year	TP-01	Total
2037-38	257.13	257.13
2038-39	278.16	278.16
2039-40	300.37	300.37
2040-41	323.34	323.34
2041-42	348.91	348.91
2042-43	376.95	376.95

Table 7-8 : Toll Revenue Most Likely Scenario
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	79.64	79.64
2025-26	88.24	88.24
2026-27	99.10	99.10
2027-28	110.63	110.63
2028-29	122.48	122.48
2029-30	133.71	133.71
2030-31	146.50	146.50
2031-32	160.79	160.79
2032-33	175.31	175.31
2033-34	191.42	191.42
2034-35	208.09	208.09
2035-36	226.01	226.01
2036-37	245.08	245.08
2037-38	265.54	265.54
2038-39	287.98	287.98
2039-40	311.70	311.70
2040-41	336.35	336.35
2041-42	363.79	363.79
2042-43	394.03	394.03

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	12.08	32.59 %	Yes		12.59 %	- 9.44%	20.00	-1.89		
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	-1.89	18.11	

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	12.25	34.46 %	Yes		14.46 %	- 10.85 %	20.00	-2.17	

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	22.18	31.97 %	Yes	1.97 %	- 1.47%	20.00	-0.29	-2.46	17.54	

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	12.44	36.52 %	Yes	16.52 %	- 12.39 %	20.00	-2.48	

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	22.90	36.20 %	Yes	6.20 %	- 4.65%	20.00	-0.93	-3.41	16.59	

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)	12.08	19.29	12.25	22.18	12.44	22.90
Differences %	32.59%	14.77%	34.46%	31.97%	36.52%	36.20%
If qualifies for Modification in Concession Period	Yes	No	Yes	Yes	Yes	Yes
Qualifying Increment or shortfall	12.59%	-	14.46%	1.97%	16.52%	0.06
Change in Concession period %	-9.44%	0.00%	-10.85%	-1.47%	-12.39%	-4.65%
Original Concession Period	20.00	20.00	20.00	17.54	20.00	20.00
Change in Concession period	-1.89	0.00	-2.17	-0.29	-2.48	-0.93
Total Change in Concession period	-1.89		-2.46		-3.41	
Calculated Modified Concession Period	18.11		17.54		16.59	
Final Concession Period subject to Cap	0.00		0.00		0.00	

Reduction in Concession Period of about 689 days is expected as per revenue in *Pessimistic scenarios*.

Reduction in Concession Period of about 900 days is expected as per revenue in *Most likely scenarios*.

Reduction in Concession Period of about 1244 days is expected as per revenue in *Optimistic scenarios*.

CHAPTER 7

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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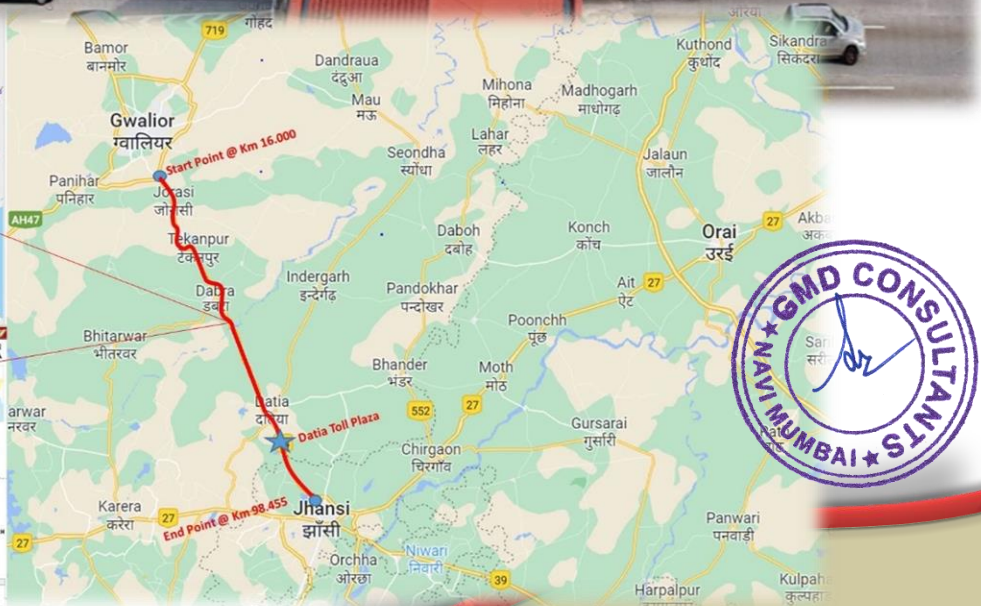
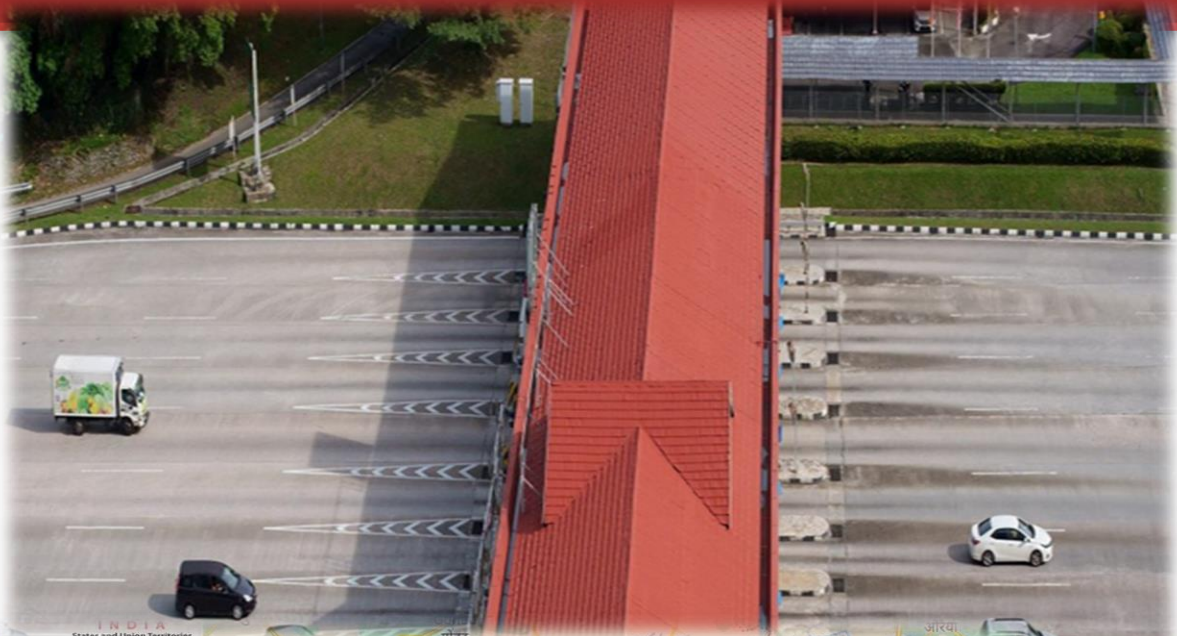
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**Gwalior -Jhansi section from km 0.000 to km
103.000 (revised section km 16.000 to km
98.455) of NH-75 (New NH-44) in the state of
Madhya Pradesh and Uttar Pradesh
(TOT Bundle -13)**



**TRAFFIC STUDY &
REVENUE
PROJECTION REPORT
(FINAL)
JANUARY 2025**

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

JANUARY 2025



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ABBREVIATIONS

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

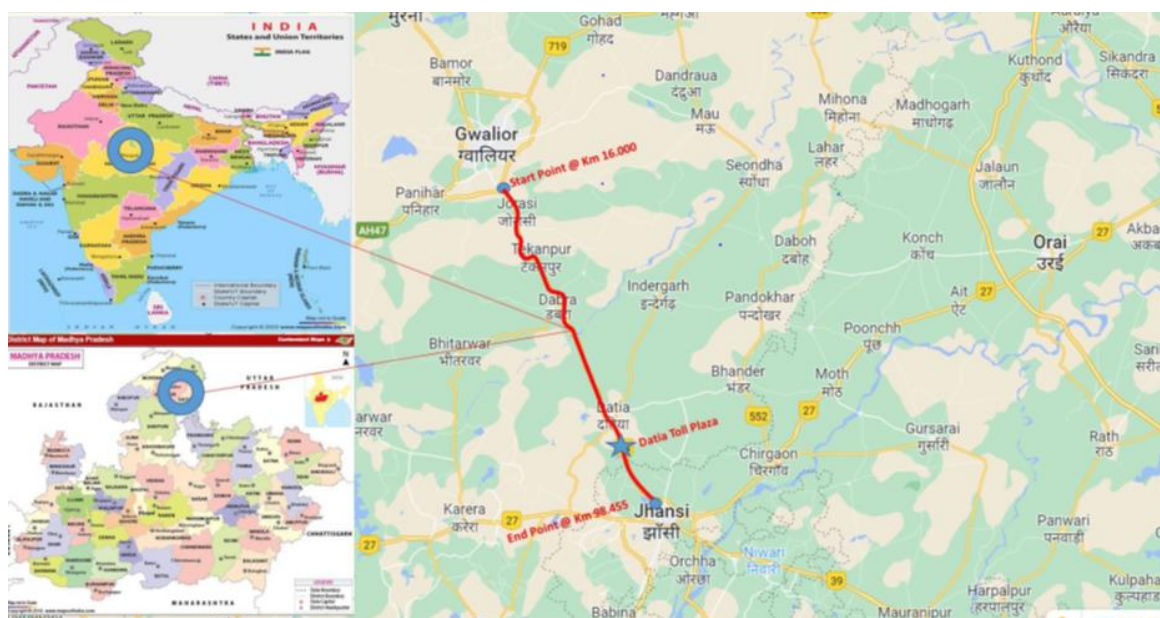


Figure 1-1: Project Stretch of ToT Bundle 13 (Part)

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 forecasts.

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 requirements 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 the 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 stretches 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 82.455 km and has 4-lane configuration with single Toll Plaza (Dagrai village at ch.97.900 KM).

The following figure shows the alignment of the project highway in the above context.

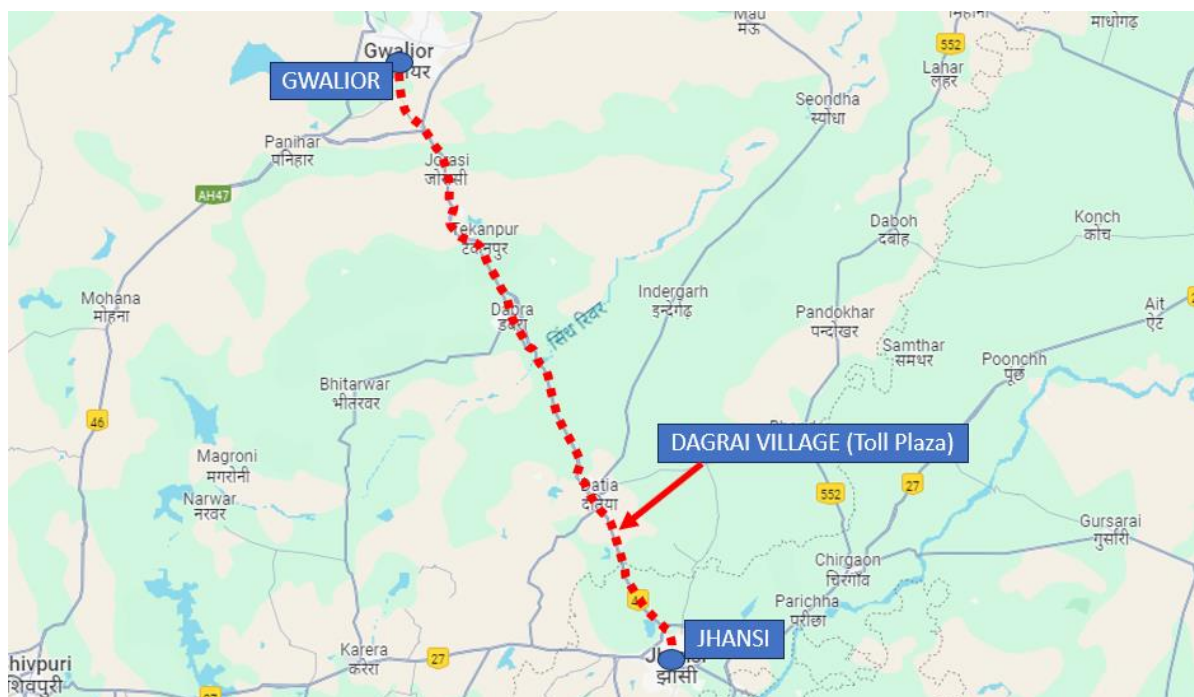


Figure 2-1 : Project Alignment with Toll Plaza

CHAPTER 3

TRAFFIC SURVEYS AND ANALYSIS

3.1 Traffic Surveys

The Consultants have collected the required information for the 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 November 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 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for year 2023-24 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for year 2023-24 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for year 2023-24 & Eight month from April 2024 to November 2024	AADT from previous traffic study report for year 2023-24 & Eight month from April 2024 to November 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

Vehicle Type	
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 from April 2024 to November 2024. Since the traffic data available for this update is for only eight months, from April 2024 to November 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 eight months to arrive at Annual Average Daily Traffic of base year 2024-25. Thus, 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	4230
3	Minibus /LCV	558	385
4	Bus	210	177
6	Truck	1026	1460
7	3-Axle Commercial vehicle	1253	1378
8	Multi axle	1393	1782
9	Oversized Vehicles	0	4
	Total	9,305	9415

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	9415	21888	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.

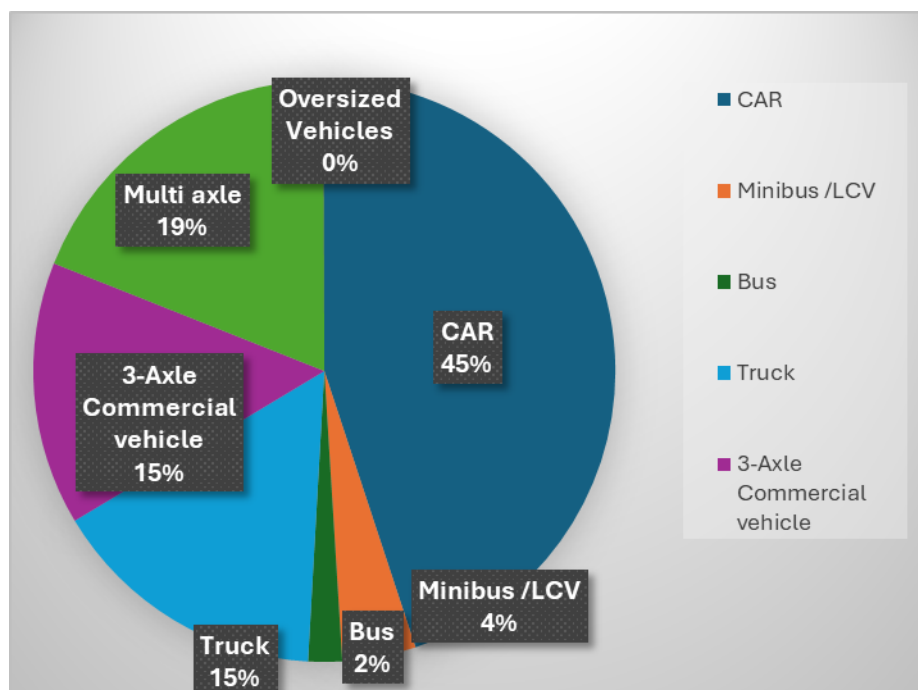


Figure 3-2: Model split of tollable vehicle @ Km 97.900

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	6528
2	Return Journey	2768
3	Local Commercial Single Journey	76
4	Monthly Pass Local	42
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.

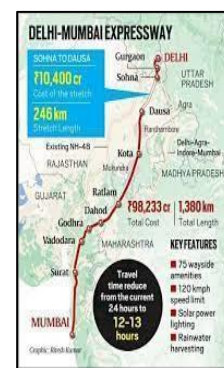
Following Factors can be considered as major contributors to friction on transportation network.

- 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.

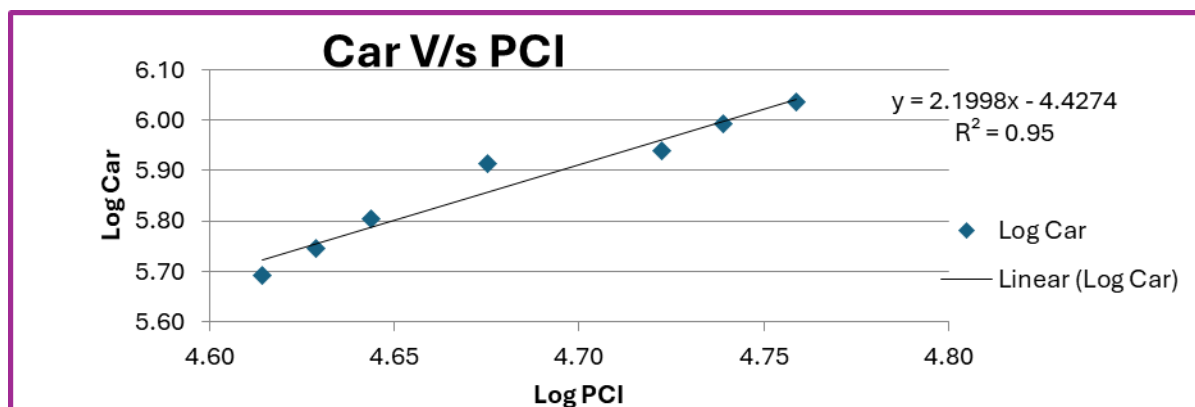


Figure 5-1 : Regression and Elasticity PCI vs. Car – Extrapolation Madhya Pradesh

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.

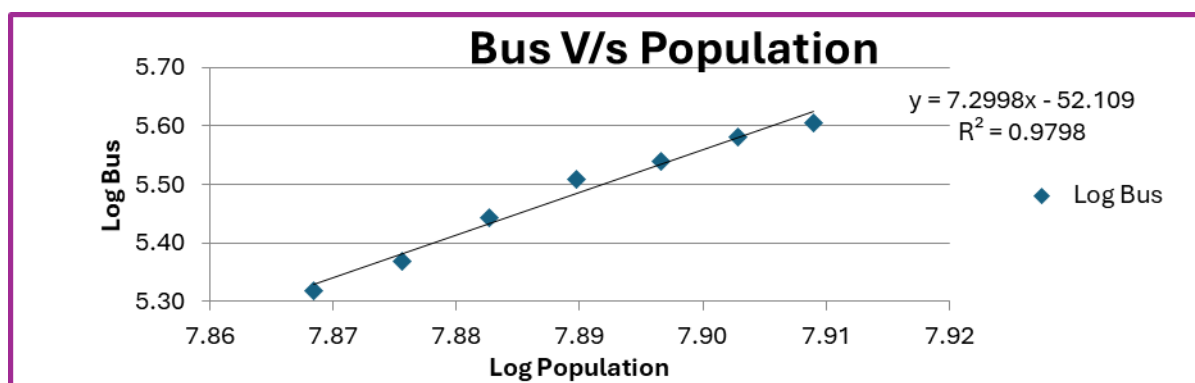


Figure 5-2 : Regression and Elasticity Population vs. Bus – Extrapolation Madhya Pradesh

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.

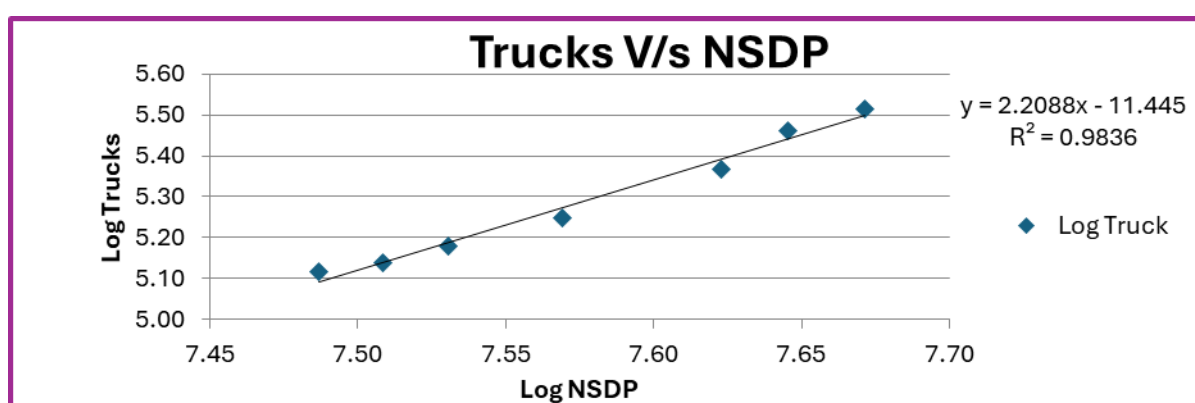


Figure 5-3 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Madhya Pradesh.

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
MADHYA PRADESH	Car/Jeep	PCI	$y = 2.2965x - 4.8829$	$R^2 = 0.9634$	2.3	6%	13.57%	Good Regression
	Bus	Population	$y = 7.4978x - 53.6722$	$R^2 = 0.9862$	7.5	2%	11.90%	Good Regression
	Truck	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.

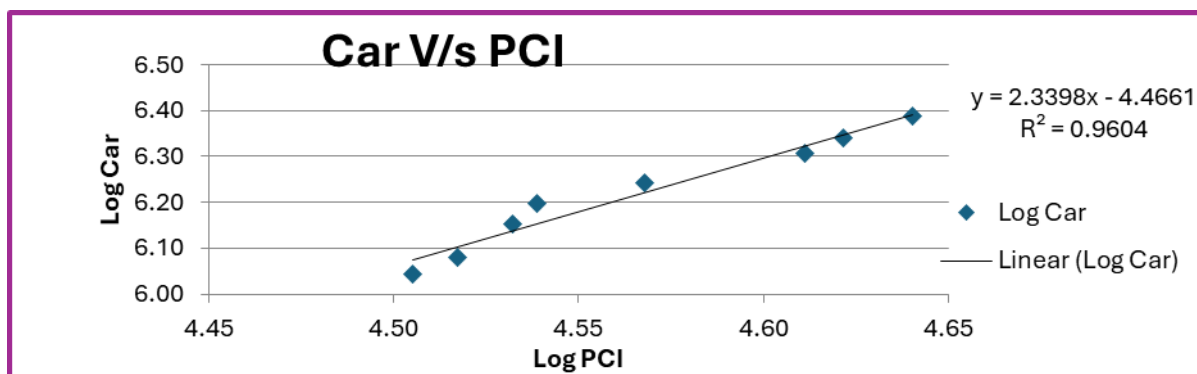


Figure 5-4 : Regression and Elasticity PCI vs. Car – Extrapolation Uttar Pradesh

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.

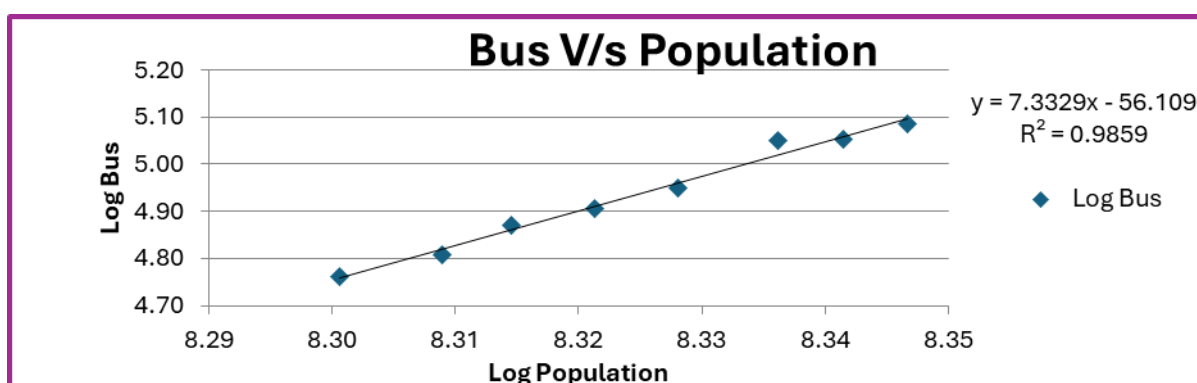


Figure 5-5 : Regression and Elasticity Population vs. Bus – Extrapolation Uttar Pradesh

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.

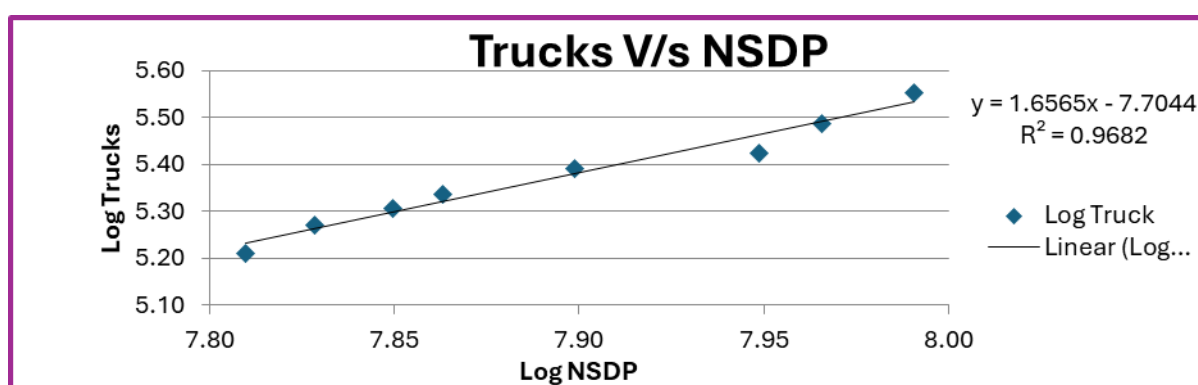


Figure 5-6 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Uttar Pradesh.

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 R² 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.

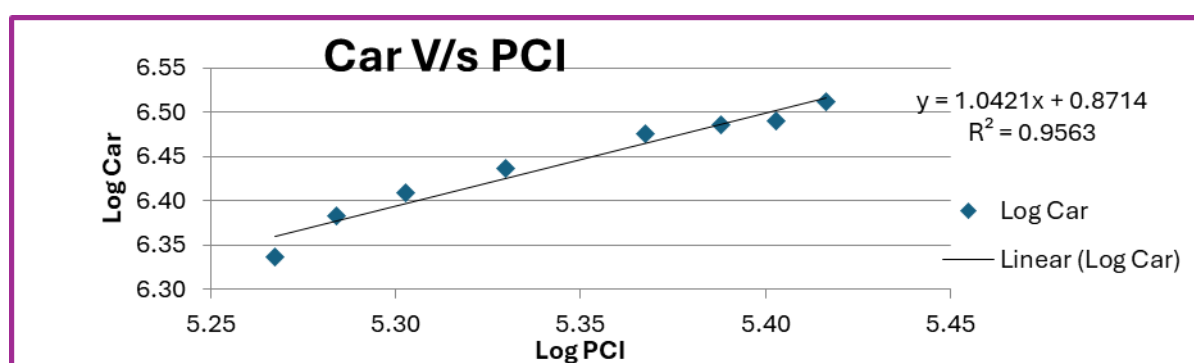
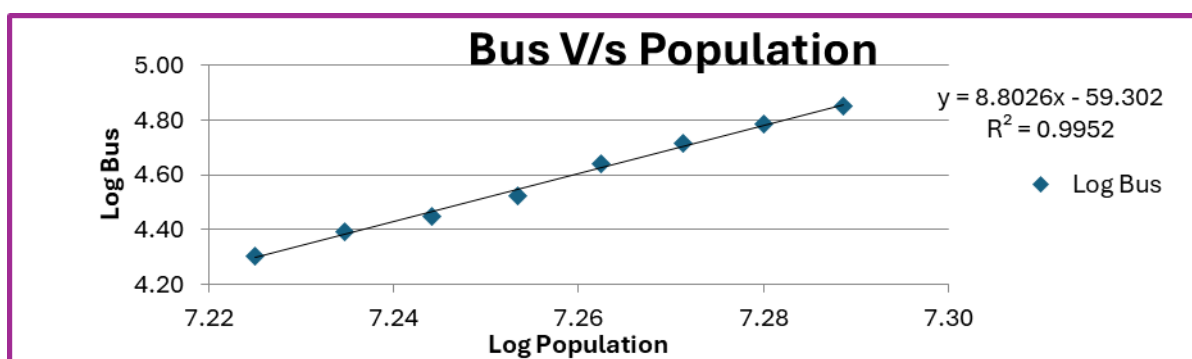


Figure 5-7 : Regression and Elasticity PCI vs. Car – Extrapolation Delhi**Table 5-10 : Population Vs Bus Delhi**

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.

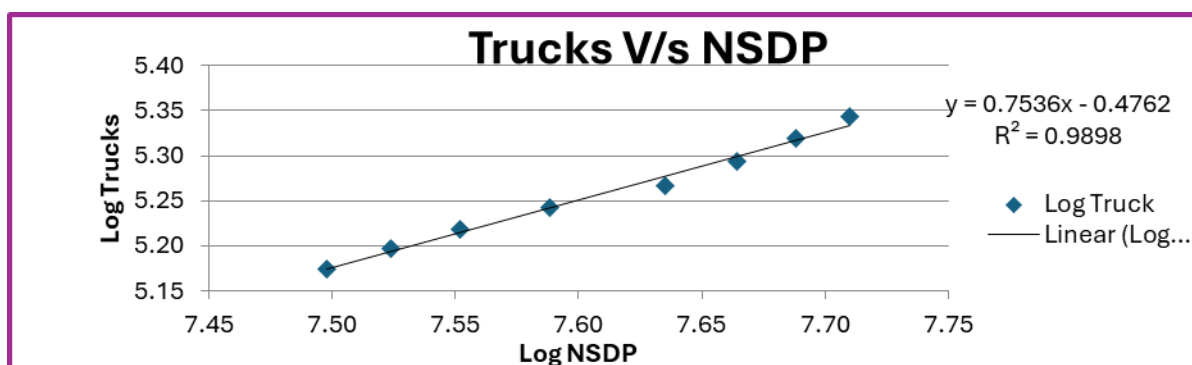


Figure 5-9 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Delhi.

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. 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 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

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.

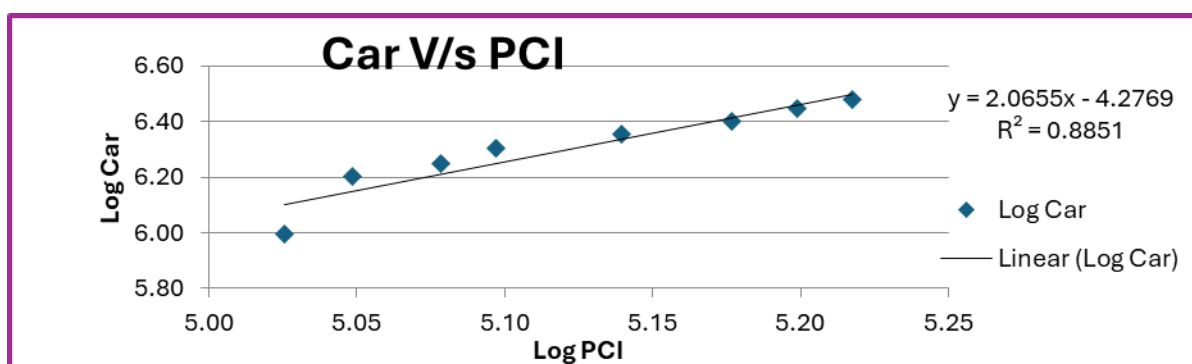


Figure 5-10 : Regression and Elasticity PCI vs. Car – Extrapolation Haryana

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.

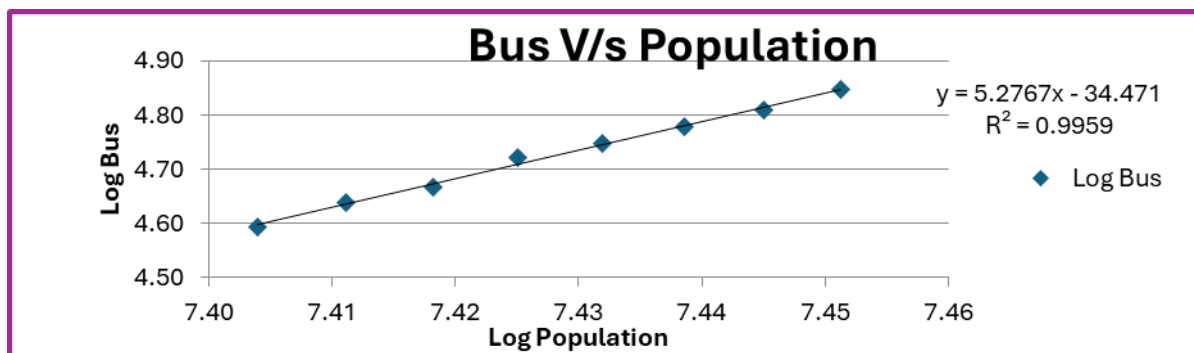


Figure 5-11 : Regression and Elasticity Population vs. Bus – Extrapolation Haryana

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.

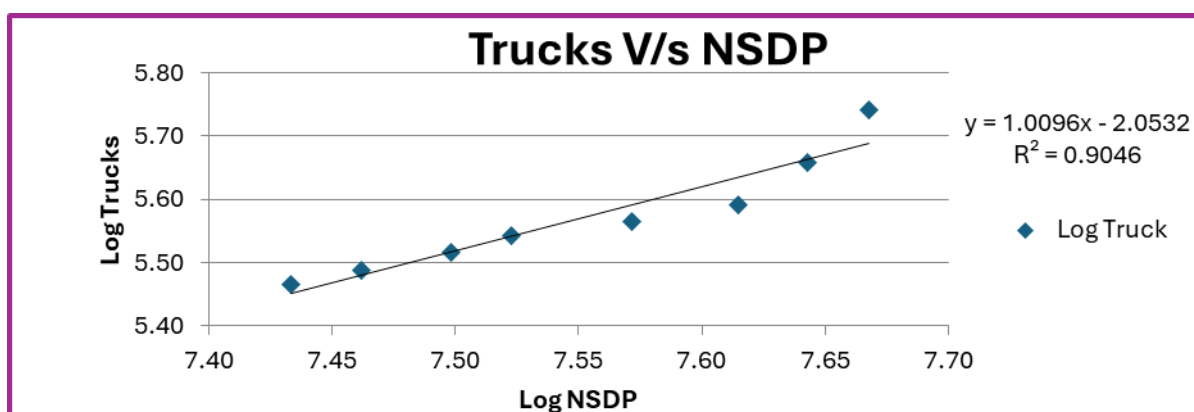


Figure 5-12 : Regression and Elasticity NSDP vs. Trucks Traffic - extrapolation Haryana.

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 R² 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 ² = 0.8851	2.0655	6.53%	13.49%	Good Regression
	Bus	Population	$y = 5.2767x - 34.4708$	R ² = 0.9959	5.2767	1.57%	8.27%	Good Regression
	Truck	NSDP	$y = 1.0096x - 2.0532$	R ² = 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.

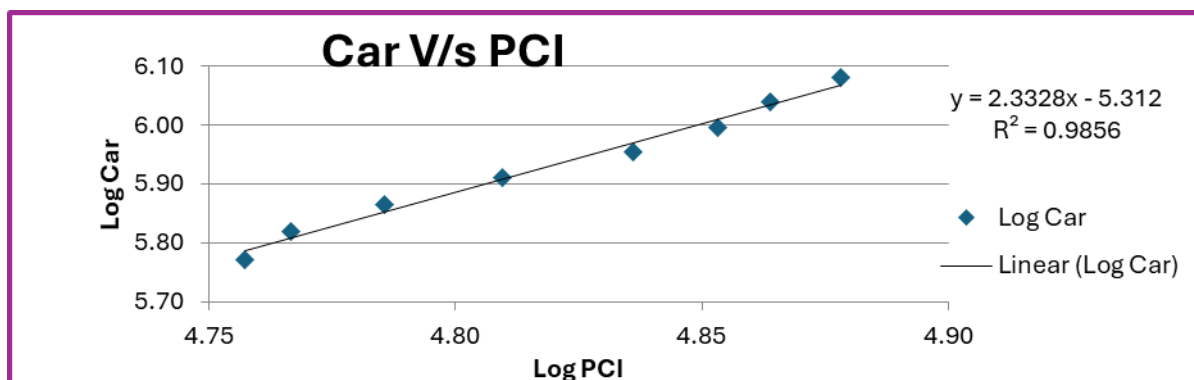


Figure 5-13 : Regression and Elasticity PCI vs. Car – Extrapolation Rajasthan

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.

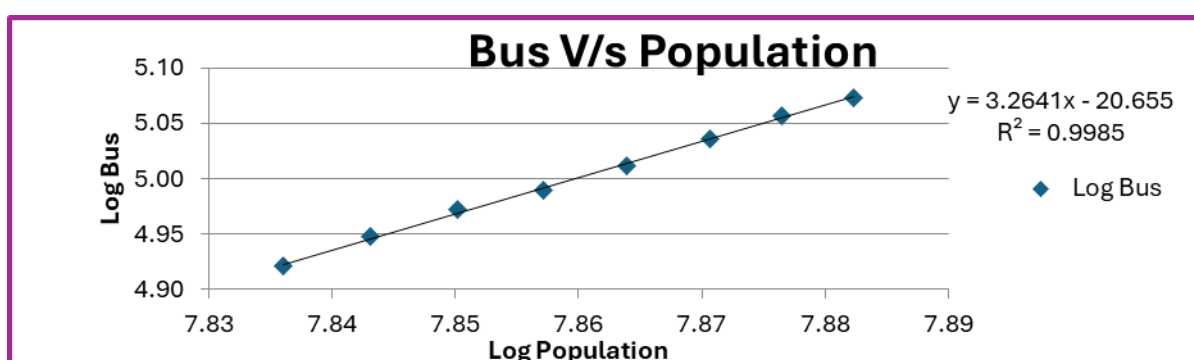


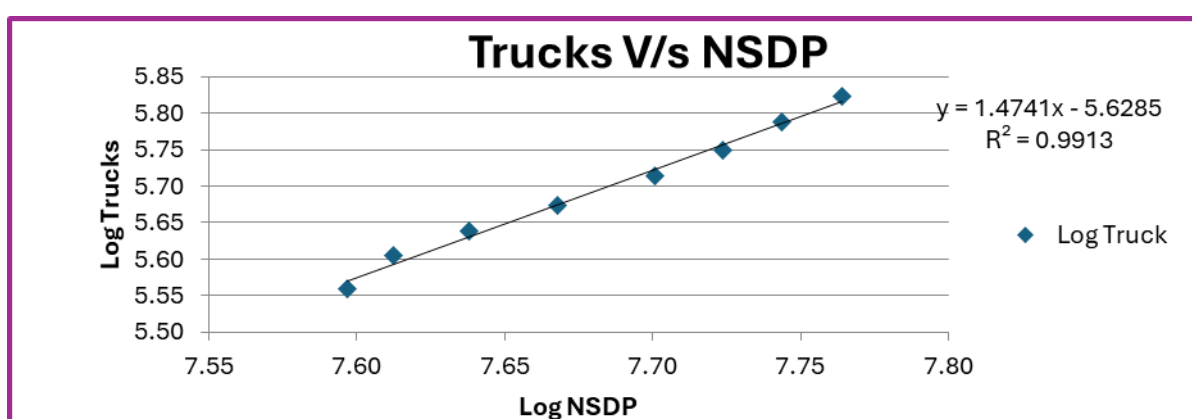
Figure 5-14 : Regression and Elasticity Population vs. Bus – Extrapolation Rajasthan

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.

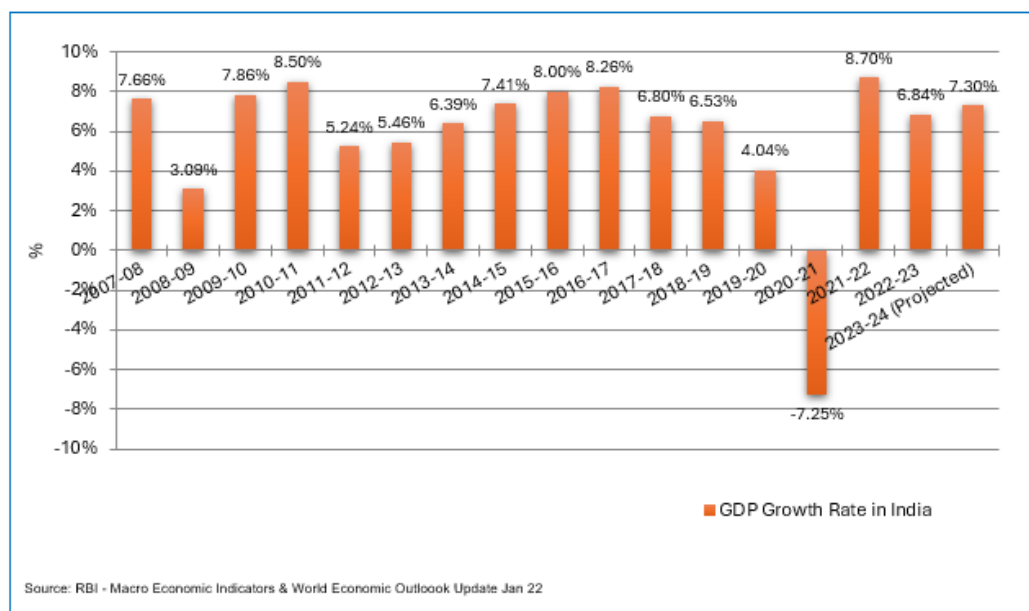


Figure 5-16 : Growth of GDP in India

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
Car/Jeep/Van	7.65%	6.51%	4.90%	4.71%	4.04%
Mini LCV	4.62%	2.84%	2.13%	1.76%	2.97%
Bus	4.72%	3.66%	2.42%	2.20%	1.98%
Minibus	4.72%	3.66%	2.42%	2.20%	1.98%
LCV	4.29%	2.84%	2.13%	1.76%	1.57%
2- Axle	4.62%	3.31%	2.13%	1.76%	1.57%
3 - Axle	4.62%	3.31%	2.13%	1.76%	1.57%
4 to 6 Axle	5.28%	3.78%	2.84%	2.35%	2.09%
7 and Above Axle	5.28%	3.78%	2.84%	2.35%	2.09%

There have been general elections (Lok Sabha) and state assembly elections in the Country which impacted tendering and award process of major infrastructure projects. This affected the growth of economy to certain extent. It is expected that economy would recover and reflect resurgence in next 2 to 3 years. This will have a positive impact on the growth of traffic as well. Considering the same, additional growth has been considered in Financial year 2026 - 2028.

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 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	4230	385	177	1460	1378	1782	4	9415	21888
2025-26	4649	411	189	1560	1472	1916	4	10201	23569
2026-27	5086	437	201	1659	1565	2051	4	11003	25264
2027-28	5538	462	213	1756	1657	2185	4	11815	26960
2028-29	5976	485	224	1842	1738	2306	4	12575	28511
2029-30	6381	500	233	1907	1799	2399	4	13223	29762
2030-31	6812	515	242	1974	1862	2496	4	13905	31069
2031-32	7271	530	251	2045	1928	2597	4	14626	32443
2032-33	7762	546	260	2118	1996	2701	4	15387	33876
2033-34	8288	562	270	2193	2066	2810	4	16193	35381
2034-35	8715	576	277	2245	2115	2897	4	16829	36545
2035-36	9164	590	284	2299	2165	2987	4	17493	37753
2036-37	9635	604	291	2354	2216	3080	4	18184	39002
2037-38	10131	618	298	2411	2269	3175	4	18906	40298
2038-39	10654	633	305	2469	2323	3273	4	19661	41641
2039-40	11183	646	312	2519	2370	3358	4	20392	42884
2040-41	11737	659	319	2570	2418	3445	4	21152	44167
2041-42	12319	672	326	2622	2467	3535	4	21945	45498
2042-43	12930	686	333	2675	2517	3627	4	22772	46874
2043-44	13571	700	341	2730	2568	3722	4	23636	48305

**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	4230	385	177	1460	1378	1782	4	9415	21888
2025-26	4628	409	188	1553	1466	1907	4	10155	23462
2026-27	5040	433	199	1644	1552	2031	4	10903	25032
2027-28	5464	456	210	1732	1635	2153	4	11654	26586
2028-29	5869	476	219	1808	1706	2261	4	12343	27975
2029-30	6236	489	226	1864	1758	2341	4	12918	29066
2030-31	6627	502	233	1921	1811	2424	4	13522	30201
2031-32	7042	515	240	1980	1866	2510	4	14157	31386
2032-33	7482	528	248	2041	1923	2598	4	14824	32619
2033-34	7950	542	257	2103	1981	2690	4	15527	33909
2034-35	8320	552	262	2143	2018	2760	4	16059	34855
2035-36	8707	562	267	2184	2056	2832	4	16612	35833
2036-37	9112	572	273	2226	2095	2906	4	17188	36847
2037-38	9536	582	279	2268	2134	2982	4	17785	37889
2038-39	9979	593	285	2311	2174	3060	4	18406	38967
2039-40	10424	602	290	2345	2207	3124	4	18996	39929
2040-41	10888	611	295	2380	2241	3190	4	19609	40926
2041-42	11372	620	301	2415	2275	3257	4	20244	41950
2042-43	11880	629	307	2451	2310	3325	4	20906	43008
2043-44	12410	638	313	2487	2345	3395	4	21592	44098

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	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2024-25	4230	385	177	1460	1378	1782	4	9415	21888
2025-26	4638	410	188	1556	1469	1912	4	10177	23514
2026-27	5062	435	199	1651	1559	2042	4	10952	25149
2027-28	5500	459	210	1743	1646	2171	4	11733	26773
2028-29	5921	480	219	1823	1722	2286	4	12455	28238
2029-30	6307	494	226	1884	1779	2372	4	13066	29407
2030-31	6717	508	234	1946	1837	2462	4	13708	30627
2031-32	7154	522	243	2010	1897	2555	4	14385	31903
2032-33	7619	537	252	2076	1959	2652	4	15099	33238
2033-34	8114	552	261	2144	2023	2752	4	15850	34628
2034-35	8512	563	267	2190	2066	2830	4	16432	35679

Year	Car	Minibuses /LCV	Bus	Truck	3-Axle Commercial vehicle	Multi axle	Oversized Vehicles	Total Tollable Traffic	PCU (Including Exempted)
2035-36	8929	574	274	2237	2110	2910	4	17038	36766
2036-37	9367	587	281	2285	2155	2993	4	17672	37897
2037-38	9826	600	288	2334	2201	3078	4	18331	39064
2038-39	10306	613	295	2384	2248	3165	4	19015	40267
2039-40	10790	623	302	2427	2288	3240	4	19674	41374
2040-41	11298	634	309	2470	2328	3317	4	20360	42515
2041-42	11831	645	316	2514	2369	3395	4	21074	43691
2042-43	12388	656	323	2559	2411	3475	4	21816	44907
2043-44	12970	667	330	2605	2453	3557	4	22586	46159

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 2/3rd 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) 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.

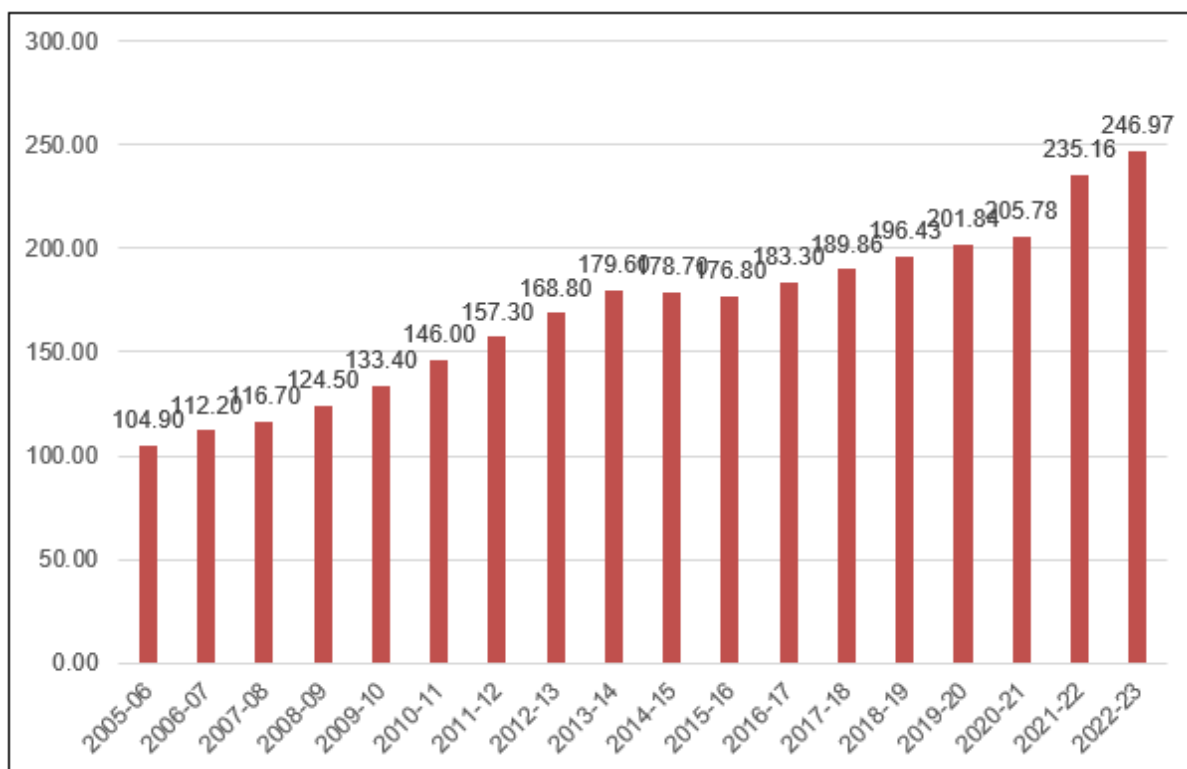


Figure 7-1 : Historical Rate of WPI Inflation in India

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	930
2025-26	150	240	505	505	550	790	960
2026-27	155	250	530	530	575	830	1010
2027-28	165	265	555	555	605	870	1060
2028-29	170	280	585	585	635	915	1110
2029-30	180	290	610	610	670	960	1170
2030-31	190	305	645	645	700	1010	1230
2031-32	200	325	675	675	740	1060	1290
2032-33	210	340	710	710	775	1115	1360
2033-34	220	355	750	750	815	1175	1430
2034-35	235	375	790	790	860	1235	1505
2035-36	245	395	830	830	905	1300	1580
2036-37	260	415	870	870	950	1370	1665
2037-38	270	440	920	920	1000	1440	1755
2038-39	285	460	965	965	1055	1515	1845
2039-40	300	485	1020	1020	1110	1595	1945
2040-41	315	510	1075	1075	1170	1680	2050
2041-42	335	540	1130	1130	1235	1775	2160
2042-43	350	570	1190	1190	1300	1870	2275
2043-44	370	600	1255	1255	1370	1970	2395

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	1145	1390
2025-26	225	360	755	755	825	1180	1440
2026-27	235	380	790	790	865	1240	1510
2027-28	245	395	830	830	905	1305	1590
2028-29	260	415	875	875	955	1370	1670
2029-30	270	440	920	920	1000	1440	1755
2030-31	285	460	965	965	1055	1515	1845
2031-32	300	485	1015	1015	1105	1590	1940
2032-33	315	510	1065	1065	1165	1675	2040
2033-34	330	535	1125	1125	1225	1760	2145
2034-35	350	565	1180	1180	1290	1850	2255
2035-36	365	595	1245	1245	1355	1950	2375
2036-37	385	625	1310	1310	1425	2050	2500
2037-38	405	655	1375	1375	1505	2160	2630
2038-39	430	690	1450	1450	1580	2275	2770
2039-40	450	730	1530	1530	1665	2395	2915
2040-41	475	770	1610	1610	1755	2525	3070
2041-42	500	810	1695	1695	1850	2660	3235
2042-43	530	855	1785	1785	1950	2800	3410
2043-44	555	900	1885	1885	2055	2955	3595

Table 7-4: Toll Rates for Monthly Pass Local @ Toll Plaza 1 – KM 97.900

Year	Car	Minibus /LCV
2024-25	350	350
2025-26	370	370
2026-27	385	385
2027-28	405	405
2028-29	425	425
2029-30	450	450
2030-31	470	470
2031-32	495	495
2032-33	520	520
2033-34	550	550
2034-35	575	575
2035-36	605	605
2036-37	640	640
2037-38	675	675
2038-39	710	710

Year	Car	Minibus /LCV
2039-40	745	745
2040-41	785	785
2041-42	830	830
2042-43	875	875
2043-44	920	920

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	4785	7730	16200	16200	17670	25400	30925
2025-26	4950	7995	16755	16755	18280	26275	31985
2026-27	5200	8400	17595	17595	19195	27595	33595
2027-28	5460	8825	18485	18485	20165	28990	35290
2028-29	5740	9270	19425	19425	21190	30460	37080
2029-30	6030	9740	20410	20410	22265	32010	38970
2030-31	6340	10240	21455	21455	23405	33645	40960
2031-32	6665	10765	22560	22560	24610	35375	43065
2032-33	7010	11320	23720	23720	25880	37200	45285
2033-34	7370	11910	24950	24950	27220	39130	47635
2034-35	7755	12530	26250	26250	28635	41165	50115
2035-36	8160	13185	27625	27625	30135	43320	52735
2036-37	8590	13875	29075	29075	31720	45595	55510
2037-38	9045	14610	30610	30610	33390	48000	58435
2038-39	9525	15385	32230	32230	35160	50545	61535
2039-40	10030	16200	33950	33950	37035	53235	64810
2040-41	10565	17070	35760	35760	39015	56080	68275
2041-42	11135	17985	37680	37680	41105	59090	71935
2042-43	11735	18955	39710	39710	43320	62275	75810
2043-44	12365	19980	41860	41860	45665	65640	79910

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	124.97	124.97
2025-26	139.68	139.68
2026-27	156.61	156.61
2027-28	175.73	175.73
2028-29	194.55	194.55
2029-30	212.71	212.71
2030-31	233.31	233.31
2031-32	256.48	256.48
2032-33	280.27	280.27
2033-34	307.67	307.67
2034-35	334.86	334.86
2035-36	363.90	363.90
2036-37	394.18	394.18
2037-38	427.76	427.76
2038-39	465.02	465.02
2039-40	504.94	504.94
2040-41	545.62	545.62
2041-42	592.46	592.46
2042-43	641.84	641.84
2043-44	697.66	697.66

Table 7-7 : Toll Revenue Pessimistic Scenario
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	124.97	124.97
2025-26	139.10	139.10
2026-27	155.28	155.28
2027-28	173.42	173.42
2028-29	191.08	191.08
2029-30	207.96	207.96
2030-31	227.05	227.05
2031-32	248.43	248.43
2032-33	270.14	270.14
2033-34	295.12	295.12
2034-35	319.61	319.61
2035-36	345.62	345.62
2036-37	372.62	372.62
2037-38	402.38	402.38
2038-39	435.32	435.32
2039-40	470.32	470.32
2040-41	505.77	505.77

Location / Year	TP-01	Total
2041-42	546.52	546.52
2042-43	589.25	589.25
2043-44	637.39	637.39

Table 7-8 : Toll Revenue Most Likely Scenario
(Rs. Crores)

Location / Year	TP-01	Total
2024-25	124.97	124.97
2025-26	139.38	139.38
2026-27	155.95	155.95
2027-28	174.59	174.59
2028-29	192.80	192.80
2029-30	210.33	210.33
2030-31	230.15	230.15
2031-32	252.39	252.39
2032-33	275.09	275.09
2033-34	301.21	301.21
2034-35	326.96	326.96
2035-36	354.44	354.44
2036-37	383.06	383.06
2037-38	414.71	414.71
2038-39	449.71	449.71
2039-40	487.09	487.09
2040-41	525.01	525.01
2041-42	568.63	568.63
2042-43	614.51	614.51
2043-44	666.25	666.25

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	18.98	11.67 %	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	33.62	8.45 %	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 - Gwalior to Jhansi	17	19.25	13.21 %	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	34.65	11.78 %	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	19.51	14.79 %	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	35.75	15.32 %	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)	18.98	33.62	19.25	34.65	19.51	35.75
Differences %	11.67%	8.45%	13.21%	11.78%	14.79%	15.32%
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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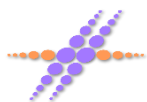
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**Traffic Study
for**

**Development of an Access-Controlled
Six lane (Expandable to Eight lane)
Greenfield Expressway from Meerut to
Prayagraj “Ganga Expressway” (Total
Length- 593.947 Km) in the State of
Uttar Pradesh**

December 2024



T & T Consultants

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1 Introduction

1.1 Project Background

The Government of Uttar Pradesh had entrusted Uttar Pradesh Expressway Industrial Development Authority (UPEIDA) to develop a six lane access controlled Expressway extendable to eight lane from Meerut to Prayagraj under Design Build Finance Operate and Transfer (DBFOT) mode. The total length of project corridor is approximately 594 km. This length is divided in four groups and RFP cum RFQ document is invited for all four groups. IRB Infrastructure Developers Limited has appointed M/s T&T Consultants Private Limited to study the traffic revenue potential of this project.

1.2 Report Updation in 2024 with optimistic and pessimistic Scenario

In this report updation from previous version the toll rates are revised as per WPI changes and optimistic, pessimistic scenario. The table below provides these changes. The growth rate forecast remains the same as FY-2021 report. This forecast remains in acceptable range since the GDP of India in FY 24 is 173.82 lakh crore and projected GDP in this report in FY 24 is 174.4 lakh crore. The percentage difference is 0.3% which is in acceptable range. Hence growth forecast in current is report is taken same as FY 21/FY 22 report.

Table 1-1 Optimistic and Pessimistic Scenario of Analysis

Parameter	Pessimistic	Optimistic
Seasonality	-15%	10%
ADT	-15%	10%
Growth Rate	-20%	10%

1.3 Project Corridor Description

1.3.1 Districts of Project Corridor

The project corridor starts from Meerut and ends at Parayagraj passing through the districts of Meerut, Hapur, Bulandshahr, Amroha, Sambhal, Budaun, Shahjahapur, Hardoi, Unnao, Raebarelli, Pratapgarh and Prayagraj. Figure 1-1 shows the alignment of project corridor.

1.3.2 Concept of Tolling based on Entry and Exit in the Project Corridor

The total Project Corridor has 21 nodes. Nodes are entry exit points or interchange points at which the traffic could enter and exit the Project Corridor or traffic interchanges between two Groups of the Project Corridor. The division of project corridor into groups is described in Section 1.4 The nomenclature from A to U in the figure below describes these points on the project corridor. The toll fee paid by the user is based on length of section the user uses. This is described in further detail in Section 1.4.1

Figure 1-1 Districts of Project Corridor



1.3.3 Strategic Location of Project Corridor

1.3.3.1 Distance Advantage from Competing Highways

Figure 1-2 shows the project corridor and its vicinity. Old NH-24, NH-19, NH-34, Yamuna-Expressway and Agra Lucknow Expressway and NH-34 are important parallel roads to the project corridor. The project corridor shortens the distance between Merrut to Prayagraj by 74 Km from Old NH-24 and 120 km from NH-19. Figure 1-2 Shows location of project highways vis-à-vis other competing highways. In the figure it could be seen competing highways of NH-19 and old NH-24 have a curvature in the alignment while the alignment of Ganga Expressway is straight. Table 1-2 compares the distance between project corridor and important OD pairs where Ganga Expressway is shorter in length.

Table 1-2 Distance Comparison (in km) between Ganga Expressway and other alternate routes between important OD pairs

From	To	Ganga Expressway	NH-19	Old NH-24	Agra-Lucknow Expressway
Meerut	Prayagraj	620*	740	694	
Meerut	Kanpur	469	544		
Meerut	Lucknow	460		486	575
Delhi	Prayagraj	672	702		
Delhi	Lucknow	505		534	554
Northern States**	Prayagraj	737	832	831	
Northern States	Kanpur	579	638		
Northern States	Lucknow	570		623	677

*Distance from Meerut centroid to Prayagraj centroid

**Northern states means states above Delhi i.e. North Haryana, Punjab, Jammu & Kashmir. The centroid taken for distance calculation is Karnal.

1.3.3.2 Network of Expressways with Ganga Expressway

With North linkages and Eastern Linkages the Ganga Expressway gets connected from Jammu & Kashmir/Uttarakhand upto Bihar-Uttar Pradesh border. This is described in following subsections.

1.3.3.2.1 North Linkages of Ganga Expressway (Meerut and Hapur End)

1. Delhi-Amritsar-Katra Expressway links Katra in Jammu and Kashmir to Western Peripheral Expressway via Amritsar, Ludhiana and Jind
2. Kundli-Manesar Expressway (Western Peripheral Expressway) links to Eastern Peripheral Expressway.
3. Link of Ganga-Expressway with Eastern Peripheral Expressway links it with Ganga Expressway. The connection of Ganga Expressway become seamless with Jammu & Kashmir and Punjab.
4. Haridwar link of Ganga Expressway is also proposed that would connect Garhwal region of Uttarakhand with Ganga Expressway
5. Delhi-Dasna-Hapur is 8 lane expressway that connects Delhi to Hapur. There is one node (node B) of Ganga Expressway at Hapur.

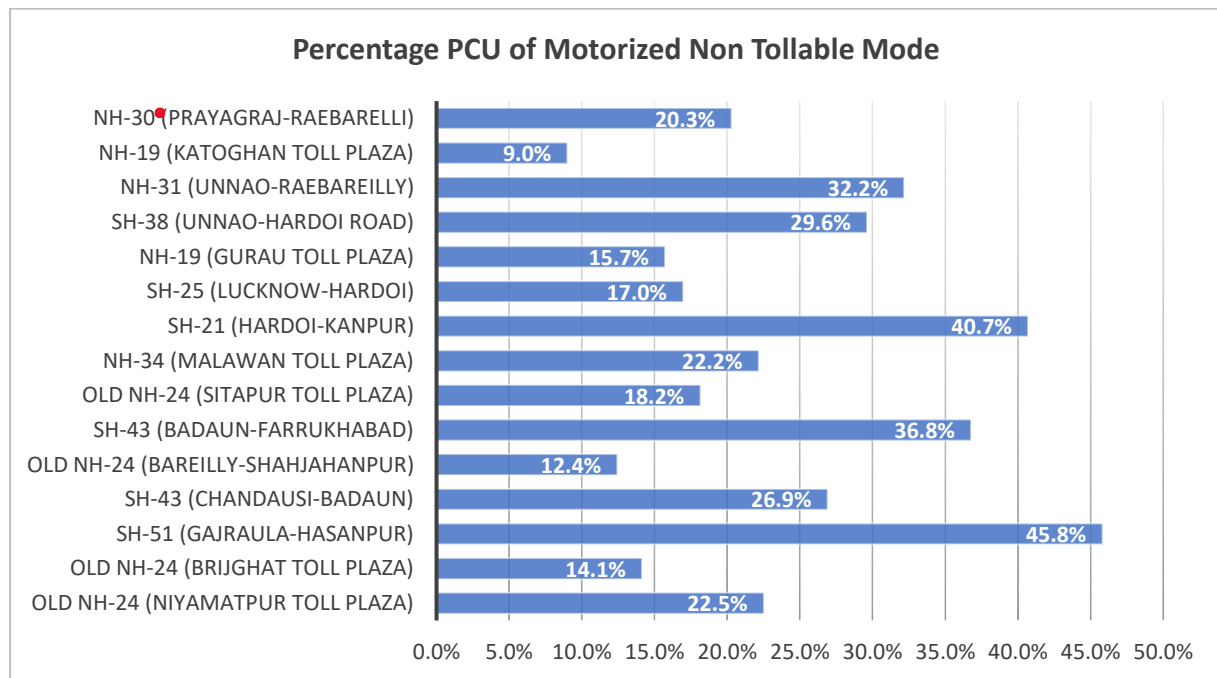
1.3.3.2.2 Eastern Linkages of Proposed Ganga Expressway

1. The Ganga-Expressway forms a seamless connection with other existing and proposed expressways. Agra-Lucknow Expressway intersects the project corridor at node N. Through node N Ganga Expressway connects to Lucknow and further to Purvanchal Expressway and NH-27. This forms a connection to Ganga Expressway to Purvanchal region of Uttar Pradesh, North Bihar and North Eastern States. Agra-Lucknow expressway and NH-21 is also likely to feed traffic from Rajasthan to Eastern parts of India (South Bihar, Jharkhand, Odhisa) at node N.
2. It is proposed in future that Ganga-Expressway would be extended from Prayagraj upto Ballia via Varanasi. These connections will increase the network length of expressway and would complement the traffic of project corridor.

Figure 1-2 Project Corridor and Highways in the Vicinity

1.3.4 Advantage of Expressway over National Highway

The expressway because of higher design speed result in time savings of user and because of less curvatures, better riding quality, absence of non tollable modes, access control result in lower operating cost of the vehicle. All these factor are captured in Road User Cost analysis of Section 3.5. One of the significant advantages of expressway over National Highway is absence of non tollable modes like two wheeler, three wheeler, non-motorized vehicles which ply on National Highways and State Highway. In National Highways and State Highways because of ribbon development occurring along the Highways friction causing factors like non tollable increase in number. Figure 1-3 shows the percentage PCU of motorized non tollable mode at various locations of parallel highways. It could be seen that at Brijghat toll plaza and Niyamatpur Toll Plaza of old NH-24 that lie in the vicinity of project corridor the percentage contribution of PCU of non-tollable mode is 14.1% and 22.5% respectively. In the State Highways in the vicinity of Project corridor the contribution is even higher and goes as high as 45.8% at SH-51. These non tollable modes along with non motorized modes become impediment to the movement of tollable modes. Moreover there percentage share is likely to increase with growing habitation near National Highway and State Highway.

Figure 1-3 Percentage Contribution of PCU of motorized non-tollable mode

1.4 Groups of Project Corridor

The Project Corridor is divided into four groups in RFQ cum RFP documents. The following sections describes each group of Project Corridor. The tolling of the project is based on length traversed from entry and exit points. The description of group is provided in following sub sections.

1.4.1 Group 1 and Concept of Entry-Exit based Tolling

Group 1 of Project Corridor starts in district of Meerut and ends at Budaun. It starts at node A and ends at node G. The length of Group 1 is 129.7 km. Table 1-3 and Table 1-4 provides nodes, section length and tolling details of the group. As described in Section 1.3.2, the user pays toll fee based on the length of corridor the user uses. Hence the user pays the toll fee at exit points. For example if the user travels from node A to node B, the user pays toll fee at exit point B based on length of expressway and structure tollable on the relevant toll plaza . However, if the user enters at nodes of Group 1 but travels beyond Group 1 (i.e. beyond Km 137+600), there is a provision of toll collection booth at this point. This point on Package 1 is at Km 137+600 which is defined as node G on the Project Corridor.

Figure 1-4 Group 1 Project Corridor

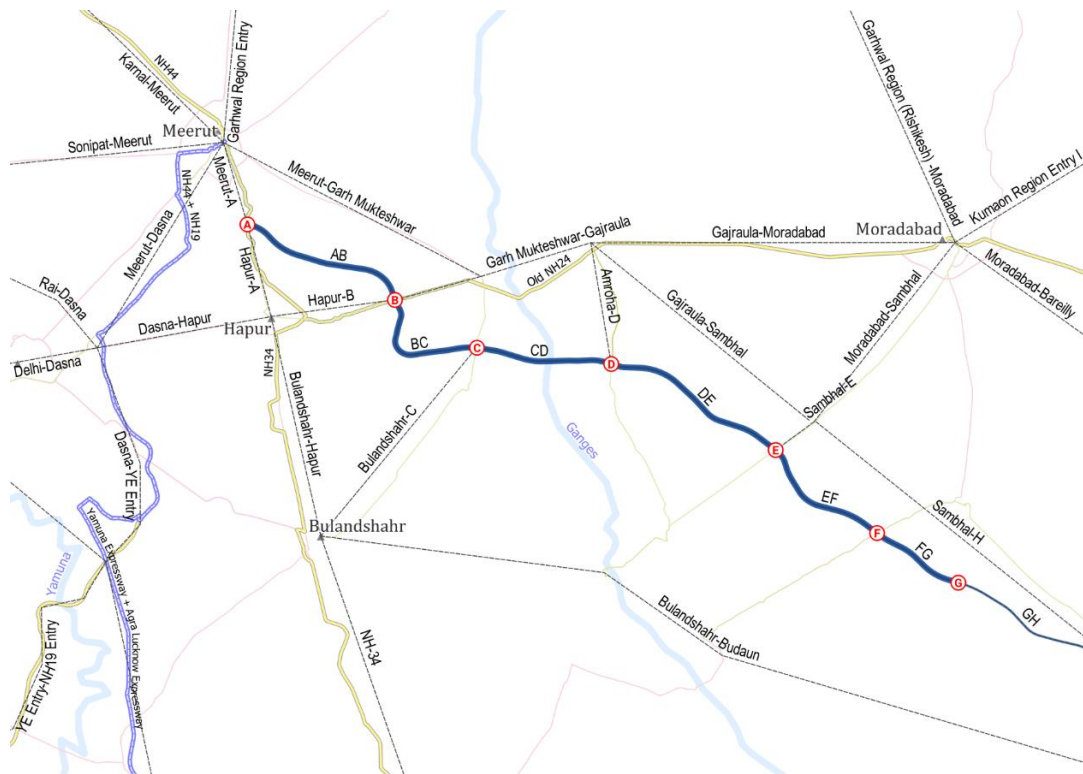


Table 1-3 Group 1 Project Stretch

SectionFrom	SectionTo	SectionFrom Code	SectionTo Code
007+900	035+270	A	B
035+270	054+640	B	C
054+640	074+181	C	D
074+181	102+427	D	E
102+427	123+288	E	F
123+288	137+600	F	G
Total Length = 129.7 km			

Table 1-4 Tolling Details of Group 1

SectionFrom Code	SectionTo Code	Location of TP (Sch R)	Length of Expressway excluding Structure in km (Sch R)	Length of Structures	Cost of Structures	Location of Structures
A	B	013+400	27.310	0.060	69.309	019+941
B	C	035+270	19.370	0.000	0.000	
C	D	054+640	18.581	0.960	299.960	066+850
D	E	074+181	28.246	0.000	0.000	
E	F	102+427	20.755	0.106	60.056	123+100
F	G	123+288	14.312	0.000	0.000	

1.4.2 Group 2

Group 2 of Project Corridor starts in district of Budaun and ends at Hardoi. It starts at node G and ends at node L. The length of Group 2 is 151.7 km. Table 1-5 and Table 1-6 provides nodes, section length and tolling details of the group.

Figure 1-5 Group 2 Project Corridor

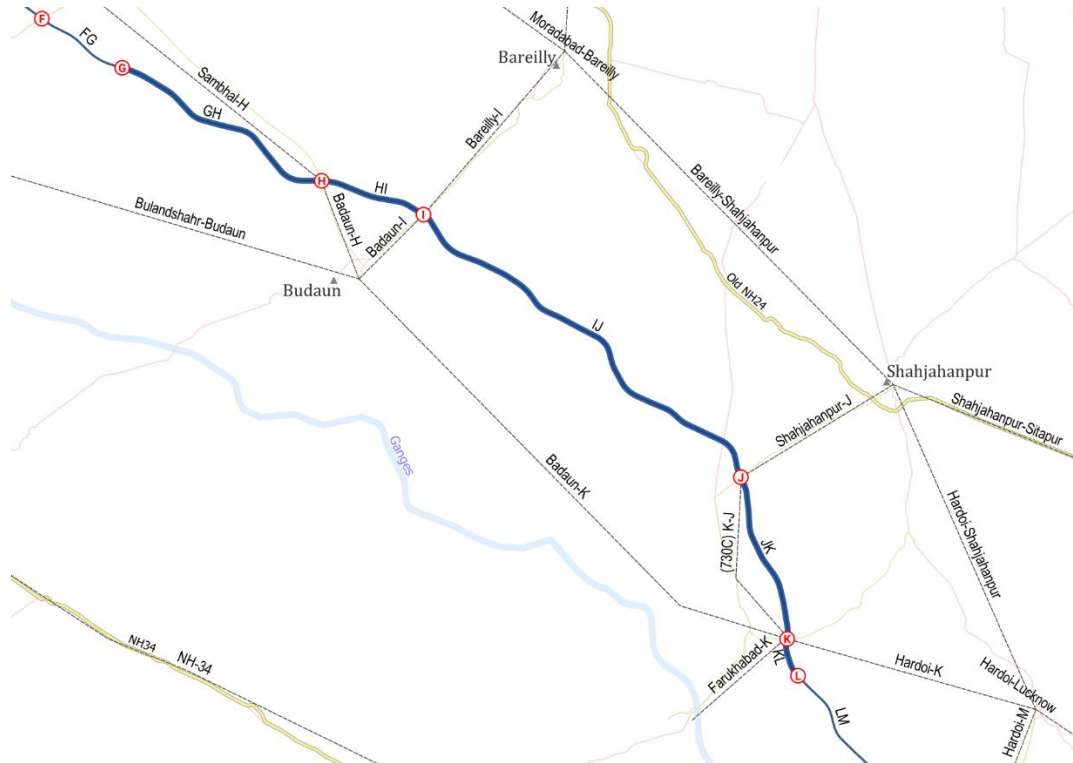


Table 1-5 Group 2 Project Stretch

SectionFrom	SectionTo	SectionFrom Code	SectionTo Code
137+600	173+454	G	H
173+454	189+394	H	I
189+394	255+167	I	J
255+167	282+845	J	K
282+845	289+300	K	L
Total Length = 151.7 km			

Table 1-6 Tolling Details of Group 2

SectionFrom Code	SectionTo Code	Location of TP (Sch R)	Length of Expressway excluding Structure in km (Sch R)	Length of Structures	Cost of Structures	Location of Structures

G	H	173+454	35.854	0.000	0.000	
H	I	189+394	15.940	0.720	50.130	207+740
I	J	255+167	64.963	0.090	229.970	217+920
J	K	282+845	27.526	0.152	56.690	238+190
K	L	289+300	6.455	0.000	0.000	

1.4.3 Group 3

Group 3 of Project Corridor starts in district of Hadoi and ends at Unnao. It starts at node L and ends at node P. The length of Group 3 is 155.7 km. Table 1-7 and Table 1-8 provides nodes, section length and tolling details of the group.

Figure 1-6 Group 3 Project Corridor

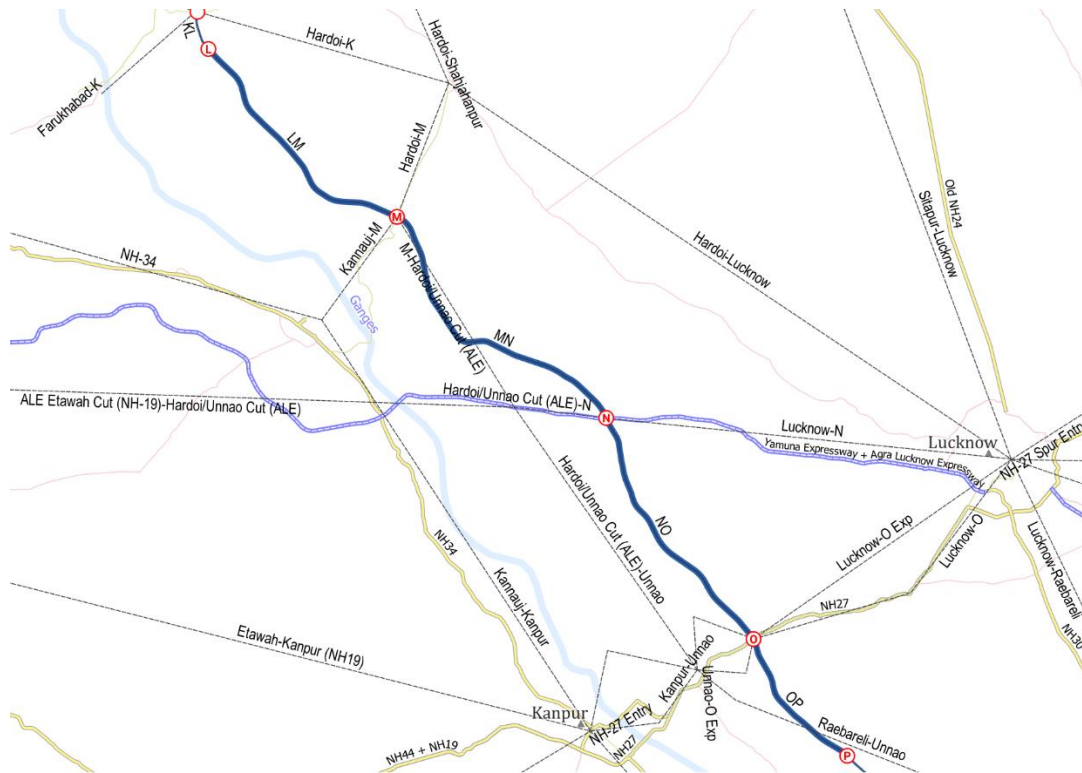


Table 1-7 Group 3 Project Stretch

SectionFrom	SectionTo	SectionFrom Code	SectionTo Code
289+300	329+945	L	M
329+945	378+136	M	N
378+136	420+932	N	O
420+932	445+000	O	P
Total Length = 155.7 km			

Table 1-8 Tolling Details of Group 3

SectionFrom Code	SectionTo Code	Location of TP (Sch R)	Length of Expressway excluding Structure in km (Sch R)	Length of Structures	Cost of Structures	Location of Structures
L	M	329+945	40.405	0.240	107.497	317+923
M	N	378+136	48.040	0.060	52.359	337+901
N	O	420+932	42.683	0.110	64.735	378+155
O	P	445+000	24.068	0.094	51.696	420+102

1.4.4 Group 4

Group 4 of Project Corridor starts in district of Unnao and ends at Prayagraj. It starts at node L and ends at node P. The length of Group 4 is 156.847 km. Table 1-9 and Table 1-10 provides nodes, section length and tolling details of the group.

Figure 1-7 Group 4 Project Corridor



Table 1-9 Group 4 Project Stretch

SectionFrom	SectionTo	SectionFrom Code	SectionTo Code
445+000	487+285	P	Q
487+285	517+708	Q	R
517+708	554+951	R	S

554+951	589+700	S	T
589+700	601+847	T	U
Total Length = 156.847 km			

Table 1-10 Tolling Details of Group 4

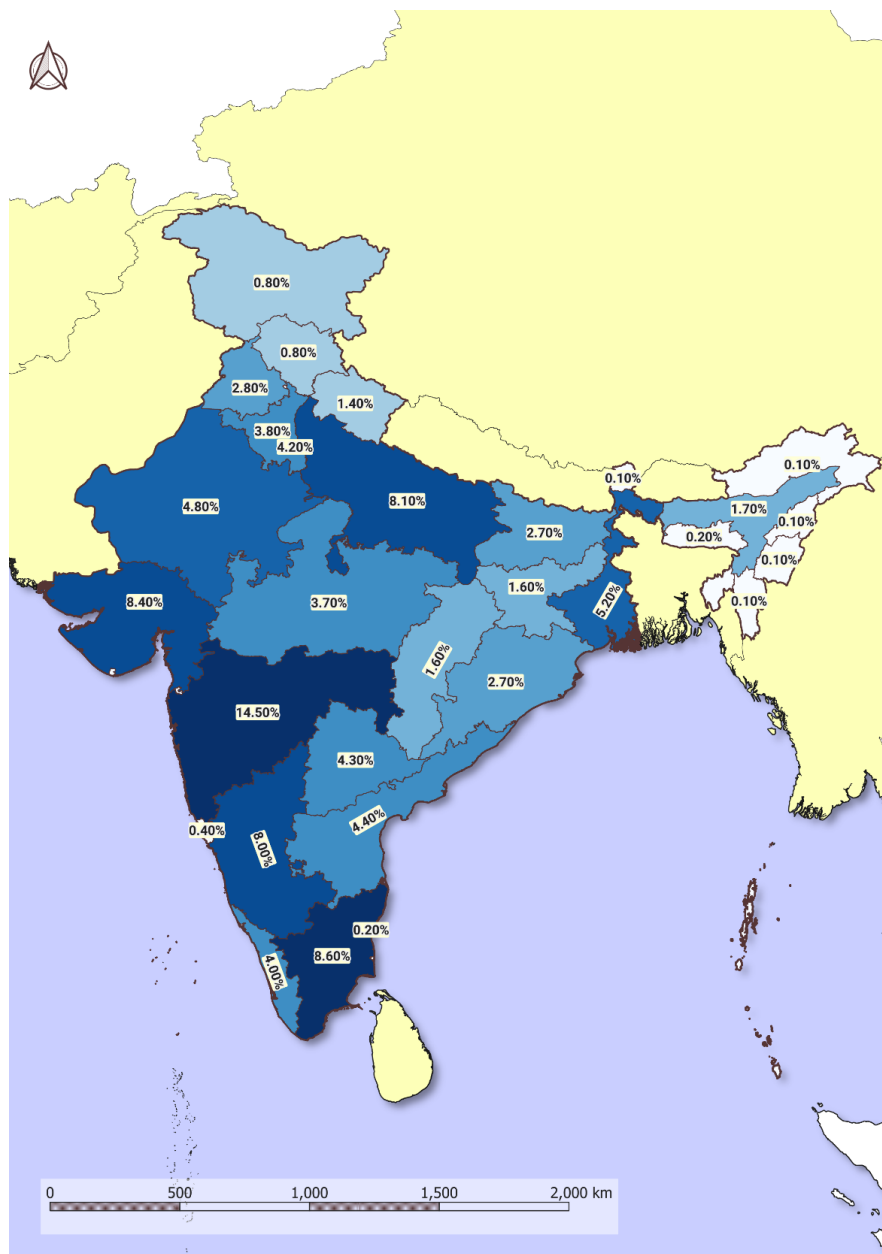
SectionFrom Code	SectionTo Code	Location of TP (Sch R)	Length of Expressway excluding Structure in km (Sch R)	Length of Structures	Cost of Structures	Location of Structures
P	Q	487+285	42.285	0.000	0.000	
Q	R	517+708	30.423	0.000	0.000	
R	S	554+951	37.243	0.000	0.000	
S	T	589+700	34.749	0.000	0.000	
T	U	601+847	12.147	0.000	0.000	

1.5 Project Influence Area

1.5.1 Socio-Economic Profile of Uttar Pradesh

The project corridor lies entirely in the state of Uttar Pradesh. In the origin Destination survey, it was found that states of Uttar Pradesh, Bihar, Jharkhand, Rajasthan, Delhi, Haryana, Punjab, Uttarakhand, Jammu and Kashmir have contribution to goods vehicle traffic. Since the entire Project lies in the state of Uttar Pradesh, the socio-economic growth of Uttar Pradesh will have major contribution in traffic growth. Northern states of Delhi, Haryana, Punjab, Uttarakhand and eastern states of Jharkhand, West Bengal, Orissa, North Eastern states would also contribute in goods traffic of the project corridor. The figure below shows the contribution of different states in GDP of India. Uttar Pradesh contributes 8.1% to GDP of India and has a population of 16.9% of total population of India.

Figure 1-8 Percentage Contribution of different states to GDP of India in year 2018-19 (base years 2011-12)



- Table 1-11 describes the NSDP, Per Capita NSDP and Net Value Added by Primary, Secondary and tertiary sector of states of India. The state of Uttar Pradesh ranks 5th in NSDP and 4th in Net value added by secondary sector and 2nd in Net Value Added by Primary sector.

Table 1-11 NSDP, PCNSDP and contribution of Primary, Secondary and Tertiary Sector of Major States in India (base year 2011-12)

Row Labels	rank	Net State Domestic Product (in crore Rs.)	Per Capita NSDP (Rs.)	Primary (in crore Rs.)	Secondary (in crore Rs.)	Tertiary (in crore Rs.)
Maharashtra	1	17,941	1,47,450	2,259	4,873	8,435

Tamil Nadu	2	10,799	1,42,941	1,188	3,459	4,896
Gujarat	3	10,369	1,53,495	1,611	3,839	3,242
Karnataka	4	10,165	1,53,276	882	2,329	5,583
Uttar Pradesh	5	9,960	44,421	2,235	2,799	4,259
West Bengal	6	6,624	67,300	1,473	1,620	3,307
Rajasthan	7	6,004	78,570	2,018	1,149	2,427
Andhra Pradesh	8	5,506	1,07,241	1,767	994	2,120
Telangana	9	5,495	1,43,618	773	935	3,110
Delhi	10	5,297	2,69,505	94	571	3,865
Kerala	11	5,133	1,48,078	379	1,270	2,890
Haryana	12	4,778	1,69,409	749	1,317	2,072
Madhya Pradesh	13	4,619	56,498	1,570	958	1,697
Punjab	14	3,548	1,15,882	862	759	1,587

2. Table 1-12 compares the socio-economic profile of districts in the vicinity of project corridor with Uttar Pradesh. Gautambudh Nagar, Lucknow and Prayagraj are top contributors in States income. The Per capita income of Gautambudh Nagar is almost 7 times states average.

Table 1-12 Socio-Economic Profile of Districts in vicinity of project corridor

Rank	District	Ratio of PCI of district with UP	Percentage contribution of State Income
1	Gautambudh Nagar	6.9	9.20%
2	Lucknow	2.7	3.60%
3	Prayagraj	2.5	3.40%
5	Meerut	2.4	3.30%
6	Kanpur Nagar	2.1	2.80%
7	Bareilly	1.9	2.50%
8	Ghaziabad	2.1	2.80%
9	Buland Shahr	1.6	2.10%
20	Badaun	1	1.30%
23	Shahjahanpur	0.9	1.30%
25	Amroha	1	1.40%
27	Unnao	0.9	1.20%
28	Hardoi	1	1.30%
37	Raebareilly	0.7	1.00%
40	Hapur	0.7	0.90%
48	Sambhal	0.7	0.90%
55	Pratapgarh	0.6	0.80%

2 Data Collection

2.1 Data collection

The data collection is mainly classified into

- **Primary data collection:** The primary data collection is a very important component of analysis. The aim of the primary data collection process is capture base year traffic volume counts, local traffic and spatial analysis of traffic moving in the project corridor.
- **Secondary data collection:** The aim of secondary data collection is to capture historical trends in traffic growth, economic parameters of Project Influence Area that drives growth, new transport projects under implementation that is likely to affect traffic in the project corridor.

The following section describes type of data collected and their source

2.1.1 Primary data collection

Primary data collection in form of Classified Volume Count (CVC) Survey and roadside origin-destination (OD) surveys. CVC and Road side OD surveys were carried out at locations shown in Figure 2-1. The schedule of surveys is described in Table 2-1. The selection of location of traffic survey were based on following criteria:

1. To capture, long distance traffic which is likely to use major part of corridor and the traffic which is moving on highways of South bank of river Ganga (NH-19, Agra-Lucknow Expressway and NH-34). Traffic moving in roads of South bank of river Ganga have origin destination pairs in Northern parts of India (Punjab, Haryana, Delhi) and Eastern part of India like Purvanchal region of Uttar Pradesh, Bihar, West Bengal, Odhisa etc. This traffic is captured at survey locations of Old NH-24, NH-19 and Agra-Lucknow Expressway.
2. The Expressway is divided into four groups and each group has entry and exit points. In order to capture sectional traffic between entry-exit points of short distances various survey locations were chosen. For example to capture traffic between districts of Badaun and Sambhal, OD survey at location of SH-43 (Chandausi-Badaun) was carried out.
3. Section 3.4 describes the method of estimating potentially divertible traffic or divertible traffic and this section gives the location of survey used in estimating potentially divertible traffic. Potentially divertible traffic or divertible means the traffic that are likely to be diverted from existing roads to proposed Ganga Expressway. For example traffic moving from Meerut to Prayagraj is captured at Old NH-24, NH-19 and Agra-Lucknow Expressway. The traffic captured at these locations from OD survey reporting Meerut and Prayagraj is potentially divertible traffic to Ganga Expressway. Likewise OD survey is used to estimate divertible traffic for different OD pairs which is described in Section 3.4. It is to be noted to derive the traffic on Ganga Expressway potentially divertible traffic and diversion percentage (derived from diversion analysis Section 3.5) is used to derive traffic on proposed Ganga Expressway. This traffic which is diverted to Ganga Expressway is defined as diverted traffic. The diverted traffic for base year (2021-22) is explained in Section 3.6.

Table 2-1 Schedule of traffic Surveys

Sno.	Location	OD Date	CVC Start Date	CVC End Date
1	Old NH-24 (Niyamatpur Toll Plaza)	09-09-2021	05-09-2021	12-09-2021
2	Old NH-24 (Brijghat Toll Plaza)	03-09-2021	05-09-2021	12-09-2021
3	SH-51 (Gajraula-Hasanpur)	21-09-202	12-09-2021	19-09-2021
4	SH-43 (Chandausi-Badaun)	17-09-2021	11-09-2021	18-09-2021

5	Old NH-24 (Bareilly-Shahjahanpur)	20-09-2021	14-09-2021	21-09-2021
6	SH-43 (Badaun-Farrukhabad)	16-09-2021	11-09-2021	18-09-2021
7	Old NH-24 (Sitapur Toll Plaza)	14-09-2021	08-09-2021	15-09-2021
8	NH-34 (Malawan Toll Plaza)	20-09-2021	15-09-2021	22-09-2021
9	SH-21 (Hardoi-Kanpur)	13-09-2021	10-09-2021	17-09-2021
10	SH-25 (Lucknow-Hardoi)	13-09-2021	10-09-2021	17-09-2021
11	Fatehabad TP (Agra-Lucknow Exp)	08-09-2021	09-09-2021	17-09-2021
12	NH-19 (Gurau Toll Plaza)	06-09-2021	06-09-2021	13-09-2021
13	SH-38 (Unnao-Hardoi Road)	17-09-2021	11-09-2021	18-09-2021
14	NH-31 (Unnao-Raebareilly)	17-09-2021	10-09-2021	17-09-2021
15	NH-19 (Katoghan Toll Plaza)	10-09-2021	08-09-2021	15-09-2021
16	NH-30 (Prayagraj-Raebareilly)	17-09-2021	09-10-2021	17-10-2021

Figure 2-1 Survey Locations



2.1.2 Secondary data collection

The secondary data collection was done to capture socio economic data like national and state domestic product, per capita income, population. Table 2-2 describes the list of documents referred their sources and its significance in parameters for which they are used.

Table 2-2 Secondary Data Sources

Parameters	Variables	Source	Documents referred
Elasticity of Transport Demand	Toll data Vehicle Registration data, Population, Per capita Income at county, State and Country level	Department of Planning commission, MORTH, Directorate of economics and statistics, NHAI, Central Statistical Organization	<ul style="list-style-type: none"> Road Transport Year book Socio-Economic survey Population Projections for India and States <ul style="list-style-type: none"> Toll Data
Economic Factor	NSDP, Sector-Wise GDP, for county, NSDP, State and Country level		

2.2 Traffic Survey

2.2.1 Classified Volume Count Survey

Classified Traffic Volume Count was carried out on site using a varifocal camera. The data was extracted from the video using image processing techniques. Image processing technique also produced time stamped thumbnails of each vehicle category that was used to cross check with automated counts results. A sample thumbnail of six axle truck is shown in figure below. The vehicles were classified according to the toll categories.

Figure 2-2 Sample Thumbnails of Six axle Truck



2.2.2 Origin & Destination (O-D) survey

Objective

The objective of the O-D survey was to gather information regarding travel characteristics of different users on the project road. Results of the O-D survey were used to describe the user characteristics, both of passengers and freight vehicles, such as distribution of local traffic, through traffic, trip characteristics like occasional, frequent users of corridor as well as commodity type carried by freight vehicles. Additionally, O-D survey was used to identify the geographical, spatial location of trips and project influence area of the project corridor.

Methodology

The O-D survey was carried out adopting road-side interview method as detailed in *IRC: 102-1988*. The survey was carried out for passenger and goods vehicles for 24 hours at three toll plaza locations. Trained enumerators under the supervision of transport planners collected and carried out the survey. The O-D survey of passenger modes captures characteristics like origin, destination, occupancy, trip purpose and length of trip by mode type etc. For freight modes, the survey captures characteristics like origin, destination, commodity type and frequency of trips.

2.3 PCU Values

The toll data was collected over past 10 years categories having different sizes and characteristics are to be converted into a standard equivalent unit called "Passenger Car Unit" (PCU). The PCU values (Rural Roads) as suggested in the IRC: 64 – 1990 "Guidelines for Capacity of Roads on Highway" have been adopted as given in Table 2-3.

Table 2-3 PCU factors

Fast Vehicles

Vehicle Group	PCU Factor
Car, Jeep, Van, Taxi and Utility Vehicles	1.0
Auto Rickshaw / Tempo	1.0
2 Wheelers	0.5
Mini Bus	1.5
Standard Bus	3.0
Light Commercial Vehicle (LCV)	1.5
2 – Axle Truck	3.0
3 – Axle Truck	3.0
Multi Axle Truck (Semi Articulated & Articulated)/ HCM/EME	4.5
Agriculture Tractor +Trailer	4.5
Agriculture Tractor	1.5

2.4 Traffic Volume Count Analysis

1. The Average Daily Traffic (ADT) was derived by taking out the mean of seven days for each category of vehicle. Table 2-4 and Table 2-5 provides ADT in volume and PCU at survey locations.
2. Table 2-6 provides the seasonal correction factor. The seasonal correction factor was derived from toll data of Agra Lucknow expressway. The SVF values for month of September were used to convert ADT into AADT.
3. Table 2-7 and Table 2-8 provides AADT for at survey locations.
4. It is observed that highest number of cars were at Brijghat toll plaza and Niyamatpur toll plazas of NH-24. The proximity to Delhi is one of the reasons for high number of cars.
5. At all 4-6 lane National highways the MAV* vehicle is in the range of 1800 to 2900. The highest number of Multi Axle vehicles were observed at Katoghan Toll Plaza.

*4-6 Axle Truck

Table 2-4 Average Daily Traffic at Survey Locations

ADT (volume)	Old NH-24 (Niyamatpur Toll Plaza)	Old NH-24 (Brijghat Toll Plaza)	SH-51 (Gajraula-Hasanpur)	SH-43 (Chandausi-Badaun)	Old NH-24 (Bareilly-Shahjahanpur)	SH-43 (Badaun-Farrukhabad)	Old NH-24 (Sitapur Toll Plaza)	NH-34 (Malawan Toll Plaza)	SH-21 (Hardoi-Kanpur)	SH-25 (Lucknow-Hardoi)	Fatehabad TP (Agra-Lucknow Exp)	NH-19 (Gurau Toll Plaza)	SH-38 (Unnao-Hardoi Road)	NH-31 (Unnao-Raebareilly)	NH-19 (Katoghan Toll Plaza)	NH-30 (Prayagraj-Raebareilly)
<i>Car, Jeep, Van, LMV</i>	11,341	18,266	2,460	1,725	3,664	1,326	5,849	1,452	1,687	3,761	7,559	2,463	1,941	497	2,388	3,852
<i>Mini Bus</i>	68	135	7	3	27	6	24	17	6	28	28	10	13	2	8	9
<i>Bus</i>	1,753	2,069	206	253	679	256	925	391	256	297	802	478	190	163	328	266
<i>LMV Goods</i>	1,685	1,824	533	498	957	513	897	269	562	712	254	586	470	176	561	521
<i>LCV, LGV</i>	2,211	3,352	581	416	1,162	298	869	734	98	406	472	1,246	249	84	1,107	452
<i>2 Axle Truck</i>	507	466	50	98	607	276	407	589	41	185	138	919	128	57	793	262
<i>3 Axle Truck</i>	1,136	1,140	174	340	1,051	411	686	570	102	403	101	873	245	81	1,178	481
<i>MAV*</i>	1,829	1,594	176	361	1,812	453	1,361	537	413	466	983	2,074	435	130	2,859	1,248
<i>HCM/EME</i>	8	26	12	5	9	6	10	12	2	6	5	5	7	9	98	20
<i>Oversized</i>	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
<i>SemiTollable</i>	18,928	11,888	8,187	4,479	5,140	6,796	8,361	4,788	6,390	3,590	416	6,229	5,103	2,200	4,263	6,133
<i>Exempted</i>	174	206	41	19	83	27	159	54	44	130	169	65	67	20	73	112
<i>Tollable Passenger</i>	13,162	20,470	2,673	1,981	4,370	1,588	6,799	1,860	1,948	4,086	8,389	2,951	2,144	662	2,724	4,127
<i>Tollable Goods</i>	7,376	8,402	1,526	1,718	5,597	1,957	4,229	2,710	1,217	2,178	1,954	5,703	1,534	537	6,595	2,984
<i>ALL</i>	39,639	40,966	12,427	8,196	15,190	10,368	19,548	9,412	9,599	9,984	10,928	14,948	8,848	3,420	13,655	13,356

*4-6 Axle Truck

Table 2-5 Average Daily Traffic in PCU at Survey Locations

ADT (PCU)	Old NH-24 (Niyamatpur Toll Plaza)	Old NH-24 (Brijghat Toll Plaza)	SH-51 (Gajraula-Hasanpur)	SH-43 (Chandausi-Badaun)	Old NH-24 (Bareilly-Shahjahanpur)	SH-43 (Badaun-Farrukhabad)	Old NH-24 (Sitapur Toll Plaza)	NH-34 (Malawan Toll Plaza)	SH-21 (Hardoi-Kanpur)	SH-25 (Lucknow-Hardoi)	Fatehabad TP (Agra-Lucknow Exp)	NH-19 (Gurau Toll Plaza)	SH-38 (Unnao-Hardoi Road)	NH-31 (Unnao-Raebareilly)	NH-19 (Katoghan Toll Plaza)	NH-30 (Prayagraj-Raebareilly)
<i>Car, Jeep, Van, LMV</i>	11,341	18,266	2,460	1,725	3,664	1,326	5,849	1,452	1,687	3,761	7,559	2,463	1,941	497	2,388	3,852
<i>Mini Bus</i>	102	203	11	4	40	9	37	26	9	43	42	14	20	3	12	14
<i>Bus</i>	5,259	6,206	618	759	2,038	767	2,775	1,173	767	890	2,405	1,435	570	490	984	798
<i>LMV Goods</i>	1,685	1,824	533	498	957	513	897	269	562	712	254	586	470	176	561	521
<i>LCV, LGV</i>	3,316	5,027	872	624	1,743	447	1,304	1,101	147	609	708	1,870	374	126	1,660	678

2 Axle Truck	1,521	1,398	150	294	1,822	827	1,220	1,766	122	555	413	2,758	383	172	2,378	787
3 Axle Truck	3,408	3,421	522	1,019	3,153	1,233	2,057	1,710	306	1,208	304	2,618	736	244	3,533	1,443
MAV	8,232	7,173	791	1,626	8,152	2,040	6,123	2,417	1,857	2,095	4,424	9,332	1,956	584	12,866	5,615
HCM/EME	25	78	35	14	26	18	29	36	7	17	16	14	21	27	293	59
Oversized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SemiTollable	10,878	7,806	5,527	2,552	3,198	4,365	4,818	2,946	4,035	2,214	246	4,051	2,928	1,169	2,499	3,735
Exempted	268	293	80	25	153	47	253	67	80	243	246	97	121	27	118	202
Tollable Passenger	16,702	24,675	3,088	2,488	5,742	2,103	8,661	2,651	2,462	4,694	10,006	3,912	2,530	990	3,384	4,663
Tollable Goods	18,186	18,922	2,903	4,075	15,853	5,079	11,629	7,298	3,001	5,197	6,120	17,178	3,939	1,329	21,292	9,104
ALL	46,034	51,696	11,599	9,139	24,947	11,593	25,361	12,962	9,579	12,349	16,618	25,238	9,519	3,515	27,292	17,705

Table 2-6 Seasonal Correction Factor

Month	Car, Jeep, Van, LMV	LCV, LGV	Bus	2 Axle Truck	MAV	Oversized	SemiTollable
Apr	1.047	1.265	0.965	1.327	1.182	1.200	0.980
May	1.196	1.103	1.117	1.154	1.256	1.452	1.017
Jun	0.932	0.935	1.126	1.014	1.079	1.410	1.104
Jul	1.077	0.996	1.219	1.086	1.137	0.955	1.047
Aug	1.065	1.042	1.055	1.088	1.108	1.040	0.876
Sep	1.155	0.999	1.053	0.991	0.988	0.927	0.989
Oct	0.977	0.831	0.938	0.762	0.840	1.174	0.880
Nov	0.803	0.850	0.779	0.760	0.858	0.865	0.806
Dec	0.876	0.865	0.840	0.848	0.805	0.661	1.089
Jan	0.980	0.959	0.942	0.868	0.823	0.903	1.320
Feb	1.010	1.176	1.129	1.241	1.087	1.080	1.149
Mar	1.017	1.192	1.027	1.283	1.108	0.888	0.944

Table 2-7 Average Annual Daily Traffic at Survey Locations

AADT (volume)	Old NH-24 (Niyamatpur Toll Plaza)	Old NH-24 (Brijghat Toll Plaza)	SH-51 (Gajraula-Hasanpur)	SH-43 (Chandausi-Badaun)	Old NH-24 (Bareilly-Shahjahanpur)	SH-43 (Badaun-Farrukhabad)	Old NH-24 (Sitapur Toll Plaza)	NH-34 (Malawan Toll Plaza)	SH-21 (Hardoi-Kanpur)	SH-25 (Lucknow-Hardoi)	Fatehabad TP (Agra-Lucknow Exp)	NH-19 (Gurau Toll Plaza)	SH-38 (Unnao-Hardoi Road)	NH-31 (Unnao-Raebareilly)	NH-19 (Katoghan Toll Plaza)	NH-30 (Prayagraj-Raebareilly)
Car, Jeep, Van, LMV	13,102	21,103	2,842	1,993	4,233	1,532	6,757	1,678	1,949	4,345	8,733	2,845	2,242	574	2,758	4,450
Mini Bus	72	142	8	3	28	6	26	18	6	30	29	10	14	2	8	10
Bus	1,846	2,178	217	266	715	269	974	411	269	312	844	504	200	172	345	280
LMV Goods	1,683	1,822	533	498	956	513	896	268	561	711	254	586	470	176	560	521
LCV, LGV	2,208	3,347	581	415	1,160	298	868	733	98	406	472	1,245	249	84	1,106	451

2 Axle Truck	503	462	49	97	602	273	403	584	40	184	137	912	127	57	786	260
3 Axle Truck	1,123	1,127	172	336	1,039	406	678	563	101	398	100	863	242	80	1,164	476
MAV	1,808	1,575	174	357	1,790	448	1,345	531	408	460	972	2,049	429	128	2,826	1,233
HCM/EME	8	26	11	5	9	6	9	12	2	6	5	5	7	9	97	19
Oversized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SemiTollable	18,729	11,763	8,101	4,432	5,086	6,725	8,273	4,737	6,323	3,552	412	6,164	5,049	2,177	4,218	6,068
Exempted	174	206	41	19	83	27	159	54	44	130	169	65	67	20	73	112
Tollable Passenger	15,019	23,423	3,066	2,262	4,976	1,808	7,757	2,107	2,224	4,688	9,606	3,359	2,456	748	3,112	4,739
Tollable Goods	7,332	8,360	1,520	1,708	5,556	1,944	4,199	2,691	1,210	2,164	1,939	5,659	1,524	534	6,538	2,960
ALL	41,254	43,752	12,729	8,421	15,701	10,503	20,389	9,590	9,801	10,534	12,126	15,246	9,097	3,479	13,942	13,880

Table 2-8 Average Annual Daily Traffic in PCU at Survey Locations

AADT (PCU)	Old NH-24 (Niyamatpur Toll Plaza)	Old NH-24 (Brijghat Toll Plaza)	SH-51 (Gajraula-Hasanpur)	SH-43 (Chandausi-Badaun)	Old NH-24 (Bareilly-Shahjahanpur)	SH-43 (Badaun-Farrukhabad)	Old NH-24 (Sitapur Toll Plaza)	NH-34 (Malawan Toll Plaza)	SH-21 (Hardoi-Kanpur)	SH-25 (Lucknow-Hardoi)	Fatehabad TP (Agra-Lucknow Exp)	NH-19 (Gurau Toll Plaza)	SH-38 (Unnao-Hardoi Road)	NH-31 (Unnao-Raebareilly)	NH-19 (Katoghan Toll Plaza)	NH-30 (Prayagraj-Raebareilly)
Car, Jeep, Van, LMV	13,102	21,103	2,842	1,993	4,233	1,532	6,757	1,678	1,949	4,345	8,733	2,845	2,242	574	2,758	4,450
Mini Bus	107	214	11	4	42	9	39	27	9	45	44	15	21	4	12	15
Bus	5,537	6,533	651	799	2,146	808	2,922	1,234	807	937	2,532	1,511	600	516	1,036	840
LMV Goods	1,683	1,822	533	498	956	513	896	268	561	711	254	586	470	176	560	521
LCV, LGV	3,312	5,021	871	623	1,741	446	1,303	1,100	146	608	707	1,867	373	126	1,658	677
2 Axle Truck	1,508	1,386	148	291	1,806	820	1,209	1,751	121	551	410	2,735	380	171	2,358	781
3 Axle Truck	3,368	3,381	516	1,007	3,116	1,219	2,033	1,690	303	1,194	301	2,588	727	241	3,492	1,427
MAV	8,136	7,089	782	1,607	8,057	2,016	6,051	2,388	1,836	2,071	4,372	9,223	1,933	577	12,716	5,550
HCM/EME	25	77	34	14	26	18	28	36	7	17	16	14	20	27	290	58
Oversized	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
SemiTollable	10,764	7,724	5,469	2,525	3,165	4,319	4,767	2,915	3,993	2,191	244	4,008	2,897	1,157	2,472	3,695
Exempted	268	293	80	25	153	47	253	67	80	243	246	97	121	27	118	202
Tollable Passenger	18,746	27,850	3,504	2,796	6,421	2,350	9,718	2,939	2,765	5,327	11,309	4,371	2,863	1,093	3,807	5,304
Tollable Goods	18,031	18,777	2,885	4,040	15,702	5,032	11,520	7,233	2,974	5,152	6,060	17,012	3,903	1,317	21,074	9,013
ALL	47,809	54,644	11,937	9,385	25,440	11,747	26,258	13,154	9,812	12,913	17,859	25,488	9,785	3,594	27,471	18,215

3 Network Analysis & Potentially divertible Traffic

3.1 Introduction

Appraisal of project corridor influenced network is the significant assignment in understanding various aspects such as (i) Potential revenue threats to the project in terms of traffic diversions due to prospective network improvements, (ii) scope of prospective capacity augmentation of project corridor due to variations in level of service and prospective land use transformations. This chapter deals with following aspects.

1. Identification of project corridor influenced network
2. The macro level if network that describes the importance of corridor for long distance traffic from different parts of India.
3. The network in the vicinity of project corridor that describes movement of traffic in the vicinity of the project corridor.
4. Zoning System that divides traffic into homogeneous zone which helps to understand the movement of traffic.
5. Major contributors of different zones in the traffic.
6. Identification and assessment of potential competing alternative routes/sections (Existing and proposed) in the project network.
7. Estimating of generalized road user cost for project corridor and competing alternative routes considering level of service (Design Service Volume/Capacity).
8. Divertible traffic in base year on the project Corridor.

3.2 Tools and Software Used

The following sections describes diverted traffic on Ganga Expressway from competing Highways. In order to derive a detailed system of zones and parallel routes for OD pairs were developed forming a transportation network comprising of Ganga Expressway, its parallel roads with network characteristics of parallel route and Expressway. Network characteristics includes congestion factor, toll rates and factors that are required in estimating Road User which is explained in detail in Section 3.3, 3.4, 3.5 and 3.6. Quantum GIS software was used for developing zoning system, divertible OD pairs and network characteristics which was integrated with spreadsheets to run diversion percentage algorithm.

3.3 Zoning System

The study area is divided in homogeneous zone to carry out the traffic demand analysis. The location of OD survey was marked on GIS map and locations within the polygon of study area. The basis of zoning are as follows:

1. Criteria of Network access: This means that regions that have common access and egress point in the network is assigned one zone. For example the traffic originating from South Bihar, Odhisa, West Bengal would enter the network via Varanasi and hence they are allotted same zone.
2. Important Location with Separate Zone: The zones that are important from the point generating trips are allotted different zones though they may be accessing the corridor via same access and egress point. For example South Bihar, Odhisa and West Bengal would enter the network via Varanasi but they are allotted different zones. The Reason being Varanasi is an important location from the point of generating trips since it is one major cities of Uttar Pradesh that have direct access to the Project Corridor.

3. Districts of Project Corridor: Each districts through which project corridor passes is allotted separate zone because they lie in immediate vicinity of the project.
4. All the locations found during OD survey interview was superimposed over zone map (Figure 3-1) and locations falling in the boundary of the zone has been allotted that particular zone.

The list of zones for this study is shown in Table 3-1 and Figure 3-1.

Table 3-1 Zoning System

Sno	ZONE	Sno	ZONE
1	Amroha	26	Meerut
2	Auraiya	27	Moradabad and Rampur
3	Bahraich	28	Nagpur
4	Bareilly	29	NH-27 Entry Lucknow*
5	Bhopal and Sagar	30	NH-34 Catchment*
6	Budaun	31	North Bihar and North Eastern States
7	Chhattisgarh	32	Northern Parts of Rajasthan*
8	Delhi	33	Northern States (above Delhi)*
9	Etawah and Gwalior	34	Pilibhit
10	Farrukabad	35	Poorvanchal Expressway Connection*
11	Fatehpur and Kaushambhi	36	Pratapgarh
12	Garhwal Region Uttarakhand	37	Prayagraj
13	Gautam Budh Nagar	38	Raebarelli
14	Ghazaiabd	39	Rewa and Shahdol
15	Gurugram and Faridabad	40	Sambhal
16	Hamirpur and Mahoba	41	Shahjahanpur
17	Hapur	42	Sitapur and Lakhimpur Kheri
18	Hardoi	43	South Bihar West Bengal Jharkhand and Odhisa
19	IIA Buladshahr	44	South Haryana
20	Jhansi	45	South Rajasthan and Gujarat
21	Kannauj	46	Southern States
22	Kanpur	47	Unnao
23	Kumaon Region Uttarakhand	48	Varanasi
24	Lucknow	49	Western Maharashtra and Western MP
25	Mathura Agra and Firozabad		

* marked zones explanation

NH-27 entry Lucknow are the districts of Uttar Pradesh that uses NH-27 to reach Lucknow.

NH-34 catchment is the districts on NH-34 South of Bulandshahr and North of Kanpu, includes Aligarh, Kannauj.

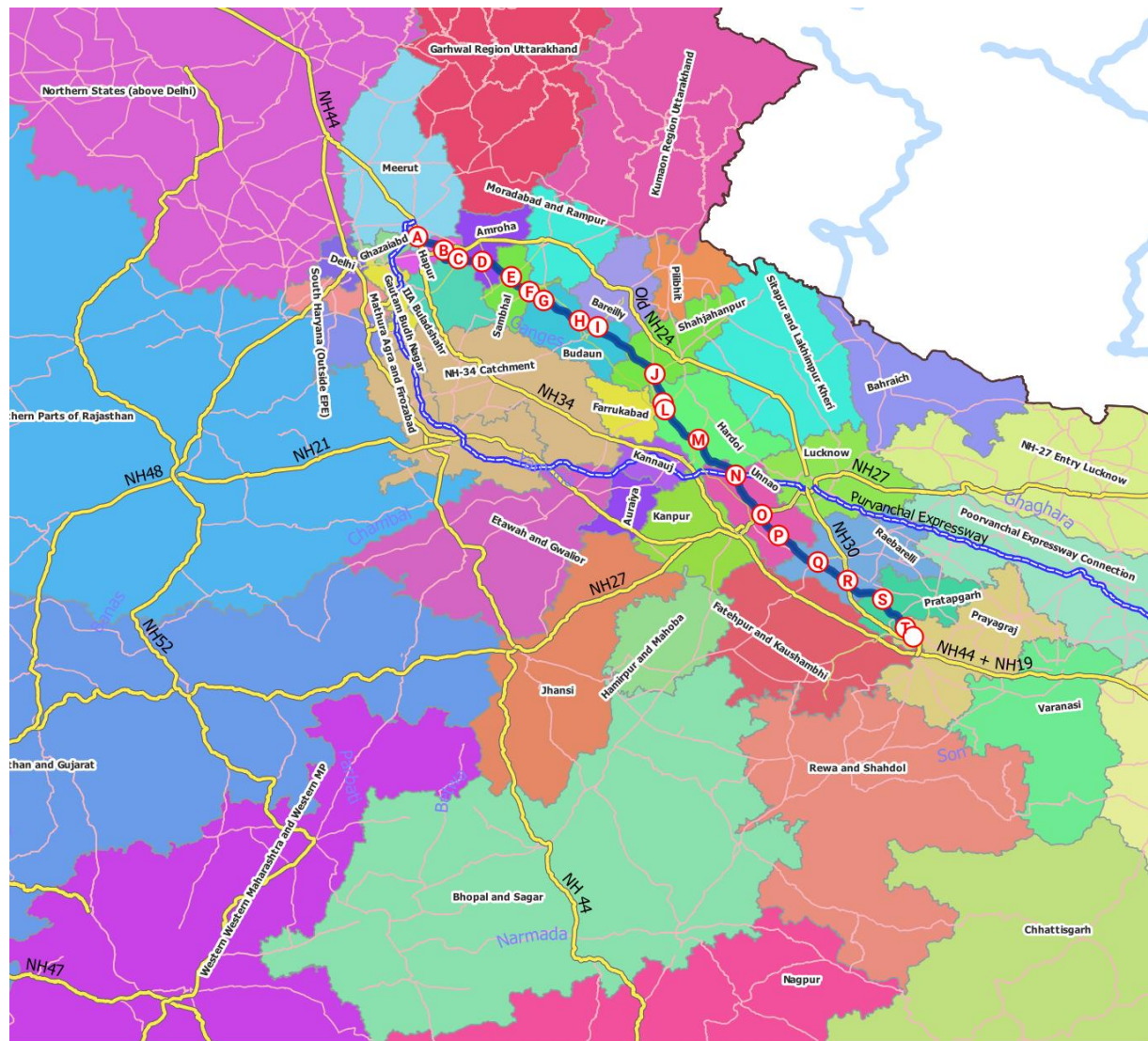
The traffic from this zone is not considered for diversion to Gan

Northern parts of Rajasthan is region that uses NH-21 to reach Agra. Includes Jaipur Ajmer

Northern States (above Delhi) includes North Haryana, Punjab and Jammu & Kashmir

Poorvanchal Expressway connection includes districts of Uttar Pradesh connected with Poorvanchal Expressway

Figure 3-1 Zoning Map



3.4 Assessment of Potentially Divertible Traffic

3.4.1 Divertible Zone Pairs

In assessment of divertible zone pairs the first preliminary investigation was done through hub and spoke model in which each zone is assigned the nearest node based on aerial distance. The hub and spoke model is shown in Figure 3-2. The hub and spoke gives an estimate of likely node to be used by any zone. Since traffic moves through road the assigned node were suitably changed and pairs that were unlikely to use the corridor. This was based on the fact that distance through corridor should not be higher than 10% to 20%. The hub and spoke model gives a good indication of nodes of corridor which is used by different OD pairs. For example Lucknow zone, Poorvanchal Expressway zone, NH-27 entry zones while travelling towards North India will use Node N of the Project Corridor. The zone of South India shows an access point at node U while travelling to Northern parts of India but they were not taken as divertible zones since NH-44 is a better option available in terms of distance to reach Northern parts of India. The divertible OD zones is described in Table 3-2.

Figure 3-2 Hub and Spoke Model for Corridor

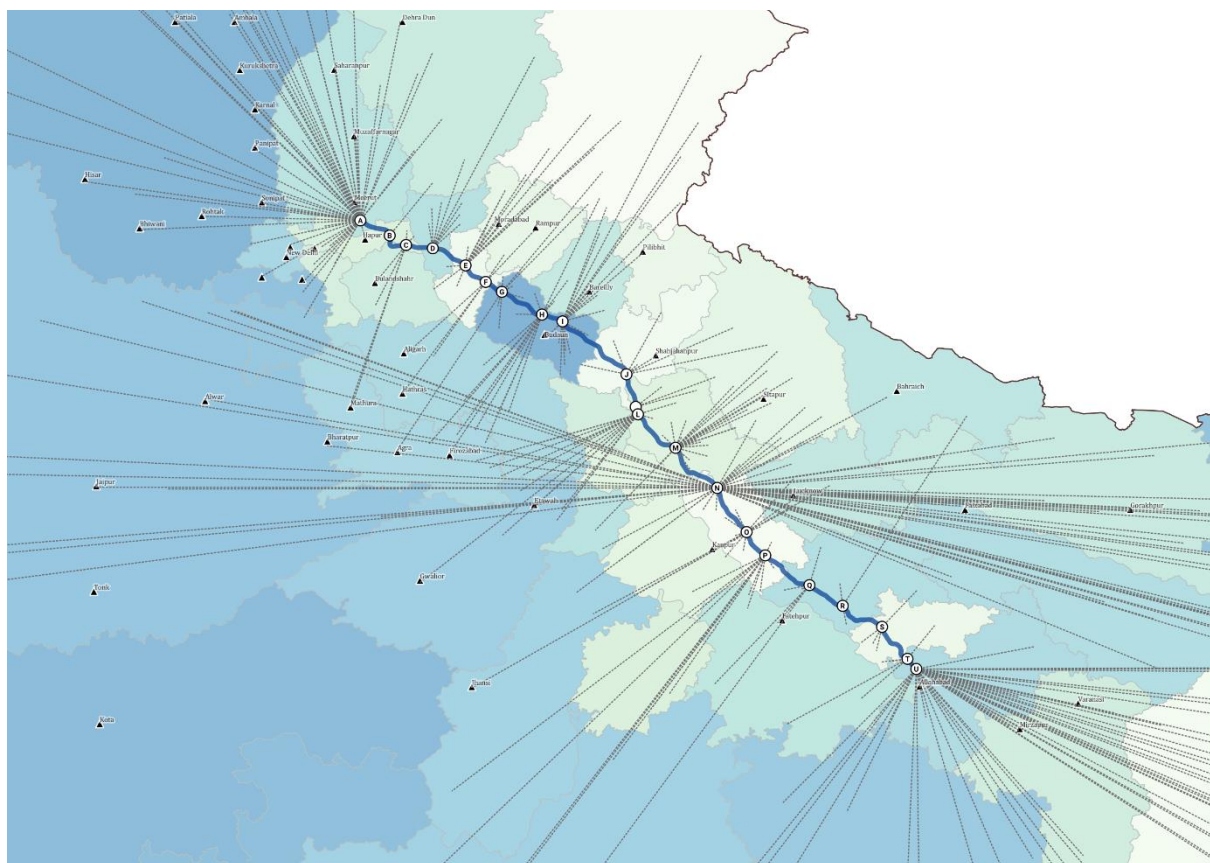


Table 3-2 Divertible Zones

Sno.	Name	Sno.	Name
1	Bareilly	17	Poorvanchal Exp Conn
2	Badaun	18	Prayagraj
3	Delhi	19	Raebarelli
4	Hapur	20	Sambhal
5	Hardoi	21	Shahjahanpur
6	IIA Buladshahr	22	South Bihar etc
7	Kanpur	23	Unnao
8	Kumaon Region Uttarakhand	24	Varanasi
9	Lucknow	25	Amroha
10	Mathura Agra and Firozabad	26	Gautam Budh Nagar
11	Meerut	27	Ghazaiabd
12	Moradabad and Rampur	28	Gurugram and Faridabad
13	NH-27 Entry Lucknow	29	Fatehpur and Kaushambhi
14	N Bihar and NE States	30	Garhwal Region Uttarakhand
15	Northern Parts of Rajasthan	31	Pilibhit
16	Northern States (above Delhi)	32	Sitapur and Lakhimpur Kheri

3.4.2 Development of Route System

Route system comprises of alternate route through which currently traffic is moving and routes traversed if the traffic moves through project corridor. 105 such routes were developed for this study. Annexure gives all the route maps developed and route code, OD pair and entry exit points in the corridor. Figure 3-3 shows the route system of traffic moving Northern states to Varanasi as an illustration. It gives following information and inputs that will be used further in analysis.

1. It gives the current route options available for traffic moving in Route 14 i.e. from Northern states to Varanasi. There are four alternatives named 14A, 14B, 14C and 14D along with project corridor.
2. It gives the entry point and exit points if the traffic moves through the project corridor. This means if the traffic moving in alternative routes moves on Project Corridor it will use entry exit points shown in figure i.e. point A and point U.
3. It gives location of survey points which is used to capture traffic moving in Route no. 14. This survey location is used further in calculating divertible OD pairs. All the traffic between the Origin Destination pairs is captured at the survey location.
4. Table 3-3 gives the route no. OD pair movement in the route and entry and exit points on the Project Corridor (if this OD pair moves on the project corridor). Route 14 shown as an illustration is marked in red.

Figure 3-3 Route 14 Map with alternatives

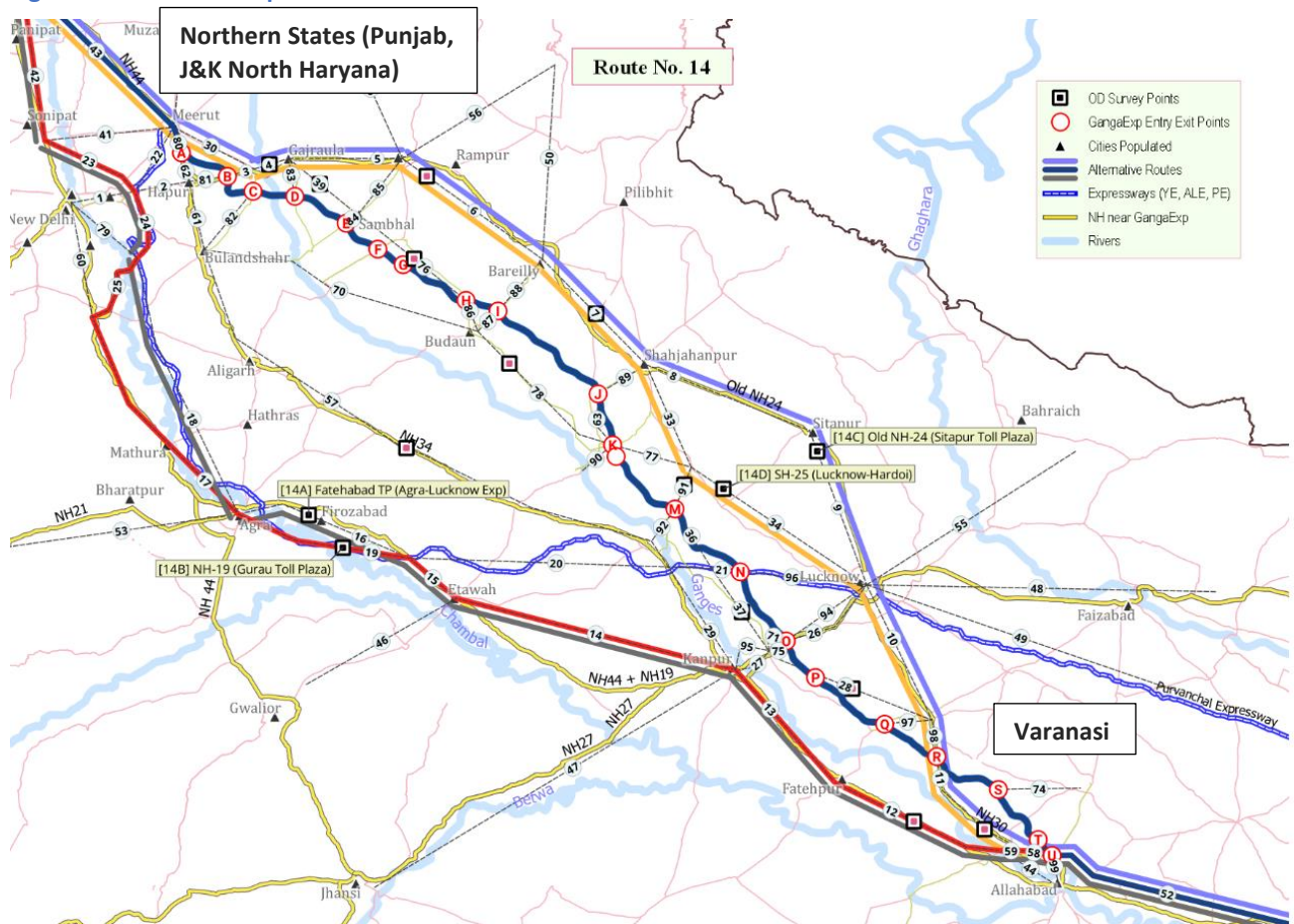


Table 3-3 Route Name, Number OD pairs served with Entry and Exit Points on Corridor

S no.	Route No.	From	To	Corridor Section (Entry-Exit)
1	2	Meerut	Prayagraj	A to U
2	3	Meerut	Varanasi	A to U
3	4	Meerut	Raebareli	A to Q
4	5	Meerut	Kanpur	A to O
5	6	Meerut	Lucknow	A to N
6	7	Meerut	Unnao	A to O
7	8	Meerut	Hardoi	A to K
8	9	Meerut	Shahjahanpur	A to J
9	10	Meerut	Bareilly	A to I
10	11	Meerut	Badaun	A to H
11	12	Meerut	Sambhal	A to E
12	13	NorthernStates	Prayagraj	A to U
13	14	NorthernStates	Varanasi	A to U
14	15	NorthernStates	Raebareli	A to Q
15	16	NorthernStates	Kanpur	A to O
16	17	NorthernStates	Unnao	A to O
17	18	NorthernStates	Lucknow	A to N
18	19	Meerut	Muradabad	A to E
19	20	Delhi	Prayagraj	B to U
20	21	Delhi	Varanasi	B to U
21	22	Delhi	Raebareli	B to Q
22	23	Delhi	Lucknow	B to N
23	24	Delhi	Kanpur	B to O
24	25	Delhi	Unnao	B to O
25	26	Delhi	Hardoi	B to K
26	27	Delhi	Shahjahanpur	B to J
27	28	Delhi	Bareilly	B to I
28	29	Delhi	Muradabad	B to E
29	30	Delhi	Sambhal	B to E
30	31	Delhi	Badaun	B to H
31	32	Amroha	Prayagraj	D to U
32	33	Amroha	Varanasi	D to U
33	34	Amroha	Raebareli	D to Q
34	35	Amroha	Lucknow	D to N
35	36	Amroha	Kanpur	D to O
36	37	Amroha	Unnao	D to O
37	38	Amroha	Hardoi	D to K
38	39	Amroha	Shahjahanpur	D to J
39	40	Amroha	Badaun	D to H
40	41	Amroha	Bareilly	D to J
41	42	Sambhal	Prayagraj	E to U
42	43	Sambhal	Varanasi	E to U

43	44	Sambhal	Raebareli	E to Q
44	45	Sambhal	Lucknow	E to N
45	46	Sambhal	Kanpur	E to O
46	47	Sambhal	Unnao	E to O
47	48	Sambhal	Hardoi	E to K
48	49	Sambhal	Shahjahanpur	E to J
49	50	Sambhal	Bareilly	E to I
50	51	Sambhal	Badaun	E to H
51	52	Moradabad	Prayagraj	E to U
52	53	Moradabad	Varanasi	E to U
53	54	Moradabad	Lucknow	E to N
54	55	Moradabad	Kanpur	E to O
55	56	Moradabad	Hardoi	E to K
56	57	Moradabad	Badaun	E to H
57	58	Bareilly	Prayagraj	I to U
58	59	Bareilly	Varanasi	I to U
59	60	Bareilly	Raebareli	I to Q
60	61	Bareilly	Kanpur	I to O
61	62	Bareilly	Unnao	I to O
62	63	Bareilly	Lucknow	I to N
63	64	Bareilly	Hardoi	I to K
64	65	Badaun	Prayagraj	I to U
65	66	Badaun	Varanasi	I to U
66	67	Badaun	Raebareli	I to Q
67	68	Badaun	Kanpur	I to O
68	69	Badaun	Lucknow	I to N
69	70	Badaun	Hardoi	I to K
70	71	Badaun	Unnao	I to O
71	72	Shahjahanpur	Prayagraj	J to U
72	73	Shahjahanpur	Varanasi	J to U
73	74	Shahjahanpur	Raebareli	J to Q
74	75	Shahjahanpur	Kanpur	J to O
75	76	Shahjahanpur	Unnao	J to O
76	77	Shahjahanpur	Lucknow	J to N
77	78	Hardoi	Prayagraj	M to U
78	79	Hardoi	Varanasi	M to U
79	80	Hardoi	Raebareli	M to Q
80	81	Hardoi	Kanpur	M to O
81	82	Hardoi	Unnao	M to O
82	83	Agra	Prayagraj	N to U
83	84	Agra	Varanasi	N to U
84	85	Lucknow	Prayagraj	O to U
85	86	Lucknow	Varanasi	O to U
86	87	Kanpur	Prayagraj	O to U
87	88	Kanpur	Varanasi	O to U
88	89	Kanpur	Raebareli	O to Q
89	90	Raebareli	Prayagraj	R to U
90	91	Raebareli	Varanasi	R to U

91	92	Hapur	Prayagraj	B to U
92	93	Hapur	Varanasi	B to U
93	94	Hapur	Lucknow	B to N
94	95	Hapur	Kanpur	B to O
95	96	Hapur	Bareilly	B to I
96	97	Hapur	Badaun	B to H
97	98	Hapur	Sambhal	B to E
98	99	Hapur	Shahjahanpur	B to J
99	100	Hapur	Hardoi	B to K
100	101	Bulandshahr	Bareilly	C to I
101	102	Bulandshahr	Lucknow	C to N
102	103	Bulandshahr	Muradabad	C to E
103	104	Bulandshahr	Sambhal	C to E
104	105	Bulandshahr	Hardoi	C to K
105	106	Bulandshahr	Shahjahanpur	C to J

- It divides each route in sections that is used further in analysis of Road user Cost. Figure 3-4 gives the name of sections and corresponding numeric code is shown in Figure 3-3. In Road User Cost Analysis attributes of each section is assigned in terms of capacity, length roughness etc which is used as input for calculation of Road user Cost.
- Table 3-4 Shows the sections of the Project Corridor and characteristics of the sections in terms of length, toll rate, type of Highway. Based on type of highways roughness value, capacity is used for Road User Cost Calculation.

Figure 3-4 Sections of project Corridor and Alternate Routes

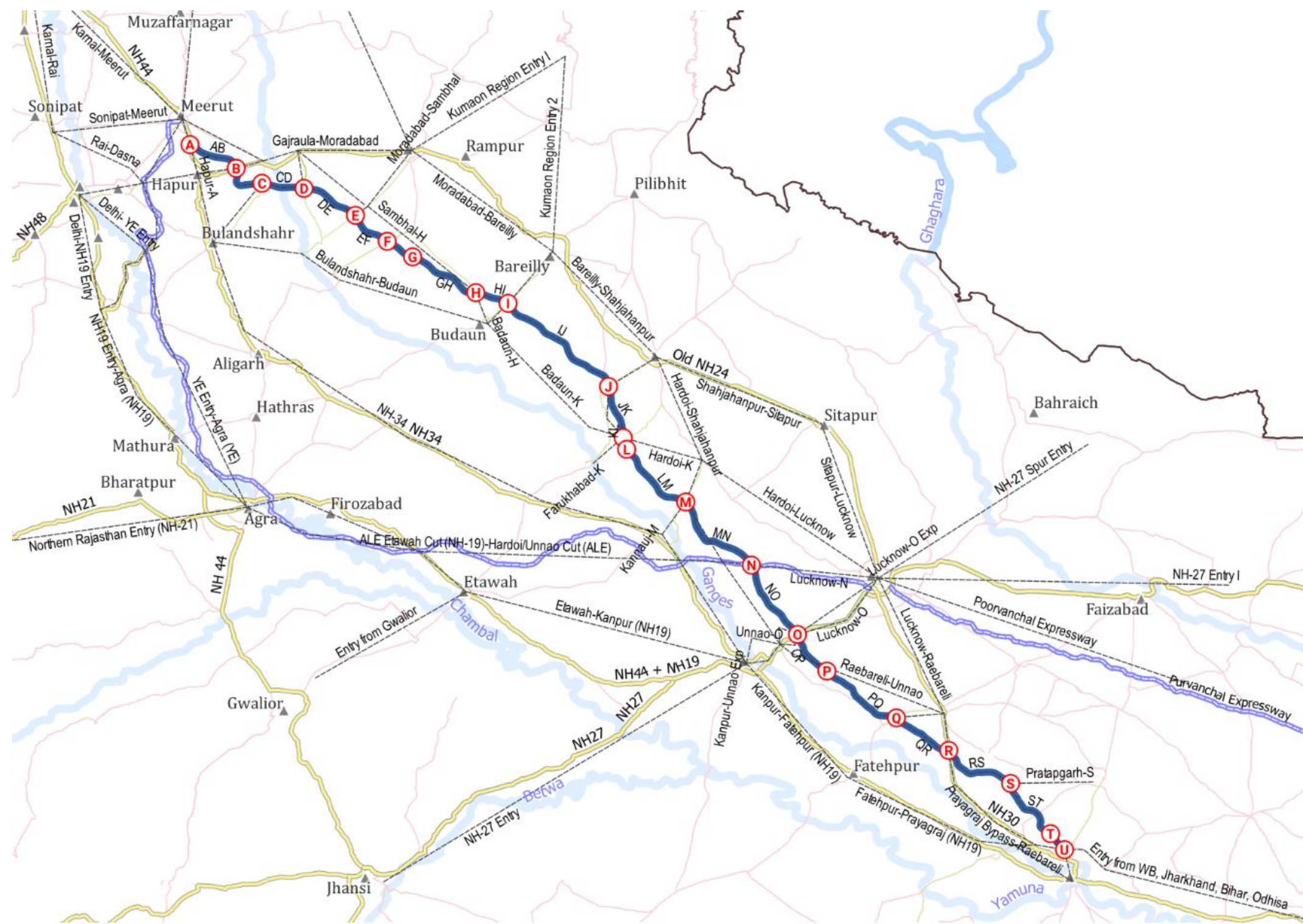


Table 3-4 Codes and Attributes of Various Road Sections

Code	Section	Length (km)	Lanes	RoadType	Toll: Car	Toll: LCV	Toll: 2Axle	Toll: 3Axle	Toll: MAV
1	Delhi-Dasna	40	Six_Lane_Expressway	Expressway	0	0	0	0	0
2	Dasna-Hapur	29	Six_Lane_Divided	NH	130	210	440	480	690
3	B-Garh Mukhteshwar	14	Four_Lane_Divided	NH	0	0	0	0	0
4	Garh Mukteshwar-Gajraula	19	Four_Lane_Divided	NH	55	90	195	210	305
5	Gajraula-Moradabad	53	Four_Lane_Divided	NH	40	65	130	145	205
6	Moradabad-Bareilly	94	Four_Lane_Divided	NH	135	205	415	630	630
7	Bareilly-Shahjahanpur	88	Four_Lane_Divided	NH	0	0	0	0	0
8	Shahjahanpur-Sitapur	86	Four_Lane_Divided	NH	0	0	0	0	0
9	Sitapur-Lucknow	88	Four_Lane_Divided	NH	45	75	155	245	245
10	Lucknow-Raebareli	79	Four_Lane_Divided	NH	95	155	325	355	510
11	Prayagraj Bypass-Raebareli	99	Two_Lane	NH	0	0	0	0	0
12	Fatehpur-Prayagraj (NH19)	107	Six_Lane_Divided	NH	55	90	185	205	295
13	Kanpur-Fatehpur (NH19)	80	Six_Lane_Divided	NH	70	115	240	260	375
14	Etawah-Kanpur (NH19)	156	Six_Lane_Divided	NH	150	235	480	525	740
15	ALE Etawah Cut (NH-19)-Etawah	30	Six_Lane_Divided	NH	0	0	0	0	0
16	Agra-ALE Etawah Cut (NH-19)	98	Six_Lane_Divided	NH	100	160	330	360	520
17	NH19 Entry-Agra (NH19)	137	Six_Lane_Divided	NH	110	180	375	590	590
18	YE Entry-Agra (YE)	168	Six_Lane_Expressway	Expressway	415	635	1,295	1,970	1,970
19	Agra (ALE)-ALE Etawah Cut (NH-19)	91	Six_Lane_Expressway	Expressway	197	309	620	949	949
20	ALE Etawah Cut (NH-19)-Hardoi/Unnao Cut (ALE)	158	Six_Lane_Expressway	Expressway	282	440	885	1,361	1,361
21	Hardoi/Unnao Cut (ALE)-N	10	Six_Lane_Expressway	Expressway	18	28	56	86	86
22	Meerut-Dasna	49	Six_Lane_Divided	NH	161	263	540	584	847
23	Rai-Dasna	53	Six_Lane_Expressway	Expressway	85	135	285	310	450
24	Dasna-YE Entry	48	Six_Lane_Expressway	Expressway	55	90	185	200	290
25	YE Entry-NH19 Entry	52	Six_Lane_Expressway	Expressway	95	150	315	345	495
26	Lucknow-O	56	Four_Lane_Divided	NH	80	130	270	295	425
27	Kanpur-Unnao	30	Four_Lane_Divided	NH	0	0	0	0	0
28	Raebareli-Unnao	95	Two_Lane	NH	0	0	0	0	0
29	Kannauj-Kanpur	79	Four_Lane_Divided	NH	0	0	0	0	0
30	Meerut-Garh Mukteshwar	44	Two_Lane	SH	0	0	0	0	0
33	Hardoi-Shahjahanpur	56	Two_Lane	SH	0	0	0	0	0
34	Hardoi-Lucknow	113	Two_Lane	SH	0	0	0	0	0
36	M-Hardoi/Unnao Cut (ALE)	34	Two_Lane	SH	0	0	0	0	0
37	Hardoi/Unnao Cut (ALE)-Unnao	54	Two_Lane	SH	0	0	0	0	0
38	Badaun-Hardoi	173	Two_Lane	SH	0	0	0	0	0
39	Gajraula-Sambhal	49	Two_Lane	SH	0	0	0	0	0
41	Sonipat-Meerut	80	Two_Lane	SH	0	0	0	0	0
42	Karnal-Rai	91	Six_Lane_Divided	NH	125	220	445	715	715
43	Karnal-Meerut	110	Four_Lane_Divided	NH	0	0	0	0	0
44	Prayagraj-EntryFatehpur	15	Six_Lane_Divided	NH	0	0	0	0	0
45	Garhwal Region (Rishikesh) -Moradabad	170	Two_Lane	SH	0	0	0	0	0
52	Entry from WB, Jharkhand, Bihar, Odhisa	24	Six_Lane_Divided	NH	96	149	311	338	480
57	NH-34	50	Two_Lane	NH	0	0	0	0	0
58	Prayagraj Bypass-U	15	Six_Lane_Divided	NH	60	93	194	211	300
59	Prayagraj Bypass	15	Six_Lane_Divided	NH	60	93	194	211	300
60	Delhi-NH19 Entry	66	Six_Lane_Divided	NH	28	42	84	84	84
61	Bulandshahr-Hapur	40	Four_Lane_Divided	NH	0	0	0	0	0
62	Hapur-A	16	Four_Lane_Divided	NH	0	0	0	0	0
63	(730C) K-J	32	Two_Lane	SH	0	0	0	0	0
70	Bulandshahr-Budaun	143	Two_Lane	SH	0	0	0	0	0

74	Pratapgarh-U	53	Two_Lane	SH	0	0	0	0	0
75	Unnao-O	11	Four_Lane_Divided	NH	0	0	0	0	0
76	Sambhal-H	68	Two_Lane	SH	0	0	0	0	0
77	Hardoi-K	44	Two_Lane	SH	0	0	0	0	0
78	Badaun-K	103	Two_Lane	SH	0	0	0	0	0
79	Delhi- YE Entry	47	Six_Lane_Expressway	Expressway	0	0	0	0	0
80	Meerut-A	15	Four_Lane_Divided	NH	0	0	0	0	0
81	Hapur-B	19	Six_Lane_Divided	NH	0	0	0	0	0
82	Bulandshahr-C	41	Two_Lane	SH	0	0	0	0	0
83	Amroha-D	22	Two_Lane	SH	0	0	0	0	0
84	Sambhal-E	8	Two_Lane	SH	0	0	0	0	0
85	Moradabad-Sambhal	37	Two_Lane	SH	0	0	0	0	0
86	Badaun-H	18	Two_Lane	SH	0	0	0	0	0
87	Badaun-I	15	Four_Lane_Divided	NH	0	0	0	0	0
88	Bareilly-I	37	Four_Lane_Divided	NH	0	0	0	0	0
89	Shahjahanpur-J	28	Two_Lane	SH	0	0	0	0	0
90	Farukhabad-K	27	Two_Lane	SH	0	0	0	0	0
91	Hardoi-M	23	Two_Lane	SH	0	0	0	0	0
92	Kannauj-M	39	Two_Lane	SH	0	0	0	0	0
96	Lucknow-N	75	Six_Lane_Expressway	Expressway	134	209	420	646	646
97	Raebareli-Q	25	Two_Lane	NH	0	0	0	0	0
98	Raebareli-R	20	Two_Lane	NH	0	0	0	0	0
99	Prayagraj-U	18	Six_Lane_Divided	NH	0	0	0	0	0
101	AB	27	Six_Lane_Expressway	Expressway	85	130	260	400	400
102	BC	19	Six_Lane_Expressway	Expressway	45	70	140	220	220
103	CD	20	Six_Lane_Expressway	Expressway	100	160	315	475	475
104	DE	28	Six_Lane_Expressway	Expressway	65	105	210	320	320
105	EF	21	Six_Lane_Expressway	Expressway	65	105	210	320	320
106	FG	14	Six_Lane_Expressway	Expressway	35	50	105	160	160
107	GH	36	Six_Lane_Expressway	Expressway	80	130	265	405	405
108	HI	17	Six_Lane_Expressway	Expressway	55	85	165	255	255
109	IJ	65	Six_Lane_Expressway	Expressway	200	315	625	965	965
110	JK	28	Six_Lane_Expressway	Expressway	80	125	255	390	390
111	KL	6	Six_Lane_Expressway	Expressway	15	25	45	75	75
112	LM	41	Six_Lane_Expressway	Expressway	120	190	385	590	590
113	MN	48	Six_Lane_Expressway	Expressway	125	200	400	620	620
114	NO	43	Six_Lane_Expressway	Expressway	115	185	370	570	570
115	OP	24	Six_Lane_Expressway	Expressway	70	110	225	345	345
116	PQ	42	Six_Lane_Expressway	Expressway	95	155	310	480	480
117	QR	30	Six_Lane_Expressway	Expressway	70	110	225	345	345
118	RS	37	Six_Lane_Expressway	Expressway	85	135	275	425	425
119	ST	35	Six_Lane_Expressway	Expressway	80	125	255	395	395
120	TU	12	Six_Lane_Expressway	Expressway	30	45	90	140	140

3.4.3 Conversion of Divertible OD Matrix into Node Matrix of Project Corridor

The next step is estimation of node matrix from OD matrix obtained from field surveys. As discussed in previous section route system is developed. Each divertible OD pair is assigned a route. For example Route 14 is assigned to OD pair Northern States and Varanasi and same route no. 14 is assigned to OD pair of Northern States and South Bihar. Table 3-5 shows the routes assigned to each divertible OD pair. The routes and code assigned is defined in the Annexure.

Table 3-5 Routes Assigned to Divertible OD Pairs

	Bareilly	Badaun	Delhi	Hapur	Hardoi	IIA Buladshahr	Kanpur	Kumaon Region Uttarakhand	Lucknow	Mathura Agra and Firozabad	Meerut	Moradabad and Rampur	NH-27 Entry Lucknow	N Bihar and NE States	Northern Parts of Rajasthan	Northern States (above Delhi)	Poorvanchal Exp Conn	Prayagraj	Raebarelli	Sambhal	Shahjahanpur	South Bihar etc	Unnao	Varanasi	Amroha	Gautam Budh Nagar	Ghaziabad	Gurugram and Faridabad	Fatehpur and Kaushambhi	Garhwal Region Uttarakhand	Pilibhit	Sitapur and Lakhimpur Kheri	
Bareilly		0	28	96	64	101	61	0	63	0	10	0	63	63	0	10	63	58	60	50	0	59	62	59	41	28	28	28	61	0	0	0	
Badaun	0	31	97	70	0	68	0	69	0	11	0	69	69	0	11	69	65	67	51	0	66	71	66	40	31	31	31	68	0	0	0		
Delhi	28	31		0	26	0	24	0	23	0	0	29	23	23	0	0	23	20	22	30	27	21	25	21	0	0	0	0	24	0	28	27	
Hapur	96	97	0		100	0	95	0	94	0	0	0	94	94	0	0	94	92	0	98	99	93	1	93	0	0	0	0	95	0	96	99	
Hardoi	64	70	26	100		105	81	0	0	0	8	56	0	0	0	8	0	78	80	48	49	79	82	79	38	26	26	26	95	8	0	0	
IIA Buladshahr	101	0	0	0	105		0	0	102	0	0	0	102	102	0	0	102	0	0	104	106	0	0	0	0	0	0	0	0	0	0	0	
Kanpur	61	68	24	95	81	0		61	0	0	5	55	0	0	16	0	87	89	46	75	88	0	88	36	24	24	24	0	5	75	0	0	
Kumaon Region Uttarakhand	0	0	0	0	0	0	61		63	0	0	0	63	63	0	63	58	60	0	0	59	62	59	0	0	0	0	61	0	0	0	0	
Lucknow	63	69	23	94	0	102	0	63		0	6	54	0	0	18	0	87	0	45	77	86	0	86	35	23	23	23	0	6	0	0	0	
Mathura Agra and Firozabad	0	0	0	0	0	0	0	0	0		0	0	0	0	0	0	83	0	0	0	84	0	84	0	0	0	0	0	0	0	0	0	0
Meerut	10	11	0	0	8	0	5	0	6	0		19	6	6	0	0	6	2	4	12	9	3	7	3	0	0	0	0	5	0	10	0	
Moradabad and Rampur	0	0	29	0	56	0	55	0	54	0	19		54	54	0	19	54	52	0	0	0	53	0	53	0	29	29	29	55	0	0	0	0
NH-27 Entry Lucknow	63	69	23	94	0	102	0	63	0	0	6	54		0	18	0	0	87	0	45	77	0	0	35	23	23	23	0	6	0	0	0	0
N Bihar and NE States	63	69	23	94	0	102	0	63	0	0	6	54	0		18	0	0	0	45	77	0	0	0	35	23	23	23	0	6	0	0	0	0
Northern Parts of Rajasthan	0	0	0	0	0	0	0	0	0	0	0	0	0	0		0	83	0	0	0	84	0	84	0	0	0	0	0	0	0	0	0	0
Northern States (above Delhi)	10	11	0	0	8	0	16	0	18	0	0	19	18	18	0		18	13	15	12	9	14	17	14	0	0	0	0	0	0	0	0	0
Poorvanchal Exp Conn	63	69	23	94	0	102	0	63	0	0	6	54	0	0	18		0	0	45	77	0	0	0	35	23	23	23	0	6	0	0	0	0
Prayagraj	58	65	20	92	78	0	87	58	87	83	2	52	0	0	83	13	0		90	42	72	0	87	0	32	20	20	20	0	2	0	0	0
Raebarelli	60	67	22	0	80	0	89	60	0	0	4	0	0	0	15	0	90		44	74	0	89	0	34	22	22	22	0	4	0	0	0	0
Sambhal	50	51	30	98	48	104	46	0	45	0	12	0	45	45	0	12	45	42	44		49	43	47	43	0	30	30	30	46	0	0	0	0
Shahjahanpur	0	0	27	99	49	106	75	0	77	0	9	0	77	77	0	9	77	72	74	49		73	76	73	39	27	27	27	75	9	0	0	0
South Bihar etc	59	66	21	93	79	0	88	59	86	84	3	53	0	0	84	14	0	0	43	73		0	0	33	21	21	21	0	3	0	0	0	0
Unnao	62	71	25	1	82	0	62	0	0	0	7	0	0	0	17	0	87	89	47	76	0		88	0	25	25	25	0	7	0	0	0	0
Varanasi	59	66	21	93	79	0	88	59	86	84	3	53	0	0	84	14	0	0	43	73	0	88		33	21	21	21	0	3	0	0	0	0
Amroha	41	40	0	0	38	0	36	0	35	0	0	0	35	35	0	0	35	32	34	0	39	33	0	33		0	0	0	36	0	0	0	0
Gautam Budh Nagar	28	31	0	0	26	0	24	0	23	0	0	29	23	23	0	0	23	20	22	30	27	21	25	21	0	0	0	24	0	0	0	0	0
Ghaziabad	28	31	0	0	26	0	24	0	23	0	0	29	23	23	0	0	23	20	22	30	27	21	25	21	0	0		24	0	0	0	0	0
Gurugram and Faridabad	28	31	0	0	26	0	24	0	23	0	0	29	23	23	0	0	23	20	22	30	27	21	25	21	0	0	0		24	0	0	0	0
Fatehpur and Kaushambhi	61	68	24	95	95	0	61	0	0	0	5	55	0	0	0	0	0	0	46	75	0	0	0	36	24	24	24		5	0	0	0	0
Garhwal Region Uttarakhand	0	0	0	0	8	0	5	0	6	0	0	0	6	6	0	0	6	2	4	0	9	3	7	3	0	0	0	0	5		0	0	0
Pilibhit	0	0	28	96	0	0	75	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
Sitapur and Lakhimpur Kheri	0	0	27	99	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Since the route system gives the entry and exit points of divertible OD pair, this OD pair gets converted into node pair when assigned to Project corridor. Nodes of project corridor means the entry and exit point of Project Corridor (in this case from point A to U as shown in the route map). The traffic moving in each parallel route is captured at survey locations described in route map. This OD pair is converted into Node Matrix of divertible traffic. For example all the OD pairs moving in different routes having an entry point at A and U is captured in the matrix at intersection cell of row containing A and column containing U. The node matrix of divertible traffic for entire Expressway for each mode is shown from Table 3-6 to Table 3-10. This node matrix was converted into Groupwise divertible node matrix for each mode and is shown from Table 3-11 to Table 3-15. This divertible traffic is candidate traffic that is considered for diversion.

Table 3-6 Divertible Node Matrix of Car

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	379	0	0	24	84	0	0	0	0	91	12	0	0	0	0	0	24
B	0	0	0	0	2,064	0	0	24	290	122	27	0	0	619	344	0	0	0	0	0	146
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	81	0	217	0	0	0	97	0	0	0	0	0	0	0
E	722	1,830	0	0	0	0	0	341	0	0	0	0	0	290	0	0	0	0	0	0	24
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	108	263	0	0	738	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	143	676	24	0	0	0	0	0	0	0	60	0	0	84	68	0	8	0	0	0	15
J	0	15	0	97	0	0	0	0	0	0	0	0	0	217	22	0	5	0	0	0	0
K	9	27	0	0	0	0	0	0	61	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	113	0	0	0	0	0	0
N	165	1,402	0	24	72	0	0	0	137	36	0	0	0	0	0	0	0	0	0	0	85
O	66	592	0	24	72	0	0	0	53	12	0	0	122	0	0	0	136	0	0	0	595
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	5	0	0	24	0	0	0	0	0	0	0	0	0	0	90	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	234
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	12	279	0	0	0	0	0	0	15	7	0	0	69	73	487	0	0	584	0	0	0

Table 3-7 Divertible Node Matrix of Bus

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	63	0	0	30	11	2	0	0	0	21	5	0	0	0	0	0	27
B	0	0	0	0	190	0	0	34	302	29	4	0	0	89	56	0	5	0	0	0	58
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	2	0	11	0	0	0	0	0	0	0	0	0	0	0
E	147	314	0	0	0	0	0	66	0	0	0	0	0	9	4	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	2	60	0	2	46	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	17	154	0	0	2	0	0	0	0	0	7	0	0	14	23	0	0	0	0	0	2
J	0	29	0	22	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	0
K	0	7	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	61	0	0	0	0	0	0
N	15	161	0	2	22	0	0	0	15	6	0	0	0	0	0	0	0	0	0	0	59
O	5	95	0	0	0	0	0	0	19	6	0	0	61	0	0	0	52	0	0	0	75
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	0	1	0	2	0	0	0	0	0	0	0	0	0	0	72	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	24	72	0	0	0	0	0	0	0	2	0	0	0	21	120	0	0	0	0	0	0

Table 3-8 Divertible Node Matrix of LCV

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	39	0	0	46	34	0	0	0	0	65	26	0	2	0	0	0	77
B	0	0	0	0	276	0	0	23	166	6	7	0	0	137	102	0	0	0	0	0	55
C	0	0	0	0	0	0	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	43	0	0	0	0	0	0	0	0	0	0	0
E	199	206	3	0	0	0	0	47	36	0	0	0	0	0	7	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	23	23	0	0	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	34	130	7	0	22	0	0	0	0	0	6	0	0	50	50	0	0	0	0	0	25
J	11	25	6	58	0	0	0	0	0	0	0	0	0	43	11	0	0	0	0	0	0
K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	39	0	0	0	0	0	0
N	61	103	5	7	0	0	0	0	38	9	0	0	0	0	0	0	0	0	0	0	42
O	31	94	0	0	0	0	0	0	44	0	0	0	10	0	0	0	17	0	0	0	173
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	4	4	0	0	0	0	0	0	0	0	0	0	0	0	20	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	23
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	39	95	0	0	7	0	0	0	0	4	0	0	4	24	380	0	0	0	0	0	0

Table 3-9 Divertible Node Matrix of 3 Axle Truck

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	38	0	0	5	24	0	0	0	0	62	2	0	0	0	0	0	104
B	0	0	0	0	80	0	0	0	63	0	0	0	0	61	30	0	0	0	0	0	64
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	22	0	0	0	3	0	0	0	0	0	0	3
E	36	51	0	0	0	0	0	0	22	0	0	0	0	13	0	0	0	0	0	0	13
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	5	14	0	2	16	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	14	50	3	0	3	0	0	0	0	0	7	0	0	109	28	0	0	0	0	0	34
J	0	12	0	6	0	0	0	0	0	0	0	0	0	16	7	0	0	0	0	0	3
K	4	6	0	0	0	0	0	0	6	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	10	0	0	0	0	0	0
N	31	89	0	6	6	0	0	0	17	5	0	0	0	0	0	0	0	0	0	0	46
O	36	40	0	0	0	0	0	0	52	2	0	0	6	0	0	0	29	0	0	0	112
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	3	0	0	0	0	0	0	0	3	0	0	0	0	0	11	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	5
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	67	78	0	3	22	0	0	0	9	3	0	0	2	36	264	0	0	15	0	0	0

Table 3-10 Divertible Node Matrix of MAV

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	58	0	0	0	5	0	1	0	0	112	34	0	0	0	0	0	541
B	0	0	0	0	92	0	0	5	81	5	0	0	0	66	48	0	5	0	0	0	123
C	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	22	0	0	0	4	0	0	0	0	0	0	7
E	66	53	0	0	0	0	0	19	22	0	0	0	0	33	0	0	0	0	0	0	15
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	24	3	0	6	45	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	18	33	4	0	0	0	0	0	0	0	11	0	0	79	31	0	0	0	0	0	42
J	0	5	0	26	0	0	0	0	0	0	0	0	0	23	14	0	0	0	0	0	10
K	10	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0	0	0	0	3
N	94	154	0	0	7	0	0	0	53	20	0	0	0	0	0	0	0	0	0	0	242
O	47	75	0	0	0	0	0	0	63	25	0	0	3	0	0	0	20	0	0	0	180
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	0	0	0	0	0	0	0	0	0	6	0	0	0	0	5	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	319	180	0	4	7	0	0	0	72	3	0	0	3	133	421	0	0	34	0	0	0

Table 3-11 Groupwise Divertible Node Matrix for Car

Group 1

Car	A	B	C	D	E	F	G*
A	0	0	0	0	379	0	235
B	0	0	0	0	2,064	0	1,571
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	394
E	722	1,830	0	0	0	0	655
F	0	0	0	0	0	0	0
G	509	3,254	24	169	883	0	0

Group 3

car	L	M	N	O	P
L	0	0	1,397	446	223
M	0	0	0	113	0
N	1,836	0	0	0	85
O	820	122	0	0	731
P	343	69	73	576	0

Group 2

Car	G	H	I	J	K	L
G	0	470	373	339	27	1,646
H	1,109	0	0	0	0	0
I	843	0	0	0	60	175
J	112	0	0	0	0	244
K	37	0	61	0	0	0
L	2,739	0	206	55	0	0

Group 4

Car	P	Q	R	S	T	U
P	0	149	0	0	0	890
Q	119	0	0	0	0	0
R	0	0	0	0	0	234
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	943	0	584	0	0	0

*The node point G is the interchange point between Group 1 and Group 2. The node matrix described in Table 3-6 to Table 3-10 is converted into Group matrix. The traffic entering/exiting beyond G from A, B,C,D, E and F is added to get the traffic at G.

Table 3-12 Groupwise Divertible Node Matrix for Bus

Group 1

Bus	A	B	C	D	E	F	G
A	0	0	0	0	63	0	97
B	0	0	0	0	190	0	577
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	14
E	147	314	0	0	0	0	80
F	0	0	0	0	0	0	0
G	64	579	0	29	71	0	0

Group 2

Bus	G	H	I	J	K	L
G	0	133	313	42	4	275
H	111	0	0	0	0	0
I	174	0	0	0	7	39
J	51	0	0	0	0	6
K	7	0	5	0	0	0
L	400	0	34	14	0	0

Group 3

Bus	G	H	I	J	K	L
G	0	133	313	42	4	275
H	111	0	0	0	0	0
I	174	0	0	0	7	39
J	51	0	0	0	0	6
K	7	0	5	0	0	0
L	400	0	34	14	0	0

Group 4

Bus	P	Q	R	S	T	U
P	0	57	0	0	0	222
Q	75	0	0	0	0	0
R	0	0	0	0	0	0
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	239	0	0	0	0	0

Table 3-13 Groupwise Divertible Node Matrix for LCV

Group 1

LCV	A	B	C	D	E	F	G
A	0	0	0	0	39	0	250
B	0	0	0	0	276	0	496
C	0	0	0	0	0	0	7
D	0	0	0	0	0	0	43
E	199	206	3	0	0	0	90
F	0	0	0	0	0	0	0
G	203	474	18	65	36	0	0

Group 2

LCV	G	H	I	J	K	L
G	0	116	244	50	7	471
H	53	0	0	0	0	0
I	193	0	0	0	6	126
J	101	0	0	0	0	55
K	0	0	0	0	0	0
L	450	0	82	13	0	0

Group 3

LCV	L	M	N	O	P
L	0	0	297	197	159
M	0	0	0	39	0
N	223	0	0	0	42
O	169	10	0	0	190
P	153	4	24	400	0

Group 4

LCV	P	Q	R	S	T	U
P	0	19	0	0	0	373
Q	28	0	0	0	0	0
R	0	0	0	0	0	23
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	553	0	0	0	0	0

Table 3-14 Groupwise Divertible Node Matrix for 2 Axle Truck

Group 1

2 Axle Truck	A	B	C	D	E	F	G
A	0	0	0	0	4	0	106
B	0	0	0	0	21	0	205
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	17
E	8	35	0	0	0	0	28
F	0	0	0	0	0	0	0
G	132	229	0	14	27	0	0

Group 2

2 Axle Truck	G	H	I	J	K	L
G	0	27	22	8	0	299
H	20	0	0	0	0	0
I	20	0	0	0	4	68
J	17	0	0	0	0	19
K	19	0	7	0	0	0
L	326	0	49	3	0	0

Group 3

2 Axle Truck	L	M	N	O	P
L	0	0	182	66	137
M	0	0	0	5	1
N	153	0	0	0	46
O	87	1	0	0	78
P	140	1	35	284	0

Group 4

2 Axle Truck	P	Q	R	S	T	U
P	0	20	0	0	0	243
Q	12	0	0	0	0	0
R	0	0	0	0	0	10
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	448	0	0	0	0	0

Table 3-15 Groupwise Divertible Node Matrix for 3 Axle Truck

Group 1

3 Axle Truck	A	B	C	D	E	F	G
A	0	0	0	0	38	0	196
B	0	0	0	0	80	0	218
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	28
E	36	51	0	0	0	0	47
F	0	0	0	0	0	0	0
G	161	290	3	17	48	0	0

Group 2

3 Axle Truck	G	H	I	J	K	L
G	0	5	109	22	0	354
H	37	0	0	0	0	0
I	71	0	0	0	7	171
J	19	0	0	0	0	27
K	11	0	6	0	0	0
L	383	0	82	11	0	0

Group 3

3 Axle Truck	L	M	N	O	P
L	0	0	264	67	222
M	0	0	0	10	0
N	155	0	0	0	46
O	131	6	0	0	141
P	189	2	36	276	0

Group 4

3 Axle Truck	P	Q	R	S	T	U
P	0	29	0	0	0	379
Q	17	0	0	0	0	0
R	0	0	0	0	0	5
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	486	0	15	0	0	0

Table 3-16 Groupwise Divertible Node Matrix for MAV

Group 1

MAV	A	B	C	D	E	F	G
A	0	0	0	0	58	0	694
B	0	0	0	0	92	0	332
C	0	0	0	0	0	0	11
D	0	0	0	0	0	0	33
E	66	53	0	0	0	0	89
F	0	0	0	0	0	0	0
G	512	451	4	35	60	0	0

Group 2

MAV	G	H	I	J	K	L
G	0	25	119	27	1	988
H	78	0	0	0	0	0
I	55	0	0	0	11	152
J	31	0	0	0	0	47
K	10	0	5	0	0	0
L	888	0	187	54	0	0

Group 3

MAV	L	M	N	O	P
L	0	0	316	127	743
M	0	0	0	4	3
N	328	0	0	0	242
O	210	3	0	0	200
P	591	3	133	426	0

Group 4

MAV	P	Q	R	S	T	U
P	0	25	0	0	0	1,163
Q	11	0	0	0	0	0
R	0	0	0	0	0	9
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	1,141	0	34	0	0	0

3.5 Estimation of Road User Cost and Diversion Percentage

This section is divided into two subsections. The first subsection provides the methodology for Road User Cost and diversion analysis. The second subsection provides the Road User Cost and Diversion Percentage.

3.5.1 Methodology for Road User Cost Analysis and Divertible Traffic

RUC analysis includes both monetary and non-monetary impacts. Monetary impacts include the vehicle operation cost, value of time, traffic accident costs, as well as vehicle emissions costs. Non-monetary impacts may include undesirable impacts to ecology and environment, increased noise, or impacts to local businesses as a result of construction activities. RUC calculations primarily make use of monetary impacts; other impacts are often neglected due to the difficulty of quantifying their effects. Road User Cost (RUC) is the primary input for estimating the percentage of diversion. In this study, Road user cost for potential route option between the O-D pairs has been estimated as per the guidelines suggested by IRC SP 30-2019. Road user cost comprises of following components such as

- Vehicle operation cost (VOC) in Rs/km
 - Uncongested condition
 - Congested condition
- Value of time (VOT) in Rs/km

The generic expression for estimating RUC is as follows

$$RUC_m^i = VOC_m^i + VOT_m^i \quad \text{Eq. 1}$$

Where, RUC is Road user cost for i^{th} route by a particular type of mode (m), VOC is vehicle operation cost for i^{th} route by a particular type of mode (m); VOT is Value of Time through i^{th} route by a particular type of mode (m);

Following parameters are required for RUC analysis:

1. Identifying appropriate alternate route by detailed network Analysis. Based on the rating analysis.
 - Number of habitations passed
 - Length of habitations: Visually
 - No: of intersections at habitations
 - Construction points at habitations
2. Identifying the congestion points in the Road Network based on the rating
3. Type of the carriageway with number of lanes for each section
4. Rise/Fall of the carriageway of existing corridors for each section
5. Roughness of the carriageway in terms of International Roughness Index (IRI) value for each section of corridor.
6. Traffic volume counts on the existing roads (Project corridor& alternate routes influencing project corridor)
7. Estimating Travel time by speed and delay survey on the existing corridors for each section
8. Distance related congestion factors of the existing roads (Project corridor & alternate routes influencing project corridor)
9. Time related congestion factors of the existing roads (Project corridor & alternate routes influencing project corridor)

Each component of RUC for each mode and each route has been calculated and the corresponding parameters considered as shown in Table 3-17.

Table 3-17 Inputs considered for RUC analysis

Description of RUC component	Parameters/Inputs considered for RUC analysis
Vehicle Operating Cost (VOC), Rs/Km	<p>Project Corridor influence Network Elements Such as</p> <ul style="list-style-type: none"> Length of the Route/Road Section in Km Category of Route (National Highway/State Highway. Rise/Fall of the carriageway of existing corridors for each section (Based on visual inspection of Network). Roughness of the carriageway in terms of International Roughness Index (IRI) value for each section of corridor (Based on visual inspection of Network). The value of 3000 is taken for SH and 2000 for SH. Volume/Design Capacity (V/C) values for Project corridor (based on Traffic volume counts). Volume/Design Capacity (V/C) values for alternate routes (Considered based on visual inspection of alternate routes in project influence network). Distance related congestion factors of the existing roads (Project corridor & alternate routes influencing project corridor) for uncongested and Congested conditions. Time related congestion factors of the existing roads (Project corridor & alternate routes influencing project corridor).
Value of Time, Rs/Km	VOT values are adopted for each mode according to the RF and Roughness values from IRC SP 30-2019.
Additional user cost (Toll Cost, Rs/Km)	Toll rates have been adopted as per the Toll information system, NHAI database.

VOC for each mode and each route considered for O-D Pair has been estimated for two distinct conditions as discussed in proceeding sections i.e. Uncongested and congested conditions of each route. Distance related and Time related congestion factors have been calculated for Uncongested and congested conditions to calculate Vehicle operation costs. Following are the generic expressions considered for estimating vehicle operating costs.

For Uncongested condition,

$$VOC_{mode}^{RF, IRI} = DRCF_{mode}^{Lanes} + TRCF_{mode}^{Lanes}$$

Where, VOC of a mode at a Particular Rise/Fall and IRI values of 2/4 lane road in Rs/Km; DRCF= Distance related congestion factors; TRCF= Time related congestion factors

$$DRCF_{mode}^{Lanes} = \sum \text{Fuel, Lubricants, Tyre, Spare Parts, Maintenance Labour}$$

$$TRCF_{mode}^{Lanes} = \sum \text{Depreciation, Fixed Costs, Value of passenger time or value of commodity, wages of Crew}$$

The costs for DRCF and TRCF components of each mode has been adopted from the tables suggested in the Annex-D (Clause 6.6), Page No. 86 IRC SP 30-2019 to calculate VOC in uncongested condition for each mode of selected alternate route choice. The DRCF and TRCF component values considered for economic cost of operation for all modes. These costs of DRCF and TRCF components are calibrated to

current 2021 price levels by applying Wholesale price indices. The detailed VOC values for uncongested condition for the selected O-D Pairs is calculated.

For Congested condition,

$$VOC_{mode}^{Lanes} = DRCF_{mode}^{Lanes} + TRCF_{mode}^{Lanes}$$

$$DRCF_{mode}^{Lanes} = a + b \left(\frac{V}{C} \right)$$

$$TRCF_{mode}^{Lanes} = a + b \left(\frac{V}{C} \right)$$

Where, VOC of a mode of 2/4 lane road in Rs/Km; DRCF= Distance related congestion factors; TRCF= Time related congestion factors; a & b are regression coefficients; V= Practical traffic volume/capacity of selected route section and C= Design capacity of selected route section.

The V/C values considered in this study are based on the Peak hour traffic volumes. Based on these V/C values of a selected route section, DRCF and TRCF values are calculated for each mode and further, VOC for congested condition has been calculated as per the above equation.

Final VOC for a section of road and mode

Thus based on the DRCF and TRCF values for both congested and uncongested conditions, the final DRCF, TRCF and VOC values for each mode and project section is calculated as per the expression shown below. The VOC values for congested condition and final VOC values for the selected O-D Pairs and its corresponding route options are calculated.

$$Final\ DRCF_{mode}^{Lanes} = Uncongested\ DRCF_{mode}^{Lanes} \times Congested\ DRCF_{mode}^{Lanes}$$

$$Final\ TRCF_{mode}^{Lanes} = Uncongested\ TRCF_{mode}^{Lanes} \times Congested\ TRCF_{mode}^{Lanes}$$

$$Final\ VOC_{mode}^{Lanes} = Final\ DRCF_{mode}^{Lanes} + Final\ TRCF_{mode}^{Lanes}$$

Estimation of Road user Cost

Road use cost for each mode and each route considered for O-D Pair has been estimated per km and entire length of the road section based on the VOC values and Toll cost to be paid by the user as per the equation as discussed in the preceding section. The generic equation has been modified as follows for this study since the accident cost data is not available.

$$RUC_m^i = VOC_m^i + VOT_m^i + Toll\ Cost_m^i$$

The equation used to calculate divertible traffic is shown in table below.

Mode	Cost Ratio Interval	Equations
Busses & Trucks	<0.750	$\% Div = 100 - \left(\frac{CR}{0.75} \right) 0.500$
	$0.750 \leq CR \leq 1.250$	$\% Div = 95 - \left(\frac{CR - 0.75}{0.5} \right) 90$
	$1.250 \leq CR \leq 2.00$	$\% Div = \left(\frac{2 - CR}{0.750} \right) 5$

3.5.2 Road User Cost and Diversion Percentages of Routes

- As described in Section 3.4.2 and Figure 3-4 the project corridor and alternative routes are divided into sections and based on the attributes of section like number of lanes, roughness, type of road (NH, SH, Expressway), length, toll rate, volume and capacity the Road User Cost of each section is calculated. The Road User Cost of sections are described in Table 3-18.

Table 3-18 Road Use Cost of sections of Project Corridor and Competitor Routes

Code	Section	Car	LCV	2Axle	3Axle	MAV
1	Delhi-Dasna	1,038	1,407	1,827	3,186	3,186
2	Dasna-Hapur	1,020	1,857	2,068	4,525	4,735
3	B-Garh Mukhteshwar	302	656	866	1,463	1,463
4	Garh Mukteshwar-Gajraula	531	1,315	1,855	2,984	3,079
5	Gajraula-Moradabad	1,233	2,903	3,916	6,483	6,543
6	Moradabad-Bareilly	2,331	5,588	7,634	12,697	12,697
7	Bareilly-Shahjahanpur	1,881	3,683	4,843	8,326	8,326
8	Shahjahanpur-Sitapur	1,847	4,018	5,303	8,954	8,954
9	Sitapur-Lucknow	1,932	3,804	5,058	8,658	8,658
10	Lucknow-Raebareli	1,792	3,533	4,766	7,965	8,120
11	Prayagraj Bypass-Raebareli	1,979	5,434	5,490	11,863	11,863
12	Fatehpur-Prayagraj (NH19)	2,740	4,318	3,510	10,460	10,550
13	Kanpur-Fatehpur (NH19)	2,081	3,037	2,237	6,752	6,867
14	Etawah-Kanpur (NH19)	4,559	7,446	6,571	17,019	17,234
15	ALE Etawah Cut (NH-19)-Etawah	753	1,100	759	2,462	2,462
16	Agra-ALE Etawah Cut (NH-19)	2,639	4,842	4,869	13,083	13,243
17	NH19 Entry-Agra (NH19)	3,756	5,637	4,354	12,459	12,459
18	YE Entry-Agra (YE)	4,916	6,731	9,155	15,295	15,295
19	Agra (ALE)-ALE Etawah Cut (NH-19)	2,533	3,493	4,793	8,304	8,304
20	ALE Etawah Cut (NH-19)-Hardoi/Unnao Cut (ALE)	4,302	5,964	8,191	14,345	14,345
21	Hardoi/Unnao Cut (ALE)-N	272	377	518	908	908
22	Meerut-Dasna	1,409	2,478	2,593	6,461	6,724
23	Rai-Dasna	1,427	1,974	2,710	4,611	4,751
24	Dasna-YE Entry	1,287	1,779	2,412	4,149	4,239
25	YE Entry-NH19 Entry	1,414	1,958	2,699	4,572	4,722
26	Lucknow-O	1,514	3,875	5,366	8,813	8,943
27	Kanpur-Unnao	647	1,406	1,856	3,134	3,134
28	Raebareli-Unnao	1,610	3,758	4,168	7,255	7,255
29	Kannauj-Kanpur	1,705	3,708	4,894	8,264	8,264
30	Meerut-Garh Mukteshwar	1,048	3,193	3,043	7,525	7,525
33	Hardoi-Shahjahanpur	1,329	4,049	3,859	9,543	9,543
34	Hardoi-Lucknow	2,173	5,598	5,846	11,877	11,877
36	M-Hardoi/Unnao Cut (ALE)	803	2,446	2,331	5,764	5,764
37	Hardoi/Unnao Cut (ALE)-Unnao	1,001	2,494	2,655	5,162	5,162
38	Badaun-Hardoi	4,121	12,554	11,965	29,588	29,588
39	Gajraula-Sambhal	930	2,373	2,492	4,997	4,997
41	Sonipat-Meerut	1,906	5,806	5,533	13,682	13,682
42	Karnal-Rai	4,032	10,787	14,494	31,495	31,495
43	Karnal-Meerut	2,371	5,157	6,806	11,493	11,493

44	Prayagraj-EntryFatehpur	376	550	379	1,231	1,231
45	Garhwal Region (Rishikesh) -Moradabad	4,050	12,337	11,758	29,075	29,075
52	Entry from WB, Jharkhand, Bihar, Odhisa	812	1,993	2,663	6,140	6,282
58	Prayagraj Bypass-U	507	1,245	1,665	3,838	3,926
59	Prayagraj Bypass	507	1,245	1,665	3,838	3,926
60	Delhi-NH19 Entry	2,026	3,666	3,586	8,885	8,885
61	Bulandshahr-Hapur	862	1,875	2,475	4,179	4,179
62	Hapur-A	353	769	1,015	1,713	1,713
63	(730C) K-J	769	2,343	2,233	5,522	5,522
70	Bulandshahr-Budaun	3,406	10,377	9,890	24,457	24,457
74	Pratapgarh-U	1,263	3,846	3,666	9,064	9,064
75	Unnao-O	237	516	681	1,149	1,149
76	Sambhal-H	1,258	3,118	3,329	6,431	6,431
77	Hardoi-K	1,041	3,171	3,022	7,474	7,474
78	Badaun-K	1,956	4,977	5,234	10,468	10,468
79	Delhi- YE Entry	1,220	1,653	2,147	3,744	3,744
80	Meerut-A	323	703	928	1,567	1,567
81	Hapur-B	464	678	468	1,518	1,518
82	Bulandshahr-C	981	2,990	2,850	7,046	7,046
83	Amroha-D	524	1,597	1,522	3,763	3,763
84	Sambhal-E	191	581	553	1,368	1,368
85	Moradabad-Sambhal	881	2,685	2,559	6,328	6,328
86	Badaun-H	429	1,306	1,245	3,079	3,079
87	Badaun-I	313	680	897	1,515	1,515
88	Bareilly-I	797	1,735	2,289	3,866	3,866
89	Shahjahanpur-J	665	2,025	1,930	4,772	4,772
90	Farukhabad-K	643	1,959	1,867	4,618	4,618
91	Hardoi-M	427	1,065	1,134	2,205	2,205
92	Kannauj-M	929	2,830	2,697	6,670	6,670
96	Lucknow-N	2,042	2,831	3,888	6,809	6,809
97	Raebareli-Q	586	1,808	1,715	4,236	4,236
98	Raebareli-R	469	1,447	1,372	3,389	3,389
99	Prayagraj-U	452	660	455	1,477	1,477
57	NH-34	948	2,481	2,575	5,243	5,243

- Once the sectional road user cost is calculated then the road user cost of all the 105 routes are calculated. In each route the road user cost for each mode is calculated via Project Corridor and alternate routes. The diversion percentage is calculated from alternative route to Project Corridor. In routes where the alternative is more than 1 the average road user cost is considered for diversion percentage. The diversion percentage is capped to 90% if it exceeds 90%.

3.6 Diverted Traffic on Project Corridor in Base Year

The diversion percentage was applied on divertible OD pairs and traffic was assigned to the project corridor through the developed route system. The mode wise node matrix of diverted traffic on Project Corridor is shown from Table 3-19 to Table 3-24. The mode wise and package wise matrix is shown from Table 3-25 to Table 3-30.

Table 3-19 Diverted Node Matrix on the Project Corridor of Cars

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	35	0	0	6	27	0	0	0	0	63	9	0	0	0	0	0	16
B	0	0	0	0	729	0	0	8	124	57	16	0	0	331	178	0	0	0	0	0	88
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	10	0	56	0	0	0	32	0	0	0	0	0	0	0
E	78	649	0	0	0	0	0	110	0	0	0	0	0	51	0	0	0	0	0	0	9
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	27	103	0	0	237	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	46	285	14	0	0	0	0	0	0	0	10	0	0	8	16	0	2	0	0	0	6
J	0	7	0	25	0	0	0	0	0	0	0	0	0	66	3	0	1	0	0	0	0
K	6	16	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	11	0	0	0	0	0	0
N	111	741	0	8	13	0	0	0	13	11	0	0	0	0	0	0	0	0	0	0	45
O	50	303	0	10	18	0	0	0	12	2	0	0	13	0	0	0	9	0	0	0	237
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	3	0	0	9	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	137
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	7	170	0	0	0	0	0	0	6	2	0	0	27	37	187	0	0	343	0	0	0

Table 3-20 Diverted Node Matrix on the Project Corridor of Bus

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	32	0	0	17	9	2	0	0	0	19	4	0	0	0	0	0	21
B	0	0	0	0	90	0	0	20	246	25	4	0	0	62	5	0	3	0	0	0	16
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0
E	60	146	0	0	0	0	0	3	0	0	0	0	0	5	2	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	1	36	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	14	128	0	0	2	0	0	0	0	0	1	0	0	4	11	0	0	0	0	0	2
J	0	25	0	16	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0
K	0	6	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	17	0	0	0	0	0	0
N	13	111	0	2	12	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	7
O	4	5	0	0	0	0	0	0	8	2	0	0	17	0	0	0	2	0	0	0	1
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	0	1	0	2	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	19	13	0	0	0	0	0	0	0	1	0	0	0	2	0	0	0	0	0	0	0

Table 3-21 Diverted Node Matrix on the Project Corridor of LCV

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	28	0	0	36	27	0	0	0	0	57	21	0	1	0	0	0	65
B	0	0	0	0	128	0	0	16	119	5	6	0	0	103	56	0	0	0	0	0	37
C	0	0	0	0	0	0	0	0	5	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	26	0	0	0	0	0	0	0	0	0	0	0
E	112	120	2	0	0	0	0	22	30	0	0	0	0	0	5	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	18	16	0	0	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	27	93	5	0	18	0	0	0	0	0	3	0	0	25	35	0	0	0	0	0	19
J	9	18	5	35	0	0	0	0	0	0	0	0	0	18	7	0	0	0	0	0	0
K	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	27	0	0	0	0	0	0
N	53	77	4	5	0	0	0	0	19	4	0	0	0	0	0	0	0	0	0	0	25
O	26	53	0	0	0	0	0	0	31	0	0	0	7	0	0	0	5	0	0	0	80
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	3	2	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	20
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	33	66	0	0	5	0	0	0	0	3	0	0	3	15	155	0	0	0	0	0	0

Table 3-22 Diverted Node Matrix on the Project Corridor of 2 Axle Truck

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	2	0	0	2	2	0	0	0	0	22	8	0	2	0	0	0	49
B	0	0	0	0	10	0	0	2	14	0	0	0	0	58	2	0	0	0	0	0	10
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	6	0	0	0	4	0	0	0	0	0	0	2
E	3	18	0	0	0	0	0	1	3	0	0	0	0	3	0	0	0	0	0	0	0
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	0	5	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	10	5	0	0	3	0	0	0	0	0	0	0	0	15	2	0	0	0	0	0	12
J	1	9	0	4	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	2
K	12	2	0	2	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	1
N	35	59	0	0	0	0	0	0	8	0	0	0	0	0	0	0	0	0	0	0	5
O	22	3	0	0	0	0	0	0	3	0	0	0	0	0	0	0	1	0	0	0	1
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	3	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	9
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	29	13	0	5	8	0	0	0	12	0	0	0	0	4	10	0	0	0	0	0	0

Table 3-23 Diverted Node Matrix on the Project Corridor of 3 Axle Truck

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	15	0	0	4	21	0	0	0	0	56	1	0	0	0	0	0	93
B	0	0	0	0	24	0	0	0	47	0	0	0	0	48	14	0	0	0	0	0	45
C	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	11	0	0	0	2	0	0	0	0	0	0	3
E	20	24	0	0	0	0	0	0	20	0	0	0	0	6	0	0	0	0	0	0	9
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	4	9	0	0	2	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	13	38	3	0	3	0	0	0	0	0	3	0	0	38	20	0	0	0	0	0	26
J	0	9	0	3	0	0	0	0	0	0	0	0	0	2	4	0	0	0	0	0	3
K	4	5	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	6	0	0	0	0	0	0
N	28	70	0	4	2	0	0	0	6	1	0	0	0	0	0	0	0	0	0	0	26
O	33	18	0	0	0	0	0	0	38	1	0	0	4	0	0	0	1	0	0	0	47
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	3	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	4
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	61	56	0	3	16	0	0	0	7	3	0	0	2	22	113	0	0	13	0	0	0

Table 3-24 Diverted Node Matrix on the Project Corridor of MAV*

AADT	A	B	C	D	E	F	G	H	I	J	K	L	M	N	O	P	Q	R	S	T	U
A	0	0	0	0	31	0	0	0	5	0	1	0	0	101	31	0	0	0	0	0	487
B	0	0	0	0	26	0	0	4	60	4	0	0	0	52	22	0	3	0	0	0	88
C	0	0	0	0	0	0	0	0	9	0	0	0	0	0	0	0	0	0	0	0	0
D	0	0	0	0	0	0	0	0	0	12	0	0	0	2	0	0	0	0	0	0	6
E	35	20	0	0	0	0	0	3	20	0	0	0	0	14	0	0	0	0	0	0	11
F	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
G	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
H	19	2	0	2	7	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
I	16	25	3	0	0	0	0	0	0	0	2	0	0	21	23	0	0	0	0	0	32
J	0	4	0	14	0	0	0	0	0	0	0	0	0	3	8	0	0	0	0	0	8
K	9	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0	0
L	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
M	0	0	0	0	0	0	0	0	0	0	0	0	0	0	3	0	0	0	0	0	3
N	85	121	0	0	3	0	0	0	14	2	0	0	0	0	0	0	0	0	0	0	151
O	42	35	0	0	0	0	0	0	44	14	0	0	2	0	0	0	1	0	0	0	76
P	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Q	0	0	0	0	0	0	0	0	0	1	0	0	0	0	0	0	0	0	0	0	0
R	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	8
S	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
T	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
U	287	127	0	3	5	0	0	0	56	2	0	0	3	82	199	0	0	31	0	0	0

*4-6 Axle Truck

Table 3-25 Groupwise Diverted Matrix of Car

Group 1

Car	A	B	C	D	E	F	G
A	0	0	0	0	35	0	120
B	0	0	0	0	729	0	803
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	98
E	78	649	0	0	0	0	170
F	0	0	0	0	0	0	0
G	250	1,626	14	52	268	0	0

Group 2

Car	G	H	I	J	K	L
G	0	134	151	113	16	777
H	367	0	0	0	0	0
I	345	0	0	0	10	32
J	32	0	0	0	0	70
K	22	0	9	0	0	0
L	1,443	0	31	15	0	0

Group 3

Car	L	M	N	O	P
L	0	0	552	206	121
M	0	0	0	11	0
N	897	0	0	0	45
O	393	13	0	0	246
P	198	27	37	192	0

Group 4

Car	P	Q	R	S	T	U
P	0	11	0	0	0	401
Q	18	0	0	0	0	0
R	0	0	0	0	0	137
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	437	0	343	0	0	0

Table 3-26 Groupwise Diverted Matrix of Bus

Group 1

Bus	A	B	C	D	E	F	G
A	0	0	0	0	32	0	71
B	0	0	0	0	90	0	380
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	8
E	60	146	0	0	0	0	10
F	0	0	0	0	0	0	0
G	51	324	0	20	16	0	0

Group 2

Bus	G	H	I	J	K	L
G	0	41	255	34	4	135
H	40	0	0	0	0	0
I	143	0	0	0	1	17
J	41	0	0	0	0	1
K	6	0	1	0	0	0
L	181	0	13	4	0	0

Group 3

Bus	L	M	N	O	P
L	0	0	90	23	41
M	0	0	0	17	0
N	143	0	0	0	7
O	19	17	0	0	3
P	36	0	2	3	0

Group 4

Bus	P	Q	R	S	T	U
P	0	5	0	0	0	46
Q	6	0	0	0	0	0
R	0	0	0	0	0	0
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	35	0	0	0	0	0

Table 3-27 Groupwise Diverted Matrix of LCV

Group 1

LCV	A	B	C	D	E	F	G
A	0	0	0	0	28	0	208
B	0	0	0	0	128	0	341
C	0	0	0	0	0	0	5
D	0	0	0	0	0	0	26
E	112	120	2	0	0	0	58
F	0	0	0	0	0	0	0
G	169	326	14	40	27	0	0

Group 2

LCV	G	H	I	J	K	L
G	0	74	182	31	6	346
H	37	0	0	0	0	0
I	145	0	0	0	3	79
J	67	0	0	0	0	25
K	0	0	0	0	0	0
L	327	0	50	7	0	0

Group 3

LCV	L	M	N	O	P
L	0	0	203	125	122
M	0	0	0	27	0
N	161	0	0	0	25
O	109	7	0	0	85
P	113	3	15	161	0

Group 4

LCV	P	Q	R	S	T	U
P	0	7	0	0	0	226
Q	12	0	0	0	0	0
R	0	0	0	0	0	20
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	280	0	0	0	0	0

Table 3-28 Groupwise Diverted Matrix of 2 Axle Truck

Group 1

2 Axle Truck	A	B	C	D	E	F	G
A	0	0	0	0	2	0	85
B	0	0	0	0	10	0	86
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	13
E	3	18	0	0	0	0	6
F	0	0	0	0	0	0	0
G	110	96	0	11	12	0	0

Group 2

2 Axle Truck	G	H	I	J	K	L
G	0	5	18	6	0	161
H	5	0	0	0	0	0
I	17	0	0	0	0	29
J	14	0	0	0	0	3
K	16	0	1	0	0	0
L	177	0	23	0	0	0

Group 3

2 Axle Truck	L	M	N	O	P
L	0	0	103	12	78
M	0	0	0	1	1
N	102	0	0	0	5
O	28	0	0	0	2
P	70	0	4	10	0

Group 4

2 Axle Truck	P	Q	R	S	T	U
P	0	3	0	0	0	83
Q	4	0	0	0	0	0
R	0	0	0	0	0	9
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	82	0	0	0	0	0

Table 3-29 Groupwise Diverted Matrix of 3 Axle Truck

Group 1

3 Axle Truck	A	B	C	D	E	F	G
A	0	0	0	0	15	0	175
B	0	0	0	0	24	0	153
C	0	0	0	0	0	0	0
D	0	0	0	0	0	0	16
E	20	24	0	0	0	0	35
F	0	0	0	0	0	0	0
G	144	205	3	11	23	0	0

Group 2

3 Axle Truck	G	H	I	J	K	L
G	0	4	87	11	0	277
H	16	0	0	0	0	0
I	56	0	0	0	3	84
J	13	0	0	0	0	9
K	9	0	1	0	0	0
L	293	0	52	5	0	0

Group 3

3 Axle Truck	L	M	N	O	P
L	0	0	151	39	179
M	0	0	0	6	0
N	111	0	0	0	26
O	90	4	0	0	48
P	148	2	22	114	0

Group 4

3 Axle Truck	P	Q	R	S	T	U
P	0	1	0	0	0	253
Q	4	0	0	0	0	0
R	0	0	0	0	0	4
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	283	0	13	0	0	0

Table 3-30 Groupwise Diverted Matrix of Multi Axle Vehicle

Group 1

MAV	A	B	C	D	E	F	G
A	0	0	0	0	31	0	625
B	0	0	0	0	26	0	233
C	0	0	0	0	0	0	9
D	0	0	0	0	0	0	21
E	35	20	0	0	0	0	47
F	0	0	0	0	0	0	0
G	457	313	3	18	14	0	0

Group 3

MAV	G	H	I	J	K	L
G	0	6	93	16	1	817
H	29	0	0	0	0	0
I	44	0	0	0	2	76
J	18	0	0	0	0	18
K	9	0	1	0	0	0
L	708	0	115	20	0	0

Group 2

MAV	L	M	N	O	P
L	0	0	192	84	636
M	0	0	0	3	3
N	225	0	0	0	151
O	135	2	0	0	77
P	483	3	82	199	0

Group 4

MAV	P	Q	R	S	T	U
P	0	4	0	0	0	863
Q	2	0	0	0	0	0
R	0	0	0	0	0	8
S	0	0	0	0	0	0
T	0	0	0	0	0	0
U	765	0	31	0	0	0

3.7 Impact of Eastern Dedicated Freight Corridor

The Eastern Dedicated Freight corridor passes through Ludhiana, Meerut, Bulandhahr, Kanpur, Prayagraj upto Dankuni. It runs in close vicinity of the project corridor. However, it is unlikely to have diversion from project corridor and instead the growth of DFC corridor is likely to increase the induced traffic in the project corridor. The reasons are as follows:

1. DFC is more likely to carry bulk commodities like oil and container traffic of heavy haulage trucks. Separate vehicle counts were carried out for container traffic and tankers at Old NH-24 (Brijghat Toll Plaza) and NH-19 (Katoghan Toll Plaza). Brijghat Toll Plaza is on North bank of river Ganga and Katoghan Toll Plaza is on South Bank of river Ganga (near Prayagraj). Less than 5% of 4-6 Axle trucks are container trucks at both plazas. Less than 7.5% 4-6 axle trucks are tanker at both plazas. At NH-19 (Katoghan Plaza) the tanker traffic is 2.5%.

Table 3-31 Container Traffic

Container Traffic	Old NH-24 (Brijghat Toll Plaza)	NH-19 (Katoghan Toll Plaza)
Day 1 Counts	43	57
Day 2 Counts	44	60
Day 3 Counts	79	54
ADT of Container	55	57
ADT of MAV (4-6 Axle Truck)	1594	2859
Percentage Container of MAV	3.5%	2.0%

Table 3-32 Tanker Traffic

Tanker	Old NH-24 (Brijghat Toll Plaza)	NH-19 (Katoghan Toll Plaza)
Day 1 Counts	89	108
Day 2 Counts	117	41
Day 3 Counts	146	69
ADT of Tanker	117	73
ADT of MAV (4-6 Axle Truck)	1594	2859
Percentage Tanker Traffic	7.4%	2.5%

2. Eastern DFC is likely to induce growth on the Project Corridor as it is likely to push industrialization in the vicinity of the project corridor. It could be seen that all major Highways having high volume of traffic has parallel rail lines which is evident from the both eastern DFC and traditional rail line runs parallel to GT road (NH-19) and Western DFC and traditional rail line runs parallel to NH-8.

4 Traffic Forecasting

4.1 Methodology

Transport demand elasticity method is used to forecast traffic for horizon year. In this method the elasticity of growth of vehicles with respect to economic factor is calculated for the base year. Under this method the growth of vehicles is taken as independent variable and economic factor is taken as dependent variable. Once the elasticity is calculated the economic factor is projected, and using the calculated elasticity values the growth rate is established. The detailed methodology is as follows:

The Generic Equation both for passenger and freight vehicles is as follows

$$G = f(F, E)$$

where,

G= Growth rate of Traffic

F= Growth of Economic Factor

E= Elasticity. Elasticity of Transport Demand

Estimation of CAGR for Passenger and Freight Vehicles:

Estimation of Cumulative Annual Average Growth Rate based on vehicle data/time series data by using ln-ln regression for interpreting elasticity. The generic equation is as follows:

Equation 4-1

$$Y_i = B_1 + B_0 \ln X_i$$

where,

B₁ = Intercept;

B₀ = Regression coefficient (elasticity); and

ln X_i = Annual growth rate of each mode.

Estimation of Economic factor (F) for Base Years

The economic factor of Passenger vehicles

Equation 4-2

$$F_{\text{Passenger}} = \left(1 + \sum_i PIA_i \times G_{p_i} \right) \times \left(1 + \sum_i PIA_i \times CAGR_{PCNSDP_i} \right) - 1$$

F_{Passenger} : Economic Factor of Passenger Vehicles

G_{p_i} : Growth rate of Population of *i*th state

CAGR_{PCNSDP_i} : CAGR of Per capita Net State Domestic Product of *i*th state

PIA_i : Percentage contribution of *i*th State

The economic factor of Freight Vehicles

For freight vehicles, CAGR of freight vehicles (based on toll data and registration data) and economic indicator (NSDP/DDP) are calculated. For economic indicator and for growth of registered vehicles the weights are based on the PIA which is essentially trip generating and trip attracting locations (i.e. origin and destination of trips).

Equation 4-3

$$F_{\text{Freight}} = \sum_i PIA_i \times CAGR_{NSDP_i}$$

where,

F_{Freight} : Economic Factor of Freight Vehicles
 PIA_i : Project influence area of each mode
 $CAGR_{NSDP/DDP}$: CAGR of Net State Domestic Product of PIA states or PIA districts

Estimation of elasticity for Base Year

Passenger vehicles

For calculating the elasticity of each for the Base year the generic equation is as follows

Equation 4-4

$$E_{\text{Passenger Vehicle}} = \frac{CAGR_{\text{Passenger Vehicles}}}{F_{\text{Passenger}}}$$

where,

$E_{\text{Passenger Vehicles}}$: Base year Elasticity of Passenger vehicles;
 $G_{p(PIA_i)}$: Urban Population growth rate;
 $CAGR_{PCNSDP(PIA_i)}$: CAGR of Per capita Net State Domestic Product/ PNDDP for each PIA

Freight Vehicles

Elasticity for Freight Vehicles,

Equation 4-5

$$E_{\text{Freight Vehicle}} = \frac{CAGR_{\text{Freight Vehicles}}}{CAGR_{NSDP(PIA)_i}}$$

where,

$E_{\text{Freight Vehicles}}$: Base year Elasticity of Freight vehicles
 G : Growth rate of vehicles;

$CAGR_{NSDP(PIA_i)}$: CAGR of Net State Domestic Product/ DDP for each PIA

Forecasting of Economic Factor

The growth rate of economic factor of both Passenger and freight vehicles for the horizon years is projected by correlating the Weighted PCNSDP/PCNDDP (for Passenger vehicles) data and Weighted NSDP (Freight vehicles) data with GDP growth rate through In-In regression analysis.

Equation 4-6

For Passenger vehicles:

$$PCNSDP/PCNDDP_i = B_1 + B_0 \ln GDP_i$$

where,

$PCNSDP/PCNDDP$ is

B_1 is Intercept;

B_0 is Regression coefficient (elasticity); and

GDP_i is Gross Domestic Product of India.

Equation 4-7

For Freight vehicles:

$$DDP/NSDP_i = B_1 + B_0 \ln GDP_i$$

where,

$DDP/NSDP_i$ is District Domestic Product/Net State Domestic Product

B_1 is Intercept;

B_0 is Regression coefficient (elasticity); and

GDP_i is Gross Domestic Product of India.

Forecasting of traffic growth rates

Based on the elasticity values calculated and projected economic factor, traffic growth rate is derived.

4.2 Traffic Growth Rates for Project Corridor

Section 4.1 describes the methodology to estimate growth rates of the Project Corridor. The following steps and inputs are required to estimate the growth rates.

1. Project Influence Area of the Project Corridor.
2. Growth rate of Economic factor for goods and passenger vehicles.
3. CAGR of each vehicle category for which growth rate is to be estimated.
4. Base year elasticity for each vehicle category as defined in Equation 4-4 and Equation 4-5.
5. Forecasting of Economic Factor for each vehicle type.
6. Forecasting of growth rates.

All these steps are described in subsequent sections.

4.2.1 Project Influence Area

The Project Influence Area (PIA) is derived from origin Destination Survey. PIA gives the contribution of different states in traffic of the Project Corridor. The PIA for each mode is determined by the following Equation:

$$PIA_j = \left(\frac{n_{O_i}/S_j + n_{D_i}/S_j}{2 \times AADT_j} \right) \times 100$$

Where

PIA_j , is Project Influence Area of j_{th} mode

n_{O_i} , is number of occurrences in origin of i_{th} state in the samples of OD survey

n_{D_i} , is number of occurrences in destination of i_{th} state samples of OD survey

S_j , is the sampling rate of j_{th} mode

$AADT_j$, is AADT of j_{th} mode*

However, In this project growth rate is calculated based on the Origin and destination of each vehicle. This means if the vehicle moves from Delhi to Uttar Pradesh the PIA is 50% Uttar Pradesh and 50% Delhi. The weight of economic factor is 50% of NSDP of Uttar Pradesh and 50% of NSDP of Delhi.

4.2.2 Growth Rate of Economic Factor

1. Equation 4-2 and Equation 4-3 defines Economic factor of goods vehicles and passenger vehicles. In order to estimate the economic factor $CAGR_{NSDP}$, $CAGR_{PCNSDP}$, $CAGR_{NSDP}$ and G_p is required to be estimated.
2. Log-Linear regression method is adopted to calculate $CAGR_{NSDP}$, $CAGR_{PCNSDP}$, and G_p of PIA states.
3. Table 4-1, Table 4-2 and Table 4-3 gives $CAGR_{NSDP}$, $CAGR_{PCNSDP}$, and G_p and R^2 value for PIA states.

Table 4-1 CAGR and R^2 of NSDP/GDP of PIA states using Log-Linear Regression Model (2011-2018)

	CAGR	R-Square
India (GDP)	7.0%	0.9958
Uttar Pradesh	6.6%	0.9822
Delhi	7.6%	0.9969
Bihar	6.2%	0.9673
Haryana	8.6%	0.9964
Jharkhand	5.7%	0.9412
Punjab	5.8%	0.9902
Rajasthan	6.3%	0.9969
Uttarakhand	8.0%	0.9976
West Bengal	5.3%	0.97

Table 4-2 CAGR and R^2 of PCNSDP/PCNDP of PIA states using Log-Linear Regression Model

	CAGR	R-Square
India (Per capita NNI)	5.6%	0.9916
Uttar Pradesh	5.0%	0.9697
Delhi	5.7%	0.9935
Bihar	4.5%	0.9443
Haryana	7.1%	0.9947
Jharkhand	4.0%	0.8884
Punjab	4.4%	0.997
Rajasthan	4.8%	0.9947
Uttarakhand	3.9%	0.9965
West Bengal	4.2%	0.9546

Table 4-3 CAGR of Population of PIA states

Urban Population Growth Rate	2011-2019
India	2.3%
Uttar Pradesh	2.2%
Delhi	2.3%
Gujarat	2.7%
Haryana	3.2%
Maharastra	1.7%
Punjab	1.9%
Rajasthan	2.1%
Uttarakhand	2.8%

4.2.3 CAGR of Passenger and Goods Vehicles

In the absence of time series of toll data vehicle registration data was used to calculate the growth rate. Following steps were used to derive CAGR of vehicle growth:

1. Road Transport Years book classifies goods vehicle in three categories namely LMV goods, Trucks and Lorries and Multi Axle/articulated vehicles. The CAGR of Multi Axle Vehicles and Trucks of neighboring states of Uttar Pradesh is shown in Table 4-4 and Table 4-5

Table 4-4 CAGR of Multi Axle Vehicles neighboring states of Uttar Pradesh

MAV	Bihar	Chhattisgarh	Haryana	Madhya Pradesh	Nagaland*	Uttar Pradesh	Cumulative
2011-12	1,899	17,356	75,220	31,026	26,560	47,938	1,99,999
2012-13	3,478	19,867	78,566	35,566	29,696	58,937	2,26,110
2013-14	4,703	21,541	80,950	40,201	32,629	65,271	2,45,295
2014-15	6,403	23,587	83,771	46,065	36,131	73,249	2,69,206
2015-16	7,889	27,177	87,397	52,082	41,918	84,790	3,01,253
2016-17	8,955	29,836	90,055	56,327	49,387	96,916	3,31,476
2017-18	10,372	32,601	93,090	61,702	54,973	1,07,464	3,60,202
2018-19	11,695	35,606	96,196	66,915	61,254	1,18,869	3,90,535
2019-20	12,964	38,415	99,129	71,859	67,699	1,30,229	4,20,295
	27.10%	10.40%	3.50%	11.10%	12.40%	13.30%	9.73%

*Nagaland is not a neighboring states but vehicles registered in Nagaland were observed during OD survey

Source: Series publication Road Transport Year Book, MORTH and SIAM

Table 4-5 CAGR of Trucks (LCV and 2 Axle Trucks) of neighboring states of Uttar Pradesh

Trucks	Bihar	Chhattisgarh	Haryana	Madhya Pradesh	Nagaland*	Rajasthan	Uttar Pradesh	Cumulative
2011-12	83,191	73,712	2,17,515	90,890	57,448	3,62,028	1,14,875	9,99,659
2012-13	86,276	77,648	2,28,943	94,632	61,190	4,01,963	1,26,795	10,77,447
2013-14	89,656	82,577	2,46,932	95,640	62,198	4,34,359	1,35,145	11,46,507
2014-15	93,551	87,021	2,64,961	96,958	63,516	4,72,345	1,44,663	12,23,015
2015-16	99,254	92,290	2,80,333	1,05,389	71,947	5,17,584	1,57,531	13,24,328
2016-17	1,06,932	97,736	3,00,266	1,14,801	81,359	5,61,138	1,72,989	14,35,221
2017-18	1,12,691	1,02,789	3,18,044	1,21,188	87,746	6,03,398	1,85,604	15,31,460
2018-19	1,19,071	1,08,045	3,35,738	1,29,265	95,823	6,47,082	1,99,251	16,34,275
2019-20	1,25,676	1,13,297	3,54,207	1,37,223	1,03,781	6,90,248	2,13,157	17,37,589
	5.30%	5.50%	6.30%	5.30%	7.70%	8.40%	8.00%	7.15%

*Nagaland is not a neighboring states but vehicles registered in Nagaland were observed during OD survey

Source: Series publication Road Transport Yearbook, MORTH and SIAM

2. The CAGR of cars, buses and LMV goods for the state of Uttar Pradesh is shown in Table 4-6.

Table 4-6 CAGR of cars buses and LMV Goods in the state of Uttar Pradesh

	LMV		
	Cars	Goods/Pick up	Bus
2011-12	13,67,795	1,76,164	34,428
2012-13	15,23,603	1,95,194	40,501
2013-14	17,79,146	2,65,025	45,607
2014-15	21,61,533	2,94,022	51,866
2015-16	24,34,850	3,16,815	57,939
2016-17	27,11,405	3,59,769	75,309
2017-18	29,26,367	3,97,753	83,656
2018-19	31,42,671	4,34,763	92,617
2019-20	33,56,210	4,72,088	1,02,014
CAGR	12%	13%	15%

Source: Road Transport Year Book, SIAM, UP Government website

4.2.4 Elasticity of transport Demand

Based on Consultants experience and growth rates of economic factor and vehicle registration the following elasticity is adopted for horizon year forecast

Table 4-7 Elasticity Adopted of different Vehicle Types

	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56
Car	1.13	1.13	1.13	1.13	1.13	1.13	1.13
Mini Bus	0.70	0.63	0.63	0.63	0.63	0.63	0.63
Bus	0.70	0.63	0.63	0.63	0.63	0.63	0.63
Pickup	1.13	1.01	1.01	1.01	1.01	1.01	1.01
LCV	0.82	0.74	0.74	0.74	0.74	0.74	0.74
2 Axle Truck	0.89	0.80	0.80	0.80	0.80	0.80	0.80
3 Axle Truck	0.53	0.47	0.47	0.53	0.53	0.53	0.53
MAV	1.20	1.08	1.08	1.08	1.08	1.08	1.08

4.2.5 Forecasting of Economic Factor

The forecasting of Economic Factor involves two important steps:

1. Forecasting the GDP of India and its growth rate up to horizon year.
2. Developing a relationship between available NSDP, PCNSP data of PIA states with GDP of India. Using this relationship the growth rate of economic factor of PIA states is predicted.

The subsection describes the above two steps

4.2.5.1 Forecasting of GDP Growth of India

1. Table 4-8 shows the forecasted GDP published by OECD.

Table 4-8 Forecasted GDP Growth as per OECD forecast and National Rail Plan

Year	GDP growth	Year	GDP Growth	Year	GDP growth
2018	6.98%	2030	5.30%	2042	3.99%
2019	7.59%	2031	5.16%	2043	3.92%
2020	7.72%	2032	5.03%	2044	3.84%
2021	7.30%	2033	4.91%	2045	3.77%
2022	6.92%	2034	4.79%	2046	3.70%
2023	6.59%	2035	4.68%	2047	3.63%
2024	6.32%	2036	4.56%	2048	3.56%
2025	6.10%	2037	4.46%	2049	3.50%
2026	5.91%	2038	4.36%	2050	3.43%
2027	5.74%	2039	4.26%		
2028	5.58%	2040	4.17%		
2029	5.44%	2041	4.08%		

Source: National Rail Plan, 2020

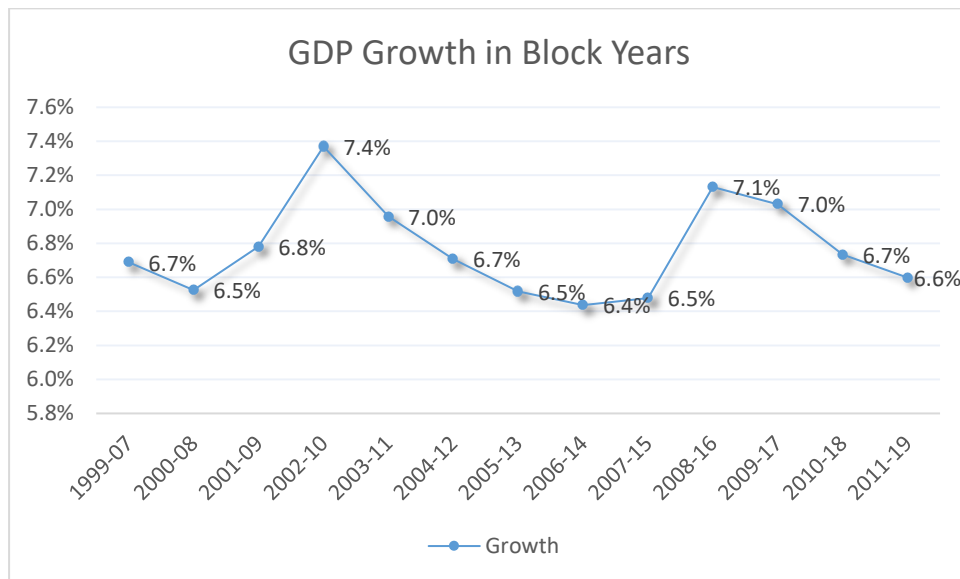
2. However, with the onset of COVID world economy has shown a contraction. Reserve Bank of India published a report dated 7th April 2021 that have forecasted depression in 2020-21 and growth in 2021-22.

Table 4-9 RBI Forecast for GDP depression and growth in 2020-21 and 2021-22

Year	RBI Forecast
2020-21	-7.50%
2021-22	11.00%

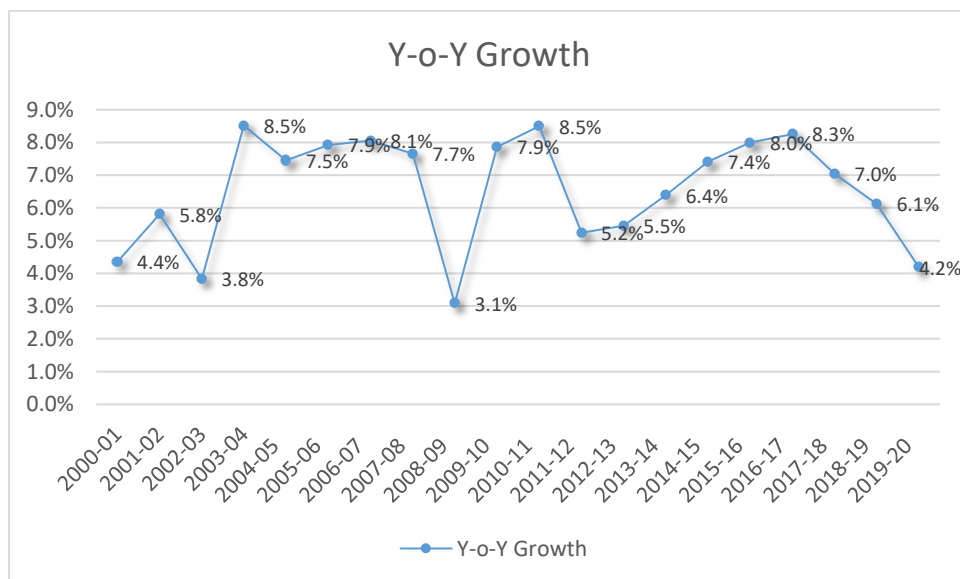
3. Figure 4-1 shows GDP growth in different block years. In block of 8 years the highest GDP growth that has occurred is 7.4%.

Figure 4-1 GDP Growth in block years



Source: Central Statistical Organization

Figure 4-2 Year-to-Year (Y-o-Y) GDP Growth of India

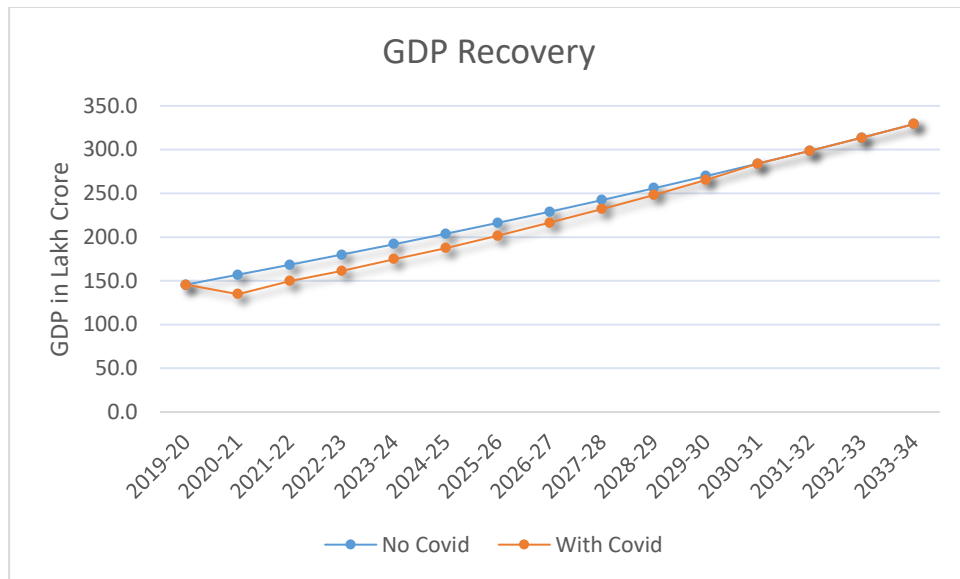


Source: Central Statistical Organization

4. Future forecast for GDP is based on following assumptions:

- GDP will show a V shape recovery (refer Figure 4-3) and the GDP achieved by OECD forecast without COVID would be achieved by 2033-34.
- Post 2033-34 the GDP growth is assumed to be same as the forecast OECD.

Figure 4-3 V-Shape Recovery of GDP



- The GDP table with and without COVID is shown in Table 4-10.
- The GDP growth forecasted for future block years is shown in Table 4-11.

Table 4-10 GDP Growth table with and without COVID

Year	No Covid Growth	No Covid	With Covid growth	With Covid
2019-20		145.7		145.7
2020-21	7.72%	156.9	-7.50%	134.7
2021-22	7.30%	168.4	11.00%	149.6
2022-23	6.92%	180.0	8.00%	161.5
2023-24	6.59%	191.9	8.00%	174.4
2024-25	6.32%	204.0	7.50%	187.5
2025-26	6.10%	216.4	7.50%	201.6
2026-27	5.91%	229.2	7.50%	216.7
2027-28	5.74%	242.4	7.00%	231.9
2028-29	5.58%	255.9	7.00%	248.1
2029-30	5.44%	269.8	7.00%	265.5
2030-31	5.30%	284.1	7.03%	284.1
2031-32	5.16%	298.8	5.16%	298.8
2032-33	5.03%	313.8	5.03%	313.8
2033-34	4.91%	329.2	4.91%	329.2
2034-35	4.79%	345.0	4.79%	345.0
2035-36	4.68%	361.2	4.68%	361.2
2036-37	4.56%	377.6	4.56%	377.6

2037-38	4.46%	394.5	4.46%	394.5
2038-39	4.36%	411.7	4.36%	411.7
2039-40	4.26%	429.2	4.26%	429.2
2040-41	4.17%	447.1	4.17%	447.1
2041-42	4.08%	465.3	4.08%	465.3
2042-43	3.99%	483.9	3.99%	483.9
2043-44	3.92%	502.9	3.92%	502.9
2044-45	3.84%	522.2	3.84%	522.2
2045-46	3.77%	541.9	3.77%	541.9
2046-47	3.70%	561.9	3.70%	561.9
2047-48	3.63%	582.3	3.63%	582.3
2048-49	3.56%	603.1	3.56%	603.1
2049-50	3.50%	624.2	3.50%	624.2
2050-51	3.43%	645.6	3.43%	645.6
2051-52	3.43%	667.7	3.43%	667.7

Table 4-11 GDP Growth in block years

Block Year	GDP Growth
2022-2026	7.7%
2027-2031	6.6%
2032-2036	4.8%
2037-2041	4.3%
2042-2046	3.8%
2047-2051	3.5%

Forecasting OF NSDP AND PCNSDP of PIA STATES

1. Log-Log regression between GDP of India and NSDP of PIA states from FY-2011-12 to 2019-20 is carried out to derive a relationship between growth of GDP of India and growth of NSDP of PIA states. Table 4-12 provides the regression analysis of PIA states.

Based on this regression equation and predicted GDP growth as described

2. Table 4-11, NSDP growth rate is predicted in the following manner.

$$\ln NSDP_{year_i} = 0.9538 \ln GDP_{year_i} - 2.0995 \quad R^2 = 0.9892$$

Using the above equation NSDP growth rate is determined in the following manner

$$\frac{NSDP_{year_{i+1}} - NSDP_{year_i}}{NSDP_{year_i}} = e^{1.1379 \ln \frac{GDP_{year_{i+1}}}{GDP_{year_i}}} - 1$$

$$G_{NSDP} = e^{0.9538 \ln(1+G_{GDP})} - 1$$

where

$$G_{NSDP} = \text{Growth Rate of NSDP of the state}$$

$$NSDP_{year_i} = NSDP \text{ of } year_i$$

$$GDP_{year_i} = GDP \text{ of } year_i$$

3. The β value for relationship between the GDP and NSDP in the above step is 0.9538. This β value is used for prediction of horizon year NSDP of PIA states
4. Table 4-12 describes the regression equation with β value and equation to predict growth rate of NSDP of PIA states.
5. Table 4-13 and Table 4-14 describes the β value of NSDP and PCNSDP states .

Table 4-12 Log-Log Regression of growth of NSDP of States (dependent variable) versus GDP of India (Independent variable)

Name of the State	Growth Rate Equation of NSDP	Log-Log Regression
Uttar Pradesh	$G_{NSDP} = e^{0.9538\ln(1+G_{GDP})} - 1$	<div><p>Uttar Pradesh</p><p>$y = 0.9538x - 2.0995$ $R^2 = 0.9892$</p></div>
West Bengal	$G_{NSDP} = e^{0.7576\ln(1+G_{GDP})} - 1$	<div><p>West Bengal</p><p>$y = 0.7576x - 0.1817$ $R^2 = 0.963$</p></div>
Rajasthan	$G_{NSDP} = e^{0.9023\ln(1+G_{GDP})} - 1$	<div><p>Rajasthan</p><p>$y = 0.9023x - 1.9914$ $R^2 = 0.9974$</p></div>
Bihar	$G_{NSDP} = e^{0.908\ln(1+G_{GDP})} - 1$	<div><p>Bihar</p><p>$y = 0.908x - 2.6286$ $R^2 = 0.9559$</p></div>

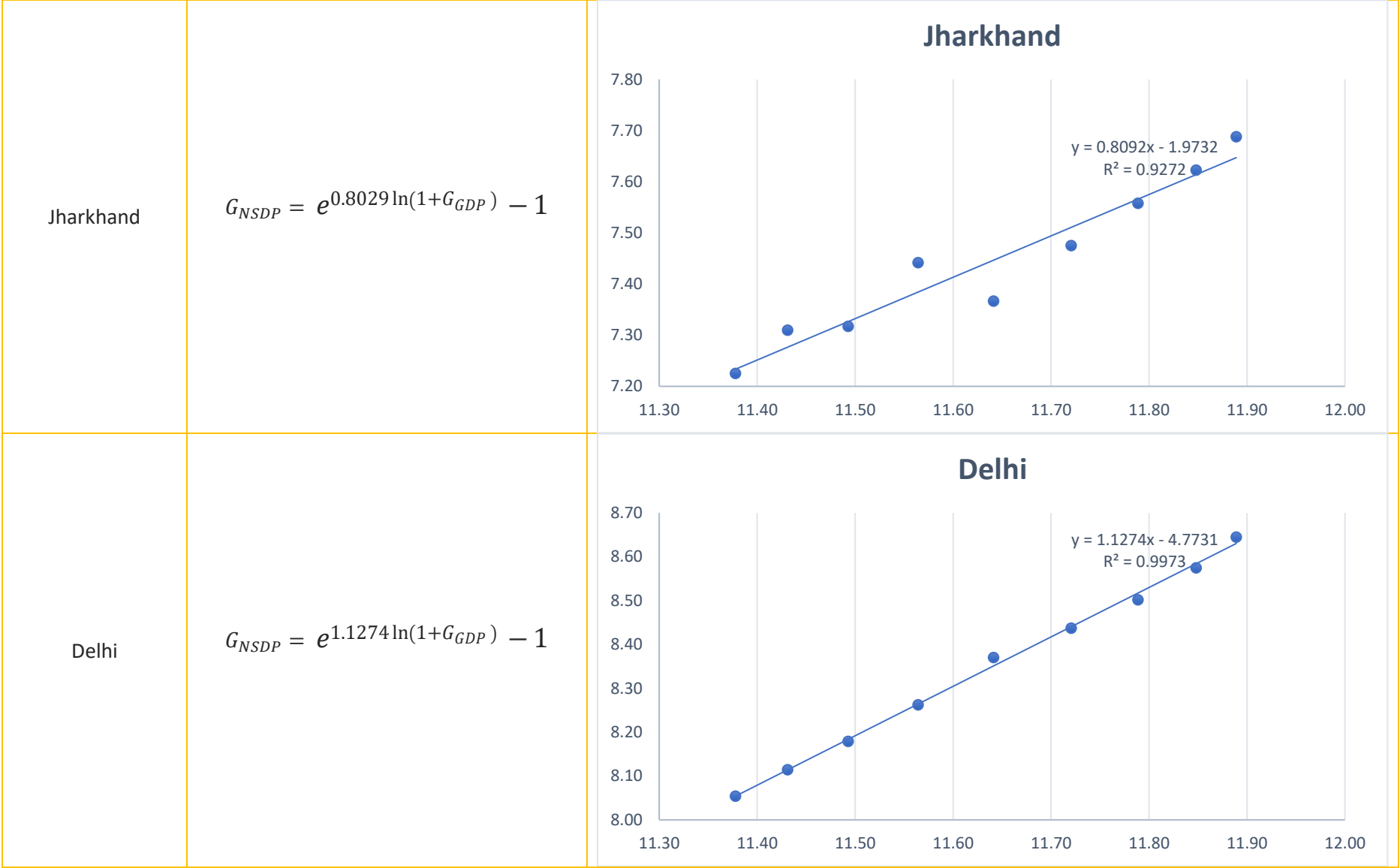


Table 4-13 β value for Log-Log Regression of growth of NSDP of States (dependent variable) versus GDP of India (independent variable)

NSDP	β	R-Square
Uttar Pradesh	0.9583	0.9892
Delhi	1.1274	0.9973
Bihar	1.02875	0.9532
Haryana	1.2268	0.9977
Jharkhand	1.01416	0.9979
Madhya Pradesh	1.0645	0.9929
Punjab	0.8356	0.9952
Rajasthan	0.9023	0.9974
Uttarakhand	1.1093	0.9988
West Bengal	0.9652	0.9838

Table 4-14 β value for Log-Log Regression of growth of PCNSDP of States (dependent variable) versus GDP of India (independent variable)

PCNSDP	β	R-Square
Uttar Pradesh	0.7293	0.9801
Delhi	0.825	0.9959
Bihar	0.8655	0.9449
Haryana	1.0189	0.9972
Jharkhand	0.90279	0.9971
Madhya Pradesh	0.8381	0.9985
Punjab	0.6434	0.9943
Rajasthan	0.6905	0.9966
Uttarakhand	0.9171	0.9985

6. The forecasted NSDP, PCNSDP and urban population growth of PIA states is shown in table below. The β value of states have been moderated to make future growth in line with national growth.

Table 4-15 Forecasted NSDP of PIA States

	2022-26	2027-31	2032-36	2037-21	2042-46	2047-51	2051-56
Uttar Pradesh	7.0%	6.4%	5.3%	4.7%	4.0%	3.5%	3.2%
Delhi	8.3%	7.5%	5.4%	4.8%	4.3%	4.0%	3.6%
Bihar	7.5%	6.8%	4.9%	4.4%	4.0%	3.6%	3.3%
Haryana	9.0%	8.2%	5.9%	5.3%	4.7%	4.3%	3.9%
Jharkhand	7.4%	6.7%	4.9%	4.3%	3.9%	3.6%	3.2%
Punjab	6.1%	5.5%	4.0%	3.6%	3.2%	2.9%	2.6%
Rajasthan	6.6%	6.0%	4.3%	3.8%	3.5%	3.2%	2.8%
Uttarakhand	8.1%	7.4%	5.3%	4.7%	4.3%	3.9%	3.5%
West Bengal	7.1%	6.4%	4.6%	4.1%	3.7%	3.4%	3.0%
Rest of India	7.3%	6.6%	4.8%	4.3%	3.8%	3.5%	3.2%

Table 4-16 Forecasted PCNSDP of PIA states

PCNSDP Growth	2022-26	2027-31	2032-36	2037-21	2042-46	2047-51	2051-56
Uttar Pradesh	5.3%	4.8%	4.9%	4.3%	3.9%	3.6%	3.2%
Delhi	6.0%	5.4%	3.9%	3.5%	3.2%	2.9%	2.6%
Bihar	6.3%	5.7%	4.1%	3.7%	3.3%	3.0%	2.7%
Haryana	7.5%	6.8%	4.9%	4.3%	3.9%	3.6%	3.2%
Jharkhand	6.6%	6.0%	4.3%	3.8%	3.5%	3.2%	2.8%
Punjab	4.6%	4.2%	3.1%	2.7%	2.5%	2.2%	2.0%
Rajasthan	5.0%	4.5%	3.3%	2.9%	2.6%	2.4%	2.2%
Uttarakhand	6.7%	6.1%	4.4%	3.9%	3.5%	3.2%	2.9%
West Bengal	5.9%	5.4%	3.9%	3.5%	3.1%	2.9%	2.6%
Rest of India	6.0%	5.4%	4.1%	3.6%	3.3%	3.0%	2.7%

Table 4-17 Forecasted urban population growth rates of PIA states

Population Growth	2022-26	2027-31	2032-36	2037-21	2042-46	2047-51	2051-56
Uttar Pradesh	1.6%	1.3%	1.1%	1.1%	1.0%	0.9%	0.8%
Delhi	1.9%	1.8%	1.6%	1.5%	1.5%	1.3%	1.2%
Bihar	1.9%	1.6%	1.5%	1.4%	1.3%	1.2%	1.1%
Haryana	2.6%	2.3%	2.1%	2.0%	1.9%	1.7%	1.5%
Jharkhand	1.9%	1.6%	1.5%	1.4%	1.3%	1.2%	1.1%
Punjab	1.5%	1.3%	1.2%	1.1%	1.1%	1.0%	0.9%
Rajasthan	1.6%	1.4%	1.3%	1.2%	1.1%	1.0%	0.9%
Uttarakhand	2.8%	2.7%	2.7%	2.6%	2.5%	2.4%	2.1%
West Bengal	1.9%	1.6%	1.5%	1.4%	1.3%	1.2%	1.1%
Rest of India	1.9%	1.6%	1.5%	1.4%	1.3%	1.2%	1.1%

4.2.6 Forecasting of Growth Rates

In calculating the traffic for horizon year the growth is calculated based on individual OD pairs. For example if the origin and destination is Delhi and Uttar Pradesh the growth rate is calculated as product of mean of economic factor of both states and elasticity value described in Table 4-7. This growth rate is input directly to OD pairs and horizon year traffic is calculated. The growth rates of different vehicle type commuting between different OD pairs is shown in Table below.

Table 4-18 Origin Destination wise Growth rate of Car

Origin	Destination	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56	2056-61
Uttar Pradesh	Uttar Pradesh	7.9%	7.0%	6.8%	6.1%	5.6%	5.1%	4.6%	4.6%
Uttar Pradesh	Delhi	8.5%	7.6%	6.6%	5.9%	5.4%	4.9%	4.4%	4.4%
Uttar Pradesh	Bihar	8.6%	7.7%	6.6%	6.0%	5.4%	4.9%	4.4%	4.4%
Uttar Pradesh	Haryana	9.7%	8.7%	7.4%	6.7%	6.1%	5.6%	5.0%	5.0%
Uttar Pradesh	Jharkhand	8.7%	7.8%	6.7%	6.0%	5.5%	5.0%	4.5%	4.5%
Uttar Pradesh	Madhya Pradesh	8.5%	7.6%	6.5%	5.9%	5.4%	4.9%	4.4%	4.4%
Uttar Pradesh	Punjab	7.4%	6.6%	5.8%	5.3%	4.8%	4.4%	3.9%	3.9%
Uttar Pradesh	Rajasthan	7.7%	6.8%	6.0%	5.4%	4.9%	4.5%	4.0%	4.0%
Uttar Pradesh	Uttarakhand	9.3%	8.5%	7.4%	6.8%	6.2%	5.7%	5.1%	5.1%
Uttar Pradesh	West Bengal	8.4%	7.5%	6.5%	5.8%	5.3%	4.8%	4.4%	4.4%
Uttar Pradesh	Rest of India	8.4%	7.5%	6.6%	5.9%	5.4%	4.9%	4.4%	4.4%
Delhi	Bihar	9.2%	8.3%	6.3%	5.7%	5.3%	4.8%	4.3%	4.3%
Delhi	Jharkhand	9.3%	8.4%	6.4%	5.8%	5.3%	4.8%	4.4%	4.4%
Delhi	Madhya Pradesh	9.1%	8.2%	6.3%	5.7%	5.2%	4.7%	4.2%	4.2%
Delhi	Rajasthan	8.3%	7.5%	5.7%	5.2%	4.8%	4.3%	3.9%	3.9%
Delhi	Uttarakhand	9.9%	9.1%	7.2%	6.6%	6.0%	5.6%	5.0%	5.0%
Delhi	West Bengal	9.0%	8.1%	6.2%	5.6%	5.1%	4.7%	4.2%	4.2%
Delhi	Rest of India	9.0%	8.1%	6.3%	5.7%	5.2%	4.7%	4.3%	4.3%
Bihar	Haryana	10.4%	9.4%	7.2%	6.5%	6.0%	5.4%	4.9%	4.9%
Bihar	Madhya Pradesh	9.2%	8.3%	6.3%	5.7%	5.2%	4.7%	4.3%	4.3%
Bihar	Punjab	8.2%	7.3%	5.6%	5.1%	4.6%	4.2%	3.8%	3.8%
Bihar	Rajasthan	8.4%	7.5%	5.8%	5.2%	4.8%	4.3%	3.9%	3.9%
Bihar	Uttarakhand	10.1%	9.2%	7.2%	6.6%	6.1%	5.6%	5.0%	5.0%
Bihar	West Bengal	9.1%	8.2%	6.2%	5.6%	5.2%	4.7%	4.2%	4.2%
Bihar	Rest of India	9.1%	8.2%	6.3%	5.7%	5.2%	4.8%	4.3%	4.3%
Haryana	Jharkhand	10.6%	9.5%	7.3%	6.6%	6.0%	5.5%	4.9%	4.9%
Haryana	Madhya Pradesh	10.3%	9.3%	7.1%	6.4%	5.9%	5.3%	4.8%	4.8%
Haryana	Punjab	9.3%	8.4%	6.4%	5.8%	5.3%	4.8%	4.3%	4.3%
Haryana	Rajasthan	9.5%	8.6%	6.6%	6.0%	5.5%	5.0%	4.5%	4.5%
Haryana	Uttarakhand	11.2%	10.2%	8.0%	7.3%	6.7%	6.2%	5.6%	5.6%
Haryana	West Bengal	10.2%	9.2%	7.0%	6.4%	5.8%	5.3%	4.8%	4.8%
Haryana	Rest of India	10.3%	9.2%	7.1%	6.5%	5.9%	5.4%	4.8%	4.8%
Jharkhand	Madhya Pradesh	9.4%	8.4%	6.4%	5.8%	5.3%	4.8%	4.3%	4.3%
Jharkhand	Punjab	8.3%	7.5%	5.7%	5.2%	4.7%	4.3%	3.9%	3.9%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

Jharkhand	Rajasthan	8.6%	7.7%	5.9%	5.3%	4.9%	4.4%	4.0%	4.0%
Jharkhand	Uttarakhand	10.2%	9.4%	7.3%	6.7%	6.1%	5.6%	5.1%	5.1%
Jharkhand	West Bengal	9.3%	8.3%	6.3%	5.7%	5.2%	4.8%	4.3%	4.3%
Jharkhand	Rest of India	9.3%	8.4%	6.4%	5.8%	5.3%	4.8%	4.4%	4.4%
Madhya Pradesh	Punjab	8.0%	7.2%	5.5%	5.0%	4.6%	4.2%	3.7%	3.7%
Madhya Pradesh	Uttarakhand	10.0%	9.1%	7.1%	6.5%	6.0%	5.5%	5.0%	5.0%
Madhya Pradesh	West Bengal	9.0%	8.1%	6.2%	5.6%	5.1%	4.6%	4.2%	4.2%
Madhya Pradesh	Rest of India	9.0%	8.1%	6.3%	5.7%	5.2%	4.7%	4.2%	4.2%
Punjab	Rajasthan	7.3%	6.5%	5.0%	4.5%	4.1%	3.8%	3.4%	3.4%
Punjab	Uttarakhand	8.9%	8.2%	6.4%	5.9%	5.4%	5.0%	4.5%	4.5%
Punjab	West Bengal	7.9%	7.2%	5.4%	4.9%	4.5%	4.1%	3.7%	3.7%
Punjab	Rest of India	8.0%	7.2%	5.6%	5.0%	4.6%	4.2%	3.8%	3.8%
Rajasthan	Uttarakhand	9.2%	8.4%	6.6%	6.1%	5.6%	5.1%	4.6%	4.6%
Rajasthan	West Bengal	8.2%	7.4%	5.6%	5.1%	4.7%	4.2%	3.8%	3.8%
Rajasthan	Rest of India	8.2%	7.4%	5.7%	5.2%	4.8%	4.3%	3.9%	3.9%
Uttarakhand	West Bengal	9.9%	9.0%	7.1%	6.5%	5.9%	5.5%	4.9%	4.9%
Uttarakhand	Rest of India	9.9%	9.1%	7.2%	6.6%	6.0%	5.5%	5.0%	5.0%
West Bengal	West Bengal	8.9%	8.0%	6.1%	5.5%	5.0%	4.6%	4.1%	4.1%
West Bengal	Rest of India	8.9%	8.0%	6.2%	5.6%	5.1%	4.7%	4.2%	4.2%
Rest of India	Rest of India	9.0%	8.1%	6.3%	5.7%	5.2%	4.7%	4.3%	4.3%

Table 4-19 Origin Destination wise Growth rate of Bus

Origin	Destination	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56	2056-61
Uttar Pradesh	Uttar Pradesh	4.9%	3.9%	3.8%	3.4%	3.1%	2.9%	2.6%	2.6%
Uttar Pradesh	Delhi	5.3%	4.2%	3.7%	3.3%	3.0%	2.8%	2.5%	2.5%
Uttar Pradesh	Bihar	5.3%	4.3%	3.7%	3.3%	3.0%	2.8%	2.5%	2.5%
Uttar Pradesh	Haryana	6.0%	4.9%	4.1%	3.8%	3.4%	3.1%	2.8%	2.8%
Uttar Pradesh	Jharkhand	5.4%	4.4%	3.8%	3.4%	3.1%	2.8%	2.5%	2.5%
Uttar Pradesh	Madhya Pradesh	5.3%	4.2%	3.7%	3.3%	3.0%	2.7%	2.5%	2.5%
Uttar Pradesh	Punjab	4.6%	3.7%	3.3%	2.9%	2.7%	2.4%	2.2%	2.2%
Uttar Pradesh	Rajasthan	4.8%	3.8%	3.4%	3.0%	2.8%	2.5%	2.3%	2.3%
Uttar Pradesh	Uttarakhand	5.8%	4.8%	4.2%	3.8%	3.5%	3.2%	2.9%	2.9%
Uttar Pradesh	West Bengal	5.2%	4.2%	3.6%	3.3%	3.0%	2.7%	2.4%	2.4%
Uttar Pradesh	Rest of India	5.2%	4.2%	3.7%	3.3%	3.0%	2.8%	2.5%	2.5%
Delhi	Bihar	5.7%	4.6%	3.5%	3.2%	2.9%	2.7%	2.4%	2.4%
Delhi	Jharkhand	5.8%	4.7%	3.6%	3.3%	3.0%	2.7%	2.4%	2.4%
Delhi	Madhya Pradesh	5.6%	4.6%	3.5%	3.2%	2.9%	2.6%	2.4%	2.4%
Delhi	Rajasthan	5.2%	4.2%	3.2%	2.9%	2.7%	2.4%	2.2%	2.2%
Delhi	Uttarakhand	6.2%	5.1%	4.0%	3.7%	3.4%	3.1%	2.8%	2.8%
Delhi	West Bengal	5.6%	4.5%	3.5%	3.1%	2.9%	2.6%	2.4%	2.4%
Delhi	Rest of India	5.6%	4.6%	3.5%	3.2%	2.9%	2.7%	2.4%	2.4%
Bihar	Haryana	6.5%	5.3%	4.0%	3.6%	3.3%	3.0%	2.7%	2.7%
Bihar	Madhya Pradesh	5.7%	4.6%	3.5%	3.2%	2.9%	2.6%	2.4%	2.4%
Bihar	Punjab	5.1%	4.1%	3.1%	2.8%	2.6%	2.4%	2.1%	2.1%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

Bihar	Rajasthan	5.2%	4.2%	3.2%	2.9%	2.7%	2.4%	2.2%	2.2%
Bihar	Uttarakhand	6.3%	5.2%	4.0%	3.7%	3.4%	3.1%	2.8%	2.8%
Bihar	West Bengal	5.7%	4.6%	3.5%	3.2%	2.9%	2.6%	2.4%	2.4%
Bihar	Rest of India	5.7%	4.6%	3.6%	3.2%	2.9%	2.7%	2.4%	2.4%
Haryana	Jharkhand	6.6%	5.3%	4.1%	3.7%	3.4%	3.1%	2.8%	2.8%
Haryana	Madhya Pradesh	6.4%	5.2%	4.0%	3.6%	3.3%	3.0%	2.7%	2.7%
Haryana	Punjab	5.8%	4.7%	3.6%	3.3%	3.0%	2.7%	2.4%	2.4%
Haryana	Rajasthan	5.9%	4.8%	3.7%	3.3%	3.1%	2.8%	2.5%	2.5%
Haryana	Uttarakhand	7.0%	5.7%	4.5%	4.1%	3.8%	3.5%	3.1%	3.1%
Haryana	West Bengal	6.4%	5.2%	3.9%	3.6%	3.3%	3.0%	2.7%	2.7%
Haryana	Rest of India	6.4%	5.2%	4.0%	3.6%	3.3%	3.0%	2.7%	2.7%
Jharkhand	Madhya Pradesh	5.8%	4.7%	3.6%	3.2%	3.0%	2.7%	2.4%	2.4%
Jharkhand	Punjab	5.2%	4.2%	3.2%	2.9%	2.6%	2.4%	2.2%	2.2%
Jharkhand	Rajasthan	5.3%	4.3%	3.3%	3.0%	2.7%	2.5%	2.2%	2.2%
Jharkhand	Uttarakhand	6.4%	5.2%	4.1%	3.7%	3.4%	3.2%	2.8%	2.8%
Jharkhand	West Bengal	5.8%	4.7%	3.5%	3.2%	2.9%	2.7%	2.4%	2.4%
Jharkhand	Rest of India	5.8%	4.7%	3.6%	3.3%	3.0%	2.7%	2.4%	2.4%
Madhya Pradesh	Punjab	5.0%	4.1%	3.1%	2.8%	2.6%	2.3%	2.1%	2.1%
Madhya Pradesh	Uttarakhand	6.2%	5.1%	4.0%	3.7%	3.4%	3.1%	2.8%	2.8%
Madhya Pradesh	West Bengal	5.6%	4.5%	3.4%	3.1%	2.9%	2.6%	2.3%	2.3%
Madhya Pradesh	Rest of India	5.6%	4.5%	3.5%	3.2%	2.9%	2.6%	2.4%	2.4%
Punjab	Rajasthan	4.5%	3.6%	2.8%	2.5%	2.3%	2.1%	1.9%	1.9%
Punjab	Uttarakhand	5.6%	4.6%	3.6%	3.3%	3.0%	2.8%	2.5%	2.5%
Punjab	West Bengal	4.9%	4.0%	3.1%	2.8%	2.5%	2.3%	2.1%	2.1%
Punjab	Rest of India	5.0%	4.0%	3.1%	2.8%	2.6%	2.3%	2.1%	2.1%
Rajasthan	Uttarakhand	5.7%	4.7%	3.7%	3.4%	3.1%	2.9%	2.6%	2.6%
Rajasthan	West Bengal	5.1%	4.1%	3.2%	2.9%	2.6%	2.4%	2.1%	2.1%
Rajasthan	Rest of India	5.1%	4.1%	3.2%	2.9%	2.7%	2.4%	2.2%	2.2%
Uttarakhand	West Bengal	6.1%	5.1%	4.0%	3.6%	3.3%	3.1%	2.8%	2.8%
Uttarakhand	Rest of India	6.2%	5.1%	4.0%	3.7%	3.4%	3.1%	2.8%	2.8%
West Bengal	West Bengal	5.5%	4.5%	3.4%	3.1%	2.8%	2.6%	2.3%	2.3%
West Bengal	Rest of India	5.6%	4.5%	3.5%	3.1%	2.9%	2.6%	2.4%	2.4%
Rest of India	Rest of India	5.6%	4.5%	3.5%	3.2%	2.9%	2.7%	2.4%	2.4%

Table 4-20 Origin Destination wise Growth rate of LCV

Origin	Destination	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56	2056-61
Uttar Pradesh	Uttar Pradesh	5.7%	4.7%	3.9%	3.5%	3.0%	2.6%	2.3%	2.3%
Uttar Pradesh	Delhi	6.3%	5.1%	3.9%	3.5%	3.1%	2.8%	2.5%	2.5%
Uttar Pradesh	Bihar	6.0%	4.9%	3.8%	3.4%	2.9%	2.6%	2.4%	2.4%
Uttar Pradesh	Haryana	6.6%	5.4%	4.1%	3.7%	3.2%	2.9%	2.6%	2.6%
Uttar Pradesh	Jharkhand	5.9%	4.8%	3.7%	3.3%	2.9%	2.6%	2.3%	2.3%
Uttar Pradesh	Madhya Pradesh	6.1%	5.0%	3.8%	3.4%	3.0%	2.7%	2.4%	2.4%
Uttar Pradesh	Punjab	5.4%	4.4%	3.4%	3.0%	2.7%	2.4%	2.1%	2.1%
Uttar Pradesh	Rajasthan	5.6%	4.5%	3.5%	3.1%	2.8%	2.5%	2.2%	2.2%
Uttar Pradesh	Uttarakhand	6.2%	5.1%	3.9%	3.5%	3.1%	2.7%	2.5%	2.5%
Uttar Pradesh	West Bengal	5.8%	4.7%	3.7%	3.2%	2.9%	2.5%	2.3%	2.3%
Uttar Pradesh	Rest of India	5.9%	4.8%	3.7%	3.3%	2.9%	2.6%	2.3%	2.3%
Delhi	Bihar	6.5%	5.3%	3.8%	3.4%	3.1%	2.8%	2.5%	2.5%
Delhi	Jharkhand	6.4%	5.3%	3.8%	3.4%	3.0%	2.8%	2.5%	2.5%
Delhi	Madhya Pradesh	6.6%	5.4%	3.9%	3.5%	3.1%	2.8%	2.6%	2.6%
Delhi	Rajasthan	6.1%	5.0%	3.6%	3.2%	2.9%	2.6%	2.4%	2.4%
Delhi	Uttarakhand	6.7%	5.5%	4.0%	3.5%	3.2%	2.9%	2.6%	2.6%
Delhi	West Bengal	6.3%	5.1%	3.7%	3.3%	3.0%	2.7%	2.4%	2.4%
Delhi	Rest of India	6.4%	5.2%	3.8%	3.4%	3.0%	2.8%	2.5%	2.5%
Bihar	Haryana	6.8%	5.5%	4.0%	3.6%	3.2%	2.9%	2.6%	2.6%
Bihar	Madhya Pradesh	6.3%	5.1%	3.7%	3.3%	3.0%	2.7%	2.4%	2.4%
Bihar	Punjab	5.6%	4.6%	3.3%	2.9%	2.6%	2.4%	2.2%	2.2%
Bihar	Rajasthan	5.8%	4.7%	3.4%	3.0%	2.7%	2.5%	2.2%	2.2%
Bihar	Uttarakhand	6.4%	5.2%	3.8%	3.4%	3.0%	2.8%	2.5%	2.5%
Bihar	West Bengal	6.0%	4.9%	3.5%	3.1%	2.8%	2.6%	2.3%	2.3%
Bihar	Rest of India	6.1%	5.0%	3.6%	3.2%	2.9%	2.6%	2.4%	2.4%
Haryana	Jharkhand	6.8%	5.5%	4.0%	3.5%	3.2%	2.9%	2.6%	2.6%
Haryana	Madhya Pradesh	6.9%	5.6%	4.1%	3.6%	3.3%	3.0%	2.7%	2.7%
Haryana	Punjab	6.2%	5.1%	3.7%	3.3%	2.9%	2.7%	2.4%	2.4%
Haryana	Rajasthan	6.4%	5.2%	3.8%	3.4%	3.0%	2.8%	2.5%	2.5%
Haryana	Uttarakhand	7.0%	5.8%	4.1%	3.7%	3.3%	3.0%	2.7%	2.7%
Haryana	West Bengal	6.6%	5.4%	3.9%	3.5%	3.1%	2.8%	2.6%	2.6%
Haryana	Rest of India	6.7%	5.5%	4.0%	3.5%	3.2%	2.9%	2.6%	2.6%
Jharkhand	Madhya Pradesh	6.2%	5.1%	3.7%	3.3%	3.0%	2.7%	2.4%	2.4%
Jharkhand	Punjab	5.5%	4.5%	3.3%	2.9%	2.6%	2.4%	2.2%	2.2%
Jharkhand	Rajasthan	5.7%	4.7%	3.4%	3.0%	2.7%	2.5%	2.2%	2.2%
Jharkhand	Uttarakhand	6.4%	5.2%	3.8%	3.3%	3.0%	2.8%	2.5%	2.5%
Jharkhand	West Bengal	5.9%	4.8%	3.5%	3.1%	2.8%	2.6%	2.3%	2.3%
Jharkhand	Rest of India	6.0%	4.9%	3.6%	3.2%	2.9%	2.6%	2.3%	2.3%
Madhya Pradesh	Punjab	5.7%	4.6%	3.4%	3.0%	2.7%	2.5%	2.2%	2.2%
Madhya Pradesh	Uttarakhand	6.5%	5.3%	3.9%	3.4%	3.1%	2.8%	2.5%	2.5%
Madhya Pradesh	West Bengal	6.1%	5.0%	3.6%	3.2%	2.9%	2.6%	2.4%	2.4%
Madhya Pradesh	Rest of India	6.2%	5.1%	3.7%	3.3%	2.9%	2.7%	2.4%	2.4%

Punjab	Rajasthan	5.2%	4.2%	3.1%	2.7%	2.5%	2.2%	2.0%	2.0%
Punjab	Uttarakhand	5.8%	4.8%	3.4%	3.1%	2.8%	2.5%	2.3%	2.3%
Punjab	West Bengal	5.4%	4.4%	3.2%	2.8%	2.5%	2.3%	2.1%	2.1%
Punjab	Rest of India	5.5%	4.5%	3.2%	2.9%	2.6%	2.4%	2.1%	2.1%
Rajasthan	Uttarakhand	6.0%	4.9%	3.6%	3.2%	2.9%	2.6%	2.3%	2.3%
Rajasthan	West Bengal	5.6%	4.6%	3.3%	2.9%	2.6%	2.4%	2.2%	2.2%
Rajasthan	Rest of India	5.7%	4.6%	3.4%	3.0%	2.7%	2.5%	2.2%	2.2%
Uttarakhand	West Bengal	6.2%	5.1%	3.7%	3.3%	2.9%	2.7%	2.4%	2.4%
Uttarakhand	Rest of India	6.3%	5.2%	3.7%	3.3%	3.0%	2.7%	2.5%	2.5%
West Bengal	West Bengal	5.8%	4.7%	3.4%	3.0%	2.7%	2.5%	2.2%	2.2%
West Bengal	Rest of India	5.9%	4.8%	3.5%	3.1%	2.8%	2.5%	2.3%	2.3%
Rest of India	Rest of India	6.0%	4.9%	3.5%	3.1%	2.8%	2.6%	2.3%	2.3%

Table 4-21 Origin Destination wise Growth rate of 2 Axle Truck

Origin	Destination	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56	2056-61
Uttar Pradesh	Uttar Pradesh	6.3%	5.1%	4.2%	3.8%	3.2%	2.8%	2.5%	2.5%
Uttar Pradesh	Delhi	6.8%	5.6%	4.3%	3.8%	3.4%	3.0%	2.7%	2.7%
Uttar Pradesh	Bihar	6.5%	5.3%	4.1%	3.7%	3.2%	2.9%	2.6%	2.6%
Uttar Pradesh	Haryana	7.2%	5.8%	4.5%	4.0%	3.5%	3.1%	2.8%	2.8%
Uttar Pradesh	Jharkhand	6.4%	5.3%	4.1%	3.6%	3.2%	2.8%	2.6%	2.6%
Uttar Pradesh	Madhya Pradesh	6.6%	5.4%	4.2%	3.7%	3.3%	2.9%	2.6%	2.6%
Uttar Pradesh	Punjab	5.8%	4.8%	3.7%	3.3%	2.9%	2.6%	2.3%	2.3%
Uttar Pradesh	Rajasthan	6.1%	5.0%	3.9%	3.4%	3.0%	2.7%	2.4%	2.4%
Uttar Pradesh	Uttarakhand	6.8%	5.5%	4.3%	3.8%	3.3%	3.0%	2.7%	2.7%
Uttar Pradesh	West Bengal	6.3%	5.1%	4.0%	3.5%	3.1%	2.8%	2.5%	2.5%
Uttar Pradesh	Rest of India	6.4%	5.2%	4.0%	3.6%	3.2%	2.8%	2.5%	2.5%
Delhi	Bihar	7.1%	5.8%	4.2%	3.7%	3.3%	3.0%	2.7%	2.7%
Delhi	Jharkhand	7.0%	5.7%	4.1%	3.7%	3.3%	3.0%	2.7%	2.7%
Delhi	Madhya Pradesh	7.2%	5.9%	4.2%	3.8%	3.4%	3.1%	2.8%	2.8%
Delhi	Rajasthan	6.6%	5.4%	3.9%	3.5%	3.1%	2.9%	2.6%	2.6%
Delhi	Uttarakhand	7.3%	6.0%	4.3%	3.8%	3.5%	3.2%	2.8%	2.8%
Delhi	West Bengal	6.8%	5.6%	4.0%	3.6%	3.2%	3.0%	2.7%	2.7%
Delhi	Rest of India	7.0%	5.7%	4.1%	3.7%	3.3%	3.0%	2.7%	2.7%
Bihar	Haryana	7.4%	6.0%	4.4%	3.9%	3.5%	3.2%	2.9%	2.9%
Bihar	Madhya Pradesh	6.8%	5.6%	4.0%	3.6%	3.2%	3.0%	2.7%	2.7%
Bihar	Punjab	6.1%	5.0%	3.6%	3.2%	2.9%	2.6%	2.4%	2.4%
Bihar	Rajasthan	6.3%	5.1%	3.7%	3.3%	3.0%	2.7%	2.5%	2.5%
Bihar	Uttarakhand	7.0%	5.7%	4.1%	3.7%	3.3%	3.0%	2.7%	2.7%
Bihar	West Bengal	6.5%	5.3%	3.8%	3.4%	3.1%	2.8%	2.5%	2.5%
Bihar	Rest of India	6.6%	5.4%	3.9%	3.5%	3.1%	2.9%	2.6%	2.6%
Haryana	Jharkhand	7.4%	6.0%	4.3%	3.9%	3.5%	3.2%	2.9%	2.9%
Haryana	Madhya Pradesh	7.5%	6.1%	4.4%	3.9%	3.6%	3.2%	2.9%	2.9%
Haryana	Punjab	6.8%	5.5%	4.0%	3.5%	3.2%	2.9%	2.6%	2.6%
Haryana	Rajasthan	7.0%	5.7%	4.1%	3.7%	3.3%	3.0%	2.7%	2.7%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

Haryana	Uttarakhand	7.7%	6.3%	4.5%	4.0%	3.6%	3.3%	3.0%	3.0%
Haryana	West Bengal	7.2%	5.9%	4.2%	3.8%	3.4%	3.1%	2.8%	2.8%
Haryana	Rest of India	7.3%	6.0%	4.3%	3.8%	3.4%	3.1%	2.8%	2.8%
Jharkhand	Madhya Pradesh	6.8%	5.6%	4.0%	3.6%	3.2%	2.9%	2.6%	2.6%
Jharkhand	Punjab	6.0%	4.9%	3.6%	3.2%	2.9%	2.6%	2.3%	2.3%
Jharkhand	Rajasthan	6.3%	5.1%	3.7%	3.3%	3.0%	2.7%	2.4%	2.4%
Jharkhand	Uttarakhand	7.0%	5.7%	4.1%	3.6%	3.3%	3.0%	2.7%	2.7%
Jharkhand	West Bengal	6.5%	5.3%	3.8%	3.4%	3.1%	2.8%	2.5%	2.5%
Jharkhand	Rest of India	6.6%	5.4%	3.9%	3.5%	3.1%	2.8%	2.6%	2.6%
Madhya Pradesh	Punjab	6.2%	5.1%	3.7%	3.3%	2.9%	2.7%	2.4%	2.4%
Madhya Pradesh	Uttarakhand	7.1%	5.8%	4.2%	3.7%	3.4%	3.1%	2.8%	2.8%
Madhya Pradesh	West Bengal	6.6%	5.4%	3.9%	3.5%	3.1%	2.9%	2.6%	2.6%
Madhya Pradesh	Rest of India	6.8%	5.5%	4.0%	3.5%	3.2%	2.9%	2.6%	2.6%
Punjab	Rajasthan	5.7%	4.6%	3.3%	3.0%	2.7%	2.4%	2.2%	2.2%
Punjab	Uttarakhand	6.4%	5.2%	3.7%	3.3%	3.0%	2.7%	2.5%	2.5%
Punjab	West Bengal	5.9%	4.8%	3.5%	3.1%	2.8%	2.5%	2.3%	2.3%
Punjab	Rest of India	6.0%	4.9%	3.5%	3.1%	2.8%	2.6%	2.3%	2.3%
Rajasthan	Uttarakhand	6.6%	5.4%	3.9%	3.5%	3.1%	2.8%	2.6%	2.6%
Rajasthan	West Bengal	6.1%	5.0%	3.6%	3.2%	2.9%	2.6%	2.4%	2.4%
Rajasthan	Rest of India	6.2%	5.1%	3.7%	3.3%	2.9%	2.7%	2.4%	2.4%
Uttarakhand	West Bengal	6.8%	5.5%	4.0%	3.6%	3.2%	2.9%	2.6%	2.6%
Uttarakhand	Rest of India	6.9%	5.6%	4.1%	3.6%	3.3%	3.0%	2.7%	2.7%
West Bengal	West Bengal	6.3%	5.1%	3.7%	3.3%	3.0%	2.7%	2.4%	2.4%
West Bengal	Rest of India	6.4%	5.2%	3.8%	3.4%	3.0%	2.8%	2.5%	2.5%
Rest of India	Rest of India	6.5%	5.3%	3.9%	3.4%	3.1%	2.8%	2.5%	2.5%

Table 4-22 Origin Destination wise Growth rate of 3 Axle Truck

Origin	Destination	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56	2056-61
Uttar Pradesh	Uttar Pradesh	3.7%	3.0%	2.5%	2.5%	2.1%	1.9%	1.7%	1.7%
Uttar Pradesh	Delhi	4.0%	3.3%	2.5%	2.5%	2.2%	2.0%	1.8%	1.8%
Uttar Pradesh	Bihar	3.8%	3.1%	2.4%	2.4%	2.1%	1.9%	1.7%	1.7%
Uttar Pradesh	Haryana	4.2%	3.5%	2.7%	2.6%	2.3%	2.1%	1.9%	1.9%
Uttar Pradesh	Jharkhand	3.8%	3.1%	2.4%	2.4%	2.1%	1.9%	1.7%	1.7%
Uttar Pradesh	Madhya Pradesh	3.9%	3.2%	2.5%	2.4%	2.1%	1.9%	1.7%	1.7%
Uttar Pradesh	Punjab	3.4%	2.8%	2.2%	2.2%	1.9%	1.7%	1.5%	1.5%
Uttar Pradesh	Rajasthan	3.6%	2.9%	2.3%	2.3%	2.0%	1.8%	1.6%	1.6%
Uttar Pradesh	Uttarakhand	4.0%	3.3%	2.5%	2.5%	2.2%	2.0%	1.8%	1.8%
Uttar Pradesh	West Bengal	3.7%	3.0%	2.3%	2.3%	2.0%	1.8%	1.6%	1.6%
Uttar Pradesh	Rest of India	3.8%	3.1%	2.4%	2.4%	2.1%	1.9%	1.7%	1.7%
Delhi	Bihar	4.2%	3.4%	2.5%	2.4%	2.2%	2.0%	1.8%	1.8%
Delhi	Jharkhand	4.1%	3.4%	2.4%	2.4%	2.2%	2.0%	1.8%	1.8%
Delhi	Madhya Pradesh	4.2%	3.5%	2.5%	2.5%	2.2%	2.0%	1.8%	1.8%
Delhi	Rajasthan	3.9%	3.2%	2.3%	2.3%	2.1%	1.9%	1.7%	1.7%
Delhi	Uttarakhand	4.3%	3.5%	2.6%	2.5%	2.3%	2.1%	1.9%	1.9%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

Delhi	West Bengal	4.0%	3.3%	2.4%	2.4%	2.1%	1.9%	1.7%	1.7%
Delhi	Rest of India	4.1%	3.4%	2.4%	2.4%	2.2%	2.0%	1.8%	1.8%
Bihar	Haryana	4.4%	3.6%	2.6%	2.5%	2.3%	2.1%	1.9%	1.9%
Bihar	Madhya Pradesh	4.0%	3.3%	2.4%	2.4%	2.1%	1.9%	1.7%	1.7%
Bihar	Punjab	3.6%	2.9%	2.1%	2.1%	1.9%	1.7%	1.6%	1.6%
Bihar	Rajasthan	3.7%	3.0%	2.2%	2.2%	2.0%	1.8%	1.6%	1.6%
Bihar	Uttarakhand	4.1%	3.4%	2.4%	2.4%	2.2%	2.0%	1.8%	1.8%
Bihar	West Bengal	3.8%	3.1%	2.3%	2.2%	2.0%	1.8%	1.7%	1.7%
Bihar	Rest of India	3.9%	3.2%	2.3%	2.3%	2.1%	1.9%	1.7%	1.7%
Haryana	Jharkhand	4.3%	3.5%	2.6%	2.5%	2.3%	2.1%	1.9%	1.9%
Haryana	Madhya Pradesh	4.4%	3.6%	2.6%	2.6%	2.3%	2.1%	1.9%	1.9%
Haryana	Punjab	4.0%	3.3%	2.3%	2.3%	2.1%	1.9%	1.7%	1.7%
Haryana	Rajasthan	4.1%	3.4%	2.4%	2.4%	2.2%	2.0%	1.8%	1.8%
Haryana	Uttarakhand	4.5%	3.7%	2.7%	2.6%	2.4%	2.2%	2.0%	2.0%
Haryana	West Bengal	4.2%	3.5%	2.5%	2.5%	2.2%	2.0%	1.8%	1.8%
Haryana	Rest of India	4.3%	3.5%	2.5%	2.5%	2.3%	2.1%	1.9%	1.9%
Jharkhand	Madhya Pradesh	4.0%	3.3%	2.4%	2.3%	2.1%	1.9%	1.7%	1.7%
Jharkhand	Punjab	3.6%	2.9%	2.1%	2.1%	1.9%	1.7%	1.5%	1.5%
Jharkhand	Rajasthan	3.7%	3.0%	2.2%	2.2%	1.9%	1.8%	1.6%	1.6%
Jharkhand	Uttarakhand	4.1%	3.4%	2.4%	2.4%	2.2%	2.0%	1.8%	1.8%
Jharkhand	West Bengal	3.8%	3.1%	2.3%	2.2%	2.0%	1.8%	1.6%	1.6%
Jharkhand	Rest of India	3.9%	3.2%	2.3%	2.3%	2.0%	1.9%	1.7%	1.7%
Madhya Pradesh	Punjab	3.7%	3.0%	2.2%	2.1%	1.9%	1.8%	1.6%	1.6%
Madhya Pradesh	Uttarakhand	4.2%	3.4%	2.5%	2.4%	2.2%	2.0%	1.8%	1.8%
Madhya Pradesh	West Bengal	3.9%	3.2%	2.3%	2.3%	2.1%	1.9%	1.7%	1.7%
Madhya Pradesh	Rest of India	4.0%	3.3%	2.4%	2.3%	2.1%	1.9%	1.7%	1.7%
Punjab	Rajasthan	3.3%	2.7%	2.0%	1.9%	1.8%	1.6%	1.4%	1.4%
Punjab	Uttarakhand	3.7%	3.1%	2.2%	2.2%	2.0%	1.8%	1.6%	1.6%
Punjab	West Bengal	3.5%	2.8%	2.0%	2.0%	1.8%	1.7%	1.5%	1.5%
Punjab	Rest of India	3.5%	2.9%	2.1%	2.1%	1.9%	1.7%	1.5%	1.5%
Rajasthan	Uttarakhand	3.9%	3.2%	2.3%	2.3%	2.0%	1.9%	1.7%	1.7%
Rajasthan	West Bengal	3.6%	2.9%	2.1%	2.1%	1.9%	1.7%	1.6%	1.6%
Rajasthan	Rest of India	3.7%	3.0%	2.2%	2.1%	1.9%	1.8%	1.6%	1.6%
Uttarakhand	West Bengal	4.0%	3.3%	2.4%	2.3%	2.1%	1.9%	1.7%	1.7%
Uttarakhand	Rest of India	4.1%	3.3%	2.4%	2.4%	2.1%	2.0%	1.8%	1.8%
West Bengal	West Bengal	3.7%	3.0%	2.2%	2.2%	2.0%	1.8%	1.6%	1.6%
West Bengal	Rest of India	3.8%	3.1%	2.2%	2.2%	2.0%	1.8%	1.6%	1.6%
Rest of India	Rest of India	3.9%	3.1%	2.3%	2.2%	2.0%	1.9%	1.7%	1.7%

Table 4-23 Origin Destination wise Growth rate of Multi Axle Vehicle (MAV)

Origin	Destination	2022-26	2027-31	2032-36	2037-41	2042-46	2047-51	2051-56	2056-61
Uttar Pradesh	Uttar Pradesh	8.4%	6.9%	5.7%	5.1%	4.4%	3.8%	3.4%	3.4%
Uttar Pradesh	Delhi	9.2%	7.5%	5.8%	5.1%	4.5%	4.0%	3.6%	3.6%
Uttar Pradesh	Bihar	8.7%	7.1%	5.5%	4.9%	4.3%	3.8%	3.5%	3.5%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

Uttar Pradesh	Haryana	9.6%	7.9%	6.0%	5.4%	4.7%	4.2%	3.8%	3.8%
Uttar Pradesh	Jharkhand	8.7%	7.1%	5.5%	4.9%	4.3%	3.8%	3.4%	3.4%
Uttar Pradesh	Madhya Pradesh	8.9%	7.3%	5.6%	5.0%	4.4%	3.9%	3.5%	3.5%
Uttar Pradesh	Punjab	7.8%	6.4%	5.0%	4.5%	3.9%	3.5%	3.1%	3.1%
Uttar Pradesh	Rajasthan	8.1%	6.7%	5.2%	4.6%	4.0%	3.6%	3.2%	3.2%
Uttar Pradesh	Uttarakhand	9.1%	7.4%	5.7%	5.1%	4.5%	4.0%	3.6%	3.6%
Uttar Pradesh	West Bengal	8.4%	6.9%	5.3%	4.8%	4.2%	3.7%	3.4%	3.4%
Uttar Pradesh	Rest of India	8.6%	7.0%	5.4%	4.8%	4.3%	3.8%	3.4%	3.4%
Delhi	Bihar	9.5%	7.7%	5.6%	5.0%	4.5%	4.1%	3.7%	3.7%
Delhi	Jharkhand	9.4%	7.7%	5.6%	4.9%	4.5%	4.1%	3.7%	3.7%
Delhi	Madhya Pradesh	9.7%	7.9%	5.7%	5.1%	4.6%	4.2%	3.7%	3.7%
Delhi	Rajasthan	8.9%	7.3%	5.3%	4.7%	4.2%	3.8%	3.5%	3.5%
Delhi	Uttarakhand	9.9%	8.0%	5.8%	5.2%	4.7%	4.2%	3.8%	3.8%
Delhi	West Bengal	9.2%	7.5%	5.4%	4.8%	4.3%	4.0%	3.6%	3.6%
Delhi	Rest of India	9.4%	7.6%	5.5%	4.9%	4.4%	4.0%	3.6%	3.6%
Bihar	Haryana	9.9%	8.1%	5.9%	5.2%	4.7%	4.3%	3.9%	3.9%
Bihar	Madhya Pradesh	9.2%	7.5%	5.4%	4.8%	4.3%	4.0%	3.6%	3.6%
Bihar	Punjab	8.2%	6.7%	4.8%	4.3%	3.9%	3.5%	3.2%	3.2%
Bihar	Rajasthan	8.5%	6.9%	5.0%	4.4%	4.0%	3.7%	3.3%	3.3%
Bihar	Uttarakhand	9.4%	7.7%	5.5%	4.9%	4.4%	4.1%	3.7%	3.7%
Bihar	West Bengal	8.8%	7.1%	5.2%	4.6%	4.1%	3.8%	3.4%	3.4%
Bihar	Rest of India	8.9%	7.3%	5.3%	4.7%	4.2%	3.8%	3.5%	3.5%
Haryana	Jharkhand	9.9%	8.1%	5.8%	5.2%	4.7%	4.3%	3.8%	3.8%
Haryana	Madhya Pradesh	10.1%	8.3%	6.0%	5.3%	4.8%	4.4%	3.9%	3.9%
Haryana	Punjab	9.1%	7.4%	5.3%	4.8%	4.3%	3.9%	3.5%	3.5%
Haryana	Rajasthan	9.4%	7.7%	5.5%	4.9%	4.4%	4.0%	3.6%	3.6%
Haryana	Uttarakhand	10.3%	8.4%	6.1%	5.4%	4.9%	4.4%	4.0%	4.0%
Haryana	West Bengal	9.7%	7.9%	5.7%	5.1%	4.6%	4.2%	3.7%	3.7%
Haryana	Rest of India	9.8%	8.0%	5.8%	5.1%	4.6%	4.2%	3.8%	3.8%
Jharkhand	Madhya Pradesh	9.1%	7.5%	5.4%	4.8%	4.3%	3.9%	3.5%	3.5%
Jharkhand	Punjab	8.1%	6.6%	4.8%	4.3%	3.8%	3.5%	3.2%	3.2%
Jharkhand	Rajasthan	8.4%	6.9%	5.0%	4.4%	4.0%	3.6%	3.3%	3.3%
Jharkhand	Uttarakhand	9.3%	7.6%	5.5%	4.9%	4.4%	4.0%	3.6%	3.6%
Jharkhand	West Bengal	8.7%	7.1%	5.1%	4.6%	4.1%	3.8%	3.4%	3.4%
Jharkhand	Rest of India	8.8%	7.2%	5.2%	4.6%	4.2%	3.8%	3.4%	3.4%
Madhya Pradesh	Punjab	8.3%	6.8%	4.9%	4.4%	3.9%	3.6%	3.2%	3.2%
Madhya Pradesh	Uttarakhand	9.6%	7.8%	5.6%	5.0%	4.5%	4.1%	3.7%	3.7%
Madhya Pradesh	West Bengal	8.9%	7.3%	5.3%	4.7%	4.2%	3.8%	3.5%	3.5%
Madhya Pradesh	Rest of India	9.1%	7.4%	5.3%	4.8%	4.3%	3.9%	3.5%	3.5%
Punjab	Rajasthan	7.6%	6.2%	4.5%	4.0%	3.6%	3.3%	3.0%	3.0%
Punjab	Uttarakhand	8.5%	7.0%	5.0%	4.5%	4.0%	3.7%	3.3%	3.3%
Punjab	West Bengal	7.9%	6.4%	4.7%	4.1%	3.7%	3.4%	3.1%	3.1%
Punjab	Rest of India	8.0%	6.6%	4.7%	4.2%	3.8%	3.5%	3.1%	3.1%
Rajasthan	Uttarakhand	8.8%	7.2%	5.2%	4.6%	4.2%	3.8%	3.4%	3.4%
Rajasthan	West Bengal	8.2%	6.7%	4.8%	4.3%	3.9%	3.5%	3.2%	3.2%
Rajasthan	Rest of India	8.3%	6.8%	4.9%	4.4%	3.9%	3.6%	3.2%	3.2%
Uttarakhand	West Bengal	9.1%	7.4%	5.4%	4.8%	4.3%	3.9%	3.5%	3.5%

Uttarakhand	Rest of India	9.3%	7.6%	5.5%	4.9%	4.4%	4.0%	3.6%	3.6%
West Bengal	West Bengal	8.5%	6.9%	5.0%	4.4%	4.0%	3.7%	3.3%	3.3%
West Bengal	Rest of India	8.6%	7.0%	5.1%	4.5%	4.1%	3.7%	3.4%	3.4%
Rest of India	Rest of India	8.8%	7.2%	5.2%	4.6%	4.2%	3.8%	3.4%	3.4%

4.2.7 Apparent Growth Rate For Group 1

Apparent growth rate is growth of traffic from (n+1)th year and nth year. The traffic in all the years are derived using the growth rate described in above section and from this derived traffic entry and exit growth rate is derived. This is called apparent growth which is the growth at a particular entry exit pair. The table below shows apparent growth rate at entry-exit pairs whose traffic was non-zero in the base year. The last row gives the average growth rate of for a particular year.

Table 4-24 Apparent Growth Rate of Car (Entry-Exit wise)

Entry Point	Exit Point	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	E	7.95%	7.95%	7.96%	7.96%	7.96%	7.05%	7.06%	7.06%	7.06%	7.06%	6.84%	6.84%
A	G	8.41%	8.42%	8.43%	8.44%	8.44%	7.53%	7.54%	7.55%	7.55%	7.56%	6.89%	6.90%
B	E	8.30%	8.30%	8.30%	8.30%	8.30%	7.43%	7.43%	7.43%	7.43%	7.43%	6.64%	6.64%
B	G	8.42%	8.42%	8.42%	8.42%	8.43%	7.55%	7.55%	7.55%	7.55%	7.55%	6.61%	6.61%
D	G	7.86%	7.86%	7.86%	7.86%	7.86%	6.96%	6.96%	6.96%	6.96%	6.96%	6.83%	6.83%
E	A	8.38%	8.39%	8.40%	8.40%	8.41%	7.48%	7.49%	7.49%	7.50%	7.51%	6.98%	6.98%
E	B	8.20%	8.21%	8.21%	8.21%	8.21%	7.32%	7.32%	7.32%	7.32%	7.33%	6.72%	6.72%
E	G	7.90%	7.90%	7.90%	7.90%	7.90%	7.00%	7.00%	7.00%	7.00%	7.00%	6.81%	6.81%
G	A	8.73%	8.73%	8.74%	8.75%	8.75%	7.83%	7.83%	7.84%	7.85%	7.85%	7.04%	7.05%
G	B	8.33%	8.33%	8.33%	8.34%	8.34%	7.45%	7.45%	7.45%	7.46%	7.46%	6.69%	6.69%
G	C	7.86%	7.86%	7.86%	7.86%	7.86%	6.96%	6.96%	6.96%	6.96%	6.96%	6.83%	6.83%
G	D	7.86%	7.86%	7.86%	7.86%	7.86%	6.96%	6.96%	6.96%	6.96%	6.96%	6.83%	6.83%
G	E	7.86%	7.86%	7.86%	7.86%	7.86%	6.96%	6.96%	6.96%	6.96%	6.96%	6.83%	6.83%
Avg.		8.16%	8.16%	8.16%	8.17%	8.17%	7.27%	7.27%	7.27%	7.27%	7.27%	6.81%	6.81%

Apparent Growth Rate of Car (Entry-Exit wise)

Entry Point	Exit Point	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46
A	E	6.84%	6.84%	6.84%	6.16%	6.16%	6.16%	6.16%	6.16%	5.61%	5.61%	5.61%	5.61%
A	G	6.90%	6.90%	6.90%	6.24%	6.24%	6.24%	6.24%	6.25%	5.70%	5.70%	5.70%	5.70%
B	E	6.64%	6.64%	6.64%	6.00%	6.00%	6.00%	6.00%	6.00%	5.47%	5.47%	5.47%	5.47%
B	G	6.61%	6.61%	6.61%	5.97%	5.97%	5.97%	5.97%	5.97%	5.45%	5.45%	5.45%	5.45%
D	G	6.83%	6.83%	6.83%	6.15%	6.15%	6.15%	6.15%	6.15%	5.60%	5.60%	5.60%	5.60%
E	A	6.98%	6.98%	6.99%	6.30%	6.30%	6.30%	6.30%	6.31%	5.75%	5.75%	5.75%	5.75%
E	B	6.72%	6.72%	6.72%	6.07%	6.07%	6.07%	6.07%	6.07%	5.53%	5.53%	5.53%	5.53%
E	G	6.81%	6.81%	6.81%	6.14%	6.14%	6.14%	6.14%	6.14%	5.59%	5.59%	5.59%	5.59%
G	A	7.05%	7.05%	7.05%	6.37%	6.38%	6.38%	6.38%	6.38%	5.82%	5.83%	5.83%	5.83%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

G	B	6.69%	6.69%	6.69%	6.04%	6.04%	6.04%	6.04%	6.04%	5.51%	5.51%	5.51%	5.51%
G	C	6.83%	6.83%	6.83%	6.15%	6.15%	6.15%	6.15%	6.15%	5.60%	5.60%	5.60%	5.60%
G	D	6.83%	6.83%	6.83%	6.15%	6.15%	6.15%	6.15%	6.15%	5.60%	5.60%	5.60%	5.60%
G	E	6.83%	6.83%	6.83%	6.15%	6.15%	6.15%	6.15%	6.15%	5.60%	5.60%	5.60%	5.60%
Avg.		6.81%	6.81%	6.81%	6.14%	6.14%	6.15%	6.15%	6.15%	5.60%	5.60%	5.60%	5.60%

Apparent Growth Rate of Car (Entry-Exit wise)

Entry Point	Exit Point	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58
A	E	5.61%	5.11%	5.11%	5.11%	5.11%	5.11%	4.59%	4.59%	4.59%	4.59%	4.59%	4.59%
A	G	5.71%	5.19%	5.20%	5.20%	5.20%	5.20%	4.68%	4.68%	4.68%	4.68%	4.68%	4.68%
B	E	5.47%	4.97%	4.97%	4.97%	4.97%	4.97%	4.47%	4.47%	4.47%	4.47%	4.47%	4.47%
B	G	5.45%	4.96%	4.96%	4.96%	4.96%	4.96%	4.46%	4.46%	4.46%	4.46%	4.46%	4.46%
D	G	5.60%	5.09%	5.09%	5.09%	5.09%	5.09%	4.58%	4.58%	4.58%	4.58%	4.58%	4.58%
E	A	5.75%	5.23%	5.23%	5.23%	5.23%	5.23%	4.71%	4.71%	4.71%	4.71%	4.71%	4.71%
E	B	5.53%	5.03%	5.03%	5.03%	5.03%	5.03%	4.52%	4.53%	4.53%	4.53%	4.53%	4.53%
E	G	5.59%	5.08%	5.08%	5.08%	5.08%	5.08%	4.57%	4.57%	4.57%	4.57%	4.57%	4.57%
G	A	5.83%	5.31%	5.31%	5.31%	5.31%	5.31%	4.78%	4.78%	4.78%	4.78%	4.78%	4.78%
G	B	5.51%	5.01%	5.01%	5.01%	5.01%	5.01%	4.51%	4.51%	4.51%	4.51%	4.51%	4.51%
G	C	5.60%	5.09%	5.09%	5.09%	5.09%	5.09%	4.58%	4.58%	4.58%	4.58%	4.58%	4.58%
G	D	5.60%	5.09%	5.09%	5.09%	5.09%	5.09%	4.58%	4.58%	4.58%	4.58%	4.58%	4.58%
G	E	5.60%	5.09%	5.09%	5.09%	5.09%	5.09%	4.58%	4.58%	4.58%	4.58%	4.58%	4.58%
Avg.		5.60%	5.10%	5.10%	5.10%	5.10%	5.10%	4.58%	4.58%	4.59%	4.59%	4.59%	4.59%

Table 4-25 Apparent Growth Rate of Bus (Entry-Exit wise)

Entry Point	Exit Point	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	E	4.90%	4.90%	4.90%	4.90%	4.91%	3.91%	3.91%	3.91%	3.91%	3.91%	3.81%	3.81%
A	G	5.26%	5.27%	5.27%	5.27%	5.28%	4.23%	4.24%	4.24%	4.24%	4.24%	3.87%	3.87%
B	E	5.24%	5.24%	5.24%	5.24%	5.24%	4.23%	4.23%	4.23%	4.23%	4.23%	3.69%	3.69%
B	G	5.23%	5.23%	5.23%	5.24%	5.24%	4.22%	4.22%	4.22%	4.22%	4.22%	3.69%	3.69%
D	G	4.89%	4.89%	4.89%	4.89%	4.89%	3.90%	3.90%	3.90%	3.90%	3.90%	3.82%	3.82%
E	A	4.92%	4.92%	4.92%	4.92%	4.92%	3.92%	3.92%	3.92%	3.92%	3.92%	3.83%	3.83%
E	B	5.21%	5.21%	5.21%	5.21%	5.21%	4.20%	4.20%	4.20%	4.20%	4.20%	3.70%	3.70%
E	G	4.89%	4.89%	4.89%	4.89%	4.89%	3.90%	3.90%	3.90%	3.90%	3.90%	3.82%	3.82%
G	A	5.17%	5.17%	5.17%	5.17%	5.18%	4.16%	4.16%	4.16%	4.16%	4.16%	3.68%	3.69%
G	B	5.21%	5.21%	5.21%	5.21%	5.21%	4.19%	4.20%	4.20%	4.20%	4.20%	3.71%	3.71%
G	D	4.89%	4.89%	4.89%	4.89%	4.89%	3.90%	3.90%	3.90%	3.90%	3.90%	3.82%	3.82%
G	E	4.89%	4.89%	4.89%	4.89%	4.89%	3.90%	3.90%	3.90%	3.90%	3.90%	3.82%	3.82%
Avg.		5.06%	5.06%	5.06%	5.06%	5.06%	4.05%	4.05%	4.06%	4.06%	4.06%	3.77%	3.77%

Apparent Growth Rate of Bus (Entry-Exit wise)

Entry Point	Exit Point	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46
A	E	3.81%	3.81%	3.81%	3.43%	3.43%	3.43%	3.43%	3.43%	3.12%	3.12%	3.12%	3.12%
A	G	3.87%	3.88%	3.88%	3.50%	3.50%	3.50%	3.50%	3.50%	3.19%	3.19%	3.19%	3.19%
B	E	3.69%	3.69%	3.69%	3.33%	3.33%	3.33%	3.33%	3.33%	3.04%	3.04%	3.04%	3.04%
B	G	3.69%	3.69%	3.69%	3.34%	3.34%	3.34%	3.34%	3.34%	3.04%	3.04%	3.04%	3.04%
D	G	3.82%	3.82%	3.82%	3.44%	3.44%	3.44%	3.44%	3.44%	3.13%	3.13%	3.13%	3.13%
E	A	3.83%	3.83%	3.83%	3.45%	3.45%	3.45%	3.45%	3.45%	3.14%	3.14%	3.14%	3.14%
E	B	3.70%	3.70%	3.70%	3.34%	3.34%	3.34%	3.34%	3.34%	3.05%	3.05%	3.05%	3.05%
E	G	3.82%	3.82%	3.82%	3.44%	3.44%	3.44%	3.44%	3.44%	3.13%	3.13%	3.13%	3.13%
G	A	3.69%	3.69%	3.69%	3.33%	3.33%	3.33%	3.34%	3.34%	3.04%	3.05%	3.05%	3.05%
G	B	3.71%	3.71%	3.71%	3.35%	3.35%	3.35%	3.35%	3.35%	3.05%	3.05%	3.05%	3.05%
G	D	3.82%	3.82%	3.82%	3.44%	3.44%	3.44%	3.44%	3.44%	3.13%	3.13%	3.13%	3.13%
G	E	3.82%	3.82%	3.82%	3.44%	3.44%	3.44%	3.44%	3.44%	3.13%	3.13%	3.13%	3.13%
Avg.		3.77%	3.77%	3.77%	3.40%	3.40%	3.40%	3.40%	3.40%	3.10%	3.10%	3.10%	3.10%

Apparent Growth Rate of Bus (Entry-Exit wise)

Entry Point	Exit Point	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58
A	E	3.12%	2.84%	2.84%	2.84%	2.84%	2.84%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%
A	G	3.19%	2.91%	2.91%	2.91%	2.91%	2.91%	2.62%	2.62%	2.62%	2.62%	2.62%	2.62%
B	E	3.04%	2.76%	2.76%	2.76%	2.76%	2.76%	2.48%	2.48%	2.48%	2.48%	2.48%	2.48%
B	G	3.04%	2.77%	2.77%	2.77%	2.77%	2.77%	2.49%	2.49%	2.49%	2.49%	2.49%	2.49%
D	G	3.13%	2.85%	2.85%	2.85%	2.85%	2.85%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%
E	A	3.14%	2.86%	2.86%	2.86%	2.86%	2.86%	2.57%	2.57%	2.57%	2.57%	2.57%	2.57%
E	B	3.05%	2.77%	2.77%	2.77%	2.77%	2.77%	2.49%	2.49%	2.49%	2.49%	2.49%	2.49%
E	G	3.13%	2.85%	2.85%	2.85%	2.85%	2.85%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%
G	A	3.05%	2.77%	2.77%	2.77%	2.77%	2.78%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
G	B	3.05%	2.78%	2.78%	2.78%	2.78%	2.78%	2.50%	2.50%	2.50%	2.50%	2.50%	2.50%
G	D	3.13%	2.85%	2.85%	2.85%	2.85%	2.85%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%
G	E	3.13%	2.85%	2.85%	2.85%	2.85%	2.85%	2.56%	2.56%	2.56%	2.56%	2.56%	2.56%
Avg.		3.10%	2.82%	2.82%	2.82%	2.82%	2.82%	2.54%	2.54%	2.54%	2.54%	2.54%	2.54%

Table 4-26 Apparent Growth Rate of LCV (Entry-Exit wise)

Entry Point	Exit Point	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	E	5.91%	5.91%	5.92%	5.92%	5.92%	4.83%	4.83%	4.83%	4.83%	4.83%	3.87%	3.87%
A	G	5.95%	5.95%	5.95%	5.96%	5.96%	4.86%	4.87%	4.87%	4.87%	4.87%	3.78%	3.78%
B	E	5.90%	5.90%	5.90%	5.90%	5.90%	4.82%	4.82%	4.82%	4.82%	4.82%	3.91%	3.91%
B	G	6.21%	6.21%	6.21%	6.21%	6.21%	5.07%	5.07%	5.07%	5.07%	5.07%	3.93%	3.93%
C	G	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
D	G	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
E	A	5.90%	5.90%	5.90%	5.90%	5.90%	4.82%	4.82%	4.82%	4.82%	4.82%	3.93%	3.93%
E	B	6.03%	6.03%	6.03%	6.03%	6.03%	4.92%	4.92%	4.93%	4.93%	4.93%	3.92%	3.92%
E	C	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
E	G	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
G	A	6.13%	6.13%	6.13%	6.14%	6.14%	5.01%	5.01%	5.01%	5.02%	5.02%	3.89%	3.89%
G	B	6.13%	6.13%	6.13%	6.14%	6.14%	5.01%	5.01%	5.01%	5.01%	5.01%	3.91%	3.91%
G	C	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
G	D	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
G	E	5.74%	5.74%	5.74%	5.74%	5.74%	4.69%	4.69%	4.69%	4.69%	4.69%	3.89%	3.89%
Avg.		5.89%	5.89%	5.89%	5.89%	5.89%	4.81%	4.81%	4.81%	4.81%	4.81%	3.89%	3.89%

Apparent Growth Rate of LCV (Entry-Exit wise)

Entry Point	Exit Point	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46
A	E	3.87%	3.87%	3.88%	3.45%	3.45%	3.45%	3.45%	3.45%	3.00%	3.00%	3.00%	3.00%
A	G	3.78%	3.78%	3.78%	3.37%	3.37%	3.37%	3.37%	3.37%	2.96%	2.96%	2.96%	2.96%
B	E	3.91%	3.91%	3.91%	3.48%	3.48%	3.48%	3.48%	3.48%	3.02%	3.02%	3.02%	3.02%
B	G	3.93%	3.93%	3.93%	3.50%	3.50%	3.50%	3.50%	3.50%	3.08%	3.08%	3.08%	3.08%
C	G	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
D	G	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
E	A	3.93%	3.93%	3.93%	3.50%	3.50%	3.50%	3.50%	3.50%	3.03%	3.03%	3.03%	3.03%
E	B	3.92%	3.92%	3.92%	3.49%	3.49%	3.49%	3.49%	3.49%	3.04%	3.04%	3.04%	3.04%
E	C	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
E	G	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
G	A	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	3.04%	3.04%	3.05%	3.05%
G	B	3.91%	3.91%	3.91%	3.48%	3.48%	3.48%	3.48%	3.48%	3.05%	3.05%	3.05%	3.05%
G	C	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
G	D	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
G	E	3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	2.98%	2.98%	2.98%	2.98%
Avg.		3.89%	3.89%	3.89%	3.46%	3.46%	3.46%	3.46%	3.46%	3.00%	3.00%	3.01%	3.01%

Apparent Growth Rate of LCV (Entry-Exit wise)

Entry Point	Exit Point	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58
A	E	3.00%	2.64%	2.64%	2.64%	2.64%	2.64%	2.38%	2.38%	2.38%	2.38%	2.38%	2.38%
A	G	2.96%	2.64%	2.64%	2.64%	2.64%	2.64%	2.37%	2.37%	2.38%	2.38%	2.38%	2.38%
B	E	3.02%	2.64%	2.64%	2.64%	2.64%	2.64%	2.38%	2.38%	2.38%	2.38%	2.38%	2.38%
B	G	3.08%	2.74%	2.74%	2.74%	2.74%	2.74%	2.47%	2.47%	2.47%	2.47%	2.47%	2.47%
C	G	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
D	G	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
E	A	3.03%	2.65%	2.65%	2.65%	2.65%	2.65%	2.39%	2.39%	2.39%	2.39%	2.39%	2.39%
E	B	3.04%	2.68%	2.69%	2.69%	2.69%	2.69%	2.42%	2.42%	2.42%	2.42%	2.42%	2.42%
E	C	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
E	G	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
G	A	3.05%	2.71%	2.71%	2.71%	2.71%	2.71%	2.44%	2.44%	2.44%	2.44%	2.44%	2.44%
G	B	3.05%	2.71%	2.71%	2.71%	2.71%	2.71%	2.44%	2.44%	2.44%	2.44%	2.44%	2.44%
G	C	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
G	D	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
G	E	2.98%	2.59%	2.59%	2.59%	2.59%	2.59%	2.33%	2.33%	2.33%	2.33%	2.33%	2.33%
Avg.		3.01%	2.64%	2.64%	2.64%	2.64%	2.64%	2.37%	2.37%	2.37%	2.37%	2.37%	2.37%

Table 4-27 Apparent Growth Rate of 2 Axle Truck (Entry-Exit wise)

Entry Point	Exit Point	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	E	6.25%	6.25%	6.25%	6.25%	6.25%	5.10%	5.10%	5.10%	5.10%	5.10%	4.24%	4.24%
A	G	6.70%	6.70%	6.70%	6.70%	6.70%	5.47%	5.48%	5.48%	5.48%	5.48%	4.13%	4.13%
B	E	6.56%	6.56%	6.56%	6.56%	6.56%	5.36%	5.36%	5.36%	5.36%	5.36%	4.28%	4.28%
B	G	6.76%	6.76%	6.76%	6.76%	6.76%	5.52%	5.52%	5.52%	5.52%	5.52%	4.27%	4.27%
D	G	6.30%	6.30%	6.30%	6.30%	6.30%	5.14%	5.14%	5.14%	5.14%	5.14%	4.21%	4.21%
E	A	6.47%	6.47%	6.47%	6.47%	6.47%	5.28%	5.29%	5.29%	5.29%	5.29%	4.30%	4.30%
E	B	6.49%	6.49%	6.49%	6.49%	6.49%	5.30%	5.30%	5.30%	5.30%	5.30%	4.27%	4.27%
E	G	6.25%	6.25%	6.25%	6.25%	6.25%	5.10%	5.10%	5.10%	5.10%	5.10%	4.24%	4.24%
G	A	6.66%	6.67%	6.67%	6.67%	6.67%	5.45%	5.45%	5.45%	5.45%	5.46%	4.14%	4.14%
G	B	6.75%	6.75%	6.75%	6.75%	6.75%	5.51%	5.51%	5.52%	5.52%	5.52%	4.26%	4.26%
G	D	6.30%	6.30%	6.30%	6.30%	6.30%	5.15%	5.15%	5.15%	5.15%	5.15%	4.21%	4.21%
G	E	6.42%	6.42%	6.42%	6.42%	6.42%	5.25%	5.25%	5.25%	5.25%	5.25%	4.14%	4.14%
Avg.		6.49%	6.49%	6.49%	6.49%	6.49%	5.30%	5.30%	5.30%	5.30%	5.31%	4.22%	4.22%

Apparent Growth Rate of 2 Axle Truck (Entry-Exit wise)

Entry Point	Exit Point	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46
A	E	4.24%	4.24%	4.24%	3.77%	3.77%	3.77%	3.77%	3.77%	3.24%	3.24%	3.24%	3.24%
A	G	4.13%	4.13%	4.13%	3.68%	3.68%	3.68%	3.68%	3.68%	3.27%	3.27%	3.27%	3.27%
B	E	4.28%	4.28%	4.28%	3.81%	3.81%	3.81%	3.81%	3.81%	3.32%	3.32%	3.32%	3.32%
B	G	4.27%	4.27%	4.27%	3.80%	3.80%	3.80%	3.80%	3.80%	3.34%	3.34%	3.34%	3.34%
D	G	4.21%	4.21%	4.21%	3.75%	3.75%	3.75%	3.75%	3.75%	3.24%	3.24%	3.24%	3.24%
E	A	4.30%	4.30%	4.30%	3.83%	3.83%	3.83%	3.83%	3.83%	3.32%	3.32%	3.32%	3.32%
E	B	4.27%	4.27%	4.27%	3.80%	3.80%	3.80%	3.80%	3.80%	3.30%	3.30%	3.30%	3.30%
E	G	4.24%	4.24%	4.24%	3.77%	3.77%	3.77%	3.77%	3.77%	3.24%	3.24%	3.24%	3.24%
G	A	4.14%	4.14%	4.14%	3.68%	3.69%	3.69%	3.69%	3.69%	3.27%	3.27%	3.27%	3.27%
G	B	4.26%	4.26%	4.26%	3.79%	3.79%	3.79%	3.79%	3.79%	3.34%	3.34%	3.34%	3.34%
G	D	4.21%	4.21%	4.21%	3.75%	3.75%	3.75%	3.75%	3.75%	3.24%	3.24%	3.24%	3.24%
G	E	4.14%	4.14%	4.14%	3.68%	3.68%	3.68%	3.68%	3.68%	3.22%	3.22%	3.22%	3.22%
Avg.		4.22%	4.22%	4.22%	3.76%	3.76%	3.76%	3.76%	3.76%	3.28%	3.28%	3.28%	3.28%

Apparent Growth Rate of 2 Axle Truck (Entry-Exit wise)

Entry Point	Exit Point	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58
A	E	3.24%	2.82%	2.82%	2.82%	2.82%	2.82%	2.54%	2.54%	2.54%	2.54%	2.54%	2.54%
A	G	3.27%	2.94%	2.94%	2.94%	2.94%	2.94%	2.65%	2.65%	2.65%	2.65%	2.65%	2.65%
B	E	3.32%	2.92%	2.92%	2.92%	2.92%	2.92%	2.63%	2.63%	2.63%	2.63%	2.63%	2.63%
B	G	3.34%	2.98%	2.98%	2.98%	2.98%	2.98%	2.68%	2.68%	2.68%	2.68%	2.68%	2.68%
D	G	3.24%	2.83%	2.83%	2.83%	2.83%	2.83%	2.55%	2.55%	2.55%	2.55%	2.55%	2.55%
E	A	3.32%	2.91%	2.91%	2.91%	2.91%	2.91%	2.62%	2.62%	2.62%	2.62%	2.62%	2.62%
E	B	3.30%	2.90%	2.90%	2.90%	2.90%	2.90%	2.61%	2.61%	2.61%	2.61%	2.61%	2.61%
E	G	3.24%	2.82%	2.82%	2.82%	2.82%	2.82%	2.54%	2.54%	2.54%	2.54%	2.54%	2.54%
G	A	3.27%	2.94%	2.94%	2.94%	2.94%	2.94%	2.64%	2.64%	2.65%	2.65%	2.65%	2.65%
G	B	3.34%	2.98%	2.98%	2.98%	2.98%	2.98%	2.68%	2.68%	2.68%	2.68%	2.68%	2.68%
G	D	3.24%	2.83%	2.83%	2.83%	2.83%	2.83%	2.55%	2.55%	2.55%	2.55%	2.55%	2.55%
G	E	3.22%	2.85%	2.85%	2.85%	2.85%	2.85%	2.57%	2.57%	2.57%	2.57%	2.57%	2.57%
Avg.		3.28%	2.89%	2.89%	2.89%	2.89%	2.89%	2.60%	2.60%	2.60%	2.60%	2.60%	2.60%

Table 4-28 Apparent Growth Rate of 3 Axle Truck (Entry-Exit wise)

Entry Point	Exit Point	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	E	3.70%	3.70%	3.70%	3.70%	3.70%	3.02%	3.02%	3.02%	3.02%	3.02%	2.46%	2.46%
A	G	3.86%	3.86%	3.86%	3.86%	3.86%	3.15%	3.15%	3.15%	3.15%	3.15%	2.40%	2.40%
B	E	3.78%	3.78%	3.78%	3.79%	3.79%	3.09%	3.09%	3.09%	3.09%	3.09%	2.51%	2.51%
B	G	3.99%	3.99%	3.99%	3.99%	3.99%	3.26%	3.26%	3.26%	3.26%	3.26%	2.50%	2.50%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

D	G	3.71%	3.71%	3.71%	3.71%	3.71%	3.03%	3.03%	3.03%	3.03%	3.03%	2.49%	2.49%
E	A	3.79%	3.79%	3.79%	3.79%	3.79%	3.09%	3.09%	3.09%	3.10%	3.10%	2.48%	2.48%
E	B	3.81%	3.81%	3.81%	3.81%	3.81%	3.11%	3.11%	3.11%	3.11%	3.11%	2.51%	2.51%
E	G	3.71%	3.71%	3.71%	3.71%	3.71%	3.03%	3.03%	3.03%	3.03%	3.03%	2.49%	2.49%
G	A	3.85%	3.85%	3.85%	3.85%	3.85%	3.15%	3.15%	3.15%	3.15%	3.15%	2.41%	2.41%
G	B	3.97%	3.97%	3.97%	3.97%	3.97%	3.24%	3.24%	3.24%	3.24%	3.24%	2.51%	2.51%
G	C	3.69%	3.69%	3.69%	3.69%	3.69%	3.01%	3.01%	3.01%	3.01%	3.01%	2.50%	2.50%
G	D	3.71%	3.71%	3.71%	3.71%	3.71%	3.03%	3.03%	3.03%	3.03%	3.03%	2.48%	2.48%
G	E	3.72%	3.72%	3.72%	3.72%	3.72%	3.04%	3.04%	3.04%	3.04%	3.04%	2.41%	2.41%
Avg.		3.79%	3.79%	3.79%	3.79%	3.79%	3.10%	3.10%	3.10%	3.10%	3.10%	2.47%	2.47%

Apparent Growth Rate of 3 Axle Truck (Entry-Exit wise)

Entry Point	Exit Point	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46
A	E	2.46%	2.46%	2.46%	2.43%	2.43%	2.43%	2.43%	2.43%	2.11%	2.11%	2.11%	2.11%
A	G	2.40%	2.40%	2.40%	2.37%	2.37%	2.37%	2.37%	2.37%	2.10%	2.10%	2.10%	2.10%
B	E	2.51%	2.51%	2.51%	2.48%	2.48%	2.48%	2.48%	2.48%	2.15%	2.15%	2.15%	2.15%
B	G	2.50%	2.50%	2.50%	2.47%	2.47%	2.47%	2.47%	2.47%	2.18%	2.18%	2.18%	2.18%
D	G	2.49%	2.49%	2.49%	2.46%	2.46%	2.46%	2.46%	2.46%	2.12%	2.12%	2.12%	2.12%
E	A	2.48%	2.48%	2.48%	2.45%	2.45%	2.45%	2.45%	2.45%	2.13%	2.13%	2.13%	2.13%
E	B	2.51%	2.51%	2.51%	2.49%	2.49%	2.49%	2.49%	2.49%	2.16%	2.16%	2.16%	2.16%
E	G	2.49%	2.49%	2.49%	2.46%	2.46%	2.46%	2.46%	2.46%	2.13%	2.13%	2.13%	2.13%
G	A	2.41%	2.41%	2.41%	2.38%	2.39%	2.39%	2.39%	2.39%	2.11%	2.11%	2.11%	2.11%
G	B	2.51%	2.51%	2.51%	2.48%	2.48%	2.48%	2.48%	2.48%	2.18%	2.18%	2.18%	2.18%
G	C	2.50%	2.50%	2.50%	2.47%	2.47%	2.47%	2.47%	2.47%	2.13%	2.13%	2.13%	2.13%
G	D	2.48%	2.48%	2.48%	2.45%	2.45%	2.45%	2.45%	2.45%	2.12%	2.12%	2.12%	2.12%
G	E	2.41%	2.41%	2.41%	2.38%	2.38%	2.38%	2.38%	2.38%	2.08%	2.08%	2.08%	2.08%
Avg.		2.47%	2.47%	2.47%	2.45%	2.45%	2.45%	2.45%	2.45%	2.13%	2.13%	2.13%	2.13%

Apparent Growth Rate of 3 Axle Truck (Entry-Exit wise)

Entry Point	Exit Point	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58
A	E	2.11%	1.85%	1.85%	1.85%	1.85%	1.85%	1.66%	1.66%	1.66%	1.66%	1.66%	1.66%
A	G	2.10%	1.89%	1.89%	1.89%	1.89%	1.89%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
B	E	2.15%	1.88%	1.89%	1.89%	1.89%	1.89%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
B	G	2.18%	1.95%	1.95%	1.95%	1.95%	1.95%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%
D	G	2.12%	1.86%	1.86%	1.86%	1.86%	1.86%	1.67%	1.67%	1.67%	1.67%	1.67%	1.67%
E	A	2.13%	1.88%	1.88%	1.88%	1.88%	1.88%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%
E	B	2.16%	1.89%	1.89%	1.89%	1.89%	1.89%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%
E	G	2.13%	1.85%	1.85%	1.85%	1.85%	1.85%	1.67%	1.67%	1.67%	1.67%	1.67%	1.67%
G	A	2.11%	1.89%	1.89%	1.89%	1.89%	1.89%	1.70%	1.70%	1.70%	1.70%	1.70%	1.70%

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

G	B	2.18%	1.95%	1.95%	1.95%	1.95%	1.95%	1.75%	1.75%	1.75%	1.75%	1.75%	1.75%
G	C	2.13%	1.85%	1.85%	1.85%	1.85%	1.85%	1.67%	1.67%	1.67%	1.67%	1.67%	1.67%
G	D	2.12%	1.85%	1.85%	1.85%	1.85%	1.85%	1.67%	1.67%	1.67%	1.67%	1.67%	1.67%
G	E	2.08%	1.84%	1.84%	1.84%	1.84%	1.84%	1.66%	1.66%	1.66%	1.66%	1.66%	1.66%
Avg.		2.13%	1.88%	1.88%	1.88%	1.88%	1.88%	1.69%	1.69%	1.69%	1.69%	1.69%	1.69%

Table 4-29 Apparent Growth Rate of MAV (4-6 Axle Truck) (Entry-Exit wise)

Entry Point	Exit Point	2022-23	2023-24	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	E	8.58%	8.58%	8.58%	8.58%	8.59%	7.01%	7.01%	7.02%	7.02%	7.02%	5.72%	5.72%
A	G	8.37%	8.37%	8.38%	8.38%	8.39%	6.85%	6.85%	6.86%	6.86%	6.86%	5.24%	5.24%
B	E	8.76%	8.76%	8.77%	8.77%	8.77%	7.16%	7.16%	7.16%	7.17%	7.17%	5.77%	5.77%
B	G	9.07%	9.07%	9.07%	9.07%	9.08%	7.41%	7.41%	7.41%	7.41%	7.41%	5.69%	5.69%
C	G	8.40%	8.40%	8.40%	8.40%	8.40%	6.86%	6.86%	6.86%	6.86%	6.86%	5.70%	5.70%
D	G	8.50%	8.50%	8.50%	8.50%	8.50%	6.94%	6.94%	6.94%	6.94%	6.94%	5.64%	5.64%
E	A	9.09%	9.09%	9.09%	9.10%	9.10%	7.43%	7.44%	7.44%	7.44%	7.45%	5.81%	5.81%
E	B	8.62%	8.62%	8.62%	8.63%	8.63%	7.04%	7.05%	7.05%	7.05%	7.05%	5.73%	5.73%
E	G	8.46%	8.46%	8.46%	8.46%	8.46%	6.91%	6.91%	6.91%	6.91%	6.91%	5.65%	5.65%
G	A	8.46%	8.47%	8.47%	8.48%	8.48%	6.93%	6.93%	6.94%	6.94%	6.94%	5.29%	5.29%
G	B	9.20%	9.20%	9.21%	9.21%	9.21%	7.52%	7.52%	7.52%	7.52%	7.52%	5.71%	5.71%
G	C	8.40%	8.40%	8.40%	8.40%	8.40%	6.86%	6.86%	6.86%	6.86%	6.86%	5.70%	5.70%
G	D	8.46%	8.46%	8.46%	8.46%	8.46%	6.90%	6.90%	6.90%	6.90%	6.90%	5.66%	5.66%
G	E	8.49%	8.49%	8.49%	8.49%	8.49%	6.93%	6.93%	6.93%	6.93%	6.94%	5.61%	5.61%
Avg.		8.63%	8.63%	8.64%	8.64%	8.64%	7.05%	7.06%	7.06%	7.06%	7.06%	5.64%	5.64%

Apparent Growth Rate of MAV (4-6 Axle Truck) (Entry-Exit wise)

Entry Point	Exit Point	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44	2044-45	2045-46
A	E	5.72%	5.72%	5.72%	5.09%	5.09%	5.09%	5.09%	5.10%	4.41%	4.41%	4.41%	4.41%
A	G	5.24%	5.24%	5.24%	4.67%	4.67%	4.67%	4.67%	4.67%	4.13%	4.14%	4.14%	4.14%
B	E	5.77%	5.77%	5.77%	5.13%	5.13%	5.13%	5.13%	5.13%	4.46%	4.46%	4.46%	4.46%
B	G	5.69%	5.69%	5.69%	5.06%	5.06%	5.06%	5.06%	5.06%	4.47%	4.47%	4.47%	4.47%
C	G	5.70%	5.70%	5.70%	5.07%	5.07%	5.07%	5.07%	5.07%	4.36%	4.36%	4.36%	4.36%
D	G	5.64%	5.64%	5.64%	5.02%	5.02%	5.02%	5.02%	5.02%	4.35%	4.35%	4.35%	4.35%
E	A	5.81%	5.81%	5.81%	5.17%	5.17%	5.17%	5.18%	5.18%	4.54%	4.54%	4.55%	4.55%
E	B	5.73%	5.73%	5.73%	5.10%	5.10%	5.10%	5.10%	5.10%	4.42%	4.42%	4.42%	4.42%
E	G	5.65%	5.65%	5.65%	5.03%	5.03%	5.03%	5.03%	5.03%	4.34%	4.34%	4.34%	4.34%
G	A	5.29%	5.29%	5.29%	4.71%	4.71%	4.71%	4.72%	4.72%	4.18%	4.18%	4.18%	4.18%
G	B	5.71%	5.71%	5.71%	5.08%	5.08%	5.09%	5.09%	5.09%	4.50%	4.50%	4.50%	4.50%
G	C	5.70%	5.70%	5.70%	5.07%	5.07%	5.07%	5.07%	5.07%	4.36%	4.36%	4.36%	4.36%
G	D	5.66%	5.66%	5.66%	5.04%	5.04%	5.04%	5.04%	5.04%	4.35%	4.35%	4.35%	4.35%
G	E	5.61%	5.61%	5.61%	4.99%	4.99%	5.00%	5.00%	5.00%	4.33%	4.33%	4.33%	4.33%
Avg.		5.64%	5.64%	5.64%	5.02%	5.02%	5.02%	5.02%	5.02%	4.37%	4.37%	4.37%	4.37%

Apparent Growth Rate of MAV (4-6 Axle Truck) (Entry-Exit wise)

Entry Point	Exit Point	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54	2054-55	2055-56	2056-57	2057-58
A	E	4.41%	3.86%	3.86%	3.86%	3.86%	3.86%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%
A	G	4.14%	3.71%	3.71%	3.71%	3.71%	3.71%	3.34%	3.34%	3.34%	3.34%	3.34%	3.35%
B	E	4.46%	3.92%	3.92%	3.92%	3.92%	3.92%	3.53%	3.53%	3.53%	3.53%	3.53%	3.53%
B	G	4.47%	3.99%	3.99%	4.00%	4.00%	4.00%	3.60%	3.60%	3.60%	3.60%	3.60%	3.60%
C	G	4.36%	3.79%	3.79%	3.79%	3.79%	3.79%	3.41%	3.41%	3.41%	3.41%	3.41%	3.41%
D	G	4.35%	3.81%	3.81%	3.81%	3.81%	3.81%	3.43%	3.43%	3.43%	3.43%	3.43%	3.43%
E	A	4.55%	4.04%	4.04%	4.04%	4.04%	4.04%	3.64%	3.64%	3.64%	3.64%	3.64%	3.64%
E	B	4.42%	3.87%	3.87%	3.87%	3.87%	3.87%	3.48%	3.48%	3.48%	3.48%	3.48%	3.48%
E	G	4.34%	3.80%	3.80%	3.80%	3.80%	3.80%	3.42%	3.42%	3.42%	3.42%	3.42%	3.42%
G	A	4.18%	3.75%	3.75%	3.75%	3.75%	3.75%	3.38%	3.38%	3.38%	3.38%	3.38%	3.38%
G	B	4.50%	4.04%	4.04%	4.04%	4.04%	4.04%	3.64%	3.64%	3.64%	3.64%	3.64%	3.64%
G	C	4.36%	3.79%	3.79%	3.79%	3.79%	3.79%	3.41%	3.41%	3.41%	3.41%	3.41%	3.41%
G	D	4.35%	3.80%	3.80%	3.80%	3.80%	3.80%	3.42%	3.42%	3.42%	3.42%	3.42%	3.42%
G	E	4.33%	3.80%	3.80%	3.80%	3.80%	3.80%	3.42%	3.42%	3.42%	3.42%	3.42%	3.42%
Avg.		4.37%	3.86%	3.86%	3.86%	3.86%	3.86%	3.47%	3.47%	3.47%	3.47%	3.47%	3.47%

5 Forecasted AADT and Revenue Forecast for Group 1

5.1 Groupwise Forecasted Entry-Exit AADT

1. The base year diverted traffic forms and input to horizon year AADT forecast.
2. Using the base year diverted traffic and growth rates between OD pairs described in the preceding chapter the horizon year mode wise sectional AADT is forecasted. 2% of induced traffic is added to the calculated AADT from the year 2025-26 to 2039-40 and 1% of induced traffic is added thereafter. The reasons for introducing induced traffic is explained in Section 5.1.1. The adopted growth rate for this project has been on conservative side which is described in Section 5.1.2.
3. The following section provides mode wise entry-exit AADT for base year and horizon year for Group 1.

5.1.1 Induced Traffic

Induced traffic/developmental traffic is defined as additional traffic that is likely to be generated when a new Transportation Infrastructure is built. A 2% induced traffic is added over normal growth. This traffic is generated on account of new infrastructure which is over and above the normal growth. To understand the induced traffic as against normal growth please refer to the following extract from World Bank Report on China's High Speed Rail Development authored by Martha Lawrence, Richard Bullock, and Zimung Li. This report was published post development of High-Speed Rail (HSR) in China.

"In addition to its direct economic benefits, HSR has played an important role in promoting regional economic and macroeconomic development. The HSR services have generated many new trips, for both business and leisure. The business trips are in principle associated with the development of larger and better-connected markets, which in turn should promote regional development for the areas served by the new services. Interviews with both passengers and businesses confirm that HSR services have significantly increased mobility and interaction between urban centers. With about 50 percent of riders traveling for business purposes, for a total ridership of 1.7 billion passengers per year, over 850 million new opportunities are created to connect, trade, and exchange ideas each year—compared to the situation prior to the HSR—leading to additional economic activity, innovation, and increased productivity."

5.1.2 Conservative Estimate of Growth Adopted

1. In current study the total diverted traffic of cars on the project corridor is 4,892 (Table 3-19). This is the result of diverted traffic based on cost benefit analysis described in Section 3.5 and 3.6. However, in adjoining highways the at Old NH-24 ON Brijghat Plaza and Niyamatpur Plaza the total number of cars is 21,103 and 13,102 (Table 2-7). In horizon years the development of new infrastructure (Ganga Expressway) in the vicinity of the Highways with increasing congestion on parallel roads would increase the traffic of car over and above normal growth.
2. In case of MAV the elasticity value for growth adopted is 1.2 and further decreasing to 1.08 in horizon years (Table 4-7). This is a conservative estimate of elasticity because the growth of registered MAV is more than 10% in Uttar Pradesh and neighboring states (except Haryana, Table 4-5). The growth of vehicle registration of MAV is 13.3% in the state of Uttar Pradesh. It is to be noted that three axle truck is counted as MAV in vehicle registration data but in this traffic study MAV only means 4-6 axle truck. The traffic report has been further

conservative in adopting elasticity value of 0.53 decreasing to 0.47 in case of 3 axle truck. With NSDP growth in the range of 6-7% the elasticity value is expected to be around 1.5 for MAV but it has been adopted as 1.2 for 4-6 axle truck and 0.57 for Three Axle truck.

3. In parallel Highways the competitive advantage in terms of road user cost would decrease when compared to Ganga Expressway because of following reasons:
 - a. Increase in congestion is expected to be more in parallel highways because of growth of tollable modes as well as non tollable modes. This is described in Section 1.3.4.
 - b. The annual revision of toll rates for National Highways has a fixed factor of 3% + 40% of WPI increase. However, Ganga Expressway toll rate revision is based only on 40% of WPI increase. Therefore the rate of increase of toll rate of competing National Highways will be higher than Ganga Expressway.

The entry-exit MAV traffic for most likely scenario for horizon years is shown in table below. The traffic in this format is calculated for all modes and all scenarios. This is used as an input in the financial model.

Table 5-1 Most Likely Scenario MAV Traffic Entry-Exit wise

Entry	Exit	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	B	0	0	0	0	0	0	0	0	0	0
A	C	0	0	0	0	0	0	0	0	0	0
A	D	0	0	0	0	0	0	0	0	0	0
A	E	27	29	32	34	37	40	43	46	49	53
A	F	0	0	0	0	0	0	0	0	0	0
A	G	548	597	650	699	752	809	870	936	995	1,058
B	A	0	0	0	0	0	0	0	0	0	0
B	C	0	0	0	0	0	0	0	0	0	0
B	D	0	0	0	0	0	0	0	0	0	0
B	E	23	25	27	29	31	34	36	39	42	45
B	F	0	0	0	0	0	0	0	0	0	0
B	G	208	227	248	268	290	313	339	366	390	416
C	A	0	0	0	0	0	0	0	0	0	0
C	B	0	0	0	0	0	0	0	0	0	0
C	D	0	0	0	0	0	0	0	0	0	0
C	E	0	0	0	0	0	0	0	0	0	0
C	F	0	0	0	0	0	0	0	0	0	0
C	G	8	9	9	10	11	12	12	13	14	15
D	A	0	0	0	0	0	0	0	0	0	0
D	B	0	0	0	0	0	0	0	0	0	0
D	C	0	0	0	0	0	0	0	0	0	0
D	E	0	0	0	0	0	0	0	0	0	0
D	F	0	0	0	0	0	0	0	0	0	0
D	G	18	20	22	23	25	27	29	31	33	36
E	A	31	34	37	40	43	47	51	55	59	63
E	B	18	19	21	23	25	26	28	31	33	35
E	C	0	0	0	0	0	0	0	0	0	0
E	D	0	0	0	0	0	0	0	0	0	0

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

E	F	0	0	0	0	0	0	0	0	0	0
E	G	41	45	49	53	57	61	66	71	75	80
F	A	0	0	0	0	0	0	0	0	0	0
F	B	0	0	0	0	0	0	0	0	0	0
F	C	0	0	0	0	0	0	0	0	0	0
F	D	0	0	0	0	0	0	0	0	0	0
F	E	0	0	0	0	0	0	0	0	0	0
F	G	0	0	0	0	0	0	0	0	0	0
G	A	402	438	477	514	553	595	641	690	734	780
G	B	280	307	336	363	393	425	459	497	530	565
G	C	3	3	3	3	4	4	4	4	5	5
G	D	16	18	19	21	22	24	26	28	30	31
G	E	13	14	15	16	18	19	20	22	23	25
G	F	0	0	0	0	0	0	0	0	0	0

Entry	Exit	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44
A	B	0	0	0	0	0	0	0	0	0	0
A	C	0	0	0	0	0	0	0	0	0	0
A	D	0	0	0	0	0	0	0	0	0	0
A	E	56	60	64	68	72	77	81	85	88	93
A	F	0	0	0	0	0	0	0	0	0	0
A	G	1,124	1,194	1,269	1,343	1,421	1,503	1,575	1,650	1,722	1,797
B	A	0	0	0	0	0	0	0	0	0	0
B	C	0	0	0	0	0	0	0	0	0	0
B	D	0	0	0	0	0	0	0	0	0	0
B	E	48	51	54	58	61	65	69	72	75	79
B	F	0	0	0	0	0	0	0	0	0	0
B	G	444	473	505	535	568	603	634	666	697	729
C	A	0	0	0	0	0	0	0	0	0	0
C	B	0	0	0	0	0	0	0	0	0	0
C	D	0	0	0	0	0	0	0	0	0	0
C	E	0	0	0	0	0	0	0	0	0	0
C	F	0	0	0	0	0	0	0	0	0	0
C	G	16	17	18	20	21	22	23	24	25	27
D	A	0	0	0	0	0	0	0	0	0	0
D	B	0	0	0	0	0	0	0	0	0	0
D	C	0	0	0	0	0	0	0	0	0	0
D	E	0	0	0	0	0	0	0	0	0	0
D	F	0	0	0	0	0	0	0	0	0	0
D	G	38	40	43	46	48	51	54	57	59	62
E	A	67	71	76	81	86	91	96	101	105	110
E	B	37	40	42	45	48	51	53	56	59	61
E	C	0	0	0	0	0	0	0	0	0	0
E	D	0	0	0	0	0	0	0	0	0	0
E	F	0	0	0	0	0	0	0	0	0	0
E	G	86	91	97	103	109	116	122	128	134	140

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

F	A	0	0	0	0	0	0	0	0	0	0
F	B	0	0	0	0	0	0	0	0	0	0
F	C	0	0	0	0	0	0	0	0	0	0
F	D	0	0	0	0	0	0	0	0	0	0
F	E	0	0	0	0	0	0	0	0	0	0
F	G	0	0	0	0	0	0	0	0	0	0
G	A	829	882	937	992	1,050	1,111	1,165	1,221	1,274	1,330
G	B	603	643	686	728	773	820	862	906	948	992
G	C	5	6	6	7	7	7	8	8	8	9
G	D	34	36	38	40	43	46	48	50	53	55
G	E	26	28	30	32	34	36	38	40	41	43
G	F	0	0	0	0	0	0	0	0	0	0

Entry	Exit	2044-45	2045-46	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54
A	B	0	0	0	0	0	0	0	0	0	0
A	C	0	0	0	0	0	0	0	0	0	0
A	D	0	0	0	0	0	0	0	0	0	0
A	E	97	101	106	110	115	119	124	129	134	139
A	F	0	0	0	0	0	0	0	0	0	0
A	G	1,874	1,956	2,041	2,122	2,207	2,295	2,387	2,482	2,574	2,669
B	A	0	0	0	0	0	0	0	0	0	0
B	C	0	0	0	0	0	0	0	0	0	0
B	D	0	0	0	0	0	0	0	0	0	0
B	E	82	86	90	94	98	102	106	111	115	119
B	F	0	0	0	0	0	0	0	0	0	0
B	G	762	798	834	870	906	945	985	1,026	1,066	1,108
C	A	0	0	0	0	0	0	0	0	0	0
C	B	0	0	0	0	0	0	0	0	0	0
C	D	0	0	0	0	0	0	0	0	0	0
C	E	0	0	0	0	0	0	0	0	0	0
C	F	0	0	0	0	0	0	0	0	0	0
C	G	28	29	30	32	33	34	36	37	38	40
D	A	0	0	0	0	0	0	0	0	0	0
D	B	0	0	0	0	0	0	0	0	0	0
D	C	0	0	0	0	0	0	0	0	0	0
D	E	0	0	0	0	0	0	0	0	0	0
D	F	0	0	0	0	0	0	0	0	0	0
D	G	65	68	71	74	77	80	83	86	90	93
E	A	116	121	127	132	138	144	150	156	162	169
E	B	64	67	70	73	76	79	82	86	89	92
E	C	0	0	0	0	0	0	0	0	0	0
E	D	0	0	0	0	0	0	0	0	0	0
E	F	0	0	0	0	0	0	0	0	0	0
E	G	146	153	160	166	173	180	187	195	202	210
F	A	0	0	0	0	0	0	0	0	0	0
F	B	0	0	0	0	0	0	0	0	0	0

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

F	C	0	0	0	0	0	0	0	0	0	0
F	D	0	0	0	0	0	0	0	0	0	0
F	E	0	0	0	0	0	0	0	0	0	0
F	G	0	0	0	0	0	0	0	0	0	0
G	A	1,388	1,448	1,512	1,573	1,636	1,702	1,770	1,842	1,910	1,981
G	B	1,038	1,087	1,137	1,185	1,236	1,289	1,344	1,401	1,456	1,513
G	C	9	10	10	11	11	11	12	12	13	13
G	D	57	60	63	65	68	71	74	77	80	83
G	E	45	47	49	51	53	56	58	60	63	65
G	F	0	0	0	0	0	0	0	0	0	0

Entry	Exit	2054-55	2055-56	2056-57	2057-58	2058-59	2059-60	2060-61	2061-62
A	B	0	0	0	0	0	0	0	0
A	C	0	0	0	0	0	0	0	0
A	D	0	0	0	0	0	0	0	0
A	E	145	150	156	162	168	174	181	188
A	F	0	0	0	0	0	0	0	0
A	G	2,767	2,870	2,976	3,086	3,200	3,318	3,441	3,568
B	A	0	0	0	0	0	0	0	0
B	C	0	0	0	0	0	0	0	0
B	D	0	0	0	0	0	0	0	0
B	E	124	129	134	139	144	150	156	162
B	F	0	0	0	0	0	0	0	0
B	G	1,151	1,196	1,243	1,291	1,342	1,394	1,449	1,505
C	A	0	0	0	0	0	0	0	0
C	B	0	0	0	0	0	0	0	0
C	D	0	0	0	0	0	0	0	0
C	E	0	0	0	0	0	0	0	0
C	F	0	0	0	0	0	0	0	0
C	G	41	43	45	46	48	50	52	54
D	A	0	0	0	0	0	0	0	0
D	B	0	0	0	0	0	0	0	0
D	C	0	0	0	0	0	0	0	0
D	E	0	0	0	0	0	0	0	0
D	F	0	0	0	0	0	0	0	0
D	G	97	100	104	108	112	116	121	125
E	A	175	182	189	197	204	212	221	230
E	B	96	100	103	107	112	116	120	125
E	C	0	0	0	0	0	0	0	0
E	D	0	0	0	0	0	0	0	0
E	F	0	0	0	0	0	0	0	0
E	G	218	226	235	244	253	262	272	282
F	A	0	0	0	0	0	0	0	0
F	B	0	0	0	0	0	0	0	0
F	C	0	0	0	0	0	0	0	0
F	D	0	0	0	0	0	0	0	0

F	E	0	0	0	0	0	0	0	0
F	G	0	0	0	0	0	0	0	0
G	A	2,055	2,132	2,211	2,294	2,379	2,468	2,560	2,655
G	B	1,573	1,635	1,699	1,766	1,836	1,908	1,983	2,061
G	C	14	14	15	15	16	17	17	18
G	D	86	89	92	96	99	103	107	111
G	E	67	70	72	75	78	81	84	87
G	F	0	0	0	0	0	0	0	0

5.2 Estimation of Entry-Exit Toll Rates

- The gazette notification of Government of Uttar Pradesh provides per km base rate for expressway and base rate of structures based on the cost of structure. This forms an input to the toll rate calculation for each vehicle type. The base rate of expressway is provided in table below

Table 5-2 Base Rate of Expressway according to Gazette Notification

Toll Rates for Expressway excluding the length of Structures / Bypass	Base rate of Fee per Km (in rupees) based on the Wholesale price index(WPI) of week ending on December 2016 (WPI 343.32) for the year 2017-18
Car, Jeep, Van, LMV	2.20
Mini Bus	3.50
Bus	7.05
LMV Goods	2.20
LCV, LGV	3.50
2 Axle Truck	7.05
3 Axle Truck	10.85
MAV	10.85
HCM/EME	10.85
Oversized	13.85
SemiTollable	1.10

- Table 5-3 provides the section length and details of structures for tolling.

Table 5-3 Group 1 Expressway Section Length and Structure Details

SectionFrom Code	SectionTo Code	Location of TP (Sch R)	Length of Expressway excluding Structure in km (Sch R)	Length of Structures	Cost of Structures	Location of Structures
A	B	013+400	27.310	0.060	69.309	019+941
B	C	035+270	19.370	0.000	0.000	
C	D	054+640	18.581	0.960	299.960	066+850

D	E	074+181	28.246	0.000	0.000	
E	F	102+427	20.755	0.106	60.056	123+100
F	G	123+288	14.312	0.000	0.000	

The entry-exit single entry MAV toll rate for most likely scenario for horizon years is shown in table below. The toll rate in this format is calculated for all modes and all scenarios and for return and monthly passes. This is used as an input in the financial model.

Table 5-4 MAV Single Entry Toll Rate

Entry	Exit	2024-25	2025-26	2026-27	2027-28	2028-29	2029-30	2030-31	2031-32	2032-33	2033-34
A	B	435	445	455	465	470	480	490	500	515	525
A	C	965	985	1,005	1,025	1,045	1,070	1,090	1,110	1,135	1,160
A	D	1,200	1,220	1,245	1,270	1,295	1,320	1,350	1,375	1,405	1,440
A	E	1,640	1,675	1,705	1,740	1,770	1,810	1,845	1,885	1,925	1,970
A	F	1,895	1,935	1,970	2,010	2,050	2,095	2,135	2,180	2,225	2,280
A	G	2,075	2,115	2,155	2,200	2,240	2,290	2,335	2,385	2,435	2,495
B	A	435	445	455	465	470	480	490	500	515	525
B	C	530	540	550	560	575	585	595	610	625	640
B	D	760	775	790	805	820	840	855	875	895	915
B	E	1,205	1,225	1,250	1,275	1,300	1,330	1,355	1,385	1,415	1,445
B	F	1,460	1,490	1,520	1,550	1,580	1,610	1,645	1,680	1,715	1,755
B	G	1,640	1,670	1,705	1,735	1,770	1,810	1,845	1,885	1,925	1,970
C	A	965	985	1,005	1,025	1,045	1,070	1,090	1,110	1,135	1,160
C	B	530	540	550	560	575	585	595	610	625	640
C	D	520	530	540	550	565	575	585	600	610	625
C	E	965	980	1,000	1,020	1,040	1,065	1,085	1,105	1,130	1,155
C	F	1,220	1,245	1,270	1,295	1,320	1,345	1,375	1,405	1,435	1,465
C	G	1,400	1,425	1,455	1,480	1,510	1,545	1,575	1,605	1,640	1,680
D	A	1,200	1,220	1,245	1,270	1,295	1,320	1,350	1,375	1,405	1,440
D	B	760	775	790	805	820	840	855	875	895	915
D	C	520	530	540	550	565	575	585	600	610	625
D	E	440	450	460	470	480	490	495	510	520	530
D	F	700	715	725	740	755	775	785	805	820	840
D	G	875	895	910	930	945	970	985	1,010	1,030	1,055
E	A	1,640	1,675	1,705	1,740	1,770	1,810	1,845	1,885	1,925	1,970
E	B	1,205	1,225	1,250	1,275	1,300	1,330	1,355	1,385	1,415	1,445
E	C	965	980	1,000	1,020	1,040	1,065	1,085	1,105	1,130	1,155
E	D	440	450	460	470	480	490	495	510	520	530
E	F	350	355	365	370	375	385	395	400	410	420
E	G	525	535	550	560	570	580	595	605	620	635
F	A	1,895	1,935	1,970	2,010	2,050	2,095	2,135	2,180	2,225	2,280
F	B	1,460	1,490	1,520	1,550	1,580	1,610	1,645	1,680	1,715	1,755
F	C	1,220	1,245	1,270	1,295	1,320	1,345	1,375	1,405	1,435	1,465
F	D	700	715	725	740	755	775	785	805	820	840
F	E	350	355	365	370	375	385	395	400	410	420
F	G	175	180	185	190	190	195	200	205	210	215

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

G	A	2,075	2,115	2,155	2,200	2,240	2,290	2,335	2,385	2,435	2,495
G	B	1,640	1,670	1,705	1,735	1,770	1,810	1,845	1,885	1,925	1,970
G	C	1,400	1,425	1,455	1,480	1,510	1,545	1,575	1,605	1,640	1,680
G	D	875	895	910	930	945	970	985	1,010	1,030	1,055
G	E	525	535	550	560	570	580	595	605	620	635
G	F	175	180	185	190	190	195	200	205	210	215

Entry	Exit	2034-35	2035-36	2036-37	2037-38	2038-39	2039-40	2040-41	2041-42	2042-43	2043-44
A	B	535	550	560	575	590	600	620	635	650	665
A	C	1,190	1,215	1,245	1,270	1,300	1,335	1,370	1,405	1,440	1,475
A	D	1,475	1,505	1,540	1,575	1,615	1,650	1,695	1,740	1,780	1,825
A	E	2,015	2,065	2,110	2,155	2,210	2,260	2,320	2,380	2,440	2,500
A	F	2,335	2,385	2,440	2,495	2,555	2,615	2,685	2,755	2,825	2,890
A	G	2,550	2,610	2,670	2,725	2,795	2,860	2,935	3,010	3,085	3,160
B	A	535	550	560	575	590	600	620	635	650	665
B	C	655	670	680	695	715	730	750	770	790	810
B	D	935	960	980	1,000	1,025	1,050	1,075	1,105	1,130	1,160
B	E	1,480	1,515	1,545	1,580	1,620	1,660	1,705	1,745	1,790	1,835
B	F	1,795	1,840	1,880	1,920	1,965	2,015	2,070	2,120	2,175	2,225
B	G	2,015	2,060	2,105	2,155	2,205	2,260	2,320	2,380	2,435	2,495
C	A	1,190	1,215	1,245	1,270	1,300	1,335	1,370	1,405	1,440	1,475
C	B	655	670	680	695	715	730	750	770	790	810
C	D	640	655	670	685	700	720	740	755	775	795
C	E	1,185	1,210	1,240	1,265	1,295	1,330	1,365	1,400	1,435	1,470
C	F	1,500	1,535	1,570	1,605	1,645	1,680	1,730	1,770	1,815	1,860
C	G	1,720	1,760	1,795	1,835	1,880	1,925	1,980	2,030	2,080	2,130
D	A	1,475	1,505	1,540	1,575	1,615	1,650	1,695	1,740	1,780	1,825
D	B	935	960	980	1,000	1,025	1,050	1,075	1,105	1,130	1,160
D	C	640	655	670	685	700	720	740	755	775	795
D	E	545	555	570	580	595	610	625	640	660	675
D	F	860	880	900	920	940	965	990	1,015	1,040	1,065
D	G	1,080	1,105	1,130	1,155	1,180	1,210	1,240	1,275	1,305	1,335
E	A	2,015	2,065	2,110	2,155	2,210	2,260	2,320	2,380	2,440	2,500
E	B	1,480	1,515	1,545	1,580	1,620	1,660	1,705	1,745	1,790	1,835
E	C	1,185	1,210	1,240	1,265	1,295	1,330	1,365	1,400	1,435	1,470
E	D	545	555	570	580	595	610	625	640	660	675
E	F	430	440	450	460	470	480	495	505	520	530
E	G	650	660	680	690	710	725	745	765	785	805
F	A	2,335	2,385	2,440	2,495	2,555	2,615	2,685	2,755	2,825	2,890
F	B	1,795	1,840	1,880	1,920	1,965	2,015	2,070	2,120	2,175	2,225
F	C	1,500	1,535	1,570	1,605	1,645	1,680	1,730	1,770	1,815	1,860
F	D	860	880	900	920	940	965	990	1,015	1,040	1,065
F	E	430	440	450	460	470	480	495	505	520	530
F	G	220	225	230	235	240	245	250	260	265	270
G	A	2,550	2,610	2,670	2,725	2,795	2,860	2,935	3,010	3,085	3,160
G	B	2,015	2,060	2,105	2,155	2,205	2,260	2,320	2,380	2,435	2,495

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G	C	1,720	1,760	1,795	1,835	1,880	1,925	1,980	2,030	2,080	2,130
G	D	1,080	1,105	1,130	1,155	1,180	1,210	1,240	1,275	1,305	1,335
G	E	650	660	680	690	710	725	745	765	785	805
G	F	220	225	230	235	240	245	250	260	265	270

Entry	Exit	2044-45	2045-46	2046-47	2047-48	2048-49	2049-50	2050-51	2051-52	2052-53	2053-54
A	B	685	700	720	740	760	780	805	830	850	875
A	C	1,515	1,555	1,595	1,640	1,685	1,735	1,785	1,835	1,885	1,945
A	D	1,875	1,925	1,975	2,035	2,085	2,145	2,205	2,270	2,335	2,405
A	E	2,565	2,635	2,705	2,785	2,855	2,935	3,020	3,110	3,195	3,295
A	F	2,970	3,050	3,130	3,220	3,305	3,400	3,495	3,595	3,695	3,810
A	G	3,245	3,335	3,425	3,520	3,615	3,715	3,825	3,935	4,040	4,165
B	A	685	700	720	740	760	780	805	830	850	875
B	C	830	855	875	900	925	950	980	1,005	1,035	1,065
B	D	1,190	1,225	1,255	1,290	1,325	1,365	1,405	1,445	1,485	1,530
B	E	1,885	1,935	1,985	2,040	2,095	2,155	2,215	2,280	2,345	2,415
B	F	2,285	2,350	2,410	2,480	2,545	2,615	2,690	2,770	2,845	2,935
B	G	2,565	2,635	2,705	2,780	2,855	2,935	3,020	3,105	3,190	3,290
C	A	1,515	1,555	1,595	1,640	1,685	1,735	1,785	1,835	1,885	1,945
C	B	830	855	875	900	925	950	980	1,005	1,035	1,065
C	D	815	835	860	885	910	935	960	990	1,015	1,045
C	E	1,505	1,550	1,590	1,635	1,680	1,725	1,775	1,825	1,875	1,935
C	F	1,910	1,965	2,015	2,070	2,125	2,185	2,250	2,315	2,380	2,450
C	G	2,190	2,250	2,305	2,370	2,435	2,505	2,575	2,650	2,725	2,805
D	A	1,875	1,925	1,975	2,035	2,085	2,145	2,205	2,270	2,335	2,405
D	B	1,190	1,225	1,255	1,290	1,325	1,365	1,405	1,445	1,485	1,530
D	C	815	835	860	885	910	935	960	990	1,015	1,045
D	E	690	710	730	750	770	790	815	840	860	890
D	F	1,095	1,125	1,155	1,185	1,220	1,250	1,290	1,325	1,365	1,405
D	G	1,370	1,410	1,445	1,490	1,530	1,570	1,615	1,660	1,710	1,760
E	A	2,565	2,635	2,705	2,785	2,855	2,935	3,020	3,110	3,195	3,295
E	B	1,885	1,935	1,985	2,040	2,095	2,155	2,215	2,280	2,345	2,415
E	C	1,505	1,550	1,590	1,635	1,680	1,725	1,775	1,825	1,875	1,935
E	D	690	710	730	750	770	790	815	840	860	890
E	F	545	560	575	595	610	625	645	660	680	700
E	G	825	845	870	895	920	945	970	1,000	1,025	1,060
F	A	2,970	3,050	3,130	3,220	3,305	3,400	3,495	3,595	3,695	3,810
F	B	2,285	2,350	2,410	2,480	2,545	2,615	2,690	2,770	2,845	2,935
F	C	1,910	1,965	2,015	2,070	2,125	2,185	2,250	2,315	2,380	2,450
F	D	1,095	1,125	1,155	1,185	1,220	1,250	1,290	1,325	1,365	1,405
F	E	545	560	575	595	610	625	645	660	680	700
F	G	280	285	295	300	310	320	325	335	345	355
G	A	3,245	3,335	3,425	3,520	3,615	3,715	3,825	3,935	4,040	4,165
G	B	2,565	2,635	2,705	2,780	2,855	2,935	3,020	3,105	3,190	3,290
G	C	2,190	2,250	2,305	2,370	2,435	2,505	2,575	2,650	2,725	2,805
G	D	1,370	1,410	1,445	1,490	1,530	1,570	1,615	1,660	1,710	1,760

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

G	E	825	845	870	895	920	945	970	1,000	1,025	1,060
G	F	280	285	295	300	310	320	325	335	345	355

Entry	Exit	2054-55	2055-56	2056-57	2057-58	2058-59	2059-60	2060-61	2061-62
A	B	900	930	955	985	1,015	1,050	1,080	1,115
A	C	2,000	2,060	2,120	2,185	2,250	2,320	2,395	2,470
A	D	2,475	2,550	2,620	2,705	2,785	2,875	2,965	3,060
A	E	3,385	3,490	3,590	3,705	3,815	3,935	4,060	4,185
A	F	3,920	4,040	4,155	4,285	4,415	4,550	4,695	4,845
A	G	4,285	4,415	4,540	4,685	4,825	4,980	5,135	5,295
B	A	900	930	955	985	1,015	1,050	1,080	1,115
B	C	1,095	1,130	1,160	1,200	1,235	1,275	1,315	1,355
B	D	1,570	1,620	1,665	1,720	1,770	1,825	1,885	1,945
B	E	2,485	2,560	2,635	2,715	2,800	2,885	2,980	3,070
B	F	3,015	3,110	3,195	3,300	3,400	3,505	3,615	3,730
B	G	3,380	3,485	3,585	3,700	3,810	3,930	4,055	4,180
C	A	2,000	2,060	2,120	2,185	2,250	2,320	2,395	2,470
C	B	1,095	1,130	1,160	1,200	1,235	1,275	1,315	1,355
C	D	1,075	1,110	1,140	1,175	1,210	1,250	1,290	1,330
C	E	1,990	2,050	2,110	2,175	2,240	2,310	2,385	2,460
C	F	2,520	2,600	2,670	2,755	2,840	2,930	3,020	3,115
C	G	2,885	2,975	3,060	3,155	3,250	3,355	3,460	3,570
D	A	2,475	2,550	2,620	2,705	2,785	2,875	2,965	3,060
D	B	1,570	1,620	1,665	1,720	1,770	1,825	1,885	1,945
D	C	1,075	1,110	1,140	1,175	1,210	1,250	1,290	1,330
D	E	915	940	970	1,000	1,030	1,060	1,095	1,130
D	F	1,445	1,490	1,530	1,580	1,625	1,680	1,730	1,785
D	G	1,810	1,865	1,920	1,980	2,040	2,105	2,170	2,240
E	A	3,385	3,490	3,590	3,705	3,815	3,935	4,060	4,185
E	B	2,485	2,560	2,635	2,715	2,800	2,885	2,980	3,070
E	C	1,990	2,050	2,110	2,175	2,240	2,310	2,385	2,460
E	D	915	940	970	1,000	1,030	1,060	1,095	1,130
E	F	720	745	765	790	810	840	865	890
E	G	1,090	1,120	1,155	1,190	1,225	1,265	1,305	1,345
F	A	3,920	4,040	4,155	4,285	4,415	4,550	4,695	4,845
F	B	3,015	3,110	3,195	3,300	3,400	3,505	3,615	3,730
F	C	2,520	2,600	2,670	2,755	2,840	2,930	3,020	3,115
F	D	1,445	1,490	1,530	1,580	1,625	1,680	1,730	1,785
F	E	720	745	765	790	810	840	865	890
F	G	365	380	390	400	415	425	440	455
G	A	4,285	4,415	4,540	4,685	4,825	4,980	5,135	5,295
G	B	3,380	3,485	3,585	3,700	3,810	3,930	4,055	4,180
G	C	2,885	2,975	3,060	3,155	3,250	3,355	3,460	3,570
G	D	1,810	1,865	1,920	1,980	2,040	2,105	2,170	2,240
G	E	1,090	1,120	1,155	1,190	1,225	1,265	1,305	1,345
G	F	365	380	390	400	415	425	440	455

5.3 Forecasted Toll Revenue and PCU for Group 1

1. The toll rates and forecasted AADT forms an input to revenue estimate for base year and horizon years. Section 5.1 provides the entry-exit AADT for base and horizon years and Section 5.2 provides entry-exit wise toll rates for base and horizon years.
2. In revenue calculation 90% of vehicles are assumed to single entry, 7% as return pass and 3% as monthly pass.
3. The following sections provide revenue estimates for base year and horizon years.
4. The growth rates adopted for calculation of AADT and revenue is based on average value of apparent growth rate described in Section 4.2.7. The tables (Table 4-24 to Table 4-29) in Section 4.2.7 also gives average value of growth rate for each financial year. This average growth is applied on base year and future year with induced growth as defined in 5.1.1 to obtain AADT and revenue in the financial model. It may be noted that there is negligible difference in AADT provided in previous section which is based on actual values of apparent growth rates (entry-exit wise) and AADT of financial model. The five-year average of growth rate used in financial model is shown in Table 5-5. After obtaining traffic from this growth rate induced traffic is applied.

Table 5-5 Growth Rate of financial Model

	Car, Jeep, Van, LMV	Bus	LCV, LGV	2 Axle Truck	3 Axle Truck	MAV
2022-23 to 2026-27	8.16%	5.06%	5.89%	6.49%	3.79%	8.64%
2027-28 to 2031-32	7.27%	4.06%	4.81%	5.30%	3.10%	7.06%
2032-33 to 2036-37	6.81%	3.77%	3.89%	4.22%	2.47%	5.64%
2037-38 to 2041-42	6.15%	3.40%	3.46%	3.76%	2.45%	5.02%
2042-43 to 2046-47	5.60%	3.10%	3.01%	3.28%	2.13%	4.37%
2047-48 to 2051-52	5.10%	2.82%	2.64%	2.89%	1.88%	3.86%
2052-53 to 2056-57	4.59%	2.54%	2.37%	2.60%	1.69%	3.47%
2057-58 to 2061-62	4.59%	2.54%	2.37%	2.61%	1.69%	3.47%

5. The revenue and PCU forecast was done for three scenarios namely optimistic, pessimistic and most likely. The variation of parameters based from most likely scenario based on which optimistic and pessimistic scenarios were calculated is shown in table below.

Parameter	Pessimistic	Optimistic
Seasonality	-15%	10%
ADT	-15%	10%
Growth Rate	-20%	10%

6. The revenue forecast for most likely, pessimistic and optimistic scenario is shown in tables below.

Table 5-6 Annual Revenue in crores for most likely scenario

Most Likely	Car, Jeep, Van, LMV	Bus	LCV, LGV	2 Axle Truck	3 Axle Truck	MAV	Total Revenue
2024-25	66	51	35	22	57	155	387
2025-26	74	56	39	24	62	175	430
2026-27	83	61	43	27	67	198	479
2027-28	93	66	47	30	72	221	530
2028-29	104	72	51	33	77	245	581
2029-30	116	78	56	36	83	274	642
2030-31	132	84	61	39	89	305	710
2031-32	147	92	67	43	95	340	787
2032-33	163	99	72	47	102	374	856
2033-34	180	108	78	51	109	412	937
2034-35	203	116	85	56	116	452	1,028
2035-36	224	126	92	60	124	498	1,127
2036-37	251	136	100	66	133	547	1,233
2037-38	276	147	107	71	142	598	1,341
2038-39	308	158	116	77	152	655	1,466
2039-40	338	171	125	83	162	717	1,601
2040-41	373	183	135	90	172	779	1,732
2041-42	411	196	144	96	183	846	1,878
2042-43	448	210	154	103	193	913	2,021
2043-44	492	224	164	110	204	985	2,185
2044-45	538	239	175	118	216	1,066	2,352
2045-46	586	255	188	126	229	1,153	2,538
2046-47	642	273	200	135	243	1,247	2,740
2047-48	699	291	214	144	257	1,344	2,957
2048-49	767	311	227	155	272	1,447	3,179
2049-50	833	332	243	165	287	1,560	3,420
2050-51	913	354	258	177	304	1,684	3,690
2051-52	987	378	277	189	322	1,816	3,979
2052-53	1,074	402	294	201	340	1,949	4,260
2053-54	1,169	429	314	215	360	2,099	4,586
2054-55	1,270	457	333	229	381	2,256	4,926
2055-56	1,379	488	355	245	403	2,429	5,313
2056-57	1,503	519	378	261	426	2,610	5,697
2057-58	1,641	555	404	280	451	2,814	6,144
2058-59	1,779	592	429	299	478	3,028	6,604
2059-60	1,938	632	459	319	506	3,264	7,138
2060-61	2,105	675	489	341	536	3,518	7,665
2061-62	2,291	719	522	365	568	3,790	8,254

Table 5-7 Annual Revenue in crores for pessimistic scenario

Pessimistic	Car, Jeep, Van, LMV	Bus	LCV, LGV	2 Axle Truck	3 Axle Truck	MAV	Total Revenue
2024-25	45	36	25	15	40	107	268
2025-26	50	39	27	17	43	119	295
2026-27	55	42	29	18	46	132	324
2027-28	61	45	32	20	49	145	354
2028-29	68	49	34	22	53	159	384
2029-30	74	52	37	24	56	176	419
2030-31	83	56	40	26	60	193	458
2031-32	92	61	43	28	64	212	502
2032-33	100	65	47	30	68	231	541
2033-34	109	70	50	32	73	252	586
2034-35	122	75	54	35	77	274	636
2035-36	133	81	58	38	82	298	691
2036-37	147	87	62	41	87	324	748
2037-38	160	93	67	44	93	351	807
2038-39	176	100	72	47	99	381	874
2039-40	191	107	77	50	105	413	946
2040-41	208	114	82	54	111	445	1,014
2041-42	227	121	87	57	118	479	1,089
2042-43	245	128	93	61	124	512	1,163
2043-44	266	136	98	65	130	548	1,247
2044-45	288	145	104	69	137	588	1,331
2045-46	310	154	111	73	145	631	1,424
2046-47	336	163	118	78	153	677	1,525
2047-48	363	173	125	83	161	724	1,633
2048-49	394	184	132	88	170	774	1,742
2049-50	424	195	140	94	179	828	1,860
2050-51	460	207	149	100	189	887	1,991
2051-52	492	220	159	106	199	949	2,131
2052-53	531	233	167	112	209	1,012	2,265
2053-54	573	247	178	119	221	1,083	2,422
2054-55	617	262	188	127	233	1,155	2,583
2055-56	665	278	200	135	246	1,236	2,766
2056-57	718	295	211	143	259	1,319	2,945
2057-58	777	314	225	152	273	1,413	3,153
2058-59	835	333	238	162	288	1,510	3,366
2059-60	902	354	253	172	304	1,617	3,612
2060-61	971	376	269	183	322	1,731	3,851
2061-62	1,048	399	285	194	339	1,852	4,117

Table 5-8 Annual Revenue in crores for optimistic scenario

Optimistic	Car, Jeep, Van, LMV	Bus	LCV, LGV	2 Axle Truck	3 Axle Truck	MAV	Total Revenue
2024-25	81	63	43	27	70	192	477
2025-26	92	69	48	30	76	219	535
2026-27	104	76	53	34	82	249	599
2027-28	118	83	59	37	88	280	667
2028-29	132	90	64	41	95	313	736
2029-30	148	98	70	45	103	352	817
2030-31	170	106	77	50	111	394	909
2031-32	192	116	85	55	119	443	1,013
2032-33	213	126	92	60	128	489	1,108
2033-34	237	137	100	66	137	541	1,218
2034-35	269	149	109	72	147	598	1,343
2035-36	299	161	120	78	157	661	1,480
2036-37	338	175	129	86	168	731	1,627
2037-38	373	190	140	93	180	802	1,778
2038-39	418	205	152	101	193	883	1,953
2039-40	461	222	164	110	207	971	2,142
2040-41	513	239	177	119	220	1,060	2,328
2041-42	569	257	191	128	234	1,156	2,535
2042-43	623	275	204	137	248	1,253	2,741
2043-44	687	295	218	148	263	1,357	2,975
2044-45	756	315	233	158	279	1,474	3,216
2045-46	828	338	251	170	297	1,602	3,485
2046-47	910	363	269	183	315	1,739	3,779
2047-48	996	388	288	196	334	1,882	4,094
2048-49	1,099	415	306	210	353	2,034	4,417
2049-50	1,199	444	328	225	374	2,200	4,771
2050-51	1,320	476	350	242	397	2,383	5,168
2051-52	1,434	509	376	259	422	2,581	5,595
2052-53	1,567	543	400	277	446	2,778	6,011
2053-54	1,713	580	428	296	473	3,003	6,494
2054-55	1,870	621	455	317	500	3,237	7,000
2055-56	2,039	663	487	340	531	3,497	7,577
2056-57	2,232	708	519	363	562	3,771	8,155
2057-58	2,447	758	556	389	596	4,079	8,827
2058-59	2,665	811	593	417	632	4,405	9,523
2059-60	2,916	868	635	447	671	4,764	10,330
2060-61	3,181	929	679	479	712	5,152	11,133
2061-62	3,477	993	725	513	756	5,569	12,033

7. The pcu forecast for most likely, pessimistic and optimistic scenario is shown in tables below.

Table 5-9 PCU forecast for most likely scenario

Entry+Exit_Point	A	B	C	D	E	F	G	Average PCU
2024-25	10,795	15,359	131	807	6,179	0	23,720	8,142
2025-26	11,824	16,784	143	879	6,740	0	25,952	8,903
2026-27	12,954	18,346	157	957	7,353	0	28,402	9,739
2027-28	14,020	19,849	170	1,031	7,946	0	30,734	10,536
2028-29	15,177	21,480	184	1,111	8,589	0	33,265	11,401
2029-30	16,433	23,251	199	1,198	9,286	0	36,012	12,340
2030-31	17,795	25,173	215	1,292	10,041	0	38,994	13,359
2031-32	19,275	27,261	233	1,393	10,860	0	42,232	14,465
2032-33	20,616	29,246	250	1,493	11,667	0	45,239	15,501
2033-34	22,053	31,381	268	1,600	12,537	0	48,468	16,615
2034-35	23,593	33,677	288	1,715	13,474	0	51,935	17,812
2035-36	25,243	36,149	309	1,839	14,483	0	55,659	19,097
2036-37	27,012	38,808	331	1,973	15,572	0	59,658	20,479
2037-38	28,767	41,463	354	2,105	16,660	0	63,638	21,855
2038-39	30,638	44,305	378	2,247	17,826	0	67,892	23,327
2039-40	32,633	47,349	404	2,399	19,077	0	72,438	24,900
2040-41	34,421	50,113	427	2,536	20,218	0	76,539	26,322
2041-42	36,309	53,045	452	2,682	21,431	0	80,882	27,829
2042-43	38,121	55,898	476	2,821	22,610	0	85,077	29,286
2043-44	40,027	58,911	500	2,968	23,857	0	89,498	30,823
2044-45	42,030	62,093	526	3,123	25,176	0	94,158	32,444
2045-46	44,137	65,455	554	3,287	26,572	0	99,070	34,153
2046-47	46,352	69,007	583	3,460	28,048	0	1,04,248	35,957
2047-48	48,491	72,463	610	3,626	29,483	0	1,09,265	37,705
2048-49	50,731	76,099	639	3,800	30,995	0	1,14,533	39,542
2049-50	53,078	79,926	669	3,984	32,587	0	1,20,065	41,473
2050-51	55,536	83,952	701	4,176	34,265	0	1,25,874	43,501
2051-52	58,112	88,191	734	4,379	36,034	0	1,31,975	45,632
2052-53	60,599	92,292	766	4,574	37,746	0	1,37,873	47,693
2053-54	63,195	96,592	800	4,779	39,543	0	1,44,044	49,850
2054-55	65,906	1,01,100	835	4,993	41,430	0	1,50,501	52,109
2055-56	68,736	1,05,827	871	5,218	43,410	0	1,57,258	54,474
2056-57	71,691	1,10,783	910	5,453	45,488	0	1,64,329	56,951
2057-58	74,777	1,15,980	950	5,699	47,670	0	1,71,730	59,544
2058-59	77,999	1,21,430	991	5,957	49,961	0	1,79,475	62,259
2059-60	81,364	1,27,145	1,035	6,226	52,367	0	1,87,582	65,103
2060-61	84,879	1,33,140	1,081	6,509	54,892	0	1,96,068	68,081
2061-62	88,549	1,39,428	1,129	6,805	57,544	0	2,04,952	71,201

Table 5-10 PCU forecast for pessimistic scenario

Entry+Exit_Point	A	B	C	D	E	F	G	Average PCU
2024-25	7,483	10,661	91	561	4,293	0	16,454	5,649

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

2025-26	8,083	11,494	98	603	4,622	0	17,756	6,094
2026-27	8,732	12,393	106	649	4,976	0	19,165	6,574
2027-28	9,340	13,253	113	691	5,316	0	20,497	7,030
2028-29	9,992	14,174	121	737	5,680	0	21,924	7,518
2029-30	10,691	15,161	129	786	6,070	0	23,454	8,042
2030-31	11,440	16,219	138	838	6,487	0	25,095	8,603
2031-32	12,243	17,355	148	894	6,934	0	26,854	9,204
2032-33	12,970	18,429	157	948	7,372	0	28,483	9,766
2033-34	13,742	19,573	167	1,006	7,839	0	30,215	10,363
2034-35	14,561	20,790	178	1,068	8,336	0	32,055	10,998
2035-36	15,430	22,085	189	1,134	8,866	0	34,011	11,673
2036-37	16,352	23,464	200	1,203	9,430	0	36,089	12,391
2037-38	17,262	24,833	212	1,272	9,991	0	38,148	13,103
2038-39	18,225	26,284	225	1,346	10,586	0	40,326	13,856
2039-40	19,242	27,822	238	1,423	11,218	0	42,633	14,654
2040-41	20,117	29,164	249	1,491	11,772	0	44,633	15,347
2041-42	21,034	30,574	261	1,561	12,355	0	46,730	16,074
2042-43	21,909	31,936	272	1,629	12,918	0	48,744	16,773
2043-44	22,822	33,362	284	1,699	13,507	0	50,849	17,503
2044-45	23,774	34,855	296	1,773	14,125	0	53,048	18,267
2045-46	24,767	36,417	309	1,850	14,772	0	55,345	19,066
2046-47	25,803	38,052	323	1,930	15,450	0	57,746	19,901
2047-48	26,798	39,634	335	2,008	16,105	0	60,061	20,706
2048-49	27,833	41,284	349	2,088	16,789	0	62,472	21,545
2049-50	28,909	43,006	362	2,172	17,504	0	64,983	22,420
2050-51	30,028	44,803	377	2,259	18,250	0	67,600	23,331
2051-52	31,192	46,678	392	2,350	19,030	0	70,325	24,281
2052-53	32,311	48,484	406	2,437	19,781	0	72,950	25,196
2053-54	33,473	50,364	421	2,528	20,563	0	75,676	26,146
2054-55	34,676	52,319	436	2,623	21,378	0	78,507	27,134
2055-56	35,925	54,352	452	2,721	22,226	0	81,448	28,161
2056-57	37,219	56,468	469	2,823	23,109	0	84,503	29,227
2057-58	38,562	58,669	486	2,929	24,029	0	87,677	30,336
2058-59	39,954	60,959	504	3,039	24,986	0	90,973	31,488
2059-60	41,397	63,342	523	3,153	25,983	0	94,398	32,685
2060-61	42,894	65,821	542	3,272	27,022	0	97,955	33,929
2061-62	44,447	68,400	562	3,396	28,103	0	1,01,652	35,223

Table 5-11 PCU forecast for optimistic scenario

Entry+Exit_Point	A	B	C	D	E	F	G	Average PCU
2024-25	13,332	18,957	162	995	7,622	0	29,287	10,051

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

2025-26	14,704	20,855	178	1,090	8,369	0	32,262	11,066
2026-27	16,223	22,952	196	1,195	9,192	0	35,552	12,187
2027-28	17,662	24,977	214	1,295	9,990	0	38,697	13,262
2028-29	19,232	27,189	233	1,403	10,860	0	42,130	14,435
2029-30	20,947	29,605	253	1,521	11,809	0	45,880	15,716
2030-31	22,819	32,245	275	1,649	12,844	0	49,977	17,116
2031-32	24,865	35,130	300	1,788	13,974	0	54,453	18,644
2032-33	26,723	37,880	323	1,926	15,091	0	58,619	20,080
2033-34	28,723	40,855	349	2,075	16,302	0	63,116	21,631
2034-35	30,877	44,073	376	2,236	17,613	0	67,970	23,306
2035-36	33,197	47,554	406	2,409	19,035	0	73,210	25,116
2036-37	35,696	51,321	438	2,597	20,576	0	78,868	27,071
2037-38	38,182	55,093	470	2,784	22,121	0	84,516	29,024
2038-39	40,845	59,153	505	2,986	23,787	0	90,581	31,122
2039-40	43,697	63,522	542	3,203	25,582	0	97,094	33,377
2040-41	46,296	67,556	576	3,402	27,248	0	1,03,069	35,449
2041-42	49,053	71,858	612	3,614	29,027	0	1,09,426	37,656
2042-43	51,707	76,058	646	3,818	30,765	0	1,15,587	39,797
2043-44	54,509	80,515	683	4,035	32,611	0	1,22,109	42,066
2044-45	57,467	85,245	721	4,264	34,573	0	1,29,013	44,469
2045-46	60,591	90,265	762	4,507	36,658	0	1,36,323	47,015
2046-47	63,890	95,593	805	4,764	38,875	0	1,44,065	49,713
2047-48	67,082	1,00,794	846	5,013	41,037	0	1,51,587	52,337
2048-49	70,439	1,06,290	889	5,275	43,324	0	1,59,517	55,105
2049-50	73,969	1,12,098	935	5,551	45,745	0	1,67,878	58,025
2050-51	77,681	1,18,238	983	5,842	48,307	0	1,76,695	61,107
2051-52	81,585	1,24,727	1,033	6,150	51,019	0	1,85,993	64,358
2052-53	85,361	1,31,024	1,082	6,448	53,653	0	1,95,002	67,510
2053-54	89,318	1,37,651	1,133	6,762	56,428	0	2,04,464	70,822
2054-55	93,464	1,44,627	1,187	7,091	59,353	0	2,14,401	74,303
2055-56	97,807	1,51,970	1,244	7,437	62,436	0	2,24,839	77,962
2056-57	1,02,358	1,59,700	1,303	7,800	65,685	0	2,35,804	81,807
2057-58	1,07,128	1,67,838	1,365	8,183	69,110	0	2,47,323	85,849
2058-59	1,12,125	1,76,407	1,430	8,584	72,721	0	2,59,424	90,099
2059-60	1,17,363	1,85,429	1,498	9,007	76,528	0	2,72,139	94,566
2060-61	1,22,853	1,94,930	1,570	9,451	80,542	0	2,85,499	99,263
2061-62	1,28,607	2,04,936	1,645	9,918	84,774	0	2,99,538	1,04,202

5.4 Modification in Concession Agreement as per Clause 29.2

5.4.1 Most Likely Scenario

In most likely scenario as per Article 29.2 and traffic at traffic dates the concession period will be extended by 2190 days. The detailed calculations shown in table below.

Table 5-12 Calculation for Modification in Concession Period as per Article 29.2 (Most Likely Scenario)

FY:	2025-26	2030-31	2035-36	2040-41	2045-46	2050-51
Weighted Average Traffic for Previous FY:	8,142	12,340	17,812	24,900	32,444	41,473
Target Traffic:	25,719	40,759	61,199	87,256	1,18,274	1,48,644
Revised Target Traffic:		32,607	48,959	69,805	94,619	1,18,915
Percent Difference from Target:	-68.34%	-49.73%	-63.62%	-64.33%	-65.71%	-65.12%
Percent Difference exceeding 5%:	-63.34%	-44.73%	-58.62%	-59.33%	-60.71%	-60.12%
Percent Difference exceeding 5% Upto 20%:	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%
Remaining Concession Period without any Modification	10056	8230	6404	4577	2751	925
Capped at 20%	12247.6	10421.6	8595.6	6768.6	4942.6	3116.6
Remaining Resultant Concession Period (yrs):	12067.2	10421.6	8595.6	6768.6	4942.6	3116.6

5.4.2 Optimistic Scenario

In optimistic scenario as per Article 29.2 and traffic at traffic dates the concession period will be extended by 2190 days. The detailed calculation shown in table below.

Table 5-13 Calculation for Modification in Concession Period as per Article 29.2 (Optimistic Scenario)

FY:	2025-26	2030-31	2035-36	2040-41	2045-46	2050-51
Weighted Average Traffic for Previous FY:	10,051	15,716	23,306	33,377	44,469	58,025
Target Traffic:	25,719	40,759	61,199	87,256	1,18,274	1,48,644
Revised Target Traffic:		32,607	48,959	69,805	94,619	1,18,915
Percent Difference from Target:	-60.92%	-41.44%	-52.40%	-52.19%	-53.00%	-51.20%

Percent Difference exceeding 5%:	-55.92%	-36.44%	-47.40%	-47.19%	-48.00%	-46.20%
Percent Difference exceeding 5% Upto 20%:	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%
Remaining Concession Period without any Modification	10056	8230	6404	4577	2751	925
Capped at 20%	12247.6	10421.6	8595.6	6768.6	4942.6	3116.6
Remaining Resultant Concession Period (yrs):	12067.2	10421.6	8595.6	6768.6	4942.6	3116.6

5.4.3 Pessimistic Scenario

In pessimistic scenario as per Article 29.2 and traffic at traffic dates the concession period will be extended by 2190 days. The detailed calculation shown in table below.

Table 5-14 Calculation for Modification in Concession Period as per Article 29.2 (Pessimistic Scenario)

FY:	2025-26	2030-31	2035-36	2040-41	2045-46	2050-51
Weighted Average Traffic for Previous FY:	5,649	8,042	10,998	14,654	18,267	22,420
Target Traffic:	25,719	40,759	61,199	87,256	1,18,274	1,48,644
Revised Target Traffic:		32,607	48,959	69,805	94,619	1,18,915
Percent Difference from Target:	-78.04%	-60.27%	-77.54%	-79.01%	-80.69%	-81.15%
Percent Difference exceeding 5%:	-73.04%	-55.27%	-72.54%	-74.01%	-75.69%	-76.15%
Percent Difference exceeding 5% Upto 20%:	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%	-20.00%
Remaining Concession Period without any Modification	10056	8230	6404	4577	2751	925
Capped at 20%	12247.6	10421.6	8595.6	6768.6	4942.6	3116.6
Remaining Resultant Concession Period (days):	12067.2	10421.6	8595.6	6768.6	4942.6	3116.6

6 ANNEXURES ROUTE MAP

Route Code with Entry Exit

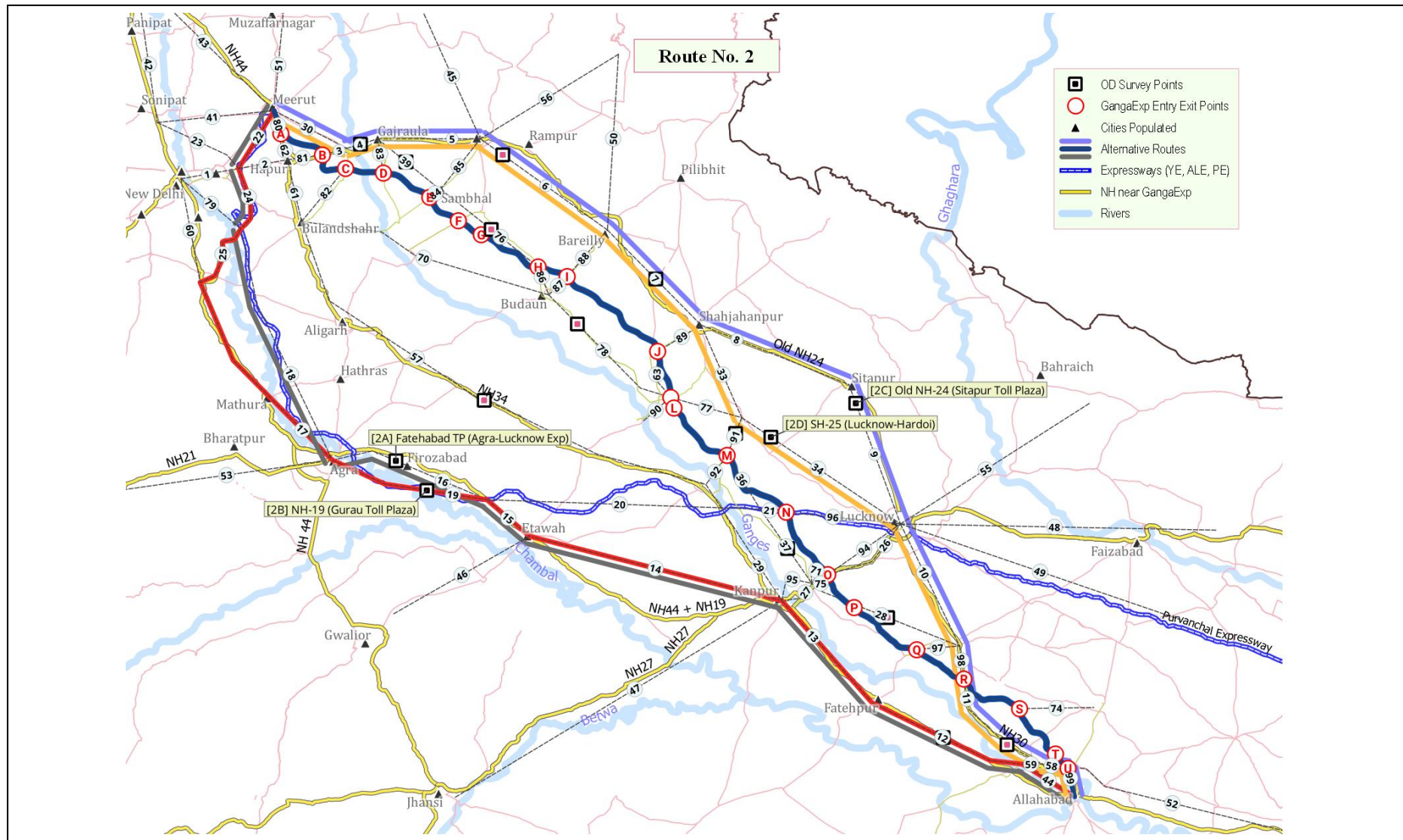
Route no.	From	To	Corridor Section (Entry-Exit)
2	Meerut	Prayagraj	A to U
3	Meerut	Varanasi	A to U
4	Meerut	Raebareli	A to Q
5	Meerut	Kanpur	A to O
6	Meerut	Lucknow	A to N
7	Meerut	Unnao	A to O
8	Meerut	Hardoi	A to K
9	Meerut	Shahjahanpur	A to J
10	Meerut	Bareilly	A to I
11	Meerut	Badaun	A to H
12	Meerut	Sambhal	A to E
13	NorthernStates	Prayagraj	A to U
14	NorthernStates	Varanasi	A to U
15	NorthernStates	Raebareli	A to Q
16	NorthernStates	Kanpur	A to O
17	NorthernStates	Unnao	A to O
18	NorthernStates	Lucknow	A to N
19	Meerut	Muradabad	A to E
20	Delhi	Prayagraj	B to U
21	Delhi	Varanasi	B to U
22	Delhi	Raebareli	B to Q
23	Delhi	Lucknow	B to N
24	Delhi	Kanpur	B to O
25	Delhi	Unnao	B to O
26	Delhi	Hardoi	B to K
27	Delhi	Shahjahanpur	B to J
28	Delhi	Bareilly	B to I
29	Delhi	Muradabad	B to E
30	Delhi	Sambhal	B to E
31	Delhi	Badaun	B to H
32	Amroha	Prayagraj	D to U
33	Amroha	Varanasi	D to U
34	Amroha	Raebareli	D to Q
35	Amroha	Lucknow	D to N
36	Amroha	Kanpur	D to O
37	Amroha	Unnao	D to O
38	Amroha	Hardoi	D to K
39	Amroha	Shahjahanpur	D to J

Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]

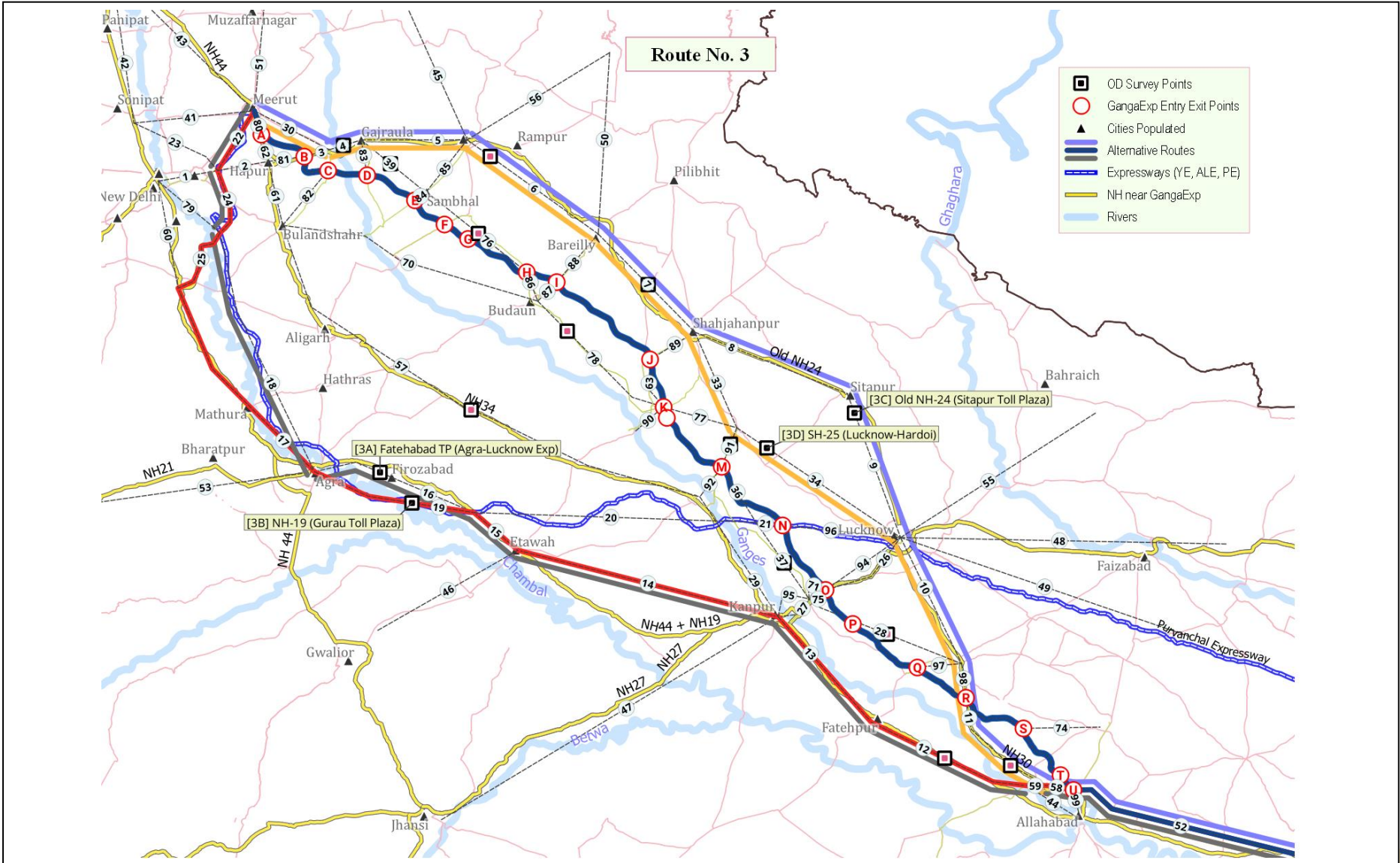
40	Amroha	Badaun	D to H
41	Amroha	Bareilly	D to J
42	Sambhal	Prayagraj	E to U
43	Sambhal	Varanasi	E to U
44	Sambhal	Raebareli	E to Q
45	Sambhal	Lucknow	E to N
46	Sambhal	Kanpur	E to O
47	Sambhal	Unnao	E to O
48	Sambhal	Hardoi	E to K
49	Sambhal	Shahjahanpur	E to J
50	Sambhal	Bareilly	E to I
51	Sambhal	Badaun	E to H
52	Moradabad	Prayagraj	E to U
53	Moradabad	Varanasi	E to U
54	Moradabad	Lucknow	E to N
55	Moradabad	Kanpur	E to O
56	Moradabad	Hardoi	E to K
57	Moradabad	Badaun	E to H
58	Bareilly	Prayagraj	I to U
59	Bareilly	Varanasi	I to U
60	Bareilly	Raebareli	I to Q
61	Bareilly	Kanpur	I to O
62	Bareilly	Unnao	I to O
63	Bareilly	Lucknow	I to N
64	Bareilly	Hardoi	I to K
65	Badaun	Prayagraj	I to U
66	Badaun	Varanasi	I to U
67	Badaun	Raebareli	I to Q
68	Badaun	Kanpur	I to O
69	Badaun	Lucknow	I to N
70	Badaun	Hardoi	I to K
71	Badaun	Unnao	I to O
72	Shahjahanpur	Prayagraj	J to U
73	Shahjahanpur	Varanasi	J to U
74	Shahjahanpur	Raebareli	J to Q
75	Shahjahanpur	Kanpur	J to O
76	Shahjahanpur	Unnao	J to O
77	Shahjahanpur	Lucknow	J to N
78	Hardoi	Prayagraj	M to U
79	Hardoi	Varanasi	M to U
80	Hardoi	Raebareli	M to Q
81	Hardoi	Kanpur	M to O
82	Hardoi	Unnao	M to O
83	Agra	Prayagraj	N to U
84	Agra	Varanasi	N to U
85	Lucknow	Prayagraj	O to U

86	Lucknow	Varanasi	O to U
87	Kanpur	Prayagraj	O to U
88	Kanpur	Varanasi	O to U
89	Kanpur	Raebareli	O to Q
90	Raebareli	Prayagraj	R to U
91	Raebareli	Varanasi	R to U
92	Hapur	Prayagraj	B to U
93	Hapur	Varanasi	B to U
94	Hapur	Lucknow	B to N
95	Hapur	Kanpur	B to O
96	Hapur	Bareilly	B to I
97	Hapur	Badaun	B to H
98	Hapur	Sambhal	B to E
99	Hapur	Shahjahanpur	B to J
100	Hapur	Hardoi	B to K
101	Bulandshahr	Bareilly	C to I
102	Bulandshahr	Lucknow	C to N
103	Bulandshahr	Muradabad	C to E
104	Bulandshahr	Sambhal	C to E
105	Bulandshahr	Hardoi	C to K
106	Bulandshahr	Shahjahanpur	C to J

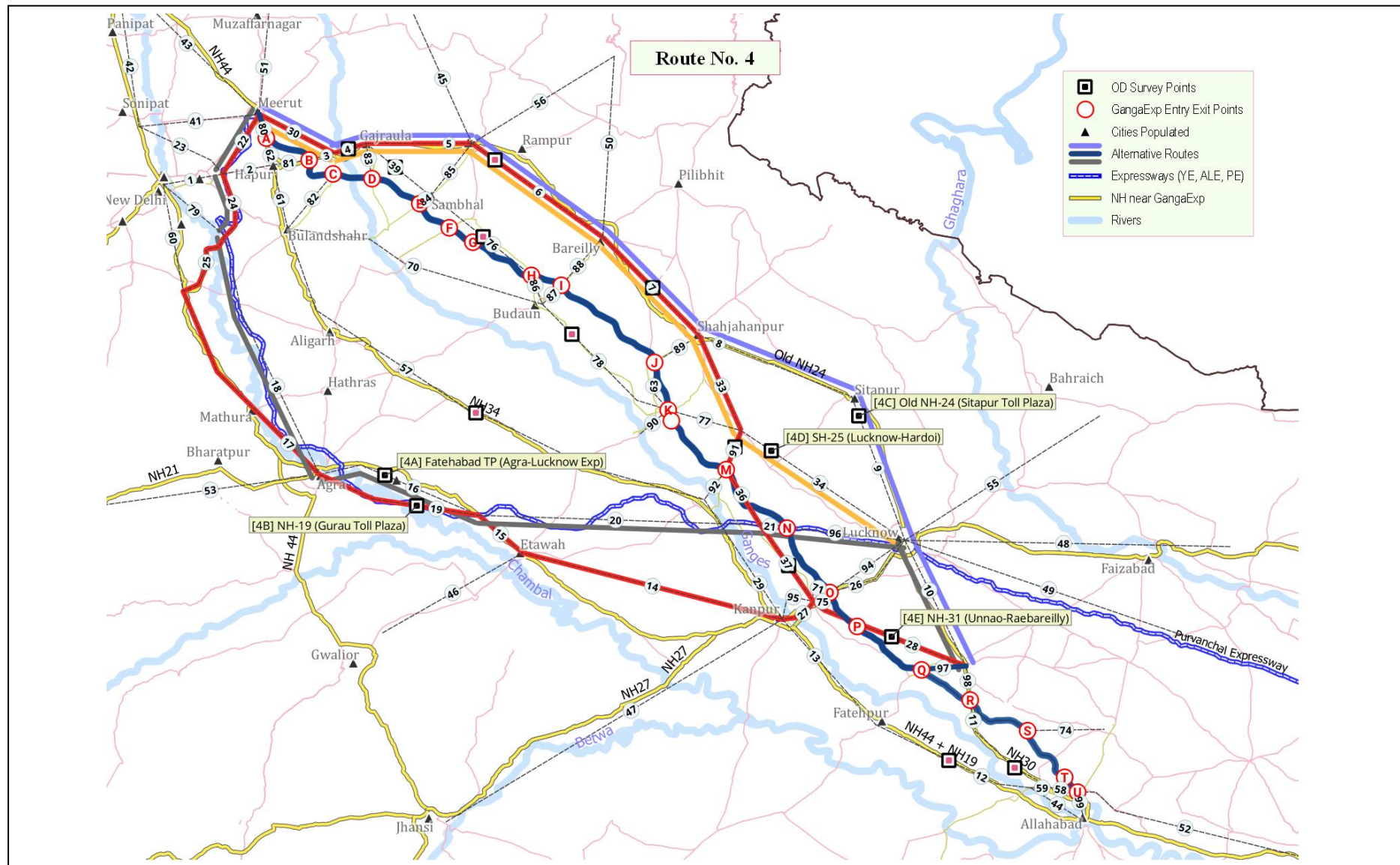
Traffic & Revenue Study for Ganga Expressway [Group 1 Traffic & Revenue Projection]



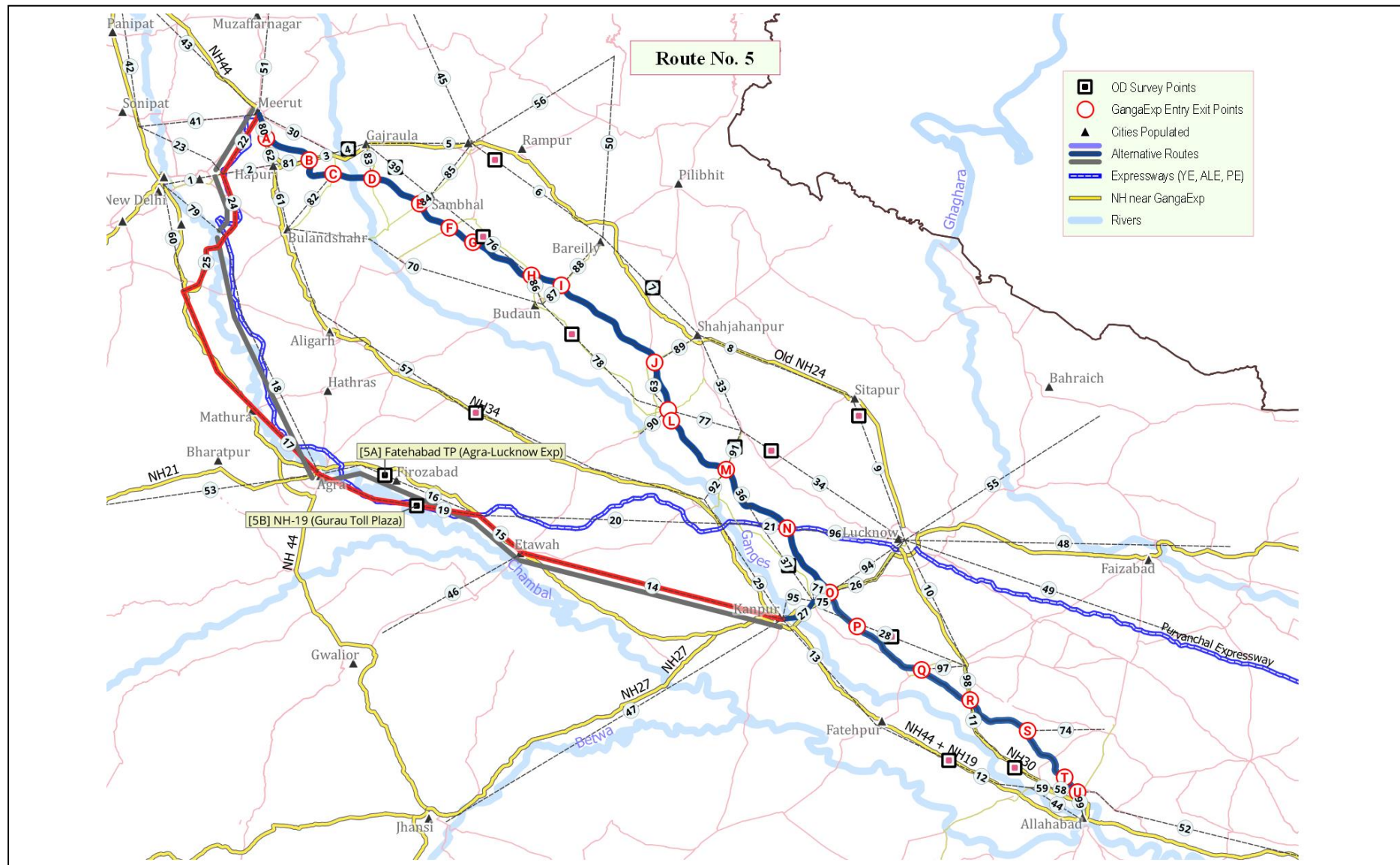
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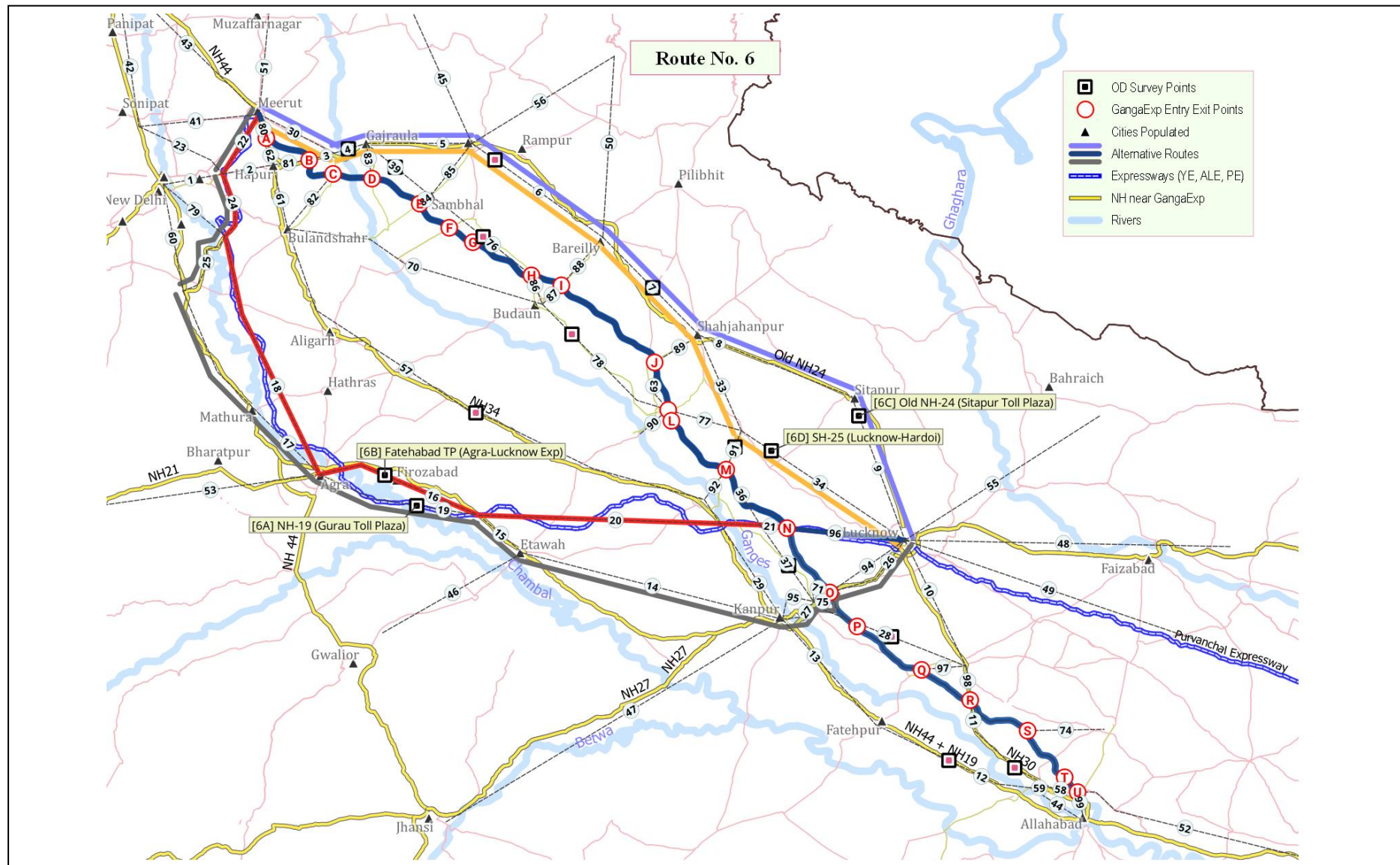
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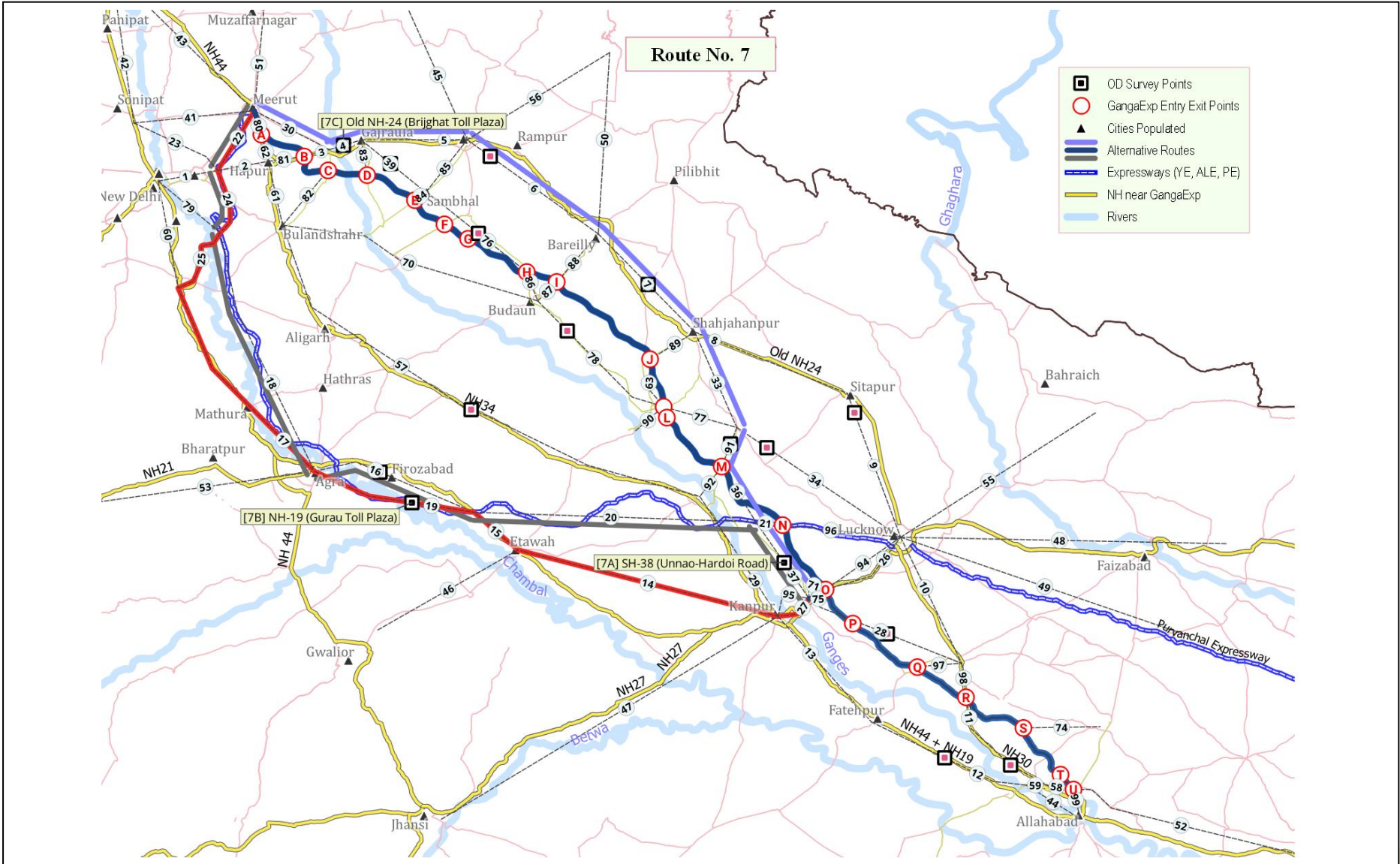
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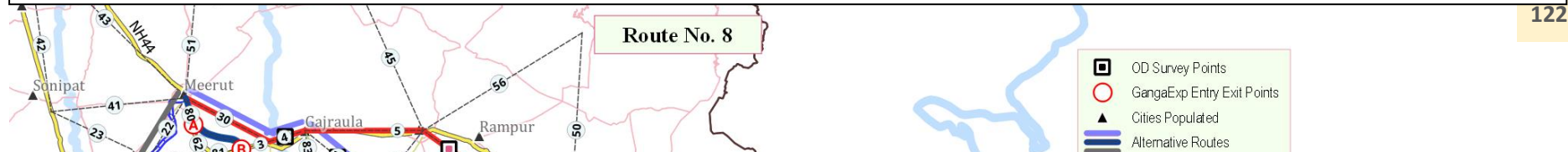
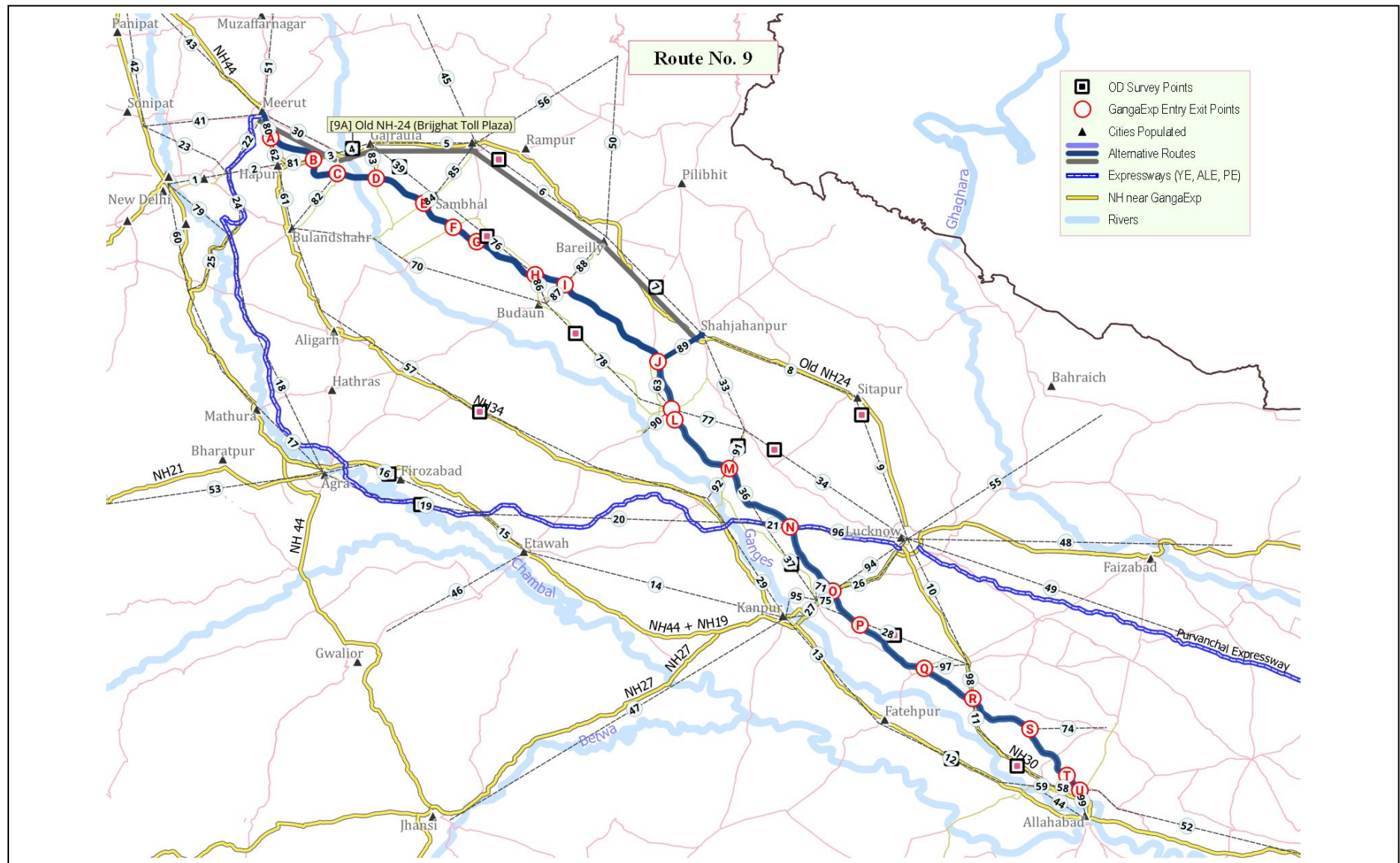


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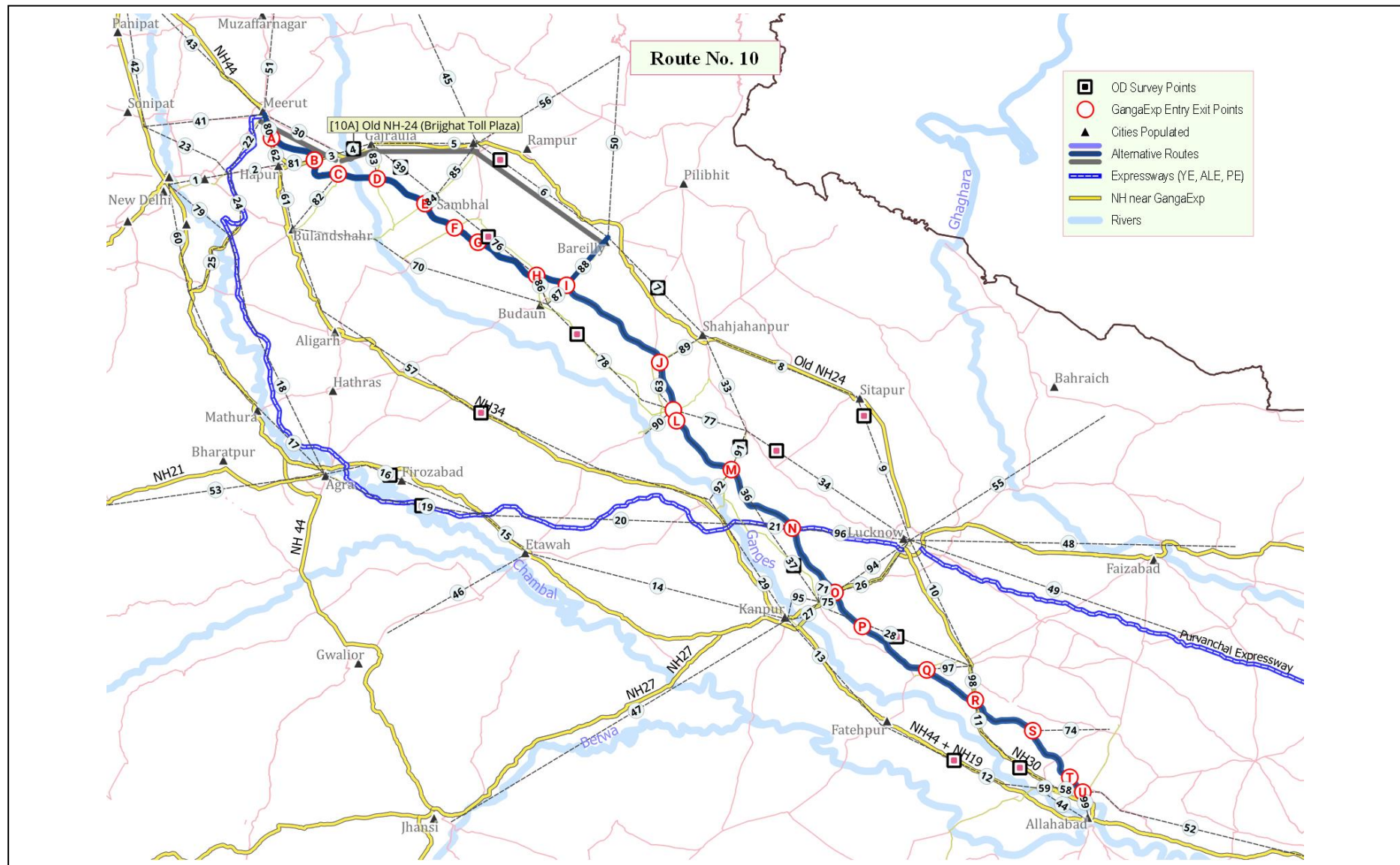




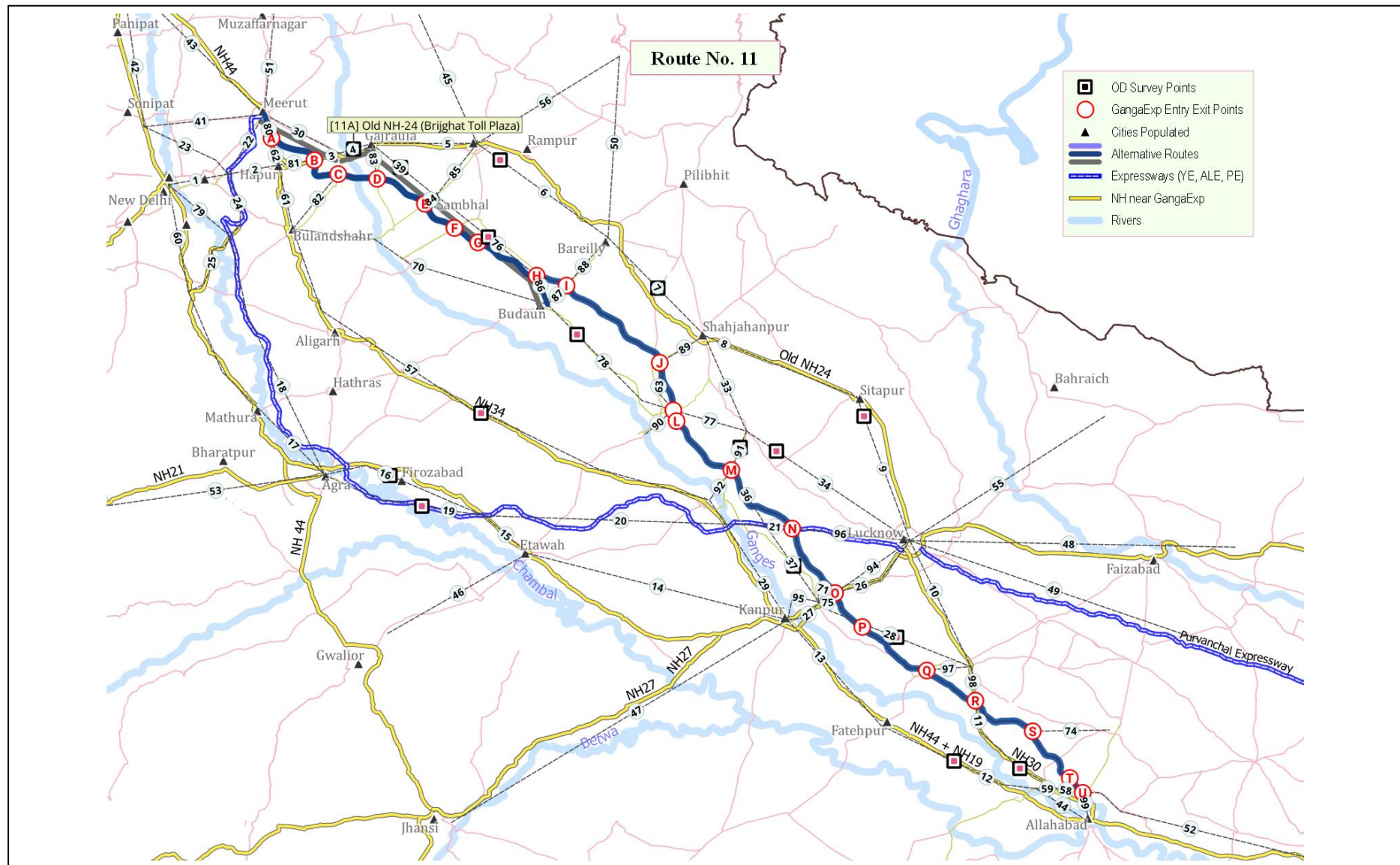
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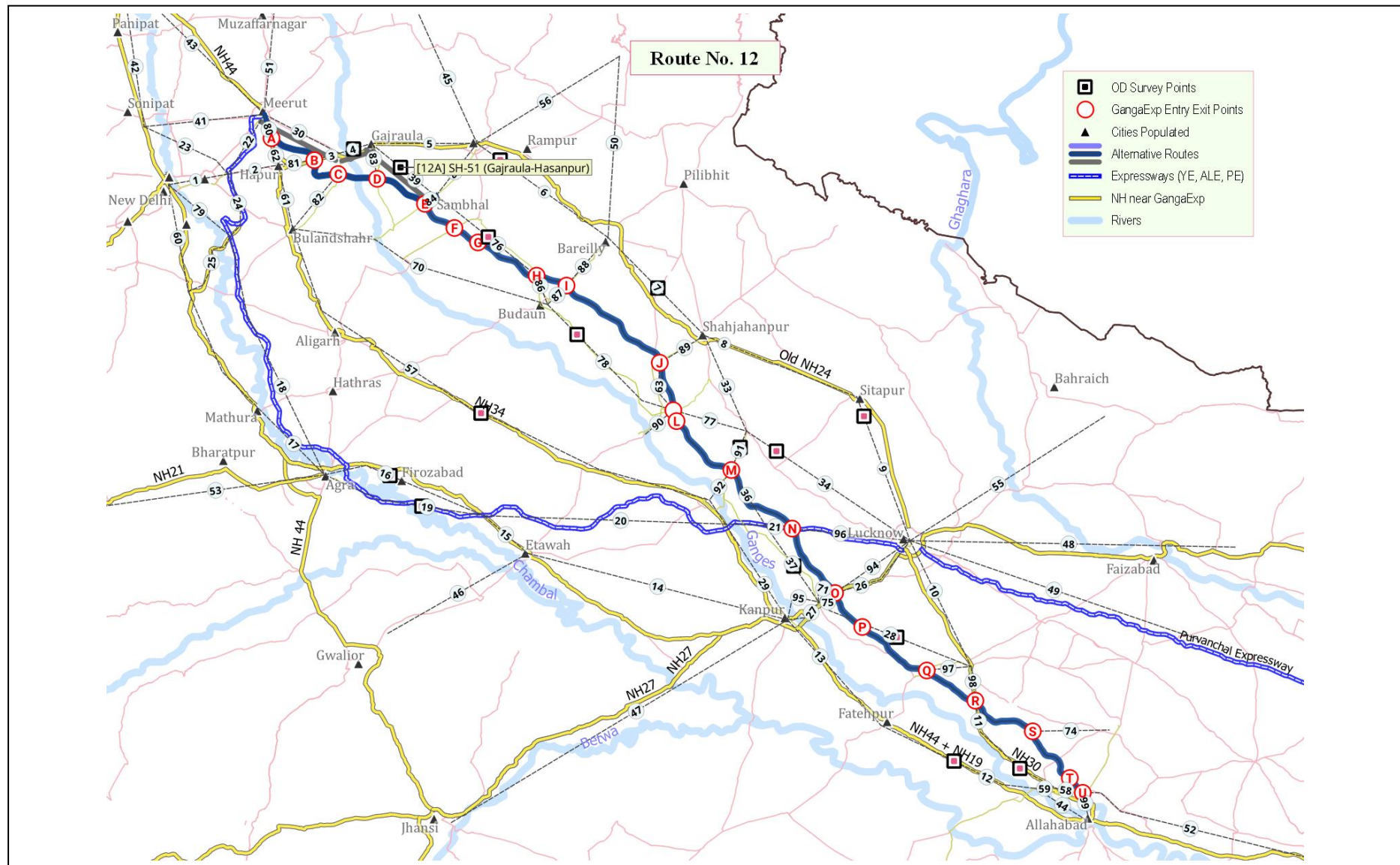
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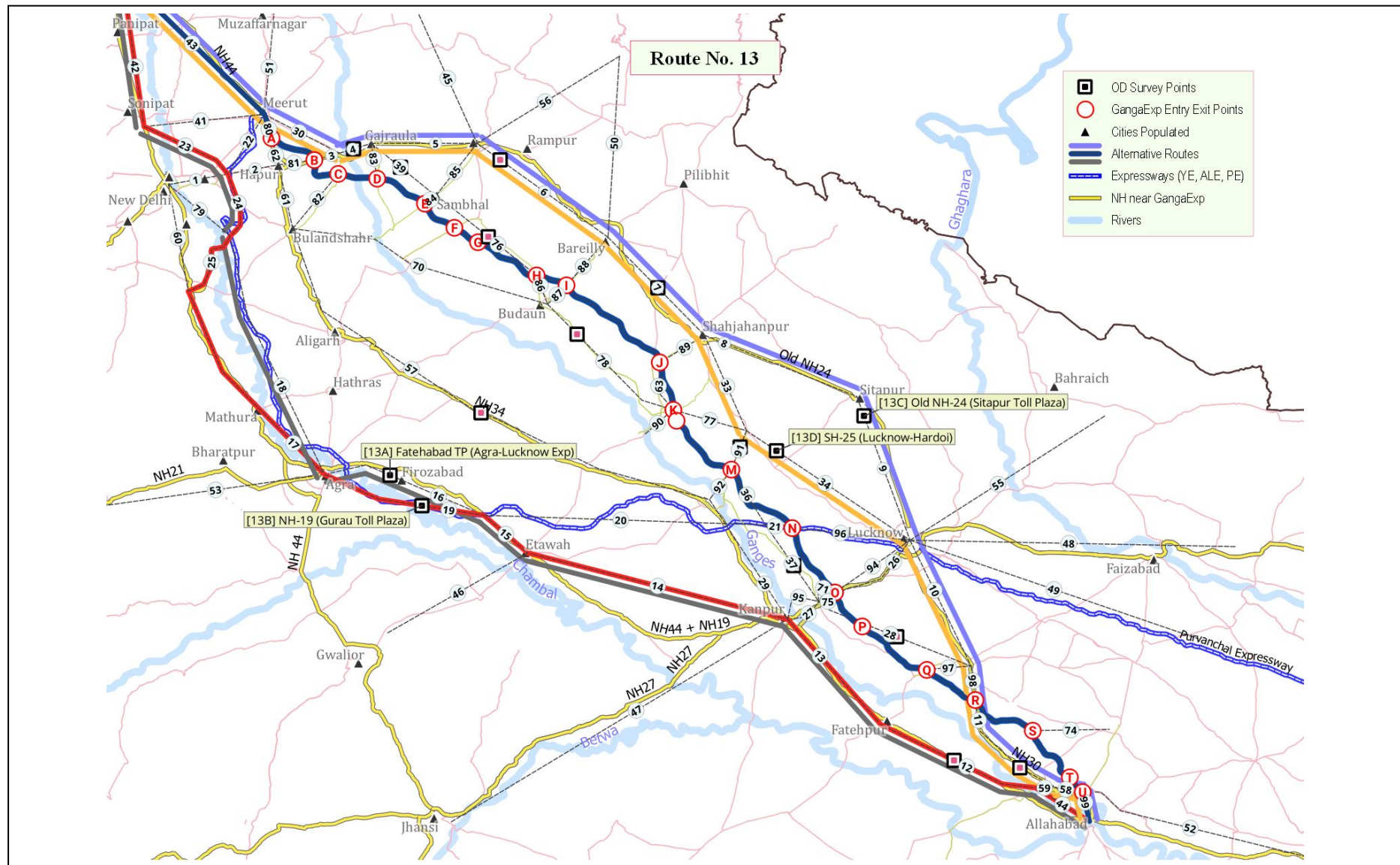
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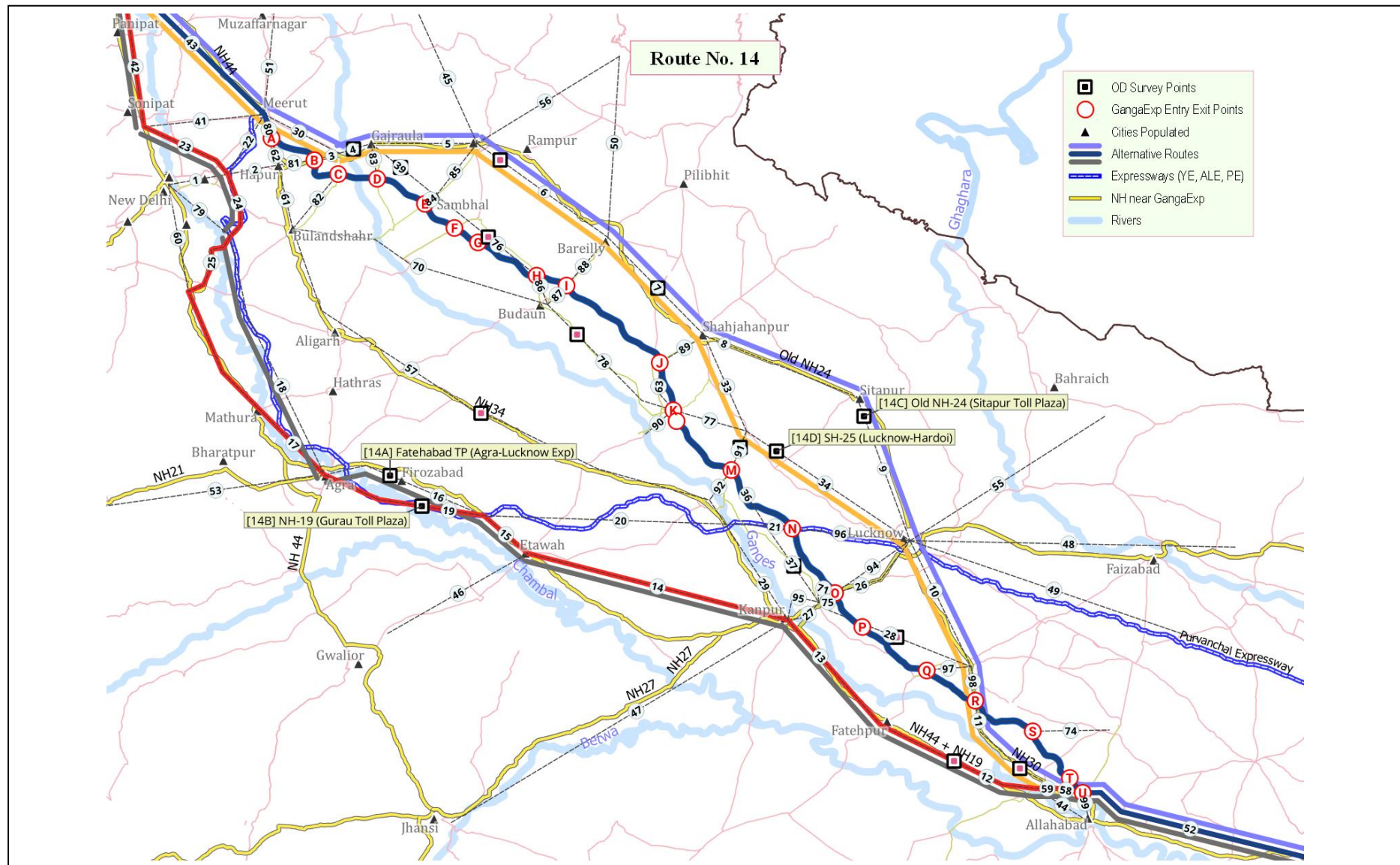
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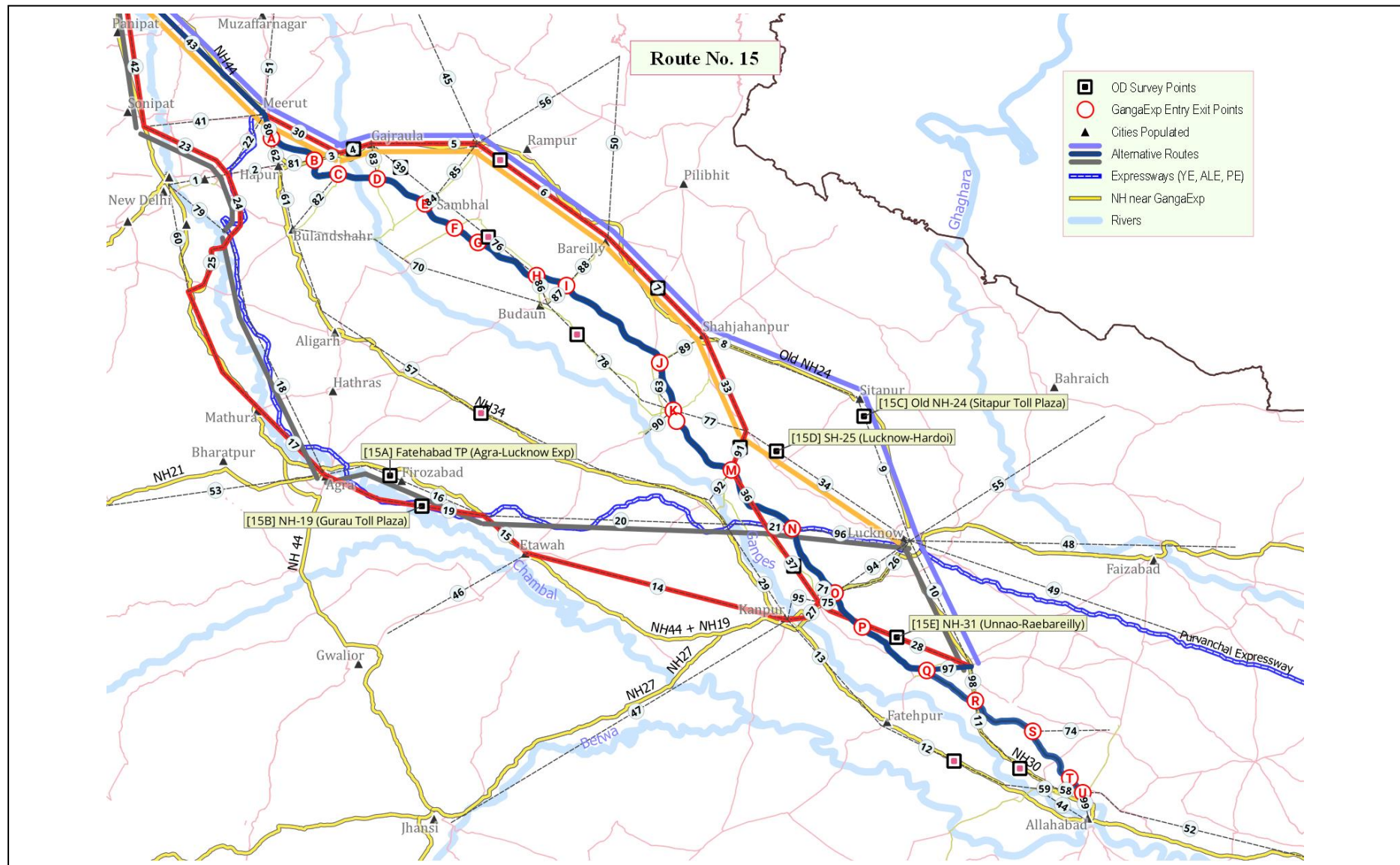
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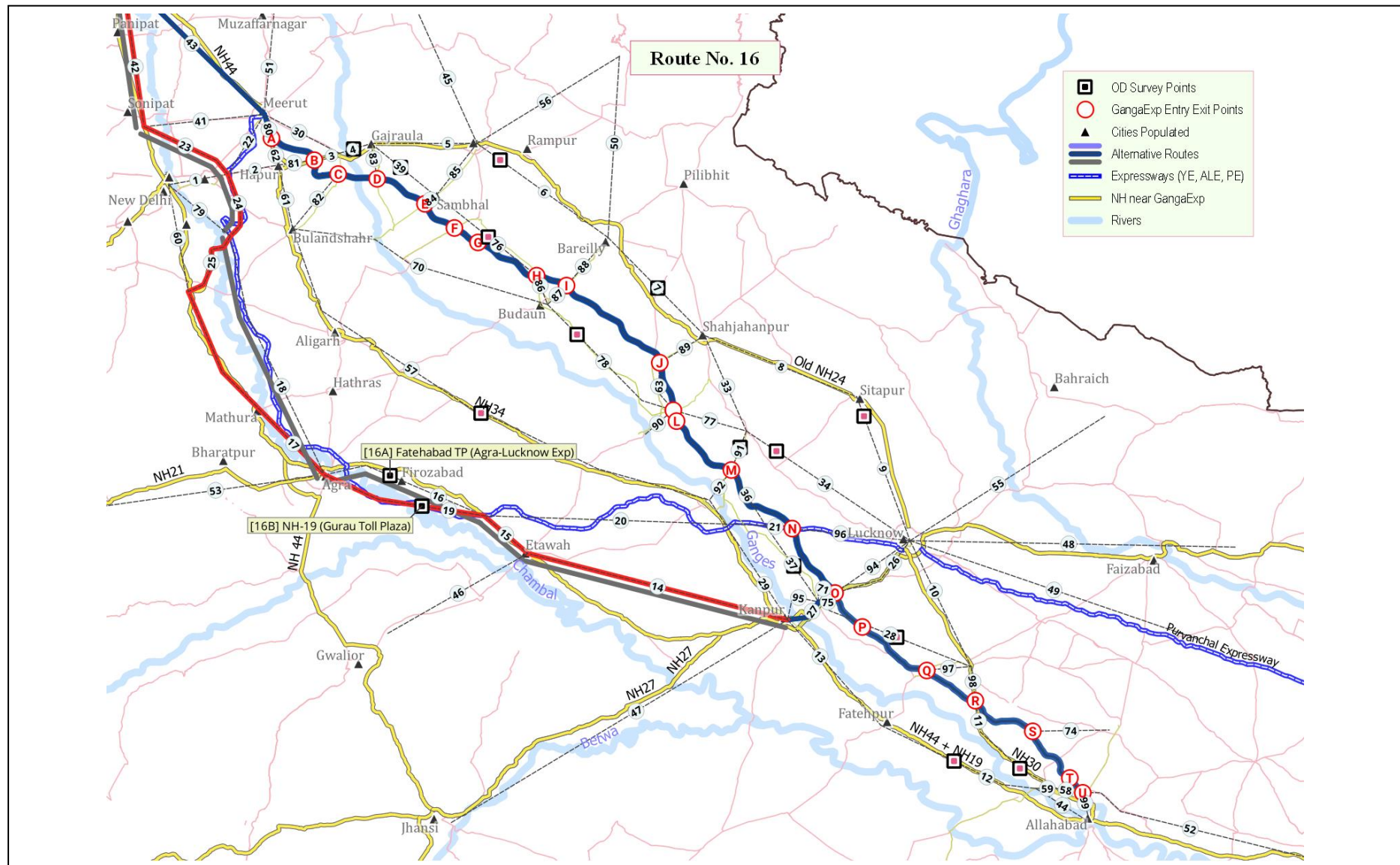
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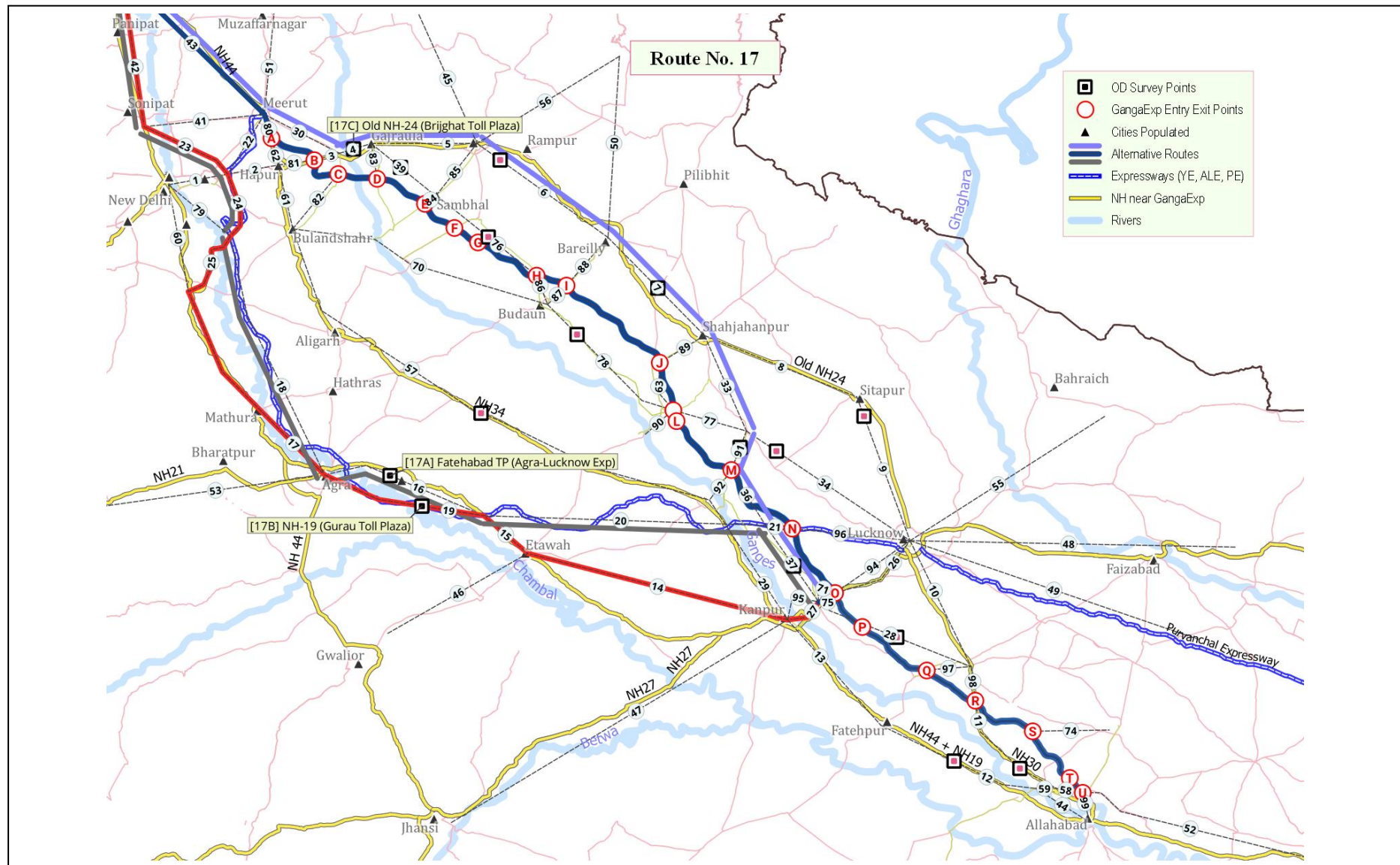
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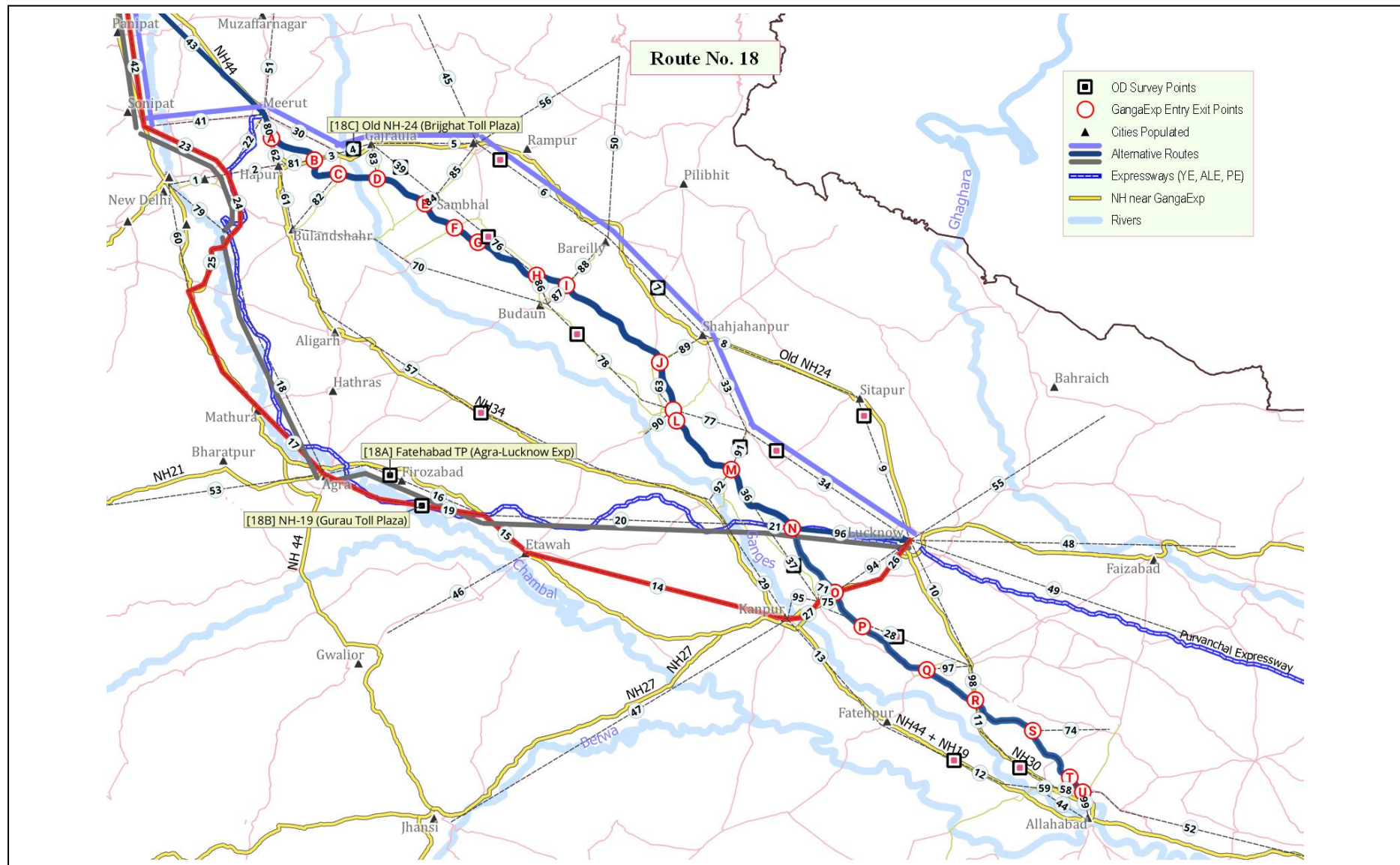
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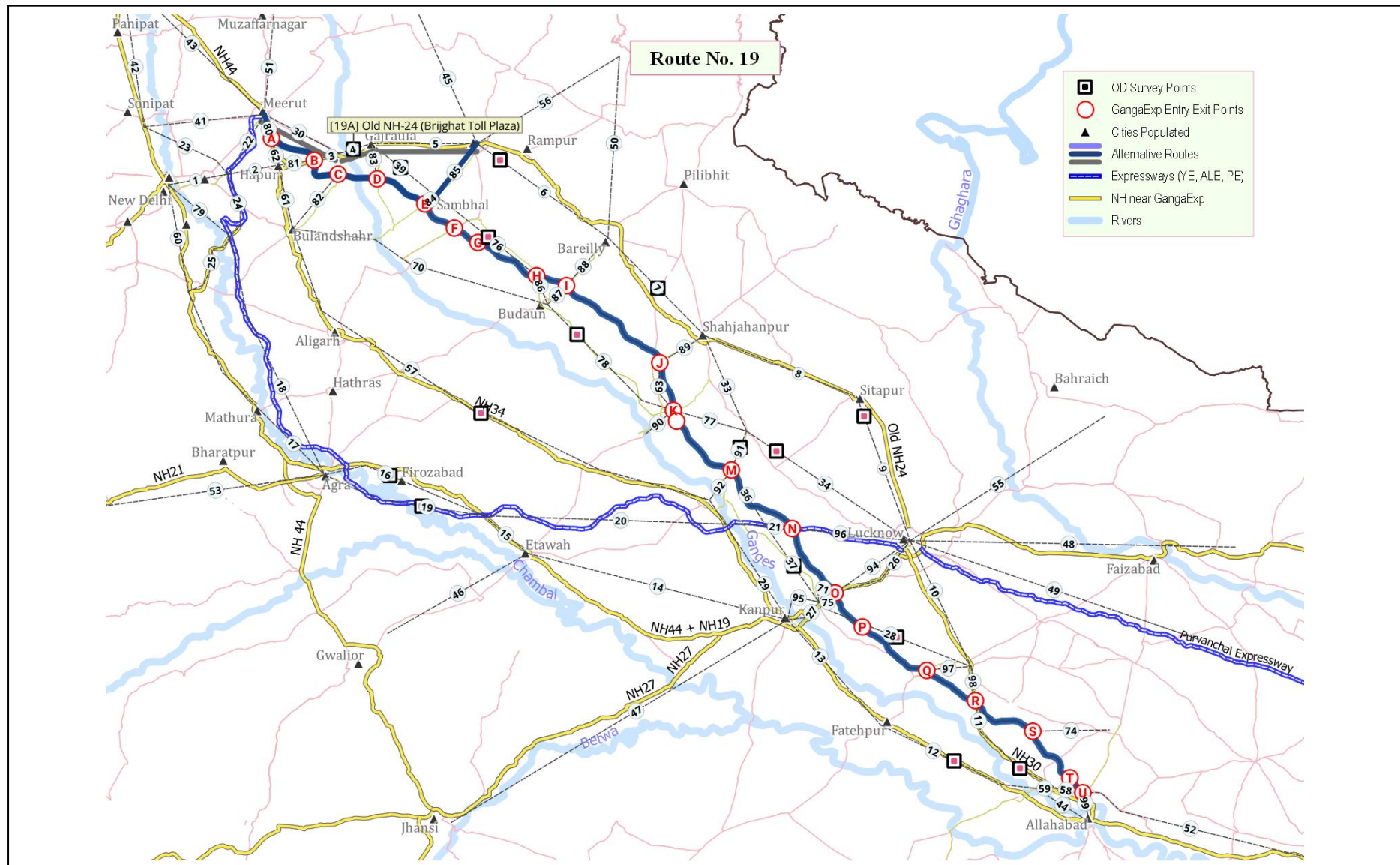
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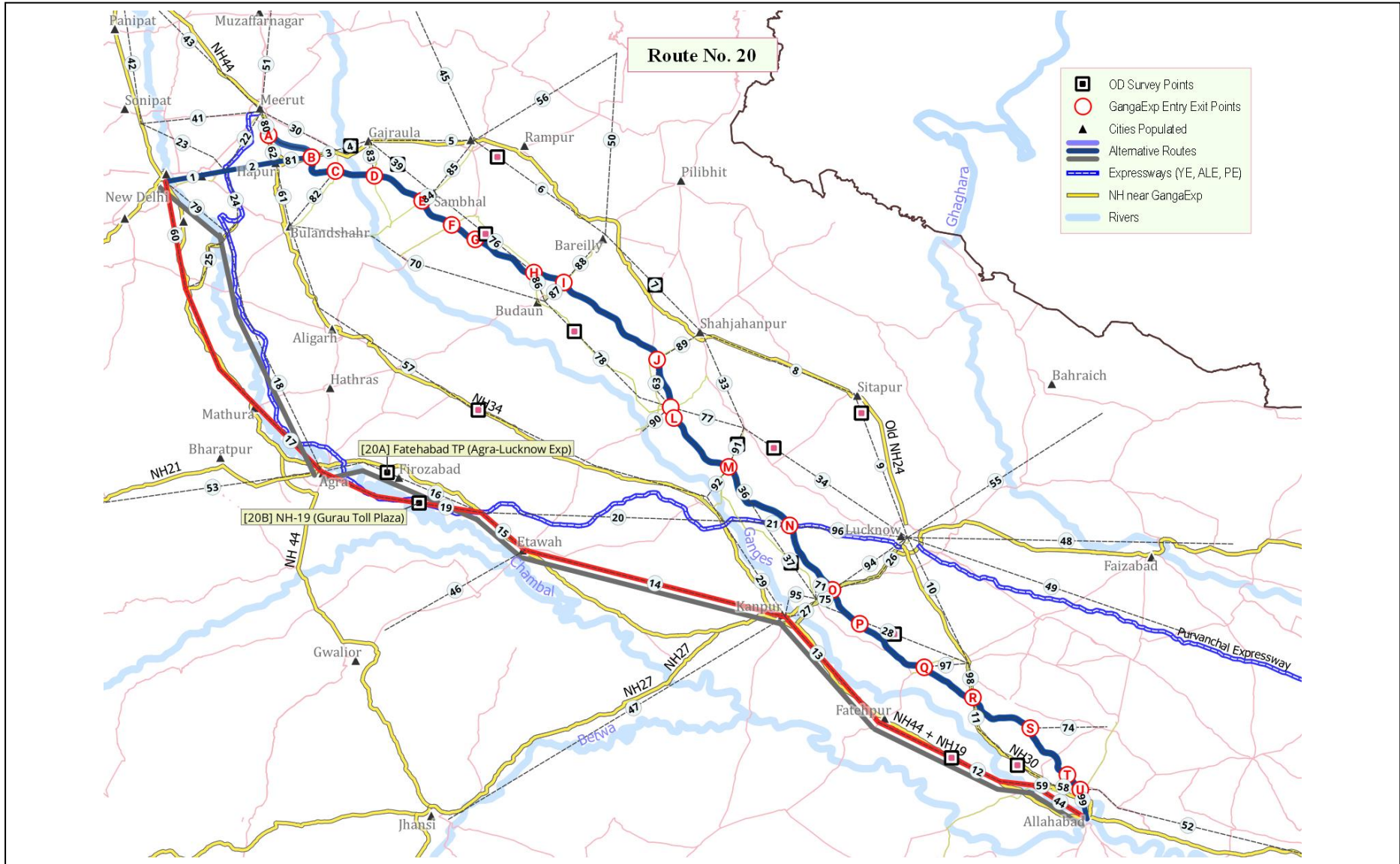
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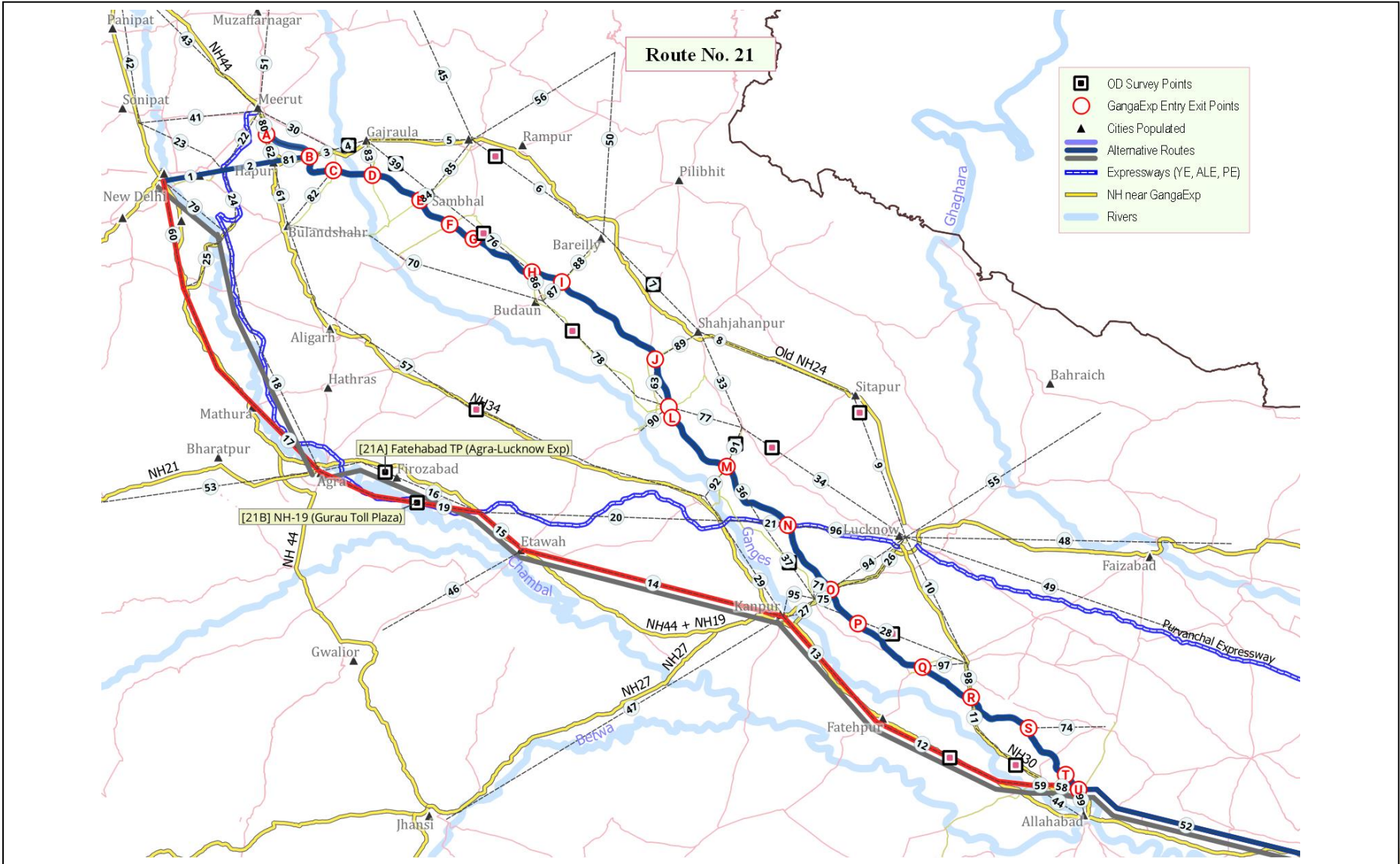
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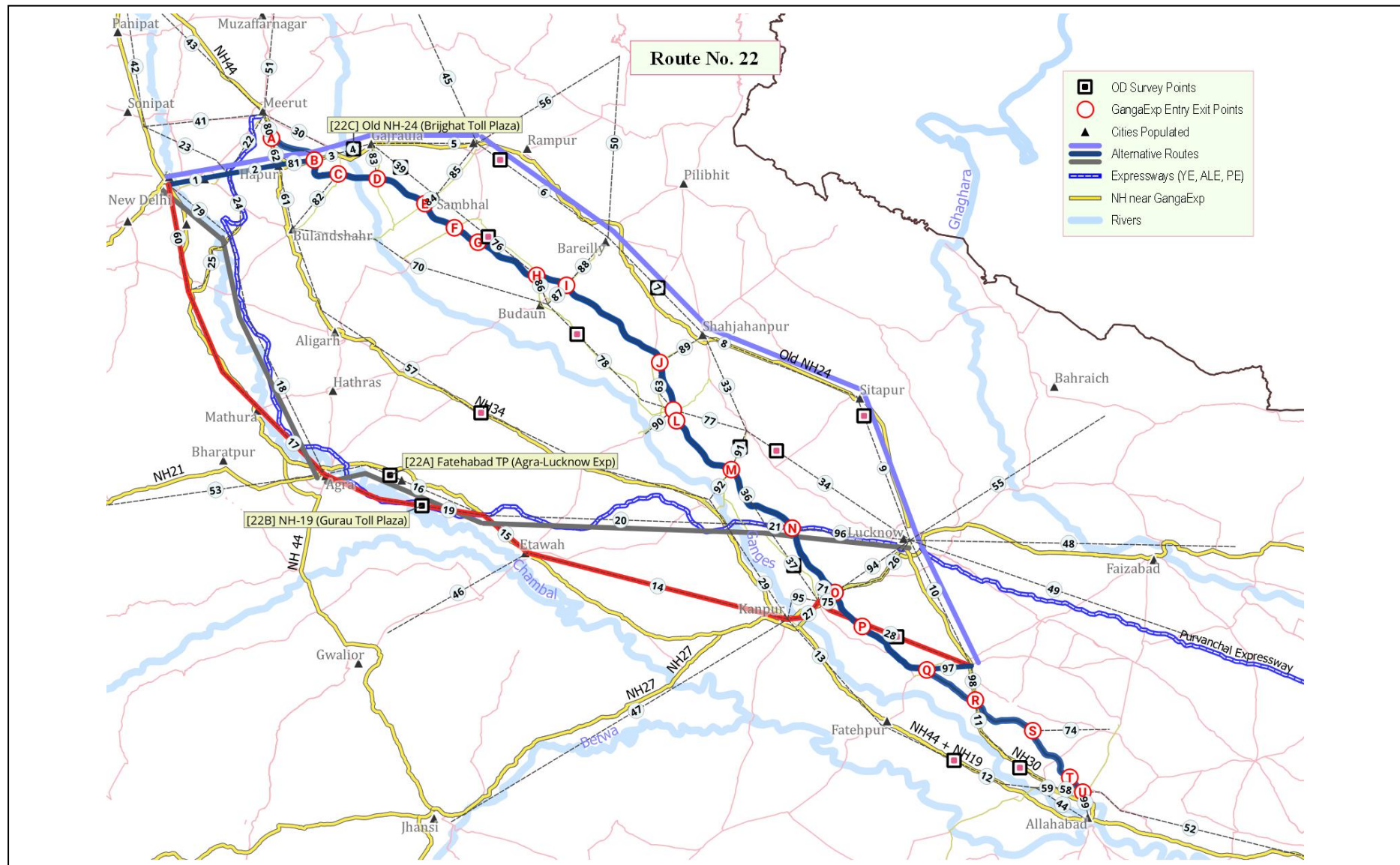
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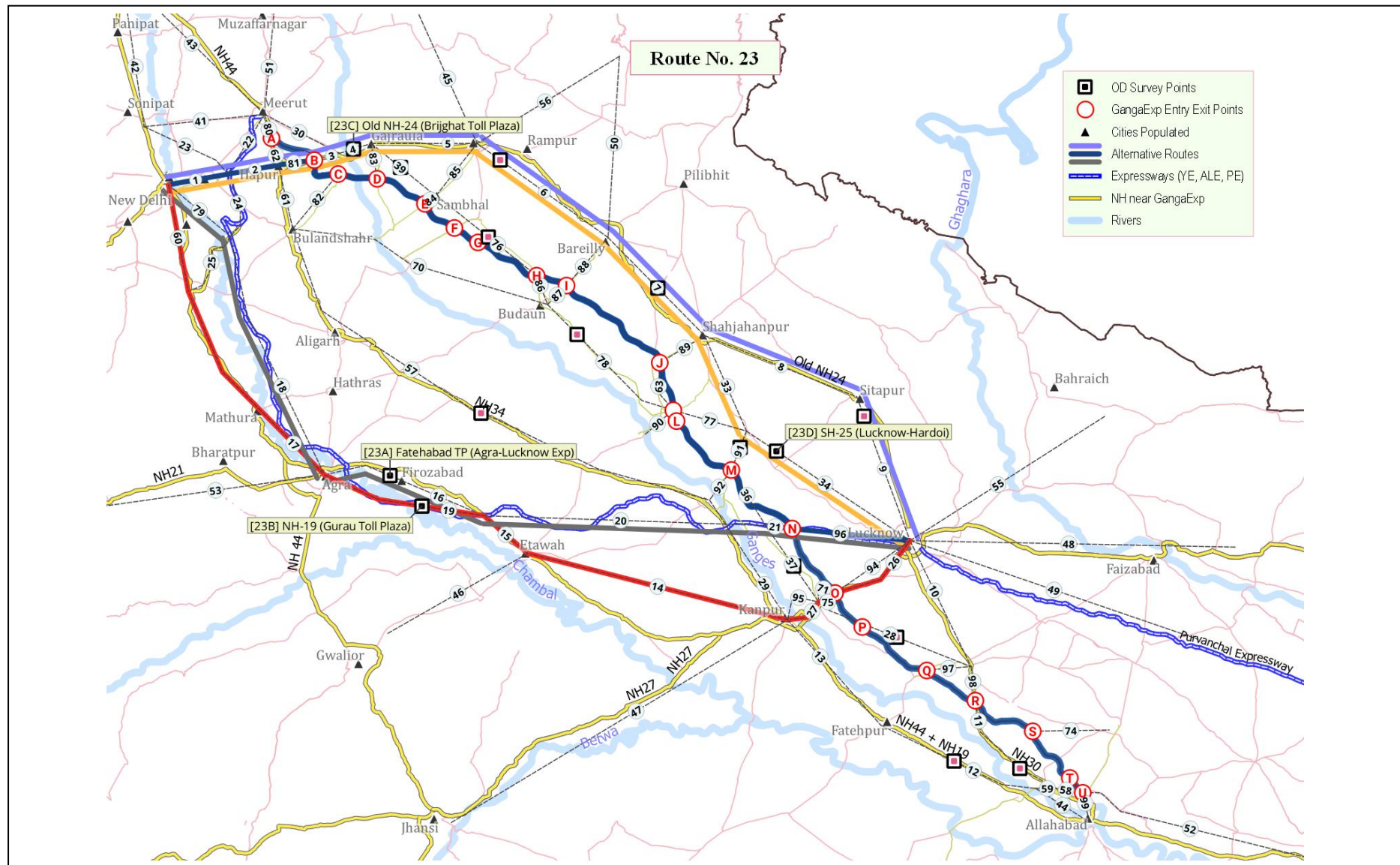
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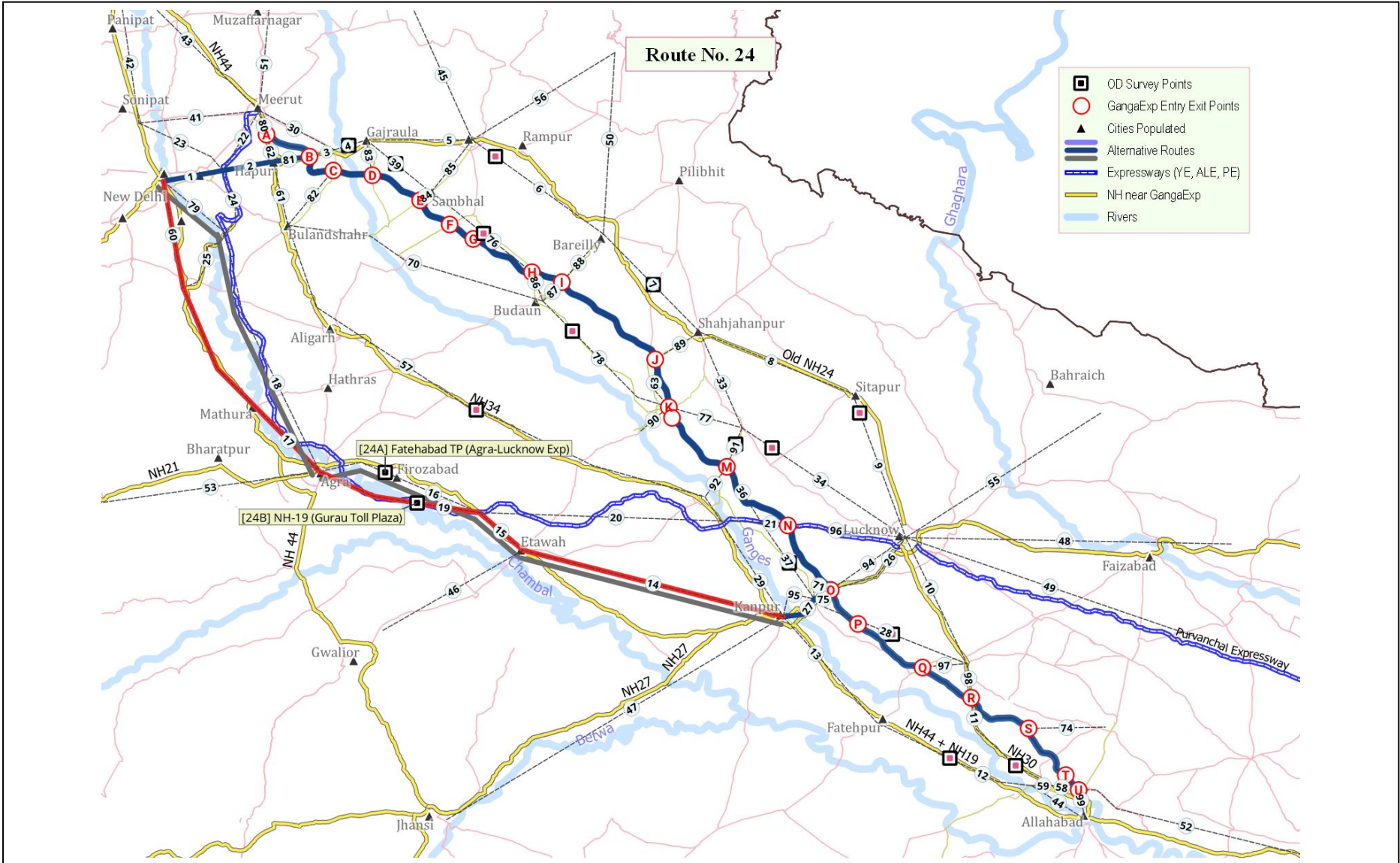
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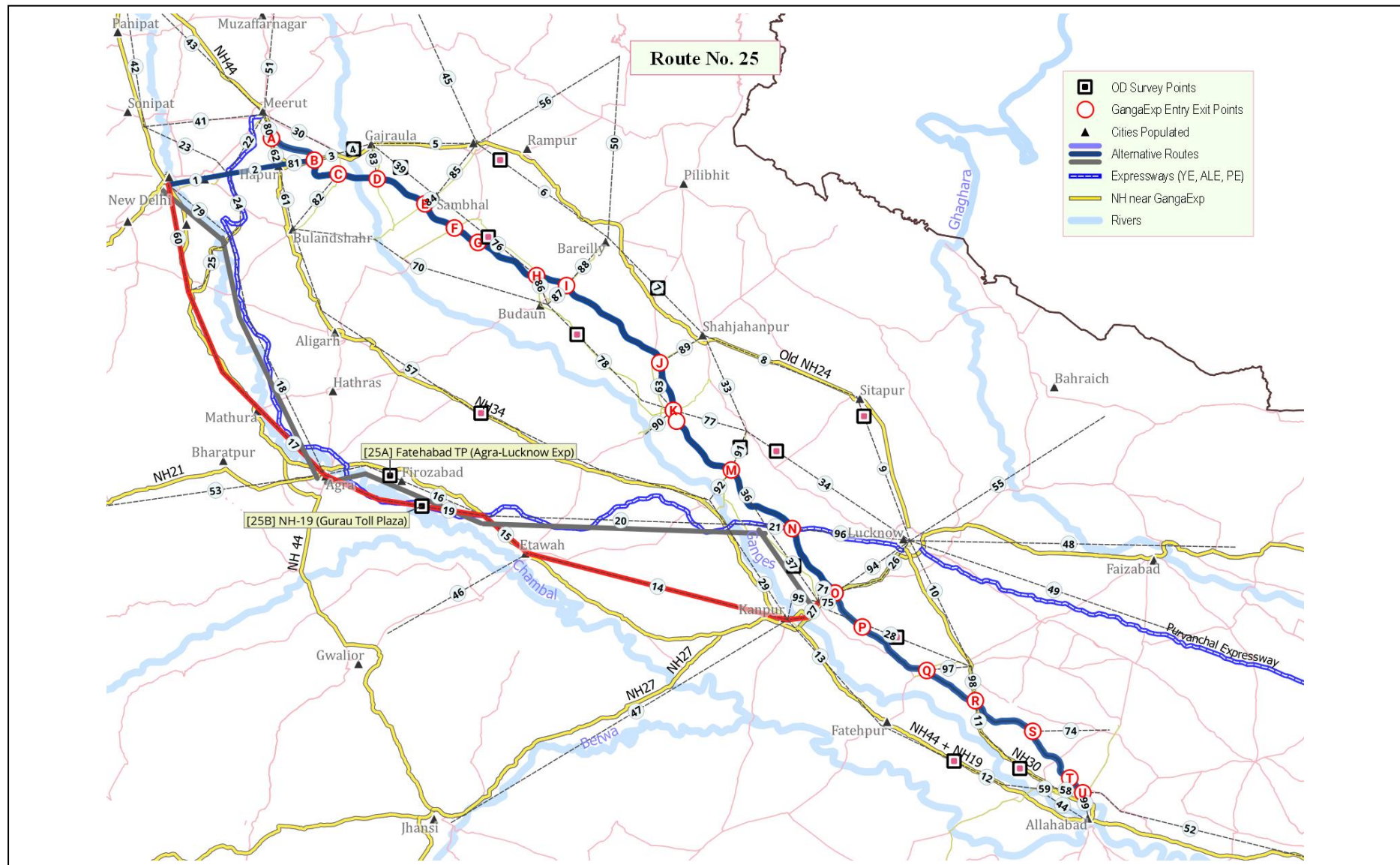
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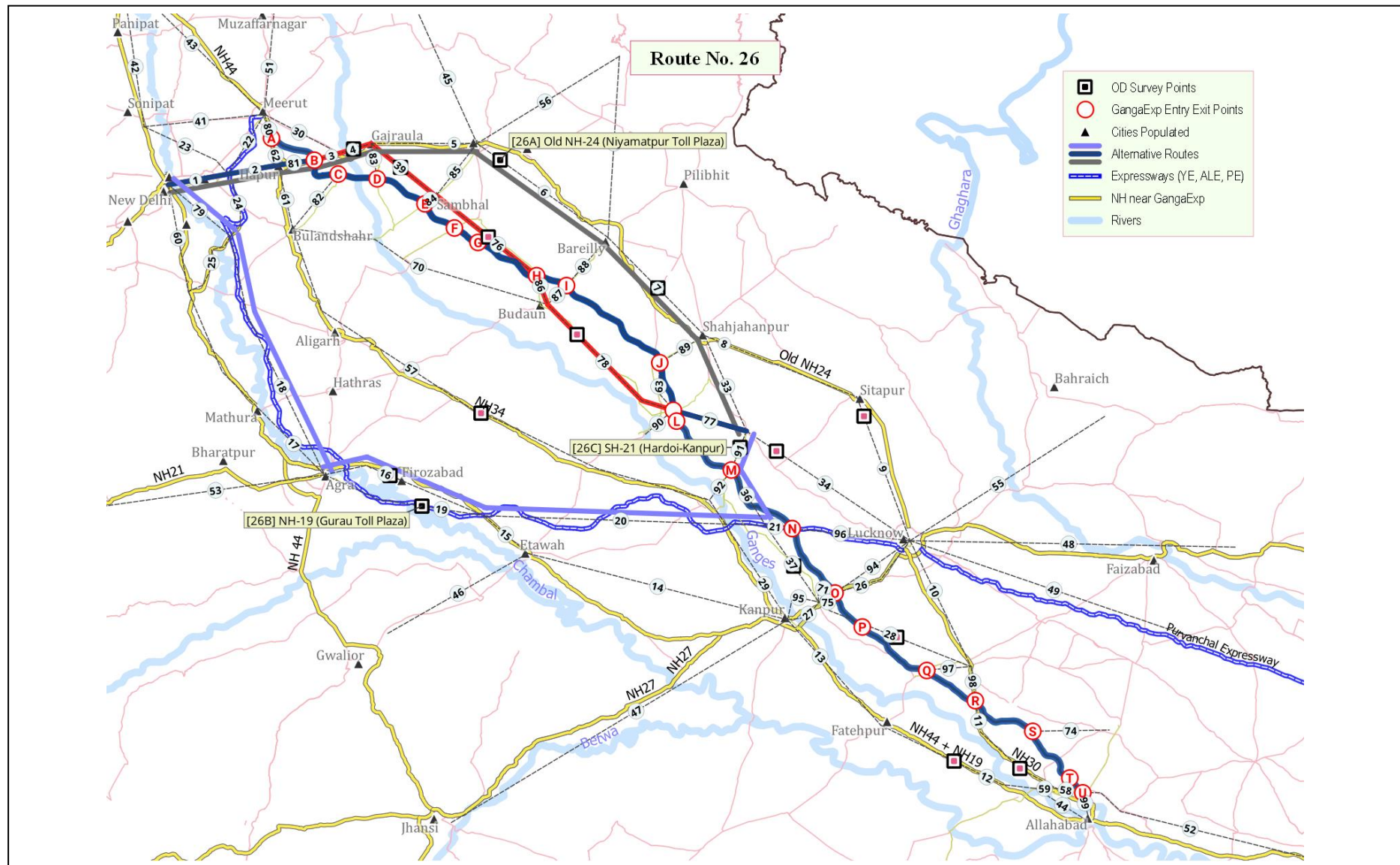
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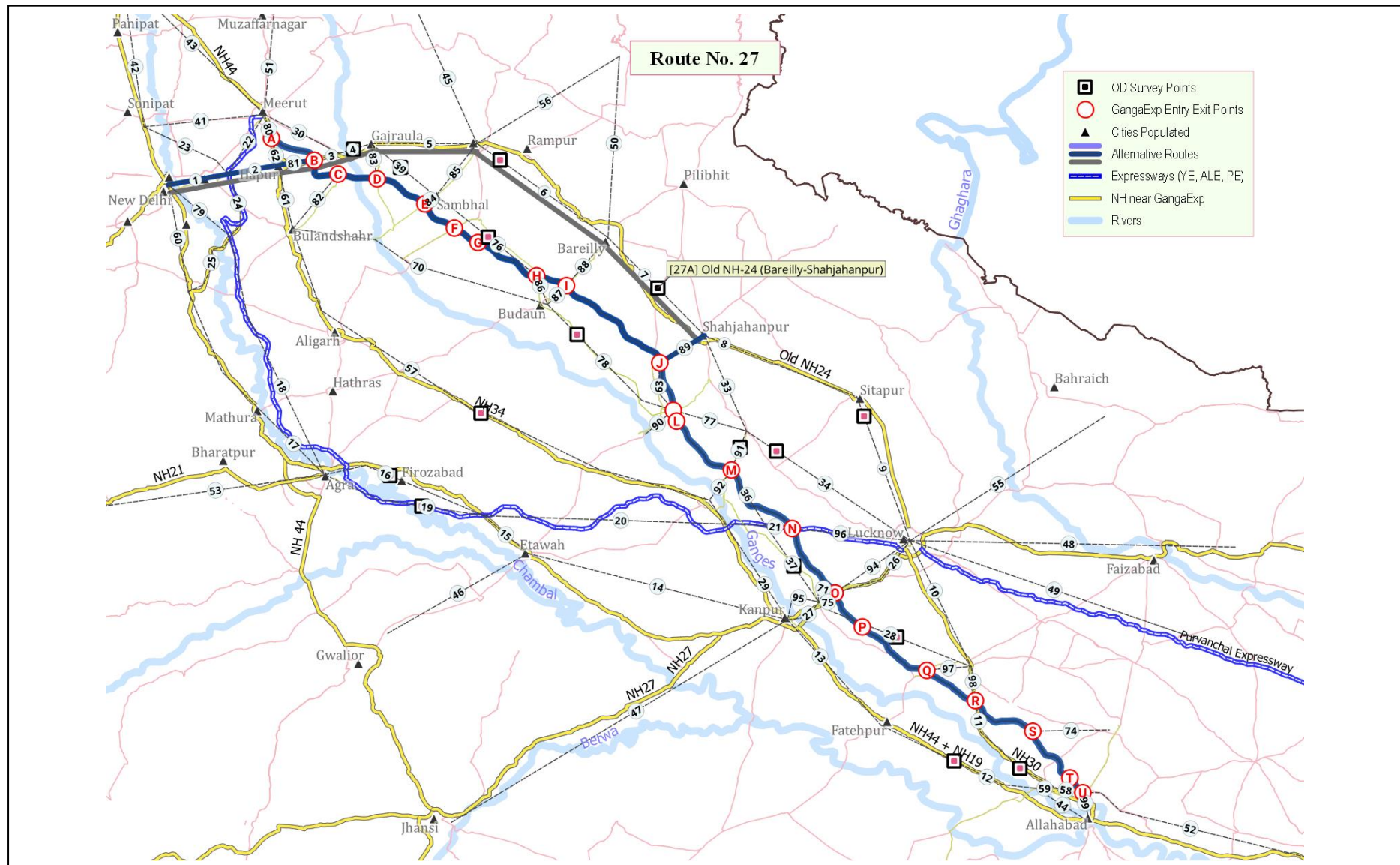
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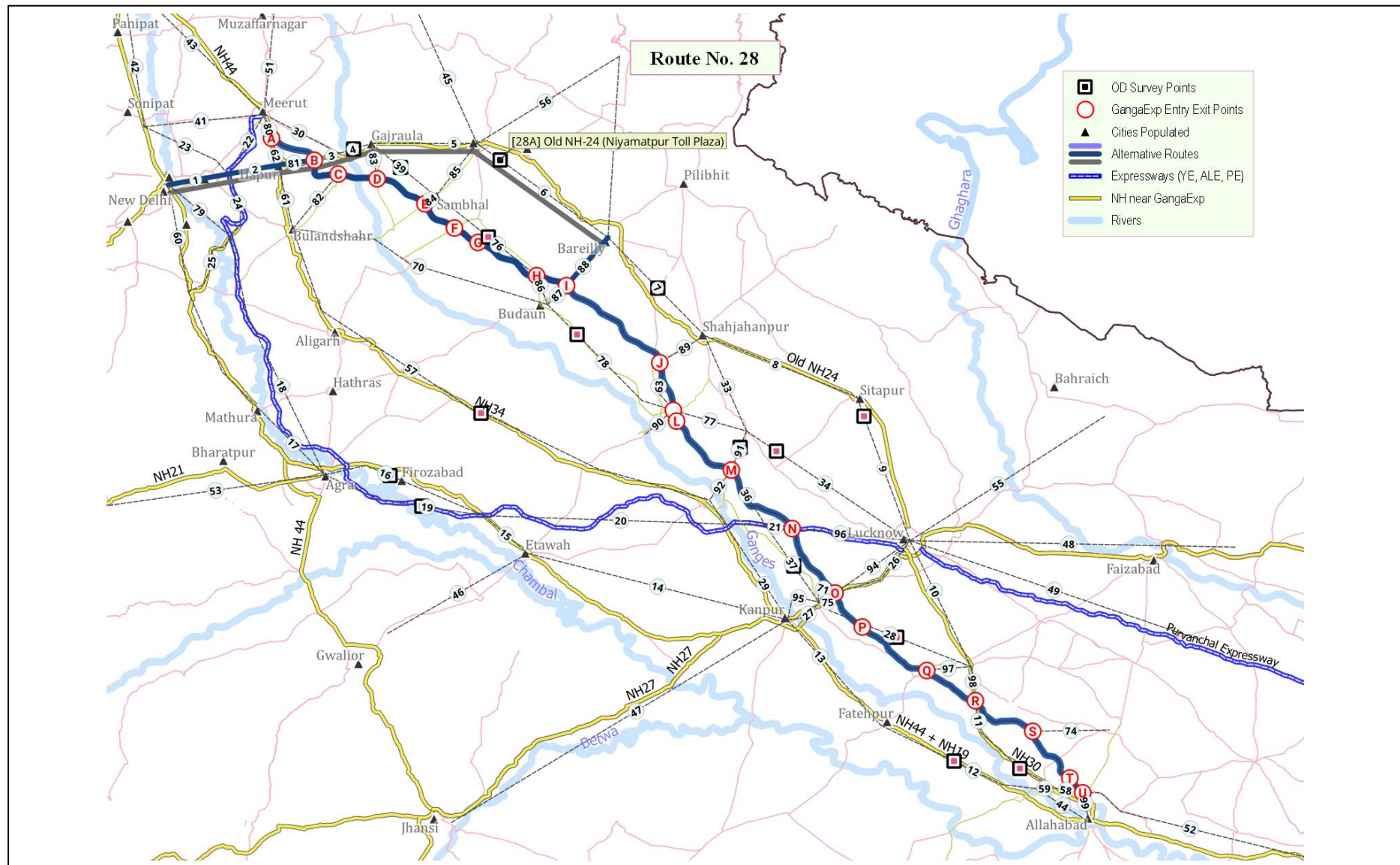
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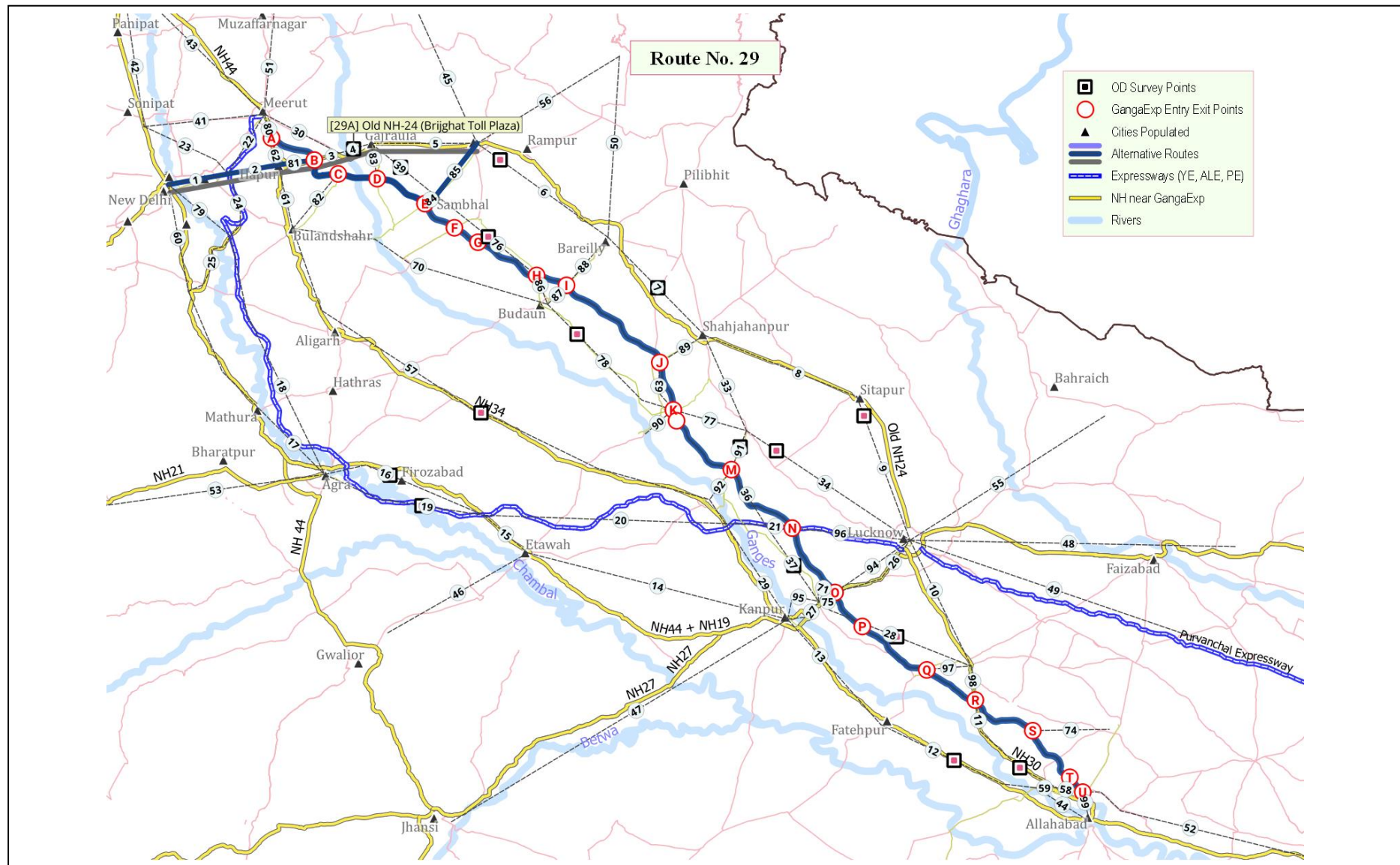
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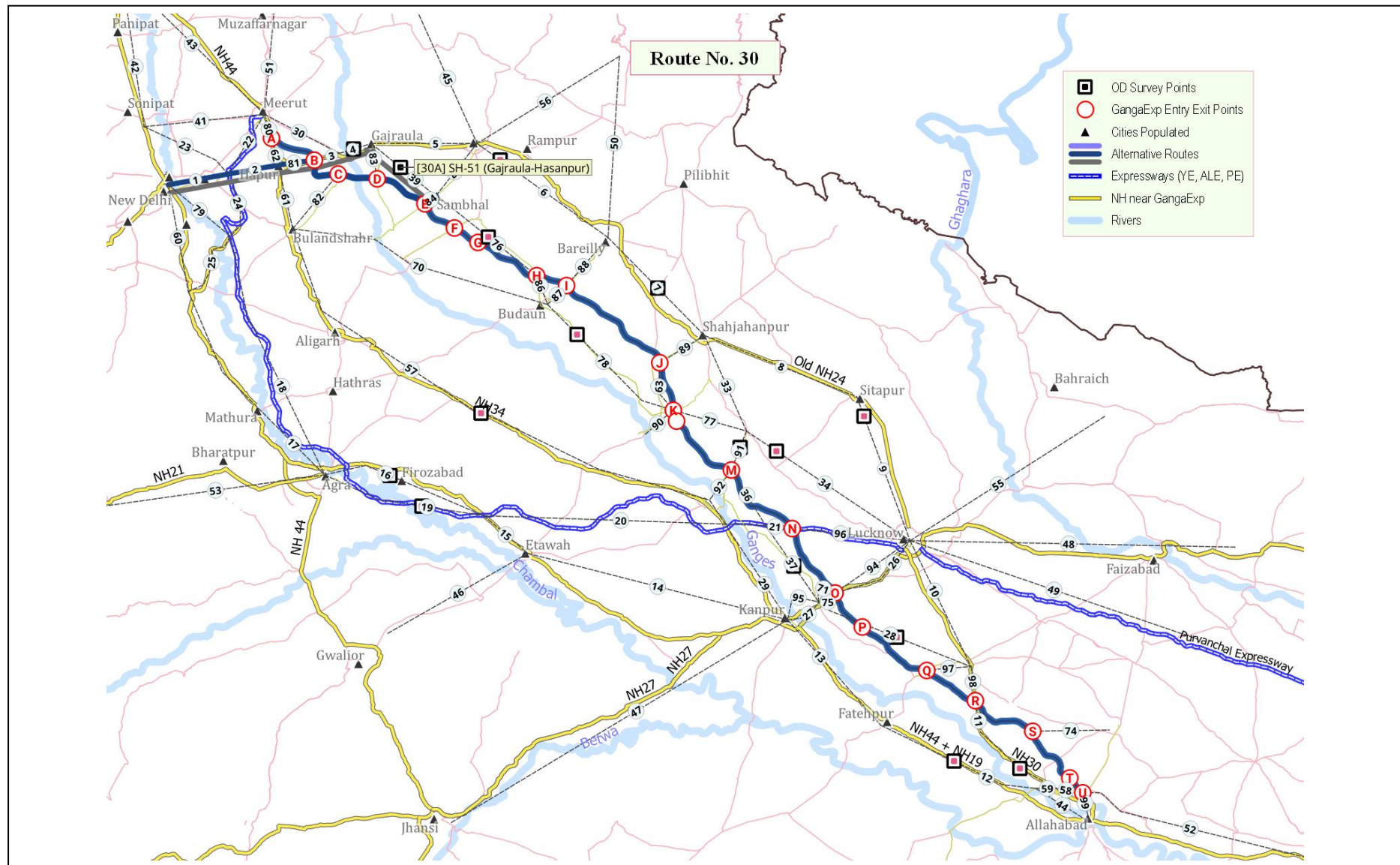
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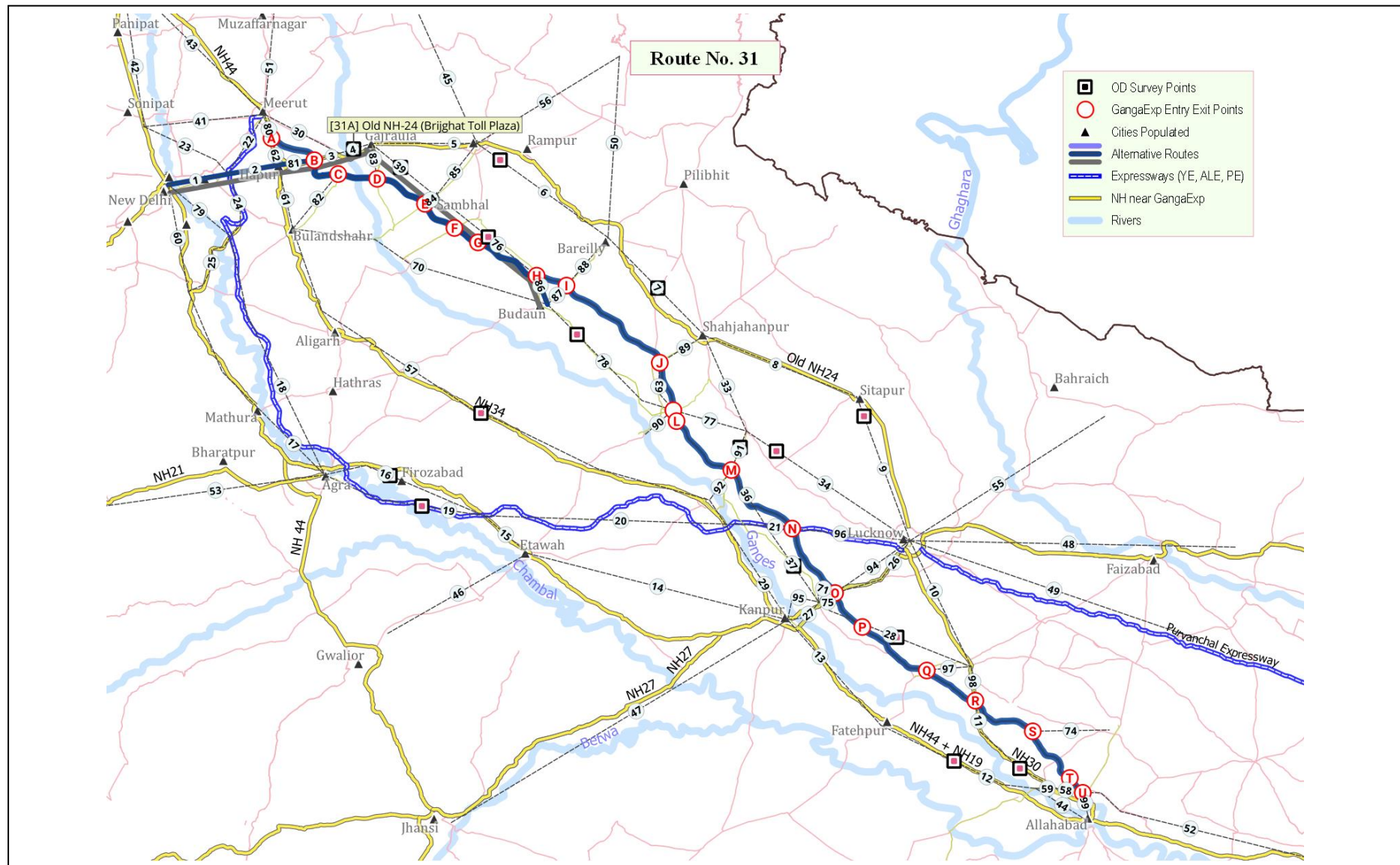
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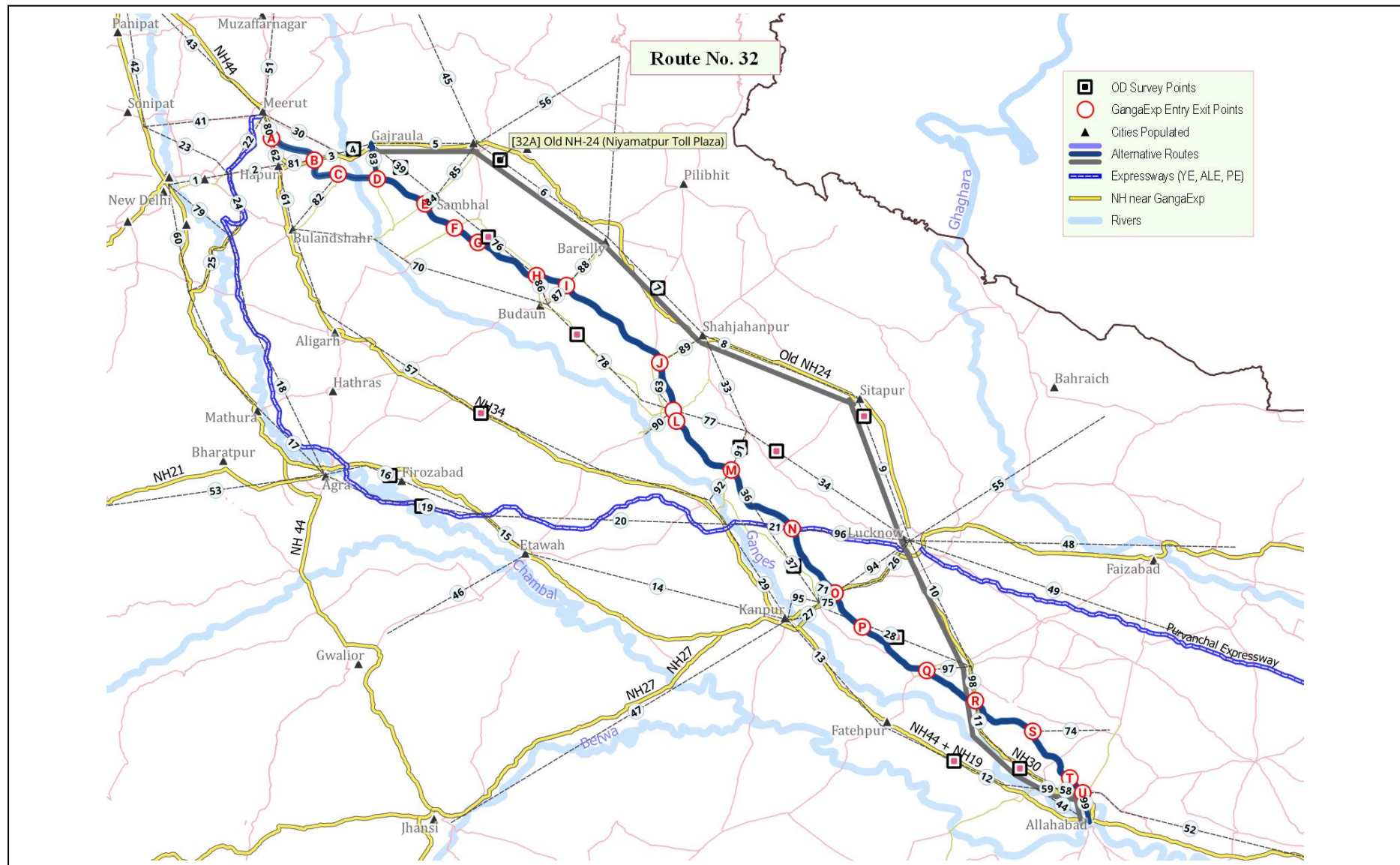
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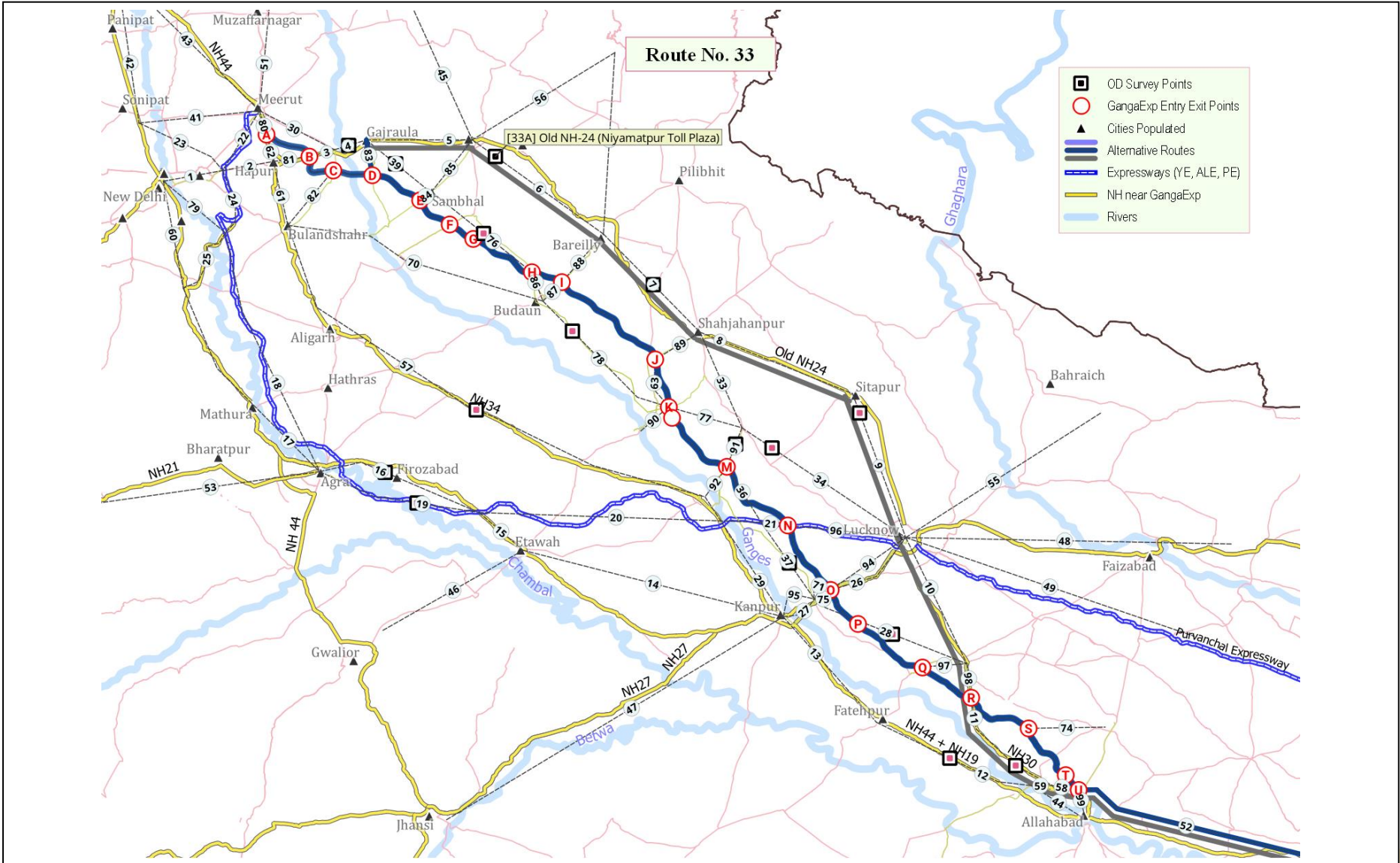
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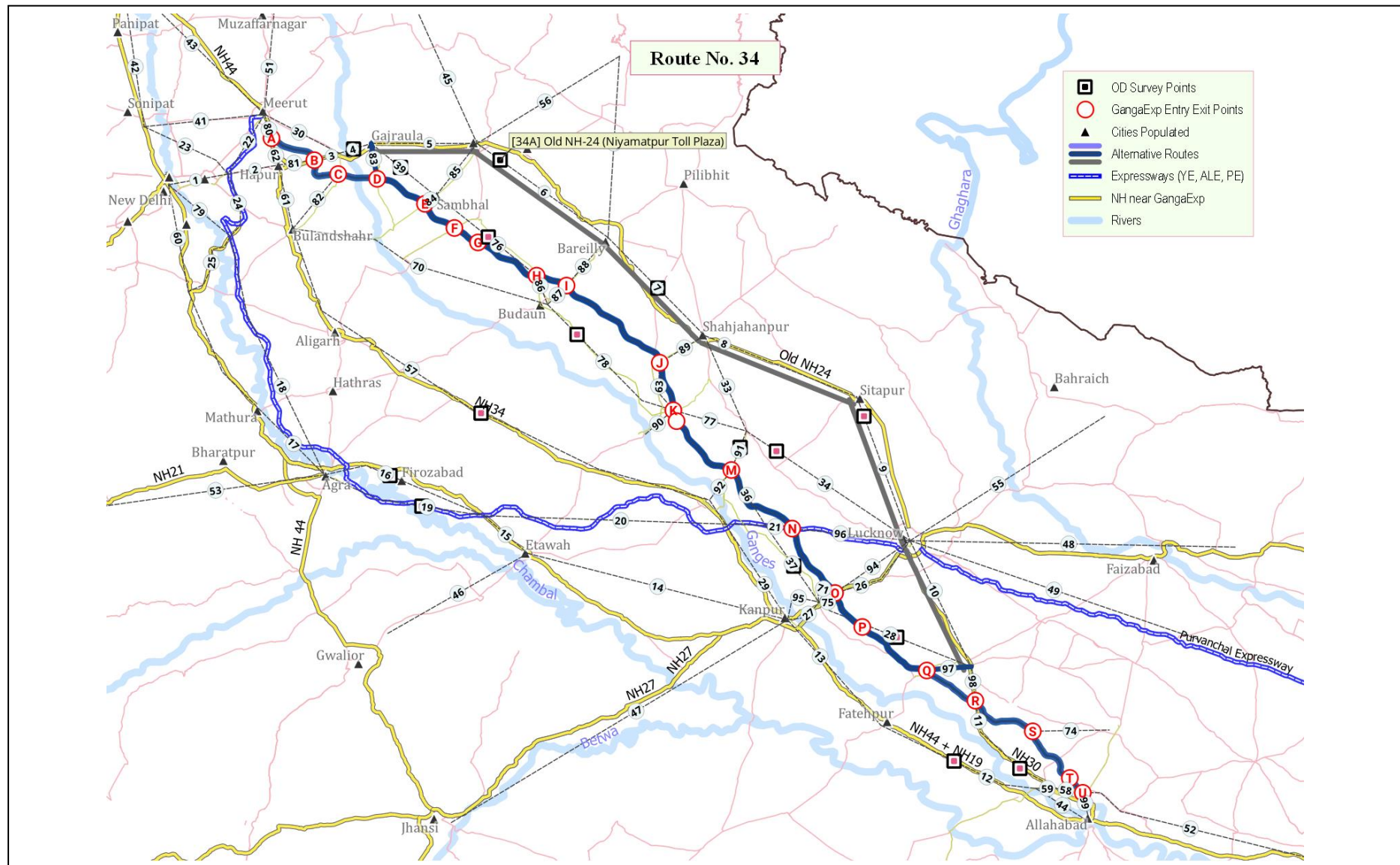
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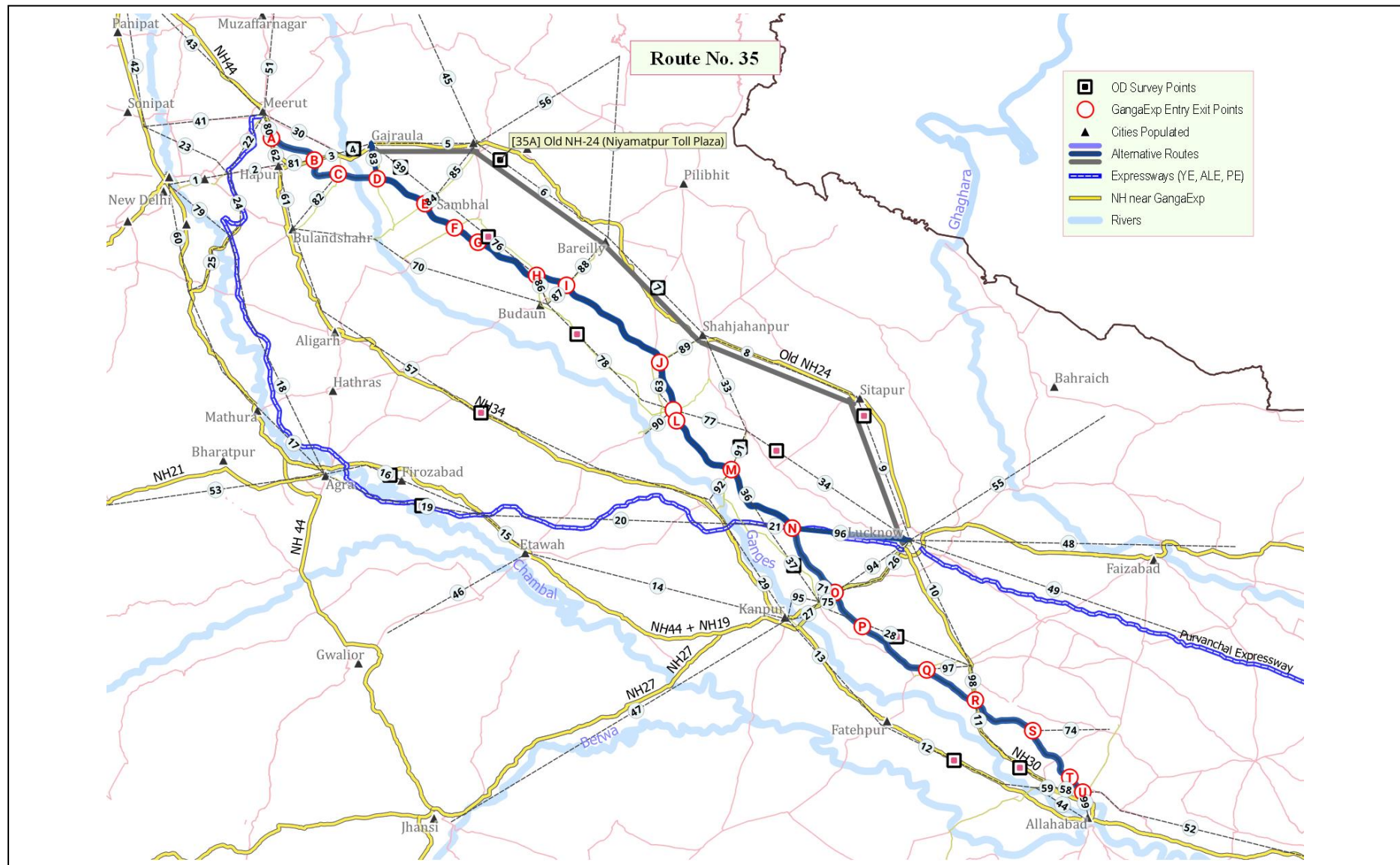
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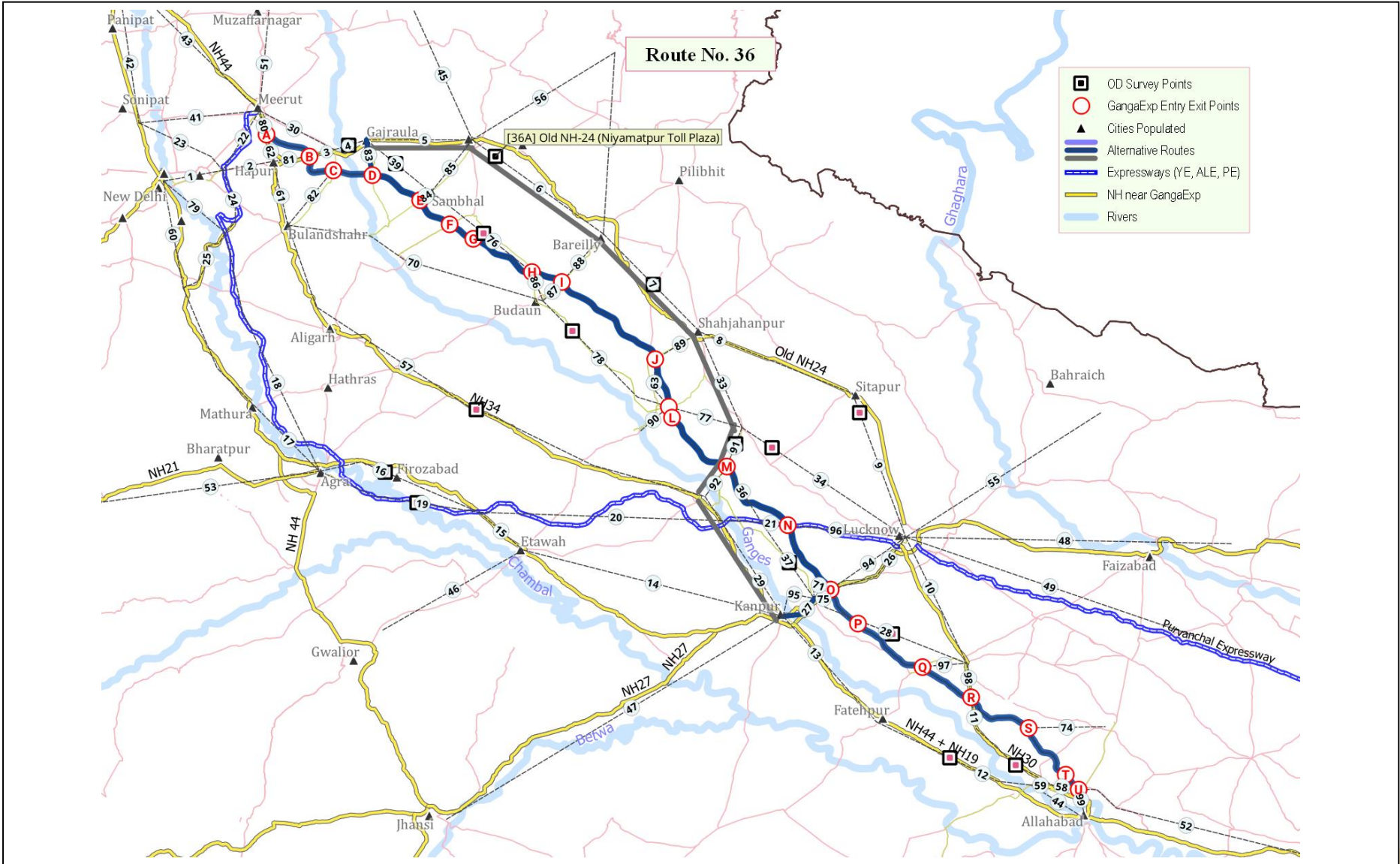
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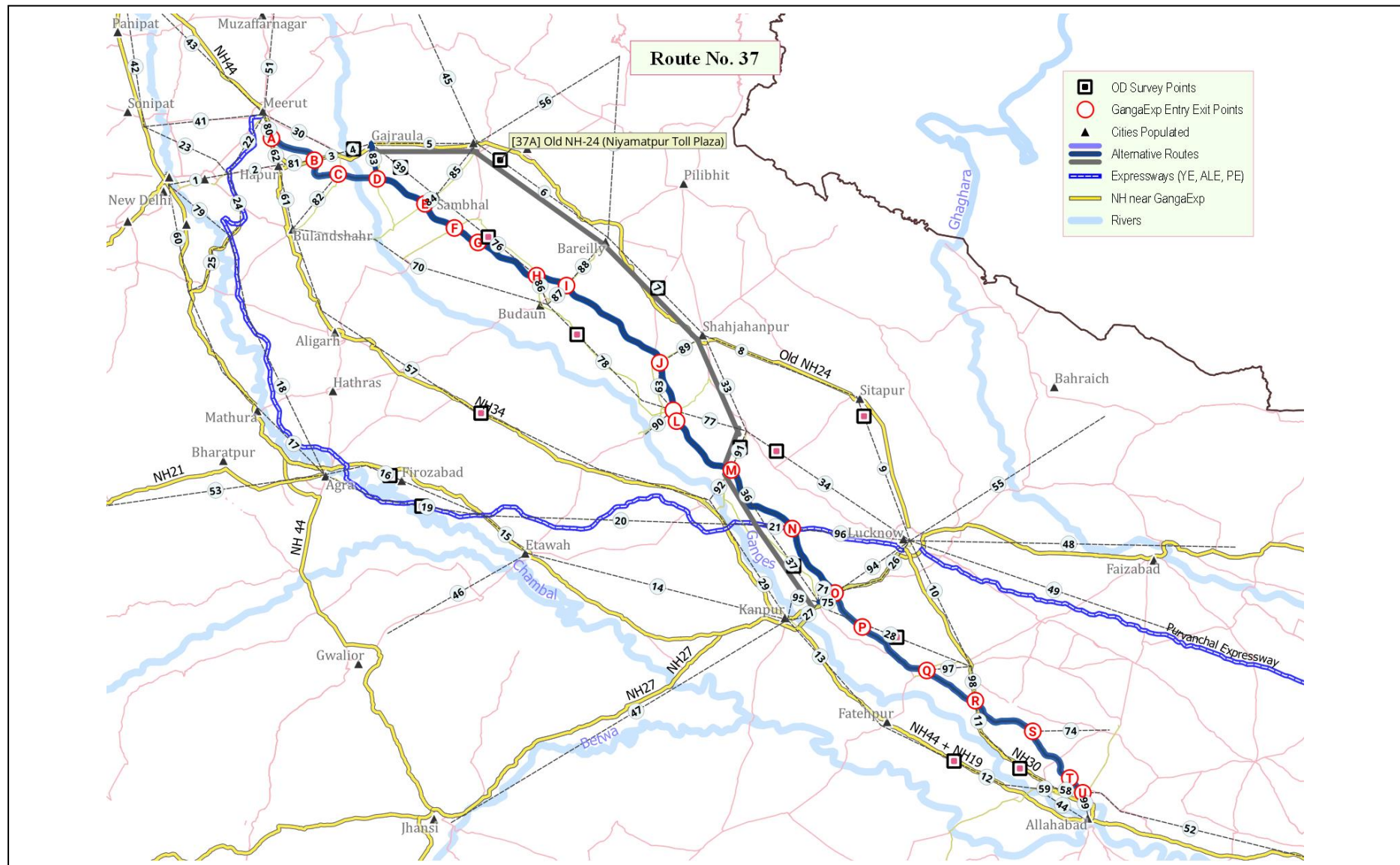
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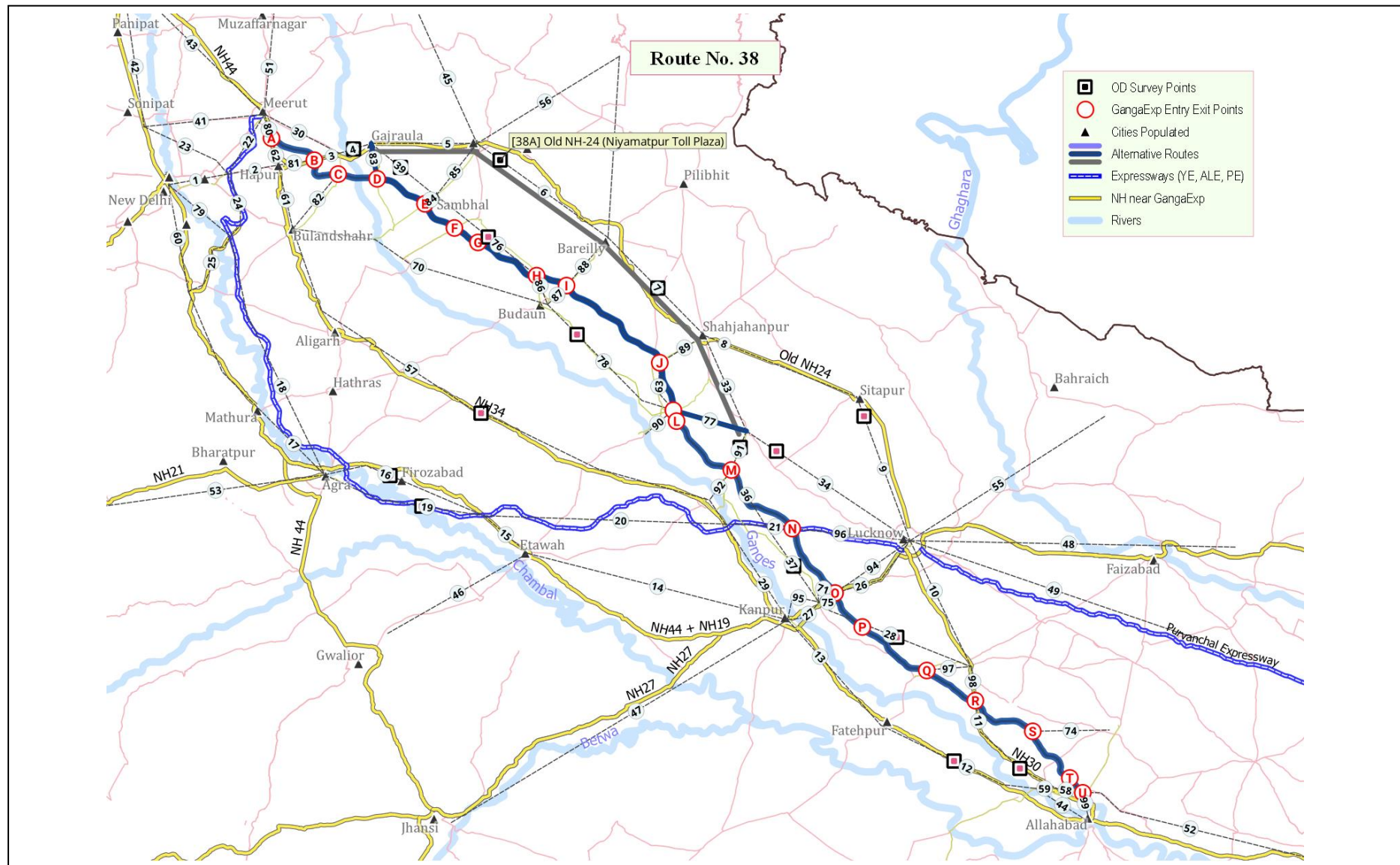
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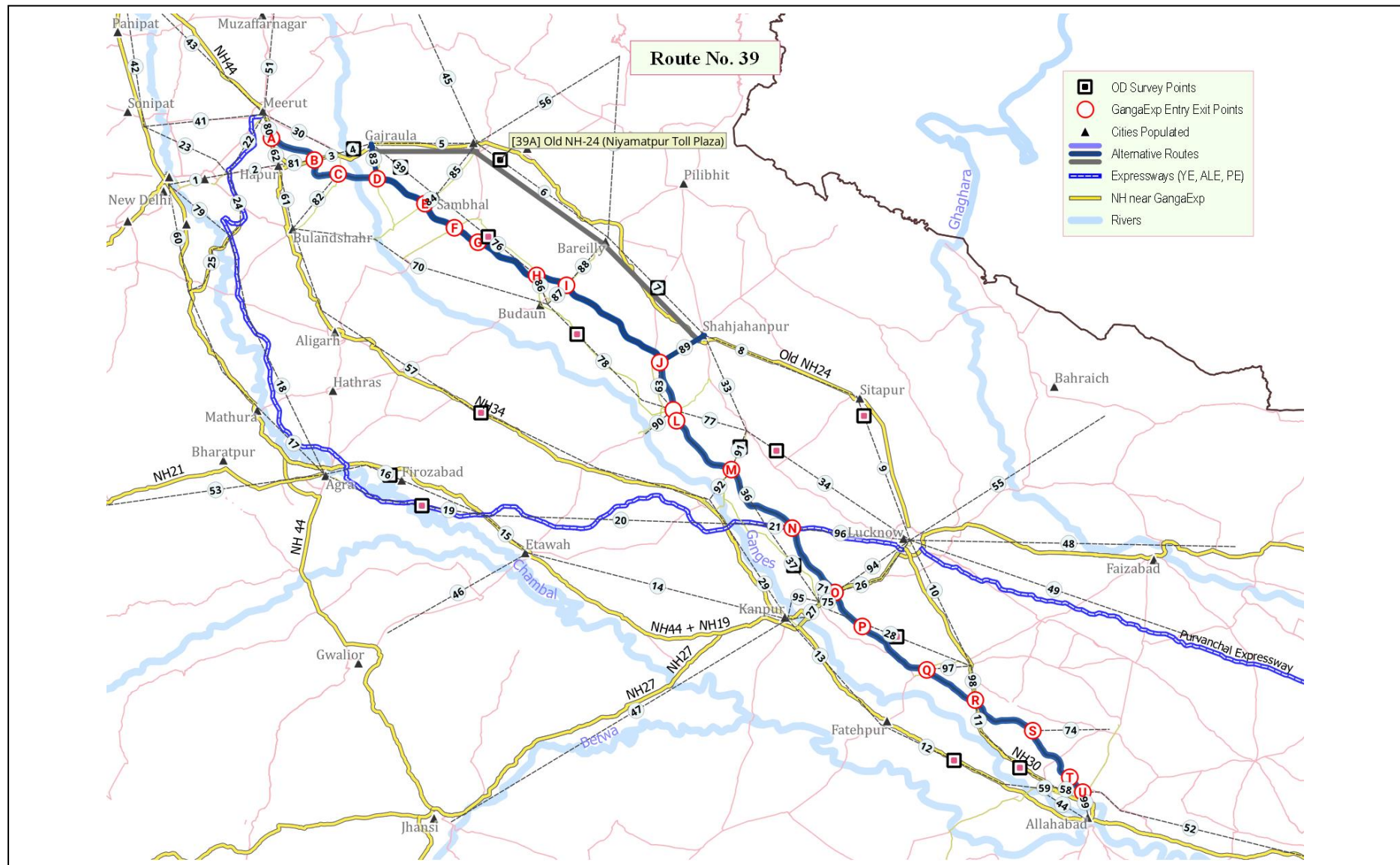
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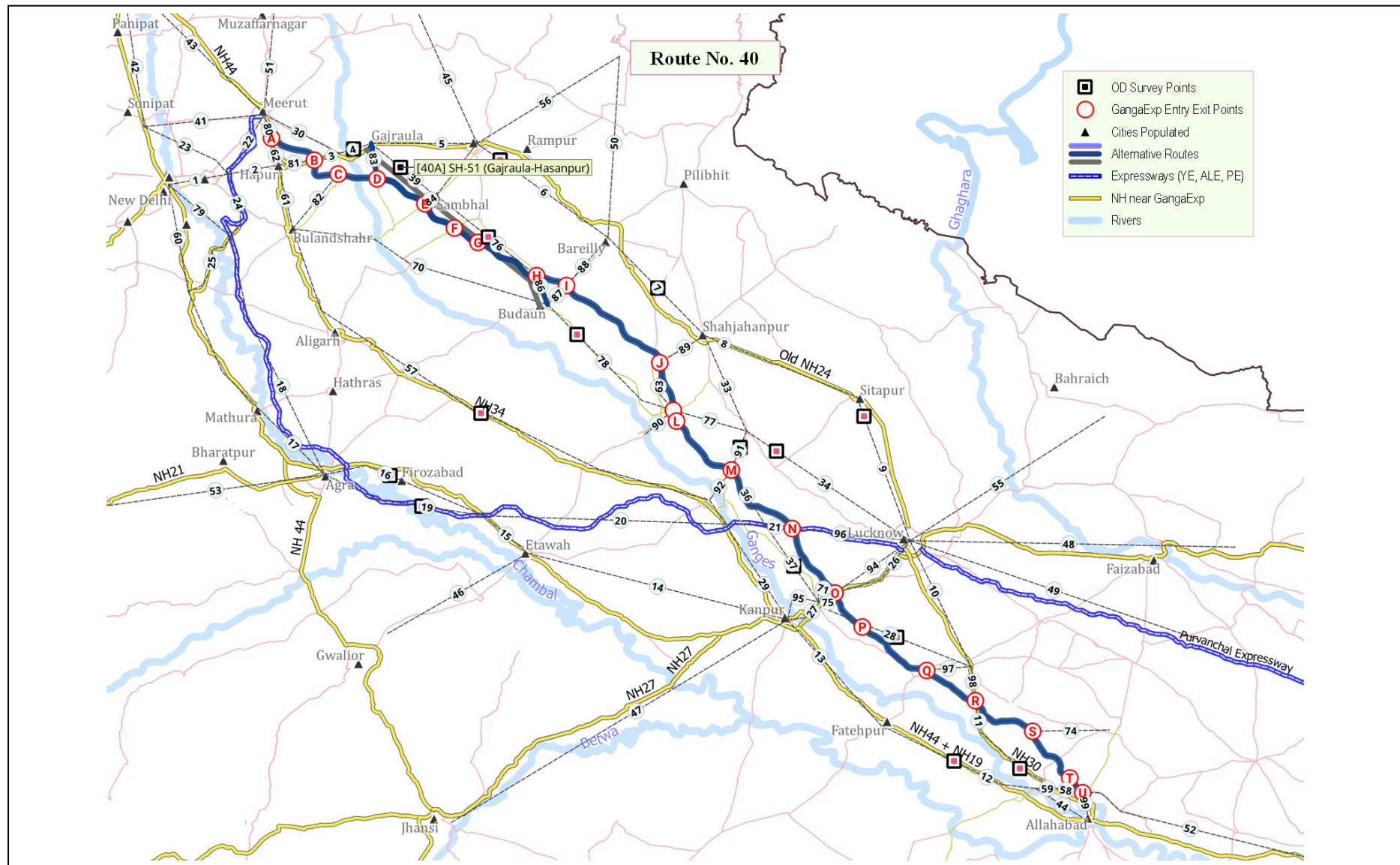
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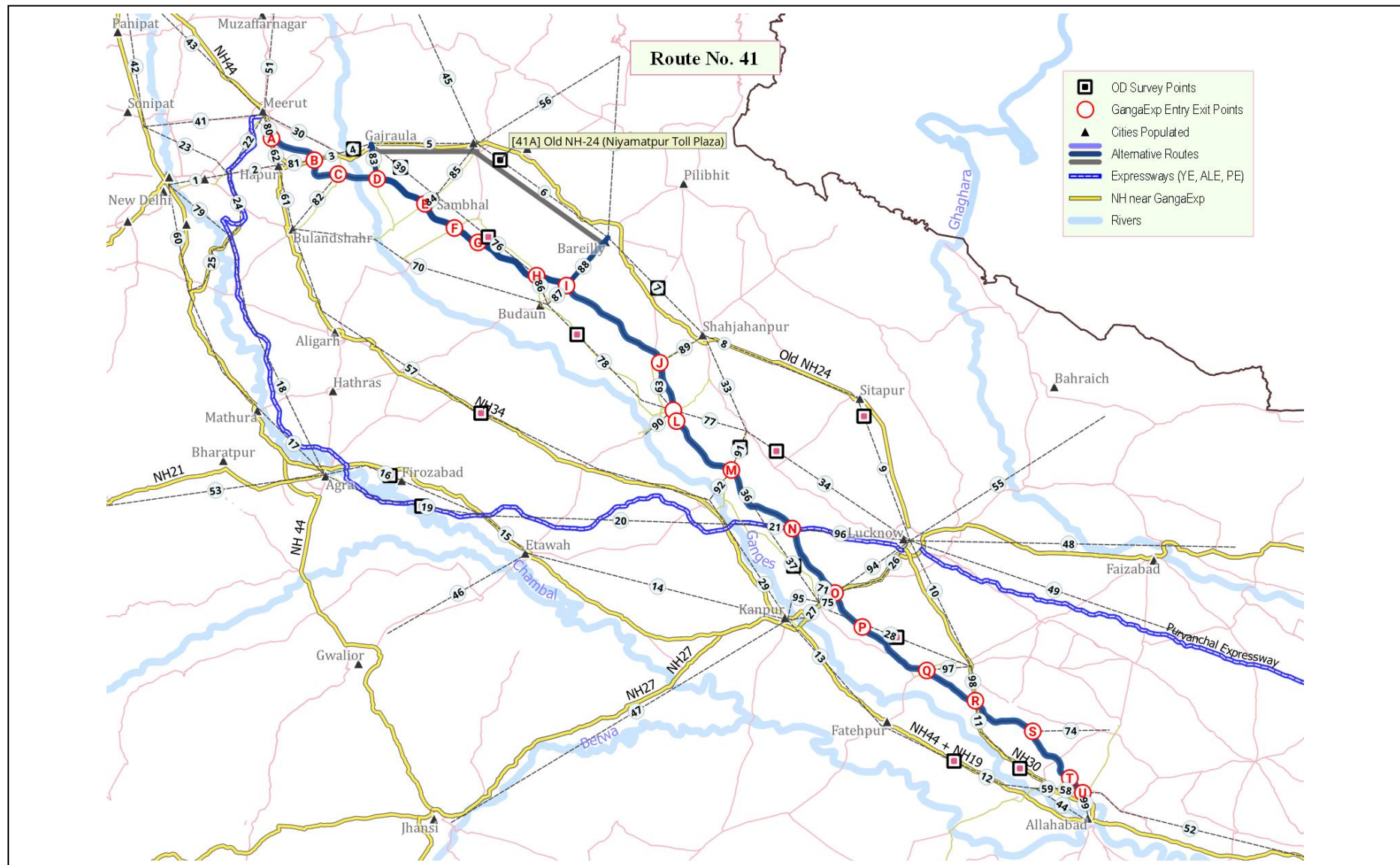
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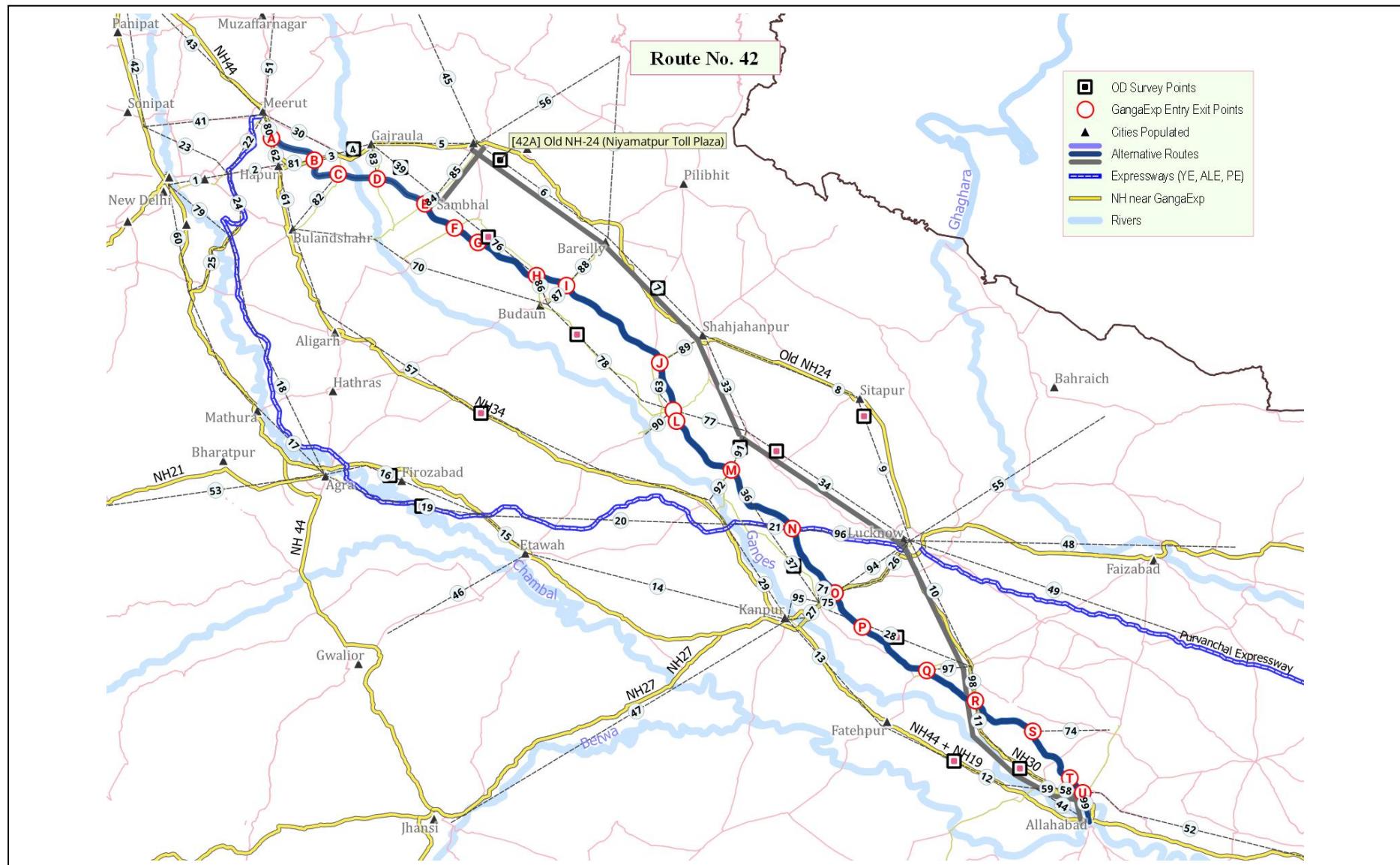
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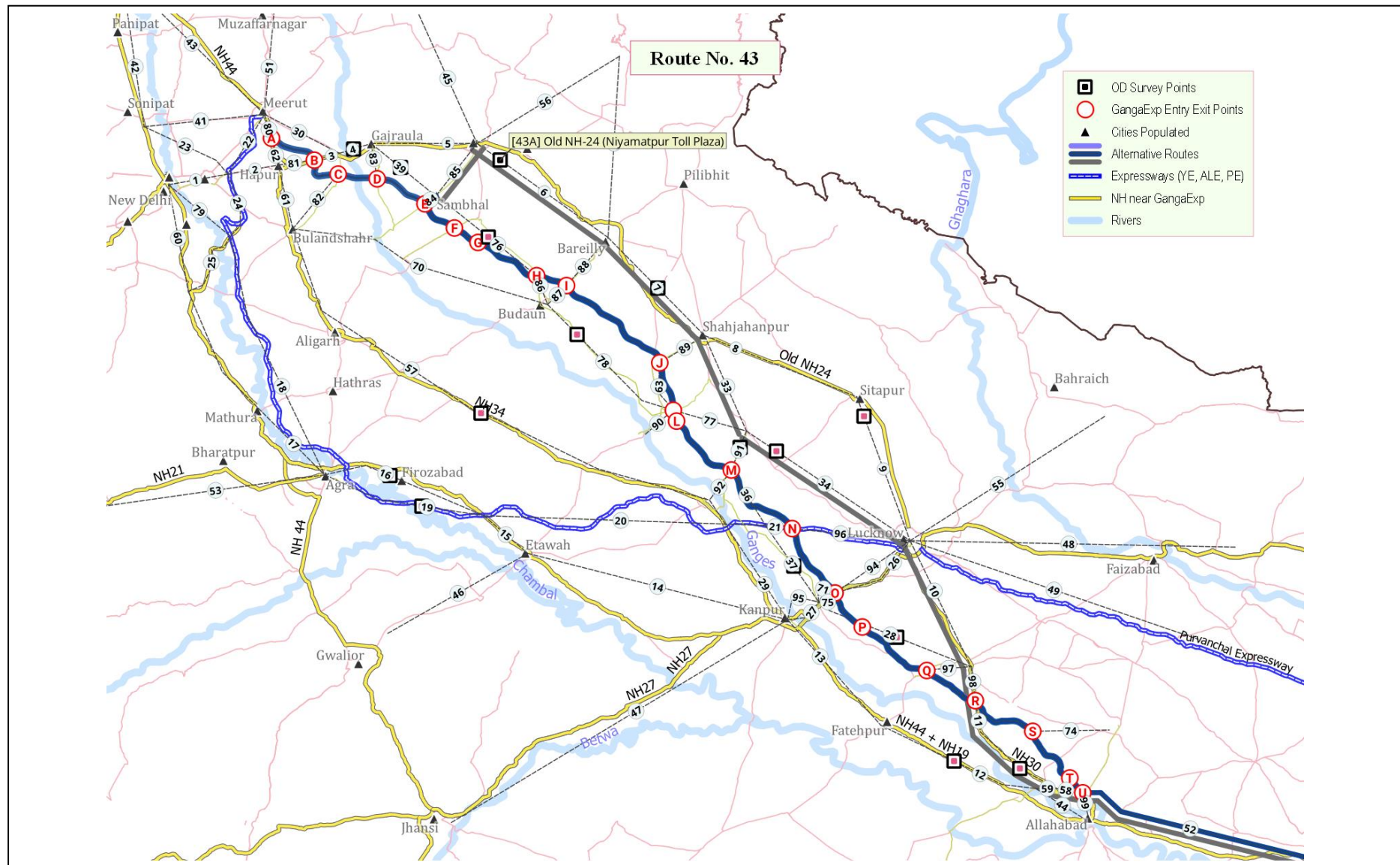
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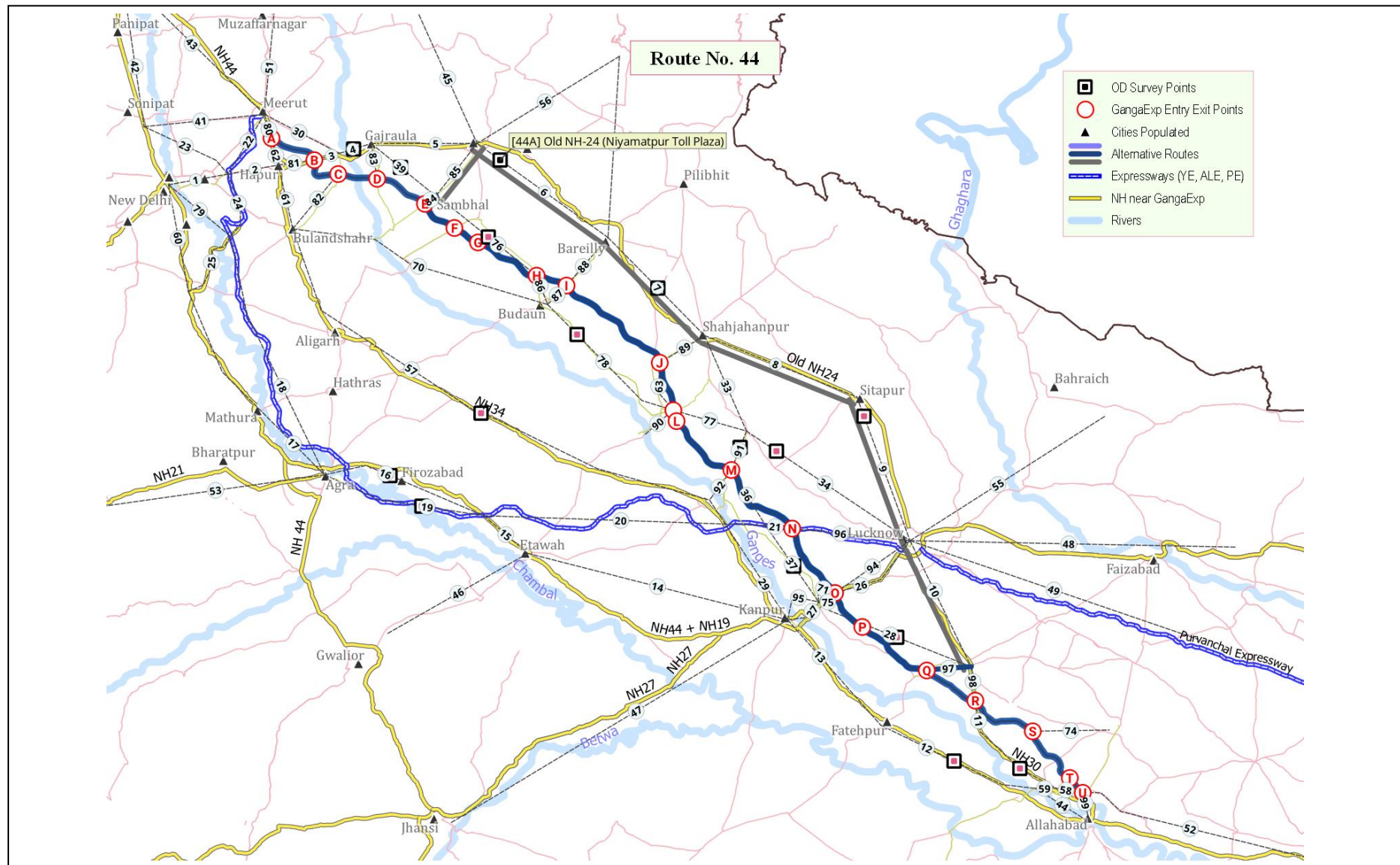
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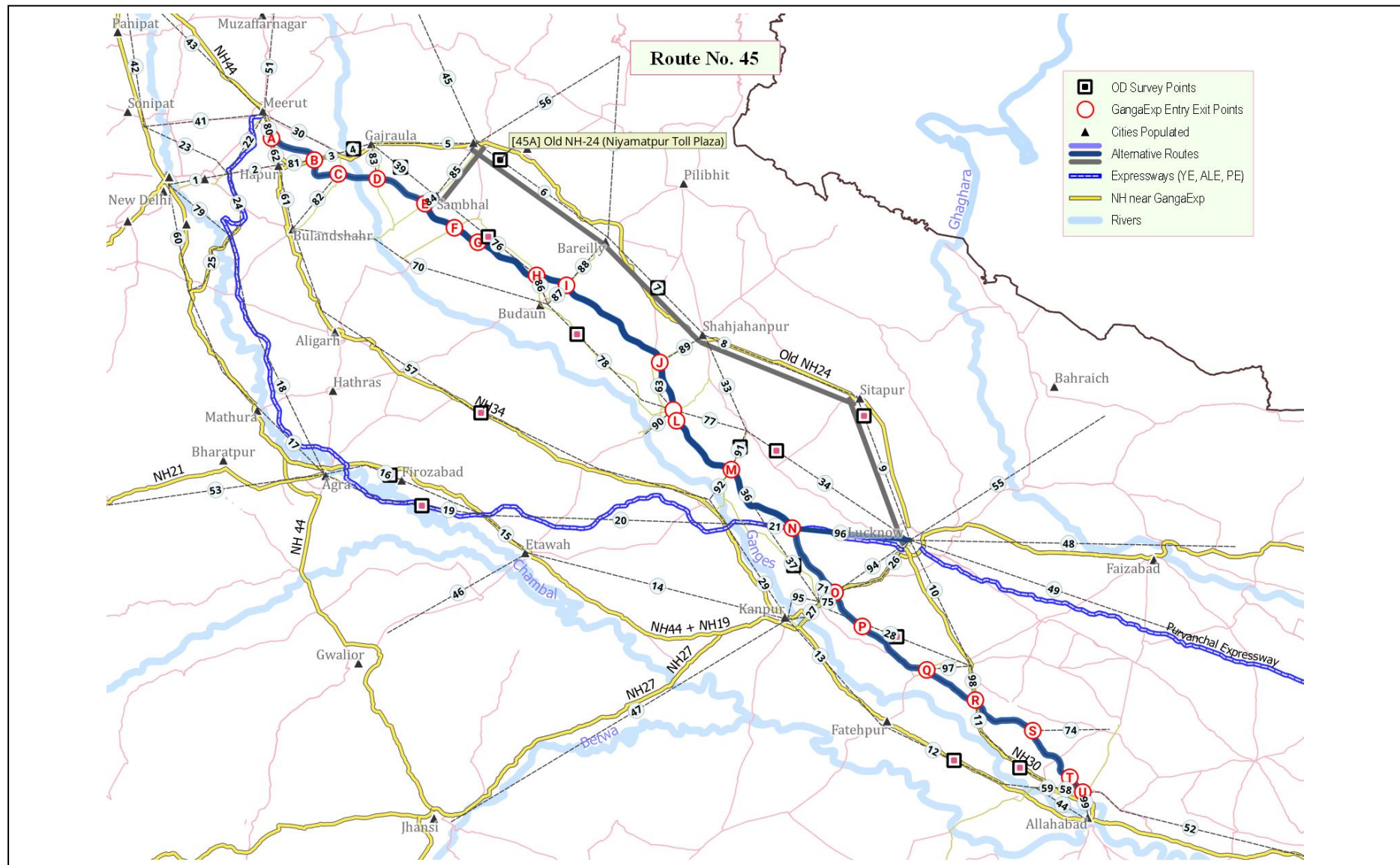
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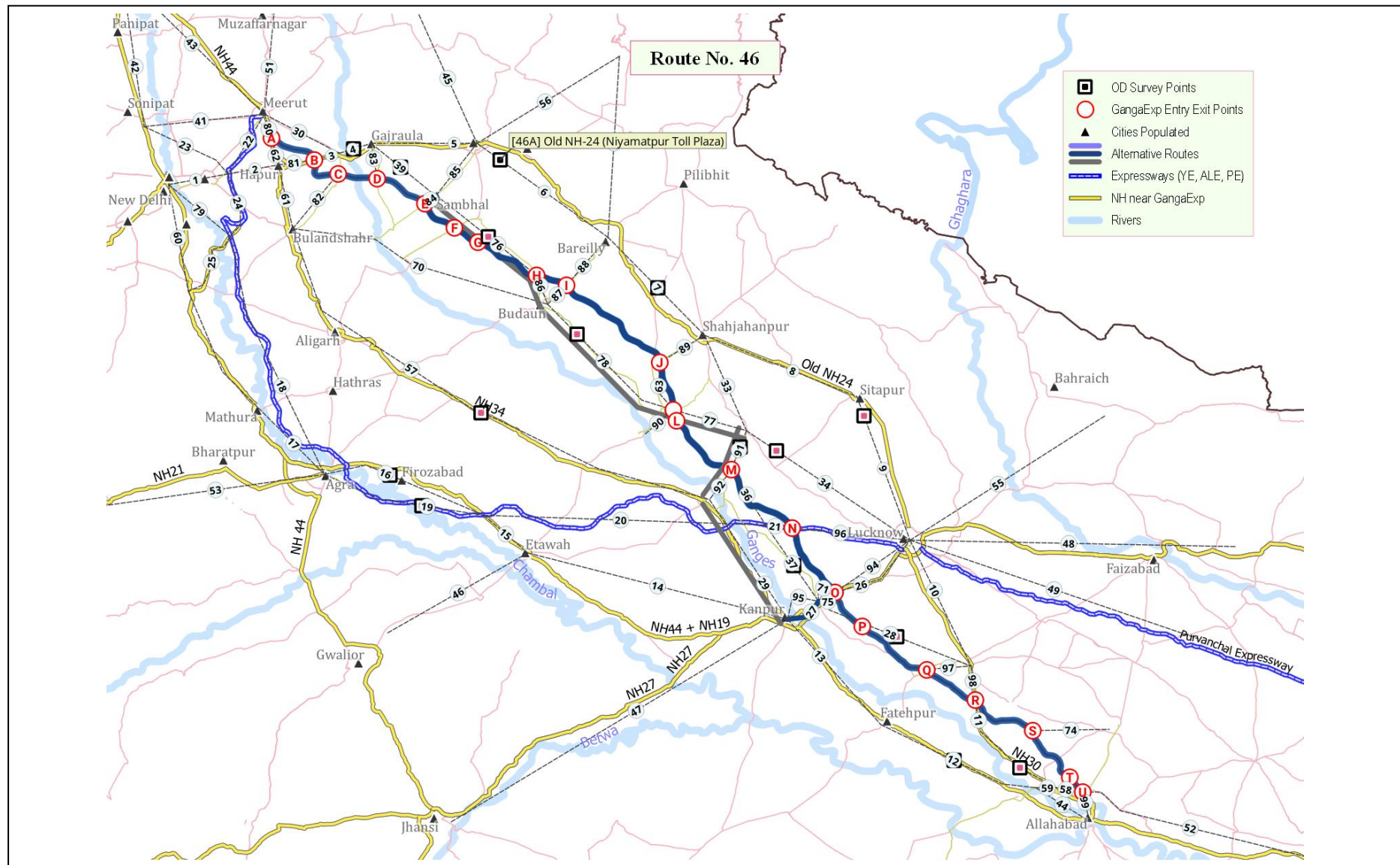
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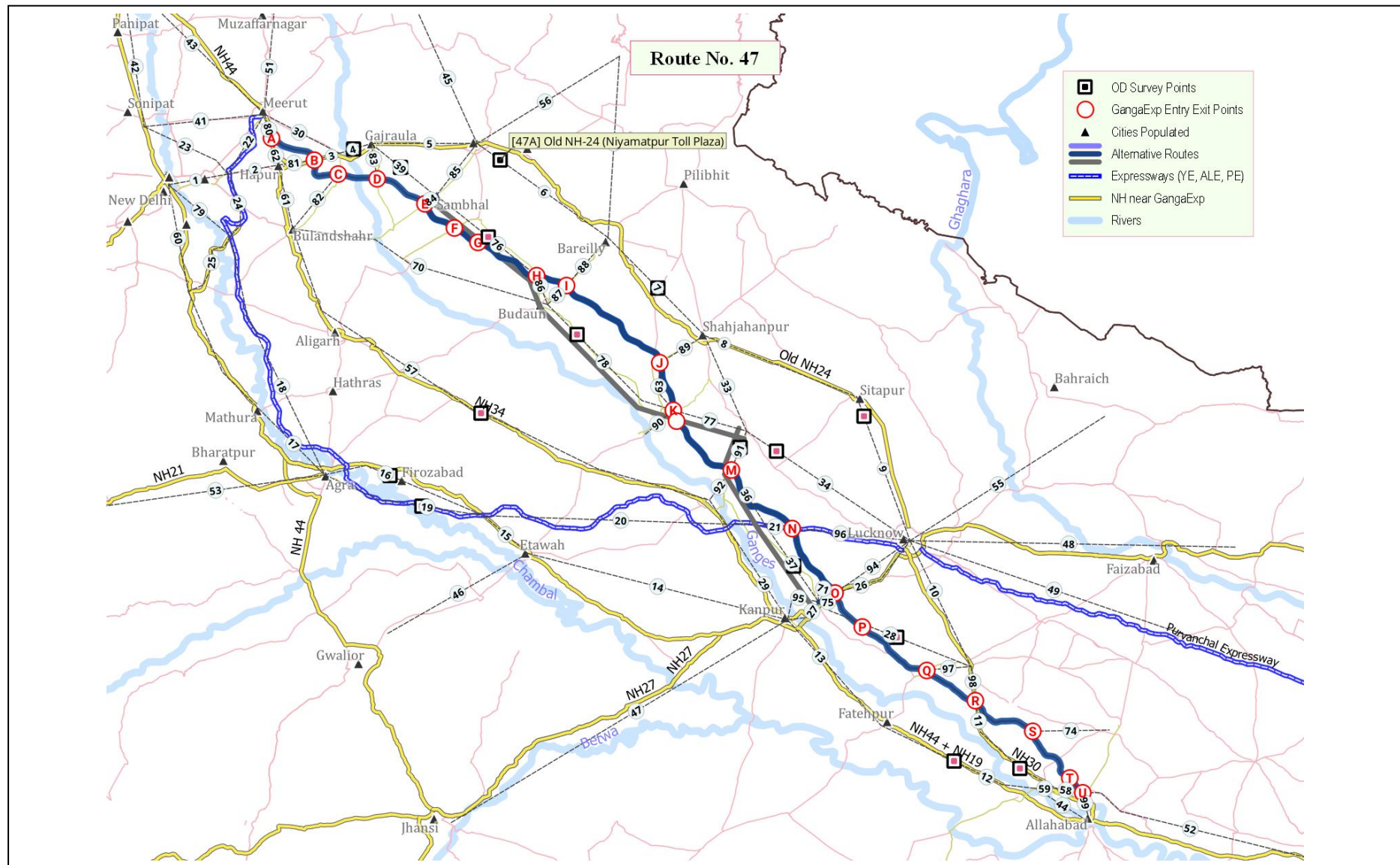
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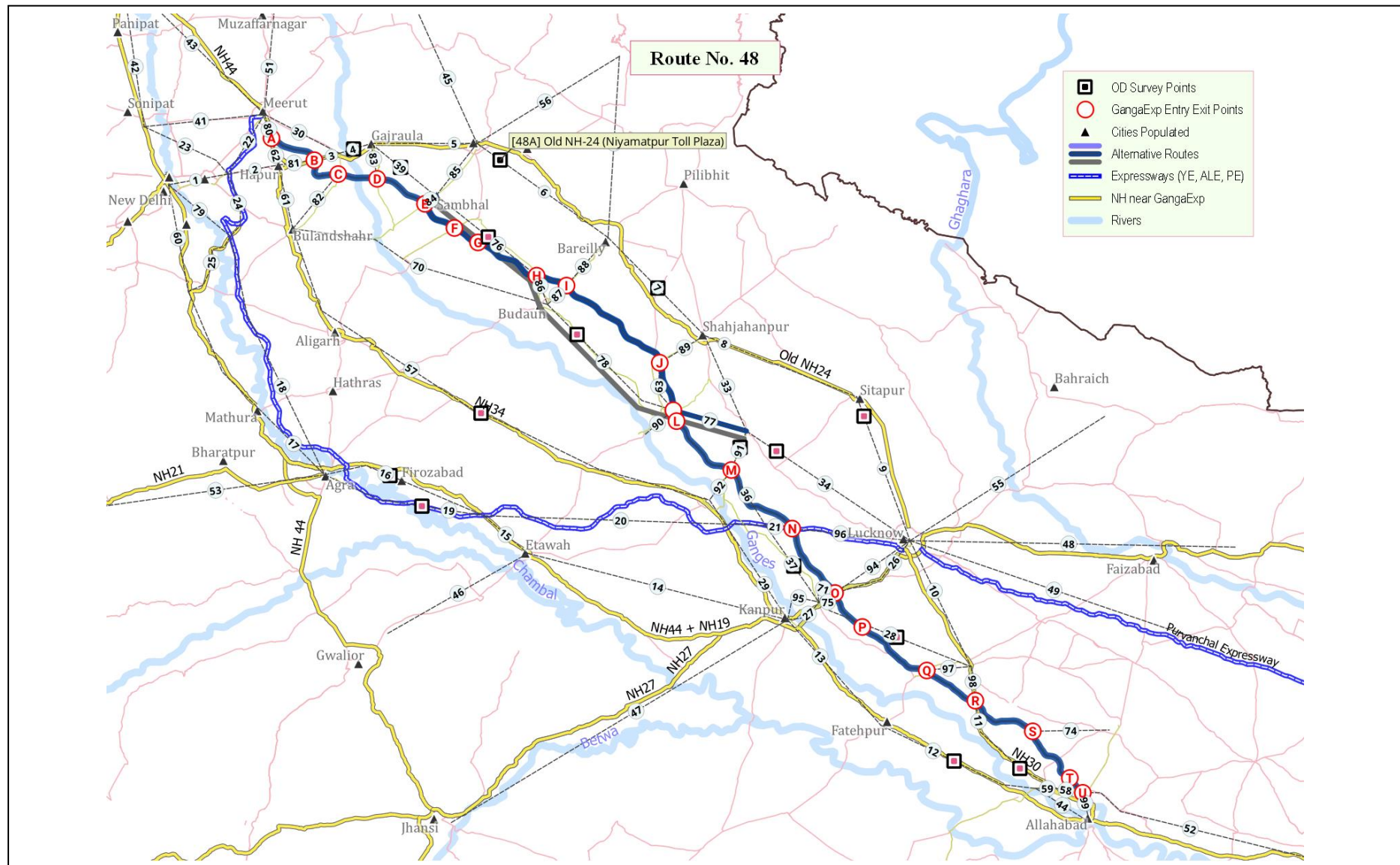
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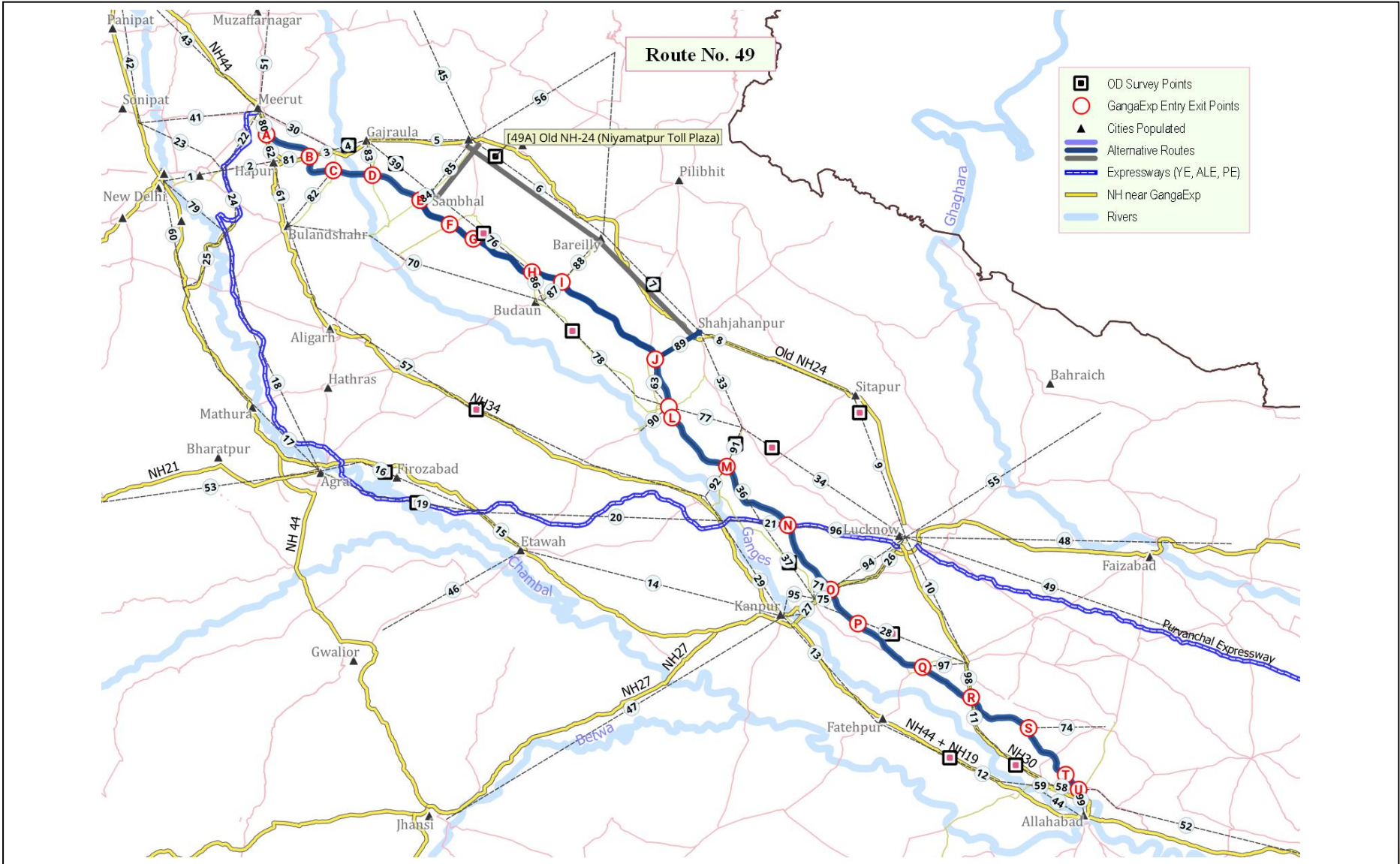
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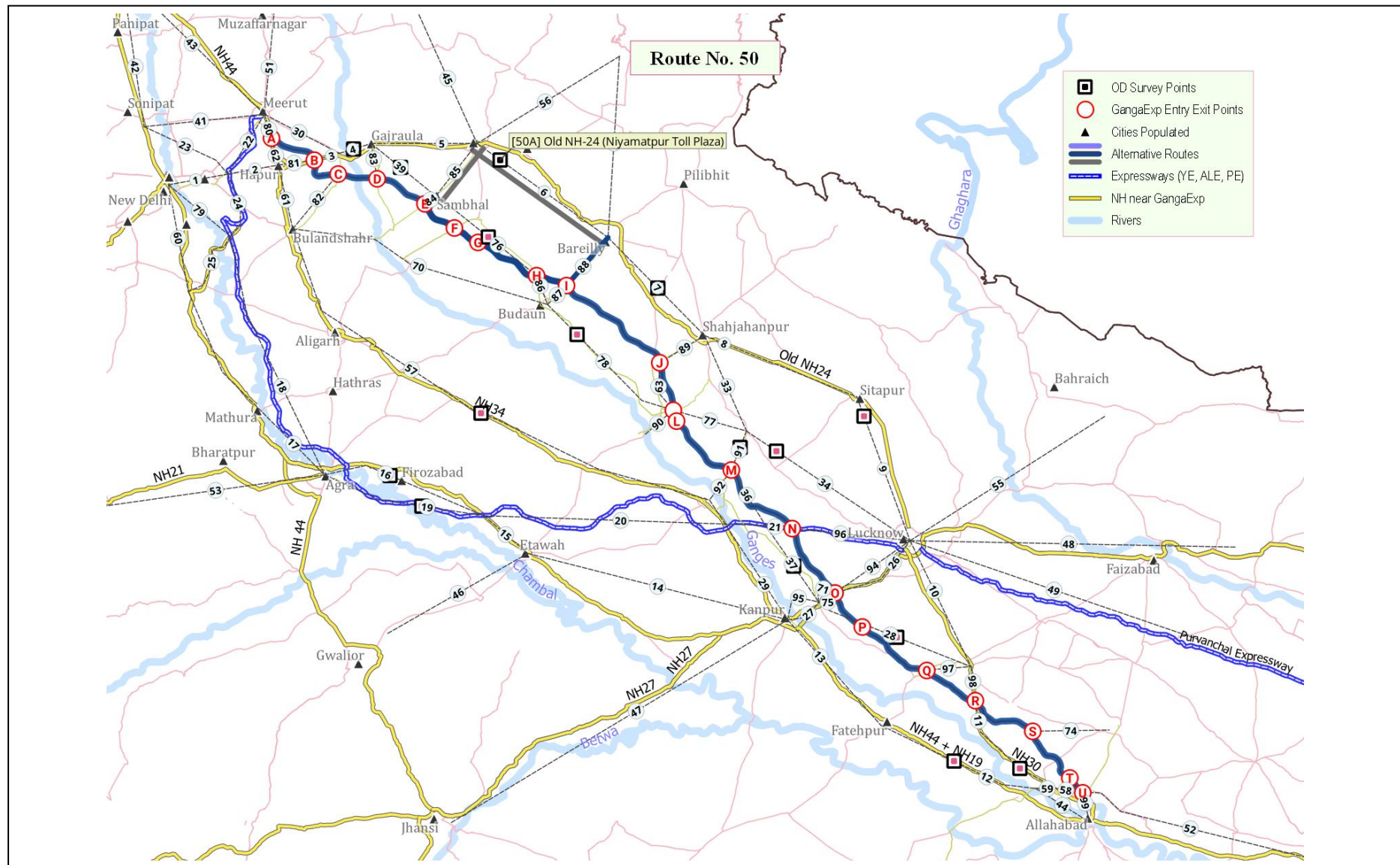
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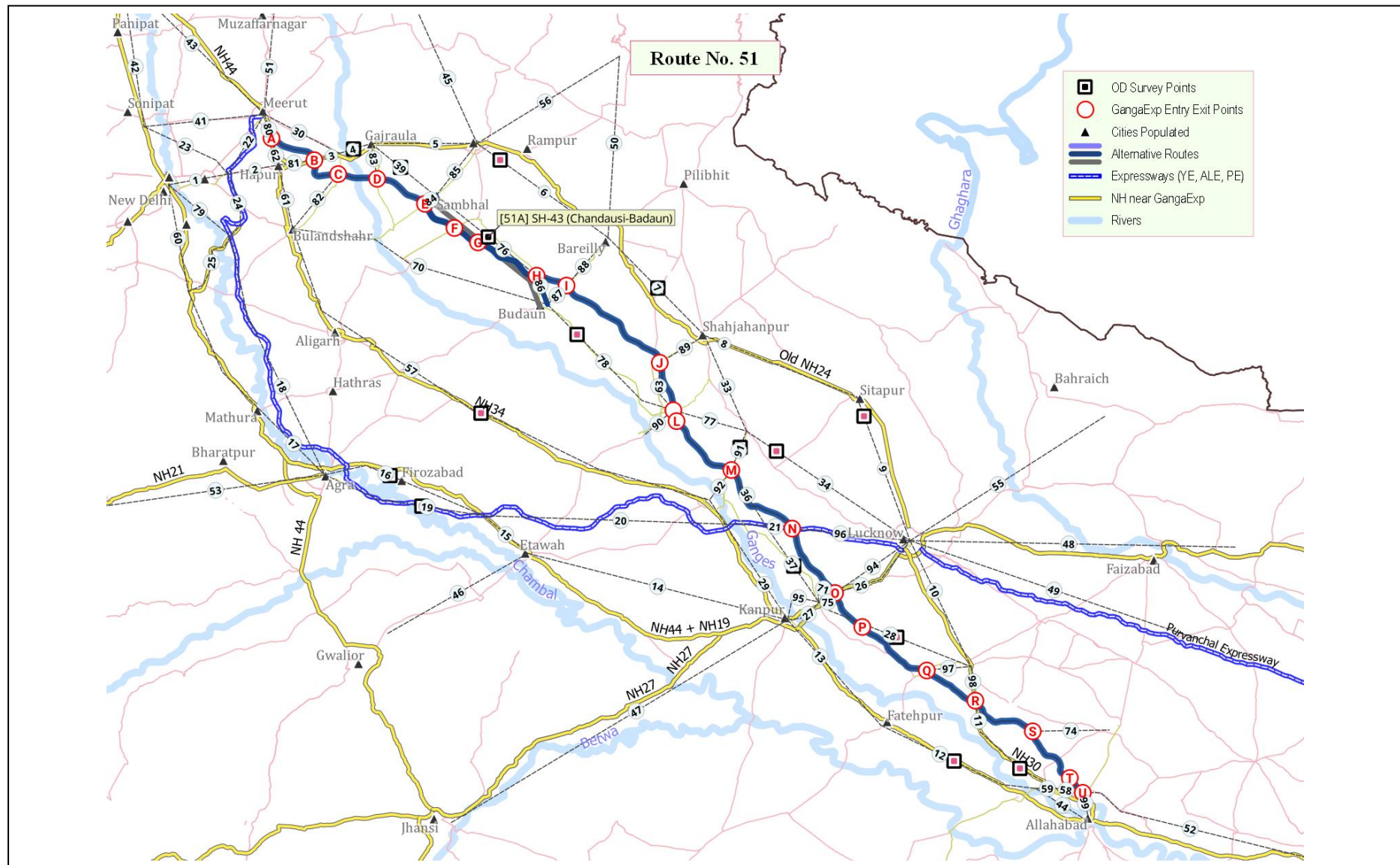
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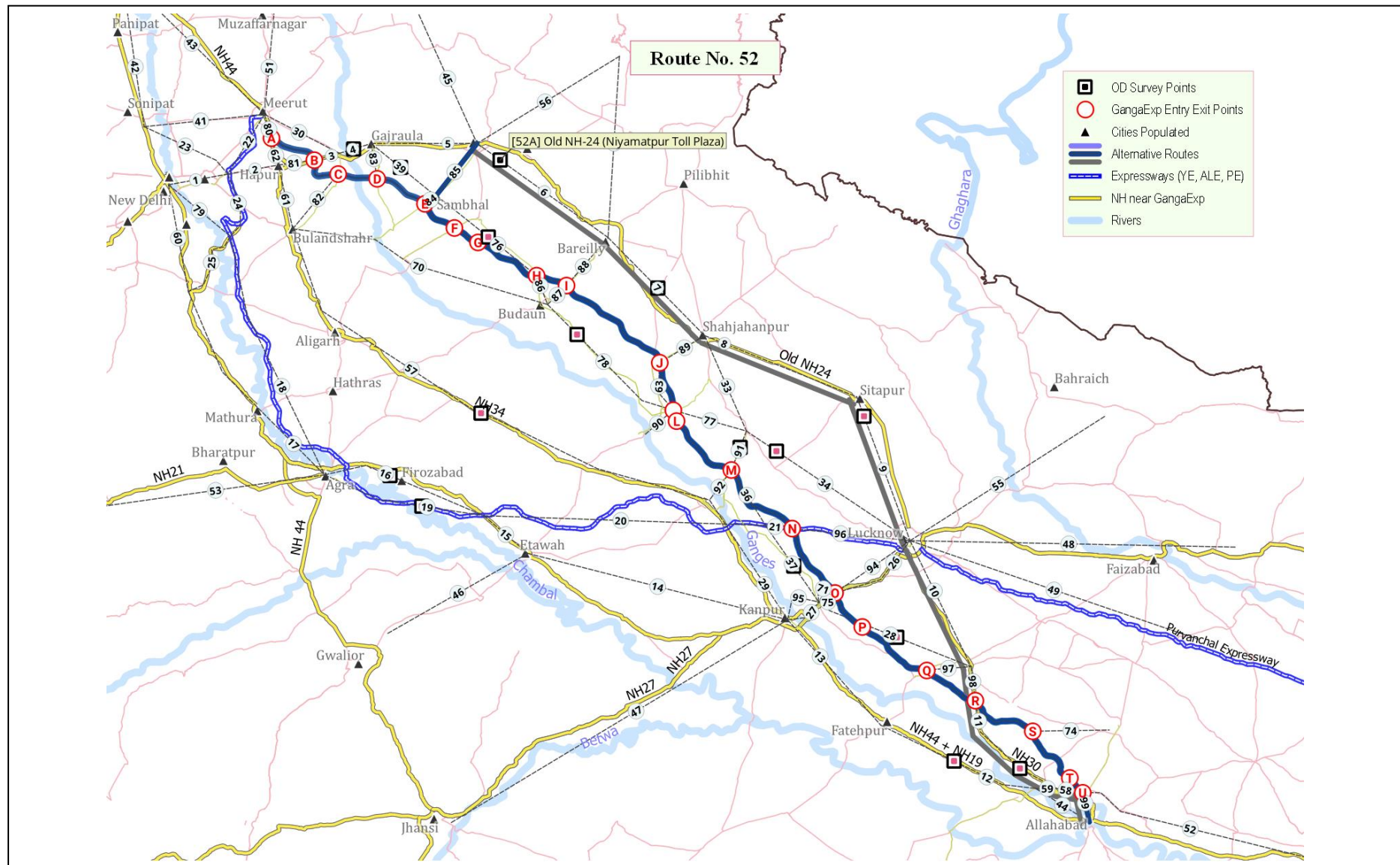
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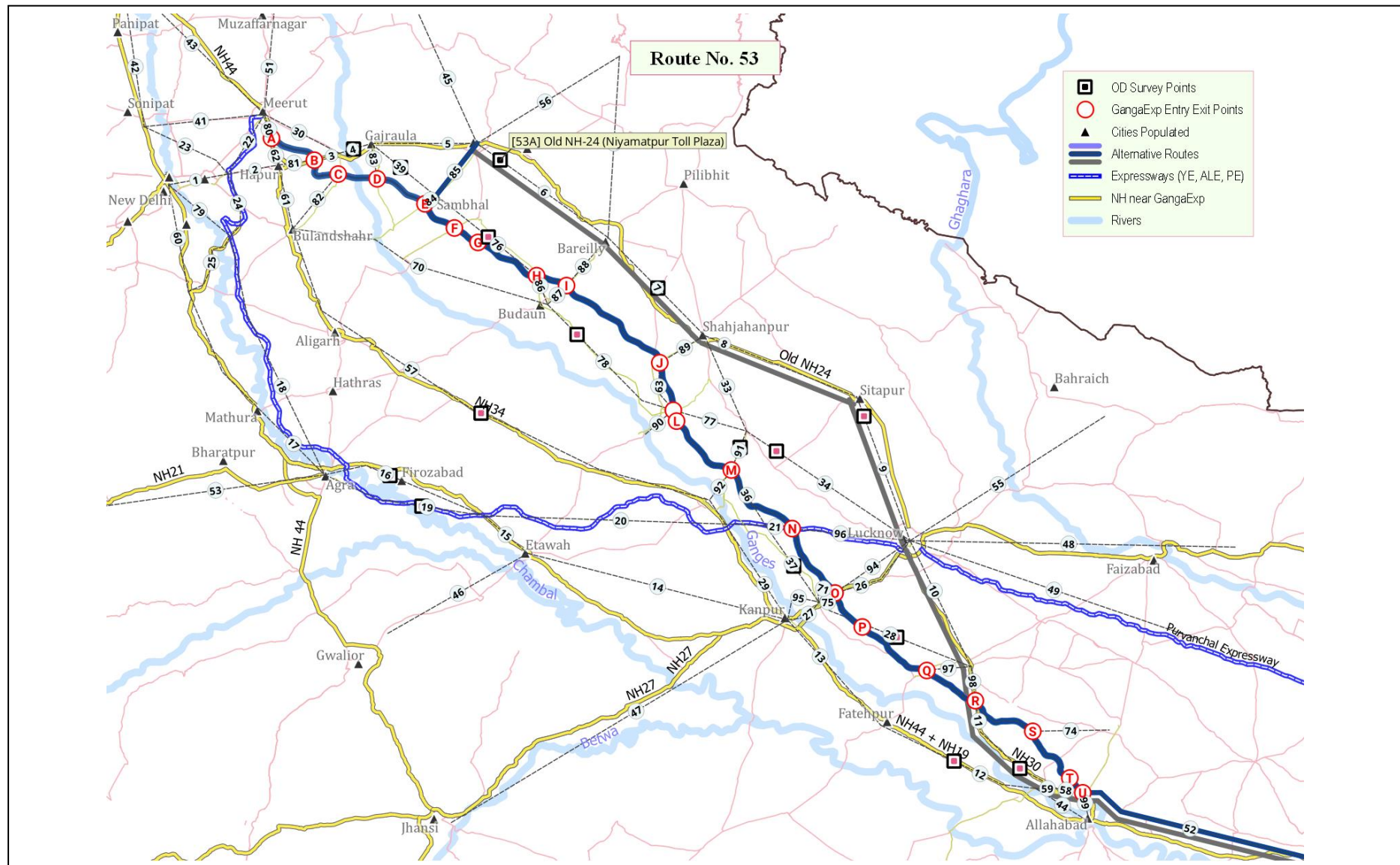
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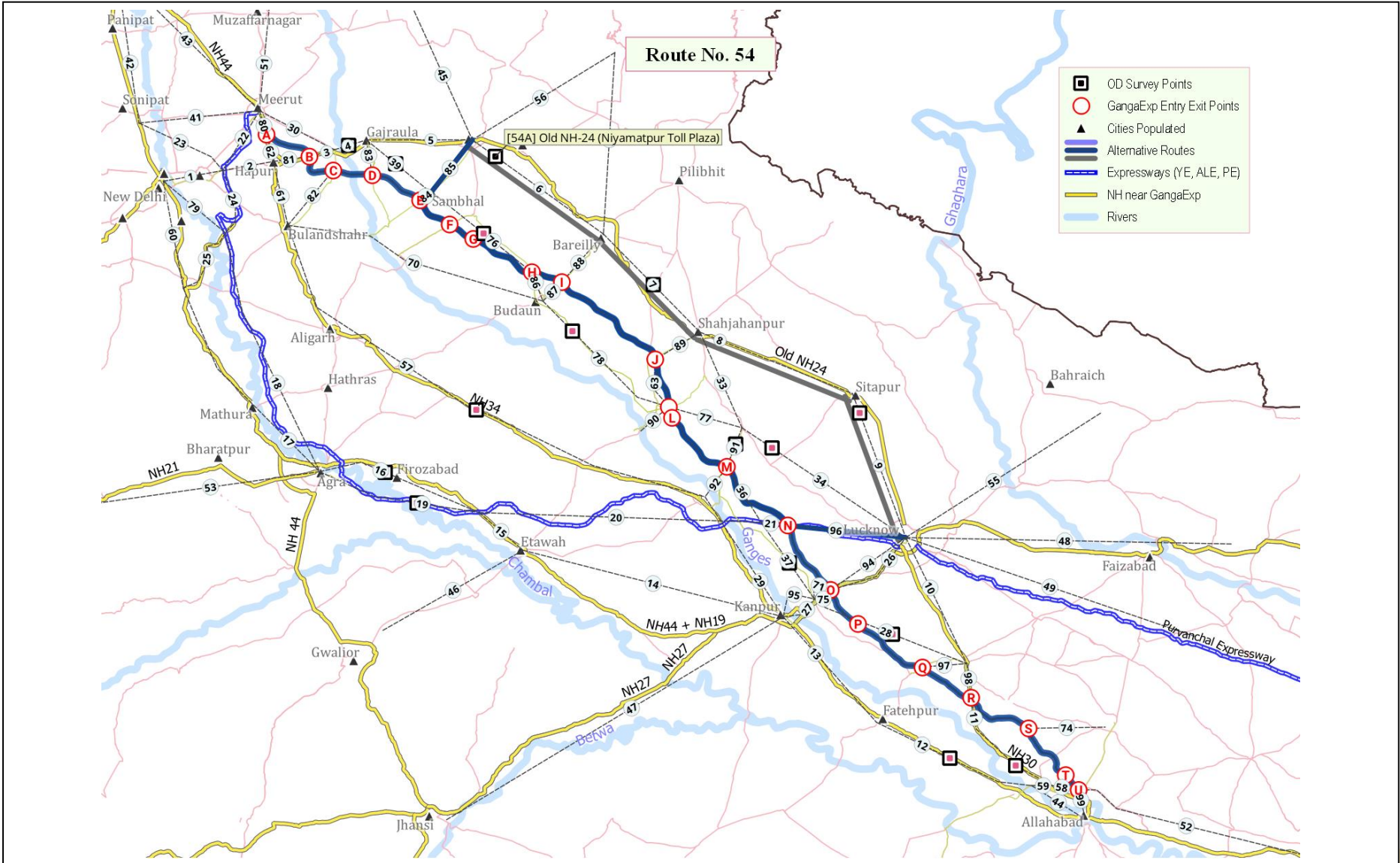
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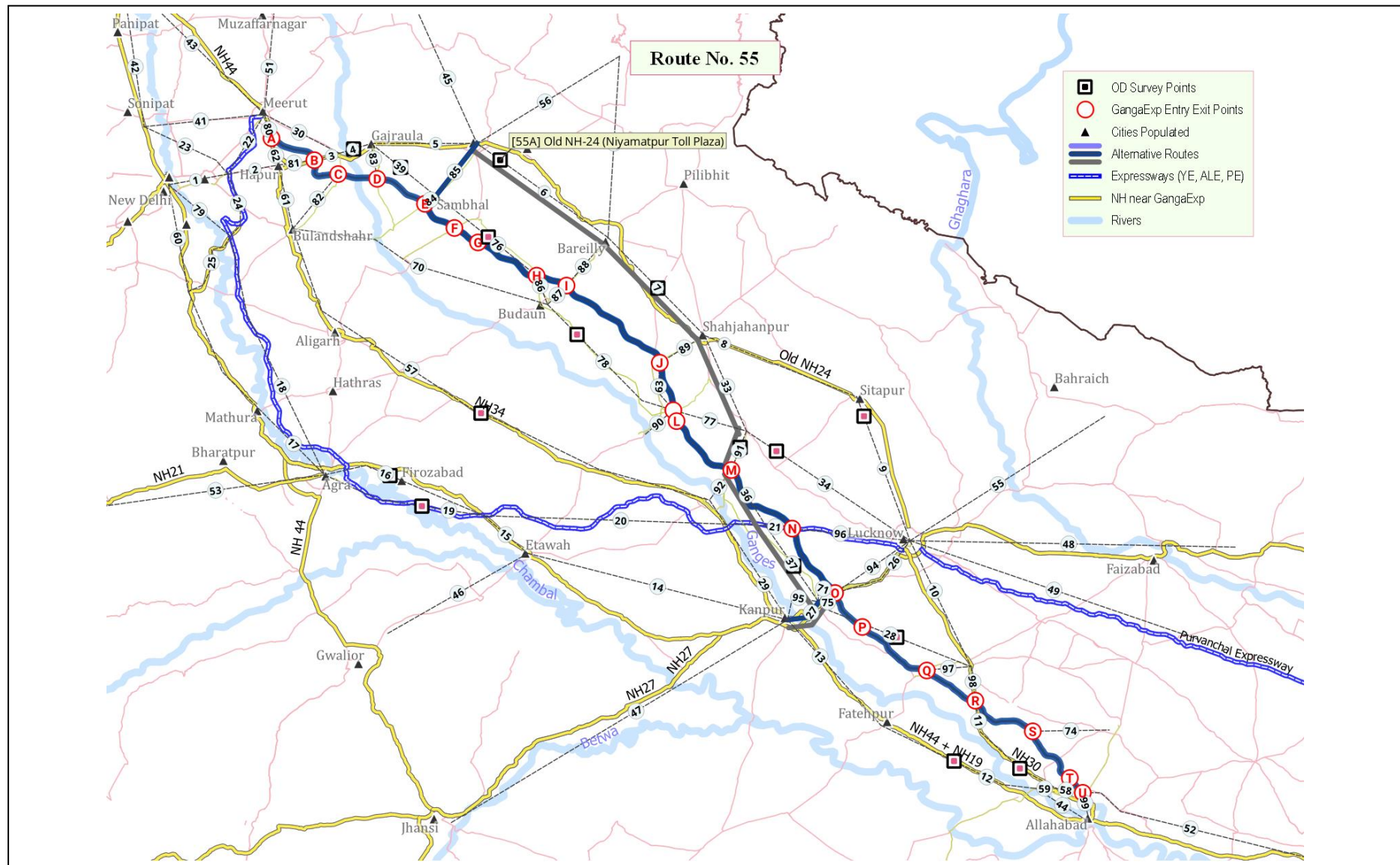
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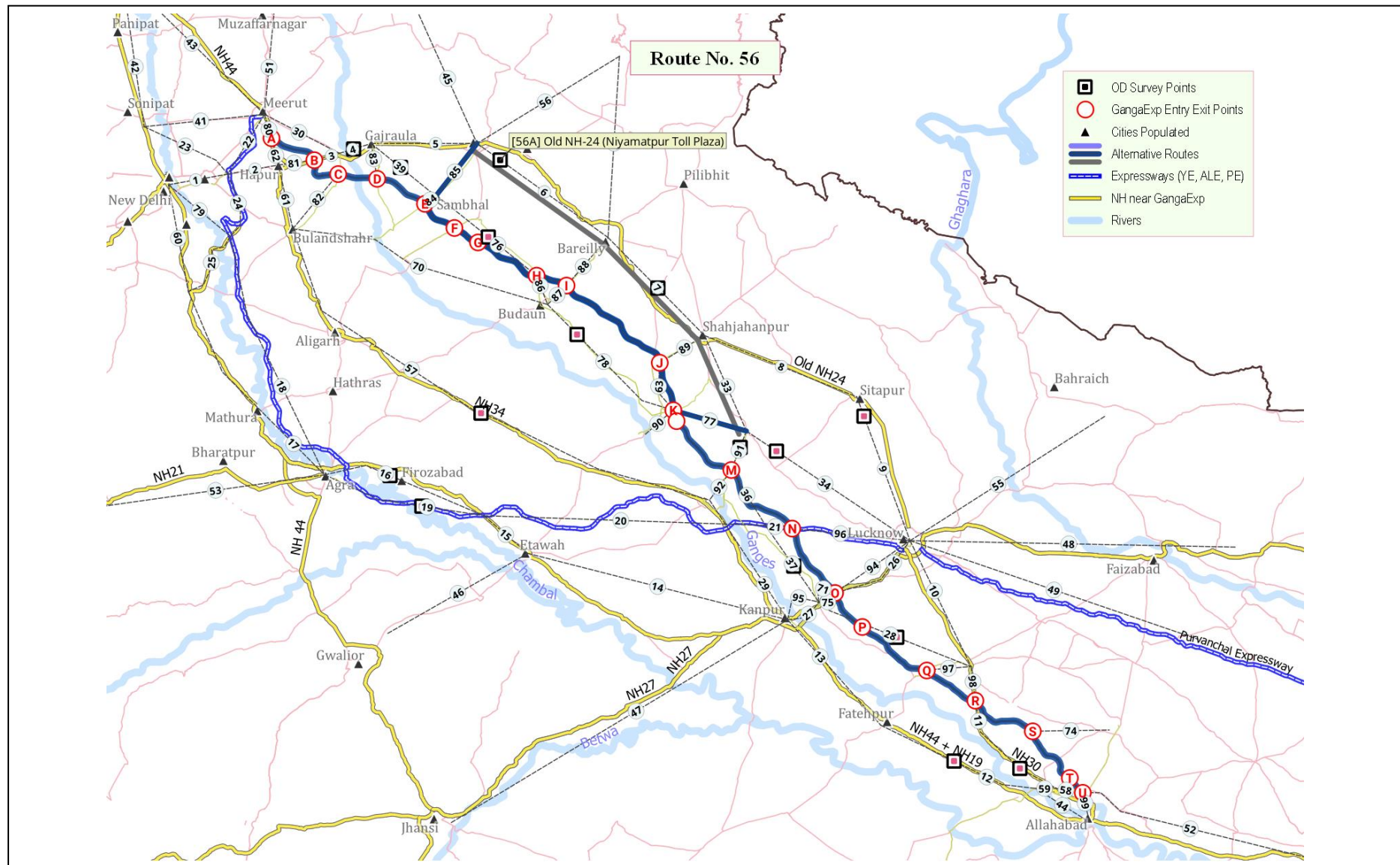
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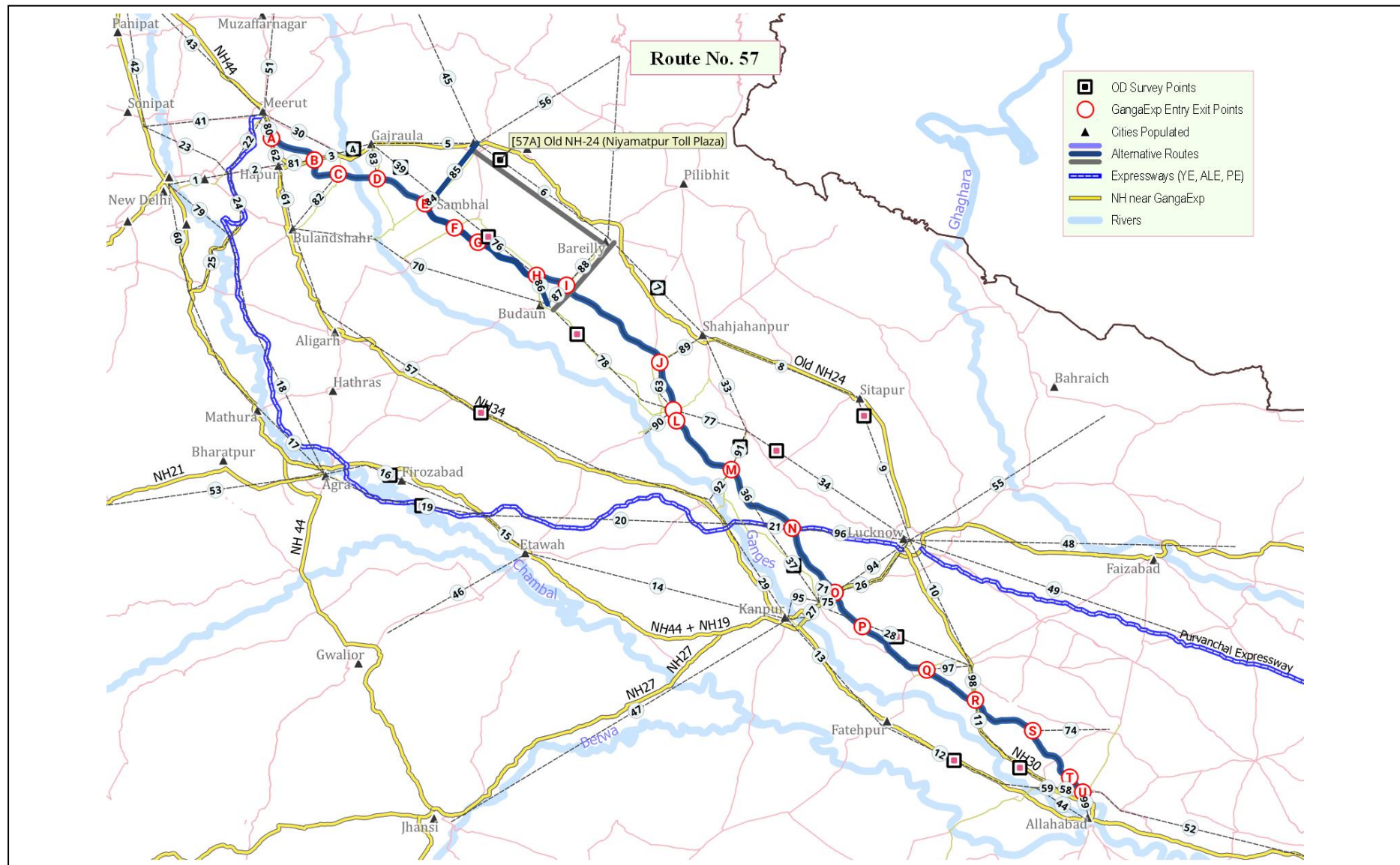
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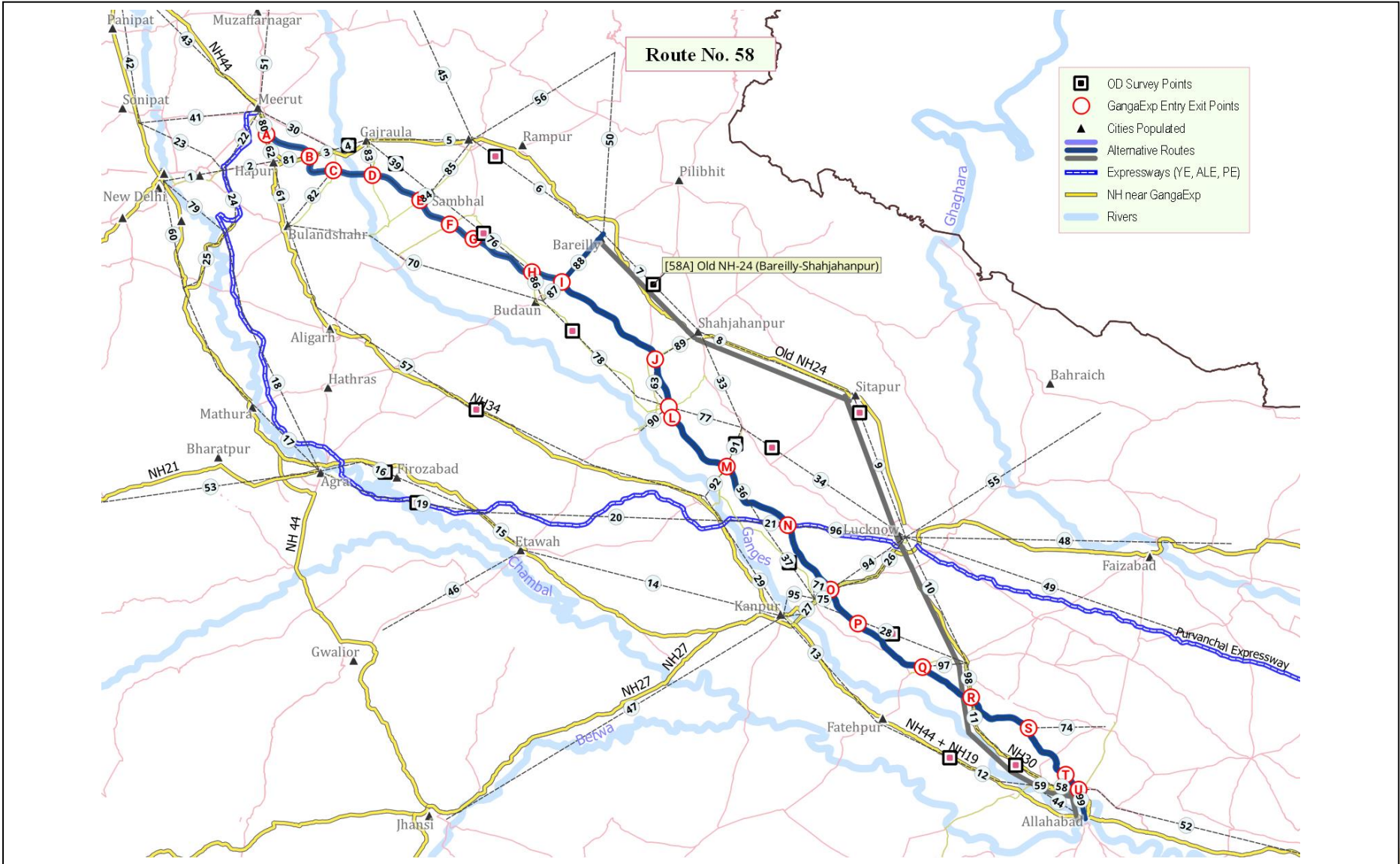
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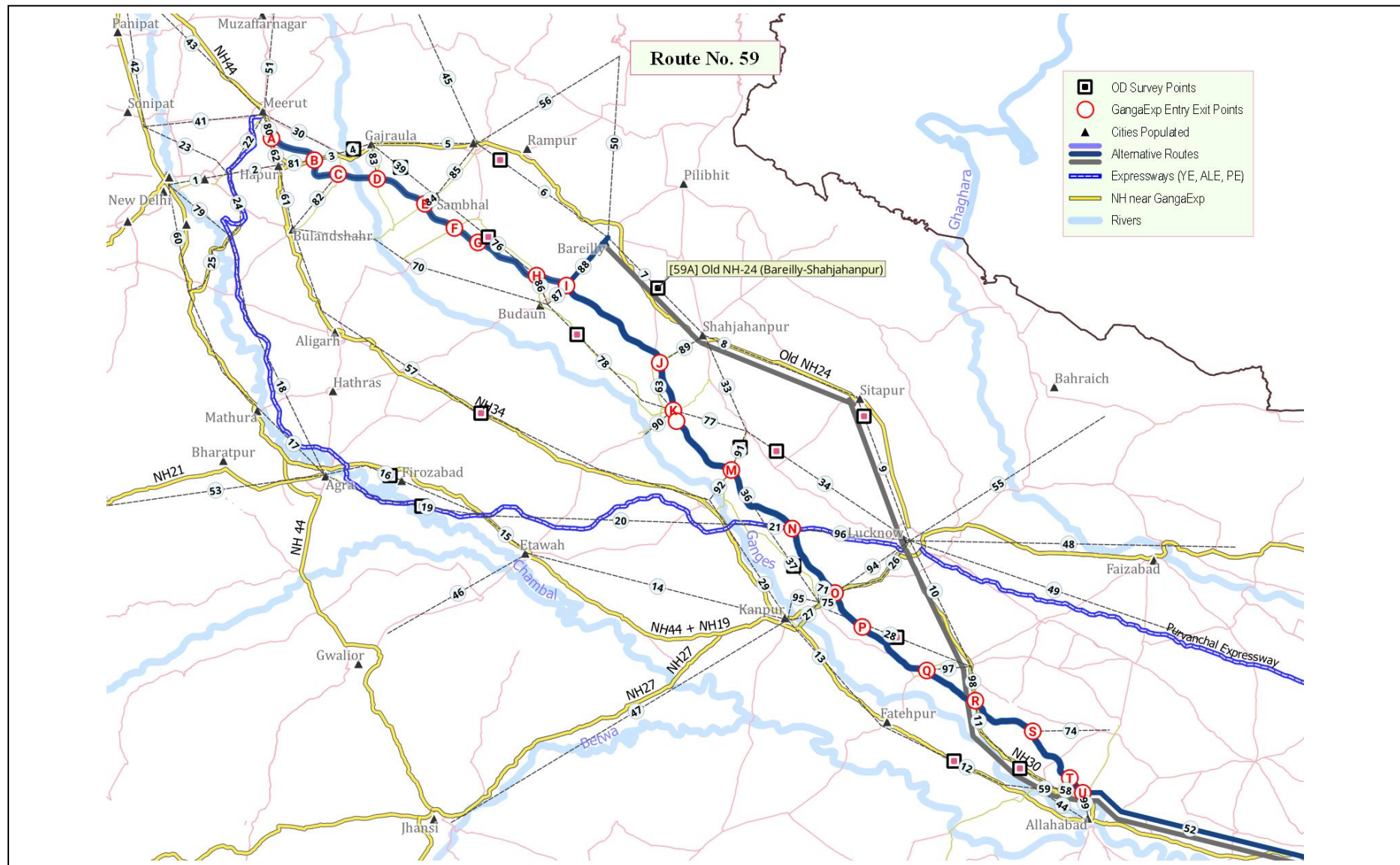
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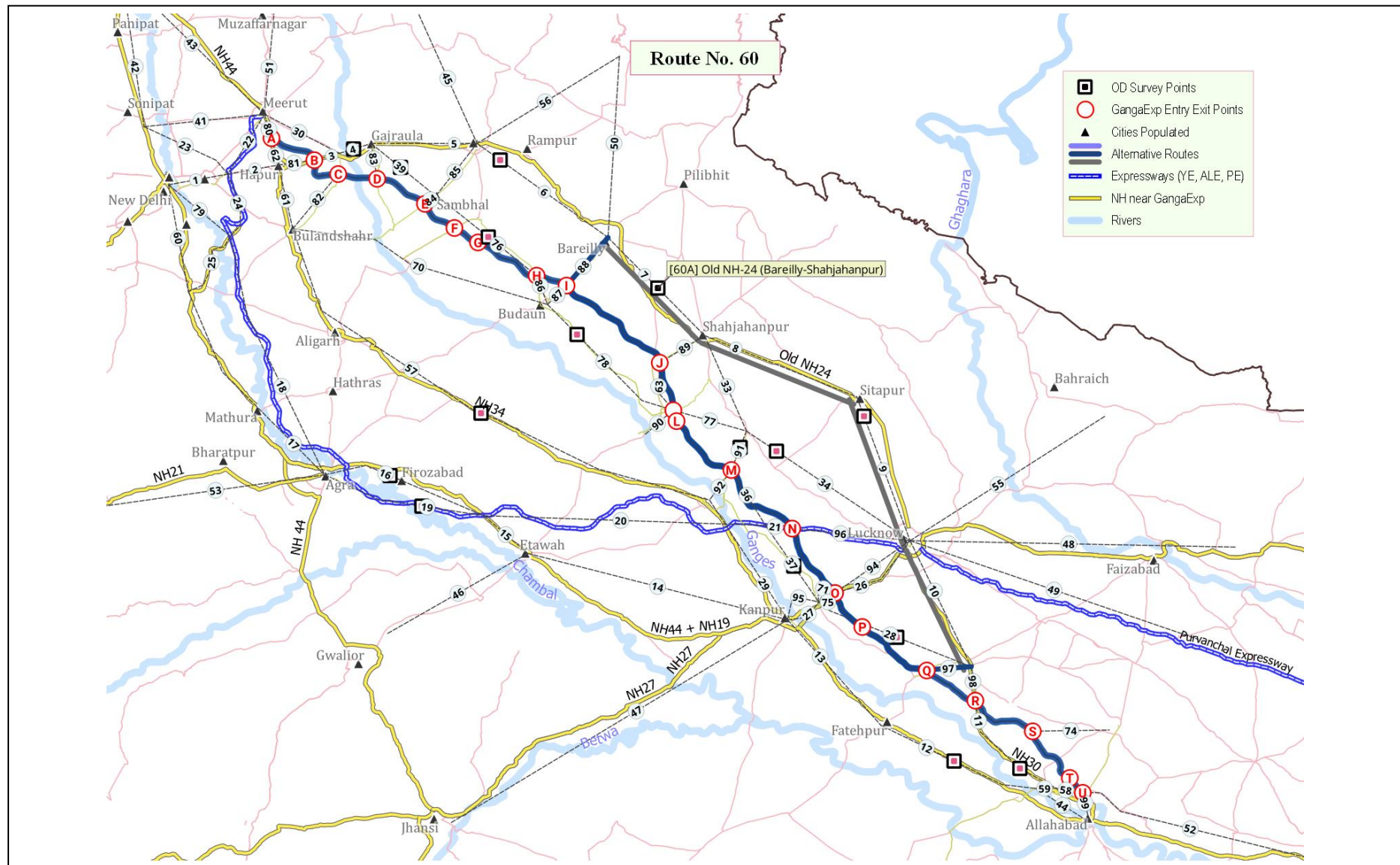
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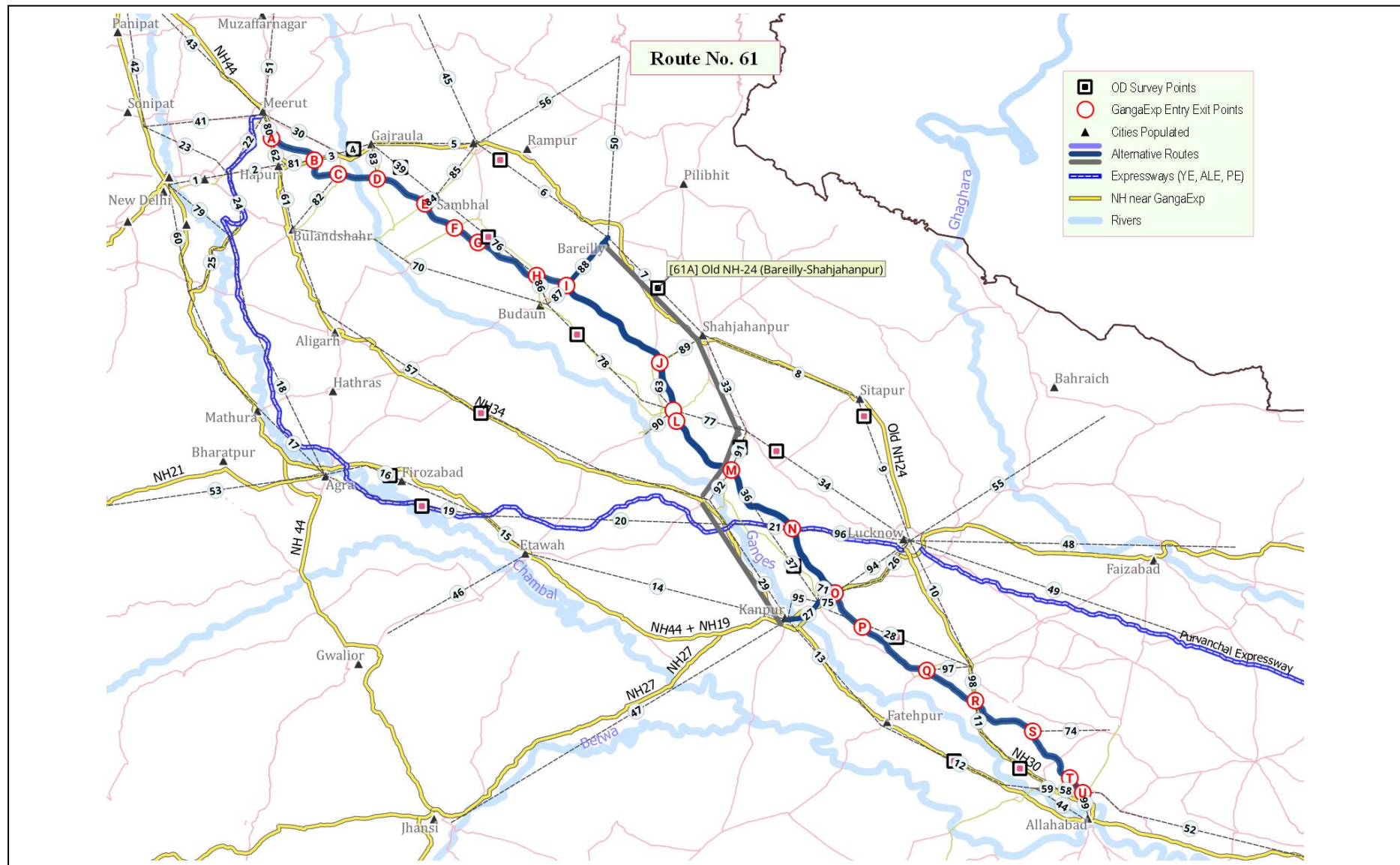
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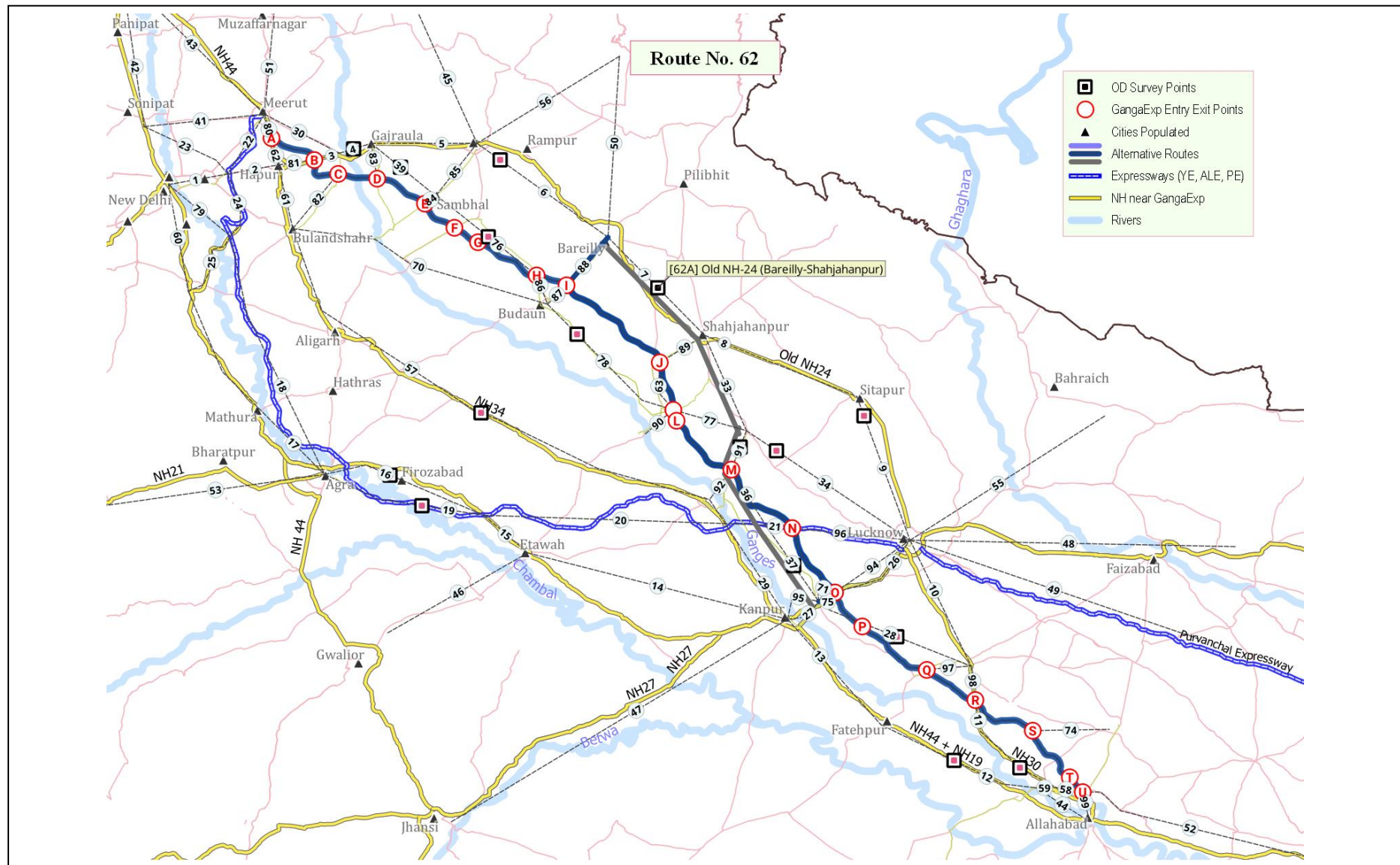
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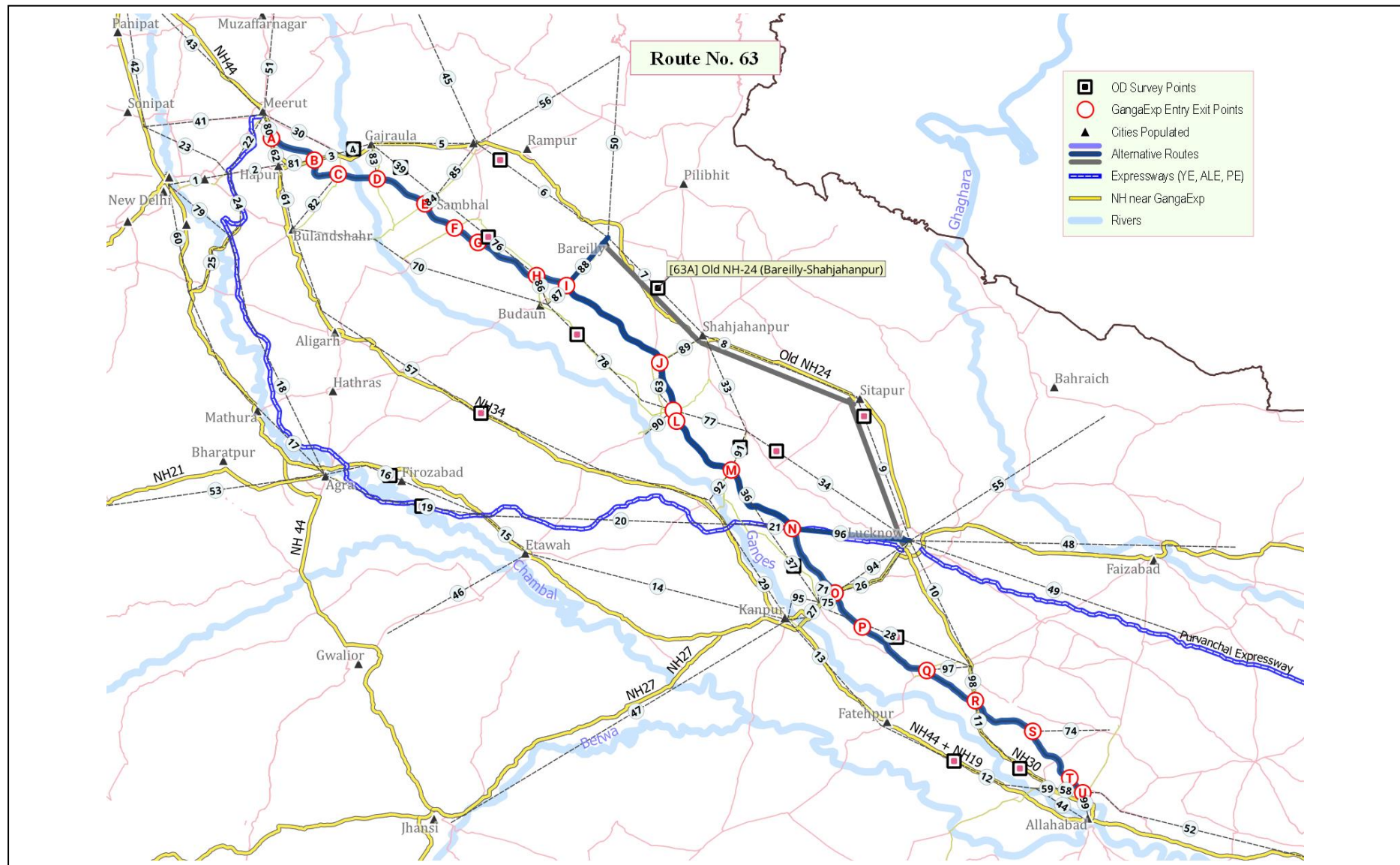
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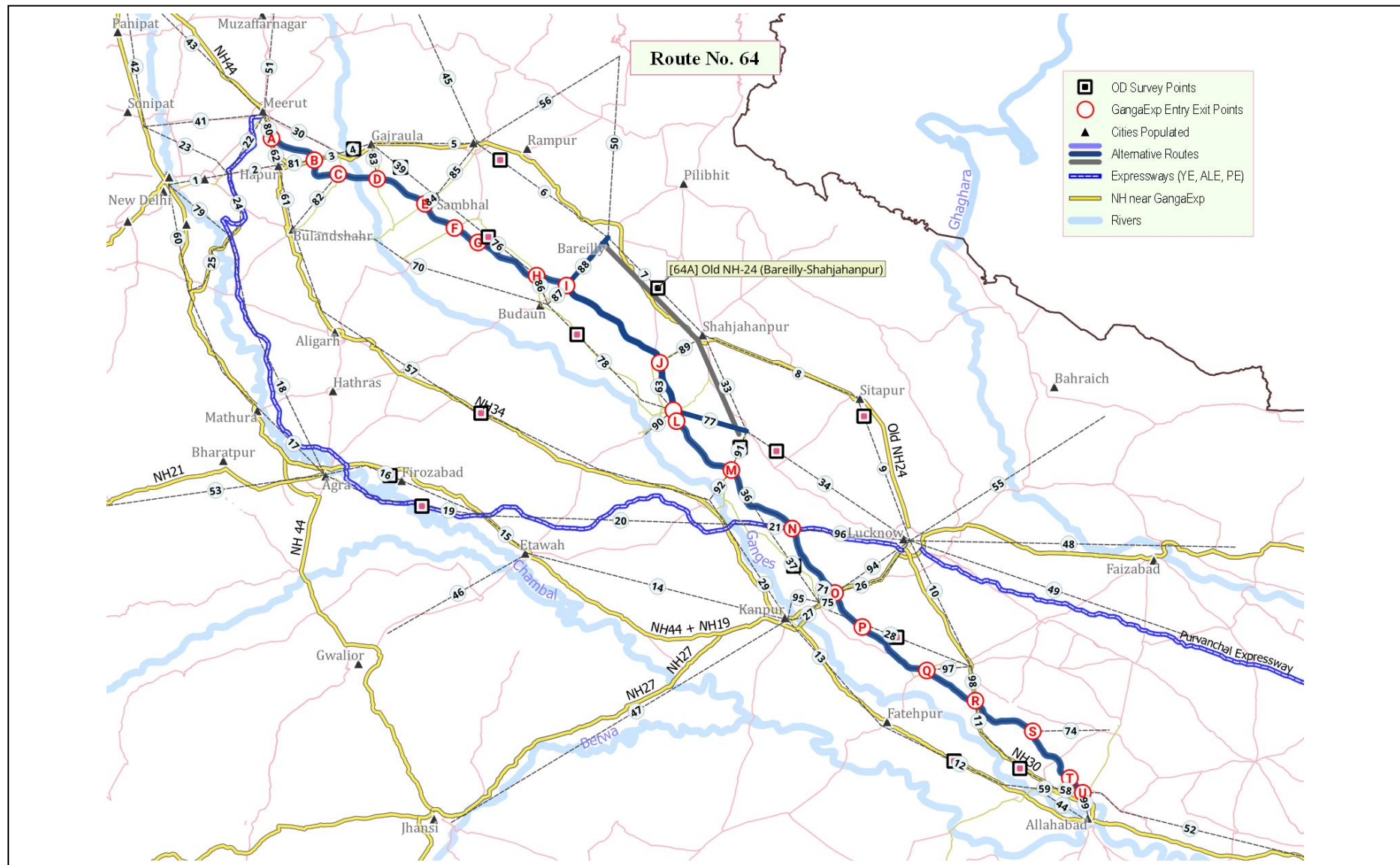
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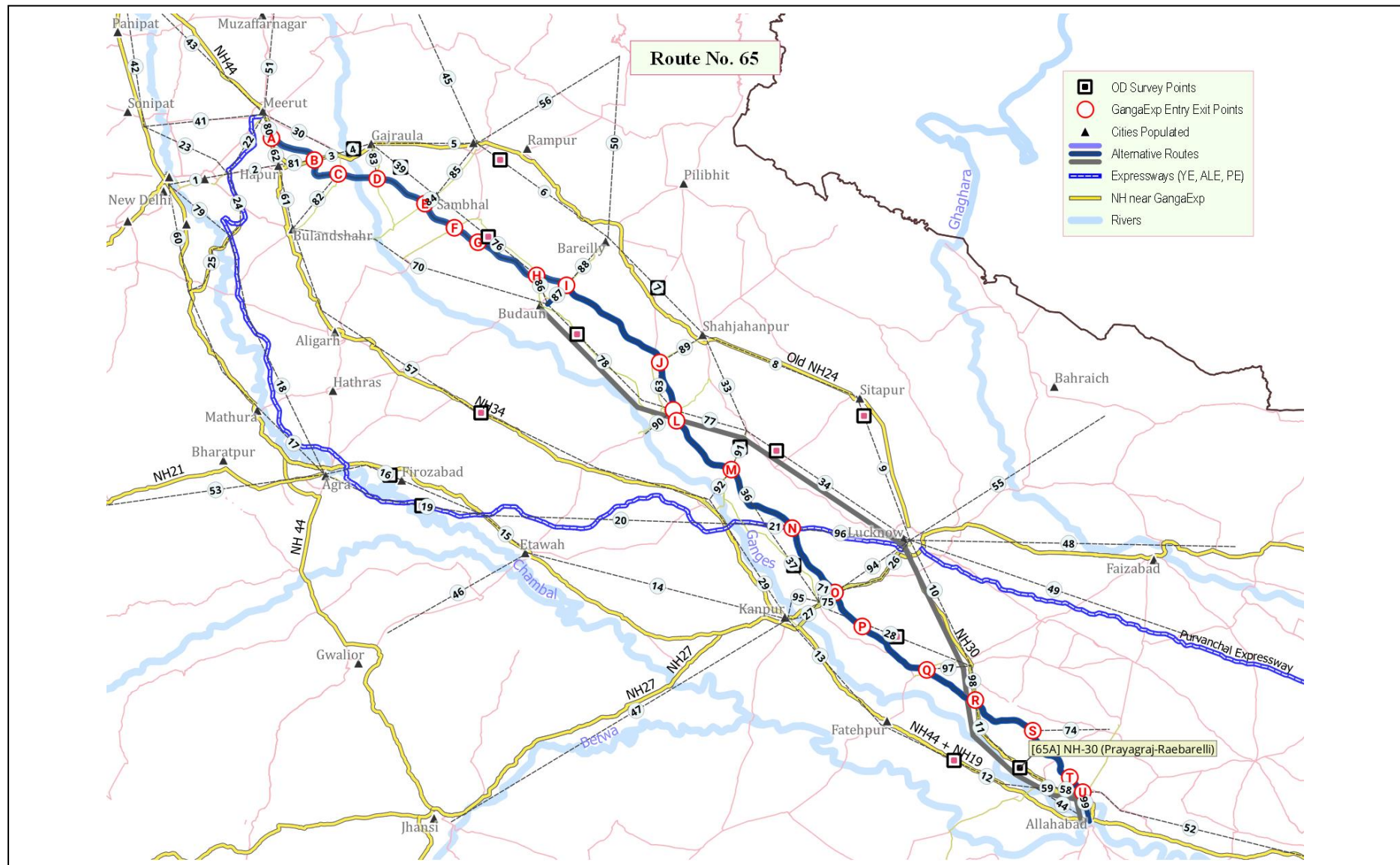
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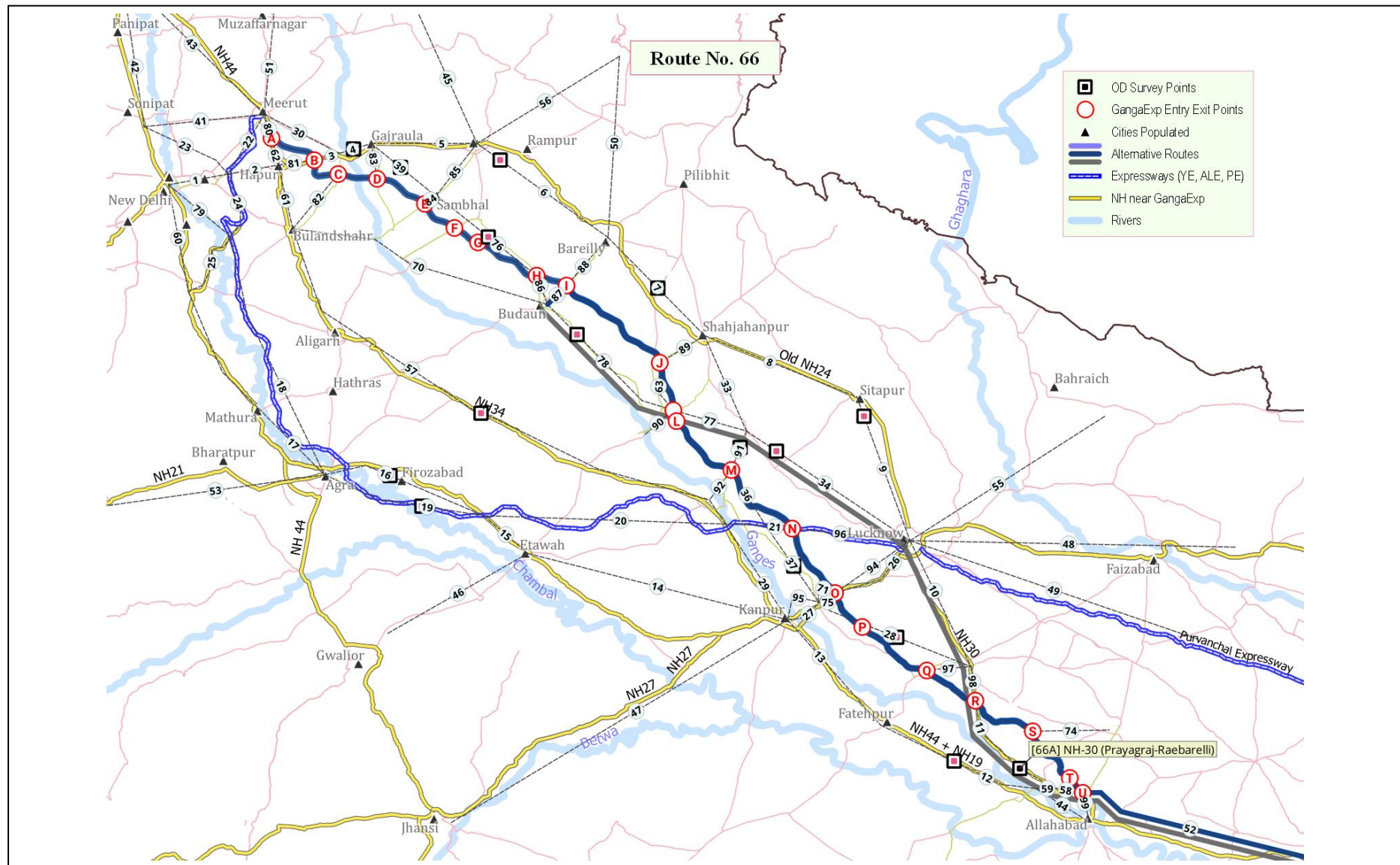
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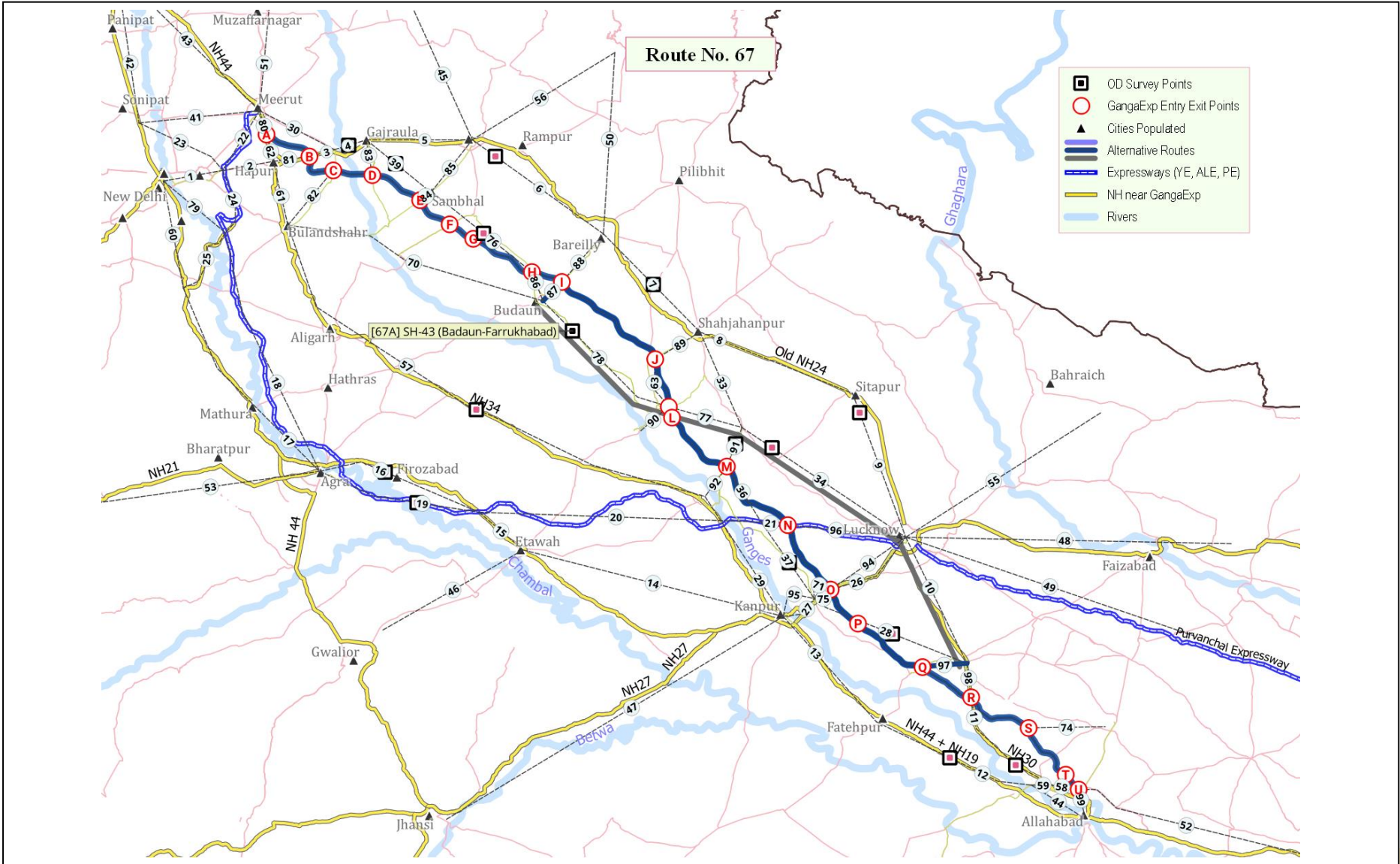
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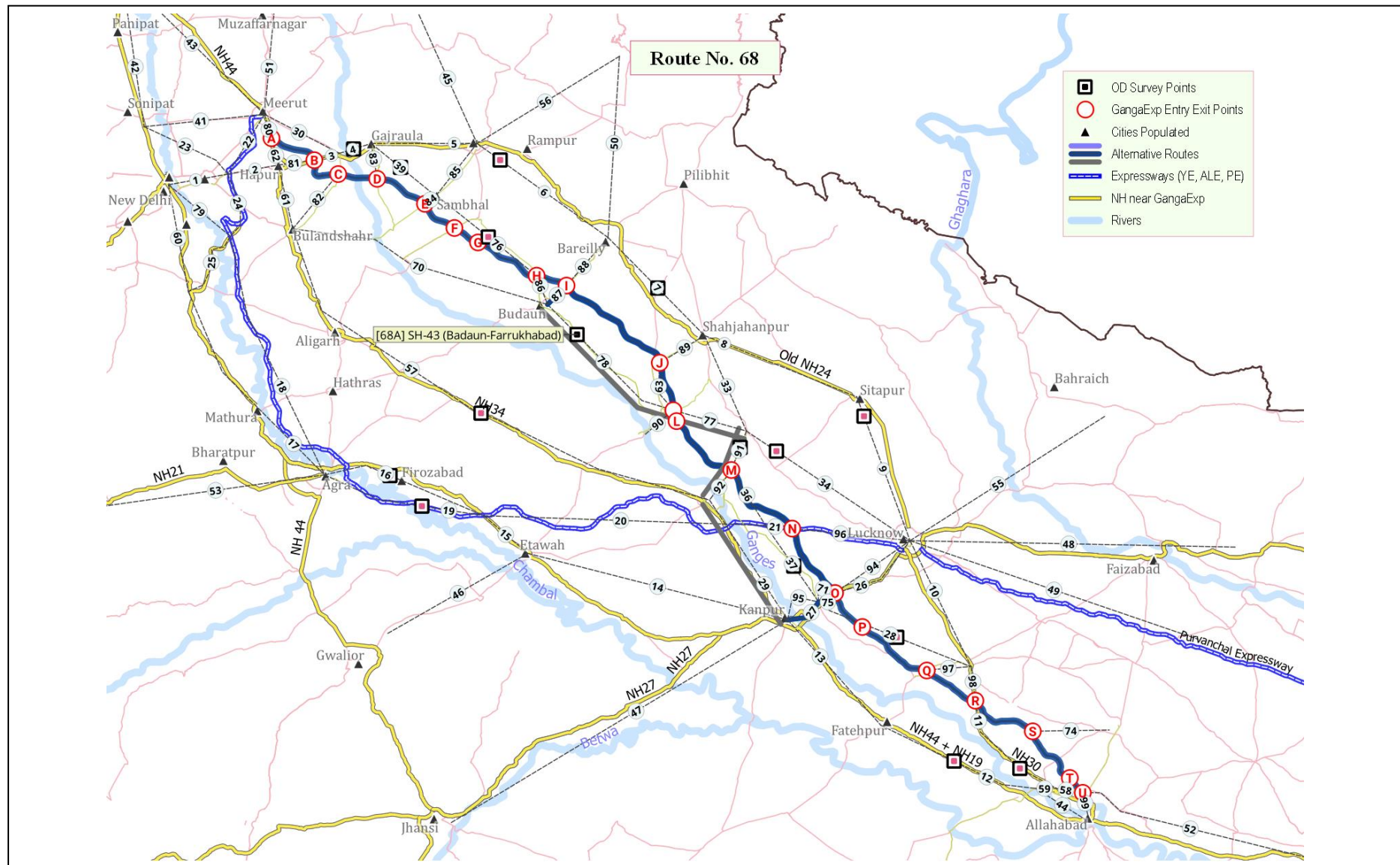
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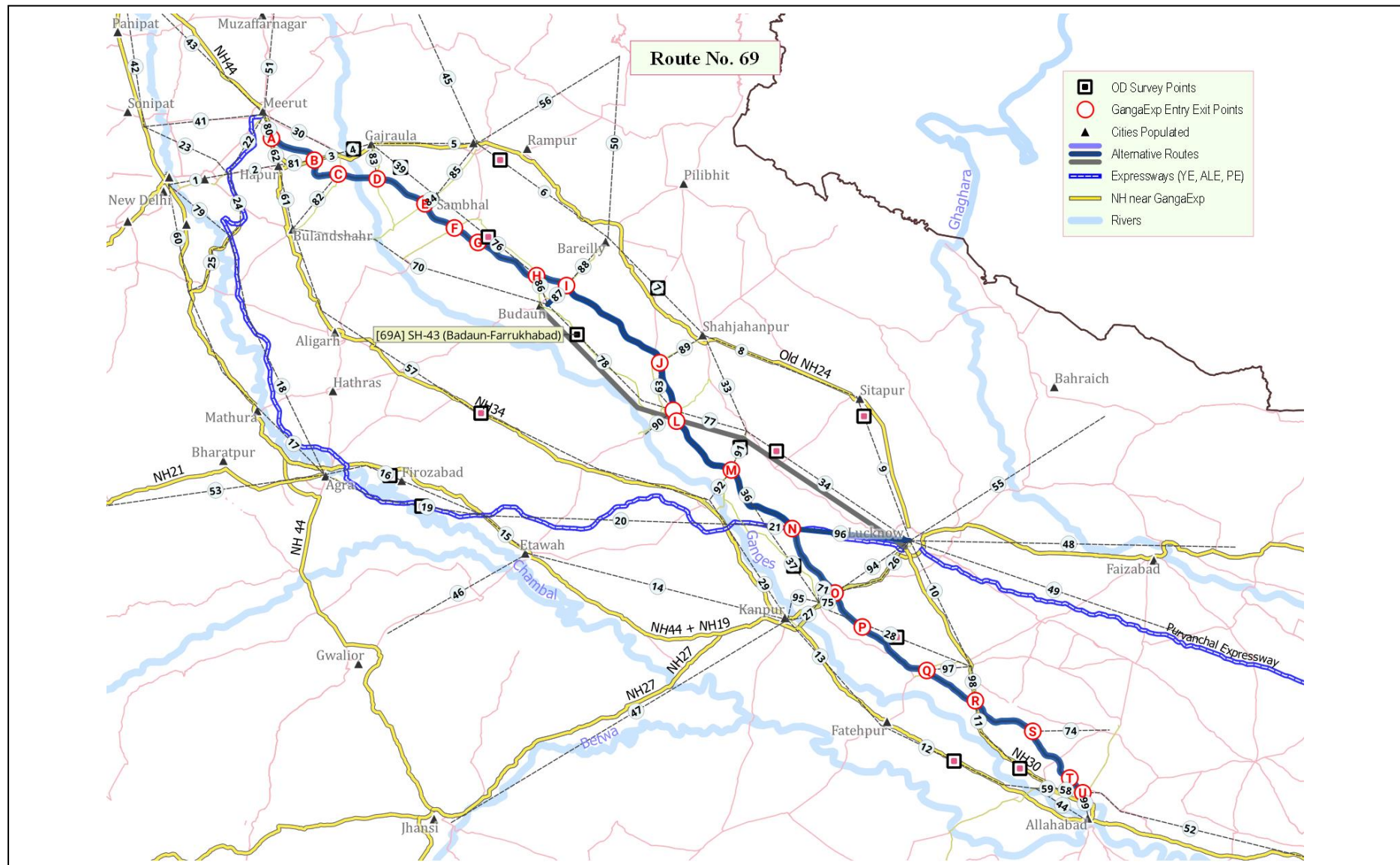
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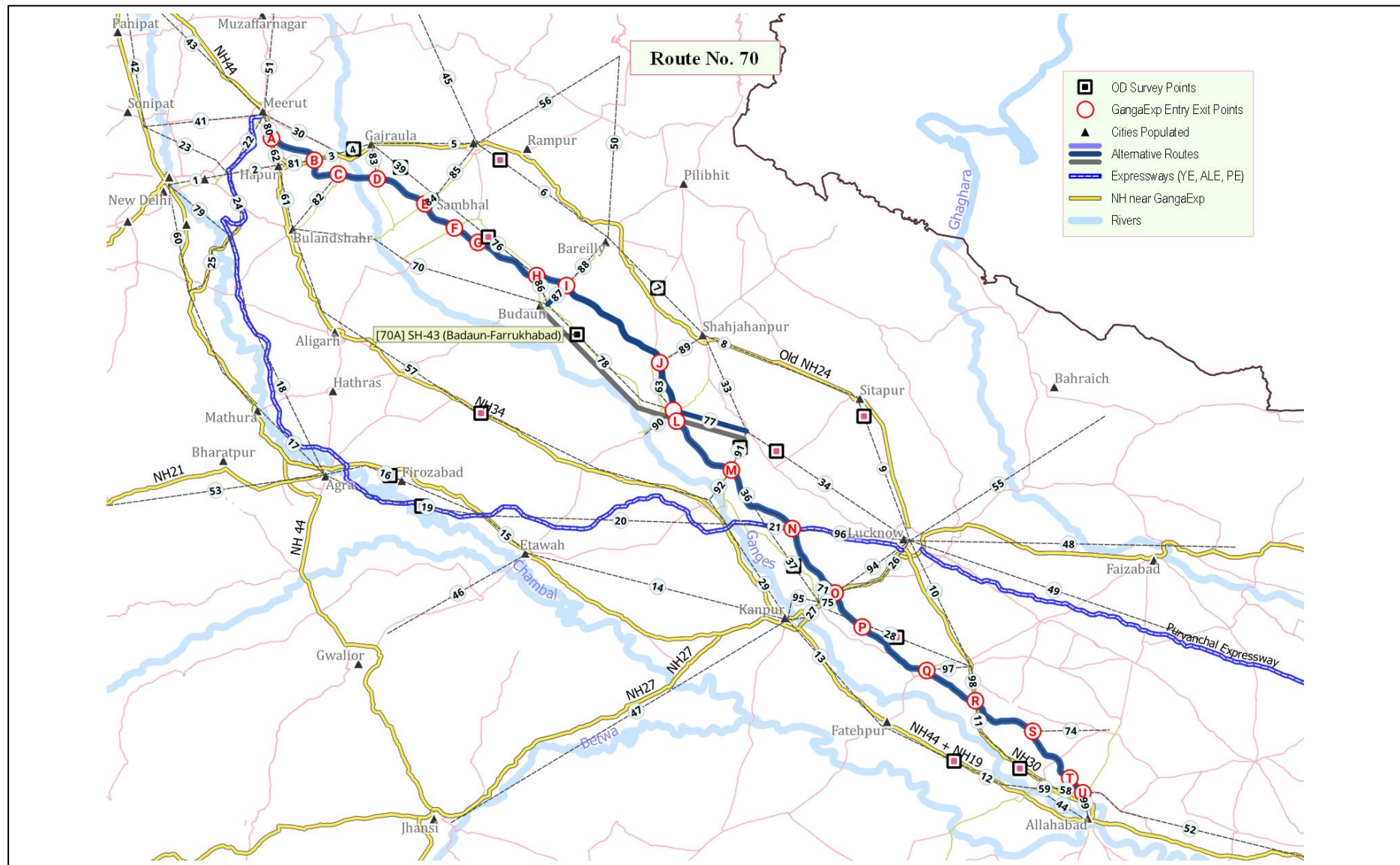
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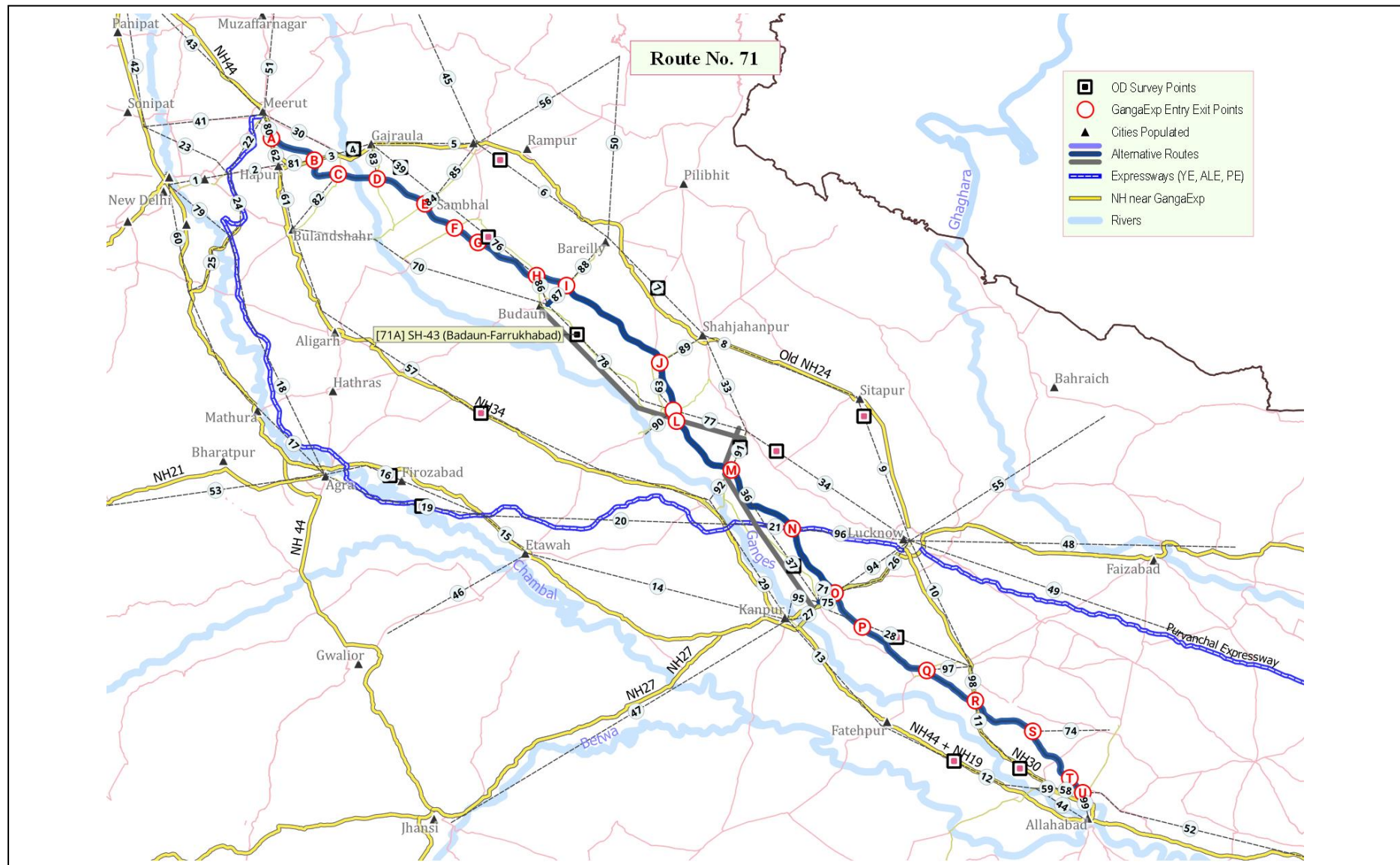
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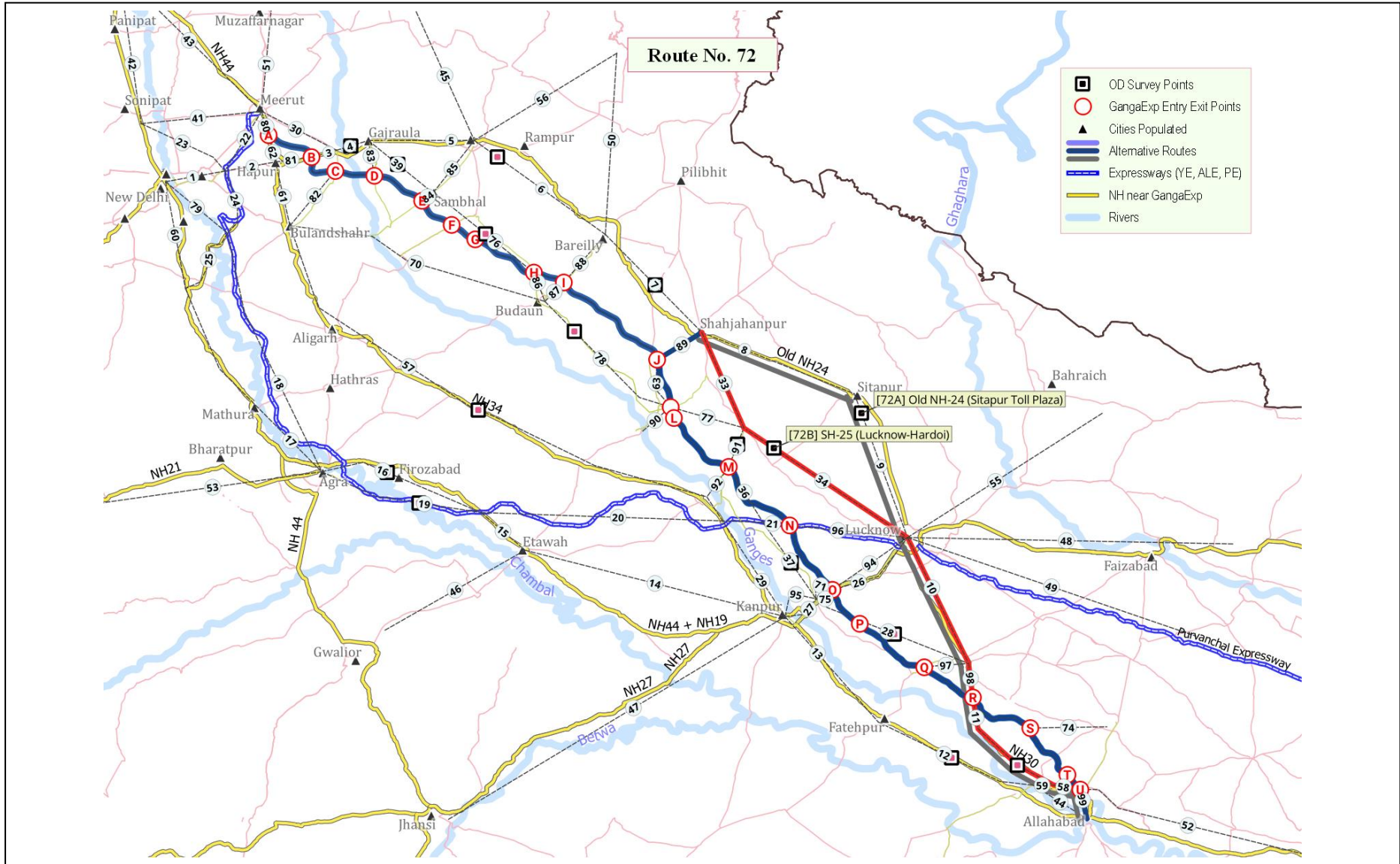
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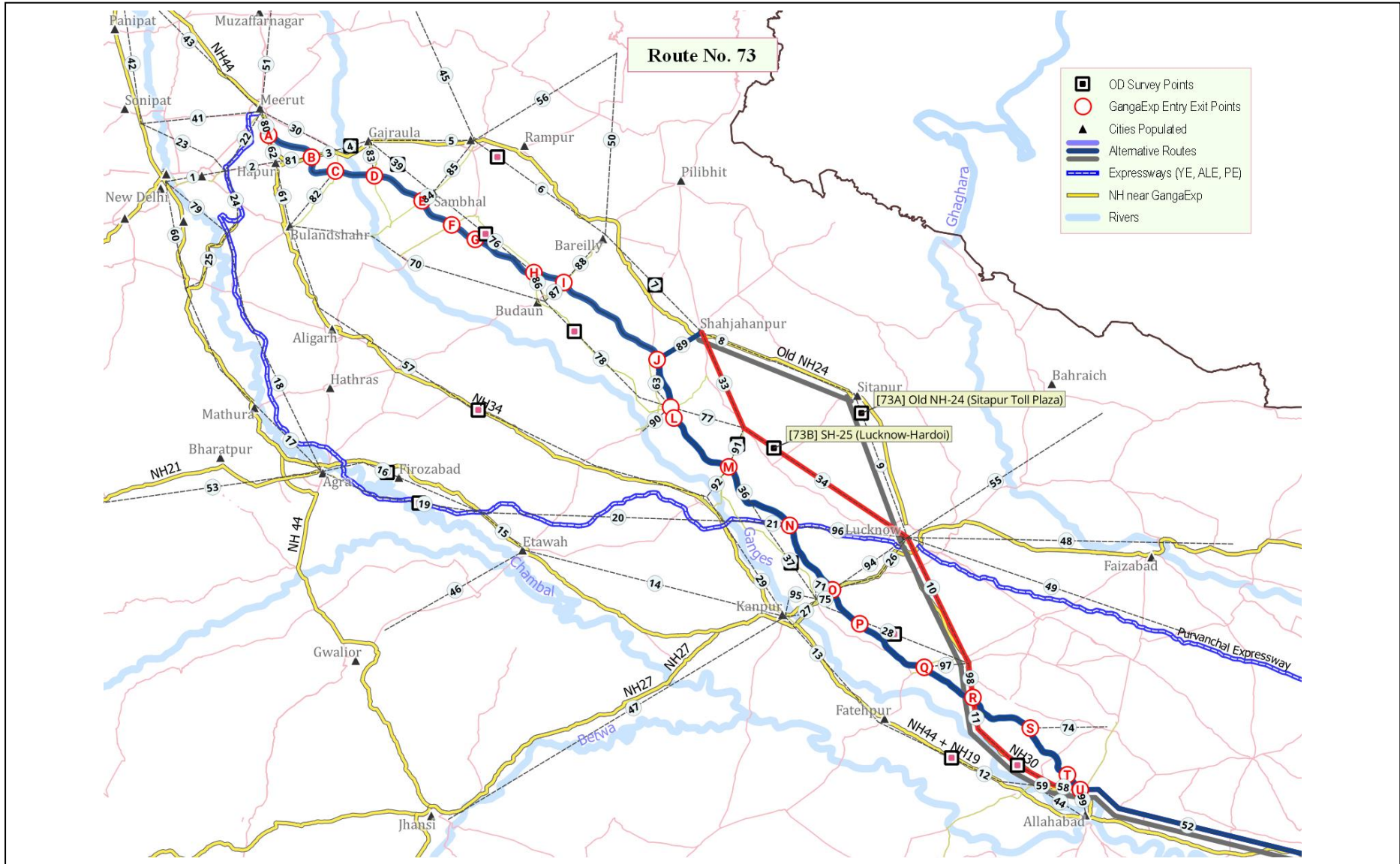
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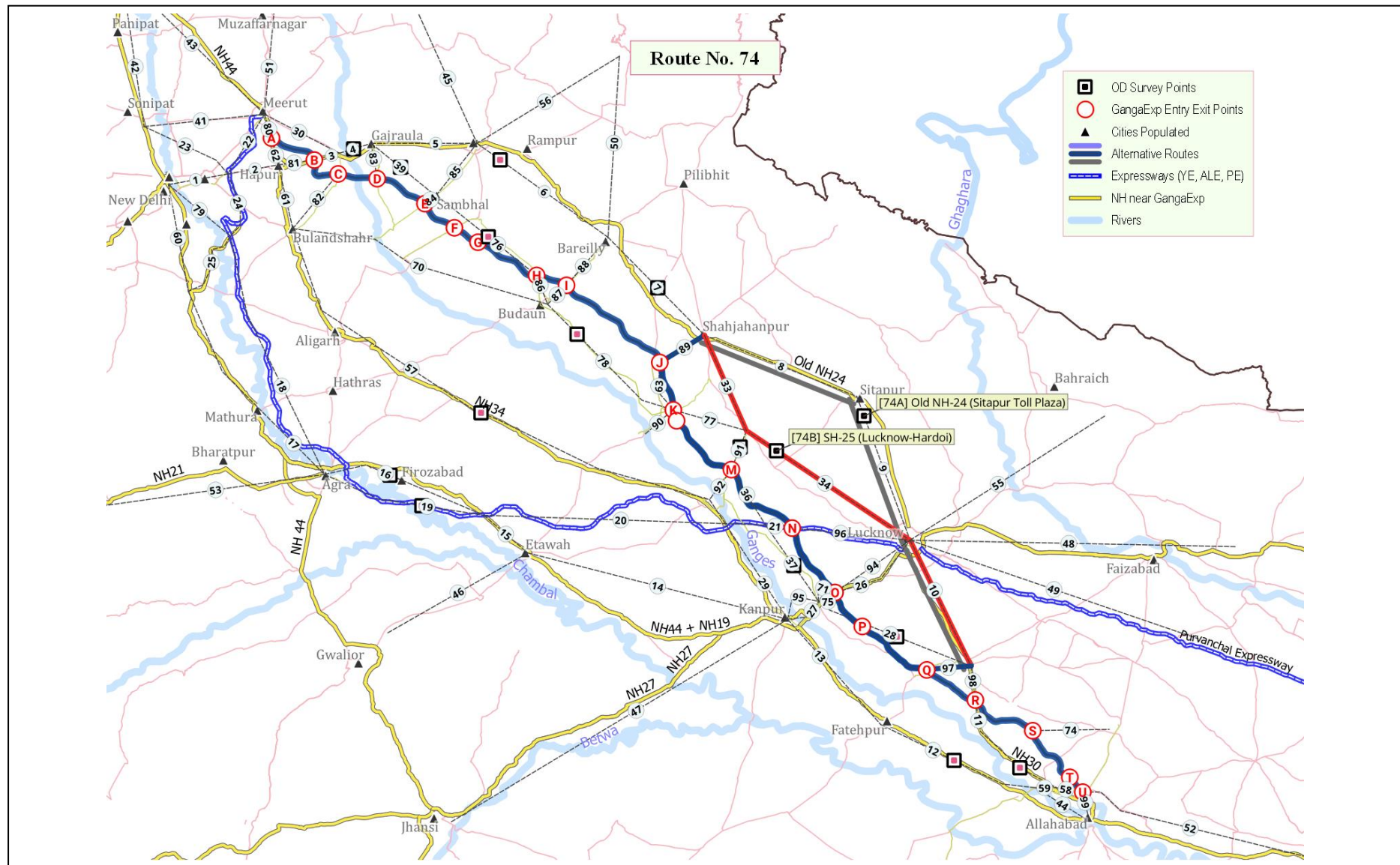
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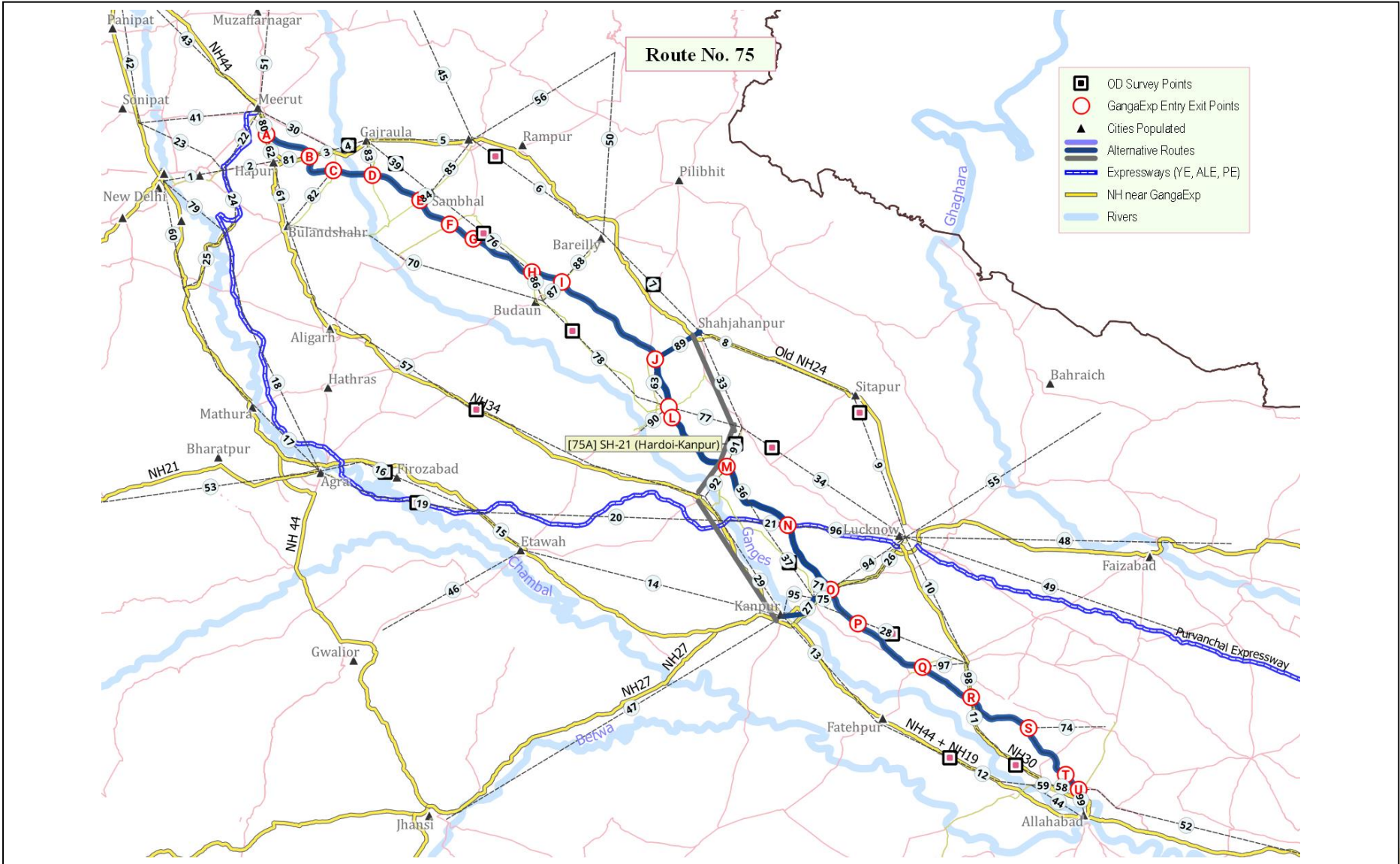
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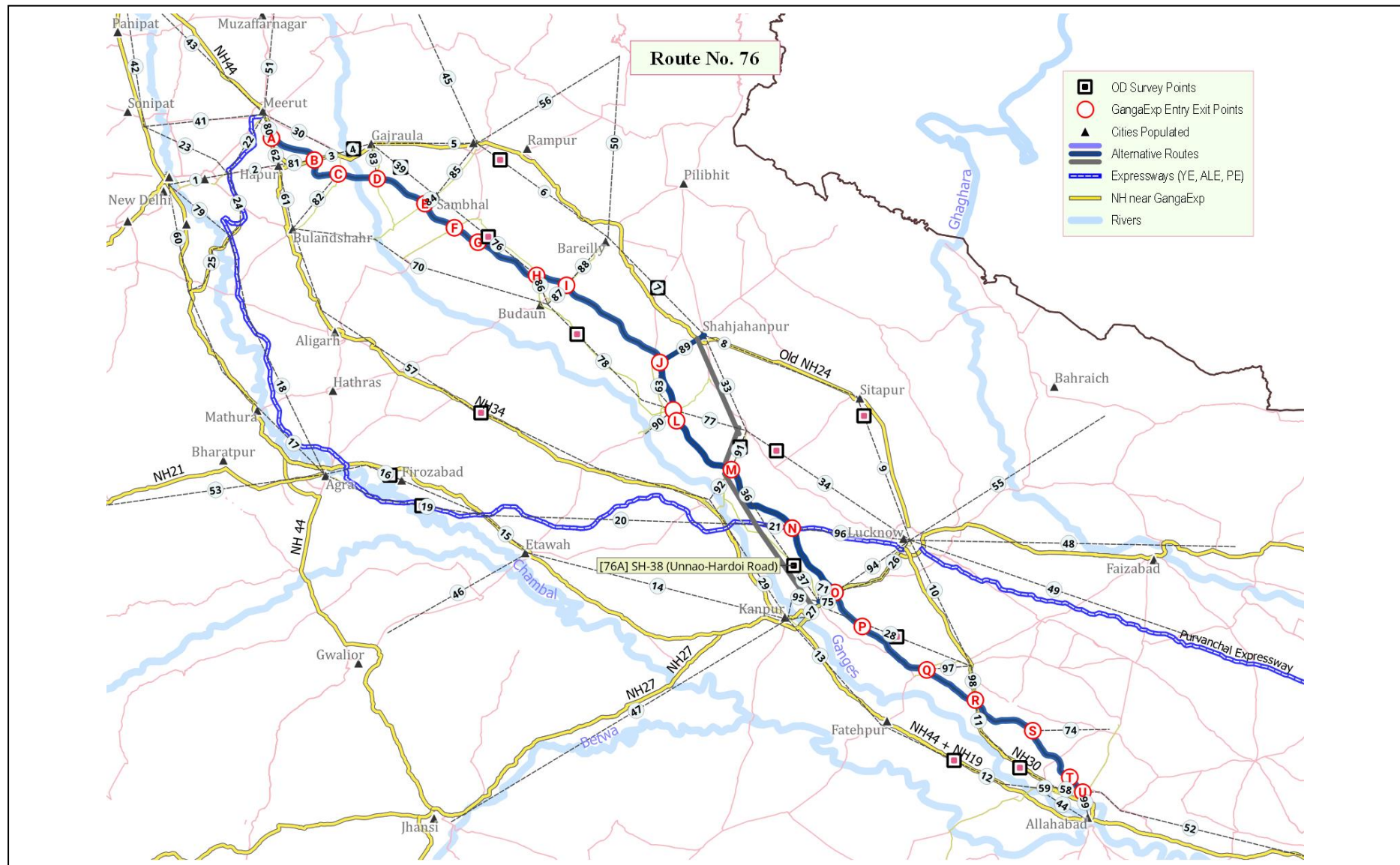
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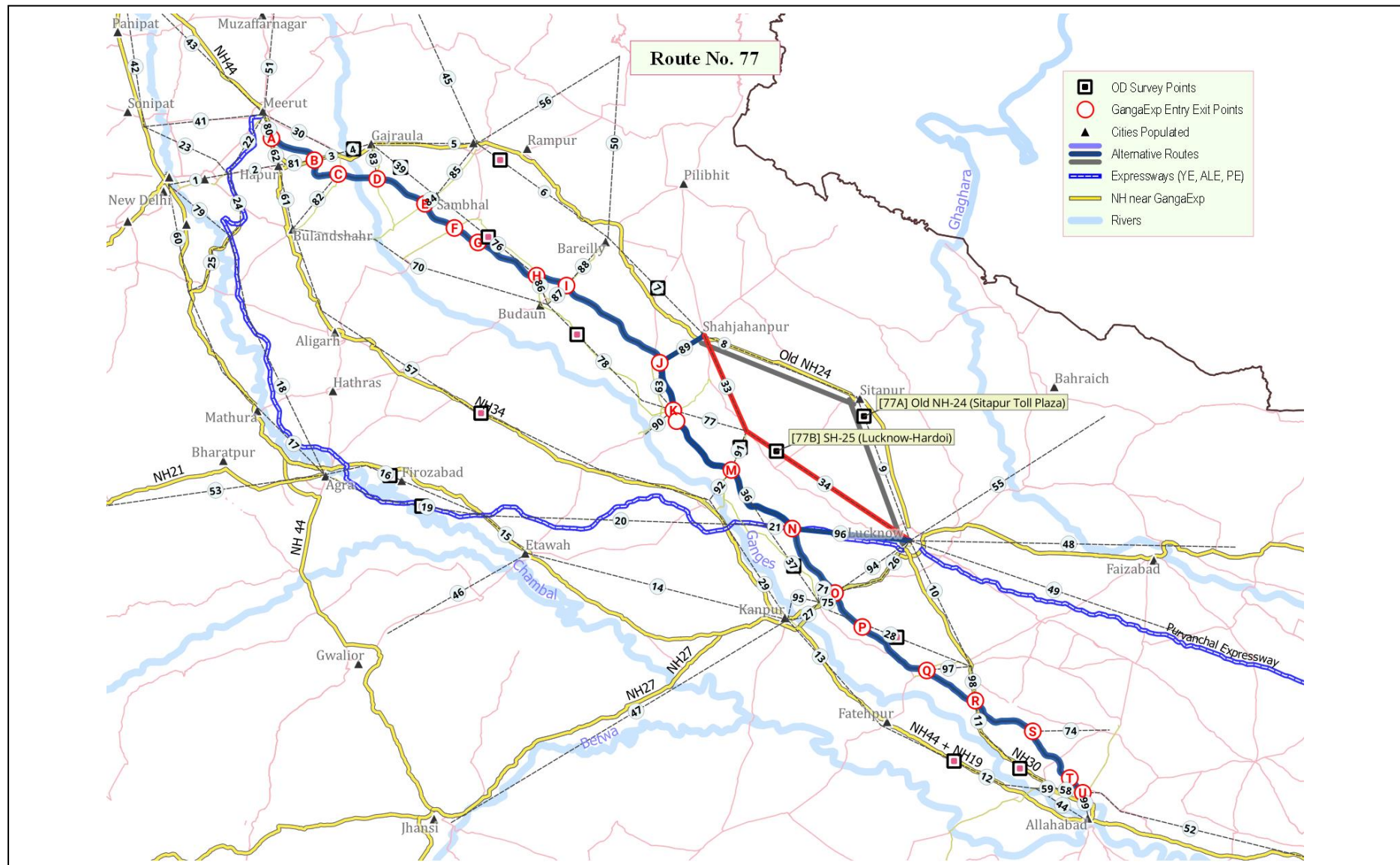
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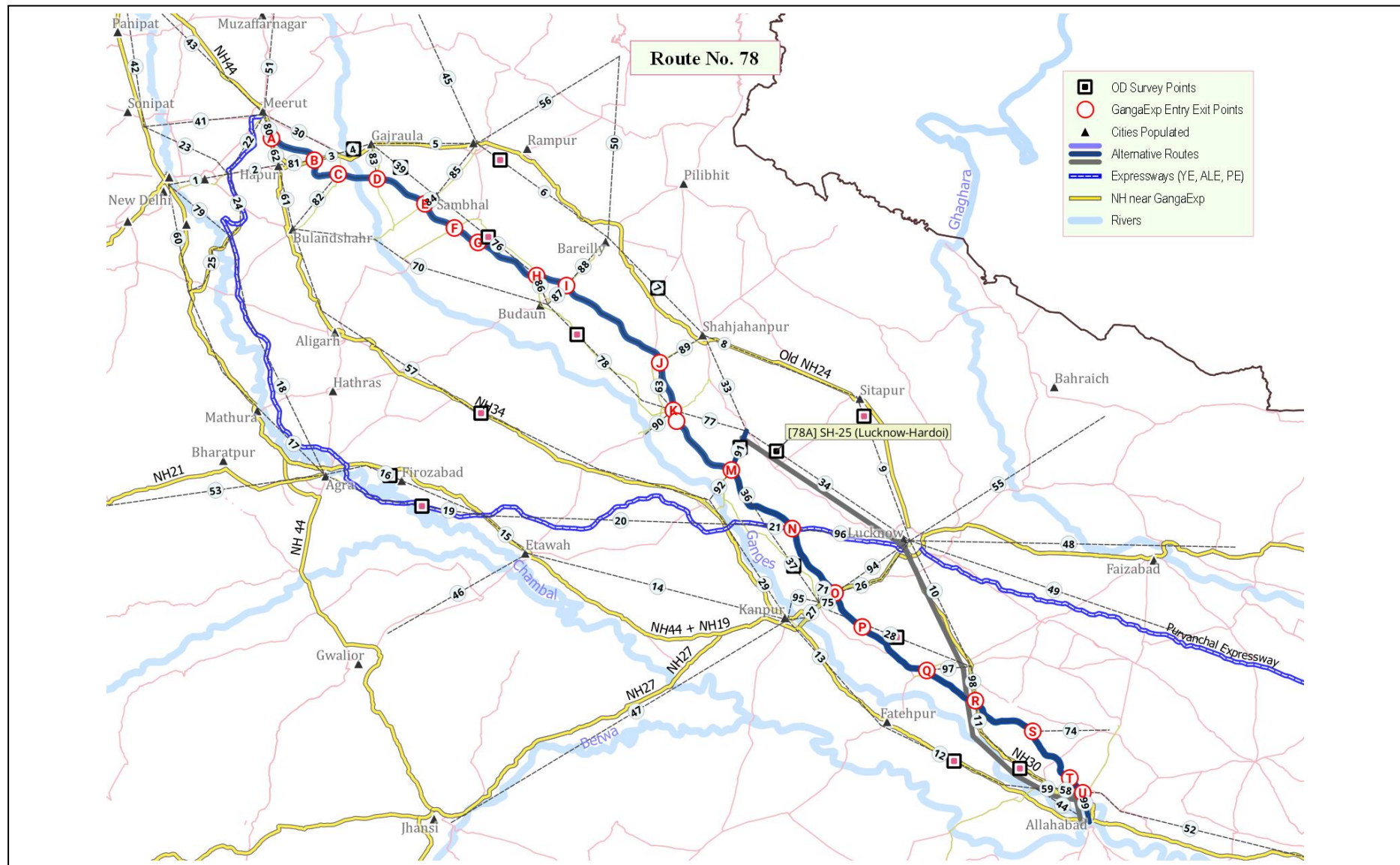
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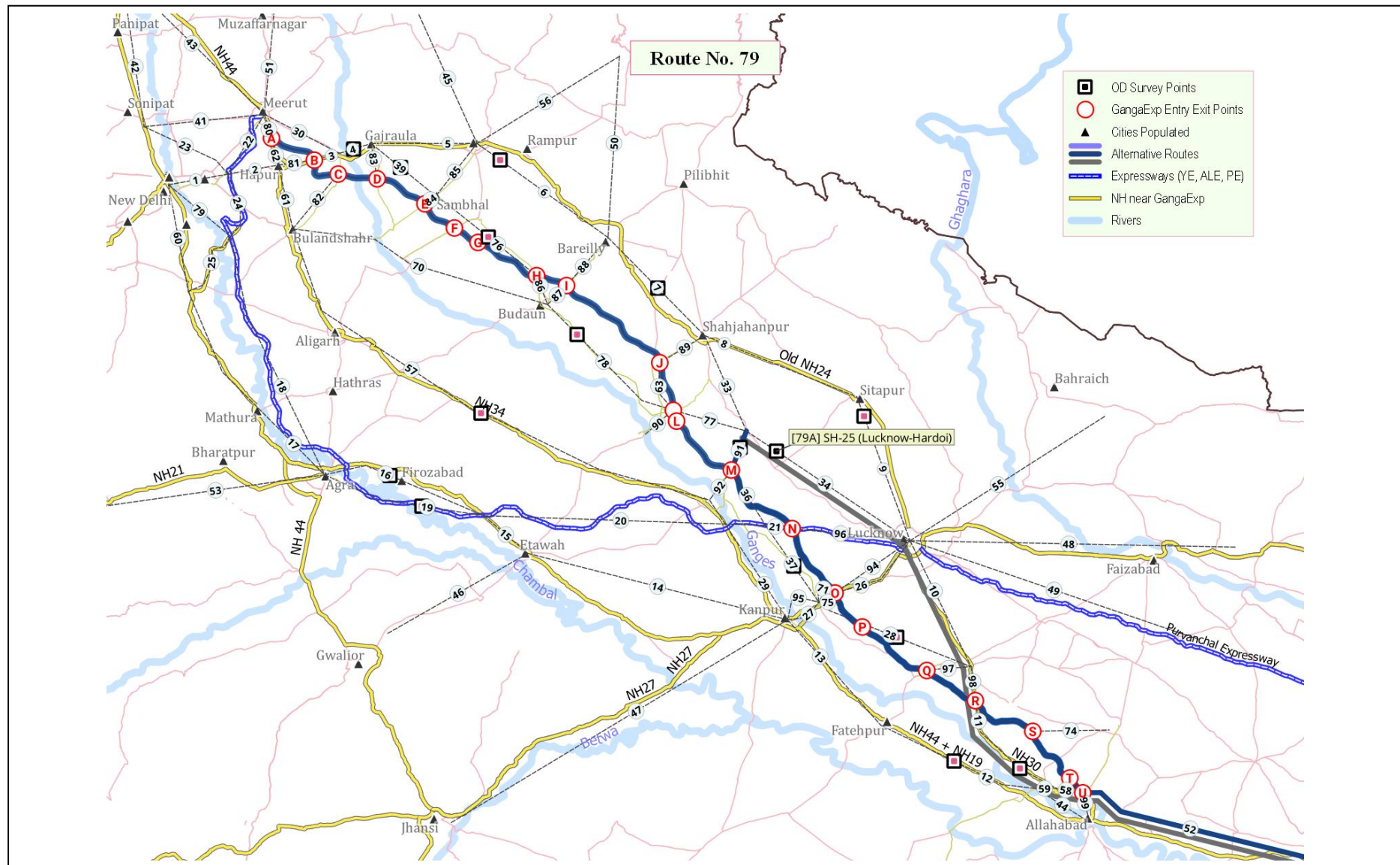
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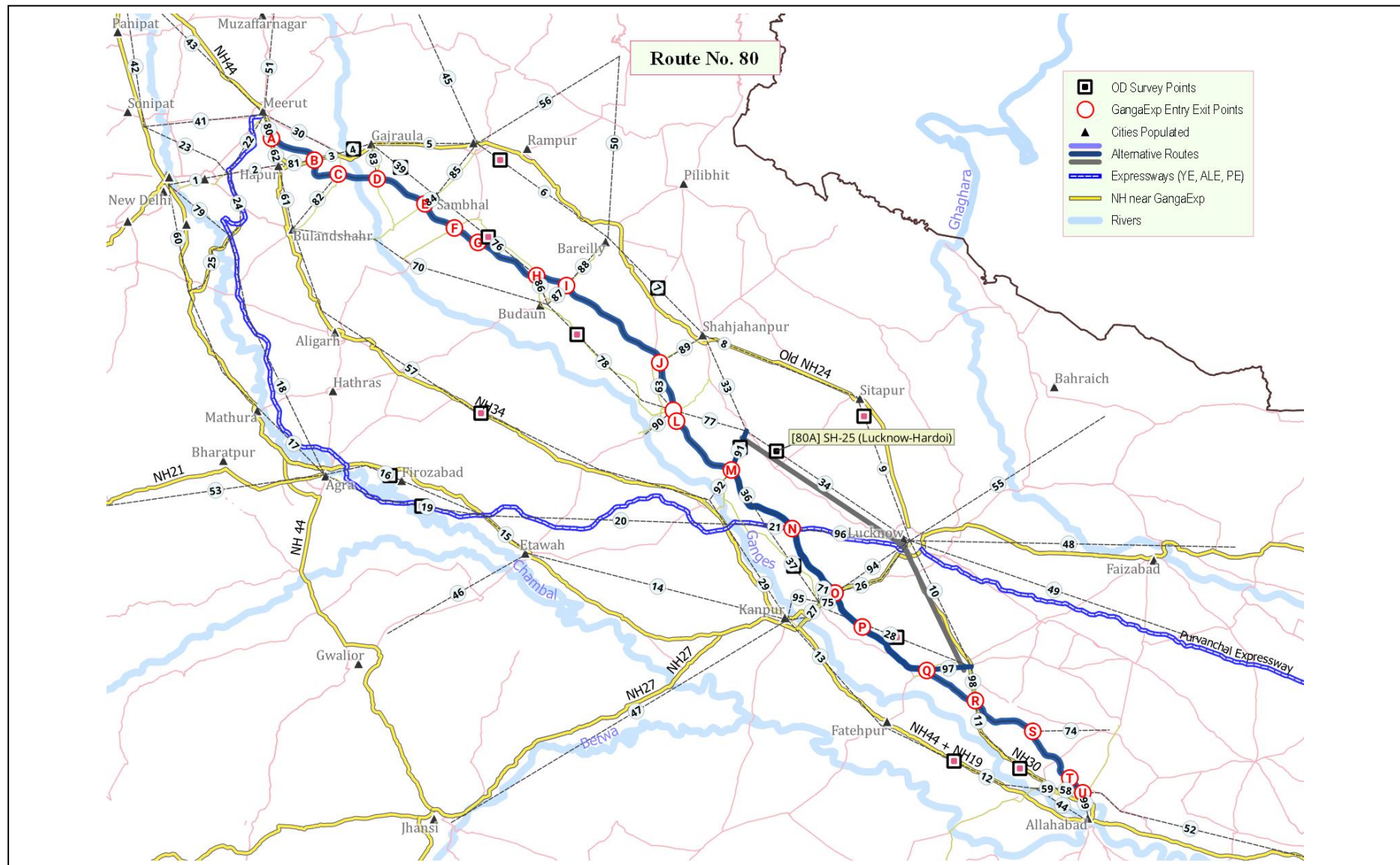
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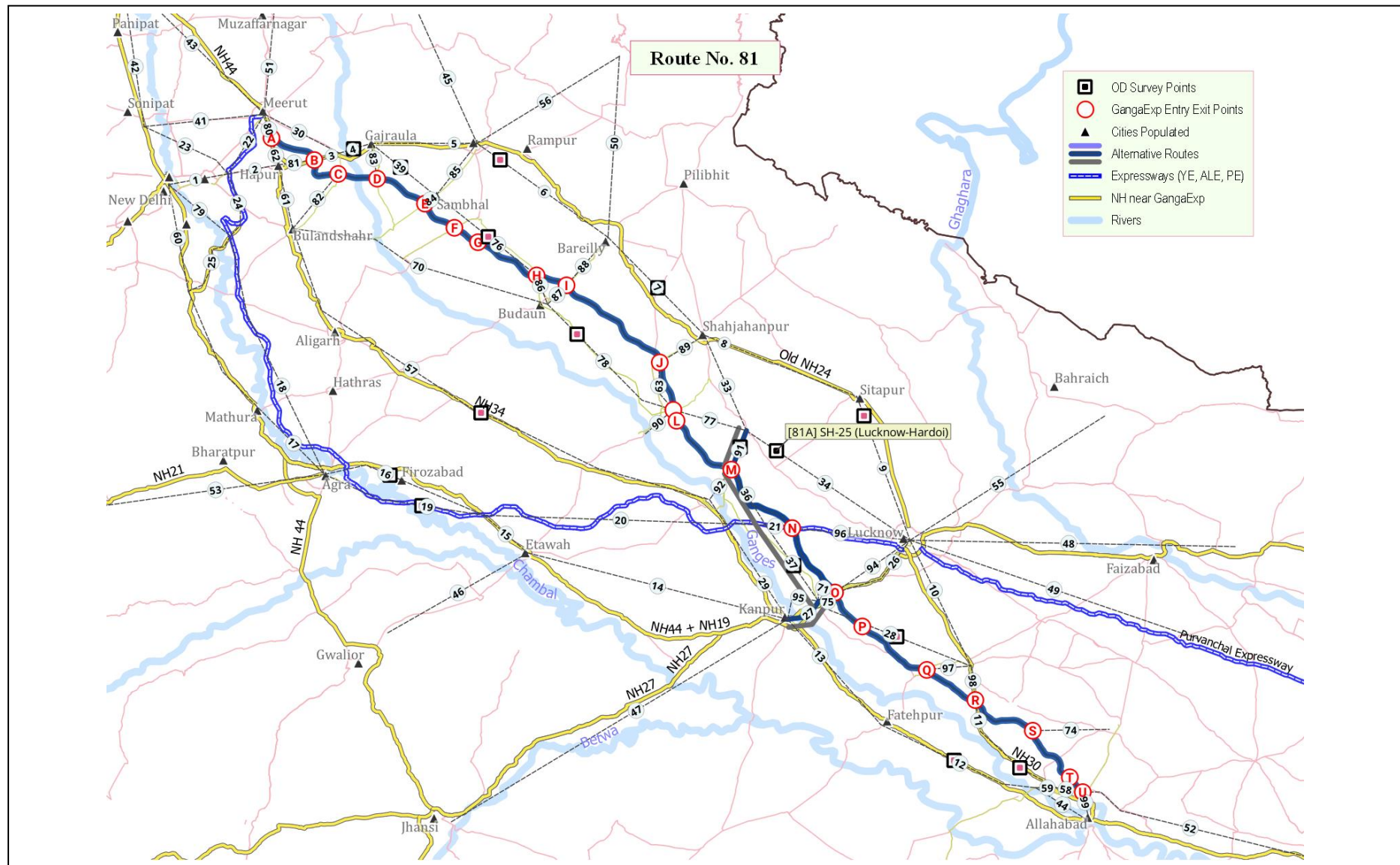
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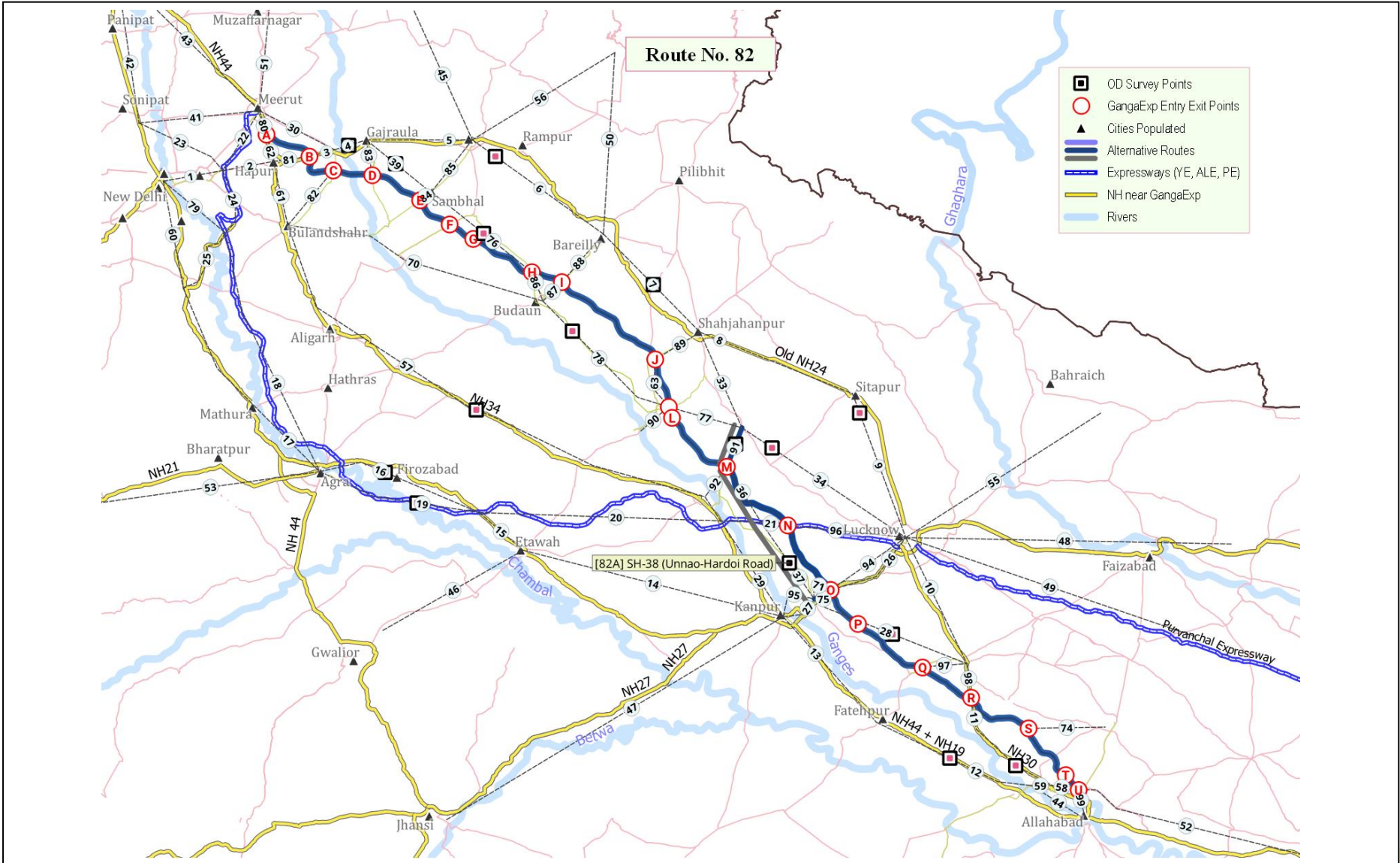
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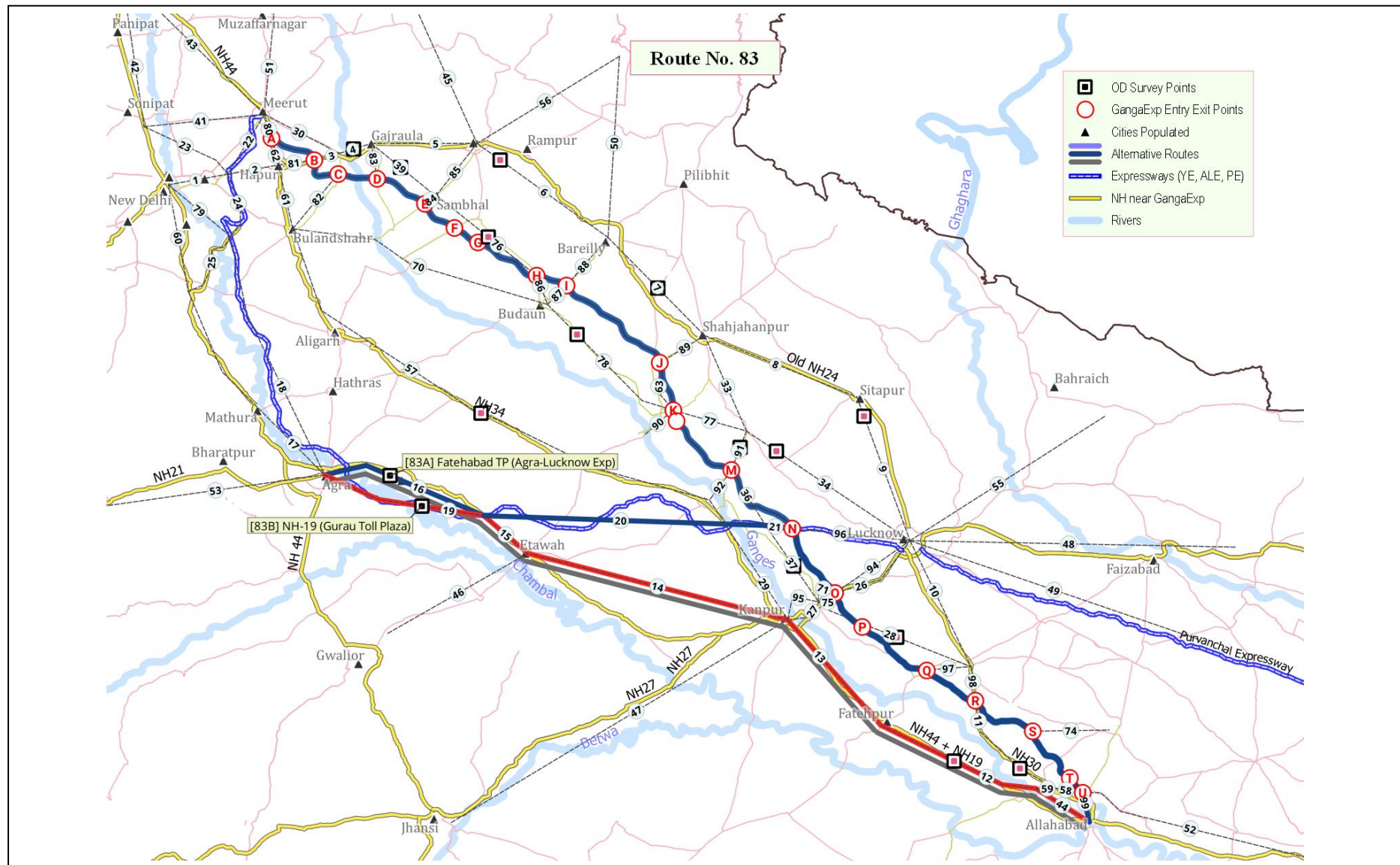
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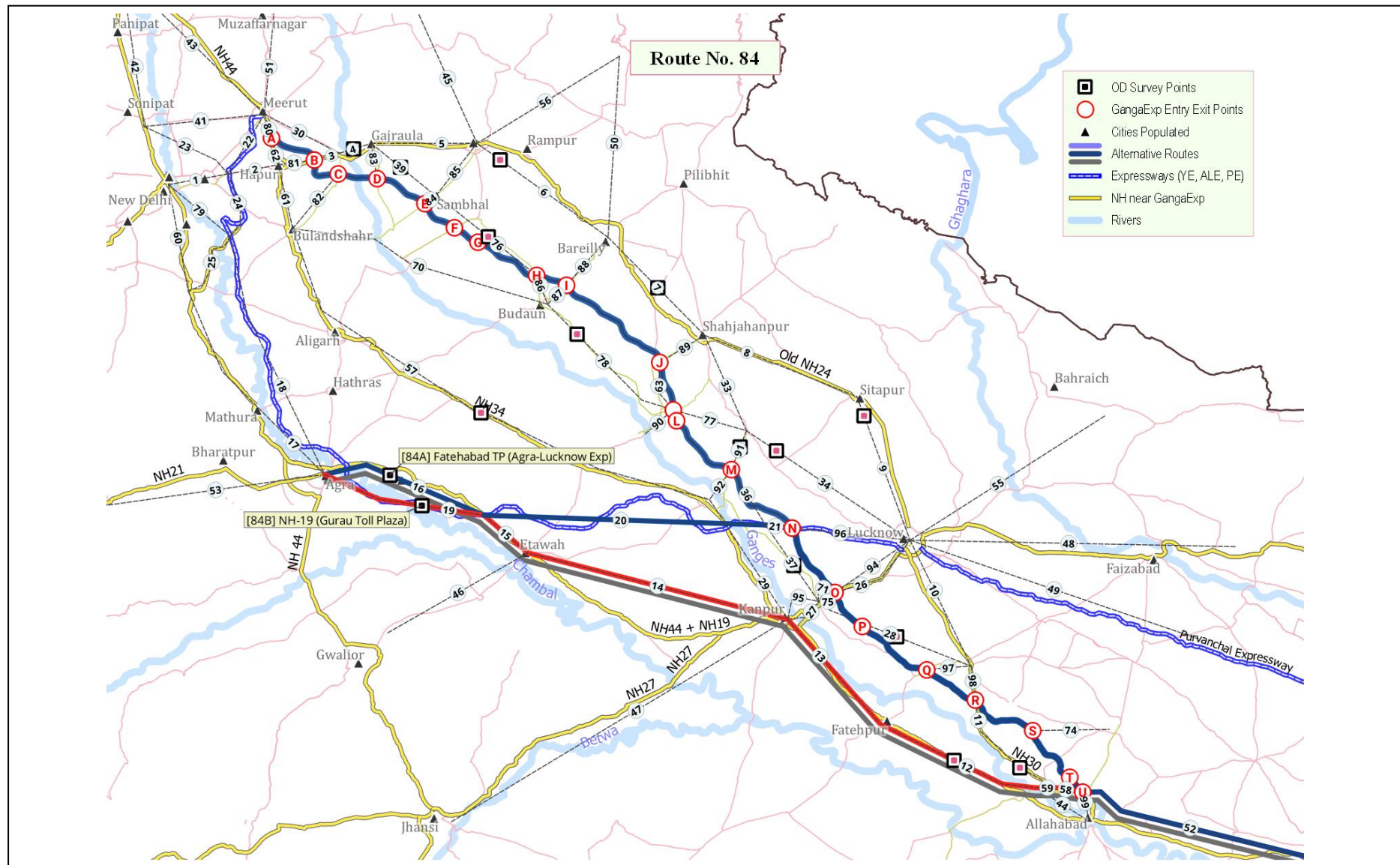
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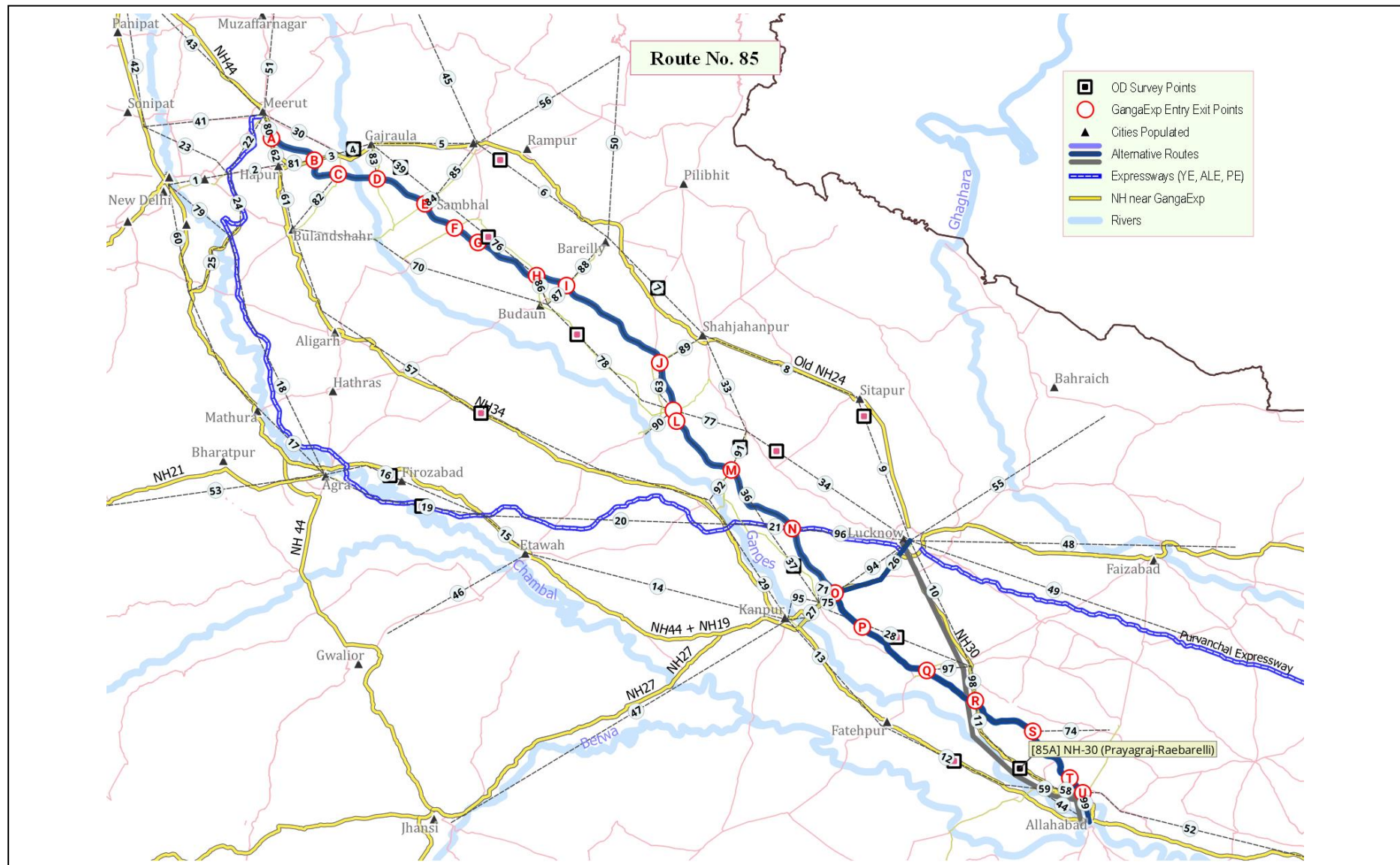
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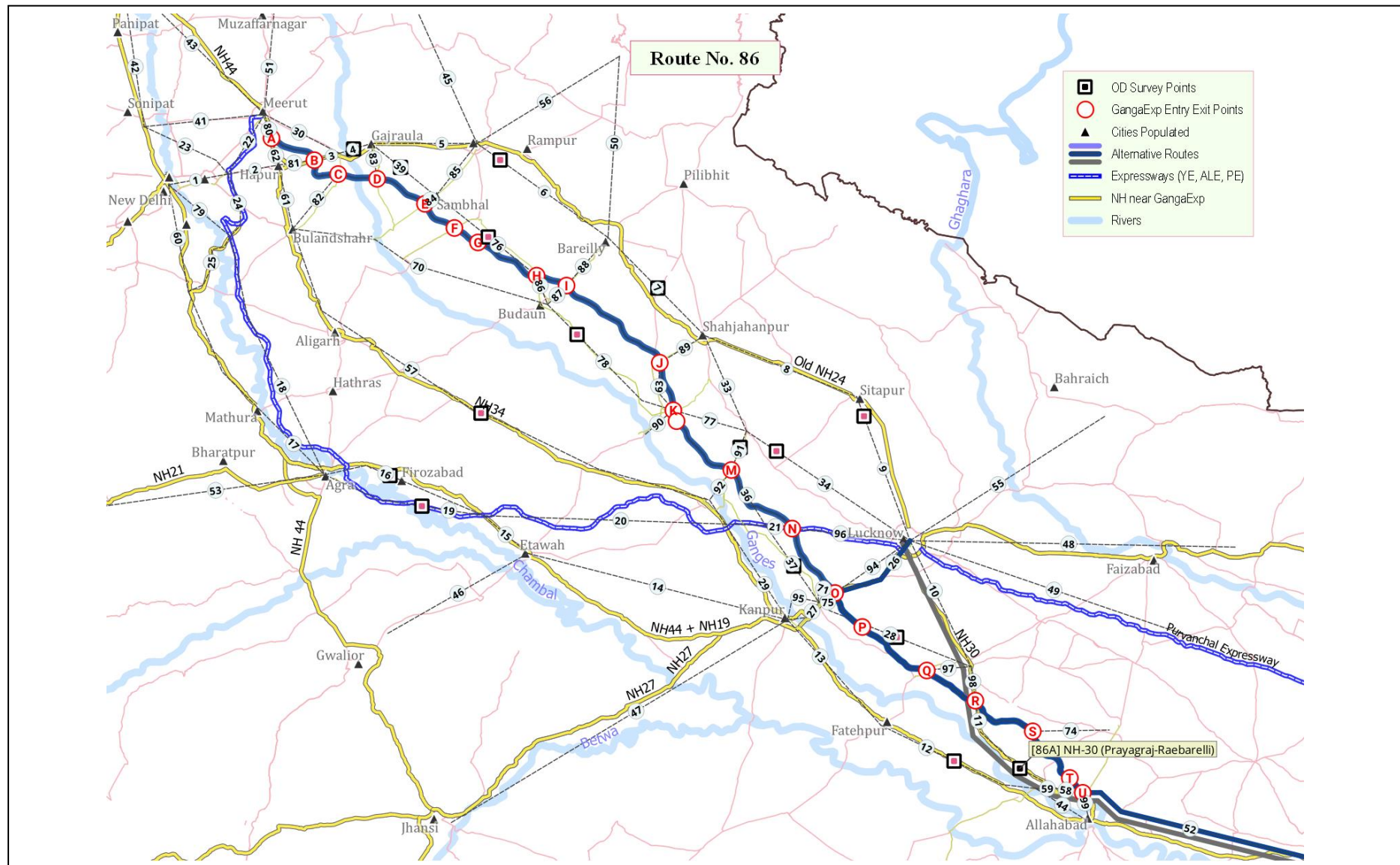
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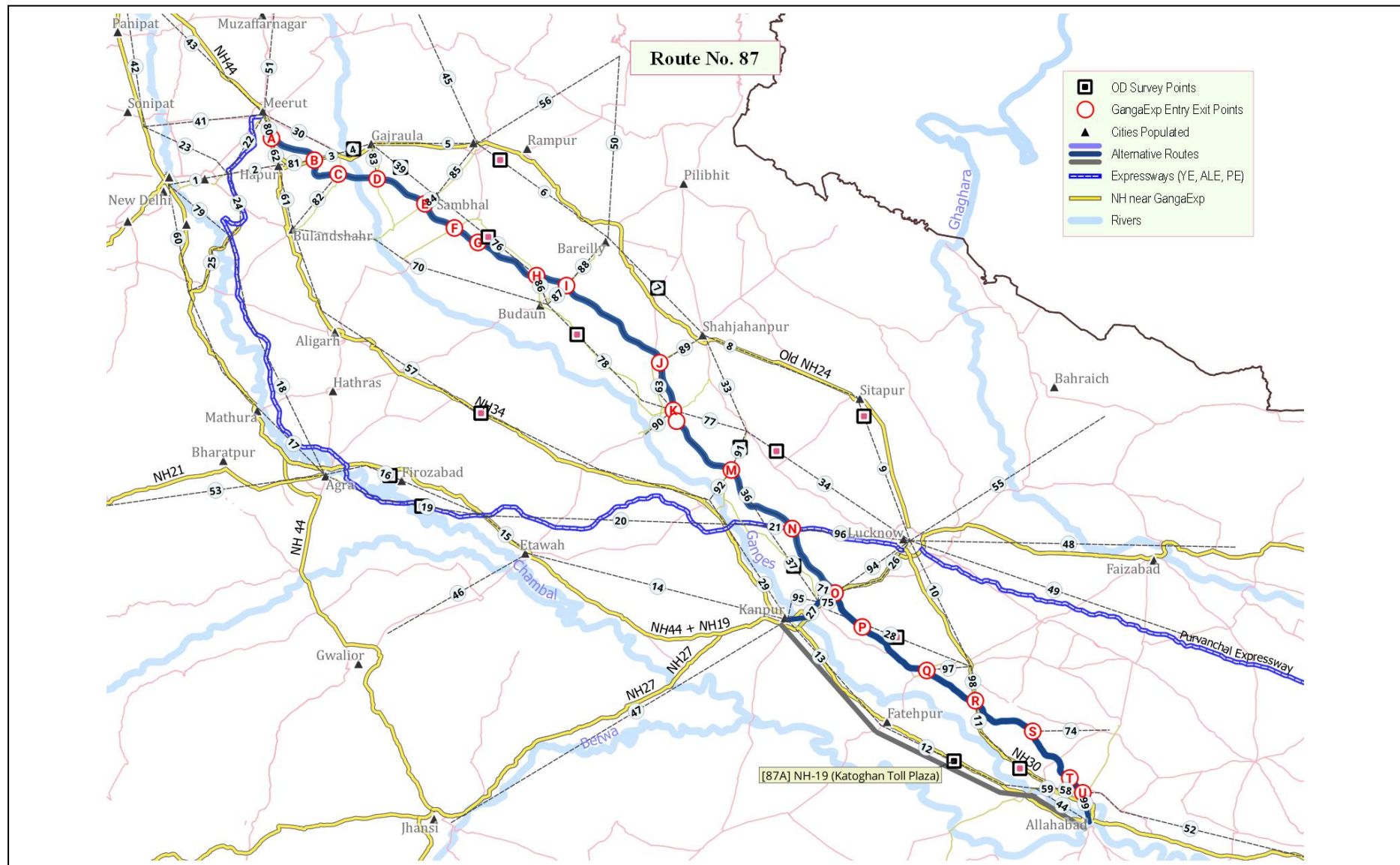
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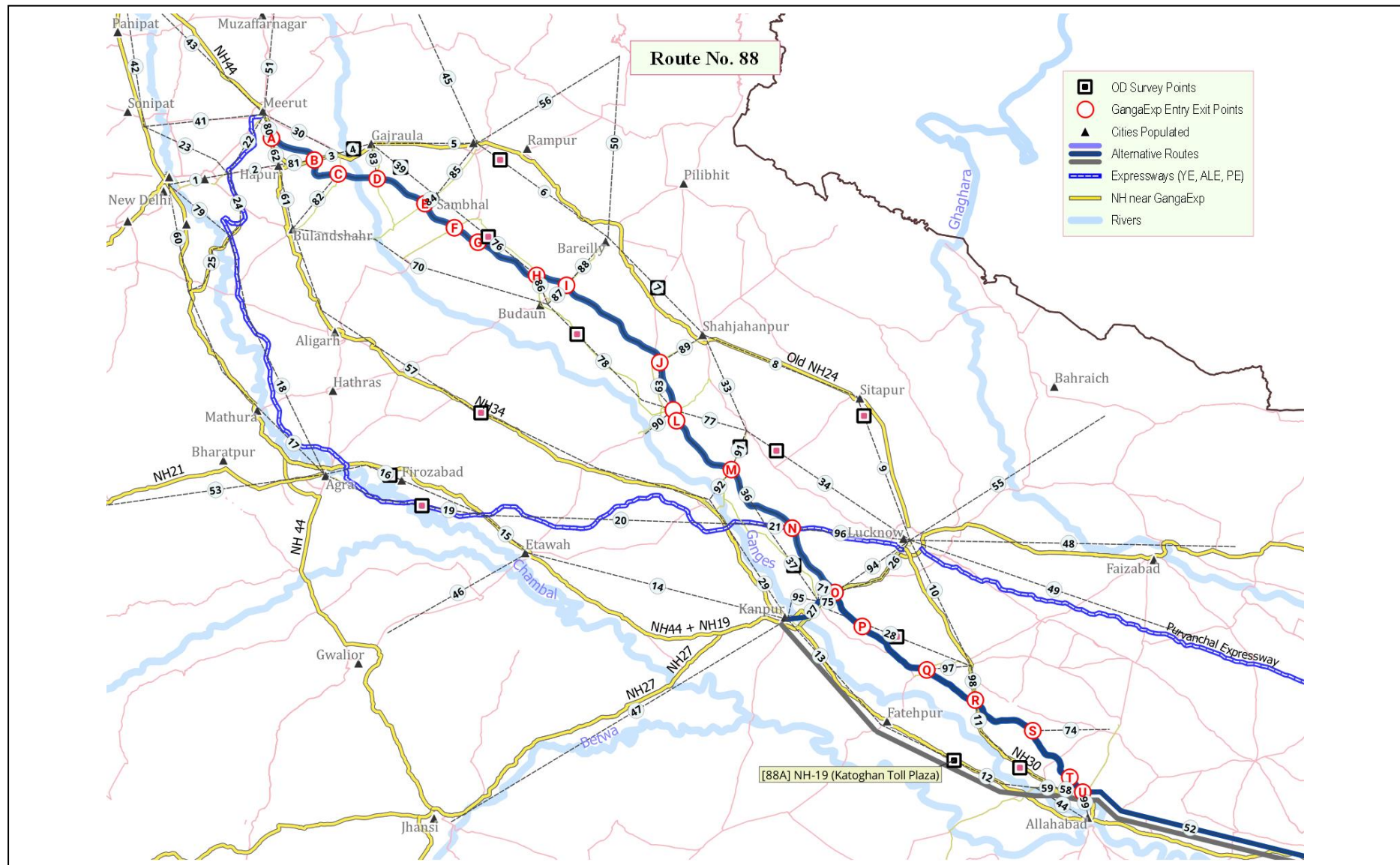
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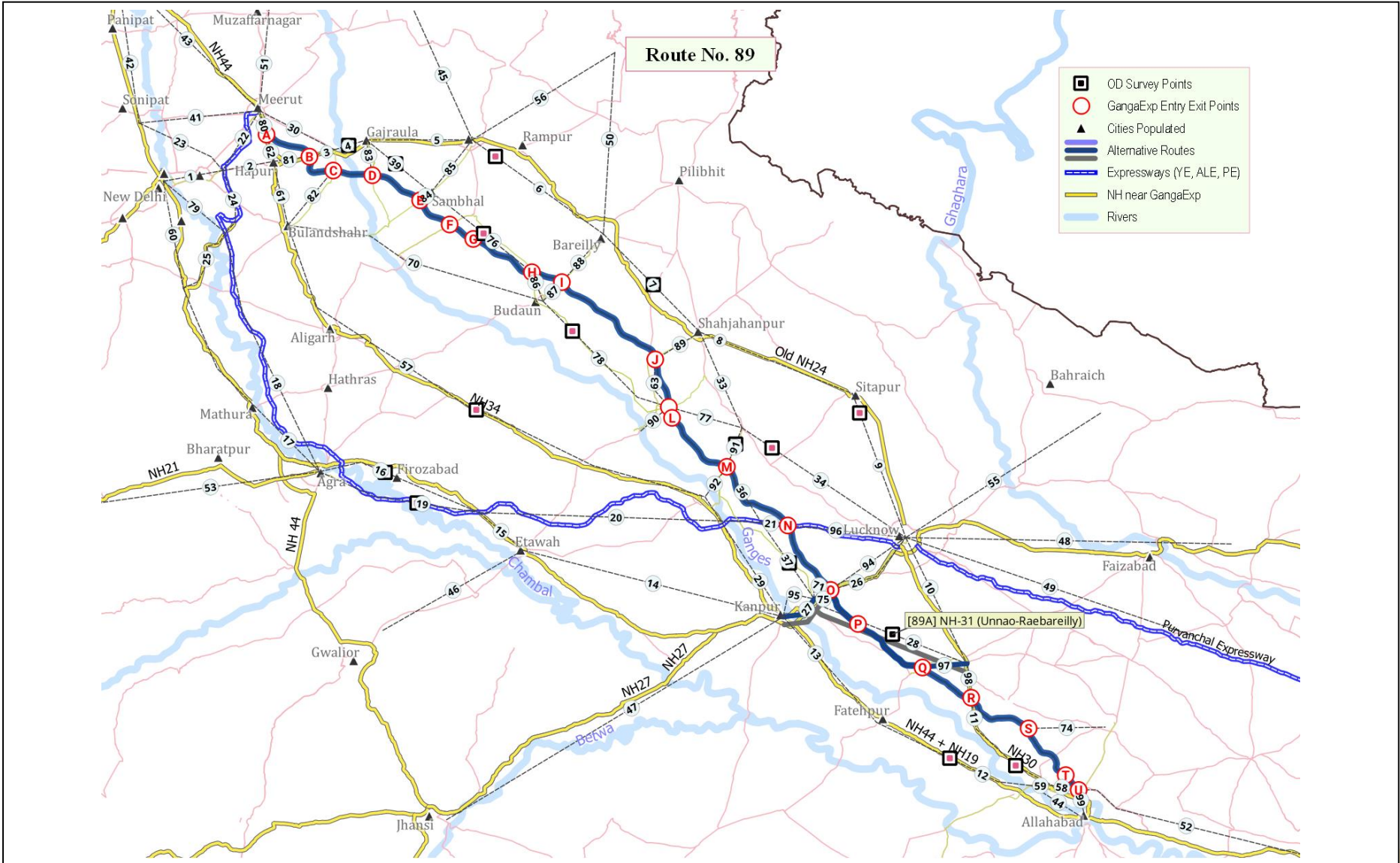
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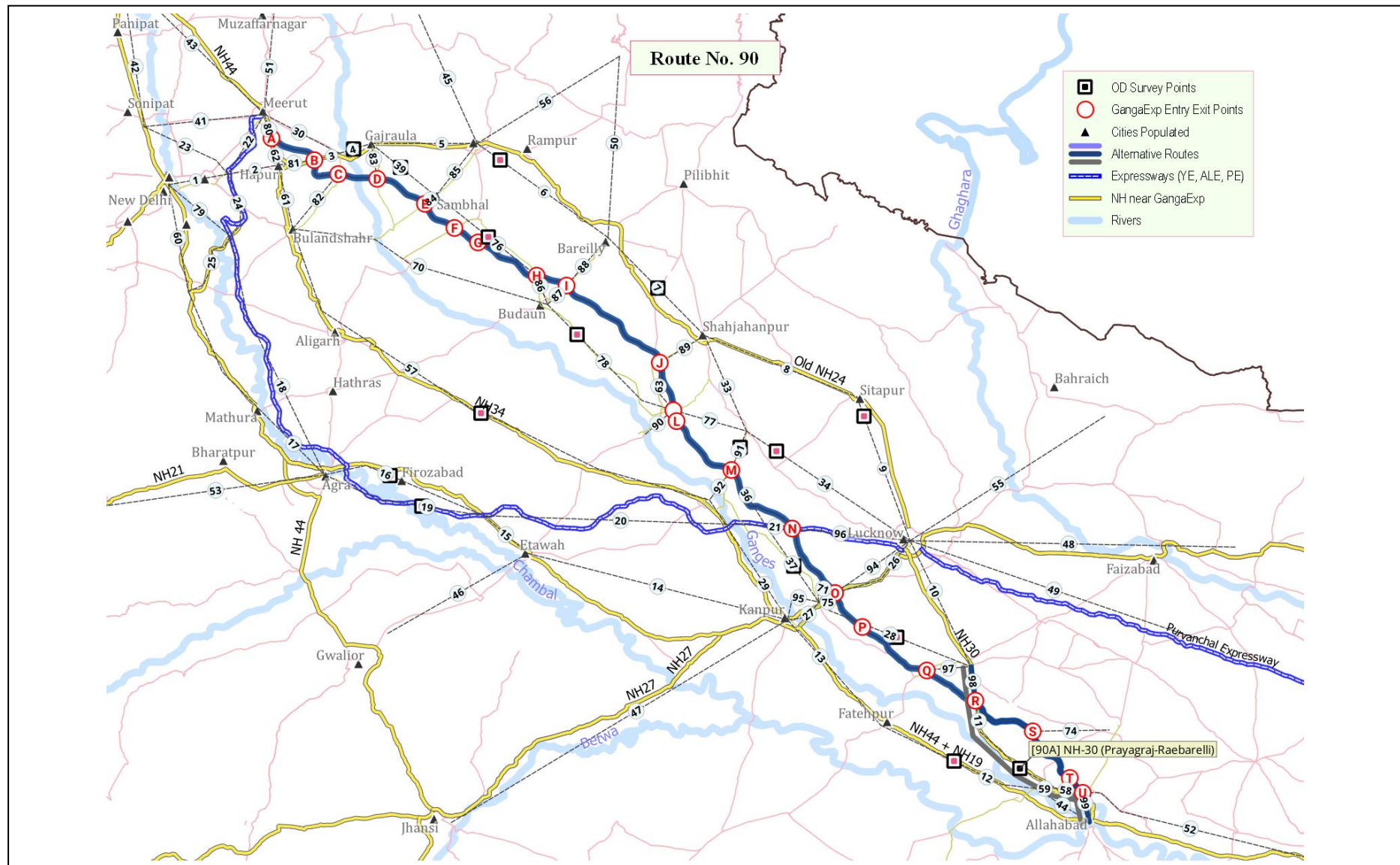
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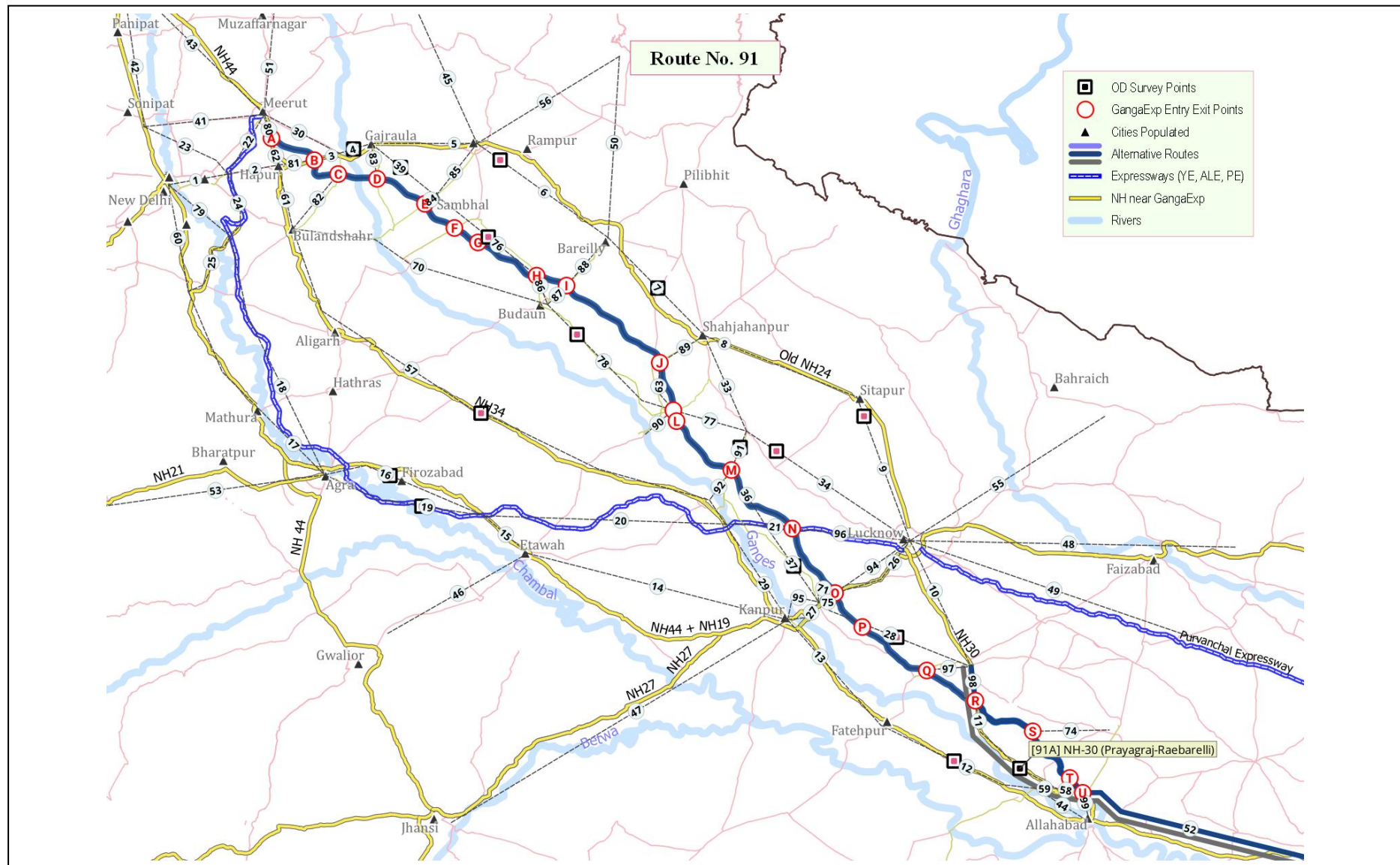
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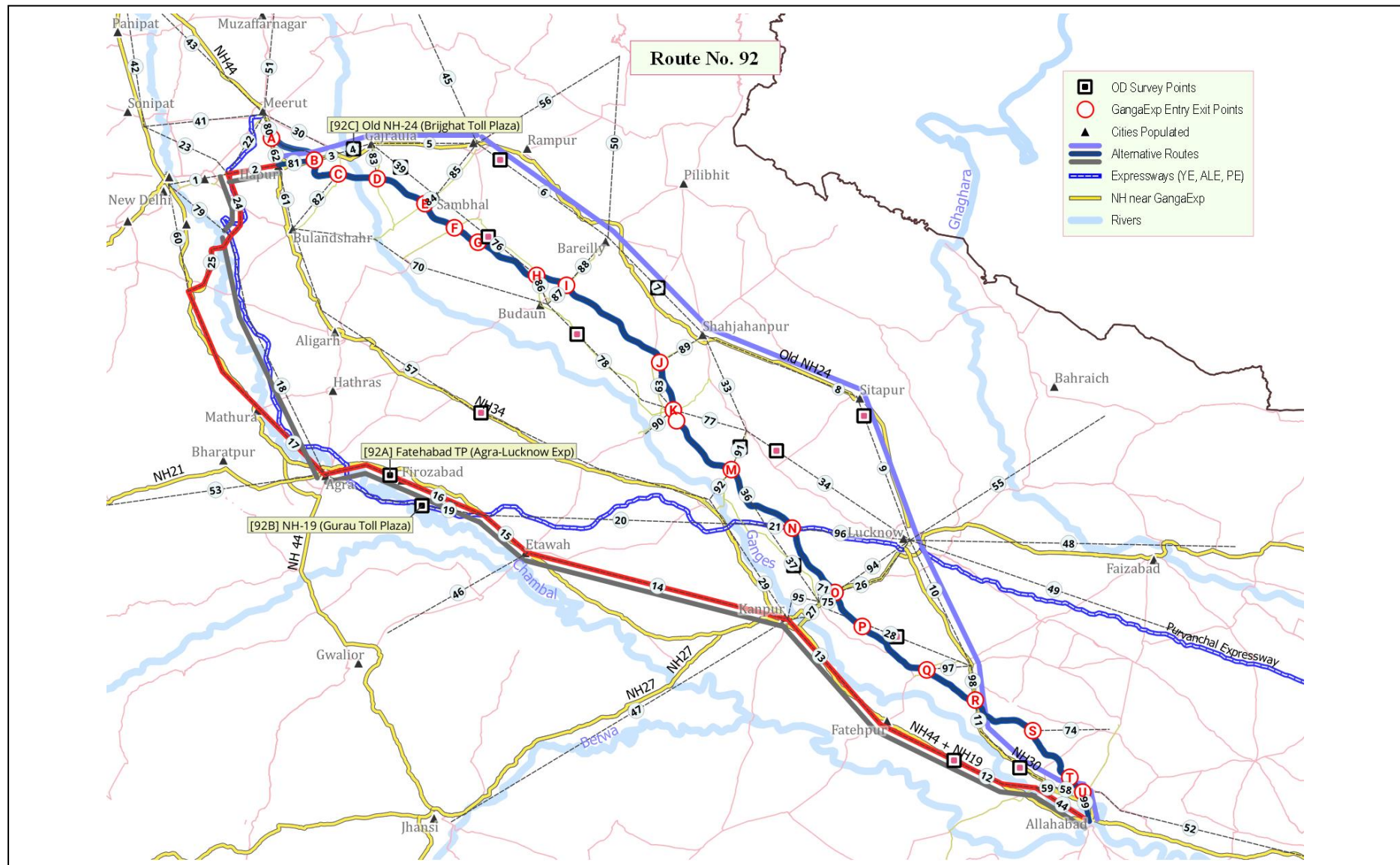
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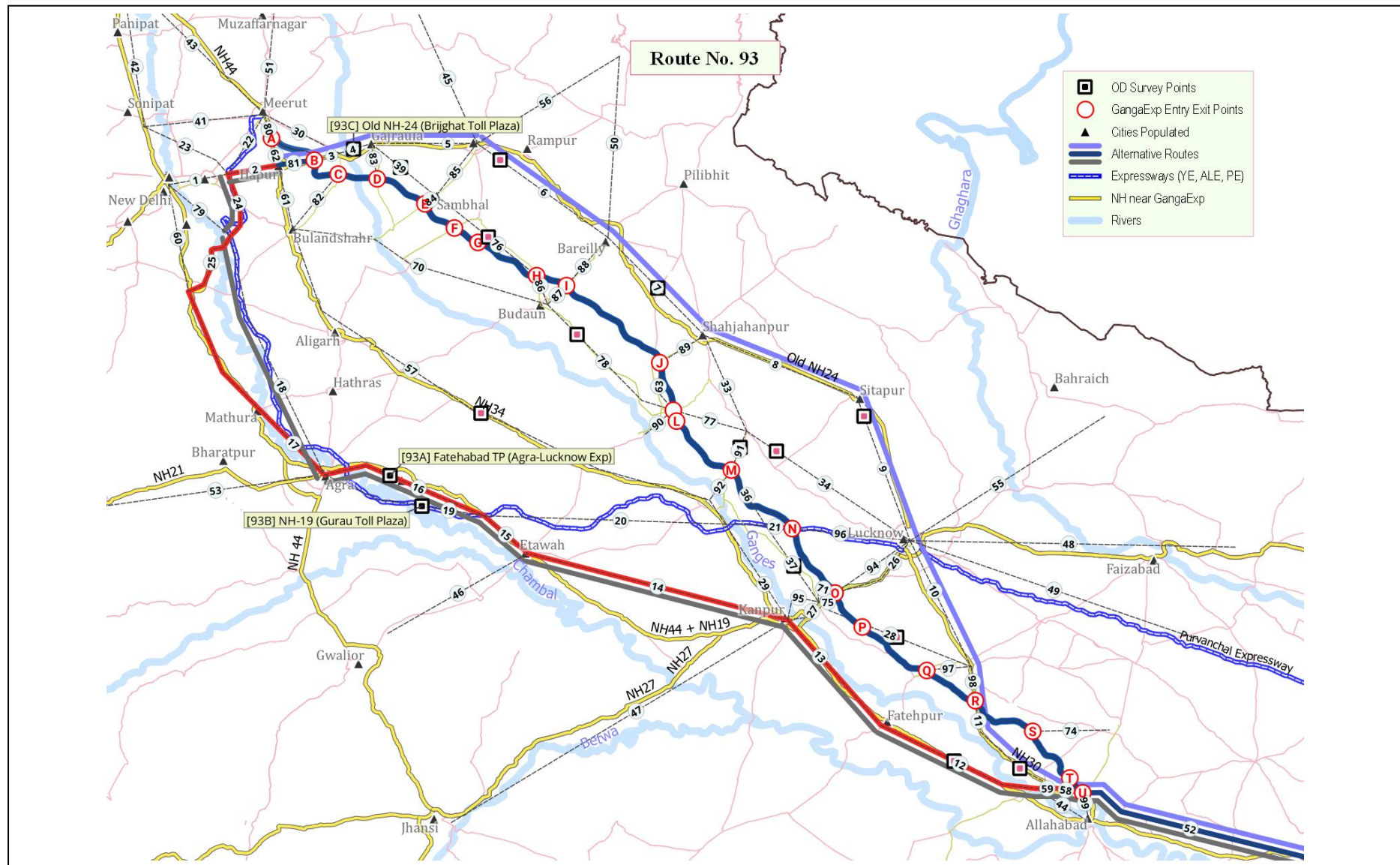
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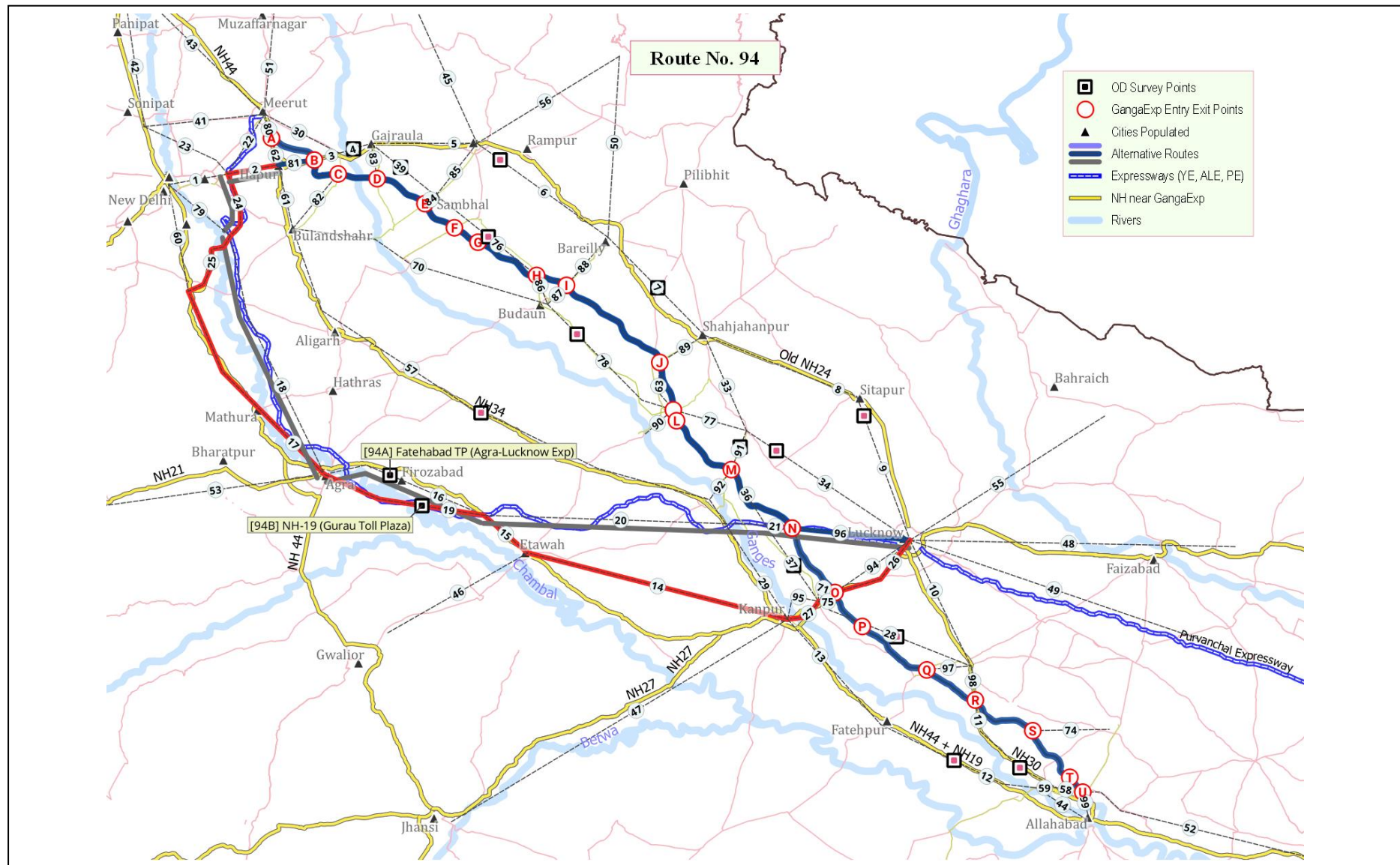
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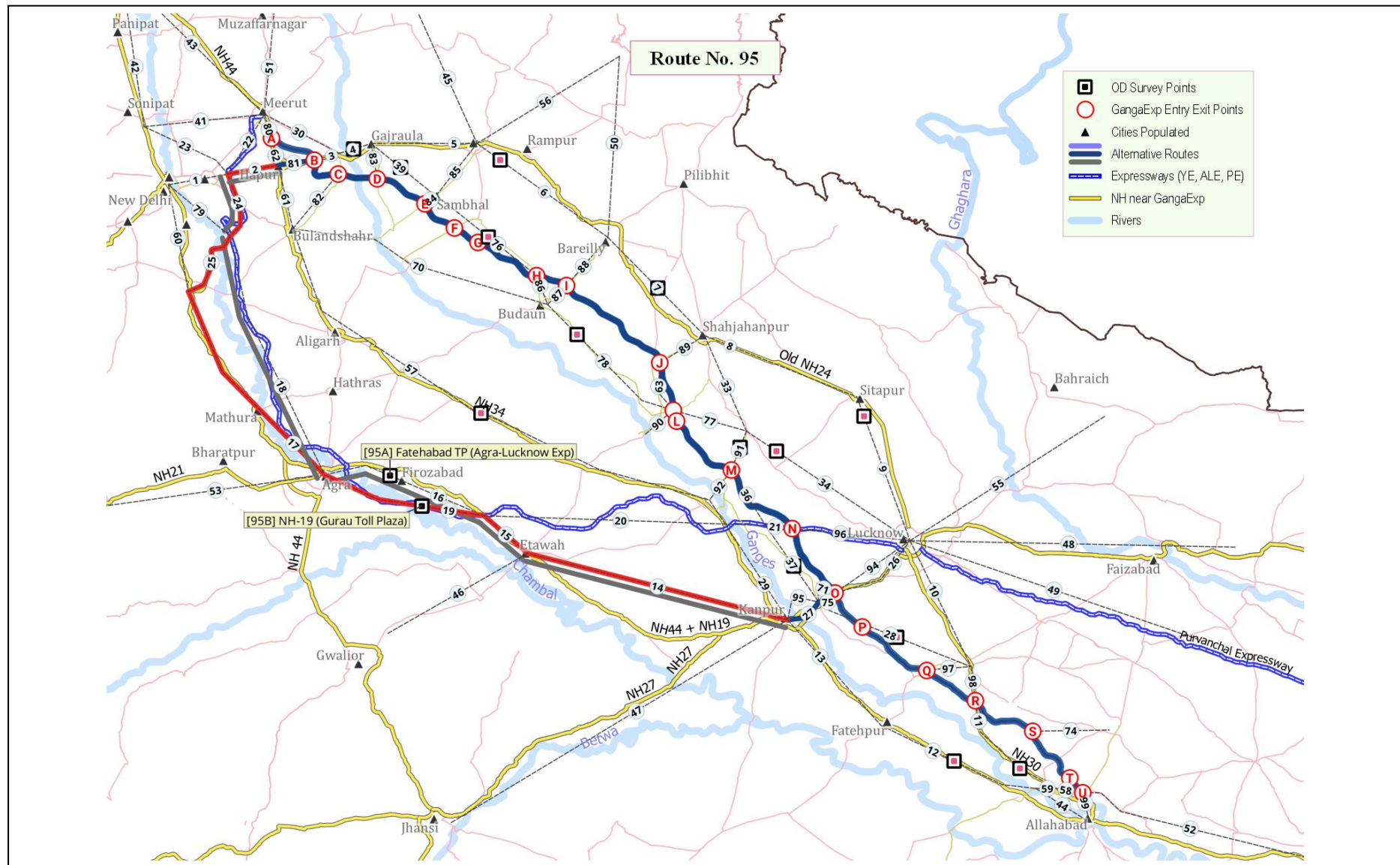
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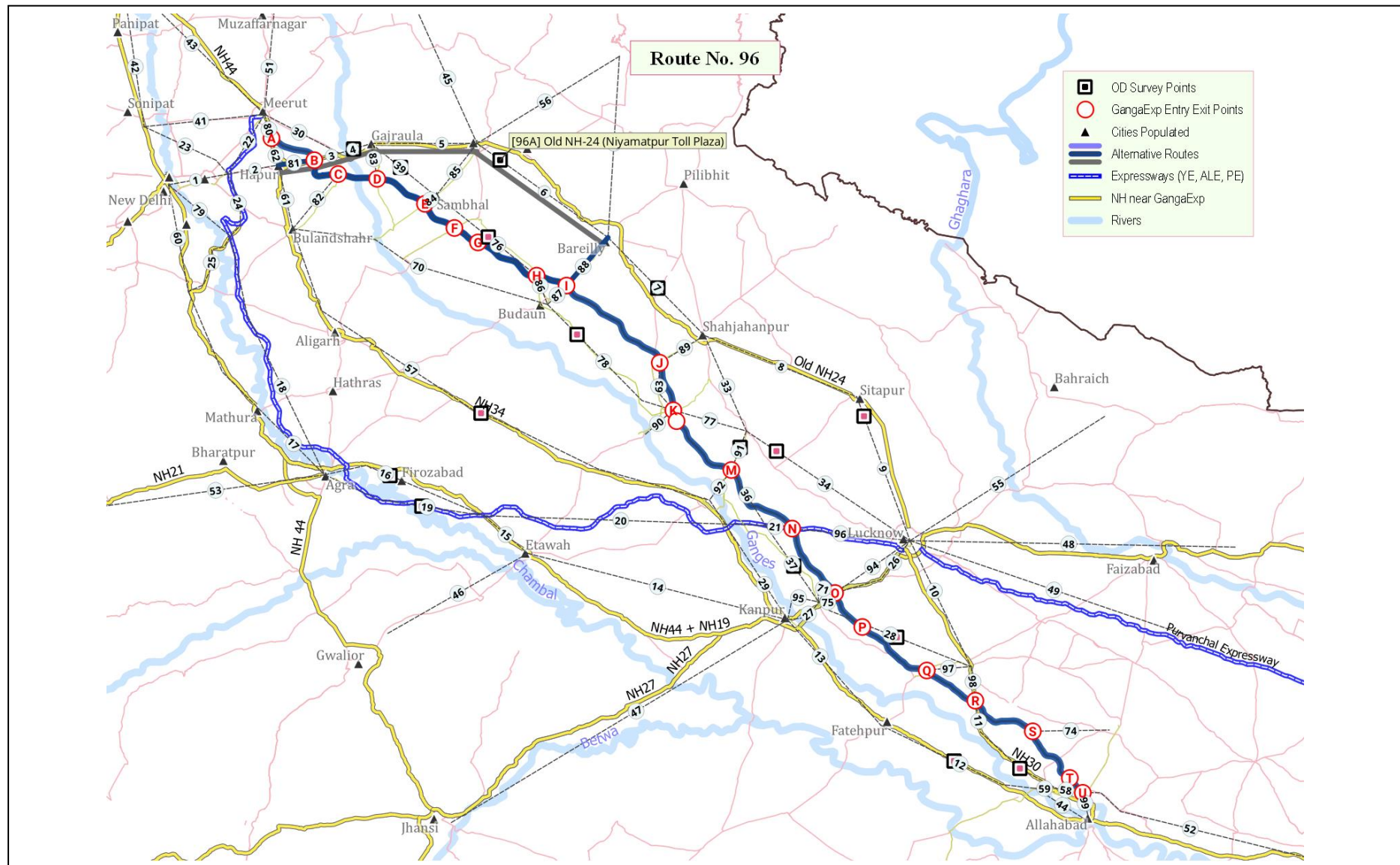
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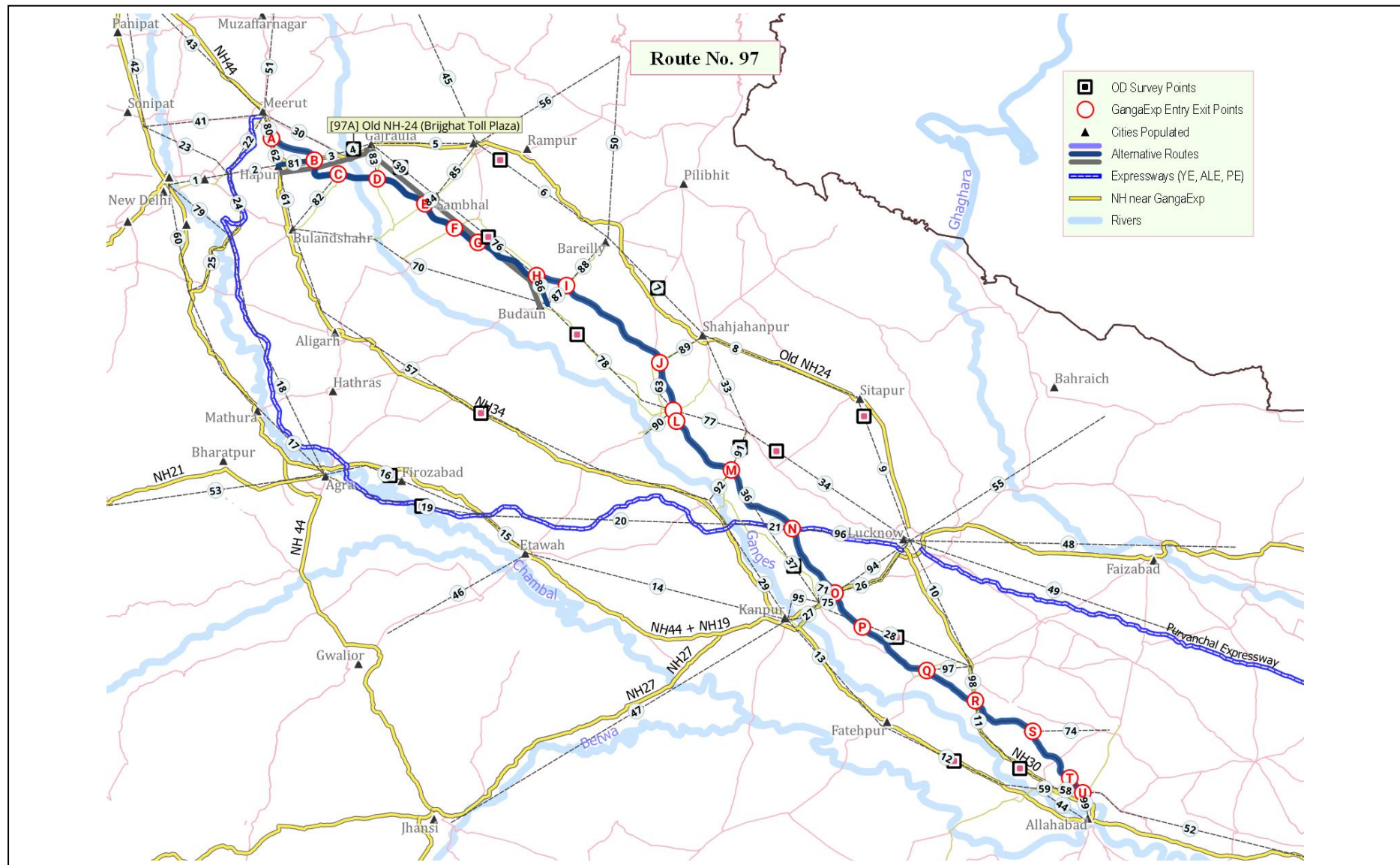
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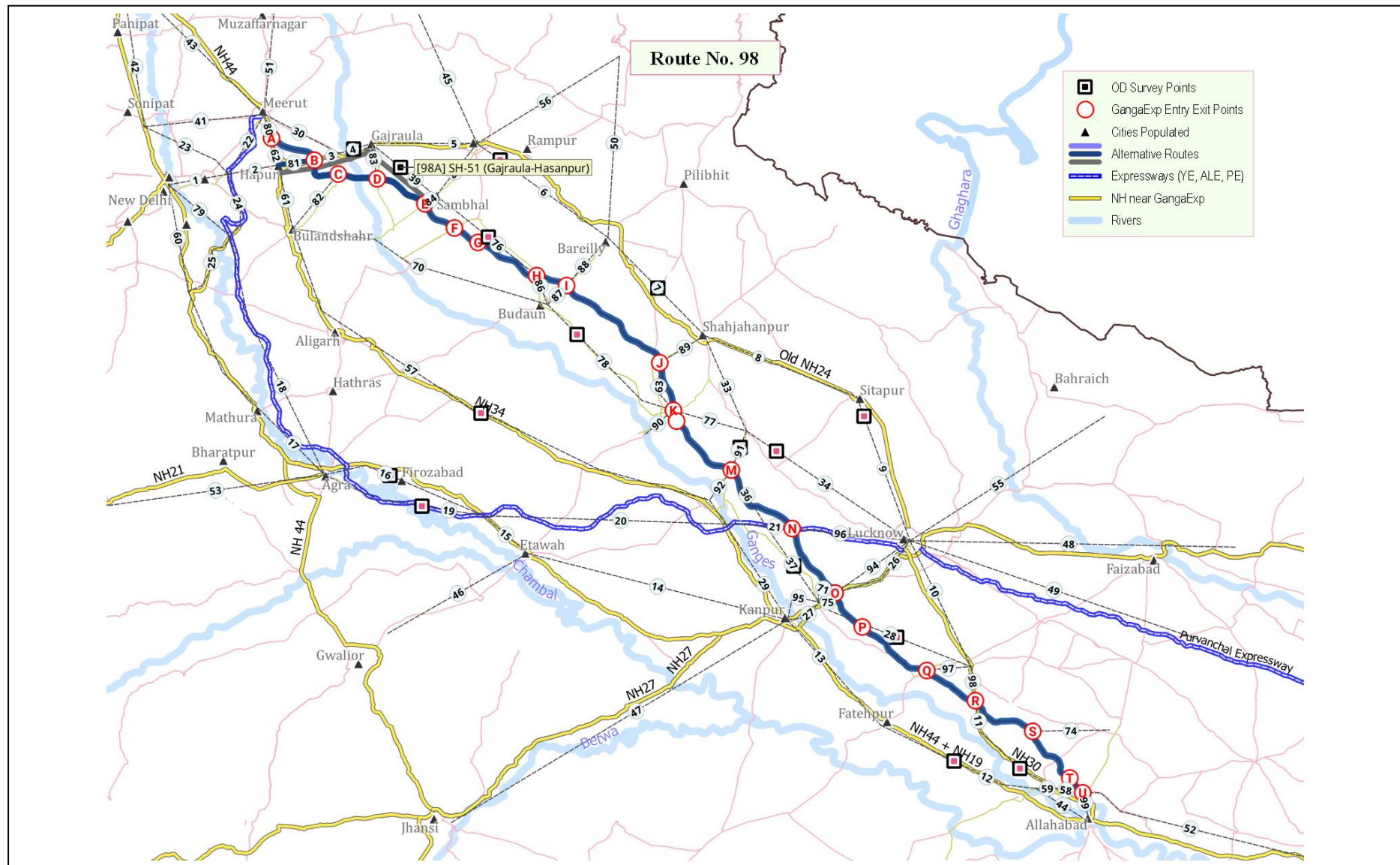
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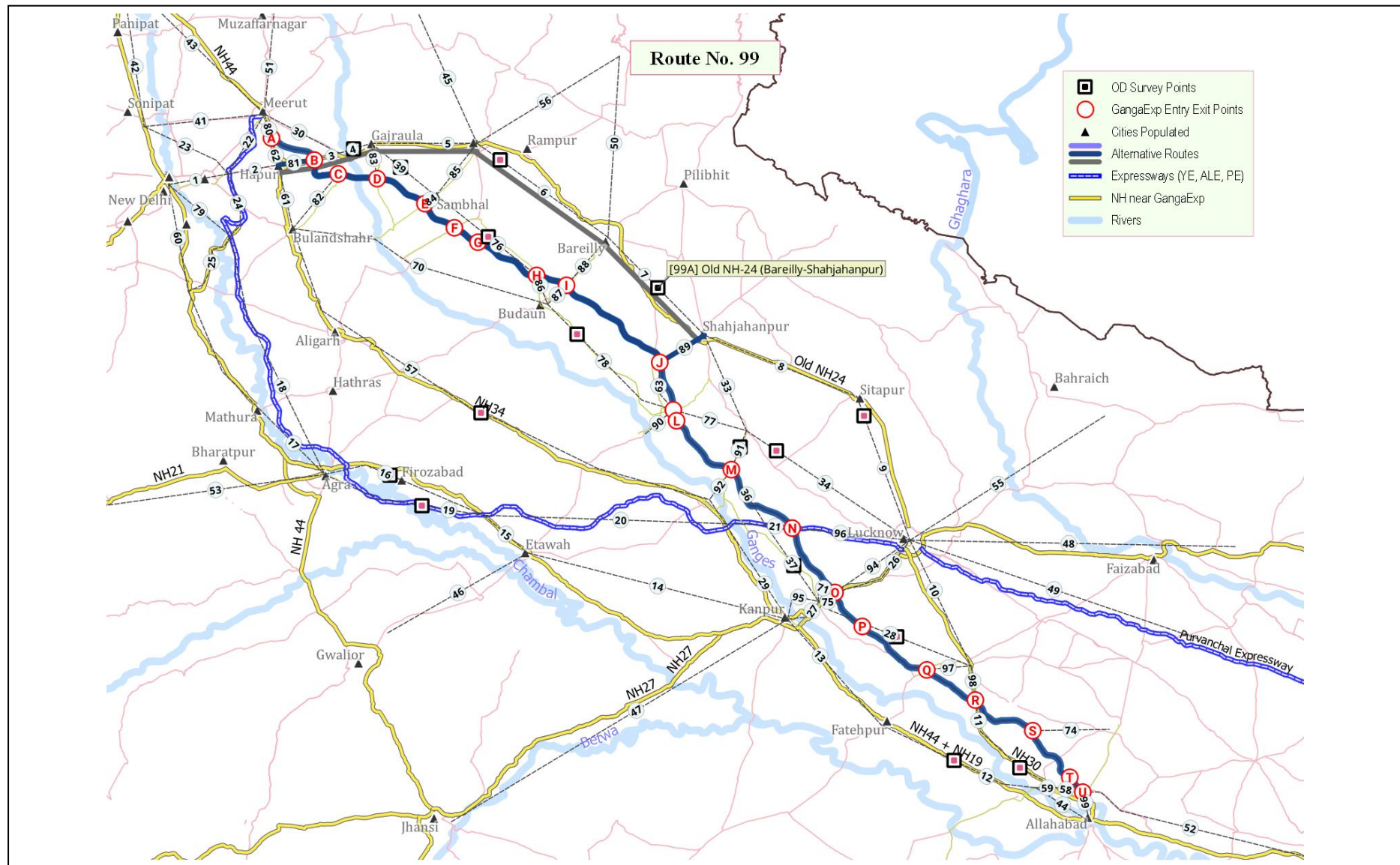
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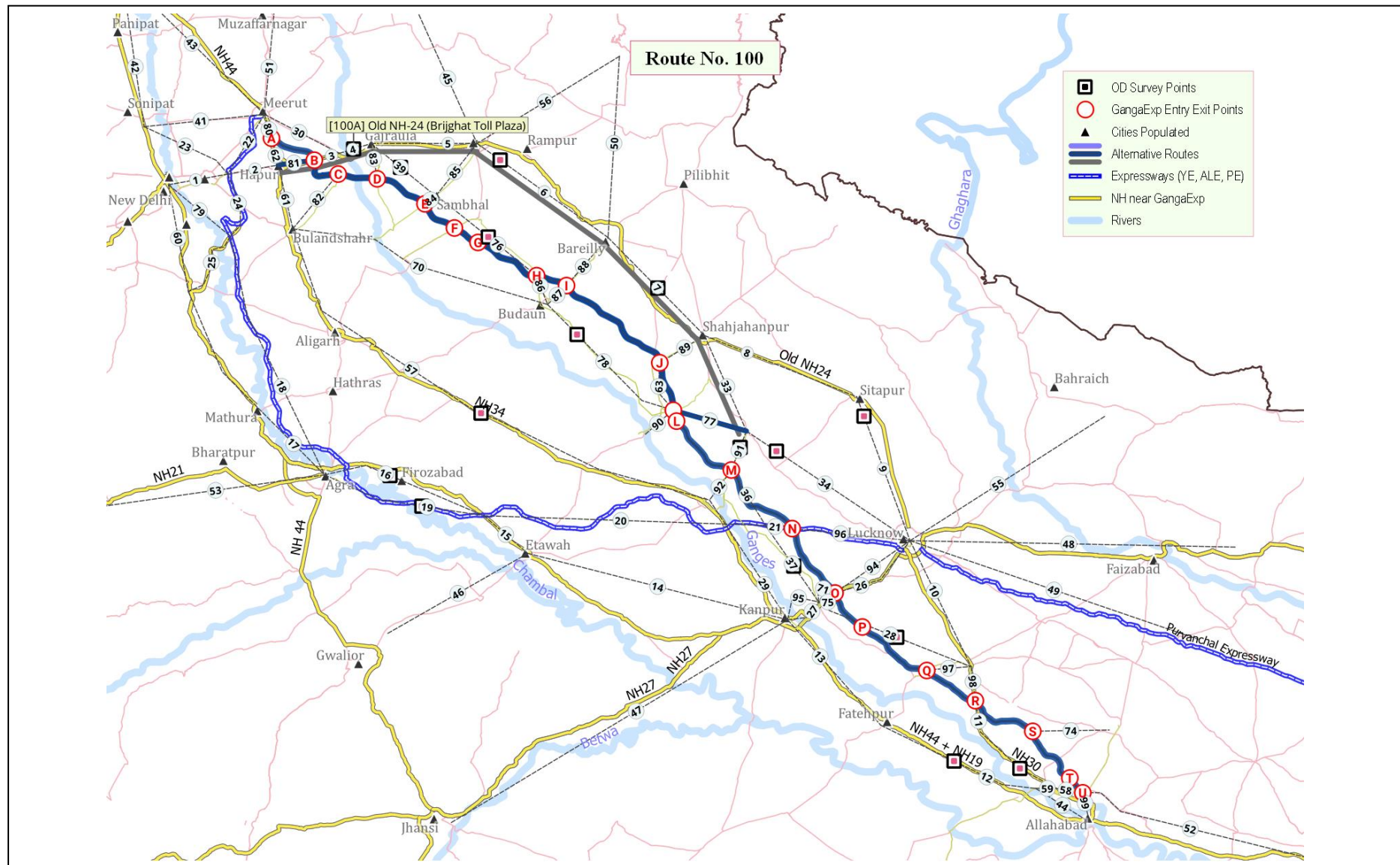
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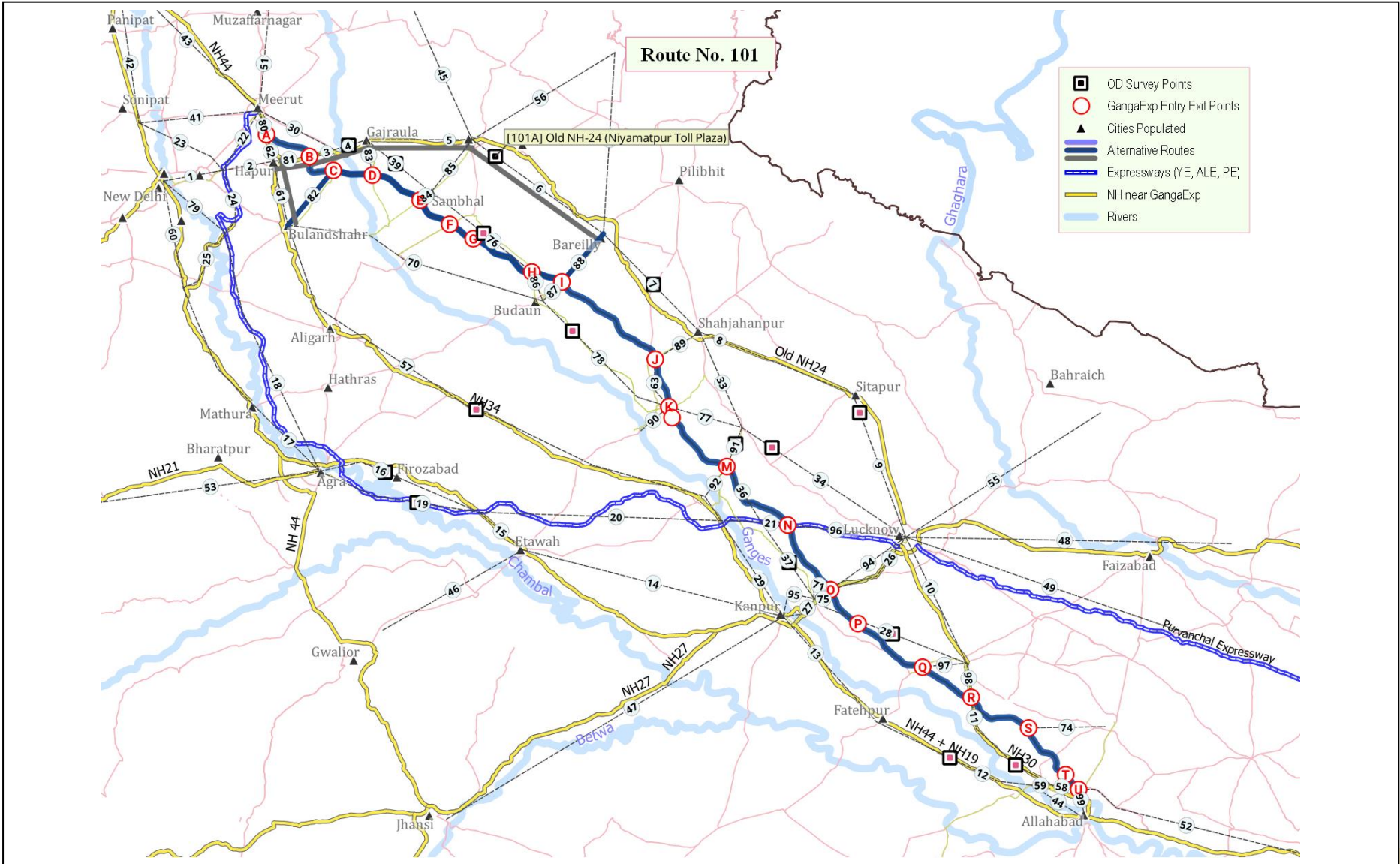
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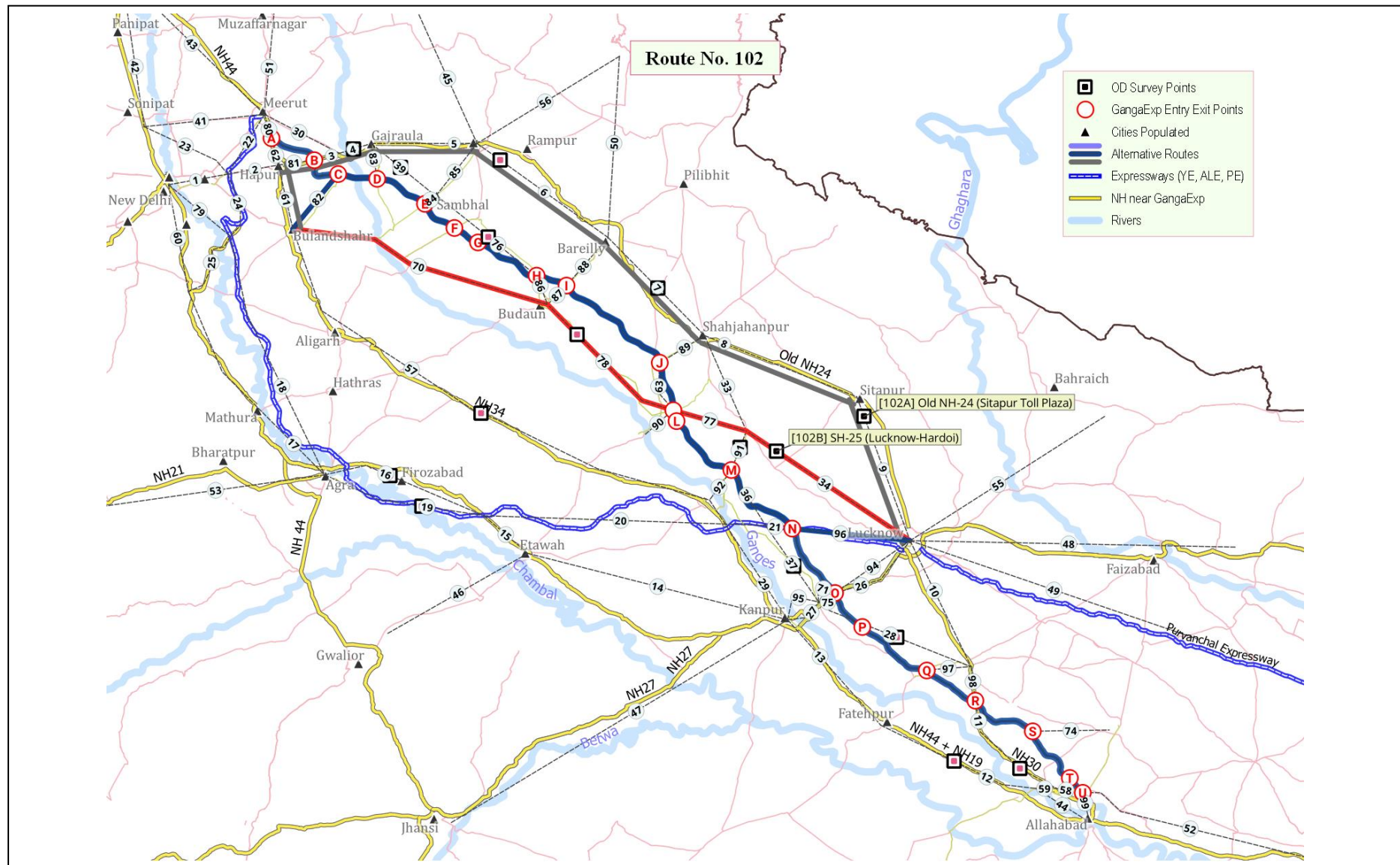
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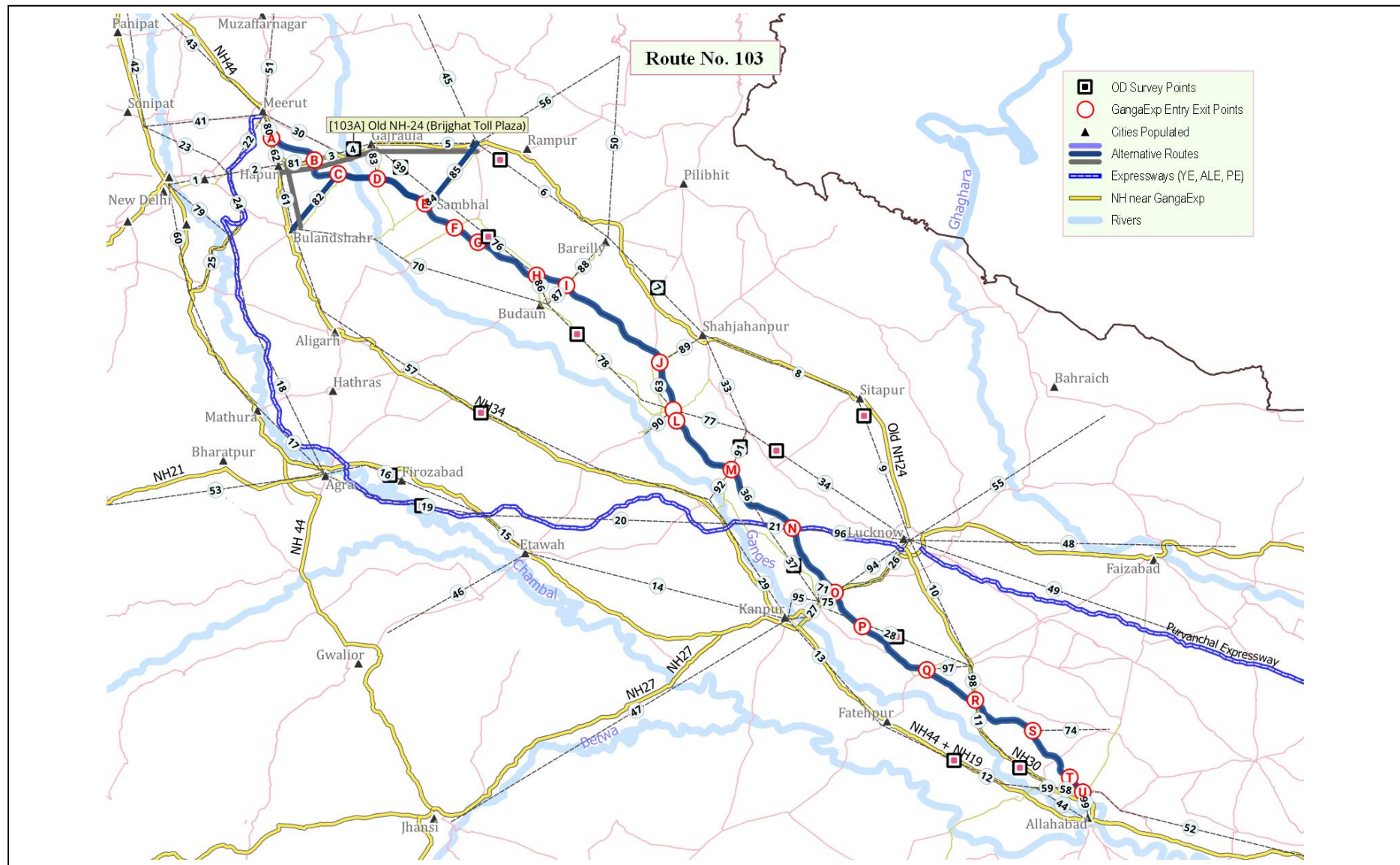
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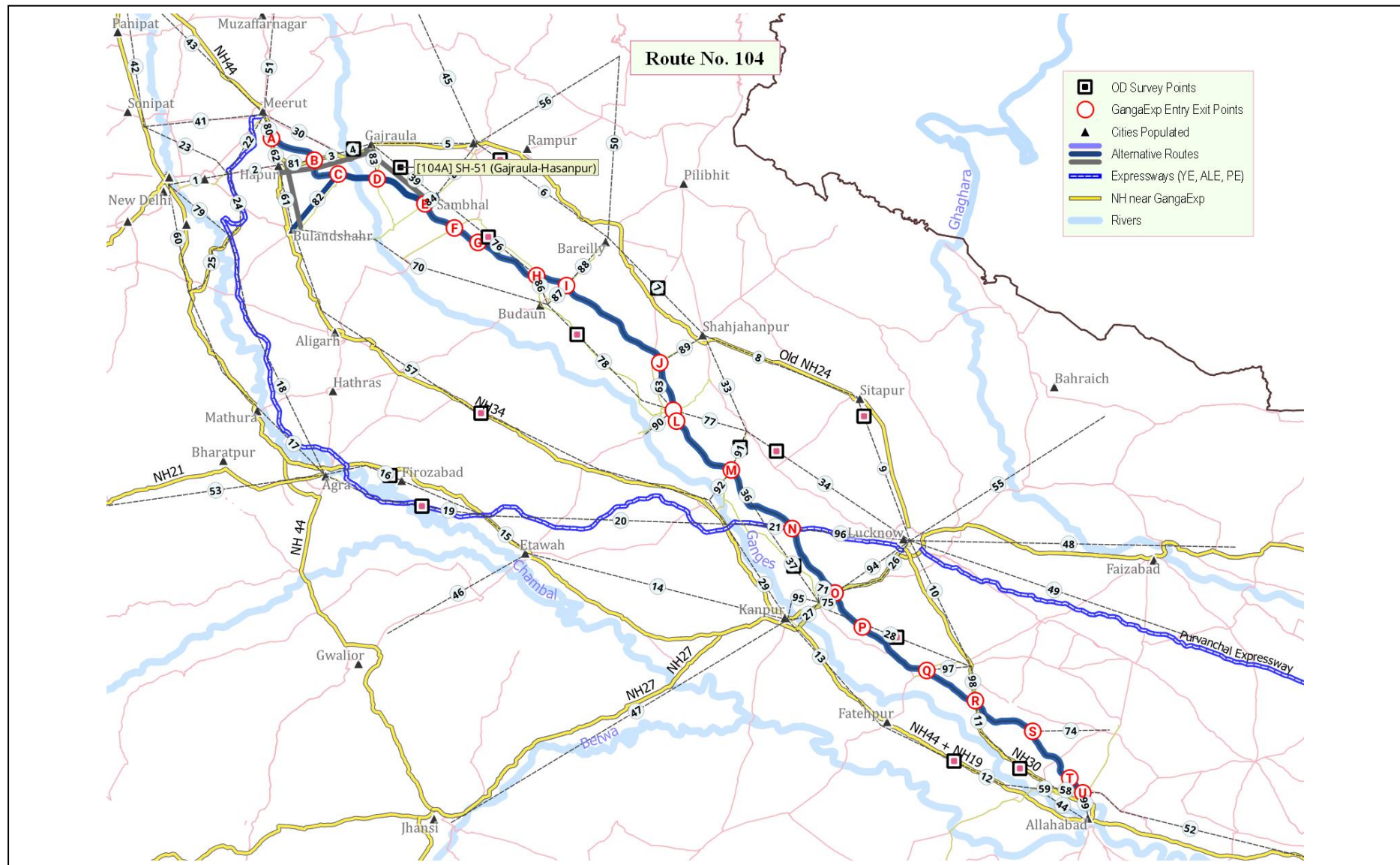
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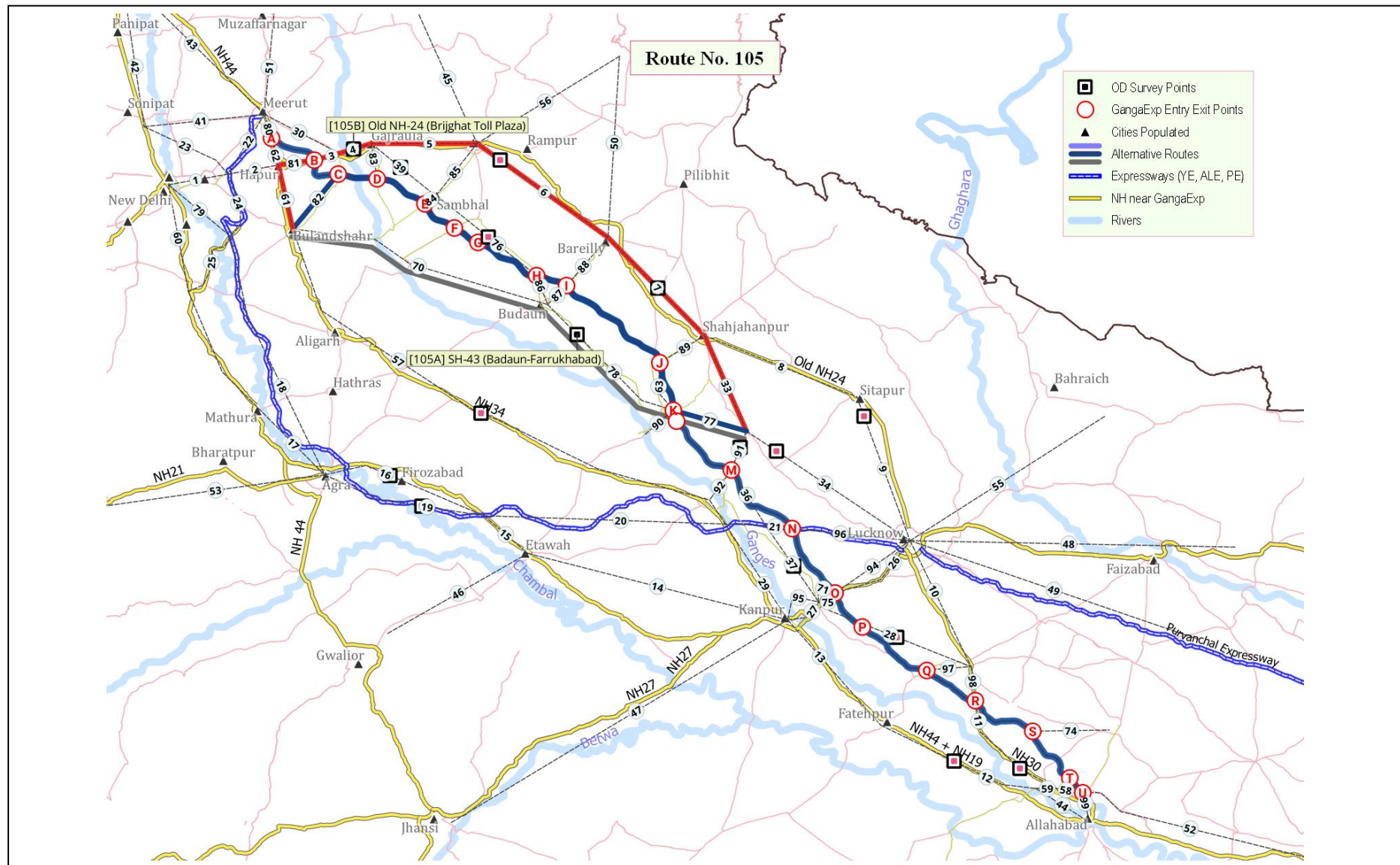
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