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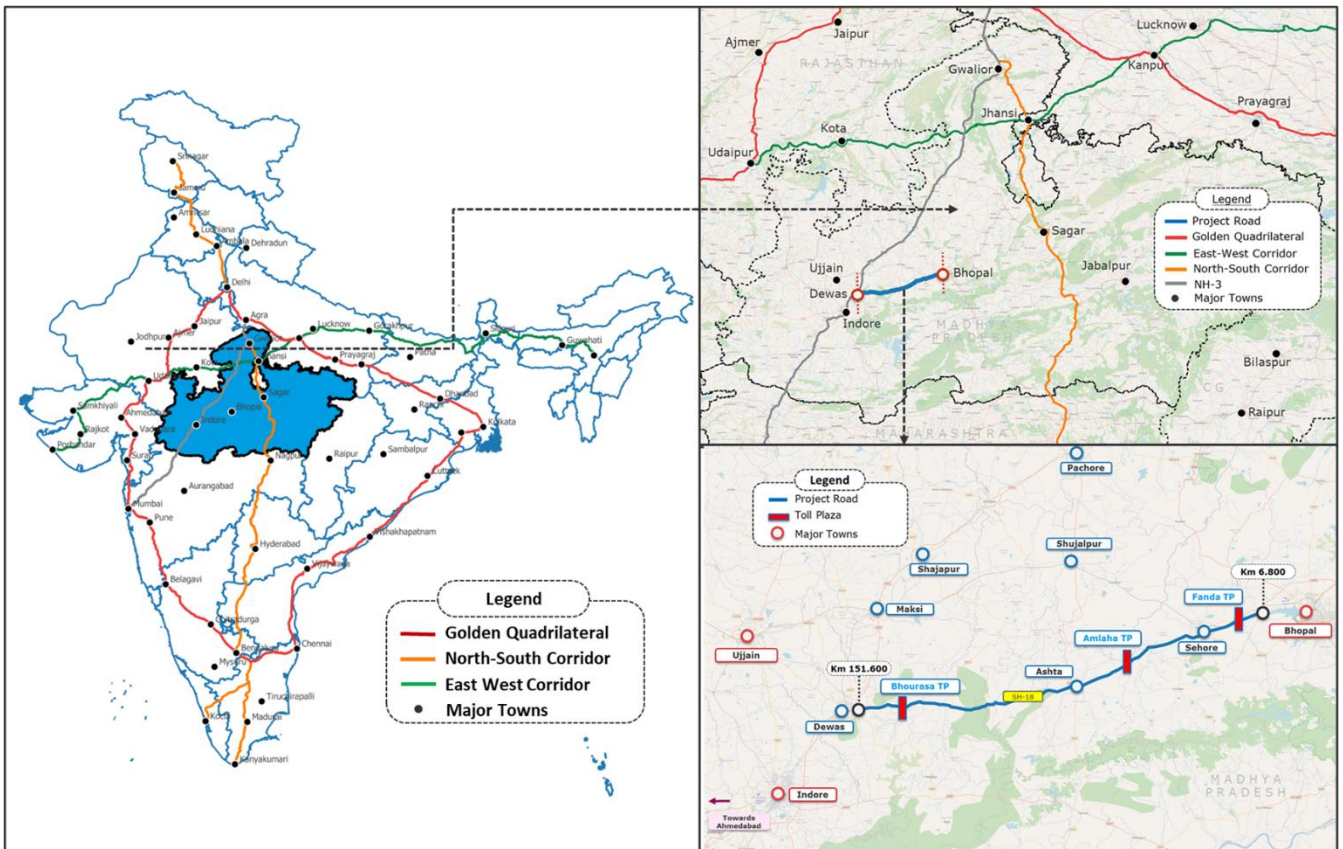
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## Traffic Study Report

Date

April 2023

### TRAFFIC STUDY FOR BHOPAL-DEWAS SECTION OF SH-18 IN THE STATE OF MADHYA PRADESH



Revision      **00**

Date            **11/04/2023**

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Description   **Traffic Study Report**

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\$/US\$/USD	United States Dollar
%	Percentage
₹/Rs	Indian Rupees
2A	2 Axle Truck
3A	3 Axle Truck
AADT	Annual Average Daily Traffic
AC	Air Conditioners
AR1	Alternate Route 1
BIA	Broad Influence Area
BOT	Build, Operate & Transfer
BP	Bharat Petroleum
CA	Concession Agreement
CAGR	Compounded Annual Growth Rate
CJV	Car/Jeep/Van
COVID	Corona Virus Disease
CSO	Central Statistical Organisation
DBCPL	Dewas Bhopal Corridor Pvt Ltd
DPIIT	Department for Promotion of Industry and Internal Trade
EI	Economic Indicator
EMP	Environment Management Plan
FDI	Foreign Direct Investment
FY	Financial Year
GDP	Gross Domestic Product
GSDP	Gross State Domestic Product
GST	Goods & Services Tax
GVW	Gross Vehicle Weight
IIA	Immediate Influence Area
IOCL	Indian Oil Corporation Ltd
IRC	Indian Roads Congress
IT	Information Technology
ITeS/ITES	Information Technology Enabled Services
km	Kilometre
LCV	Light Commercial Vehicle
MAV	Multi Axle Vehicle
MBus	Mini-Bus
MLCV	Mini Light Commercial Vehicle
MPRDC	Madhya Pradesh Road Development Corporation
MPSIDC	Madhya Pradesh State Industrial Development Corporation Limited
NH	National highway
NHAI	National Highway Authority of India
NHDP	National Highway Development Programme
OD	Origin & Destination
PCU	Passenger Car Unit
PIA	Project Influence Area

PR	Project Road
RBI	Reserve Bank of India
SEZ	Special Economic Zone
SH	State Highway
SPV	Special Purpose Vehicle
sq.km	Square Kilometre
TP	Toll Plaza
WPI	Wholesale Price Index
YOY	Year on Year

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*Appendix 2.1: Zoning*

*Appendix 2.2: Top 20 OD pairs*

# 1. INTRODUCTION

## 1.1 General

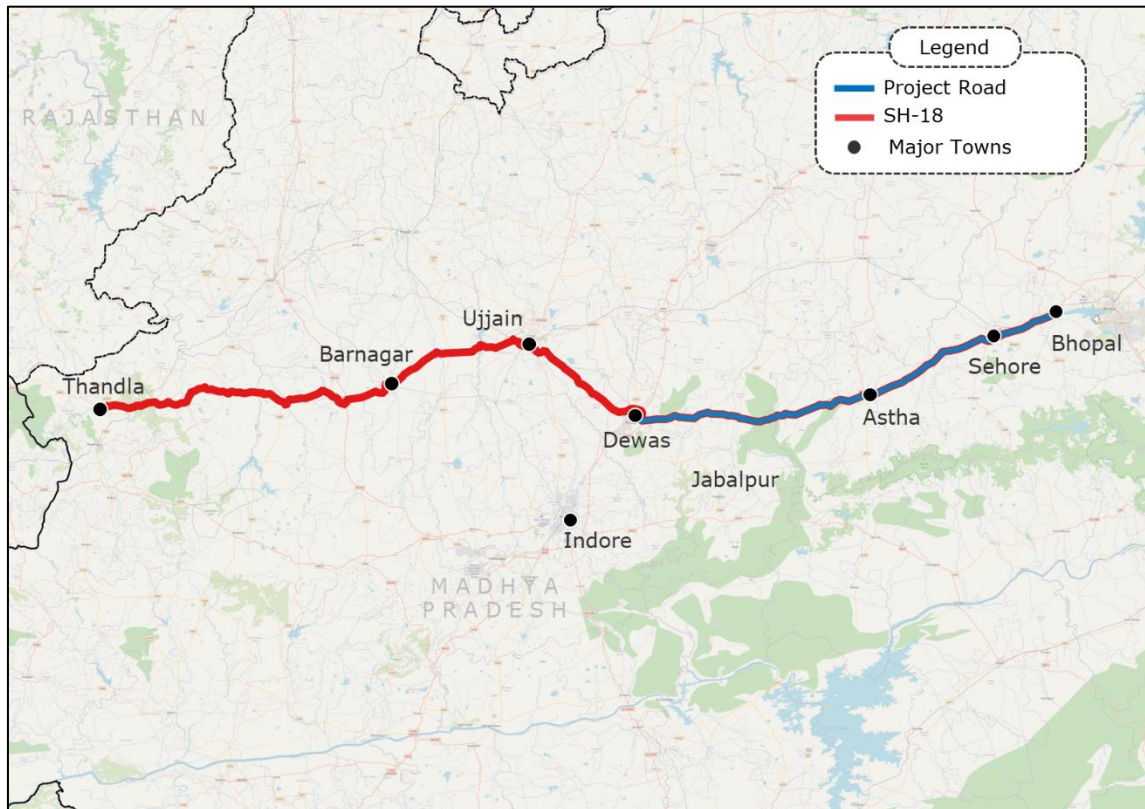
The Madhya Pradesh Road Development Corporation (MPRDC) is responsible for development of highway network in the State of Madhya Pradesh and as a part of this endeavour, the department had decided to upgrade roads to meet with the growing traffic requirements. The project road as part of upgradation of widening and improvement of existing 2-lane to 4-lane section by Madhya Pradesh state government was awarded to consortium comprising of M/s Chetak Enterprises, M/s MSK Projects India Ltd. and M/s BSBK Pvt. Ltd. with M/s. Chetak Enterprises as its leader, which in turn formed a SPV - M/s Dewas Bhopal Corridor Pvt Ltd (DBCPL). The project is undertaken on Build, Operate and Transfer (BOT) basis for a concession period of 25 years and is operational since 10<sup>th</sup> February 2009.

The project road section is a part of SH-18, starts at Bhopal (km 6.80) and ends at Dewas Bypass junction (km 151.60). The length of project road is about 140.79 km.

SH-18 starts from Bhopal and ends at the border with Gujarat while passing through some of the important towns and cities of Madhya Pradesh. The importance of the highway arises from the fact that these cities have religious, tourism, agriculture and industrial significance such as Bhopal being the capital of Madhya Pradesh, Dewas having importance in terms of its industrial and agricultural output and Ujjain being one of the holy Hindu pilgrimage destinations. The highway essentially connects Indore and Bhopal, two of the largest cities of Madhya Pradesh, via NH-52 from Dewas. Additionally, the highway provides connectivity between Bhopal and state of Gujarat.

The location of the project road and the regions in and along the project influence area are shown in **Figure 1-1**.





**Figure 1-1: Alignment of NH-19 with Major Places**

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

## 1.2 Scope of Services

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

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

- 1 day OD Survey at each toll plaza
- Analysis of recent toll/traffic data up to February 2023 and its growth trends
- Estimation of the base AADT for FY23
- Analysis of OD data to cover:
  - Trip matrix and influence factors for different zones contributing traffic on the corridor
  - Identification of Project Influence Area from analysis of travel pattern - regional distribution of traffic

- Commodity composition- Goods type distribution
- Top OD pairs by vehicle types
- To study the impact of traffic diversion (from/to project road) in present condition and future improved scenario, a cost ratio-based diversion analysis using spreadsheet-based modelling out for potential OD pairs
- Identify factors which may have a positive and / or negative impact on the traffic - all major developments like industrial corridors, freight corridor, economic corridors, ports, Bharatmala, Sagarmala
- Upcoming developments and future development potential of the region would be assessed for the induced/newly generated traffic
- Traffic projections for the balance concession period in three scenarios – low, most likely and high
- Toll revenue estimates using WPI forecasts and tolling ticket segmentation
- Scenario analysis of toll revenue

### **1.3 Report Structure**

This report is divided into four chapters, including this introduction chapter. Chapter 2 details upon the project road characteristics and socio – economic profile of the districts in the project influence area including the estimation of AADT and travel characteristics in the Project Influence Area (PIA). Chapter 3 contains the details on the derivation of traffic growth rates used for traffic forecasting and presents traffic projections for the study period. Chapter 4 presents the details regarding tolling strategy, toll rates and the revenue projections for the duration of the concession.

## 2. TRAFFIC SURVEY AND ANALYSIS

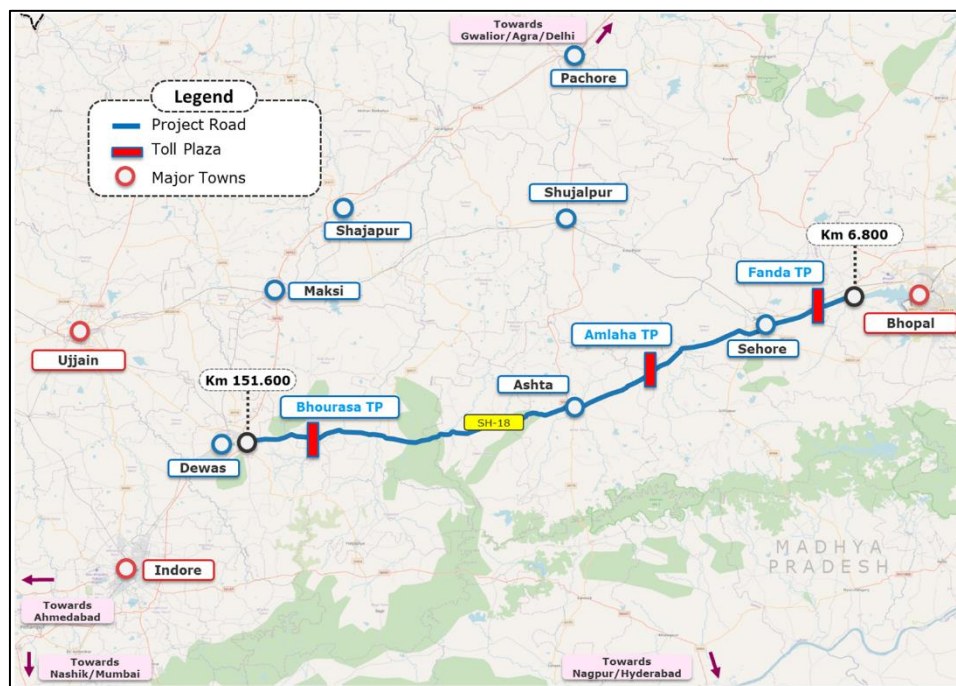
### 2.1 General

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

### 2.2 Project Road Characteristics

The project road falls under the jurisdiction of Bhopal, Sehore and Dewas districts in the state of Madhya Pradesh. The project road section starts from km 6.800 at Bhopal and ends at the junction with Dewas Bypass at km 151.600 having a total length of 140.79 km. It connects Bhopal with Dewas while passing through the towns/cities of Sehore, Astha and Sonkatch. There are three operational toll plazas on the project road, viz., Fanda (TP01), Amlaha (TP02) and at Bhourasa (TP03) as part of the concession.

The alignment of the project road and its surrounding road network along with the three toll plaza locations is shown in **Figure 2-1**.

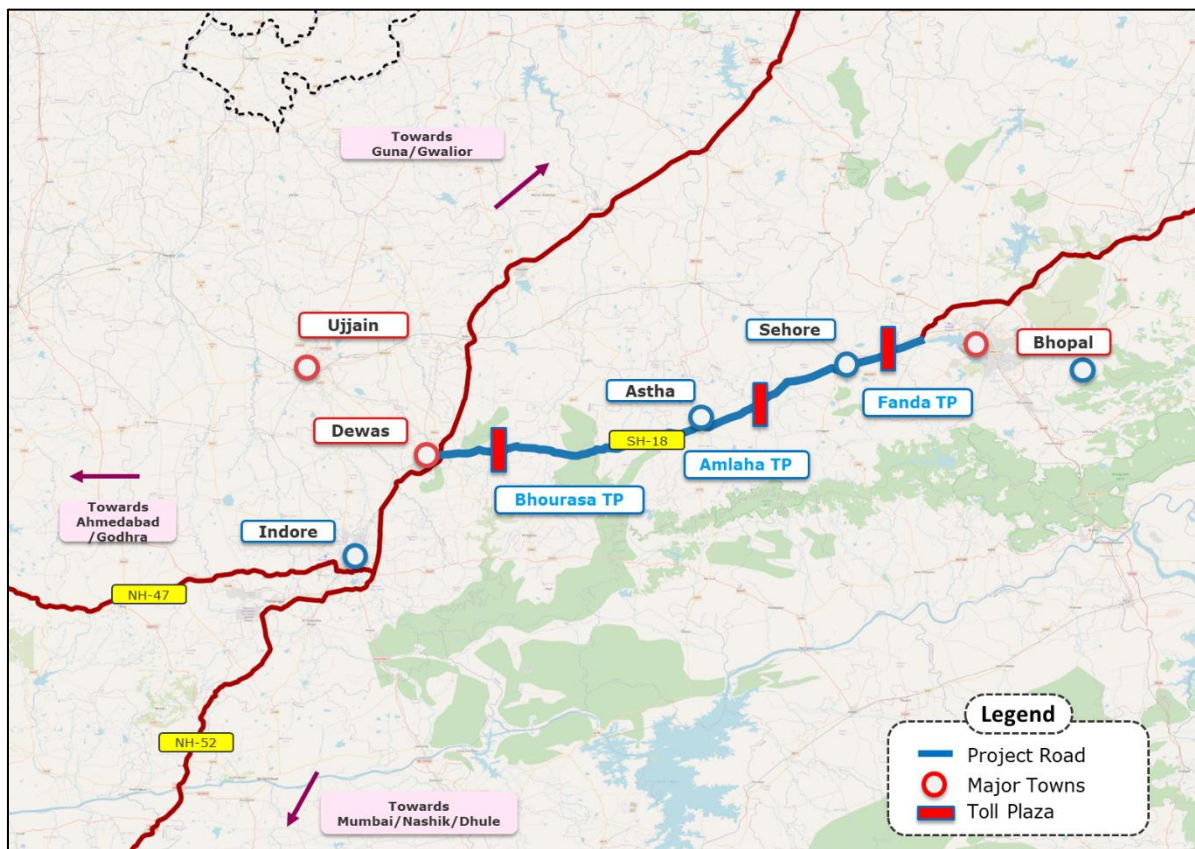


**Figure 2-1: Project Road and Location of Toll Plazas**

The project road connects two major cities of Madhya Pradesh – Bhopal (political capital of Madhya Pradesh) and Indore (business and trading capital of Madhya Pradesh) via Dewas and serves the regional traffic demand. Additionally, the Project Road provides connectivity to the mobility requirements of smaller towns/cities along the project corridor such as Sehore, Astha, Sonkatch, etc.

### 2.2.1 Network characteristics in vicinity of the project road

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



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

The project section serves long distance as well as short distance traffic plying on the project corridor. Major traffic generators influencing the project road traffic include Indore, Dewas, Bhopal, Vidisha, Ujjain, Astha, Sehore etc.

From the network assessment and site reconnaissance, the following observations have been found:

- The traffic from/to Ahmedabad/Godhra/Vadodara & beyond to/from Bhopal/Vidisha/Sagar & beyond travels enters/exits the project section via NH-47, and thus travelling the entire project corridor.
- The traffic from/to Mumbai/Nashik/Dhule & beyond to/from Bhopal/Vidisha/Sagar & surroundings travels enters/exits the project section via NH-60/52, and thus travelling the entire project corridor.

### 2.2.2 Profile of Project Influence Area

The project road, Bhopal-Dewas falls under the jurisdiction of districts of Bhopal, Sehore and Dewas.

A brief description of influence areas for the project corridor is as follows.



### **Bhopal District**

Bhopal district, spanning over an area of about 2,772 square km, lies in the central part of the state of Madhya Pradesh. The district is bounded by Guna district on the north, Vidisha district on the northeast, Raisen district on the east and Sehore and Rajgarh district on the southwest and west, respectively. Bhopal city is the district as well as state head quarter. Bhopal is well connected with all parts of country by air, rail and roads. It lies on Delhi-Bhopal-Mumbai and Delhi-Bhopal-Chennai main railway line.

As per 2011 census, the population of Bhopal district is about 2.37 million with a density of 855 persons/sq.km and a decadal growth rate of 28.62 percent. The agricultural activity in Bhopal district is mainly dependent on the monsoon.

### **Sehore District**

Sehore district is primarily an agricultural district occupying the Chambal and Narmada basin valley. It is bound by the Rajgarh and Shajapur districts in the north-west, Bhopal and Raisen districts in the north-east and Hoshangabad, Harda and Dewas districts in the south. Agriculture is the main occupation of the people in the district. Sehore district has a total population of about 1.31 million with a decadal growth of 21.5 percent.

The district has alluvial soil with fairly good fertility. Most part of the district has rich black cotton soil. Soyabean and wheat are the two major crops produced in the district with other crops such as sugarcane, gram, maize, lentil, etc. are also sown. Sehore district is known for the production of "Sharbati" wheat or the "Golden Grain" owing to the presence of black and fertile alluvial soil in the region. About 400 sq.km. of area is cultivated resulting in over 100 kilo tonnes of annual production. Quartzite is the only major mineral found in the district.

### **Dewas District**

The Dewas district lies in the central part of the state and covers an area of 7,020.84 square km. Dewas lies north-east of Indore, south-east of Ujjain and southwest of Shajapur. Dewas is an industrial city of the state providing employment to thousands of industrial workers. These industrial areas are present along Indore Road and few pockets of industries on Ujjain Road. It is also known for its Bank Note Press. Dewas district has a total population of about 1.56 million with a decadal growth of 19.5 percent as per census 2011.

The chief agricultural products in the district are soyabean, wheat, sorghum, rice, cotton, etc. The district is known as the soyabean capital of India. Several industries with high tech manufacturing processes have been set up for extraction of soyabean oil.

The district has several centres of attraction which allures numerous travellers from different parts of country as well as world. Kavadia Hills, a group of seven hills with various shapes are made up of stone pillars. These hills are the result of volcanic eruption,

yet these seem to be minutely carved by humans. Other places include Khivni Sanctuary, Pawar Chattries, Gidya Khoh, etc.

### **Indore District**

Indore district lies at the heart of Malwa region. Indore city is the district capital and is known as the commercial capital of Madhya Pradesh. Traditional agro industries as well as modern corporate and IT companies are present in the district. The district has an area of 3,898 sq.km with a population of 3.28 million and a decadal growth rate of 32.9 percent as per the census 2011.

Agriculture is the main source of economy due to the presence of immensely fertile soil of the Malwa region. The district has abundance of black cotton soil. The main crops grown are jowar, cotton, ground nut, wheat, gram, linseed, etc.

Indore is one of the premier textile centres of India. There are a number of textile mills in the region and a number of firms are involved in the export of textile. Besides, there are hosiery industry, cotton ginning and processing factories, oil mills, sugar mills, printing presses, etc. The metal industry is also an integral part of Indore which includes alloy, automobile and steel industries.

## **2.3 Traffic Surveys**

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

Location	Duration	Date (s)
<b>Origin and Destination Survey</b>		
Fanda (TP01)	1 Day	6 <sup>th</sup> March 2023
Amlaha (TP02)		
Bhourasa (TP03)		

**Table 2-1: Traffic Survey Location and Date**

Trained enumerators were engaged for conducting traffic surveys under the supervision of experienced transport planner.

## **2.4 Traffic Characteristics – AADT FY23**

The traffic data at the toll plaza location was provided by the client for the period from November 2013 to March 2023.

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

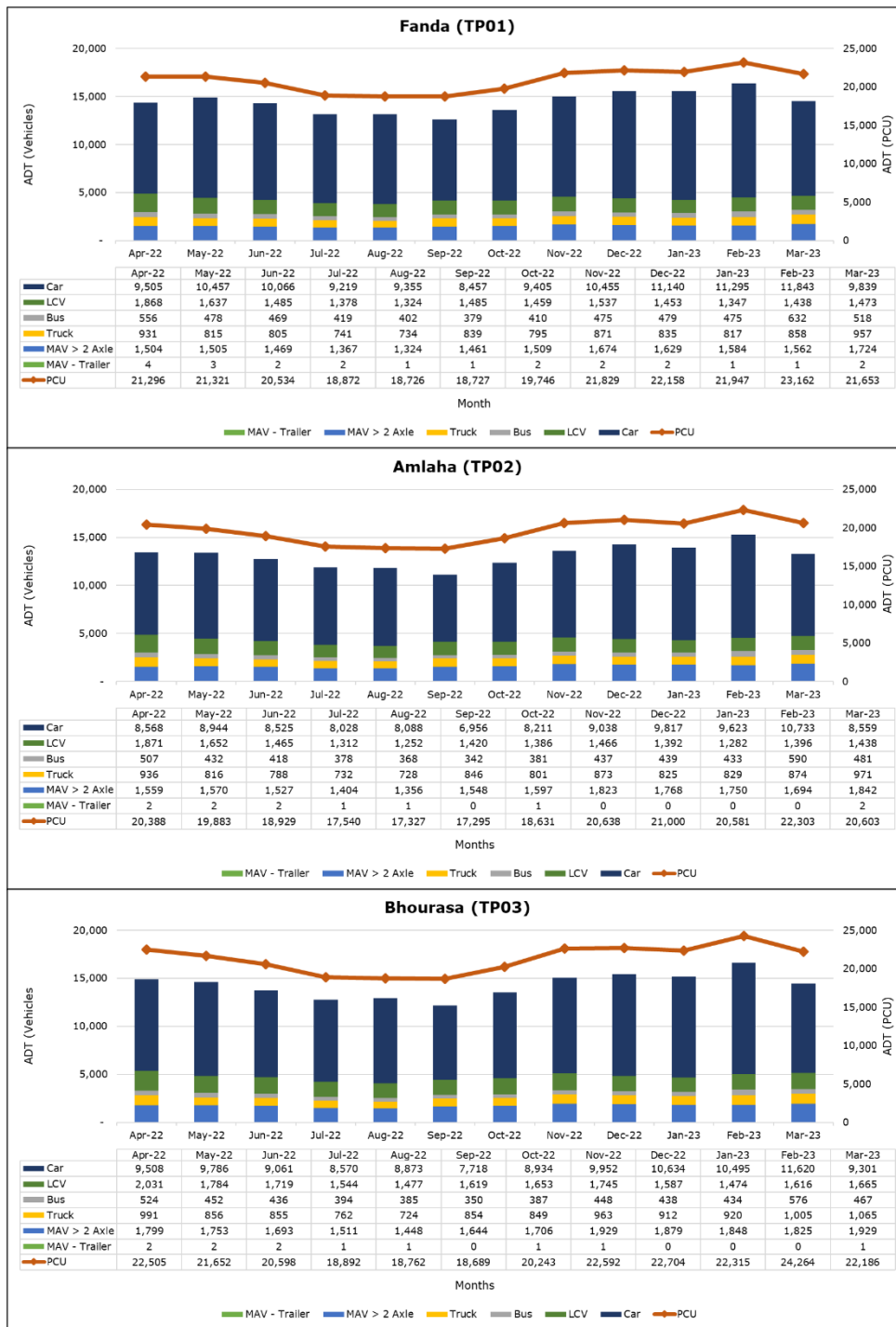


Figure 2-3: Month on Month Traffic Data of FY23 for TP01, TP02 and TP03

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

Mode	CJV	Bus	LCV	Truck	MAV > 2A	MAV - Trailer	PCUs
Fanda (TP01)	10,086	1,490	474	833	1,526	2	20,831
Amlaha (TP02)	8,757	1,444	434	835	1,620	1	19,593
Bhourasa (TP03)	9,538	1,659	441	896	1,747	1	21,284

Table 2-2: AADT for FY23

## 2.5 Travel Characteristics

### 2.5.1 Survey Methodology

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

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

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

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

### 2.5.2 Traffic Zoning System

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

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

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

**Immediate Influence Area (IIA):** It includes the cities/towns/villages and districts along the project road and adjacent to it, and for which the project road serves as the primary mobility network. For the present study, it consists of the districts of Bhopal, Sehore and Dewas districts within Madhya Pradesh.

**Broad Influence Area (BIA):** It includes the remaining districts of Madhya Pradesh and other states including Gujarat, Maharashtra, Uttar Pradesh, Rajasthan, and remaining states of India.



Detailed zoning system is prepared for IIA, while more aggregate or broad zoning is developed for BIA. The zoning system adopted for data collection was based on 86 zones and is presented in **Appendix 2.1**.

### 2.5.3 Sample Size

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

Modes	Car	Bus	LCV	Truck	MAV > 2 A	Total
<b>Fanda (TP01)</b>						
Sample	4,922	313	443	292	539	6,509
AADT	10,086	474	1,490	833	1,528	14,412
Percentage (%)	48.8	66.0	29.7	35.1	35.3	45.2
<b>Amlaha (TP02)</b>						
Sample	4,810	348	653	378	720	6,909
AADT	8,757	434	1,444	835	1,621	13,091
Percentage (%)	54.9	80.2	45.2	45.3	44.4	52.8
<b>Bhourasa (TP03)</b>						
Sample	5,606	385	682	329	697	7,699
AADT	9,538	441	1,659	896	1,748	14,282
Percentage (%)	58.8	87.3	41.1	36.7	39.9	53.9

**Table 2-3: Sample Size Collected in OD Survey at TP01, TP02 and TP03**

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

### 2.5.4 Regional Distribution

Based on the OD matrices, the regional distribution of tollable vehicles at the toll plaza locations has been calculated. **Table 2-4** gives the distribution indicating the attraction and generation zones for the traffic on the project road.

Region/Modes	Car	Bus	LCV	Truck	MAV > 2A
<b>Fanda (TP01)</b>					
Madhya Pradesh	98.0	98.0	95.1	93.5	85.8
Gujarat	0.5	0.3	0.5	1.3	4.0
Maharashtra	0.7	0.9	2.8	1.6	2.9
Uttar Pradesh	0.3	0.3	0.4	0.3	1.2
Rajasthan	0.1	0.1	0.7	1.9	0.5
Delhi	0.1	0.0	0.0	0.2	0.3
Northern India	0.0	0.0	0.0	0.2	0.3
Eastern India	0.2	0.3	0.6	1.0	3.5
Rest of India	0.2	0.0	0.0	0.0	1.4
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Amlaha (TP02)</b>					
Madhya Pradesh	98.0	96.6	97.0	95.2	85.9
Gujarat	0.7	1.4	1.2	2.4	5.8
Maharashtra	0.6	0.7	1.1	1.6	3.4
Uttar Pradesh	0.2	0.6	0.2	0.2	0.8
Rajasthan	0.3	0.2	0.2	0.4	1.8
Delhi	0.0	0.0	0.0	0.0	0.2
Northern India	0.0	0.0	0.0	0.1	0.4
Eastern India	0.2	0.4	0.2	0.1	1.5

Region/Modes	Car	Bus	LCV	Truck	MAV > 2A
Rest of India	0.0	0.0	0.1	0.0	0.2
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Bhourasa (TP03)</b>					
Madhya Pradesh	97.9	99.1	97.9	95.8	89.0
Gujarat	0.6	0.0	0.3	2.4	3.6
Maharashtra	1.0	0.1	1.3	1.1	4.5
Uttar Pradesh	0.2	0.5	0.2	0.1	0.4
Rajasthan	0.1	0.0	0.2	0.3	0.3
Delhi	0.0	0.0	0.0	0.0	0.1
Northern India	0.0	0.0	0.1	0.3	0.7
Eastern India	0.1	0.3	0.1	0.0	1.4
Rest of India	0.0	0.0	0.0	0.0	0.1
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>Combined for the Project Road</b>					
Madhya Pradesh	98.0	97.9	96.7	94.9	87.0
Gujarat	0.6	0.6	0.6	2.0	4.4
Maharashtra	0.8	0.6	1.7	1.4	3.7
Uttar Pradesh	0.2	0.5	0.2	0.2	0.8
Rajasthan	0.2	0.1	0.4	0.9	0.9
Delhi	0.0	0.0	0.0	0.1	0.2
Northern India	0.0	0.0	0.0	0.2	0.5
Eastern India	0.2	0.3	0.3	0.4	2.1
Rest of India	0.1	0.0	0.0	0.0	0.5
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

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

**Passenger traffic:**

- Majority of the passenger traffic at the toll plaza locations is from the state of Madhya Pradesh. In case of car traffic, Madhya Pradesh contributes about 98.0 percent at all the toll plaza locations.
- The share of bus traffic from Madhya Pradesh is about 98.0 percent at TP01, 96.6 percent at TP02 and 99.1 percent at TP03. The top OD pair for car traffic is from/to Bhopal/Sehore to/from Dewas/Indore at all the toll plaza locations.

**Freight Traffic**

- About 95.1 percent at TP01, 97.0 percent at TP02 and 97.9 percent at TP03 of LCV traffic is from the state of Madhya Pradesh, followed by Maharashtra accounting for 2.8 percent at TP01, 1.1 percent at TP02 and 1.3 percent at TP03.
- In case of truck traffic, Madhya Pradesh accounts for 93.5 percent at TP01, 95.2 percent at TP02 and 95.8 percent at TP03. In addition, Gujarat contributes about 1.3 percent at TP01, 2.4 percent each at TP02 & TP03. Also, Maharashtra accounts for 1.6 percent each at TP01 & TP02 and 1.1 percent at TP03.
- The share of MAV > 2A traffic, is about 85.8 percent at TP01, 85.9 percent at TP02 and 89.0 percent at TP03 is from the state of Madhya Pradesh. Also, Gujarat contributes around 4.0 percent at TP01, 5.8 percent at TP02 and 3.6 percent at TP03. In addition, Maharashtra contributes around 2.9 percent at TP01, 3.4 percent at TP02 and 4.5 percent at TP03.
- The top OD pair for MAV > 2A traffic is from/to Bhopal to/from Indore at all the toll plaza locations.

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

### 2.5.5 Travel Pattern

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

S. No.	Crossing TPs	Traffic Stream	Car	Bus	LCV	Truck	MAV>2A
<b>Fanda (TP01)</b>							
1	1,2,3	Bhopal, Raisen, Vidisha - Dewas, Ujjain, Ratlam and beyond	11.6%	14.4%	11.9%	11.6%	12.9%
2	1,2,3	Bhopal, Raisen, Vidisha - Indore and surroundings	25.5%	44.9%	31.7%	46.5%	38.1%
3	1,2,3	Bhopal, Raisen, Vidisha - Godhra, Ahmedabad and beyond	0.7%	0.6%	0.9%	2.7%	6.3%
4	1,2,3	Bhopal, Raisen, Vidisha - Mumbai, Pune, Nashik, Dhule and beyond	1.1%	1.8%	5.6%	2.0%	4.7%
5	1,2,3	Beyond Bhopal, Raisen, Vidisha - Dewas, Ujjain, Ratlam and beyond	0.5%	0.6%	0.5%	3.8%	7.9%
6	1,2,3	Beyond Bhopal, Raisen, Vidisha - Indore and surroundings	0.9%	0.9%	3.0%	5.8%	6.4%
7	1,2,3	Beyond Bhopal, Raisen, Vidisha - Godhra, Ahmedabad and beyond	0.3%	0.0%	0.0%	0.0%	1.6%
8	1,2,3	Beyond Bhopal, Raisen, Vidisha - Mumbai, Pune, Nashik, Dhule and beyond	0.2%	0.0%	0.0%	0.0%	1.6%
9	1	Bhopal, Raisen, Vidisha & beyond - Zones between TP01 & TP02	51.2%	33.1%	38.8%	18.4%	15.5%
10	1,2	Bhopal, Raisen, Vidisha & beyond - Zones between TP02 & TP03	8.0%	3.6%	7.6%	9.3%	5.1%
Total			100.0%	100.0%	100.0%	100.0%	100.0%
<b>Amlaha (TP02)</b>							
1	1,2,3	Bhopal, Raisen, Vidisha - Dewas, Ujjain, Ratlam and beyond	13.1%	16.0%	8.9%	11.0%	10.8%
2	1,2,3	Bhopal, Raisen, Vidisha - Indore and surroundings	30.0%	49.3%	39.0%	45.4%	36.5%
3	1,2,3	Bhopal, Raisen, Vidisha - Godhra, Ahmedabad and beyond	0.9%	2.2%	2.2%	4.2%	9.5%
4	1,2,3	Bhopal, Raisen, Vidisha - Mumbai, Pune, Nashik, Dhule and beyond	0.6%	0.6%	1.6%	3.2%	4.7%
5	1,2,3	Beyond Bhopal, Raisen, Vidisha - Dewas, Ujjain, Ratlam and beyond	1.4%	2.1%	1.2%	0.8%	2.6%
6	1,2,3	Beyond Bhopal, Raisen, Vidisha - Indore and surroundings	1.9%	3.6%	3.0%	6.1%	7.5%
7	1,2,3	Beyond Bhopal, Raisen, Vidisha - Godhra, Ahmedabad and beyond	0.1%	0.5%	0.2%	0.5%	1.7%
8	1,2,3	Beyond Bhopal, Raisen, Vidisha - Mumbai, Pune, Nashik, Dhule and beyond	0.0%	0.0%	0.3%	0.0%	2.1%
9	1,2	Bhopal, Raisen, Vidisha & beyond - Zones between TP02 & TP03	14.9%	6.8%	13.0%	8.0%	12.1%
10	2	Zones between TP01 & TP02 - Zones between TP02 & TP03	23.8%	7.2%	20.4%	15.1%	2.3%
11	2,3	Zones between TP01 & TP02 - Dewas, Ujjain, Ratlam and beyond	5.8%	4.1%	4.1%	2.5%	2.2%
12	2,3	Zones between TP01 & TP02 - Indore and beyond	7.5%	7.6%	6.2%	3.2%	8.1%
Total			100.0%	100.0%	100.0%	100.0%	100.0%
<b>Bhourasa (TP03)</b>							
1	1,2,3	Bhopal, Raisen, Vidisha - Dewas, Ujjain, Ratlam and beyond	12.5%	25.4%	12.4%	17.9%	11.9%
2	1,2,3	Bhopal, Raisen, Vidisha - Indore and surroundings	27.8%	50.2%	28.1%	37.0%	34.4%
3	1,2,3	Bhopal, Raisen, Vidisha - Godhra, Ahmedabad and beyond	0.9%	0.0%	0.6%	2.7%	4.3%
4	1,2,3	Bhopal, Raisen, Vidisha - Mumbai, Pune, Nashik, Dhule and beyond	1.4%	0.0%	1.9%	0.9%	5.6%
5	1,2,3	Beyond Bhopal, Raisen, Vidisha - Dewas, Ujjain, Ratlam and beyond	1.3%	2.1%	1.2%	2.0%	3.1%
6	1,2,3	Beyond Bhopal, Raisen, Vidisha - Indore and surroundings	0.9%	1.6%	2.7%	3.2%	7.6%
7	1,2,3	Beyond Bhopal, Raisen, Vidisha - Godhra, Ahmedabad and beyond	0.0%	0.0%	0.0%	0.0%	0.8%
8	1,2,3	Beyond Bhopal, Raisen, Vidisha - Mumbai, Pune, Nashik, Dhule and beyond	0.2%	0.0%	0.0%	0.0%	2.1%
9	3	Zones between TP02 & TP03 - Dewas, Ujjain, Ratlam and beyond	27.8%	13.5%	24.1%	12.7%	8.1%

S. No.	Crossing TPs	Traffic Stream	Car	Bus	LCV	Truck	MAV>2A
10	3	Zones between TP02 & TP03 - Indore and beyond	17.7%	3.1%	21.8%	10.1%	13.5%
11	2,3	Zones between TP01 & TP02 - Dewas, Ujjain, Ratlam and beyond	5.1%	2.4%	4.5%	5.7%	2.7%
12	2,3	Zones between TP01 & TP02 - Indore and beyond	4.3%	1.8%	2.8%	7.5%	5.9%
Total			100.0%	100.0%	100.0%	100.0%	100.0%

**Table 2-5: Traffic Streams at TP01, TP02 and TP03**

**Passenger Traffic:**

- The car traffic originating from/to Bhopal/Raisen/Vidisha & surroundings to/from Indore & surroundings (stream 2) is about 25.5 percent at TP01, 30.0 percent at TP02 and about 27.8 percent at TP03. This stream of traffic is through traffic crossing all the toll plazas of the project road. It may be noted that majority of car trips were found to be for the purpose of work and business at the toll plaza locations.
- In case of Bus, about 49.7 percent at TP01, 52.5 percent at TP02 and around 51.6 percent at TP03 are found to be travelling between Bhopal/Raisen/Vidisha & surroundings to/from Indore & surroundings (stream 2).
- At TP01, the local car traffic is found to be about 51.2 percent travelling between Bhopal/Raisen/Vidisha & beyond and zones between TP01 & TP02 (stream 9). It may be noted that majority of the traffic is from/to Bhopal & surroundings.
- Also, at TP02, about 23.8 percent of car traffic travelling from/to zones between TP01 & TP02 to/from zones between TP02 & TP03 (stream 10) and about 27.8 percent at TP03 travelling from/to zones between TP02 & TP03 to/from Dewas/Ujjain/Ratlam and beyond towards Rajasthan (stream 9).

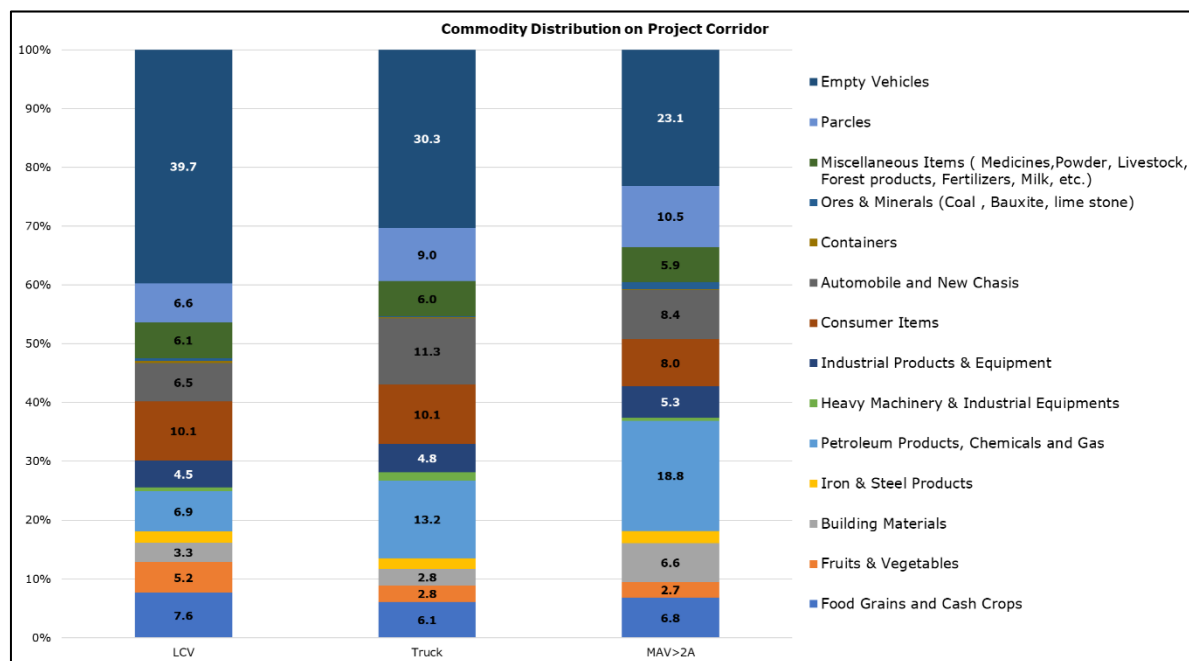
**Freight Traffic:**

- Around 31.7 percent at TP01, 39.0 percent at TP02 and 28.1 percent at TP03 of LCV are found to be travelling between Bhopal/Raisen/Vidisha & surroundings and Indore & surroundings (stream 2).
- In case of Truck, around 46.5 percent at TP01, 45.4 percent at TP02 and 37.0 percent at TP03 are found to be travelling between Bhopal/Raisen/Vidisha & surroundings and Indore & surroundings (stream 2).
- Also, about 11.6 percent at TP01, 11.0 percent at TP02 and 17.9 percent at TP03 of trucks are found to be travelling from/to Bhopal, Raisen, Vidisha & surroundings to/from Dewas, Ujjain, Ratlam and beyond towards Rajasthan (stream 1).
- In case of MAV>2A, about 38.1 percent at TP01, 36.5 percent at TP02 and 34.4 percent at TP03 are found to be travelling from/to Bhopal, Raisen, Vidisha & surroundings to/from Indore & surroundings (stream 2).
- About 63-73 percent of Trucks (about 600 vehicles) and around 69-80 percent of MAV>2A (about 1,200 vehicles) are found to be crossing all the toll plazas (stream 1-

8). The major through interaction is between Bhopal/Raisen/Vidisha & surroundings and Indore & surroundings.

### 2.5.6 Commodity Distribution

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



**Figure 2-4: Commodity Distribution for Project Corridor**

- Major commodities being transported across all the toll plazas are food grains/fruits & vegetables, consumer items, automobile & new chassis, and petroleum products.
- Around 10 percent each of LCV and Truck are found to be transporting consumer items along the entire project corridor.
- About 13-19 percent of Truck and MAV>2A are found to be transporting petroleum products, chemicals and gas products along the entire project corridor.
- Around 9-11 percent of Truck and MAV>2A are transporting parcels along the entire project corridor.

**Table 2-6** presents the commodity-wise share of the commercial traffic at each of the toll plazas on the project road.

Modes/ Commodity	LCV	Truck	MAV > 2A	LCV	Truck	MAV > 2A	LCV	Truck	MAV > 2A
	Fanda (TP01)			Amlaha (TP02)			Bhourasa (TP03)		
Food Grains and Cash Crops	8.1	10.3	8.7	8.9	4.2	5.8	6.2	4.6	6.3
Fruits & Vegetables	2.9	3.8	2.8	7.7	2.9	2.6	4.4	1.8	2.6
Building Materials	3.2	4.1	5.8	3.8	1.1	9.3	2.9	3.6	4.6
Iron & Steel Products	1.1	0.3	0.4	1.5	2.4	3.6	2.6	2.4	1.7
Petroleum Products, Chemicals and Gas	6.1	15.1	21.5	4.1	11.9	16.7	10.0	13.1	18.8

Modes/ Commodity	LCV	Truck	MAV > 2A	LCV	Truck	MAV > 2A	LCV	Truck	MAV > 2A
	Fanda (TP01)			Amlaha (TP02)			Bhourasa (TP03)		
Heavy Machinery & Industrial Equipment's	0.5	2.4	0.7	0.5	1.1	0.1	1.0	0.9	0.7
Industrial Products	3.4	5.8	4.3	6.0	4.8	5.0	3.8	4.0	6.5
Consumer Items	9.3	11.0	10.2	11.6	9.5	5.1	9.2	10.0	9.3
Automobile and New Chassis	5.2	15.1	7.1	7.2	9.0	9.6	6.6	10.6	8.3
Containers	0.2	0.0	0.0	0.0	0.0	0.0	0.9	0.3	0.3
Ores & Minerals (Coal, Bauxite, limestone)	0.7	0.3	0.0	0.0	0.0	0.3	0.9	0.3	3.0
Miscellaneous Items	8.1	2.1	6.1	5.2	9.0	5.0	5.6	6.1	6.7
Parcels	9.5	8.2	11.3	5.7	8.7	12.1	5.7	10.0	8.2
Empty Vehicles	41.8	21.6	21.2	37.8	35.4	24.7	40.2	32.2	23.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table 2-6: Commodity Distribution at TP01, TP02 and TP03**

- About 6-8 percent of LCV, and around 4-10 percent of Trucks are found to be transporting food grains and cash crops across all the three toll plazas. It is to be noted that majority of the traffic is from Bhopal/Sehore/Astha as these areas are famous for growing the golden grain variety of wheat.
- Also, about 9-11 percent of Trucks are found to be transporting consumer items across all the three toll plazas.
- Around 11-15 percent of Trucks and 16-22 percent of MAV>2A are found to be carrying petroleum/gas products and chemicals across all the three toll plazas. The higher share of petroleum/gas products can be attributed to the presence of BP, IOCL and Reliance Industries bottling plants present at Bhauri near Bhopal.
- About 9-15 percent of Trucks and around 7-10 percent of MAV>2A are found to be transporting automobiles and new chassis. This can be attributed to the automobile manufacturing plants of Eicher, Force motors etc., located near Dewas/Pithampur/Bhopal.
- In case of MAV>2A, about 11.3 percent at TP01, 12.1 percent at TP02 and 8.2 percent at TP03 are found to be transporting parcels. This may be attributed to the increasing e-commerce demand between two major cities at both ends of the project road.

## 3. TRAFFIC GROWTH RATE AND PROJECTIONS

### 3.1 General

As the project road has been executed on a BOT basis with a concession period of 25 years, an estimation of the traffic using the tolled highway and its future growth are important elements to assess the project's economics as these are generally the main/sole source of revenue for the project. This chapter details various aspects of the current traffic of the project road and its growth potential.

### 3.2 Project Road Traffic

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

- Normal Traffic
- Diverted Traffic
- Induced/Developmental Traffic

#### 3.2.1 Normal Traffic

Normal traffic is the traffic which is already plying on the project road as assessed in Table 2.2.

#### 3.2.2 Diverted Traffic

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

In context of the project road, there are no routes in vicinity of toll plazas to avoid the project road. However, in the context of wider network assessment, the development of the proposed green-field Indore – Bhopal Expressway may impact the project road traffic.

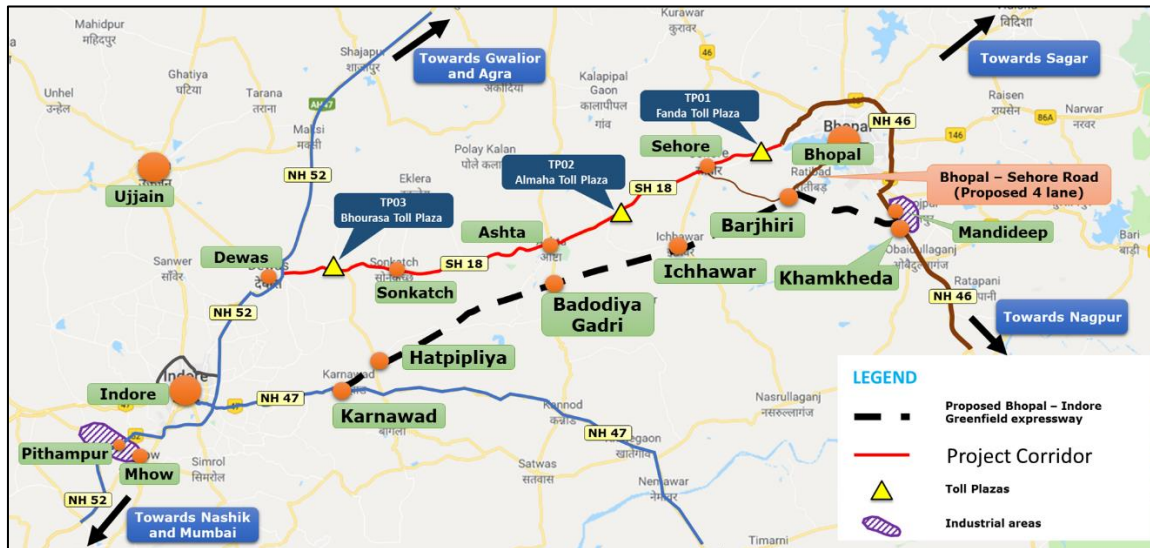
#### **Impact of Indore - Bhopal Expressway**

Indore – Bhopal expressway is a proposed 4-lane access-controlled greenfield expressway connecting Bhopal (the state capital of Madhya Pradesh) to Indore (the commercial capital of Madhya Pradesh) via NH-47. The proposed highway is of 147.763 km starting from Khamkheda on NH-46 (Hoshangabad Road) and passes through Barjhiri, Ichhawar, Badodiya Gadri, Hatpipliya and joins NH-47 near Karnawad. As per limited information available in the public domain, the alignment of the expressway has been finalised and hiring of consultants for EMP preparation is underway. Going by the trend of similar projects being developed as green field facilities, it can be expected that the project (if implemented) will be only operational by 2029. There have been reports



of protest against the concept of new green field facility with involves land acquisition given that the 4-lane project road is under-utilised at present. The construction of this expressway will involve huge cost of land acquisition and construction. The implementation of this expressway will require the forest and environmental clearances (wildlife) as the greenfield alignment passes through the wildlife reserves.

**Figure 3-1** presents the routes from Indore to Bhopal including the Alternate Route.



**Figure 3-1: Route Alignment Map (Project Road and Alternate Route)**

The route via PR is about 189.7 km long. The route via Indore – Bhopal Expressway (AR1) is 173.76 km long and is about 15.94 km shorter than through PR. The per km toll rates on the expressway will be significantly higher (1.5 times of the normal NHAI per km toll rates accounting for 1.25 times for normal length of expressway and increase for the likely equivalent structure length) than the project road toll rates.

Since, it is cheaper to widen the existing highway to a six-lane facility and at present it is underutilised by traffic, it is highly unlikely that this expressway will get the required clearance and taken up for implementation.

### 3.2.3 Induced/ Developmental traffic

Developmental /new generated traffic is the one which would be generated, over and above normal growth, because of lowering of transport costs or new developments in the immediate influence area of the project road.

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

It will connect 550 district headquarters to minimum 4-lane highway by raising the number of corridors to 50 (from current 6) and move 80 percent freight traffic (currently



40 percent) to national highways by connecting 24 logistics parks and 7 north east multimodal waterway ports.

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

In the context of the project influence area, the Kandla – Sagar economic corridor has been proposed to pass through Dewas and Bhopal while two more inter-corridor roads, Betul – Bhopal and Dewas – Ujjain – Ratlam, have also been proposed.

As the project road is a part of the Kandla-Sagar economic corridor, it is likely to remain an important highway for the East/West movement and may see sustained growth in the future. This has been considered while setting out traffic growth rates for rest of the concession period.

### **3.3 Methodology for Traffic Growth Rate Estimation**

#### **3.3.1 Methodology**

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

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

$\text{Log}_e (P) = A_0 + A_1 \text{Log}_e (EI)$ , where:

P = Traffic Volume

EI = Economic Indicator

A0 = Regression constant

A1 = Regression co-efficient (Elasticity Index).

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

- Identify the influence area - From the analysis of travel patterns observed during the OD surveys, the project influencing states and districts, which are likely to impact the traffic growth on the project road, were identified.
- Review Past traffic Data – Based on data points available for the project corridor from different sources a review of past traffic and tonnage growth is carried out.

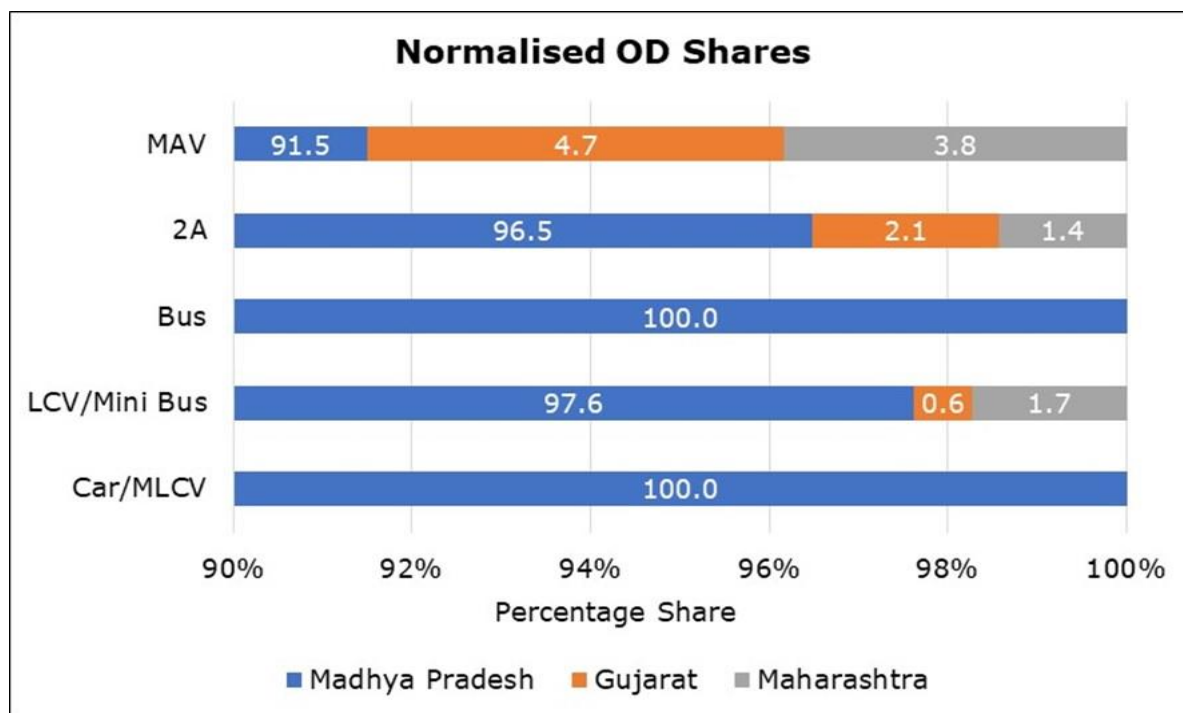
- Analysis of economic growth of the Project Influencing Area (PIA) - For each PIA state an economic profile describing past performance and future outlook was prepared. This also considers India’s past economic performance and its future outlook.
- Estimation of traffic elasticity to income – in order to translate economic growth into traffic growth, an elasticity factor was estimated.
- Derivation of traffic growth rates – On the basis of the traffic weighted PIA outlook and related traffic elasticity, traffic growth rates were estimated.

The methodology thus adopted incorporates, as basic data inputs, the perspective growth envisaged in the influence area and the changes in transport demand elasticities over a period of time. The traffic growth rates by vehicle type for the project road have been determined till FY34 in line with the maximum possible extension of the concession period.

### 3.4 Identification of PIA States

The travel pattern as derived from origin and destination survey analysis reveals the predominance of Madhya Pradesh in both passenger and freight vehicles. Besides Madhya Pradesh, the states of Gujarat and Maharashtra do contribute to the project road traffic.

The normalised shares of all the influencing states for the combined for the three toll plaza locations on the project road are presented in **Figure 3-2**.



**Figure 3-2 Normalised OD Shares for the Project Road**

Cars and Buses are entirely generated from the state of Madhya Pradesh. In case of LCVs, about 97.6 percent is from Madhya Pradesh whereas, Gujarat and Maharashtra contribute to a nominal share in the LCV traffic.

In 2A trucks, Madhya Pradesh has a share of about 96.5 percent, Gujarat contributes about 2.1 percent and Maharashtra contributes to around 1.4 percent. In case of MAV trucks, a major percentage of 91.5 percent is from Madhya Pradesh followed by 4.7 percent from Gujarat and 3.8 percent from Maharashtra.

In view of the above regional distribution, the state of Madhya Pradesh has been considered as the PIA state for passenger modes. Along with Madhya Pradesh, the states of Gujarat and Maharashtra have been considered as the PIA states for the freight vehicles.

### **3.5 Past Economic Growth of PIA**

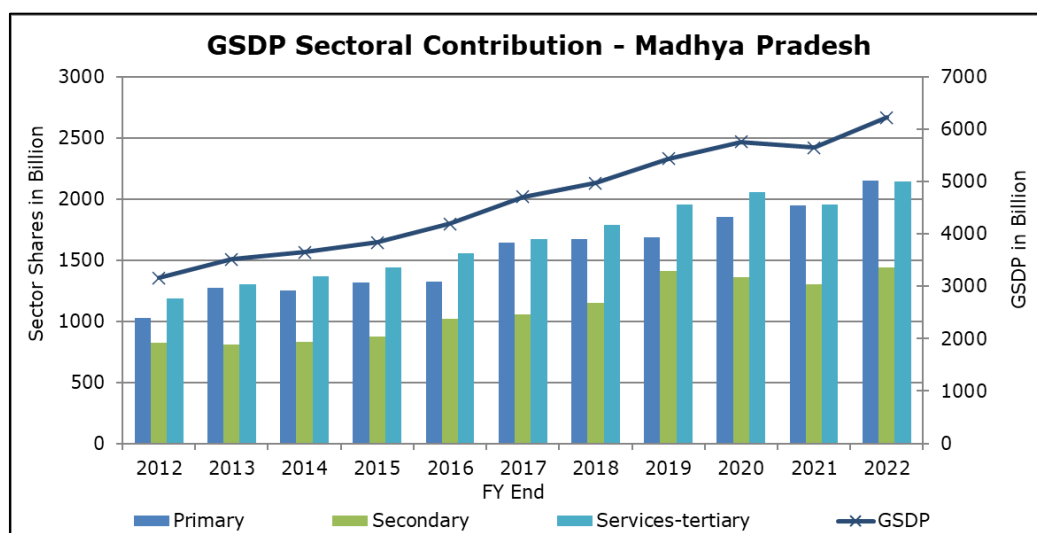
Growth of traffic on the project road depends on existing developments and future growth prospects of the connecting regions. A number of economic indicators for the PIA state, as published by Central Statistical Organisation (2011/12 prices), have been studied to assess their past performance.

#### **Primary PIA State - Madhya Pradesh**

The state of Madhya Pradesh has been considered as the Primary PIA state, as it contributes the majority share of traffic on the project road. Past economic performance of the state has been as follows:

- Madhya Pradesh's Gross State Domestic Product (GSDP) stood at Rs 5,755.5 billion in FY20 and has been growing at a compounded annual growth rate of 7.8 percent since FY12. The GSDP estimates for the year FY22 is Rs 6,216.5 billion and exhibits a growth of 10 percent over FY21 due to low base affect.
- The state's growth has been growing between 5-12 percent since 2015-16. It has shown a growth of around 5.9 percent in FY20.
- The services sector is the largest contributor to GSDP (39.0 percent), agriculture allied activities sector at 35.2 percent and secondary sector at 25.9 percent of the GSDP in 2019-20.

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



**Figure 3-3: GSDP (in Rs billion) and its Sectoral Composition for Madhya Pradesh**

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

Particulars	2011-12 to 2019-20	2014-15 to 2019-20
GSDP	7.8	8.5
Agriculture and Allied	6.9	7.2
Industry	7.8	9.8
Services	7.1	7.4
Construction	3.9	5.5
Per Capita Income	6.2	6.9

**Table 3-1 : Average Annual Growth Rates (%) of State Income for Madhya Pradesh**

Madhya Pradesh is a predominant exporter of drug formulations and biologicals, AC, refrigeration machinery and oil meals.

Currently, the state has five operational Special Economic Zones (SEZs). Also, 12 more have been formally approved and 6 have been notified. These SEZs are dispersed over a manifold range of sectors including IT/ITeS, mineral-based, agro-based and multi-products etc. Jabalpur, Gwalior, Bhopal and Indore are the major hubs where the SEZs have been approved.

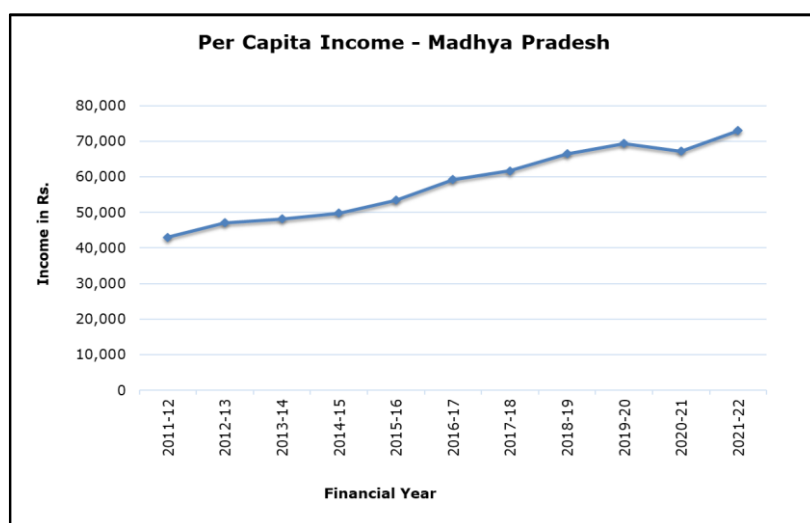
Madhya Pradesh State Industrial Development Corporation Limited (MPSIDC) is a body set up for promoting and facilitating industrial development in the state. The body has promoted growth centers in seven decisive districts of the state: Bhopal, Gwalior, Jabalpur, Indore, Rewa, Ujjain and Sagar.

In order to attract high investments and catalyze growth, the state is highlighting the need to facilitate the road infrastructure development. In August 2022, Mr. Nitin Gadkari, Minister of Road Transport & Highways inaugurated and laid foundation stone of 6 National Highway projects of 119 kms worth Rs. 2,300 crore (US\$ 279.18 million) in Indore, Madhya Pradesh.

According to the Department for Promotion of Industry and Internal Trade (DPIIT), cumulative FDI inflow in Madhya Pradesh was valued at US\$ 508.98 million between October 2019- June 2022.

The state houses 280 pharmaceutical units belonging to evident global and national players like Cipla, Lupin, Mylan, etc. In FY22 formulations and biological product exports from Madhya Pradesh stood at 13% (worth US\$ 1084.41 million).

The per capita income of Madhya Pradesh is Rs 73,034 in the year 2021-22 and has been growing at 5.5 percent during 2011-12 to 2021-22. The growth in per capita income is presented in **Figure 3-4**.



**Figure 3-4: Per Capita Income of Madhya Pradesh 2011-12 to 2021-22**

### Other PIA States

The other PIA states contributing to the traffic on the project road are Gujarat and Maharashtra. Economic indicators of PIA states are as follows.

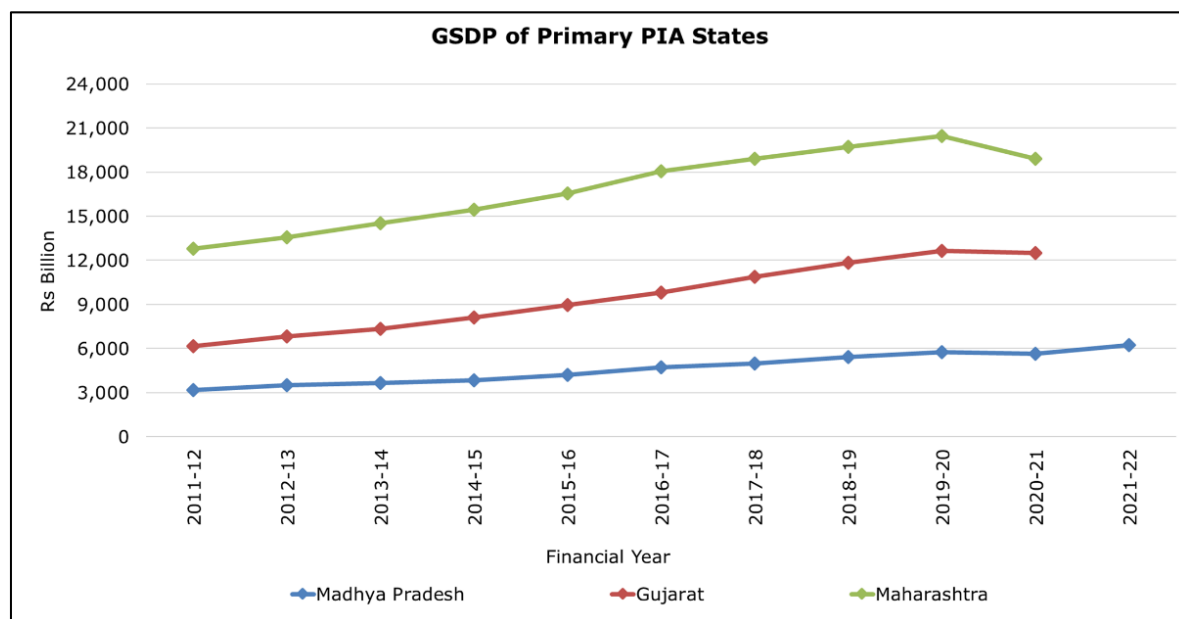
- Gujarat's Gross State Domestic Product (GSDP) stood at Rs 12,652.8 billion in 2019-20 and has been growing at a compounded annual growth rate of 9.6 percent since 2011-12.
- Gross State Domestic Product (GSDP) of Maharashtra stood at Rs 20,439.8 billion in 2019-20 and has been growing at a compounded annual growth rate of 6.3 percent since 2011-12. The state has shown a negative growth of 7.6 percent in FY21 due to the impact of COVID-19.
- The secondary sector is the largest contributor to GSDP of the PIA state of Gujarat, 46.3 percent whereas for the state of Maharashtra, services sector is the largest contributor to GSDP with 57.6 percent.

The average annual growth rates as obtained using regression analysis till the last available year are presented in **Table 3-2**.

State/Particular	Gujarat	Maharashtra
	2011-12 to 2019-20	
GSDP	9.6	6.3
Primary	6.5	2.7
Secondary	10.9	5.4
Tertiary	8.6	7.5
Construction	3.7	3.1
Per Capita Income	8.2	5.2

**Table 3-2: Average Annual Growth Rates (%) of State Income for other PIA States**

The GSDP over the years for the states of Madhya Pradesh, Gujarat and Maharashtra are presented in **Figure 3-5**.

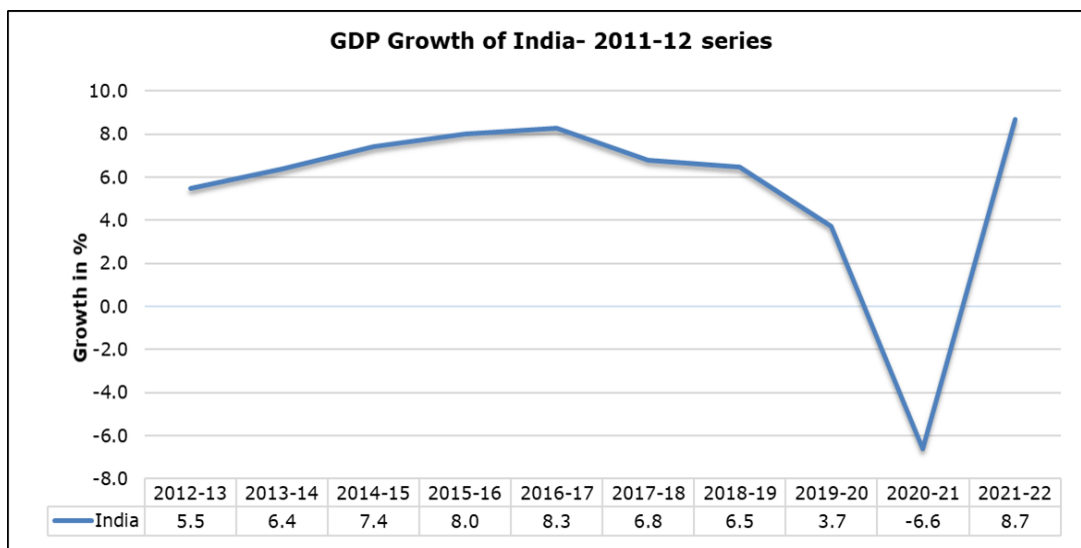


**Figure 3-5: GSDP (in Rs Billion) for Influencing PIA States**

### 3.6 India and PIA Outlook

#### 3.6.1 India’s past performance and outlook for future

India’s growth trend during the recent years has been presented in **Figure 3-6**.



**Figure 3-6: GDP Growth in India**

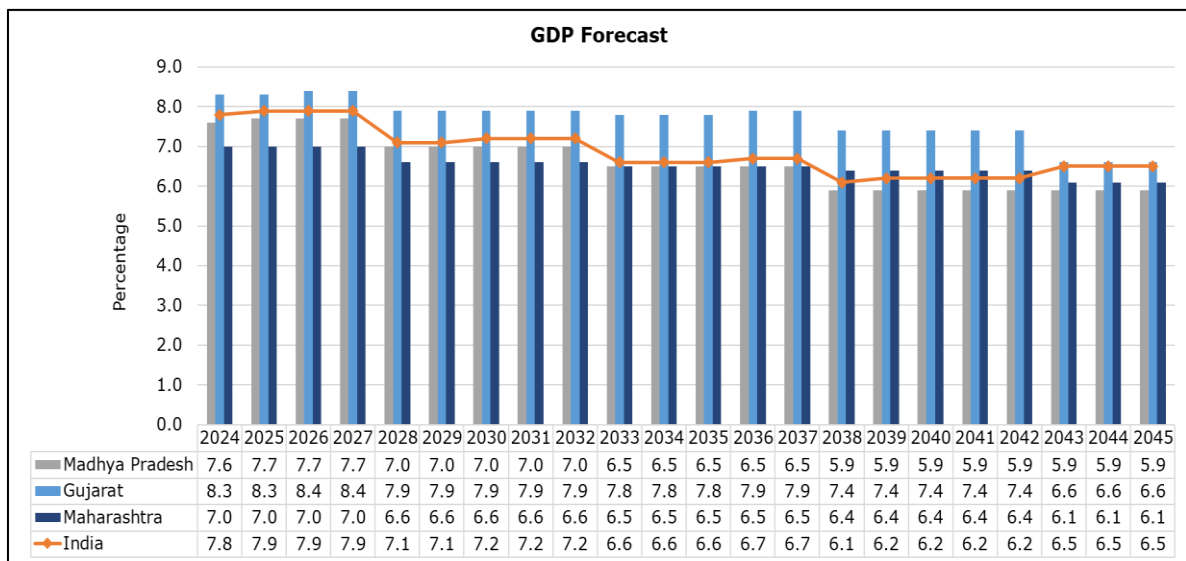
Economic growth in India has been broadly on an accelerating path till FY18. It is likely to be the fastest growing major economy in the world in the medium-term. The growth in real GDP was 8.3 percent for FY17 and 6.8 percent in FY18, while the growth in FY19 was slightly lower at 6.5 percent. The long-term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

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

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

In light of the outlook being predicted by various agencies for the current years and likely revival thereafter spread over a couple of years, the year-on-year growth for Indian economy and PIA states as provided by the client from FY24 and beyond is presented in

**Figure 3-7.**



**Figure 3-7: GDP Forecast**

### 3.6.2 PIA States Outlook

A snapshot of the main economic indicators in the past for the PIA states is presented in

**Table 3-3.**

Indicators	Madhya Pradesh	Gujarat	Maharashtra
GSDP in Rs Billion (in FY20)	5,755.5	12,652.8	20,439.8
GSDP growth (FY12 to FY20)	7.8	9.6	6.3
Per capita Income in Rs (FY20)	69,429	186,980	166,422
Sector Share (%) in FY20			
Agriculture and allied	35.2	17.2	13.9
Industry	25.9	46.3	28.5
Services	39.0	36.4	57.6

**Table 3-3: Main Economic Indicators of PIA States**

Based on the OD shares of the toll plaza location and the outlooks adopted for PIA states, the future weighted income for different vehicle types is presented in **Table 3-4.**

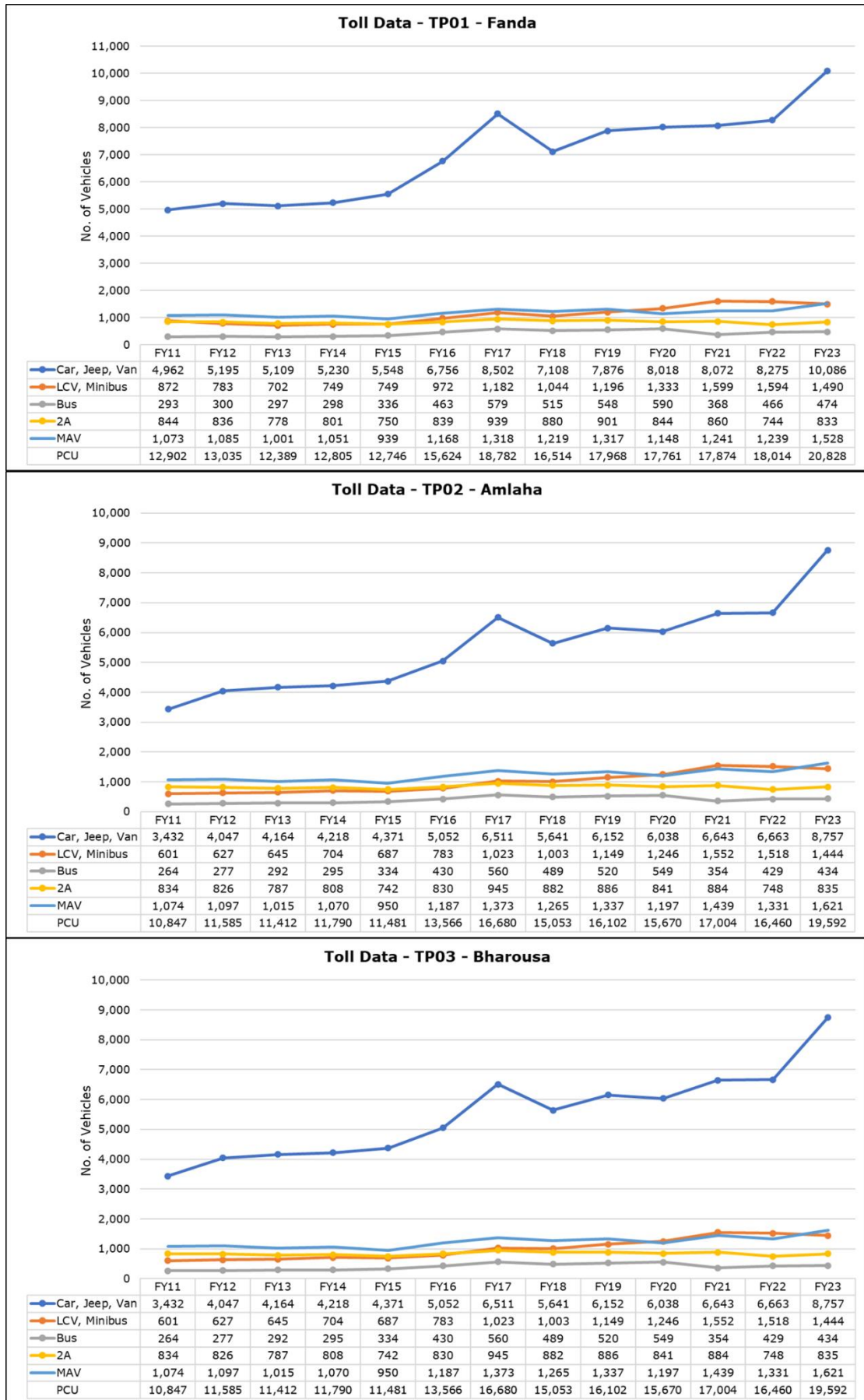
FY End/Mode	Car	MLCV/LCV/M Bus	Bus	2A	MAV
2024	7.6	7.6	7.6	7.6	7.6
2025	7.7	7.7	7.7	7.7	7.7
2026	7.7	7.7	7.7	7.7	7.7
2027	7.7	7.7	7.7	7.7	7.7
2028	7.0	7.0	7.0	7.0	7.0
2029	7.0	7.0	7.0	7.0	7.0
2030	7.0	7.0	7.0	7.0	7.0
2031	7.0	7.0	7.0	7.0	7.0
2032	7.0	7.0	7.0	7.0	7.0
2033	6.5	6.5	6.5	6.6	6.6
2034	6.5	6.5	6.5	6.6	6.6

**Table 3-4: Future Perspective of PIA Weighted Income**

### 3.7 Past Traffic Data on Project Road

The toll traffic data for the project road from the date of operation till March 2023 was provided by the client. The past traffic data along with the FY23 AADT is presented in **Figure 3-8.**





**Figure 3-8: Past Traffic Data at the Project Road**

A time series analysis of the traffic data and comparison of the yearly averages with the FY23 AADT including exemptions and violations is presented in **Table 3-5**.

FY/Mode	CJV	MLCV/LCV /M Bus	Bus	2A	MAV	PCU
<b>TP01- Fanda</b>						
<b>Trendline Growth in %</b>						
FY11 vs FY23	5.9	7.3	5.1	0.2	2.6	4.3
FY15 vs FY23	5.2	8.8	1.1	-0.3	3.3	4.0
FY19 vs FY23	5.4	6.4	-5.1	-2.8	3.8	3.1
FY20 vs FY23	7.4	3.4	-4.1	-1.8	9.0	5.0
<b>TP02-Amlaha</b>						
<b>Trendline Growth in %</b>						
FY11 vs FY23	6.7	9.3	5.0	0.3	3.3	4.8
FY15 vs FY23	6.4	10.5	0.4	0.0	4.3	4.8
FY19 vs FY23	8.4	6.8	-5.9	-2.3	5.0	4.5
FY20 vs FY23	11.8	4.3	-5.0	-1.9	8.7	6.6
<b>TP03- Bhourasa</b>						
<b>Trendline Growth in %</b>						
FY11 vs FY23	6.5	8.1	4.1	-2.1	1.8	3.6
FY15 vs FY23	5.3	8.3	0.5	-2.9	3.2	3.4
FY19 vs FY23	7.4	6.9	-6.2	-3.2	4.7	4.0
FY20 vs FY23	9.4	5.1	-5.8	-2.1	8.4	5.7

**Table 3-5: Past Toll Data Traffic Comparison**

The comparison of past data across the toll plazas shows average trend line growth for car traffic of 6-7 percent between FY11 to FY23 across the three toll plazas. The slowdown in FY20 can be attributed to manufacturers deciding to reduce production of diesel cars in the near-future, technology disruption in the form of compliance to Bharat Stage VI norms, economic downturn and COVID 19.

LCV category has shown 8-11 percent trendline growth from FY15 to FY23 across the three plazas. In 2A truck category, around 0.2 percent and 0.3 percent of trend line growth is seen between FY11 and FY23 at TP01 and TP02 respectively; TP03 has shown a negative growth of 2.1 percent. In case of MAVs category, the trend line growth of around 3-4 percent is witnessed between FY15 and FY23 across the three toll plazas. Higher MAV growth has been observed in FY18 at TP03 due to damage of a bridge on the NH3 on adjoining Dewas-Shivpuri stretch (in March-April 2017) which possibly diverted some of the MAV traffic to TP03 of DBCPL stretch. The traffic has possibly diverted back to NH-3 in FY20.

The other main factors that might have impacted the traffic in the past include the impact of demonetisation in November 2016, GST in July 2017, all India truckers' strike in July 2018, revision of permissible Gross Vehicle Weights (GVW) for freight vehicle as per the new notification released by NHA1 on 18th July, 2018 and the impact of country wide/ state lockdowns starting from March 2020 and continuing in few months of FY21.

### 3.8 Past and Future Transport Demand Elasticity

The econometric model applied for the project, relates traffic growth to changes in state domestic product via an elasticity factor according to IRC guidelines. The elasticity by

vehicle types have been estimated based on the regression analysis of weighted income of PIA states with the actual traffic data.

A regression between GSDP (as independent variable) and registered vehicles (as dependant variable) of Madhya Pradesh during FY12 to FY19 was carried out which showed elasticities of 1.1 and 1.5 in cars and trucks respectively.

The best measure of deriving traffic elasticity to income is time series data of traffic on the road. In case of the project road, past traffic data is available since the year of operation of the toll plaza. The YOY mode wise traffic elasticity has been derived using rate of growth in the traffic vis a vis the rate of growth in income (weighted income derived from weighted OD shares). The elasticity estimates for different time periods have been done using regression analysis with mode wise traffic as dependent variable and weighted income as independent variable. The point-to-point year on year and trend line elasticity for different modes is presented in **Table 3-6**.

Period/Modes	CJV	MLCV/LCV/M Bus	Bus	2A	MAV> 2 Axle
<b>TP01-Fanda</b>					
<b>YOY Elasticity</b>					
FY13 vs FY12	-0.1	-0.9	-0.1	-0.6	-0.7
FY14 vs FY13	0.6	1.6	0.1	0.7	1.1
FY15 vs FY14	1.2	0.0	2.5	-1.2	-1.9
FY16 vs FY15	2.4	3.3	4.2	1.3	2.7
FY17 vs FY16	2.1	1.8	2.0	1.0	1.1
FY18 vs FY17	-2.9	-2.1	-2.0	-1.1	-1.3
FY19 vs FY18	1.2	1.6	0.7	0.3	0.9
FY20 vs FY19	0.3	2.0	1.3	-1.1	-2.2
FY21 vs FY20	-0.4	-8.9	19.6	-0.9	-3.2
FY22 vs FY21	0.2	0.0	2.6	-1.4	0.0
FY23 vs FY22	2.8	-0.8	0.2	1.5	3.0
<b>Trend Line Elasticity</b>					
FY12 vs FY23	0.9	1.2	0.8	0.1	0.4
FY15 vs FY23	0.8	1.3	0.3	0.0	0.6
FY19 vs FY23	1.1	0.8	-0.3	-0.5	0.9
FY20 vs FY23	1.3	0.1	0.3	-0.3	1.4
<b>TP02- Amlaha</b>					
<b>YOY Elasticity</b>					
FY13 vs FY12	0.3	0.3	0.5	-0.4	-0.7
FY14 vs FY13	0.3	2.2	0.3	0.7	1.2
FY15 vs FY14	0.7	-0.5	2.6	-1.5	-1.9
FY16 vs FY15	1.7	1.6	3.2	1.3	2.8
FY17 vs FY16	2.3	2.5	2.4	1.1	1.3
FY18 vs FY17	-2.4	-0.3	-2.2	-1.2	-1.3
FY19 vs FY18	1.0	1.6	0.7	0.0	0.7
FY20 vs FY19	-0.3	1.5	0.9	-0.8	-1.8
FY21 vs FY20	-5.2	-10.9	18.5	-2.4	-8.0
FY22 vs FY21	0.0	-0.2	2.1	-1.6	-0.8
FY23 vs FY22	4.0	-0.6	0.2	1.5	2.8

Period/Modes	CJV	MLCV/LCV/M Bus	Bus	2A	MAV > 2 Axle
<b>Trend Line Elasticity</b>					
FY12 vs FY23	0.9	1.4	0.7	0.1	0.5
FY15 vs FY23	0.9	1.5	0.2	0.0	0.7
FY19 vs FY23	1.5	0.8	-0.5	-0.5	0.8
FY20 vs FY23	1.8	0.2	0.1	-0.4	1.1
<b>TP03- Bhourasa</b>					
<b>YOY Elasticity</b>					
FY13 vs FY12	-0.2	-1.5	-0.1	-1.2	-1.1
FY14 vs FY13	1.4	1.9	0.6	-0.3	-1.2
FY15 vs FY14	2.0	1.2	2.2	-0.7	-1.5
FY16 vs FY15	2.0	4.2	3.4	1.2	2.4
FY17 vs FY16	2.3	2.4	1.1	0.9	1.1
FY18 vs FY17	-2.6	-2.0	-0.4	-1.9	-0.8
FY19 vs FY18	0.3	0.5	0.6	-0.7	0.0
FY20 vs FY19	0.4	1.7	1.2	-1.3	-1.9
FY21 vs FY20	-2.7	-7.3	19.3	-2.0	-7.1
FY22 vs FY21	0.5	0.1	2.5	-1.6	-0.5
FY23 vs FY22	2.5	0.1	-0.5	1.7	2.3
<b>Trend Line Elasticity</b>					
FY12 vs FY23	0.9	1.3	0.7	-0.3	0.3
FY15 vs FY23	0.8	1.3	0.2	-0.4	0.5
FY19 vs FY23	1.4	1.0	-0.5	-0.6	0.8
FY20 vs FY23	1.5	0.5	0.0	-0.4	1.1

**Table 3-6: Actual Past Traffic Elasticity****Cars**

- The elasticities and the past growth levels for cars are a result of increasing income levels, increasing vehicle ownership and higher propensity to travel on highways in India due to network level developments and higher levels of service. These levels of growth are likely to continue in the near to medium term since car ownership levels are still very low and the road network is undergoing continual development. Actual trend line elasticity for the period FY15/ FY19 to FY23 has been varying between 1.1 to 1.5 in the past across the three toll plazas. This high elasticity is a combination of the impacts witnessed due to covid 19 resulting in a higher elasticity due to low base effects in FY21 and FY22.
- It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. CJV elasticity has been considered as 0.9 for the toll plazas up to FY30 and tapered in subsequent years.
- The motorisation levels in India also play an important role in determining car growth. With the increasing car ownership levels, propensity to travel and network level improvements on National Highways, car growth is likely to be at a high rate as witnessed in the recent past. The low motorization rate suggests that there is room

for continued growth for many years to come. With the continual increase in motorization rate and improved road network usage by cars for inter-urban travel, car growth is expected to be robust in India.

### **Bus**

- Over the years in India there has been a change in passenger's travel mode preferences with increasingly more people shifting from public transport systems towards personalised modes. This has resulted in elasticity of bus traffic/demand to GSDP majorly varying between 0.4 and 0.8 during different time periods (FY15/FY16 to FY19) across the two toll plazas and different national highways.
- The project road has witnessed an elasticity of 0.7 or 0.8 across the three toll plazas for the period FY12 to FY23. An elasticity of 0.7 has been adopted for all the toll plazas till the end of the concession period.

### **Truck and MAV**

- The switch between MLCV and LCV is being observed across other national highways wherein MLCVs have been gaining importance lately over LCV category. Actual trend line elasticity for LCV including MLCV in FY15 to FY23 has been 1.3-1.5 at both toll plazas. For future, 1.1 has been adopted till FY25 and further tapered to 0.9 for all the toll plazas till the end of concession period.
- Considering the ongoing technical advancements in automobile industry, some of the standard 2 Axle/ 3 Axle trucks are gradually being replaced by MAVs. In quite a few highways now, after a rapid decline over the years, 2A/3A trucks now with lower base have started showing growth trend due to their preference to cater to the local supplies of the region. In light of these changing freight composition in the automobile industry and giving due consideration to the freight mix on the PR, an elasticity of 0.2 for 2A trucks has been adopted for the toll plazas till the end of concession period.
- The elasticity values achieved in the past for 3A/MAV at all toll plaza locations is varying around 0.4-0.7 in the long-term trend analysis. In case of MAV, an elasticity of 0.5 has been adopted for all the toll plazas till the end of concession.
- It is likely that this growth would slow down over time as the market becomes more mature and saturated, therefore elasticity to GSDP can be expected to decline over time. With the anticipated growth momentum in the coming years, higher elasticity values have been considered in the initial slabs for cars and further tapering has been done in the future slabs.

In India as a whole, the freight vehicle mix has been changing in the last decade favouring MAV to 2 Axle/ 3 Axle vehicles for long-distance traffic, given the operational efficiencies achievable with larger vehicles. Considering the ongoing technical advancements in automobile industry, some of the standard 2 Axle/ 3 Axle trucks would gradually be

replaced by MAVs. Mature national highways with tolling in operation for few years, have already witnessed the shift in 2A/3A trucks to MAV for long distance movement. As per the latest industry trends, there is a shift happening between various categories of MAVs also - 4A, 5A and 6A and above. 4A trucks are likely to see a replacement soon to 5A and above axle trucks which can carry more tonnage as compared to 4A trucks.

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

Giving due consideration to the growth momentum being witnessed in the immediate past, higher elasticity values have been considered for the slab up to FY25 and further tapering has been done in the next slab. The recommended elasticity values adopted for all vehicle types in line with the past traffic data and changes in freight traffic pattern observed on the project road are presented **Table 3-7**.

FY/Modes	Cars	MLCV/LCV /M Bus	Bus	2A	MAV
Up to 2025	0.9	1.1	0.7	0.2	0.5
2025-2030	0.9	1.0	0.7	0.2	0.5
Beyond 2030	0.8	0.9	0.7	0.2	0.5

**Table 3-7: Recommended Elasticity for Project Road**

### 3.9 Projected Traffic Growth Rates

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

$$T_{gr} = (GSDP_{gr}) \times E$$

Where,

$T_{gr}$  – Traffic growth rate for mode

$GSDP_{gr}$  – Growth rate of GSDP

E – Elasticity value for mode

The estimated traffic growth rates for the project road have been presented in **Table 3-8**.

FY End/Mode	Car	MLCV/LC V/M Bus	Bus	2A	MAV
2024	6.8	8.3	5.3	1.5	3.8
2025	6.9	8.4	5.4	1.5	3.8
2026	6.9	7.7	5.4	1.5	3.8
2027	6.9	7.7	5.4	1.5	3.8
2028	6.3	7.0	4.9	1.4	3.5

FY End/Mode	Car	MLCV/LC V/M Bus	Bus	2A	MAV
2029	6.3	7.0	4.9	1.4	3.5
2030	6.3	7.0	4.9	1.4	3.5
2031	5.6	6.3	4.9	1.4	3.5
2032	5.6	6.3	4.9	1.4	3.5
2033	5.2	5.9	4.6	1.3	3.3
2034	5.2	5.9	4.6	1.3	3.3

**Table 3-8: Projected Traffic Growth Rates for Project Road (%)**

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

### 3.10 Traffic Projections and Capacity Analysis on PR

**Table 3-9** presents the projections of the total traffic at the toll plazas on the project road using the above growth rates till the end of concession as assessed in this study.

FY Ending March /TP	TP01- Fanda	TP02- Amlaha	TP03- Bhourasa	Average
2023	22,425	21,308	23,088	22,274
2024	23,649	22,445	24,326	23,473
2025	24,966	23,666	25,658	24,763
2026	26,346	24,944	27,051	26,114
2027	27,813	26,301	28,529	27,547
2028	29,231	27,612	29,959	28,934
2029	30,731	28,998	31,469	30,399
2030	32,316	30,461	33,065	31,947
2031	33,855	31,885	34,618	33,453
2032	35,473	33,383	36,251	35,036
2033	37,059	34,850	37,850	36,586
2034	38,721	36,387	39,526	38,211

**Table 3-9: Projected Traffic in PCUs at Toll Plazas**

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

## 4. TOLL REVENUE PROJECTIONS

### 4.1 Tolling Strategy

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

As per the Concession Agreement, there are three operational toll plazas at Fanda, Amlaha and Bhaourasa with tolling lengths of 31.6 km, 40.0 km and 69.19 km respectively. It is worth mentioning that the user could earlier buy the ticket for all the plazas from any toll plaza and the users can show the barcoded ticket while crossing the other plazas. The practice has been recently stopped.

### 4.2 Schedule of User Fee

As per Schedule of User Fee (Schedule C) of Concession Agreement for the project, the per km toll rates applicable from 2006/07 for normal tolling length on the rate revision basis and concessions are provided.

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

#### Normal Ticket:

Traffic purchasing single journey ticket.

#### Monthly Pass

The rate of monthly pass shall be based on the toll charges for the single ticket on the same day and calculated for the month of consisting of 30 or 31 days.

#### Local Personal

Car Traffic from local areas around toll plazas is issued a local personal monthly.

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

- (i) Traffic paying normal toll rates (single trip)
- (ii) Traffic paying monthly pass rates
- (iii) Traffic paying local personal rates

### 4.3 Tolling Streams

In line with the above categories of toll payments, a segmentation of total traffic was done. The tolling stream distribution derived the latest year of FY23 (average of April to March) toll data for each of the toll plaza has been adopted for the present study and is presented in **Table 4-1**.

Ticket Type/Modes	Car	MLCV/LC V/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer
<b>TP01-Fanda</b>						
Single Traffic Fanda	85.5	83.2	94.1	99.2	99.5	97.8
Single Traffic Amlaha	0.0	0.0	0.0	0.0	0.0	0.0



Ticket Type/Modes	Car	MLCV/LC V/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer
Single Traffic Bhourasa	0.0	0.0	0.0	0.0	0.0	0.0
Barcode Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Monthly Pass Journeys	2.1	7.9	2.8	0.1	0.4	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Exemptions	12.3	8.8	3.1	0.7	0.1	2.2
Violations	0.1	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>TP02-Amlaha</b>						
Single Traffic Amlaha	88.2	87.5	95.2	99.1	99.7	97.9
Single Traffic Fanda	0.0	0.0	0.0	0.0	0.0	0.0
Single Traffic Bhourasa	0.0	0.0	0.0	0.0	0.0	0.0
Barcode Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Monthly Pass Journeys	0.8	1.5	1.3	0.0	0.0	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Local 50 Discount Traffic Amlaha	0.0	0.0	0.0	0.0	0.1	0.0
Exemptions	10.9	11.0	3.4	0.9	0.2	2.1
Violations	0.1	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>TP03 -Bhourasa</b>						
Single Traffic Bhourasa	76.0	78.3	93.4	95.9	97.4	97.7
Single Traffic Amlaha	0.0	0.0	0.0	0.0	0.0	0.0
Single Traffic Fanda	0.0	0.0	0.0	0.0	0.0	0.0
Barcode Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Monthly Pass Journeys	0.8	5.0	0.9	0.0	0.0	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Local 50 Discount Traffic Bhourasa	0.0	1.6	0.5	0.7	0.0	0.0
Local Special scheme	0	0	0	0	0	0
Exemptions	22.8	11.6	3.4	1.8	1.5	1.4
Violations	0.0	3.5	1.9	1.5	1.0	0.9
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

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

The paying traffic for the year FY23 (April to March) has been worked out by deducting the barcode journeys, toll exempt percentage (exemptions and violations) from total AADT and is presented in **Table 4-2**.

TP/Mode	Car	MLCV/LC V/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer	PCU
<b>AADT</b>							
TP1	10,086	1,490	474	833	1,526	2	22,425
TP2	8,757	1,444	434	835	1,620	1	21,308
TP3	9,538	1,659	441	896	1,747	1	23,088
<b>Exemption and violation (%)</b>							
TP1	12.4	8.9	3.1	0.7	0.1	2.2	
TP2	10.9	11.0	3.4	0.9	0.3	2.1	
TP3	22.8	15.0	5.3	3.3	2.5	2.3	
<b>Tollable traffic</b>							
TP1	8,840	1,358	459	827	1,524	2	20,910

TP/Mode	Car	MLCV/LC V/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer	PCU
TP2	7,803	1,285	419	828	1,615	1	21,308
TP3	7,360	1,409	418	866	1,703	1	20,197

**Table 4-2: Toll Paying Traffic, FY23**

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

Ticket Type/Modes	Car	MLCV/LCV/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer
<b>TP01-Fanda</b>						
Single Traffic Fanda	97.6	91.3	97.0	99.9	99.6	100.0
Monthly Pass Journeys	2.4	8.7	3.0	0.1	0.4	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Local 50% Discount Traffic Fanda	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>TP02-Amlaha</b>						
Single Traffic Amlaha	99.1	98.2	98.7	100.0	100.0	100.0
Monthly Pass Journeys	0.9	1.8	1.3	0.0	0.0	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Local 50% Discount Traffic Amlaha	0.0	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>
<b>TP03 -Bhourasa</b>						
Single Traffic Bhourasa	98.5	92.2	98.7	99.3	100.0	100.0
Monthly Pass Journeys	1.0	6.0	0.9	0.0	0.0	0.0
Local Pass Journeys	0.0	0.0	0.0	0.0	0.0	0.0
Local 50% Discount Traffic Bhourasa	0.0	1.8	0.4	0.7	0.0	0.0
Local Special scheme	0.5	0.0	0.0	0.0	0.0	0.0
<b>Total</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>	<b>100.0</b>

**Table 4-3: Tolling Distribution for the Project Road Excluding Barcode Journeys, Exemptions and Violations (in %)**

The normal toll paying traffic (purchasing for crossing only the corresponding toll plaza) for cars is around 97-99 percent at all the three toll plazas. In case of MAV>2 Axle, the same shares are around 99-100 percent at the three plazas.

The monthly pass trip rates as derived from the toll data are presented in **Table 4-4**.

Toll Plaza/Modes	Car	MLCV/LCV /M Bus	Bus	Truck	MAV > 2 Axle
Fanda	1.34	3.66	1.52	1.99	4.41
Amlaha	1.40	3.87	1.42	2.00	2.00
Bhourasa	1.32	4.08	0.43	2.00	2.00

**Table 4-4: Monthly Pass Trip Rates**

The trip rate derived from the toll data for car users availing monthly pass at TP01 is 1.34 while at TP02 it is 1.40 and at TP03, it is 1.32.

#### 4.4 Toll Rates

This section presents details on the toll rates that are likely to be imposed on the users of the project road during the concession period. The toll rates (Rs/km) for the base year 2006-07 for different vehicle categories as per concession agreement are presented in **Table 4-5**.

Mode	Base rate per km (in Rs) as per CA
Car, Jeep, Van	0.4
LCV	0.9
Bus	1.8
2 Axle Truck	2.1
MAV	4.2

**Table 4-5: Toll Rates in Rs/km for Different Vehicle Categories**

The CA states that the 2006 toll rates shall be increased by seven percent each year with effect from the 1st day of April 2008 and such increased rate shall be deemed to be the base rate for the subsequent years.

The stream of toll rates to be charged at the toll plazas for cardinal years is presented in **Table 4-6**. The toll fee has been rounded to nearest Rupees as per Schedule C of the concession agreement.

FY Ending March /Mode	Car	MLCV/LC V/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer
<b>TP01-Fanda</b>						
2023	31	74	153	184	367	367
2025	35	84	175	210	420	420
2030	49	118	246	295	589	589
2034	65	155	322	387	772	772
<b>TP02-Amlaha</b>						
2023	39	93	194	233	464	464
2025	45	107	222	266	531	531
2030	63	150	311	374	745	745
2034	82	196	408	490	977	977
<b>TP03 -Bhourasa</b>						
2023	67	161	335	402	803	803
2025	77	185	384	461	919	919
2030	108	259	538	646	1,289	1,289
2034	142	340	705	847	1,690	1,690

**Table 4-6: Toll Rates at the Three Toll Plazas (in Rs)**

The users purchasing local commercial tickets will pay 50 percent of the above normal toll rates; the traffic opting for monthly passes will pay 30 times the normal traffic toll rates. All passes have been rounded to the nearest Rupees as per concession agreement.

#### 4.5 Projected Tollable Traffic

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

FY Ending March	Tollable Traffic in PCU			
	TP01-Fanda	TP02-Amlaha	TP03-Bhourasa	Average
2023	20,910	20,029	20,197	20,379
2024	22,030	21,077	21,243	21,450
2025	23,233	22,202	22,367	22,601
2026	24,494	23,380	23,540	23,805
2027	25,832	24,628	24,784	25,082
2028	27,126	25,835	25,987	26,316
2029	28,493	27,109	27,255	27,619
2030	29,937	28,453	28,594	28,994
2031	31,341	29,764	29,902	30,336
2032	32,818	31,142	31,275	31,745
2033	34,265	32,491	32,621	33,126
2034	35,781	33,905	34,029	34,572

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

#### 4.6 Toll Revenue Estimates

The concession period for the project road is 25 years from the appointed date (the date financial close is achieved). Toll revenue realised for FY23 is Rs 1,877.3 million.

Toll revenue streams have been calculated assuming that:

- Toll would be collected for all 365 days in a year; for leap years, 366 days have been used
- Appointed date is March 2008
- Tolling would terminate on 1st December 2033 (original concession end date is 19<sup>th</sup> March 2033); as the concessionaire has received an extension of 195 days (on account of change of scope), 22.5 days (on account for demonetization) and 40 days for Covid 19; however, the revenues have been presented for full year of FY34.

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

FY Ending March	Car	MLCV/LCV/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer	Total
2023 (Actual)	386.4	155.6	106.5	252.3	975.7	0.7	1,877.3
2024	447.1	181.5	120.2	275.3	1,086.7	0.8	2,111.6
2025	509.4	209.8	135.4	298.0	1,204.5	0.9	2,358.1

FY Ending March	Car	MLCV/LCV/M Bus	Bus	Truck	MAV > 2 Axle	MAV - Trailer	Total
2026	586.5	241.5	152.4	323.9	1,338.4	1.0	2,643.7
2027	664.1	278.8	172.2	351.9	1,487.0	1.1	2,955.1
2028	762.6	319.0	193.8	382.5	1,650.8	1.2	3,309.9
2029	859.4	365.0	217.1	414.4	1,824.2	1.3	3,681.5
2030	980.3	417.5	243.5	449.6	2,020.8	1.5	4,113.2
2031	1,110.7	474.9	273.4	487.8	2,237.8	1.6	4,586.3
2032	1,260.2	541.7	307.2	530.6	2,484.5	1.8	5,126.1
2033	1,417.1	612.1	343.1	574.2	2,740.3	2.0	5,688.7
2034*	1,589.7	693.2	383.8	622.1	3,030.0	2.2	6,321.0

**\*-presented for full year of FY34**

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

Cars are likely to generate around 23.6 percent share of the total revenue. In case of LCVs and buses around 10.0 and 5.9 percent respectively is likely to be generated. The revenue from MAV>2 Axle represents the highest share accounting for about 49.3 percent of the total revenue generated from the PR. Trucks are likely to generate about 11.1 and MAV-Trailers are likely to generate a very insignificant amount of total revenue.

While in terms of ticket wise toll collection, the vehicles paying normal tolls are around 99.4 per cent of total toll revenues followed by 0.6 percent revenue by local and monthly passes.

The project road has a revenue CAGR of 11.7 percent during the tenure of concession.

## **APPENDICES**

**APPENDIX 2.1  
TRAFFIC ZONING SYSTEM**

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh  
Traffic Zoning System

Zone	Place/Region	District/ State	State
1	Bhopal/ Upper Lake/ Airport	Project Corridor - Bhopal district	Madhya Pradesh
2	Khajoori Sadak/ Phanda Kala/Munqaliya Chhap/ Neelbad		
3	Lasudia Parihar/ Thuna Kalan		
4	Sehore/ Galla Mandi		
5	Bilkisganj		
6	Naplakhedi/Gudbhela		
7	Amlaha/Sonda/Khokhri		
8	Ashta/Kothri		
9	Dodi/ Mehatwara/Jawar/Kakaria Khedi		
10	Sonkatch/Jamodi		
11	Bhonrasa/ Jamgod/ Khatamba		
12	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar		
13	Islamnagar/ Harrakheda/ Berasia/ Rest of Bhopal district		
14	Ichawar	Rest of Sehore district	
15	Nasrullaganj/ Salkanpur	Rest of Dewas district	
16	Kannod/ Satwas/ Khategaon		
17	Hatpipliya/ Chapda/ Punjapura		
18	Shyampur/ Narsingarh/ Biaora/ Rajgarh	Sehore/ Rajgarh district	
19	Maksi/ Shajapur/ Agar/ Susner	Shajapur/ Agar	
20	Tilawad/ Shujalpur/ Saranapur/ Pachore	Shajapur/ Rajgarh	
21	Mandideep	Raisen district	
22	Obaidullaganj/ Sultanpur/ Bari/ Udaipura		
23	Raisen/ Gairatganj/ Kalendi		
24	Hoshangabad(Narmadapuram)/ Itarsi/ Satpura	Hoshangabad district	
25	Maksudaganj/ Sironj	Guna/ Vidisha districts	
26	Vidisha	Vidisha	
27	Sagar/ Rahatgarh/ Bina/ Damoh	Sagar/ Damoh	
28	Katni/ / Umariya/ Shahdol	Katni/ Umariya/ Shahdol	
29	Harda/Khirkhya/Timarni	Harda District	
30	Betul/ Chhindwara/ Seoni	Southern MP	
31	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	South-eastern MP	
32	Amrarkantak/Dindori	Annupur District	
33	Gwalior/Shivpuri/Morena/ Bhind	Northern MP	
34	Guna/Raghogarh-Vijaipur/Ruthiyai/Ashoknagar		
35	Shahgarh/ Tikamgarh/ Chhatarpur/ Panna/ Satna/ Rewa/ Chitrakoot		
36	Kshipra/ Dakachhya/ Mangliya	Indore district	
37	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal		
38	Mhow/Dr. Ambedkar Nagar		
39	Pithampur	Dhar district	
40	Dhar/ Mangod/ Ghatabilod/ Lebad		
41	Kukshi/Barwaha/Barwani		
42	Alirajpur/ Jhabua/ Petlawad	Western MP	
43	Barnagar/ Badnawar	Ujjain/ Dhar	
44	Ujjain	Ujjain District	
45	Naqda		
46	Ratlam/ Jaora	Ratlam District	
47	Manpur/ Gujri/ Mandleshwar/ Khalghat/ Manawar/ Sendhwa/ Khargone	Southern MP	
48	Khandwa/ Mundi/Torani/ Barwaha		
49	Omkareshwar/Sanawad	Khandwa District	
50	Mandsaur/ Neemuch	Northern MP	
51	Jhansi/ Lalitpur	Jhansi/ Lalitpur	
52	Kanpur/ Lucknow	Kanpur/ Lucknow	
53	Prayagraj/ Varanasi/ Jaunpur/ Eastern Uttar Pradesh	Prayagraj/ Varanasi/ Jaunpur/ Eastern Uttar Pradesh	Uttar Pradesh
54	Agra/ Mathura/ Meerut/ Western Uttar Pradesh	Agra/ Mathura/ Meerut/ Western Uttar Pradesh	Uttar Pradesh
55	Noida/ Ghaziabad	Noida/ Ghaziabad	
56	Godhra/ Dahod	Godhra/ Dahod	
57	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	Gujarat
58	Ahmedabad/ Vadodara/ Anand	Ahmedabad/ Vadodara/ Anand	
59	Bharuch/ Dahej	Bharuch/ Dahej	
60	Surat/ Hazira/ Vapi	Surat/ Hazira/ Vapi	
61	Morbi/ Rajkot/ Jamnagar	Morbi/ Rajkot/ Jamnagar	
62	Kandla/ Mundra/ Gandhidham/ Bhuj	Kandla/ Mundra/ Gandhidham/ Bhuj	Rajasthan
63	Rest of Gujarat	Rest of Gujarat	
64	Banswara/ Udaipur/ Rajsamand/ Chittorgarh	Banswara/ Udaipur/ Rajsamand/ Chittorgarh	
65	Bundi/ Kota/ Baran	Bundi/ Kota/ Baran	Rajasthan
66	Jaipur/ Ajmer/ Kishangarh	Jaipur/ Ajmer/ Kishangarh	
67	Rest of Rajasthan	Rest of Rajasthan	
68	Naqpur/ Eastern Maharashtra	Naqpur/ Eastern Maharashtra	Maharashtra
69	Dhule/ Shirpur/ Nandurbar/ Jalgaon/ Nashik	Dhule/ Shirpur/ Nandurbar/ Jalgaon/ Nashik	
70	Mumbai	Mumbai	
71	Pune	Pune	
72	Aurangabad/ Rest of Maharashtra	Aurangabad/ Rest of Maharashtra	Goa
73	Goa	Goa	
74	Patna/ Gaya/ Aurangabad/ Bihar	Bihar	Bihar
75	Ranchi/ Jamshedpur	Ranchi/ Jamshedpur	Jharkhand
76	Bokaro/ Dhanbad	Bokaro/ Dhanbad	
77	Asansol/ Durgapur/ Kolkata/ Howrah/ Rest of West Bengal	West Bengal	West Bengal
78	Bilaspur/ Mungeli/ Ambikapur/ North Chhattisgarh	Bilaspur/ Mungeli/ Ambikapur/ North Chhattisgarh	Chhattisgarh
79	Raipur/ Durg/ Bhilai/ South Chhattisgarh	Raipur/ Durg/ Bhilai/ South Chhattisgarh	
80	Odisha	Odisha	Odisha
81	Gurugram/ Faridabad/ Rest of Haryana	Haryana	Haryana
82	Delhi	Delhi	Delhi
83	Punjab/ Chandigarh	Punjab/ Chandigarh	Punjab/ Chandigarh
84	Jammu & Kashmir/Uttarakhand/Himachal Pradesh	Jammu & Kashmir/Uttarakhand/Himachal Pradesh	Jammu & Kashmir/Uttarakhand/Himachal Pradesh
85	Tamil Nadu/Karnataka/Telangana/Andhra Pradesh/Kerala	South India	South India
86	Sikkim/ Assam/ Meghalaya/ Tripura/ Mizoram/ Manipur/ Nagaland/ Arunachal Pradesh/ Nepal/ Bangladesh	North East India	North East India



**APPENDIX 2.2**  
**MODE WISE TOP 20 OD PAIRS**

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh

Top 20 Origin Destination Pairs at TP01-Fanda Toll Plaza			
Car			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Sehore/ Galla Mandi	43%
2	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	24%
3	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	7%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
5	Bhopal/ Upper Lake/ Airport	Ujjain	5%
6	Khajoori Sadak/ Phanda Kala/Mungaliya Chhap/ Neelbad	Sehore/ Galla Mandi	2%
7	Bhopal/ Upper Lake/ Airport	Ichhawar	1%
8	Bhopal/ Upper Lake/ Airport	Amlaha/Sonda/Khokhri	1%
9	Bhopal/ Upper Lake/ Airport	Lasudia Panhar/ Thuna Kalan	1%
10	Bhopal/ Upper Lake/ Airport	Naplakhedi/Gudbhela	1%
11	Bhopal/ Upper Lake/ Airport	Aurangabad/ Rest of Maharashtra	1%
12	Bhopal/ Upper Lake/ Airport	Rest of Gujarat	0%
13	Bhopal/ Upper Lake/ Airport	Alirampur/ Jhabua/ Pettawad	0%
14	Bhopal/ Upper Lake/ Airport	Rattlam/ Jaora	0%
15	Bhopal/ Upper Lake/ Airport	Bhonrasa/ Jamgod/ Khatamba	0%
16	Bhopal/ Upper Lake/ Airport	Nasrullaqani/ Salkanpur	0%
17	Sehore/ Galla Mandi	Vidisha	0%
18	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	0%
19	Bhopal/ Upper Lake/ Airport	Kukshi/Barwaha/Barwani	0%
20	Khajoori Sadak/ Phanda Kala/Mungaliya Chhap/ Neelbad	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	0%
<b>Total</b>			<b>92%</b>
Bus			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	42%
2	Bhopal/ Upper Lake/ Airport	Sehore/ Galla Mandi	28%
3	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	6%
4	Bhopal/ Upper Lake/ Airport	Ujjain	6%
5	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	2%
6	Khajoori Sadak/ Phanda Kala/Mungaliya Chhap/ Neelbad	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
7	Bhopal/ Upper Lake/ Airport	Lasudia Panhar/ Thuna Kalan	1%
8	Khajoori Sadak/ Phanda Kala/Mungaliya Chhap/ Neelbad	Sehore/ Galla Mandi	1%
9	Bhopal/ Upper Lake/ Airport	Maksi/ Shatanpur/ Agar/ Susner	1%
10	Bhopal/ Upper Lake/ Airport	Aurangabad/ Rest of Maharashtra	1%
11	Bhopal/ Upper Lake/ Airport	Naplakhedi/Gudbhela	1%
12	Bhopal/ Upper Lake/ Airport	Kannod/ Satwas/ Khategaon	1%
13	Sehore/ Galla Mandi	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	1%
14	Bhopal/ Upper Lake/ Airport	Rattlam/ Jaora	0%
15	Khajoori Sadak/ Phanda Kala/Mungaliya Chhap/ Neelbad	Ashta/Kothri	0%
16	Khajoori Sadak/ Phanda Kala/Mungaliya Chhap/ Neelbad	Sonkatch/Jamodi	0%
17	Sehore/ Galla Mandi	Amarkantak/Dindori	0%
18	Sehore/ Galla Mandi	Ranchi/ Jamshedpur	0%
19	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	Jhansi/ Lalitpur	0%
20	Bhopal/ Upper Lake/ Airport	Amlaha/Sonda/Khokhri	0%
<b>Total</b>			<b>94%</b>

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh

Top 20 Origin Destination Pairs at TP01-Fanda Toll Plaza			
LCV			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Sehore/ Galla Mandi	32%
2	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	27%
3	Bhopal/ Upper Lake/ Airport	Ashta/Koثرi	6%
4	Bhopal/ Upper Lake/ Airport	Ujjain	5%
5	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
6	Bhopal/ Upper Lake/ Airport	Pune	4%
7	Bhopal/ Upper Lake/ Airport	Ichhawar	2%
8	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
9	Bhopal/ Upper Lake/ Airport	Alirajpur/ Jhabua/ Petlawad	1%
10	Bhopal/ Upper Lake/ Airport	Kukshi/Barwaha/Barwani	1%
11	Bhopal/ Upper Lake/ Airport	Lasudia Parihar/ Thuna Kalan	1%
12	Bhopal/ Upper Lake/ Airport	Mumbai	1%
13	Bhopal/ Upper Lake/ Airport	Jainur/ Aimer/ Kishanagarh	1%
14	Bhopal/ Upper Lake/ Airport	Rest of Rajasthan	1%
15	Bhopal/ Upper Lake/ Airport	Aurangabad/ Rest of Maharashtra	1%
16	Vidisha	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
17	Khatoori Sadak/ Phanda Kala/Munqaliya Chhap/ Neelbad	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
18	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
19	Bhopal/ Upper Lake/ Airport	Naplakhedi/Gudbhela	0%
20	Bhopal/ Upper Lake/ Airport	Nasrullaganj/ Salkanpur	0%
<b>Total</b>			<b>91%</b>
Truck			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	41%
2	Bhopal/ Upper Lake/ Airport	Sehore/ Galla Mandi	13%
3	Bhopal/ Upper Lake/ Airport	Ashta/Koثرi	7%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
5	Bhopal/ Upper Lake/ Airport	Ujjain	3%
6	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
7	Bhopal/ Upper Lake/ Airport	Dhar/ Mangod/ Ghatablod/ Lebad	2%
8	Bhopal/ Upper Lake/ Airport	Ichhawar	2%
9	Bhopal/ Upper Lake/ Airport	Rest of Gujarat	1%
10	Bhopal/ Upper Lake/ Airport	Mumbai	1%
11	Bhopal/ Upper Lake/ Airport	Bilisoani	1%
12	Bhopal/ Upper Lake/ Airport	Pithampur	1%
13	Bhopal/ Upper Lake/ Airport	Khandwa/ Mundi/Torani/ Barwaha	1%
14	Bhopal/ Upper Lake/ Airport	Bundi/ Kota/ Baran	1%
15	Bhopal/ Upper Lake/ Airport	Pune	1%
16	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
17	Vidisha	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
18	Bhopal/ Upper Lake/ Airport	Dodi/ Mehatwara/Jawar/Kakaria Khedi	0%
19	Bhopal/ Upper Lake/ Airport	Shyampur/ Narsingpur/ Biaora/ Rajgarh	0%
20	Bhopal/ Upper Lake/ Airport	Mhow/Dr. Ambedkar Nagar	0%
<b>Total</b>			<b>83%</b>
MAV>2A			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	33%
2	Bhopal/ Upper Lake/ Airport	Sehore/ Galla Mandi	14%
3	Bhopal/ Upper Lake/ Airport	Ujjain	6%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	4%
5	Bhopal/ Upper Lake/ Airport	Rest of Gujarat	3%
6	Bhopal/ Upper Lake/ Airport	Ashta/Koثرi	3%
7	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
8	Bhopal/ Upper Lake/ Airport	Mumbai	2%
9	Bhopal/ Upper Lake/ Airport	Pune	1%
10	Ujjain	Bilaspur/ Mungeli/ Ambikapur/ North Chhattisgarh	1%
11	Bhopal/ Upper Lake/ Airport	Dhar/ Mangod/ Ghatablod/ Lebad	1%
12	Bhopal/ Upper Lake/ Airport	Ahmedabad/ Vadodara/ Anand	1%
13	Bhopal/ Upper Lake/ Airport	Alirajpur/ Jhabua/ Petlawad	1%
14	Bhopal/ Upper Lake/ Airport	Khandwa/ Mundi/Torani/ Barwaha	1%
15	Vidisha	Rest of Gujarat	1%
16	Bhopal/ Upper Lake/ Airport	Ichhawar	1%
17	Bhopal/ Upper Lake/ Airport	Goa	1%
18	Bhopal/ Upper Lake/ Airport	Lasudia Parihar/ Thuna Kalan	1%
19	Bhopal/ Upper Lake/ Airport	Aurangabad/ Rest of Maharashtra	1%
20	Khatoori Sadak/ Phanda Kala/Munqaliya Chhap/ Neelbad	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
<b>Total</b>			<b>76%</b>

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh

Top 20 Origin Destination Pairs at TP02-Amlaha Toll Plaza			
Car			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	27%
2	Sehore/ Galla Mandi	Ashta/Kothri	18%
3	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	12%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	8%
5	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	5%
6	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	4%
7	Amlaha/Sonda/Khokhri	Ashta/Kothri	3%
8	Bhopal/ Upper Lake/ Airport	Ujjain	3%
9	Sehore/ Galla Mandi	Ujjain	1%
10	Bhopal/ Upper Lake/ Airport	Sonkatch/Jamodi	1%
11	Ashta/Kothri	Ichhawar	1%
12	Bhopal/ Upper Lake/ Airport	Kannod/ Satwas/ Khategaon	1%
13	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
14	Amlaha/Sonda/Khokhri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
15	Bhopal/ Upper Lake/ Airport	Dhar/ Mangod/ Ghatablod/ Lebad	1%
16	Vidisha	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	0%
17	Vidisha	Ujjain	0%
18	Sehore/ Galla Mandi	Dodi/ Mehatwara/Jawar/Kakarria Khedi	0%
19	Bhopal/ Upper Lake/ Airport	Manpur/ Gujir/ Manoheswar/ Khaighat/ Manawar/ Sendunwa/	0%
20	Bhopal/ Upper Lake/ Airport	Tilwad/ Shujalpur/ Sarangpur/ Pachore	0%
<b>Total</b>			<b>86%</b>
Bus			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	46%
2	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	9%
3	Sehore/ Galla Mandi	Ashta/Kothri	6%
4	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	6%
5	Bhopal/ Upper Lake/ Airport	Ujjain	6%
6	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	5%
7	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	3%
8	Bhopal/ Upper Lake/ Airport	Dhar/ Mangod/ Ghatablod/ Lebad	2%
9	Bhopal/ Upper Lake/ Airport	Kannod/ Satwas/ Khategaon	1%
10	Sagar/ Rahatgarh/ Bina/ Damoh	Ujjain	1%
11	Bhopal/ Upper Lake/ Airport	Ahmedabad/ Vadodara/ Anand	1%
12	Bhopal/ Upper Lake/ Airport	Mhow/Dr. Ambedkar Nagar	1%
13	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
14	Bhopal/ Upper Lake/ Airport	Mandsaur/ Neemuch	1%
15	Bhopal/ Upper Lake/ Airport	Rest of Gujarat	1%
16	Amlaha/Sonda/Khokhri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
17	Sehore/ Galla Mandi	Ujjain	1%
18	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	Jhansi/ Lalitpur	1%
19	Bhopal/ Upper Lake/ Airport	Mumbai	1%
20	Bhopal/ Upper Lake/ Airport	Jaipur/ Aimer/ Kishangarh	0%
<b>Total</b>			<b>92%</b>

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh

Top 20 Origin Destination Pairs at TP02-Amlaha Toll Plaza			
LCV			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	35%
2	Sehore/ Galla Mandi	Ashta/Kothri	13%
3	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	7%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
5	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	4%
6	Amlaha/Sonda/Khokhri	Ashta/Kothri	4%
7	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	2%
8	Bhopal/ Upper Lake/ Airport	Ujjain	1%
9	Bhopal/ Upper Lake/ Airport	Sonkatch/Jamodi	1%
10	Bhopal/ Upper Lake/ Airport	Dodi/ Mehatwara/Jawar/Kakaria Khedi	1%
11	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
12	Bhopal/ Upper Lake/ Airport	Tilwad/ Shujapur/ Sarangpur/ Pachore	1%
13	Sehore/ Galla Mandi	Mhow/Dr. Ambedkar Nagar	1%
14	Bhopal/ Upper Lake/ Airport	Mumbai	1%
15	Bhopal/ Upper Lake/ Airport	Pithampur	1%
16	Ashta/Kothri	Ichhawal	1%
17	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	Ichhawal	1%
18	Mandideep	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
19	Vidisha	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
20	Bhopal/ Upper Lake/ Airport	Ahmedabad/ Vadodara/ Anand	1%
<b>Total</b>			<b>81%</b>
Truck			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	38%
2	Sehore/ Galla Mandi	Ashta/Kothri	13%
3	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	7%
4	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	4%
5	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
6	Bhopal/ Upper Lake/ Airport	Ujjain	2%
7	Bhopal/ Upper Lake/ Airport	Pithampur	2%
8	Bhopal/ Upper Lake/ Airport	Rest of Gujarat	2%
9	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
10	Bhopal/ Upper Lake/ Airport	Ahmedabad/ Vadodara/ Anand	2%
11	Bhopal/ Upper Lake/ Airport	Dodi/ Mehatwara/Jawar/Kakaria Khedi	2%
12	Mandideep	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
13	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	1%
14	Bhopal/ Upper Lake/ Airport	Aurangabad/ Rest of Maharashtra	1%
15	Bhopal/ Upper Lake/ Airport	Ratlam/ Jaora	1%
16	Bhopal/ Upper Lake/ Airport	Pune	1%
17	Bhopal/ Upper Lake/ Airport	Dhar/ Manqod/ Ghatabilod/ Lehad	1%
18	Mandideep	Mumbai	1%
19	Hoshangabad(Narmadapuram)/ Itarsi/ Satpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
20	Vidisha	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
<b>Total</b>			<b>85%</b>
MAV>2A			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	31%
2	Bhopal/ Upper Lake/ Airport	Ashta/Kothri	8%
3	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	7%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	4%
5	Bhopal/ Upper Lake/ Airport	Rest of Gujarat	3%
6	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
7	Bhopal/ Upper Lake/ Airport	Mumbai	2%
8	Mandideep	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
9	Bhopal/ Upper Lake/ Airport	Ahmedabad/ Vadodara/ Anand	2%
10	Sehore/ Galla Mandi	Ashta/Kothri	2%
11	Bhopal/ Upper Lake/ Airport	Rest of Rajasthan	2%
12	Bhopal/ Upper Lake/ Airport	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	1%
13	Vidisha	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
14	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
15	Bhopal/ Upper Lake/ Airport	Dodi/ Mehatwara/Jawar/Kakaria Khedi	1%
16	Bhopal/ Upper Lake/ Airport	Pithampur	1%
17	Vidisha	Rest of Gujarat	1%
18	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Mumbai	1%
19	Bhopal/ Upper Lake/ Airport	Pune	1%
20	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	1%
<b>Total</b>			<b>74%</b>

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh

Top 20 Origin Destination Pairs at TP03-Bhourasa Toll Plaza			
Car			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	27%
2	Sonkatch/Jamodi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	19%
3	Sonkatch/Jamodi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	9%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	8%
5	Ashta/Kothri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	8%
6	Ashta/Kothri	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	4%
7	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	3%
8	Bhopal/ Upper Lake/ Airport	Ujjain	3%
9	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	3%
10	Ashta/Kothri	Ujjain	3%
11	Sehore/ Galla Mandi	Ujjain	1%
12	Sonkatch/Jamodi	Ujjain	1%
13	Bhopal/ Upper Lake/ Airport	Mumbai	1%
14	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	Hatpaliya/ Chhanda/ Punjapura	1%
15	Bhopal/ Upper Lake/ Airport	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	1%
16	Bhopal/ Upper Lake/ Airport	Ratlam/ Jaora	0%
17	Lasudia Parihar/ Thuna Kalan	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	0%
18	Ashta/Kothri	Maksi/ Shajapur/ Agar/ Susner	0%
19	Sagar/ Rahatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	0%
20	Bhopal/ Upper Lake/ Airport	Pithampur	0%
<b>Total</b>			<b>91%</b>
Bus			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	49%
2	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	18%
3	Sonkatch/Jamodi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	7%
4	Bhopal/ Upper Lake/ Airport	Ujjain	7%
5	Ashta/Kothri	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	3%
6	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	1%
7	Ashta/Kothri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
8	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
9	Harda/Khirkiva/Timarni	Ujjain	1%
10	Ashta/Kothri	Ujjain	1%
11	Sonkatch/Jamodi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
12	Sehore/ Galla Mandi	Ujjain	1%
13	Sonkatch/Jamodi	Ujjain	1%
14	Mandideep	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
15	Raisen/ Gairatganj/ Kalendi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
16	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	Pravaorat/ Varanasi/ Jaunpur/ Eastern Uttar Pradesh	1%
17	Harda/Khirkiva/Timarni	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
18	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
19	Khaijori Sadak/ Phanda Kala/Munqaliya Chhap/ Neelbad	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	0%
20	Sehore/ Galla Mandi	Maksi/ Shajapur/ Agar/ Susner	0%
<b>Total</b>			<b>95%</b>

Traffic Study for Bhopal-Dewas Section of SH-18 in the State of Madhya Pradesh

Top 20 Origin Destination Pairs at TP03-Bhourasa Toll Plaza			
LCV			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	26%
2	Sonkatch/Jamodi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	16%
3	Sonkatch/Jamodi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	16%
4	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	7%
5	Ashta/Kothri	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
6	Ashta/Kothri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	5%
7	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	3%
8	Bhopal/ Upper Lake/ Airport	Ujjain	3%
9	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
10	Bhopal/ Upper Lake/ Airport	Mumbai	1%
11	Sagar/ Rehatgarh/ Bina/ Damoh	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
12	Sonkatch/Jamodi	Ujjain	1%
13	Bhopal/ Upper Lake/ Airport	Omkarshwar/Sanawad	1%
14	Bhopal/ Upper Lake/ Airport	Maksi/ Shaitapur/ Aqar/ Susner	1%
15	Bhopal/ Upper Lake/ Airport	Pithampur	0%
16	Bhopal/ Upper Lake/ Airport	Pune	0%
17	Sehore/ Galla Mandi	Ujjain	0%
18	Ashta/Kothri	Maksi/ Shaitapur/ Aqar/ Susner	0%
19	Ashta/Kothri	Ujjain	0%
20	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	0%
<b>Total</b>			<b>91%</b>
Truck			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	33%
2	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	11%
3	Ashta/Kothri	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
4	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
5	Ashta/Kothri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	5%
6	Sonkatch/Jamodi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	5%
7	Bhopal/ Upper Lake/ Airport	Ujjain	4%
8	Sonkatch/Jamodi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	3%
9	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	3%
10	Bhopal/ Upper Lake/ Airport	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	2%
11	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	2%
12	Bhopal/ Upper Lake/ Airport	Pithampur	1%
13	Lasudia Parihar/ Thuna Kalan	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	1%
14	Bhopal/ Upper Lake/ Airport	Maksi/ Shaitapur/ Aqar/ Susner	1%
15	Bhopal/ Upper Lake/ Airport	Ratlam/ Jaora	1%
16	Bhopal/ Upper Lake/ Airport	Omkarshwar/Sanawad	1%
17	Shahgarh/ Tikamgarh/ Chhatarpur/ Panna/ Satna/ Rewa/ Chitrakoot	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
18	Bhopal/ Upper Lake/ Airport	Mumbai	1%
19	Bhopal/ Upper Lake/ Airport	Wanpur/ Gujr/ Mandleshwar/ Khajniat/ Mahawar/ Sehinwa/ Khandwa	1%
20	Bhopal/ Upper Lake/ Airport	Ahmedabad/ Vadodara/ Anand	1%
<b>Total</b>			<b>84%</b>
MAV>2A			
S.No.	Origin	Destination	% of total
1	Bhopal/ Upper Lake/ Airport	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	30%
2	Ashta/Kothri	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	8%
3	Bhopal/ Upper Lake/ Airport	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	7%
4	Bhopal/ Upper Lake/ Airport	Palanpur/Modasa/ Himmatnagar/ Deesa/ Mehsana/ North Gujarat	4%
5	Bhopal/ Upper Lake/ Airport	Mumbai	4%
6	Ashta/Kothri	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	3%
7	Sehore/ Galla Mandi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	3%
8	Sonkatch/Jamodi	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	3%
9	Bhopal/ Upper Lake/ Airport	Ujjain	3%
10	Sonkatch/Jamodi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	2%
11	Bhopal/ Upper Lake/ Airport	Aurangabad/ Rest of Maharashtra	2%
12	Bhopal/ Upper Lake/ Airport	Pithampur	1%
13	Shahgarh/ Tikamgarh/ Chhatarpur/ Panna/ Satna/ Rewa/ Chitrakoot	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	1%
14	Sehore/ Galla Mandi	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	1%
15	Ashta/Kothri	Ujjain	1%
16	Dewas/ Bhopal Circle/ Itawa/ Vikram Nagar	Jabalpur/ Narsingpur/ Lakhnadon/ Mandla/Shahpura	1%
17	Bhopal/ Upper Lake/ Airport	Omkarshwar/Sanawad	1%
18	Bhopal/ Upper Lake/ Airport	Ratlam/ Jaora	1%
19	Bhopal/ Upper Lake/ Airport	Maksi/ Shaitapur/ Aqar/ Susner	1%
20	Indore/ Vijaynagar/ Bhawrasala/ Ralamandal	Patna/ Gaya/ Aurangabad/ Bihar	1%
<b>Total</b>			<b>77%</b>