Urban Model Corridors

(Pilot districts -Indore, Dhar & Datia)

Draft Environment and Social Management Plan

Madhya Pradesh Rural Road Development Authority

Contents

List of Figures

List of Tables

1. Introduction

1.1. Project Background

1.1.1. Urban Model Corridor, Indore

The project stretch for Urban Street is in Indore district, having 2 heavy traffic junctions – Bada Ganpati junction and Kalani Nagar Junction. There are 2 police stations which cover the entire stretch – Malharganj and Aerodrome. The road abutting land use is primarily commercial and residential. The stretch on airport Road starts from Bada Ganpati junction and ends at Aerodrum Police station. It is a 2.8 km long stretch covering two major intersections. The route runs through entirely urban area, with presence of shops of various kinds. The traffic on this road is completely motorized, with a large chunk of traffic comprising of people moving towards airport.

Currently, it is a four-lane divided carriageway with mix of paved and earthen shoulder on either side. The width of shoulder varies across the stretch. There is also paver block footpath at across the left-hand side of the junction. There are drain openings present on the junction of footpath and shoulder.

The location of the stretch is shown in the below map:

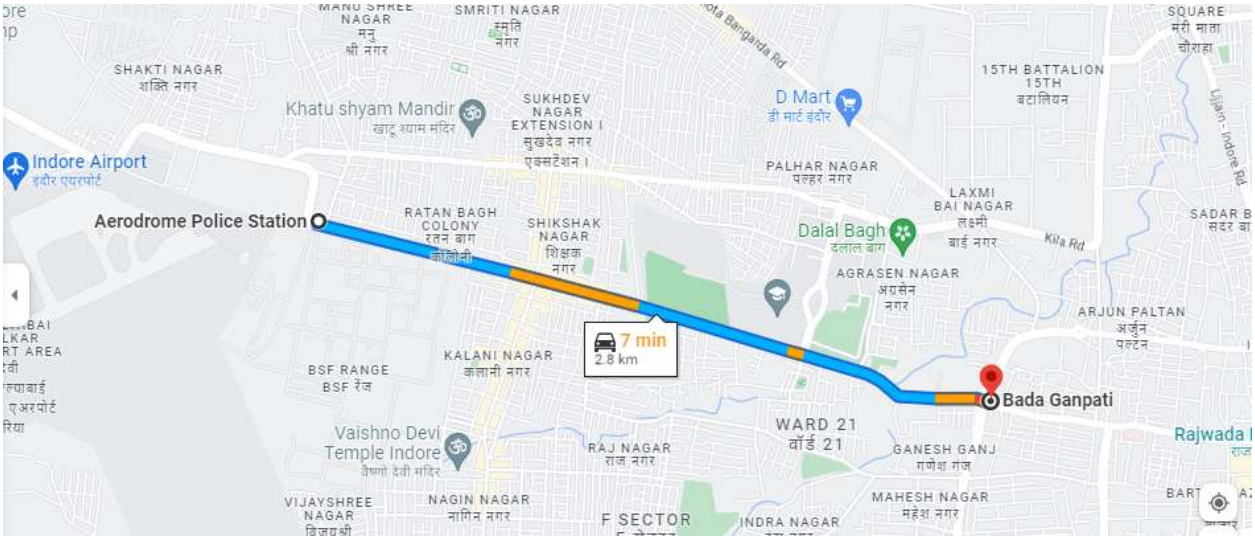


Figure 1: Alignment of the selected Urban Corridor in Indore

1.1.2. Urban Model Corridor, Dhar

The selected stretch is of 1.5 Km length starting at Eicher Chowraha near Pithampur Industrial Area and ending at Rau-Pithampur Road in the district of Dhar. The road starts near Eicher Chowraha Pithampur bus stand and ends near Pithampur Energy Station petrol pump on Rau-Pithampur Road. The predominant land use along the stretch is industrial, with presence of small shops and fruits and vegetable vendors. The traffic on this road comprises of motorized and non-motorized traffic, with a large chunk of traffic comprising of employees of Eicher factory.

Figure 2: Alignment of the selected Urban Corridor in Dhar

1.1.3. Urban Model Corridor, Datia

The selected stretch is of 1.5 Km length starting at Krishi Upaj Mandi, Datia and ending at Ritika Marriage Hall on SH-19 in the district of Dhar. The road starts near Krishi Upaj Mandi, the farmers market located in Datia town and ends at the nearest median diversion to Ritika Marriage Hall. The predominant land use along the stretch is commercial with some share of residential, with presence of big and small shops, car repairing stores, fruits and vegetable vendors. The traffic on this road is completely motorized, with a large chunk of traffic comprising of people coming to market.

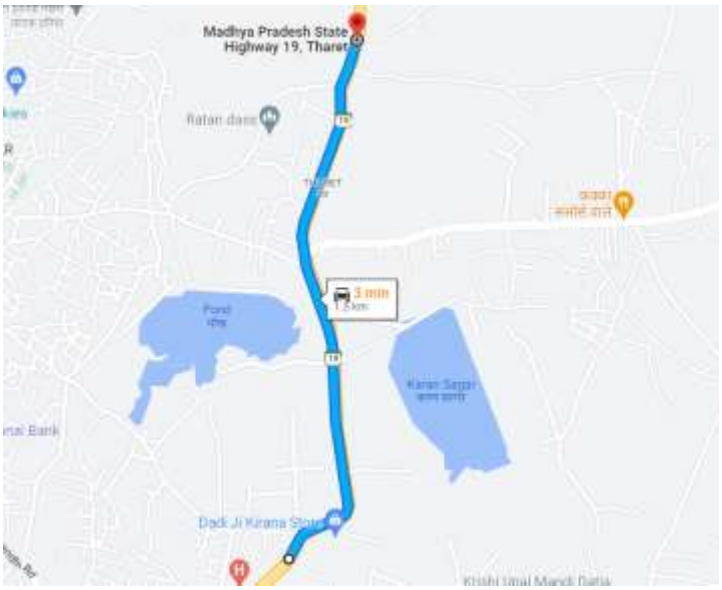


Figure 3: Alignment of the selected Urban Corridor in Dhar

1.2. Need and Justification

The objective of the study is to improve the safety and operational efficiency of all road users of the corridor with special focus on pedestrians, local communities including roadside vendors, keeping in view international best practices in on a selected urban stretch of 1.9 km length.

The vision of the study is to develop a model urban street that creates a balance between the movement of all road users i.e., pedestrians, cyclists, transit, and vehicles and their activities through equitable allocation of road space.

The outcome of the project is beneficial to all using this corridor. However, the proposed project will have localized and minimal negative impacts at the major habitation areas where improvements and widening will impact petty shops and other commercial/ vendor activity.

1.3. Objectives of ESMP

The Environmental and Social Impact assessment of the project has been carried out to analyze the impact of proposed interventions along the corridor on the nearby habitants, including shopkeepers, dwellers, residents, and road users including pedestrians, vehicle drivers etc.

1.4. Methodology of preparation of ESMP

For social baseline and impact assessment, various levels of discussions were held with stakeholders including government officials, community representatives and a wide range of road users and roadside dwellers. The main purpose of this approach was to obtain a fair impression on the people's perceptions about the baseline condition and their views on the proposed safety countermeasures along the corridor.

In order to establish the environmental condition baseline within the study area, relevant secondary and primary data was collected and reviewed, a comprehensive field visit was undertaken, and a number of consultations with local people were carried out.

1.5. Structure of ESMP Report

The structure of the report is as follows:

- Chapter 1 of the report includes the introduction of the project including need and justification, methodology followed for the preparation of ESMP along with the objectives.
- Chapter 2 of the report deals with description of the baseline status of the selected corridor and the proposed design countermeasures along the corridor.
- Chapter 3 of the report details out the policies and frameworks which needs to be adhered throughout the project.
- Chapter 4 of the report includes the baseline assessment of the project area including social, physical and biological characteristics.
- Chapter 5 of the report includes the alternatives analyzed during the proposal stage of road safety countermeasures along the corridor.
- Chapter 6 details out the consultations held with key stakeholders at different levels to explain the design proposal and gather their viewpoint along with analyzing the impact of the proposed countermeasures.
- Chapter 7 of the report explains the potential environmental and social impacts of the project if any.
- Chapter 8 of the report includes the detailed environmental and social management plan prepared for the project.
- Chapter 9 of the project covers the institutional arrangements for environmental and social management including the grievance redressal mechanism.

2. Description of Project

2.1. Urban Corridors Selection Process and Finalization

As part of the scope of work for the CPRSP project, preliminary analysis was carried out over candidate corridors for selection of Urban Model corridors. After analysis, the candidate corridors were chosen in the districts of Dhar and Indore. For the remaining corridor for the district of Datia, the urban roads in Datia were mapped on Google Map and land use pattern within 0.5 km radius of each of these road stretches were identified and analyzed.

During the site visit, apart from the land-use patterns, traffic conditions with respect to all road users were observed keeping in mind the project's emphasis on pedestrians and communities.

2.2. Improvement Proposal and Design Counter Measures

2.2.1. Urban Corridor, Indore

The below table provides a summary of all design recommendations along with their design details and extent of the improvements along the corridor:

Table 1: Proposed Elements: Indore

Urban Corridor Design - Proposed Elements		
S. No.	**Components**	**Details**
1	Footpath	1. 2.5 mt clear width of footpath 2. 2.4 mt clear height 3. Tree grates are proposed within the proposed width except All Advertisement panels, posts, poles, junction boxes, public utility structures etc. to be removed except new proposed Trees with tree grates 4. Material: RCC Paver block, Pre-Cast Cement Concrete paver block
2	Kerb Ramp	1. Slope: 1:12 2. 1.2 mt width of Ramp 3. Kerb ramp proposed at all level changes at entry points of properties, minor road 4. Tactile warning strip proposed at curbside edge of the slope
3	Tactile Paving	Tactile pavers (Guiding and warning path) proposed at all walking surfaces to guide people with vision impairment
4	Carriageway	1. Road signages as per IRC specifications – Regulatory, Cautionary, Informatory signs and STOP signs 2. Road markings as per IRC specifications – Centre line, Traffic Lane marking, Edge line, Zebra crossings, STOP line markings, Arrow markings, Chevron markings, Parking marking, Bus stop marking 3. Road studs / Cat eyes

5	Hawker / Vendor zone	Proposed 2.5m wide Hawker space at designated area
6	On street Parking	Proposed 2.5m wide Parking space at designated area
7	Pedestrian Crossings @250mt	1. **Tabletop crossings** – 3m wide raised crossing at all midblock at 150mm level 2. **Refuge Island** at all medians – 3m X 2-2.5m
8	Traffic calming measures	Rumble strip with Speed Hump before crossings Speed Breaker at all minor road junctions
9	Tree Grates	1.2 M x 1.2 M Tree Pit
10	Bus Stop	Proposed 12 New Bus stops
11	Public Toilets	Proposed new 2 Mobile Toilets
12	Bollards	Proposed bollards at refuge island
13	Pedestrian Lights	Proposed streetlights for pedestrians on edge of footpath
14	Benches	Proposed benches at Hawker / Vendor zone

Roads/Streets Development Details:	
S.No.	**Activities Proposed**
1	• 2.5m wide footpath proposed both side of the corridor. • Redesign of Traffic Island • Median refuge- At Bada Ganpati intersection and at midblock crossing @ Ch: 0.250km • Tabletop crossing: At Bada Ganpati intersection left turn road and at midblock crossing @ Ch: 0.250km • Road Signages: STOP Marking, Pedestrian crossing, No Stopping, Speed Limit, Hazard Marker, Stack type Advanced direction sign • Road markings: Traffic Lane marking, Edge line, Zebra crossing, Bi-directional signages • Traffic Calming Measures: Rumble strip with Speed Hump @ Ch: 0.250km • Link Road: 3 nos. roads with Speed breaker and STOP sign and marking • Streetlight for Pedestrian • New Trees / plantation • Pedestrian phase proposed at Bada Ganpati junction signal. • A drop-off and pick up zone is proposed at Bada Ganpati Temple junction (near entry gate) for dropping off and picking up elder devotees and passengers safely and easily.
2	• Median Cut or Mid-block crossing @ Ch: 0.250km • Tabletop crossing and Median refuge- at midblock crossing @ Ch:0.260km and Ch:0.490km • Reconstruction of Medians @ Ch:0.300km to Ch:0.360km, Ch:0.410km to Ch:0.430km • 2.5m wide footpath proposed both side of the corridor. Existing footpath width and height upgraded as per proposal to maintain continuity of footpath area. • No modifications or upgradation recommended on the existing footpath both side of the corridor @Ch: 0.410 km to Ch:0.500 km • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:0.280km and Ch:0.490km • Road Signages: Pedestrian crossing, Speed Limit, Speed Hump, Median cut signages, Rumble strip • Road markings: Traffic lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian • New Trees / plantation
3	• Dedicated Footpaths – 1-1.5m wide footpath south side of the corridor • Reconstruction of Median @ Ch:0.710 km to Ch:0.720 km • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:0.550 km and @Ch:0.710 km • Tabletop crossing and Median refuge- At midblock crossing @ chainage: 0.530 km, 0.720 km, 0.750 km

	• Junction channelization at Geetanjali hospital junction @ Ch:0.750 km with two islands • Road Signages: STOP Marking, Pedestrian crossing, No Stopping, Speed Limit, Hazard Marker, Speed Hump, Rumble strip, Bus stop sign, Public Toilets and Stack type Advanced direction sign • Road markings: Traffic Lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian • New Trees / plantation • No modifications or upgradation recommended on the existing footpath in the north side of the corridor • Relocation of existing bus stop @Ch:0.540km to Ch:0.490km
4	• Existing footpath width (2.5m) upgraded as per proposal to maintain continuity of footpath area. • Reconstruction of Median @ Ch:0.770 km to Ch:0.820 km • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:0.790 km and @Ch:0.980 km • Tabletop crossing and Median refuge- At midblock crossing @ chainage: 0.990 km, 1.020 km • Hawker space for daily markets proposed @Ch:0.920km to Ch:1.000km • Road Signages: STOP Marking, Pedestrian crossing, No Stopping, Speed Limit, Hazard Marker, Speed Hump, Rumble strip, Bus stop sign, Public Toilets and Stack type Advanced direction sign • Road markings: Traffic Lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian • New Trees / plantation • Relocate of Advertisement board (single Pole board Ch:0.830km) to Ch:1+020.00 km outside RAPTC boundary wall
5	• South edge of the corridor - existing footpath width (2.5m) upgraded as per proposal to maintain continuity of footpath area. • North edge of the corridor – proposed dedicated 2.5m wide footpath with 2.5m space for street vendors and hawkers. • Dedicated hawker space or Vendor zone proposed – 2.5m wide space for them @ Ch:1.020km to Ch:1.270km • On street paid parking for private vehicles (two-wheeler and car) is also proposed along the north edge of the corridor @Ch:1.040km to Ch:1.070km and Ch:1.180km to Ch:1.250km • Due to limited space, a drop-off and pick up zone is proposed @ Ch:1.040km for dropping off and picking up passengers safely and easily. • Proposed median cut for pedestrian crossing @ Ch:1.000km with Tabletop crossing and median refuge island • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:1.030 km and @Ch:1.250 km • Road Signages: STOP Marking, Pedestrian crossing, Hazard Marker, Speed Limit, Speed Hump, Rumble strip, Bus stop sign, Public Toilets • Road markings: Traffic lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian • New Trees / plantation
6	• South edge of the corridor - existing footpath width (2.5m) upgraded as per proposal to maintain continuity of footpath area. • North edge of the corridor – proposed dedicated 2.5m wide footpath • Reduced median @ Ch:1.250km to Ch:1.300 km • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:1.300 km • Tabletop crossing and Median refuge- At midblock crossing @Ch:1.260 km and Ch:1.290 km • Road Signages: STOP Marking, Pedestrian crossing, Speed Limit, Hazard Marker, Speed Hump, Rumble strip, Bus stop sign, Public Toilets • Road markings: Traffic Lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian

	• New Trees / plantation
7	• South edge of the corridor - existing footpath width (2.5m) upgraded as per proposal to maintain continuity of footpath area. • North edge of the corridor – proposed dedicated 2.5m wide footpath • Reduced median @ Ch:1.580km to Ch:1.600 km • Reconstruction of Median @ Ch:1.830 km to Ch:1.850 km • STOP line proposed at Kalani nagar junction • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:1.830 km and Ch:1.880 km • On street private vehicles parking proposed @Ch:1.890km to Ch:1.920km • Road Signages: STOP Marking, Pedestrian crossing, No Stopping, Speed Limit, Hazard Marker, Speed Hump, Rumble strip, Bus stop sign, Public Toilets and Stack type Advanced direction sign • Road markings: Traffic Lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian • New Trees / plantation
9	• No modifications or upgradation recommended on the existing footpath - South side of the corridor • North edge of the corridor - existing footpath width (2.5m) upgraded as per proposal to maintain continuity of footpath area. • Tabletop crossing and Median refuge- At midblock crossing @Ch:2.150 km, Ch:2.180 km, Ch:2.400 km and Ch:2.440km • Traffic Calming Measures: Rumble strip with Speed Hump @Ch:2.140 km, Ch:2.200km, Ch:2.390km and Ch:2.450 km • Reconstruction of Median @ Ch:2.670 km to Ch:2.720 km • Road Signages: STOP Marking, Pedestrian crossing, Speed Limit, Hazard Marker, Speed Hump, Rumble strip, Bus stop sign, Public Toilets • Road markings: Traffic Lane marking, Edge line, Zebra crossing, Bi-directional signages • Streetlight for Pedestrian • New Trees / plantation

2.2.2. Urban Corridor, Dhar

2.2.2.1. Street Elements

Table 2: Proposed Elements: Dhar

S.No	Elements	Proposed Countermeasures
1	**Footpath**	• A 1.5 m wide clear dedicated footpath space is recommended for both sides of the corridor. • It should be continuous and clear of any obstructions. Footpaths should be 0.15 m high so that they aren't surmountable for vehicles. • It is suggested to upgrade existing footpath on the eastern side of the corridor as per IRC design guidelines (IRC 103 2012).
2	**Carriageway**	• Recommended constant width of 7 m (per direction) carriageway for smooth flow of vehicles along with 2.5m wide paved shoulder is proposed both side of the road stretch. • The carriageway should be defined clear boundaries through kerbs and material differences for smooth driving. The bent/curved part of the road is • Proposed to be properly defined with kerbs and cat eye for prevention of road accidents.

S.No	Elements	Proposed Countermeasures
3	**Street Vending**	• Street vending spaces are proposed at their current locations. • Dedicated 2 m wide space for vendors are recommended on road wherever provided near Eicher factory gates, Rau-Pithampur T junction, Petrol pump energy station etc. • Food sellers are proposed to be located near Eicher Factory outside areas/gates.
4	**On-Street Parking – Car and IPT**	• It is recommended to provide dedicated space for on-street parking of car and two-wheelers at current locations. • Dedicated parking space for trucks is proposed near factory gates i.e., Eicher Factory, Syncom Formulation Ltd, Kanchan Precision Pvt Ltd., etc. • On street parallel parking space would be in shoulder space wherever provided. • A dedicated parking space for IPT is proposed near Eicher Chowraha bus stop.
5	**Street Furniture**	• Integrate all existing elements when designing the corridor. • Bollards are proposed at all corner legs of the Rau-Pithampur T junction to provide pedestrian safety. • Pedestrian streetlights are also proposed at the side of the footpath for night-time safety of pedestrians. • All elements should be located such that they are convenient to use, universally accessible, do not obstruct movement, and provide easy access for street cleaning.
6	**Utilities**	It is recommended to integrate all existing utilities with proper planning and mapping of it when designing the corridor.

2.2.2.2. Safety Elements

S.No	Elements	Proposed Countermeasures
1	**Pedestrian Crossing**	• It is recommended to provide zebra crossings at the interval of 250 m starting from the start point of the corridor at Eicher Chowraha Junction towards Rau-Pithampur Road T Junction and up to the petrol pump on the East-West segment of the corridor for safe pedestrian crossings. • Flashing ambers (Caution signal) are proposed at all mid-block crossing for pedestrian safety due to heavy truck movement on road. • Zebra crossing is proposed at all legs of the Rau-Pithampur Road Junction for pedestrian movements.
2	**Traffic Calming Measures**	• It is recommended to provide traffic calming measures on the corridor as per IRC guidelines (IRC 99 2018). • It is proposed to provide transverse bar marking near factory gates and Eicher Chowraha underpass. • It is proposed to provide transverse bar marking on the East-West segment of the carriageway before Ganesh Mandir where the carriageway level changes. • Transverse bar markings are proposed at all mid-block crossings combined with pedestrian crossings.

S.No	Elements	Proposed Countermeasures
3	**Traffic Signages**	• It is recommended to provide all traffic signages as per IRC guidelines (IRC-67-2012). • Clear visibility to road users to provide no conflict with other services. • Uniform signage is recommended to make it easily identifiable and readable by the road users. • It is recommended to provide cautionary signage where carriageway level changes on the East-West segment of the carriageway.
4	**Traffic Markings**	• It is recommended to provide all markings as per IRC guidelines (IRC 35 2015) cautiously considering the usage and its impact.
5	**Advertisements**	• In upcoming days, it is suggested to place any advertisement boards such a way that no part of the advertisement structure shall project on the carriageway and footpath.

S.No	Elements	Proposed Countermeasures
1	**Universal Accessibility**	• It is recommended to design the corridor following principles of universal accessibility and barrier free environment. • It includes footpath width, pavement material, bollard gap, curb ramp, slope ramp, etc.

2.2.2.2. Intersections

S.No	Elements	Proposed Countermeasures
1	**Major Intersections**	• It is recommended to provide at-grade crossings with pedestrian access ramps across all arms of the Rau-Pithampur Road T Junction. • A three-phase signalized system with pedestrian phase is proposed at Rau-Pithampur T junctions as the junction meets the warrant for signalization.

2.2.3. Urban Corridor, Datia

2.2.3.1. Street Elements

Table 3:Proposed Elements: Datia

S.No	Elements	Proposed Countermeasures
1	**Footpath**	• A 1.5m clear dedicated footpath space is recommended on both side of the stretch on proposed shared space. • It should be continuous and clear of any obstructions. Footpaths should be 0.15 m high so that they aren't surmountable for vehicles. • It is suggested to upgrade existing footpath as per IRC design guidelines.
2	**Carriageway**	• Carriageway surface should be smooth throughout the stretch for safety and comfort of road users.

S.No	Elements	Proposed Countermeasures
		• The carriageway should be properly scaled and defined clear boundaries through curbs and material differences for smooth driving.
3	**Street Vending**	• Dedicated Street vendor spaces are proposed at their current locations.
4	**Street Furniture**	• Street furniture includes seating, dustbins, bollards, railings, streetlight, toilets etc. • It is recommended to provide all elements as per design guidelines. Integrate all existing elements when designing the corridor. • All elements should be located such that they are convenient to use, universally accessible, do not obstruct movement, and provide easy access for street cleaning.
5	**Utilities**	It is recommended to integrate all existing utilities with proper planning and mapping of it when designing the corridor.

2.3. Manpower Requirement

There are approximately 50 persons who are employed as supervisor, Skilled and semi-skilled labor during construction of the corridor.

2.4. Project Implementation Schedule

The construction of project is of about 3 months. Tentative implementation schedule of the project is listed below:

2.4.1. Urban Corridor, Indore

Table 4: Project Implementation Schedule

S.No	Description	Indicative Time Frame
1	Detailed Design and Bidding documents	December 2022
2	Procurement	December 2022
3	Construction Commencement	Yet to start
4	Project Completion	March 2023
5	Defect Liability Period	3 years

2.4.2. Urban Corridor, Dhar

Table 5: Project Implementation Schedule

S.No	Description	Indicative Time Frame
1	Detailed Design and Bidding documents	December 2022
2	Procurement	February 2023
3	Construction Commencement	Yet to start
4	Project Completion	March 2023
5	Defect Liability Period	3 years

2.4.3. Urban Corridor, Datia

Table 6: Project Implementation Schedule

S.No	Description	Indicative Time Frame
1	Detailed Design and Bidding documents	December 2022
2	Procurement	February 2023
3	Construction Commencement	Yet to start
4	Project Completion	March 2023
5	Defect Liability Period	3 years

3. Policy, Legal and Regulatory Framework

3.1. Legal Framework

Below mentioned are the applicable policies and regulations at Central and state level and of World Bank:

Table 7: Applicable Policies and Regulations

Sl. No.	Act, Policy	Provisions	Applicability to the Project
1	The Constitution ofIndia (Articles 15,16 and 46, 338, 243M, 243 ZC, 244-, 330, 332, 243D and 340 T 65th Amendment	The Indian Constitution (Article 15) prohibits any discrimination based on religion, race, caste, sex, and place of birth and also contains a clause allowing the union and state governments to make any special provision for the advancement of any socially and educationally backward classes of citizens or for the Scheduled Castes and Scheduled Tribes. Article 16 refers to the equality of opportunity in matters of public employment. Article 46 directs the state to promote with special care the educational and economic interests of the weaker sectionsof the people, particularly of the Scheduled Castes and the Scheduled Tribes and also directs the state to protectthem from social injustice and all formsof exploitation. Article 338 provides for Setting up of National Commission for STs Articles 243M, 243 ZC, 244 provide for reservation of seats for the Local Self-Governments bodies Article 330 provides for Reservation of seats for SCs in the Lok Sabha is provided under, Article 332 provides for in the State Assemblies under and Articles 243D and 340T provides Reservation of seats for the Local Self-Governments bodies under. Sixty-fifty amendment constituting national commission for SC and ST	Relevant as the provisions under the Constitution ensure the access, equity and inclusiveness of the vulnerable groups in the Program particularly as the state as population of SC, STs in many districts
2	Article 366 (25) of the Constitution of India Article	Article 366 (25) refers to Scheduled Tribes as those communities, who are scheduled in accordance with Article	**Relevant** as some of the project interventions would be in tribal dominated areas,

	244(1) of Constitution	342 of the Constitution, wherein communities shall be declared as such by the President through an initial public notification or through a subsequent amending Act of Parliament. The Fifth Schedule under Article 244(1) of Constitution defines "Scheduled Areas" as such areas as the President may by order declare to be Scheduled Areas after consultation with the Governor of that State. Defines following essential characteristics, for a community to be identified as Scheduled Tribes are. • Indications of primitive traits. • Distinctive culture. • Shyness of contact with the community at large. • Geographical isolation; and • Backwardness. The criteria for declaring any area as a "Scheduled Area" under the Fifth Schedule are (a) preponderance of tribal population, (b) compactness and reasonable size of the area, (c) a viable administrative entity such as a district, block or Taluka, and (d) economic backwardness of the area as compared to the neighboring areas.	besides in other areas where tribal population is dispersed
3	Right to Information Act, 2005	provides for setting out the practical regime of right to information for citizens to secure access to information under the control of Public Authorities. The act sets out obligations of public authorities with respect to provision of information; requires designating of a Public Information Officer; process for any citizen to obtain information/disposal of request, etc.; provides for institutions such as Central Information Commission/State Information Commission	Relevant as all program related information would need to be disclosed
4	Panchayats (Extension to Scheduled Areas Act (PESA, 1996)	The salient feature of the Panchayats (Extension to the Scheduled Areas) Act, 1996 (PESA) and the modalities worked out to grant rights to tribals in the country are I. Legislation on Panchayats shall be in conformity with the customary law, social and religious practices and traditional management practices of community resources.	Relevant as there are scheduled areas in the state, wherein project proposes roads – upgrading to BT standards and multiple connectivity links

		II. Habitation or a group of habitations or a hamlet or a group of hamlets comprising community and managing its affairs in accordance with traditions and customs; and shall have a separate Gram Sabha. III. Every Gram Sabha to safeguard and preserve the traditions and customs of people, their cultural identity, community resources and the customary mode of dispute resolution. V. The Gram Sabhas have roles and responsibilities in approving all development works in the village, identify beneficiaries, issue certificates of utilization of funds; powers to control institutions and functionaries in all social sectors and local plans. Gram Sabhas or panchayats at appropriate level shall also have powers to manage minor water bodies; power of mandatory consultation in matters of land acquisition; resettlement and rehabilitation and prospecting licenses/mining leases for minor minerals; power to prevent alienation of land and restore alienated land; regulate and restrict sale/consumption of liquor; manage village markets, control money lending to STs; and ownership of minor forest produce. The provisions of Panchayat with certain modification and exceptions have been extended to the Schedule V areas viz. the ten States where the Panchayats exist in the country. Gram Sabhas have been constituted in every State as per the Panchayat Raj Act/PESA Rules of the concerned State	
5	Involuntary Resettlement (OP4.12)	This policy covers direct economic and social impacts that both result from Bank-assisted investment projects, and are caused by (a) the involuntary taking of land resulting in (i) relocation or loss of shelter. (ii) lost of assets or access to assets; or (iii) Loss of income sources or means of livelihood, whether or not the	Not relevant. There shall be no land acquisition Further, provision is being made to screen and identify such locations and avoid any land take through design modifications. All land take would be sourced through voluntary donation.

		affected persons must move to another location. In the event of inadequate land width to construct the road specifically in habitation sections need for taking land may arise.	
6	Indigenous People (OP4.10)	The scheduled Caste and Scheduled Tribepopulation are present in the state and project districts. Some of the project roads are likely to provide new connectivity to habitations with scheduled caste and schedule Tribe population. The policy requires a social assessment by the borrower. (a) a process of free, prior, and informed consultation with the affected Indigenous Peoples" communities at each stage of the project, and particularly during project preparation, to fully identify their views and ascertain their broad community support for the project;	Relevant. A Vulnerability Framework is provided outliningthe process of screening the sub projects for presence of Scheduled caste and Scheduled tribe Population in the habitations to be connected, ensuring their participation in the transect walk process and consultations during DPR preparation to ascertain their views and broad support for theproject, and Extending additional support to them and other vulnerable people adversely affected by the project. Disclosure of project information at the community level in a culturally appropriate way and local language "Hindi".

Apart from compliance to the above policies, the project will comply with the bank procedure, BP17.50 in respect of Disclosure shall be carried out at all stages of the project as at planning stage, prioritization stage, project preparation stage and implementation stages. Consultations shall be conducted with the community and the PRI at project preparation and implementation stage.

3.2. Applicable national and State Environmental, Social and Labor regulations

Some major labour laws applicable to establishments engaged in building and other construction work:

(a) **Employees Compensation Act 1923:** The Act provides for compensation in case of injury, disease or death arising out of and during the course of employment.

(b) **Payment of Gratuity Act 1972:** gratuity is payable to an employee under the Act on satisfaction of certain conditions on separation if an employee has completed 5 years' service or more or on death at the rate of 15 days wages for every completed year of service. The Act is applicable to all establishments employing 10 or more employees.

(c) **Employees P.F. and Miscellaneous Provision Act 1952 (*since amended*):** The Act provides for monthly contribution by the employer plus workers @ 10% or 8.33%. The benefits payable under the Act are:

(i) Pension or family pension on retirement or death, as the case may be.

(ii) Deposit linked insurance on the death in harness of the worker.

(iii) Payment of P.F. accumulation on retirement/death etc.

(d) **Maternity Benefit Act 1961:** The Act provides for leave and some other benefits to women employees in case of confinement or miscarriage etc.

(e) **Sexual Harassment of Women at the Workplace (Prevention, Prohibition and Redressal) Act, 2013:** This Act defines sexual harassment in the workplace, provides for an enquiry procedure in case of complaints and mandates the setting up of an Internal Complaints Committee or a Local Complaints Committee

(f) **Contract Labour (Regulation & Abolition) Act 1970:** The Act provides for certain welfare measures to be provided by the Contractor to contract labour and in case the Contractor fails to provide, the same are required to be provided, by the Principal Employer by law. The Principal Employer is required to take Certificate of Registration and the Contractor is required to take license from the designated Officer. The Act is applicable to the establishments or Contractor of Principal Employer if they employ 20 or more contract labour.

(g) **Minimum Wages Act 1948:** The Employer is supposed to pay not less than the Minimum Wages fixed by appropriate Government as per provisions of the Act if the employment is a scheduled employment. Construction of Buildings, Roads, Runways are scheduled employments.

(h) **Payment of Wages Act 1936:** It lays down the mode, manner and by what date the wages are to be paid, what deductions can be made from the wages of the workers.

(i) **Equal Remuneration Act 1976**: The Act provides for payment of equal wages for work of equal nature to male and female workers and for not making discrimination against Female employees in the matters of transfers, training and promotions etc.

(j) **Payment of Bonus Act 1965:** The Act is applicable to all establishments employing 20 or more employees. Some of the State Governments have reduced this requirement from 20 to 10. The Act provides for payments of annual bonus subject to a minimum of 8.33% of the wages drawn in the relevant year. It applies to skilled or unskilled manual, supervisory, managerial, administrative, technical or clerical work for hire or reward to employees who draw a salary of Rs. 10,000/- per month or less. To be eligible for bonus, the employee should have worked in the establishment for not less than 30 working days in the relevant year. The Act does not apply to certain establishments.

(k) **Industrial Disputes Act 1947:** the Act lays down the machinery and procedure for resolution of Industrial disputes, in what situations, a strike or lock-out becomes illegal and what are the requirements for laying off or retrenching the employees or closing down the establishment.

(l) **Trade Unions Act 1926:** The Act lays down the procedure for registration of trade unions of workmen and employers. The Trade Unions registered under the Act have been given certain immunities from civil and criminal liabilities.

(m) **Child Labour (Prohibition & Regulation) Act 1986:** The Act prohibits employment of children below 14 years of age in certain occupations and processes and provides for regulation of employment of children in all other occupations and processes. Employment of Child Labour is prohibited in the Building and Construction Industry.

(n) **Inter-State Migrant workmen's (Regulation of Employment & Conditions of Service) Act 1979:** The Act is applicable to an establishment which employs 5 or more inter-state migrant workmen through an intermediary (who has recruited workmen in one state for employment in the establishment situated in another state). The Inter-State migrant workmen, in an establishment to which this Act becomes applicable, are required to be provided certain facilities such as housing, medical aid, traveling expenses from home up to the establishment and back, etc.

(o) **The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act 1996 and the Building and Other Construction Workers Welfare Cess Act, 1996 (BOCWW Cess Act):** All the establishments who carry on any building or other construction work and employ 10 or more workers are covered under these Acts. All such establishments are required to pay cess at the rate not exceeding 2% of the cost of construction as may be notified by the Government. The Employer of the establishment is required to provide safety measures at the building or construction work and other welfare measures, such as Canteens, First – Aid facilities, Ambulance, Housing accommodations for workers near the work place etc. The Employer to whom the Act applies has to obtain a registration certificate from the Registering Officer appointed by the Government.

(p) **Factories Act 1948:** the Act lays down the procedure for approval of plans before setting up a factory engaged in manufacturing processes, health and safety provisions, welfare provisions, working hours, annual earned leave and rendering information regarding accidents or dangerous occurrences to designated authorities. It is applicable to premises employing 10 persons or more with aid of power or 20 or more persons without the aid of power.

(q) **Bonded Labour System (Abolition) Act, 1976**: The Act provides for the abolition of bonded labour system with a view to preventing the economic and physical exploitation of weaker sections of society. Bonded labour covers all forms of forced labour, including that arising out of a loan, debt or advance.

(r) **Employer's Liability Act, 1938:** This Act protects workmen who bring suits for damages against employers in case of injuries endured in the course of employment. Such injuries could be on account of negligence on the part of the employer or persons employed by them in maintenance of all machinery, equipment etc. in healthy and sound condition.

(s) **Employees State Insurance Act 1948:** The Act provides for certain benefits to insured employees and their families in case of sickness, maternity and disablement arising out of an employment injury. The Act applies to all employees in factories (as defined) or establishments which may be so notified by the appropriate Government. The Act provides for the setting up of an Employees' State Insurance Fund, which is to be administered by the Employees State Insurance Corporation. Contributions to the Fund are paid by the employer and the employee at rates as prescribed by the Central Government. The Act also provides for benefits to dependents of insured persons in case of death as a result of an employment injury.

(t) **The Personal Injuries (Compensation Insurance) Act, 1963:** This Act provides for the employer's liability and responsibility to pay compensation to employees where workmen sustain personal injuries in the course of employment.

(u) **Industrial Employment (Standing Order) Act 1946:** It is applicable to all establishments employing 100 or more workmen (employment size reduced by some of the States and Central Government to 50). The Act provides for laying down rules governing the conditions of employment by the Employer on matters provided in the Act and get the same certified by the designated Authority.

(v) Any other applicable law, if any

Some of the major laws that are applicable for protection of environment:

1. **The Environment (Protection) Act, 1986 and as amended:** This provides for the protection and improvement of environment and for matters connected therewith, and the prevention of hazards to human beings, other living creatures, plants and property. 'Environment' includes water, air and land and the inter-relationship which exists among and between water, air and land, and human beings, other living creatures, plants, micro-organism and property.

2. **State Tree Preservation Acts as may be in force:** These provide for protection of trees of important species. Contractors will be required to obtain prior permission for full or partial cutting, uprooting, or pruning of any such trees.

3. **The Wildlife (Protection) Act, 1972, and as amended:** This provides for protection of wildlife through notifying National Parks and Sanctuaries and buffer areas around these zones; and to protect individuals of nationally important species listed in the Annex of the Act.

4. **The Biological Diversity Act, 2002:** This provides for conservation of biological diversity, sustainable use of components of biological diversity, and fair and equitable sharing of the benefits arising out of the use of biological resources, knowledge and for matters connected therewith or incidental thereto.

5. **The Public Liability Insurance Act, 1991 as amended and The Public Liability Insurance Rules, 1991 as amended:** These provide for public liability insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling hazardous substances and for mattes connected herewith or incidental thereto. Hazardous substance means any substance or preparation which is defined as hazardous substance under the Environment (Protection) Act 1986 and exceeding such quantity as may be specified by notification by the Central Government.

6. **The Ancient Monuments and Archaeological Sites and Remains Act, 1958 and the Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010,** (applicable for chance finds as there is no archaeological) These provide for conservation of cultural and historical remains found in India. Accordingly, area within the radii of 100m and 300m from the "protected property" are designated as "protected area" and "controlled area" respectively. No development activity (including building, mining, excavating, blasting) is permitted in the "protected area" and development activities likely to damage the protected property is not permitted in the "controlled area" without prior permission of the Archaeological Survey of India (ASI) or the State Departments of Art and Culture or Archaeology as applicable.

7. **The Environmental Impact Assessment Notification, 2006 and as amended:** This provides for prior environmental clearance for new, modernization and expansion projects listed in Schedule 1 of the Notification. Contractors will be required to ensure that no work starts until applicable clearances under the Notification is not available. Contractors will be responsible for implementation of any environmental management plan stipulated as per the permission under this Notification; and will be required to prepare and submit to the employer and compliance report stipulated in the permission under the Notification.

8. **The Water (Prevention and Control of Pollution) Act, 1974 as amended, and the Water (Prevention and Control of Pollution) Rules, 1975 as amended:** These provide for the prevention and control of water pollution and the maintaining and restoring of wholesomeness of water. 'Pollution' means such contamination of water or such alteration of the physical, chemical or biological properties of water or such

discharge of any sewage or trade effluent or of any other liquid, gaseous or solid substance into water(whether directly or indirectly) as may, or is likely to, create a nuisance or render such water harmful or injurious to public health or safety, or to domestic, commercial, industrial, agricultural or other legitimate uses, or to the life and health of animals or plants or of aquatic organisms. Contractors will need to obtain consent for establishment and consent for operation of any item of work or installation of equipment that generates wastewater, and observe the required standards of establishment and operation of these items of work or installations; as well as install and operate all required waste water treatment facilities.

9. **The Water (Prevention and Control of Pollution) Cess Act, 1977 and The Water (Prevention and Control of Pollution) Cess Rules, 1978:** These provide for the levy and collection of a cess on water consumed by persons carrying on certain industries and by local authorities, with a view to augment the resources of the Central Board and the State Boards for the prevention and control of water pollution under the Water (Prevention and Control of Pollution) Act, 1974.

10. **The Air (Prevention and Control of Pollution) Act, 1981 as amended, and the Air (Prevention and Control of Pollution) Rules, 1982:** These provides for prevention, control and abatement of air pollution. 'Air Pollution' means the presence in the atmosphere of any 'air pollutant', which means any solid, liquid or gaseous substance (including noise) present in the atmosphere in such concentration as may be or tend to be injurious to human beings or other living creatures or plants or property or environment. Contractors will need to obtain consent for establishment and consent for operation of any item of work or installation of equipment that generates air pollution such as batching plants, hot mix plants, power generators, backup power generation, material handling processes, and observe the required standards of establishment and operation of these items of work or installations.

11. **Noise Pollution (Control and Regulation) Rules, 2000, and as amended:** This provides for standards for noise for day and night for various land uses and specifies special standards in and around sensitive receptors of noise such as schools and hospitals. Contractors will need to ensure compliance to the applicable standards and install and operate all required noise control devices as may be required for all plants and work processes.

12. **Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996:** This provides for Requirement of preparation of on-site and off-site Disaster Management Plans for accident-prone areas.

13. **The Explosives Act 1884 and the Explosives Rules, 2008:** These provide for safe manufacture, possession, sale, use, transportation and import of explosive materials such as diesel, Oil and lubricants etc.; and also, for regulating the use of any explosives used in blasting and/or demolition. All applicable provisions will need compliance by the contractors.

14. **The Petroleum Rules, 2002:** This provides for safe use and storage of petroleum products and will need to be complied by the contractors.

15. **The Gas Cylinder Rules 2004 and amendments:** This provides for regulations related to storage of gas, and possession of gas cylinder more than the exempted quantity. Contractors should comply with all the requirements of this Rule.

16. **Manufacture, Storage and Import of Hazardous Chemical Rules of 2000 and as amended:** These provide for use and storage of hazardous material such as highly inflammable liquids like HSD/LPG. Contractors will need to ensure compliance to the Rules; and in the event where the storage quantity exceeds the regulated threshold limit, the contractors will be responsible for regular safety audits and other reporting requirements as prescribed in the Rules.

17. **Hazardous & Other Wastes (Management and Transboundary Movement) Rules, 2016: These** provide for protection of general public from improper handling storage and disposal of hazardous waste. The rules prescribe the management requirement of hazardous wastes from its generation to final disposal. Contractors will need to obtain permission from the State Pollution Control Boards and other designated authorities for storage and handling of any hazardous material; and will to ensure full compliance to these rules and any conditions imposed in the permit.

18. **The Bio Medical Waste Management Rules, 2016:** This provides for control, storage, transportation and disposal of bio-medical wastes. As and where the contractor has any first aid facility and dispensaries, established in either temporary or permanent manner, compliance to these Rules are mandatory.

19. **Construction and Demolition Waste Management Rules, 2016:** This provides for management of construction and demolition waste (such as building materials possible to be reused, rubble and debris or the

like); and applies to all those waste resulting from construction, re-modelling, repair or demolition of any civil structure. Contractor will need to prepare a waste disposal plan and obtain required approval from local authorities, if waste generation is more than 20 tons in any day or 300 tons in any month during the contract period; and ensure full compliance to these rules and any conditions imposed in the regulatory approval.

20. **The E-Waste (Management) Rules, 2016:** This provides for management of E-wastes (but not covering lead acid batteries and radio-active wastes) aiming to enable the recovery and/or reuse of useful material from e-waste, thereby reducing the hazardous wastes destined for disposal and to ensure the environmentally sound management of all types of waste of electrical and electronic equipment. This Rule applies to every manufacturer, producer, consumer, bulk consumer, collection centers, dealers, e-retailer, refurbisher, dismantler and recycler involved in manufacture, sale, transfer, purchase, collection, storage and processing of e-waste or electrical and electronic equipment listed in Schedule I, including their components, consumables, parts and spares which make the product operational.

21. **Plastic waste Management Rules, 2016:** This provides for control and management of the plastic waste generated from any activity. Contractors will ensure compliance to this Rule.

22. **The Batteries (Management and Handling) Rules 2001:** This provides for ensuring safe disposal and recycling of discarded lead acid batteries likely to be used in any equipment during construction and operation stage. Rules require proper control and record keeping on the sale or import of lead acid batteries and recollection of the used batteries by registered recyclers to ensure environmentally sound recycling of used batteries. Contractors will ensure compliance to this Rule.

23. **The Ozone Depleting Substances (Regulation and Control) Rules, 2000 and as amended:** This provides for regulation of production and consumption of ozone depleting substances in the country, and specifically prohibits export to or import from countries not specified in the Rules, and prohibits unless specifically permitted, any use of ozone depleting substance.

24. **The Coastal Regulation Zone Notifications, 1991 and as amended:** This provides for regulation of development activities within the 500m of high tide line in coastal zone and 100m of stretches of rivers and estuaries influenced by tides. Contractors will be required to ensure that no work starts until applicable clearances under the Notification is not available. Contractors will be responsible for implementation of any plan stipulated as per the permission under this Notification; and will be required to prepare and submit to the employer and compliance report stipulated in the permission under the Notification.

25. **The Motor Vehicle Act 2019 as amended (and State Motor Vehicle Acts as may be in force) and the Motor Vehicle Rules and as amended (and State Motor Vehicle Rules as may be in force):** To minimize the road accidents, penalizing the guilty, provision of compensation to victim and family and check vehicular air and noise pollution. Contractors will be required to ensure full compliance to these rules.

26. **Easement Act, 1882:** This provides for the rights of landowners on groundwater. Contractors will need to ensure that other landowners' rights under the Act is not affected by any groundwater abstraction by the contractors.

27. **State Groundwater Acts and Rules as may be in force and the Guidelines for Groundwater Abstraction for drinking and domestic purposes in Notified Areas and Industry/Infrastructure project proposals in Non-Notified areas, 2012:** These provide for regulating extraction of ground water for construction/industrial and drinking and domestic purposes. Contractors will need to obtain permission from Central/State Groundwater Boards prior to groundwater abstraction through digging any bore well or through any other means; and will ensure full compliance to these rules and any conditions imposed in the permit.

28. **The Mines Act, 1952 as amended; the Minor Mineral and concession Rules as amended; and the State Mineral (Rights and Taxation) Acts as may be in force:** These provide for for safe and sound mining activity. The contractors will procure aggregates and other building materials from quarries and borrow areas approved under such Acts. In the event the contractors open any new quarry and/or borrow areas, appropriate prior permission from the State Departments of Minerals and Geology will need to be obtained. Contractors will also need to ensure full compliance to these rules and any conditions imposed in the permit.

29. **The Insecticides Act, 1968 and Insecticides Rules, 1971 and as amended:** These provide for regulates the manufacture, sale, transport, distribution, export, import and use of pesticides to prevent risk to human beings or animals, and for matters connected therewith. No one should import or manufacture; sell, stock or exhibit foe sale; distribute, transport, use: (i) any misbranded insecticides, (ii) any insecticide the sale, distribution or use of which is for the time being prohibited under the Act; and (iii) any insecticide except in accordance with the condition on which it was registered under the Act.

30. **National Building Codes of India, 2005 and as amended:** This provides guidelines for regulating the building construction activities in India. The code mainly contains administrative regulations, development control rules and general building requirements; stipulations regarding materials, structural design and construction; and building and plumbing services. Contractors will be required to comply with all Bureau of Indian Standards Codes dealing with: (i) use and disposal of asbestos containing materials in construction; (ii) paints containing lead; (iii) permanent and temporary ventilations in workplace; (iv) safety, and hygiene at the workplace; (v) prevention of fire; (vi) prevention of accidents from faulty electrical gadgets, equipment and accessories; and all other such codes incidental to the Contract.

31. Any other applicable law, if any.

3.3. Applicable World Bank Safeguard Policies

Table 8:Applicable World Bank Environmental Safeguard Policies

Sr.No.	World Bank Policy	Applicability Due to	How Project Address Policy Requirements?
1.	Environmental Assessment OP 4.01	Project is likely to have impacts on environmental components such as on ambient air quality water bodies, existing slopes in on embankment, trees along the road, etc.	Preparation and application of environmental Codes of Practice for addressing environmental issues.
2.	Natural Habitats OP 4.04	Some rural roads are likely to be in/close to sensitive natural habitats.	Avoidance measures, including non-inclusion of such sub- projects in the project.

3.4. IRC Codes, MORTH Clauses, and other guidelines Applicable

All the applicable clauses are mentioned below:

- IRC 35: 2015: Code of practice for Road Markings (with paints)
- IRC 67:2012: Code of practice for Road Signs
- IRC 69-1977: Space standards for roads in urban areas
- IRC 103-2012: Guidelines for pedestrian facilities
- IRC: SP:63 -2018: Guidelines for the Use of Interlocking Concrete Block Pavement
- *Complete street design and Better Street Better Cities guideline by ITDP*
- IRC 70 – Street parking
- IRC 99-2018.

4. Baseline Conditions

4.1. Baseline Conditions

4.1.1. Urban Corridor, Indore

4.1.1.1. Traffic Surveys and Analysis

To capture traffic flow characteristics and travel pattern of users passing through the project corridor and other characteristics, the following primary traffic survey was planned and conducted.

- Intersection turning movement count survey
- Pedestrian count survey

4.1.1.1.1. Intersection turning movement count survey

Intersection Turning Movement Count surveys have been carried out at three major intersections on the model corridor namely at Bada Ganpati junction, Geetanjali Hospital junction and Kalani Nagar junction. Classified traffic volume counts for all vehicle types were carried out separately for all different turning movements of traffic from each of the approach roads as per the guidelines of IRC SP 41 (1994). The survey was carried out by recording traffic for each successive 1-hour interval for 24 hours for three working day with the help of trained enumerators. Each turning movement at an intersection was recorded by deploying enumerators in sufficient numbers at suitable locations at site. Data obtained from turning movement counts were analyzed for estimation of peak hour traffic.

Data collected from the site was fed to the computer and compiled. The various vehicle types having different sizes and characteristics were converted into a standard unit called Passenger Car Unit (PCU). PCUs for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “Guidelines for Capacity of Urban Roads in Plain Areas”, IRC-64-1990.

Table 9: PCU Factors Adopted for the Study (IRC:64)

Sl. No.	Vehicle Type	PCU Factor
Fast Vehicles		
1	Two wheelers, Motorcycle, or scooter etc.	0.5
2	Passenger car, pick-up van	1.0
3	Auto-rickshaw	1
4	Light commercial vehicle	1.5
5	Minibus	1.5
6	Truck / Bus	3
7	MAV	4.5
8	Agricultural Tractor Trailer	4.5
Slow Vehicle		
9	Cycle	0.5
10	Cycle Rickshaw	2
11	Hand Cart	3
12	Animal Drawn Cart	6

The peak hour traffic of an intersection is the key parameter considered in the estimation of the intersection capacity and provides for a measure of its level of service. It is also the key parameter in warranting for recommendation of grade separated junctions. The peak hour traffic volumes as observed at the two surveyed locations are shown in the table below.

Table 10: Peak Hour Traffic at Surveyed Intersections

	Survey Location	Peak Hour Traffic (PCU)	Peak Hour
1	Bada Ganpati junction	10,259	18:00 – 19:00
2	Geetanjali Hospital junction	5,704	12:00 – 13:00
3	Kalani Nagar junction	2,935	12:00 – 13:00

The total peak hour traffic volume at Bada Ganpati junction has been observed to be 10,259 PCUs between 18:00 hrs. and 19:00 hrs. whereas the peak hour traffic volume for Geetanjali Hospital junction has been observed to be 5,704 PCUs between 12:00 hrs. and 13:00 hrs. For Kalani Nagar junction peak hour traffic was observed to be 2,935 PCUs between 12:00 hrs. and 13:00 hrs.

4.1.1.1.2. Pedestrian count survey

The number of pedestrians walking along and across at intersections of the corridor has been recorded at three locations. It has been observed that there is significant presence of pedestrians in the peak hour. This warrants the need for footpath and crossing facilities at the location. Out of three locations, high number of pedestrian volumes was recorded at Bada Ganpati junction. Due to famous Ganpati temple and commercial activity along the study corridor, the junction has recorded significant number of pedestrians in the peak hour. Hence, it is recommended that the minimum width of the footpath should be at least 2.5m wide with proper crossing facility.

Table 11: Peak hour pedestrian count at intersections

Sr. No.	Location	Approach Road section	Peak hour volume	Peak Hour
1	Bada Ganpati junction	From Airport	346	8:00 – 9:00
		From Jinsi	297	8:00 – 9:00
		From Malharganj	887	18:00 – 19:00
		From Gangwal	244	18:00 – 19:00
2	Junction near Geetanjali Hospital	From Airport	100	9:00 – 10:00
		From Bada Ganpati	96	19:00 – 20:00
		From RAPTC	107	19:00 – 20:00
		From Ramchandra Nagar	139	8:00 – 9:00
3	Kalani Nagar junctions	From Airport	137	19:00 – 20:00
		From Bada Ganpati square	138	
		From Anjani Nagar	117	
		From Kalani Nagar	115	

4.1.1.1.3. PV2 analysis

Pedestrian crossing warrants are guidelines that suggest what kind of pedestrian crossing facility should be provided under the given traffic and site conditions. These warrants help in identifying the most appropriate type of crossing facility to be provided at a particular location based on certain factors.

In India, planning and design of pedestrian facilities is based on the guidelines provided by the Indian Road Congress document IRC: 103 titled “Guidelines for Pedestrian Facilities” (IRC:103, 2012). This document suggests that mid-block crossings may be warranted when one or more of the following conditions exist:

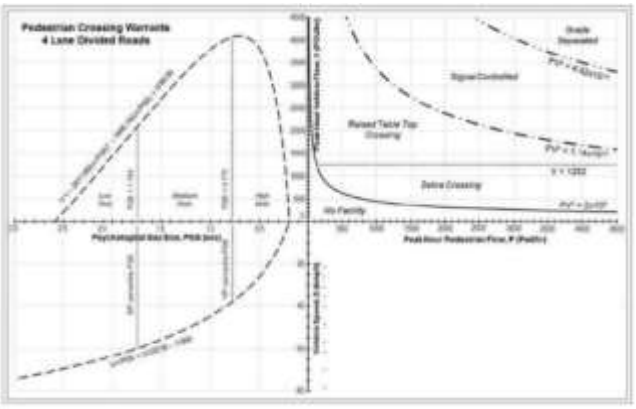
1. Peak hour volumes of pedestrians (P) and vehicles (V) are such that PV2 > 1 x 10^8 for undivided carriageways and PV2 > 2 x 10^8 for divided carriageways.
2. Approach speeds of vehicles exceed 65 kmph.
3. Waiting time for pedestrian/vehicle becomes too long.
4. Accident records indicate 5 or more injuries to pedestrian in a year due to collision with vehicles.

The nomograph for planning pedestrian crossings is presented below from IRC:103 - Guidelines for Pedestrian Facilities (Draft). These can be used to decide a type of crossing facility which shall be provided at a location.

Crossing facility**	PV^2 value ranges*		
	2-lane undivided	4-lane divided	6-lane divided
No facility	< 1.00 x 10^8	< 2.00 x 10^8	< 2.00 x 10^8
Zebra crossing	1.00 x 10^8 – 6.41 x 10^8	2.00 x 10^8 – 1.14 x 10^{10}	2.00 x 10^8 – 2.78 x 10^{10}
Signalized crossing	6.41 x 10^8 – 2.66 x 10^{10}	1.14 x 10^{10} – 4.92 x 10^{10}	2.78 x 10^{10} – 1.17 x 10^{11}
Grade separated crossing	> 2.66 x 10^{10}	> 4.92 x 10^{10}	> 1.17 x 10^{11}

*Where 'P' is the peak hour pedestrian flow & 'V' is the peak hour vehicle flow of both directions for 2 lane undivided roads and of one direction for 4 lane and 6 lane divided roads. Pedestrian flow is defined as the number of pedestrians passing a given point per unit time expressed as pedestrians per hour or pedestrian per minute or pedestrians per 15 minutes. Vehicle flow is defined as the total number of vehicles that pass over a given point of a street in a given interval of time. It is expressed as PCU per hour.

Source: IRC:103 - Guidelines for Pedestrian Facilities (Draft)



The above warrant charts and PV2 value ranges can be used to identify the need of a pedestrian crossing facility as well as the most appropriate crossing facility for the corridor based on the peak hour pedestrian volume and vehicular volume. From pedestrian count survey, PV^2 analysis has been carried out at four locations and presented below.

Approach Roads	Lanes	Peak hour Pedestrian Flow (P)	Peak Hour Vehicle Flow (V)	PV^2	Existing Facility	IRC Recommendations
Bada Ganpati Junction:						
Towards Jinsi Square	4 Lane Divided	135	2076	0.05 X 10^{10}	Faded Zebra Crossing	Zebra Crossing
Towards Airport Road	4 Lane Divided	80	2202	0.03 X 10^{10}	Faded Zebra Crossing	Zebra Crossing
Towards Gangwal Circle	4 Lane Divided	128	5657	0.4 X 10^{10}	Faded Zebra Crossing	Zebra Crossing
Towards Malharganj	2 Lane Undivided	92	4052	0.1 X 10^{10}	Faded Zebra Crossing	Zebra Crossing
Geetanjali Hospital Junction:						
Towards Airport	4 Lane Divided	53	3191	0.05 X 10^{10}	Faded Zebra Crossing	Zebra Crossing

Towards Bada Ganpati	4 Lane Divided	51	1787	1.62 X 10^8	Faded Zebra Crossing	No Facility
Towards RAPTC	4 Lane Divided	37	1740	1.11 X 10^8	Faded Zebra Crossing	No Facility
Towards Ramchandra Nagar	2 Lane Undivided	34	2099	1.49 X 10^8	Faded Zebra Crossing	Zebra Crossing
Kalani Nagar Junction:						
Towards Anjani Nagar	2 Lane Undivided	117	601	0.423X 10^8	No facility	No Facility
Towards Airport Road	4 Lane Divided	137	1529	3.2 X 10^8	No facility	Zebra Crossing
Towards Kalani Nagar	2 Lane Undivided	115	1069	1.31 X 10^8	No facility	Zebra Crossing
Towards Bada Ganpati Square	4 Lane Divided	138	1172	1.9 X 10^8	No facility	No Facility

At present, Bada Ganpati junction is signalized junction with zebra crossing at four legs. Due to high movement of pedestrian movement along and across the junction, it is recommended to provide refuge island at the junction along with zebra crossing. Geetanjali Hospital junction is unsignalized junction with zebra crossing facility. As the junction is unsignalized, traffic calming measures is recommended to provide before crossing for pedestrian safety. Also, Kalani Nagar junction was recorded with high number of pedestrian footfall due to adjacent commercial land use. At present there was no provision of safe crossing facility at the junction. Hence, it is recommended to provide pedestrian crossing at the junction. The recommendations are listed below.

Bada Ganpati Junction -	Zebra crossing + Median Refuge Island
Geetanjali Junction -	Zebra crossing + TCM (Rumble strip with speed hump) before crossing + Median Refuge Island
Kalani Nagar Junction	Zebra crossing + TCM (Rumble strip with speed hump) before crossing + Median Refuge Island

4.1.1.1.4. Walkability Index

Qualitative assessment for the evaluation of pedestrian facility encompasses the quality assessment of the characteristics of the Footpaths. This process uses the perception of the pedestrians and develops to quantify the comfort level of pedestrians while encountering certain roadway characteristics. Walkability Index is used for evaluating pedestrian infrastructure performance considering the following factors:

- Physical and user characteristics/parameter
- Importance weight and satisfaction rating of individual parameter

Walkability is defined as a measure of how friendly an area is to walk. It benefits health, environment, and the economy. Presence or absence and quality of footpaths, sidewalks or other pedestrian rights-of-way, traffic and road conditions, land use patterns, building accessibility, and safety, these are all factors influencing walkability. As per Indian Highway Capacity Manual (Indo-HCM) 2012-2017,

Walkability Index: QOS = $\sum^{10}{}_{i=1}$ Ai * Bi

where,

Ai : importance weight for physical and user characteristics

Bi : satisfaction rating for physical and user characteristics

A field assessment was done at the time of site visit. The satisfaction ratings have been assessed by linking the existing condition of the footpaths with the help of factors defined in below. The physical and user characteristics are assessed based on the rating of pedestrian facility i.e., only footpaths are considered and thus the Walkability Index has been developed in Indo-HCM manual.

The user perception of the Footpaths has been recorded with the help of questionnaire surveys by collecting the physical characteristics and user characteristics. The overall walkability of Bada Ganpati urban model corridor is presented below.

Table 12:Quality of Service - Bada Ganpati Model Urban Corridor

Parameters Considered	Weightage*	Satisfaction Rating		Total Index	
		South side	North Side	South side	North Side
Physical Characteristics					
Footpath surface	3.48	2	1	7	3
Footpath width	3.35	2	1	7	3
Obstructions	3.22	1	2	3	6
Potential for vehicular conflict	3.16	2	2	6	6
Continuity	2.32	1	1	2	2
User Characteristics					
Encroachment	3.1	1	2	3	6
Availability of crossing	3.17	2	2	6	6
Security	3.05	1	1	3	3
Comfort	2.74	2	2	5	5
Walk environment	2.98	1	2	3	6
			Walkability Index	**46**	**49**
			Quality of Services (QOS)**	**E**	**E**

**source: Indian Highway Capacity Manual (Indo-HCM) 2012-2017 - Table 9E.5: Importance Rating of Pedestrian Facility across Various Land uses*
*** source: Indian Highway Capacity Manual (Indo-HCM) 2012-2017 - Quality of Service for Footpaths (Table 9.14)*

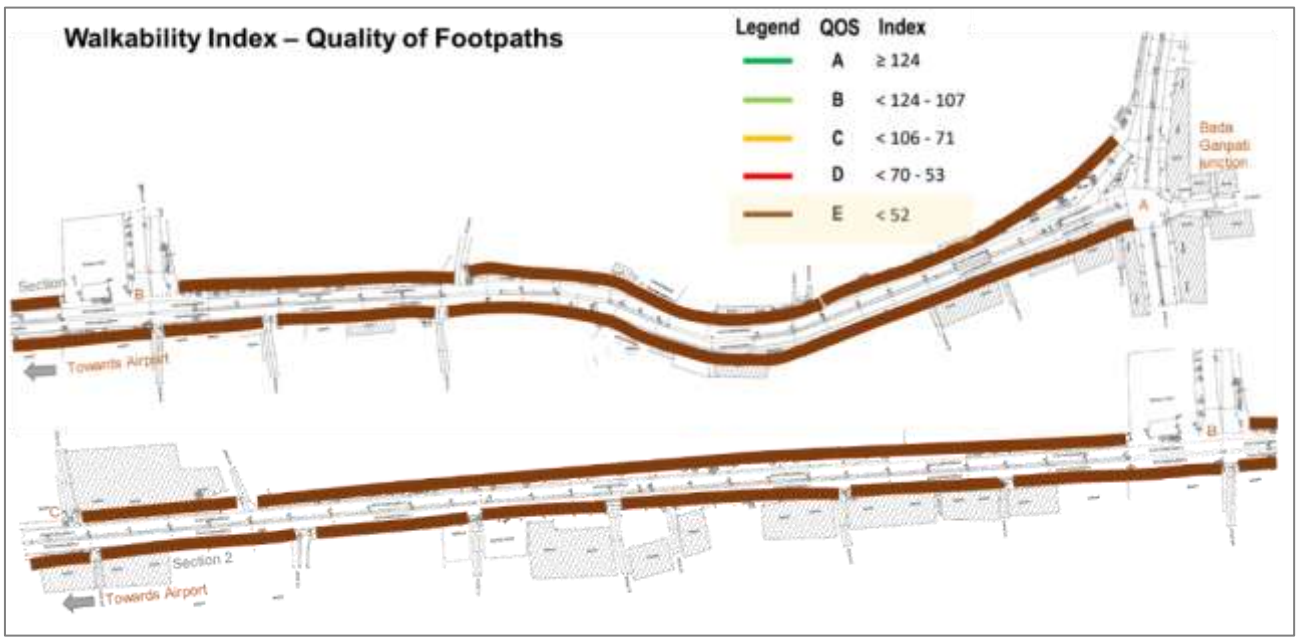


Figure 4: Walkability Index - Bada Ganpati Model corridor

From the derived results, it can be noted that the model corridor footpath offers QOS E on both sides to the pedestrians which is not within the acceptable range. Therefore, appropriate measures need to be proposed for safe movement of pedestrian. The major walkability issues are highlighted below.

- Lack of footpath for pedestrian / absence of footpath
- Inadequate footpath width
- Encroachment – due to parking and vendors
- Discontinuation of footpath
- Improper crossing facilities on intersection and midblock
- Other issues – surface quality, obstructions etc.

4.1.1.2. Audit Observations

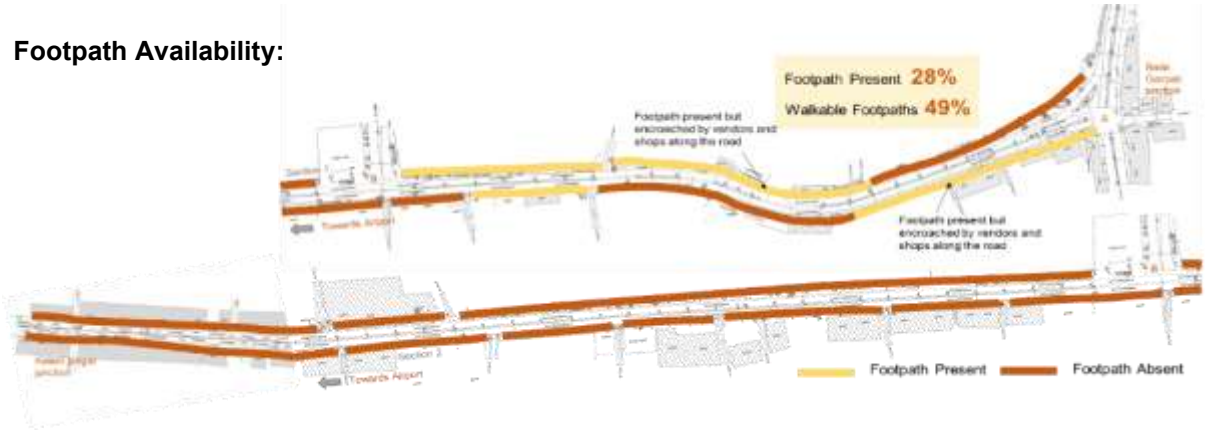
4.1.1.2.1. Street elements

A. Footpath

Field Observations:

- Due to lack of facilities to walk along the roadside, it is seen that pedestrians are fully or partially using the traffic lane to walk along the road. This increases the pedestrian's exposure with the motorized traffic.
- Also, footpaths are not continuous, and they are encroached mostly by vendors even, if available which is making it non usable by the pedestrians.
- Only 28% of the stretches have footpath facility for pedestrians. But only 49% of available footpaths are in walkable condition, remaining parts are mostly encroached by local shops, vendors and on street parking.

Footpath Availability:




Due to lack of footpath facility pedestrians are using traffic lane

Pedestrians are using traffic lane


Pedestrians are forced to walk on carriageway as no footpaths are available


Available shoulders are encroached by on street parking


Footpath available but encroached by local shops

B. Carriageway

Field Observations:

- The divided carriageway on both sides of the corridor has approximately 3 lanes of width, of which the inner two-lane width is used by motorists while the outer lane is used as shoulder, for a variety of purposes including pedestrians (in the absence or presence of unused footpaths), encroachment by vendors and parking.
- Inner two-lane width is constant but outer lane is not constant throughout the corridor, boundary is not clearly defined through curbs. Carriageway near Mahavir colony is not maintaining constant width.
- Throughout the corridor, the carriageways have faded road markings and, in some stretches, absent.


Carriageway – south edge


Carriageway – North edge


Carriageway near Mahavir colony

C. Street Vending

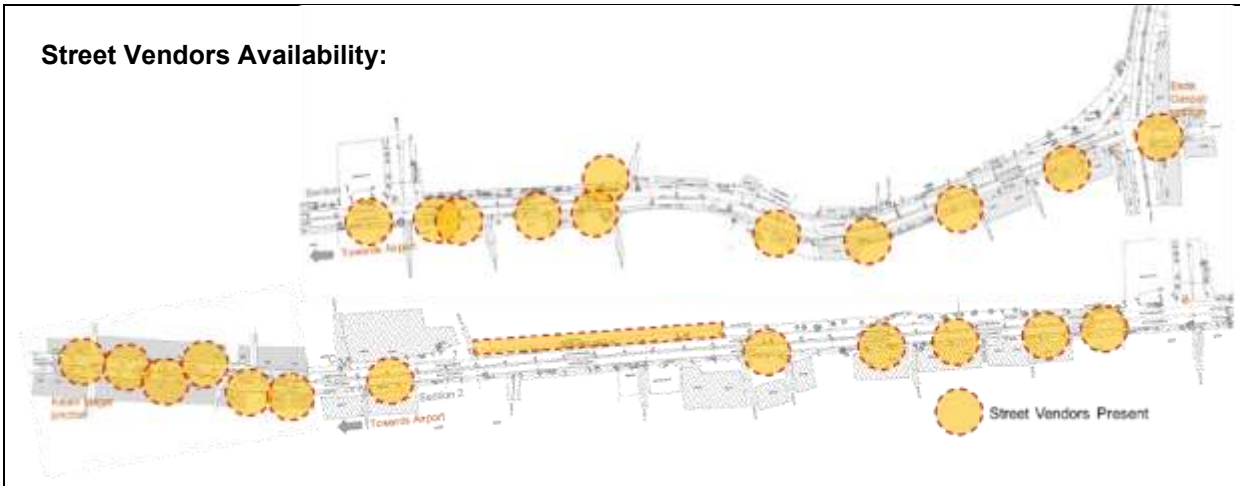
Field Observations:

- Street vendors are present throughout the stretch as depicting in the below map. All street vendors occupy space on the roadside shoulder and carriageway.
- Unauthorized occasional street vendors like food seller, vegetable sellers are seen on the south edge of the corridor near Janta colony, Sitaram Park colony, Mahavir colony, Ganga colony, Kalani Nagar.
- On the north edge of the corridor, a wide earthen shoulder is available from the Bada Ganpati Square till the RAPTC Playground. This space has roadside trees, occasional street vendors and parked vehicles.
- Street vendors i.e., potters, bike seat repair are seen on the north edge of the corridor near RAPTC ground.


Street Vending space – South Edge


Street Vending space – North Edge

Street Vendors Availability:



D. On street parking – Car and IPT

Field Observations:

- On-street car parking was observed throughout the stretch as depicted in the below map.
- Presence of shops, malls, and hospitals on the south edge of the corridor lead to high number of private cars parked on the road.
- IPT parking is observed near Bada Ganpati junctions on the north edge.
- There are no proper allocated pickup/stop points for the IPTs along the stretch.
- Sudden stop of the vehicles (IPTs) on to the highspeed traffic could cause rear-end collisions. This is also increasing the pedestrian presence near these points and hence can influence pedestrian related crashes.
- Presence of informal parking on the wide-open roadside is a potential roadside hazard.

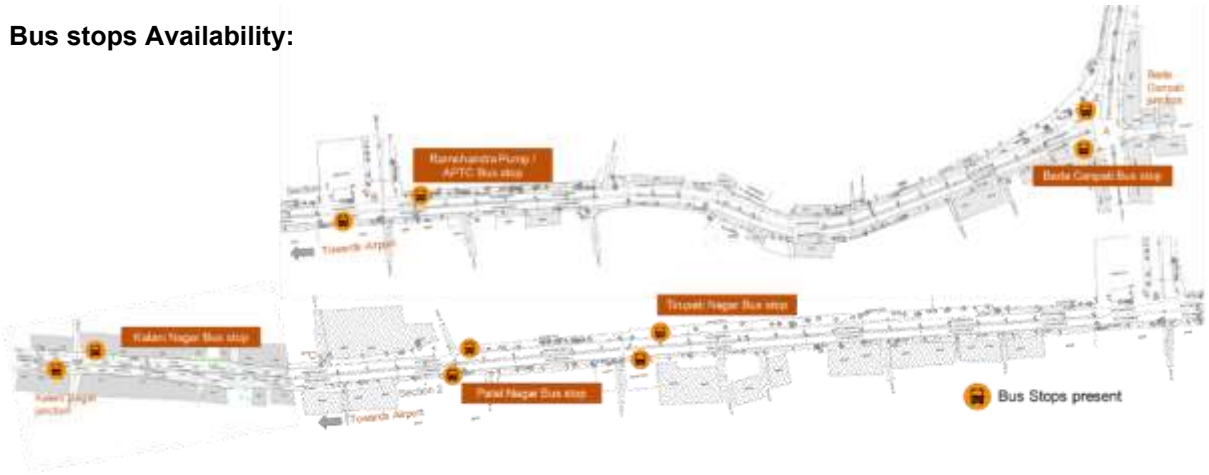
On street parking availability:

E. Bus Stops

Field Observations:

- Presence of bus stops on the edge of the roadway and bus waiting for the road users on roadside causes a vision obstruction for the bus passengers who get down and intents to cross the road.
- Bus stops are in good conditions but there is lack of facilities i.e., bus stops signage, bus route information, etc.
- No bus stops were observed at Bada Ganpati intersection, passengers were waiting on the carriageway creating congestion on road.
- IPTs, cars were parked in front of bus stops creating unsafe condition for bus passengers.

Bus stops Availability:




Bus shelter not available at Shikshak Nagar


Vehicles parked at Bus stop


Bus stop at Ramchandra Nagar


No Bus stop at Bada Ganpati Intersection

F. Street Furniture

Field Observations:

- Dustbins were present at some locations but are not in use by the road users.
- Street lights were present in the median of the corridor.
- Bollards, railings were not observed throughout the stretch for pedsetrain safety.
- Toilets were not observed on the road.


Dustbins observed on the footpath and shoulder


Streetlights observed throughout the stretch

G. Utilities

Field Observations:

- At some places, presence of open drain was noticed.

- It can cause water to stagnate on roadside and sometime extend to the one of the lanes. This could cause aquaplaning related crashes due to loss of control of vehicles.
- Presence of unprotected electric poles/boxes, manholes were noticed which pose as roadside hazard.


Open Manhole observed on footpath


Utility box/electric poles observed on the road

H. Landscaping / plantation

Field Observations:

- Many trees were observed throughout stretch mainly on the north edge of the corridor as depicting in the below map.

4.1.1.2.2. Safety elements

A. Pedestrian Crossing

Field Observations:

- Presence of inadequate facility for pedestrian crossing (such as faded zebra cross markings, absence of refuge island etc.)
- Informal crossing points are created at some locations which is used by pedestrians.
- Midblock pedestrian crossings were not observed along the corridor and this gives rise to jaywalking and pedestrian related hazards


Zebra crossing observed but no cuts provided

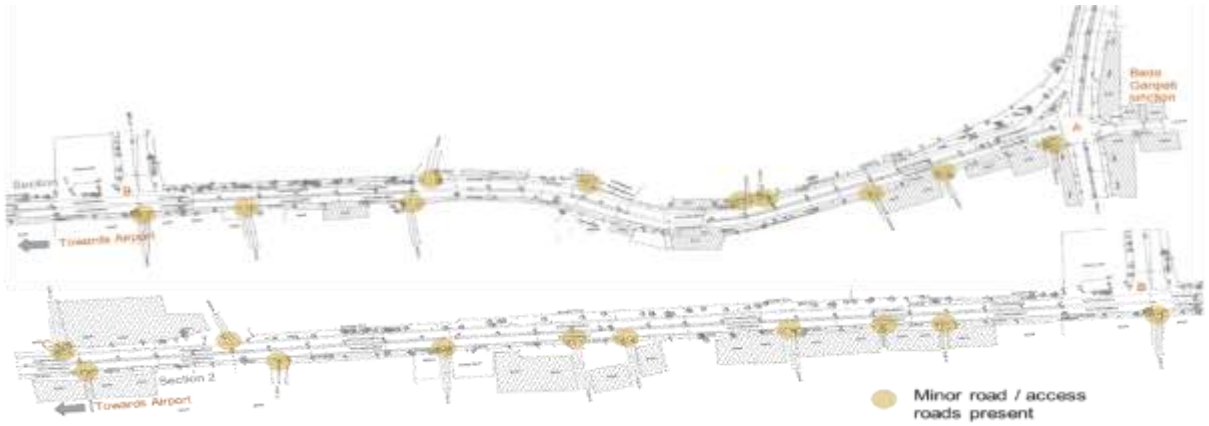

Informal crossing points


Faded zebra crossings

B. Traffic Calming Measures

Field Observations:

- Multiple access openings are present along the road without any traffic calming measures, creating multiple conflict points between the vehicles accessing the opening and high-speed traffic. This could result in front-side, rear-end and head-on type of collisions.
- The land use on south edge of the road is predominantly commercial leading to high volume of pedestrians. There are chances of conflict between the pedestrians and motorized vehicles moving on high speed.




No calming measures for pedestrian crossing


No TCM measures on minor road junctions

C. Traffic Signages

Field Observations:

- Lack of traffic signages throughout the stretch. No signages are seen on the stretch. Only Information signages/advance direction signs were there.
- Various minor junctions leading to nearby residential areas are available without any proper signages and safety measures for the road users.
- Access to the petrol pump is provided without any proper signage or physical separation from the carriageway, which is acting as a conflict point for the access and through traffic.
- Gantry mounted advance direction signs were observed at Bada Ganpati junction and between Shanidham Chouraha and Geetanjali hospital junction mid-block.

- Non-standard speed limit post signs were observed at one place.


Lack of traffic signages, no signage


Information signage / Gantry mounted sign


Lack of traffic signage at minor junctions


Lack of traffic signage at important location


One Speed Limit sign observed

D. Road Markings

Field Observations:

- Road markings like centerline and edge line markings are not continuous throughout the stretch and are missing at majority of the sections.
- Road markings are completely missing at some stretches.
- Zebra crossing markings are present but are mostly faded.


Lack of traffic markings, zero visibility


Markings not properly visible


No markings


Zebra crossing are faded, not properly visible

E. Advertisements

Field Observations:

- Advertisement structures are projected on carriageway and footpath/shoulder area.
- The visibility of the access road is very poor due to the presence of structures on the corner of the access point at Shanidham Chouraha.
- Shops advertisement or display are placed mainly on footpath blocking the walking area.
- An unipole advertisement structure (opposite to Narsingha Vatika) placed in such a way that it is projected on the carriageway.

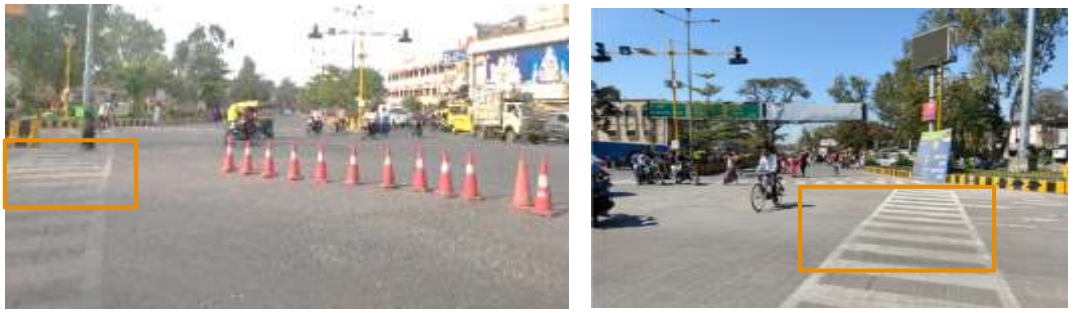
4.1.1.2.3. Universal accessibility

Universal accessibility and barrier free design elements

Field Observations:

- No disabled friendly accessibility facilities were observed throughout the corridor.

- Pedestrian facilities are not properly designed. At Bada Ganpati junction, pedestrian crossings are ending at traffic island which doesn't have any provision for pedestrians.



4.1.1.2.4. Intersections

A. Major Intersections

Field Observations:

Major Intersections:

Bada Ganpati Square Junction

- Temporary left-turn channelization is present on road from Gangwal circle at Bada Ganpati junction using traffic cones.
- Presence of an uncontrolled intersection creating several conflict points, causing potential speeding related crashes as the road users are not guided at the intersection.
- Encroachment by vendors is visible at the corner of the junction.
- Presence of inadequate facility for pedestrian crossing at the junction with faded markings and absence of refuge island. The north-east corner of the junction (with temple) has some area with paver blocks (presumably for pedestrian refuge. However, this is flush with the pavement and therefore is encroached by motorists).

Junction at Geetanjali Hospital

- This is an unsignalized junction
- Median divider on the west leg is terminated before the access to the IOCL petrol pump on the north-west corner and leaves a wide-open median opening. This and the absence of left turn channelizing islands along with large corner radius encourages unchanneled and haphazard movements across the junction
- Bus Stop on the south edge of the west leg is very close to the junction




Kalani Nagar Junction

- Permanent left-turn channelization using kerbs is present at all corners of intersection. Only two left turn channels are currently being used for turning, other two are being used for parking.
- Presence of an uncontrolled intersection creating several conflict points, causing potential speeding related crashes as the road users are not guided at the intersection.
- Presence of inadequate facility for pedestrian crossing at the junction.
- Buses and IPTs stop very close to intersection.




4.1.2. Urban Corridor, Dhar

4.1.2.1. Traffic Surveys & Analysis

To capture traffic flow characteristics and travel pattern of users passing through the project corridor, the following primary traffic surveys were planned and conducted.

- Intersection Turning Movement Count Survey
- Pedestrian Count Survey

4.1.2.1.1. Intersection Turning Movement Count Survey

Intersection Turning Movement Count survey has been carried out at one major intersection on the model corridor namely at Rau-Pithampur Road T Junction. Classified traffic volume counts for all vehicle types were carried out separately for all different turning movements of traffic from each of the approach roads as per the guidelines of IRC SP 41 (1994). The survey was carried out by recording traffic for each successive 1-hour interval for 24 hours for three working days (between 13th April to 16th April) with the help of trained enumerators. Each turning movement at an intersection was recorded by deploying enumerators in sufficient numbers at suitable locations at site. Data obtained from turning movement counts were analyzed for estimation of peak hour traffic.

Data collected from the site was fed to the computer and compiled. The various vehicle types having different sizes and characteristics were converted into a standard unit called Passenger Car Unit (PCU). PCUs for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “Guidelines for Capacity of Urban Roads in Plain Areas”, IRC-64-1990.

Table 13: PCU Factors Adopted for the Study (IRC:64)

Sl. No.	Vehicle Type	PCU Factor
	Fast Moving Vehicles	
1	Two Wheelers, Motorcycle, Scooter, etc.	0.5
2	Passenger Car, Pick-up Van	1.0
3	Auto Rickshaw	1
4	Light Commercial Vehicle	1.5
5	Minibus	1.5
6	Truck/Bus	3
7	Multi Axle Vehicle	4.5
8	Agricultural Tractor Trailer	4.5
	Slow Moving Vehicles	
9	Bicycle	0.5
10	Cycle Rickshaw	2
11	Hand Cart	3
12	Animal Drawn Cart	6

The peak hour traffic of an intersection is the key parameter considered in the estimation of the intersection capacity and provides for a measure of its level of service. It is also the key parameter in warranting for recommendation of grade separated junctions. The peak hour traffic volume as observed at the surveyed location is shown in the table below.

Table 14: Peak Hour Traffic at Rau-Pithampur Road T Junction

Sl. No.	Survey Location	Peak Hour Traffic (PCU)	Peak Hour
1	Rau-Pithampur Road T Junction	3,577	19:00 – 20:00

The total peak hour traffic volume at Rau-Pithampur Road T Junction has been observed to be 3,577 PCUs between 19:00 hrs. and 20:00 hrs.

It is observed for the Rau-Pithampur T intersection that the traffic signal installation warrant is satisfied for a minimum of 8 hrs. on a typical day and hence the junction is proposed as signalized junction. A **three-phase signalized system with pedestrian phase** is proposed at Rau-Pithampur T junctions. The 8 hrs. traffic volume as observed at the surveyed location is shown in the table below.

Table 15: Typical 8 hours- Traffic at Rau-Pithampur Road T Junction

Direction	Vehicles on Major Street (Total Both Approaches)	Higher Vehicles on Minor Street (One Direction)
07:00 - 08:00	1513	626
08:00 - 09:00	1569	733
09:00 - 10:00	970	475
10:00 - 11:00	1091	664
11:00 - 12:00	1799	966
12:00 - 13:00	2069	1078
13:00 - 14:00	1470	794
14:00 - 15:00	1336	686
15:00 - 16:00	1253	675
16:00 - 17:00	1315	766
17:00 - 18:00	1897	1013
18:00 - 19:00	1791	992
19:00 - 20:00	1533	983
20:00 - 21:00	1030	915
21:00 - 22:00	939	538
Major Road: Eicher Square to Rau		

4.1.2.1.2. Pedestrian Count Survey

The number of pedestrians walking along and across at intersections of the corridor has been recorded at one location (at Rau-Pithampur Road T Junction). It has been observed that there is significant presence of pedestrians in the peak hour at this location, and this warrants the need for footpath and crossing facilities at the location. It is recommended that the minimum width of the footpath should be at least 1.5m wide with proper crossing facility.

Table 16: Peak Hour Pedestrian Count at Rau-Pithampur Road T Junction

Sr. No.	Location	Approach Road	Peak Hour Pedestrian Volume	Peak Hour
1	Rau-Pithampur Road T Junction	From Sector II	418	18:00 – 19:00
		From Eicher Square	139	09:00 – 10:00

		From Rau	233	10:00 – 11:00

4.1.2.1.3. PV^2 Analysis

Pedestrian crossing warrants are guidelines that suggest the kind of pedestrian crossing facility which should be provided under the given traffic and site conditions. These warrants help in identifying the most appropriate type of crossing facility to be provided at a particular location based on certain factors.

In India, planning and design of pedestrian facilities is based on the guidelines provided by the Indian Roads Congress document IRC:103 (2012) entitled "Guidelines for Pedestrian Facilities". This document suggests that mid-block crossings may be warranted when one or more of the following conditions exist:

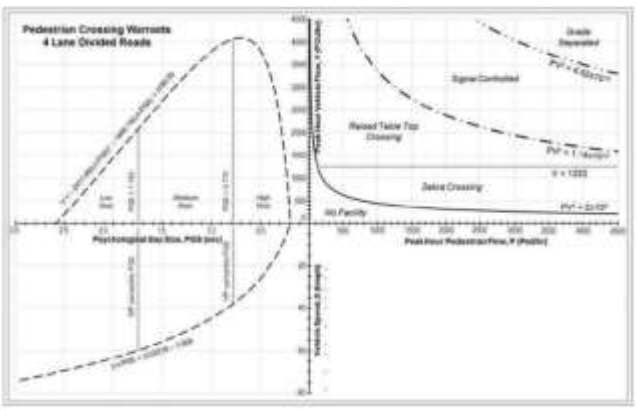
1. Peak hour volume of pedestrians (P) and vehicles (V) are such that PV2 > 1 x 10^8 for undivided carriageways and PV2 > 2 x 10^8 for divided carriageways.
2. Approach speeds of vehicles exceed 65 kmph.
3. Waiting time for pedestrian/vehicle becomes too long.
4. Accident records indicate 5 or more injuries to pedestrian in a year due to collision with vehicles.

The nomograph for planning pedestrian crossings is presented in the figure below (based on IRC:103 - Guidelines for Pedestrian Facilities (Draft)). These can be used to decide upon the type of crossing facility that shall be provided at a location.

Crossing facility**	PV^2 value ranges*		
	2-lane undivided	4-lane divided	6-lane divided
No facility	< 1.00 x 10^8	< 2.00 x 10^8	< 2.00 x 10^8
Zebra crossing	1.00 x 10^8 – 6.41 x 10^8	2.00 x 10^8 – 1.14 x 10^{10}	2.00 x 10^8 – 2.78 x 10^{10}
Signalized crossing	6.41 x 10^8 – 2.66 x 10^{10}	1.14 x 10^{10} – 4.92 x 10^{10}	2.78 x 10^{10} – 1.17 x 10^{11}
Grade separated crossing	> 2.66 x 10^{10}	> 4.92 x 10^{10}	> 1.17 x 10^{11}

*Where 'P' is the peak hour pedestrian flow & 'V' is the peak hour vehicle flow of both directions for 2 lane undivided roads and of one direction for 4 lane and 6 lane divided roads. Pedestrian flow is defined as the number of pedestrians passing a given point per unit time expressed as pedestrians per hour or pedestrian per minute or pedestrians per 15 minutes. Vehicle flow is defined as the total number of vehicles that pass over a given point of a street in a given interval of time. It is expressed as PCU per hour.

Source: IRC:103 - Guidelines for Pedestrian Facilities (Draft)



The above warrant charts and PV^2 value ranges can be used to identify the need of a pedestrian crossing facility as well as the most appropriate crossing facility for the corridor based on the peak hour pedestrian and vehicular volumes. From the pedestrian count survey, PV^2 analysis has been carried out at one location and presented below.

Approach Road	No. of Lanes	Peak hour Pedestrian Flow (P)	Peak Hour Vehicle Flow (V)	PV^2	Existing Facility	IRC Recommendation
Rau-Pithampur Road T Junction:						
From Sector II	2-Lane Undivided	109	2,988	9.728 x 10^8	None	Zebra Crossing
From Eicher Square	4-Lane Divided	150	1,300	2.535 x 10^8	None	Zebra Crossing
From Rau	4-Lane Divided	259	1,126	3.283 x 10^8	None	Zebra Crossing

As per IRC:103 - Guidelines for Pedestrian Facilities (Draft), it is suggested to provide zebra crossings with a proper opening and a flashing amber signal in the median which is to be at the same level as the carriageway on either side of the median to seek the driver's attention and ensure pedestrian safety. At present, Rau-Pithampur Road T Junction is an unsignalized junction with no existing pedestrian crossing facility. Due to large movement of pedestrians along and across the junction, it is recommended to provide refuge island at the junction along with zebra crossings. Along with the zebra crossing facility, three-phase signalized system with pedestrian phase is proposed at Rau-Pithampur T junctions. The recommendations are listed below.

4.1.2.2. Audit Observations

4.1.2.2.1. Street Elements

A. Footpath

Field Observations:

- Due to lack of footpath, it is observed that the pedestrians are fully or partially using the carriageway to walk along the road. This enhances exposure of pedestrians with the motorized traffic.
- On the western side of the 750 m North-South segment of the corridor, footpath is completely absent starting from the T-junction on the north till the junction of the vehicle underpass with NH79 in the south.
- On the eastern side of the 750 m North-South segment of the corridor, footpath is present but mostly encroached by vendors, shops, and construction materials. A 3.5 m wide concrete footpath is also present on the eastern side of the corridor starting from the first entrance to the Eicher factory till the second entrance to the Eicher factory. Earthen shoulder is present from the second entrance till the junction of the vehicle underpass with NH79.
- Footpath is completely absent on the eastern part of the corridor starting from the Rau-Pithampur Road T Junction to the Pithampur Energy Station petrol pump on Rau-Pithampur Road. Earthen shoulder is present on both sides of the road.

East side


Footpath present encroached by construction material and vendors


A concrete footpath is present but not continuous


Footpath is absent, People walking on carriageway

West side


Footpath is completely absent in west side


Earthen shoulder is present encroached by on street parking and vendors


New 3.5 m wide concrete footpath outside new bus terminal

B. Carriageway

Field Observations:

- The divided carriageway on both sides of the corridor has 2 lanes of width with 5 – 6 m wide earthen shoulders. The carriageway condition is overall good, but shoulders are poorly maintained.
- There is a slight steep slope in carriageway near the Eicher VE parts distribution center factory on 750 m East-West segment of the corridor. Also, carriageway is slightly bend due to presence of Ganesh Mandir placed at the median.
- The shoulders are used by pedestrians (in the absence or presence of unused footpaths) and encroached by on-street cars, two wheelers, trucks, and vendors.
- Throughout the corridor, the carriageways do not have road markings except edge marking on some stretches.


4 Lane divided carriageway


Bad condition of road shoulder

Uniform carriageway with earthen shoulder

C. Street Vending

Field Observations:

- Street vendors are available throughout the stretch as depicted in the below images. All street vendors mainly occupy roadside shoulder space and footpath.
- Unauthorized occasional street vendors like food sellers, shops, etc. are observed on the eastern side of the corridor in front of the Eicher Chowraha bus stand and on the western side of the corridor near Eicher Factory gates, and banks.
- Vendors are also observed at the Rau-Pithampur Road T Junction and on the East-West segment of the corridor. Vendors like tyre repairing, small garages, etc. are observed near factory.

Street vendors – East side

Street vendors – West side

D. On-Street Parking – Car and IPT

Field Observations:

- On-street car and two wheeler parking are observed along the corridor as depicted in the below map.
- Presence of Eicher Factory, HDFC bank, and other factories throughout the corridor are leading to high number of private cars and two wheelers parked on the roadside shoulder of the corridor.
- High number of trucks are parked on shoulder near factory gates for the purpose of loading and unloading of materials.
- IPTs stand is observed near Eicher Chowraha bus stand on the western side. Vehicles are parked on the shoulder.

On street parking – east side

On street parking – west side in front of Eicher factory

On street Truck parking on shoulder

On-street car parking – west side in front of HDFC bank

On street Truck parking on shoulder

E. Bus Stops

Field Observations:

- A formal bus stand and shelter is situated on the western side of the start point of the corridor located at the Eicher junction of the vehicle underpass with NH79. Buses have been observed to stop at both sides of the point.
- Maharana Pratap Bus Terminal Pithampur is under construction on the eastern side of the corridor opposite Eicher Factory.

Bus Stand at Eicher Factory gate no 3

Maharana Pratap Bus Terminal Pithampur

F. Street Furniture

Field Observations:

- Dustbins are present at some locations but are not in use by the road users.
- LED street lights are present in the median of the corridor.
- Bollards and railings are not observed throughout the corridor. This increases the risk on pedestrian safety.
- Sulabh complex (toilet) is observed on the western side of the start point of the corridor located at the junction of the vehicle underpass with NH79.
- Street furniture like benches is present along the concrete footpath on the eastern edge of the corridor near new bus terminal.

Dustbins observed throughout the corridor

Public Toilets

Bollards and Benches

Bollards and Dustbins

G. Utilities

Field Observations:

- At some places, presence of open drain has been noticed. This can cause water to stagnate on roadside and sometime extend to the one of the lanes and could result in aquaplaning related crashes due to loss of control of vehicles.
- Presence of unprotected electric boxes and open manholes are noticed, and these poses as roadside hazard.

Open Drains and manhole

Electric boxes, poles on shoulder

Roadside Open Drains and manhole

H. Landscaping/Plantation

Field Observations:

- Trees planted on shoulders create threat to safe movement of pedestrians.
- Many trees are observed throughout the corridor and mainly on the western and northern edge of the corridor.

Trees are observed on shoulder throughout the corridor

4.1.2.2.2. Safety Elements

A. Pedestrian Crossing

Field Observations:

- Presence of inadequate facility for pedestrian crossing (absence of zebra cross markings).
- Haphazard movement of pedestrians are observed at Eicher Chowraha junction. At the southern end of the corridor (junction of vehicle underpass with NH79), there is severe encroachment by street vendors and random movement of pedestrians on road moving to/from nearby commercial establishments and bus stops.
- At Rau-Pithampur T Junction on the northern end of the corridor, inadequate pedestrian crossing facilities are observed, and these create conflict points between pedestrian and vehicular movement.
- Midblock pedestrian crossings are not observed on the road.

B. Traffic Calming Measures

Field Observations:

- The adjacent land use of the corridor is dominated by industrial area leading to high movement of heavy trucks. There are chances of conflict between the pedestrians and trucks moving on road.

- Multiple property entrances are present without adequate traffic calming measures thereby creating multiple conflict points between heavy trucks accessing the entrances and vehicular traffic on road.
- Rau-Pithampur Road T Junction and Eicher Chowraha underpass are unsignalized and there are no traffic calming measures present on these, thereby creating an unsafe condition for pedestrian crossings.
- There is slight steep slope in carriageway near the Eicher VE parts distribution center factory on the East-West segment of the corridor. Also, due to the presence of Ganesh Mandir placed at the median, the carriageway is slightly bent at the location. However, since no traffic calming measures and signages are present at this location, these can be cause for severe accidents.

C. Traffic Signages

Field Observations:

- Lack of traffic signages are observed throughout the stretch. No signages are seen on the stretch.
- Non-standard T junction sign is observed at one place before the Rau-Pithampur Road T Junction. Also, one "Median Gap" sign is observed at end of the median near Eicher Chouraha gate no 3. No other signages are present throughout the stretch.

Only two traffic sings are observed throughout the stretch

D. Traffic Markings

Field Observations:

- Road traffic markings are absent throughout the corridor.
- Edge line markings are faded condition present at some stretches however not continuous throughout the stretch and are missing at majority of the sections.

E. Advertisements

Field Observations:

- No advertisement boards are observed throughout the corridor.

4.1.2.2.3. Universal Accessibility

Universal Accessibility and Barrier Free Design Elements

Field Observations:

- No disabled friendly accessibility facilities were observed throughout the corridor.

4.1.2.2.4. Intersections

A. Major Intersection

Field Observations:

Eicher Chouraha:

- Unsignalized vehicular underpass with single lane service road both at eastern and southern legs of the junction.
- 4-lane divided Mhow – Ghatabillod road / NH-79 road plying over the underpass connecting Rau-Pithmapur Road which is in north side of the junction.
- The side road condition is not good, existing footpaths are encroached with street vendors and IPT vehicles parking.
- Northern leg of junction (meeting Rau-Pithampur Road) is a divided 4-lane carriageway.
- Lack of pedestrian crossing facility.

Rau-Pithampur Road T Junction:

- Unsignalized junction
- Comprises of 4-lane divided carriageway configuration for both the eastern and southern legs on the Rau-Pithampur Road.
- Northern leg of junction (meeting Vikas Bhawan Road) is an undivided 2-lane carriageway.
- Junction opening is wide and un-channelized. The median dividers end well before the junction and there are no present channelizing islands for left turning traffic. Pedestrian facilities are not available.
- Lack of pedestrian crossing facility.

4.1.3. Urban Corridor, Datia

4.1.3.1. Traffic Surveys & Analysis

To capture traffic flow characteristics and travel pattern of users passing through the project corridor, the following primary traffic surveys were planned and conducted.

- Intersection Turning Movement Count Survey
- Pedestrian Count Survey

4.1.3.1.1. Intersection Turning Movement Count Survey

Intersection Turning Movement Count survey has been carried out at one major intersection on the model corridor namely at Bhander Junction in Datia. Classified traffic volume counts for all vehicle types were carried out separately for all different turning movements of traffic from each of the approach roads as per the guidelines of IRC SP 41 (1994). The survey was carried out by recording traffic for each successive 1-hour interval for 24 hours for three working days (between 20th April to 22nd April) with the help of trained enumerators. Each turning movement at an intersection was recorded by deploying enumerators in sufficient numbers at suitable locations at site. Data obtained from turning movement counts were analyzed for estimation of peak hour traffic.

Data collected from the site was fed to the computer and compiled. The various vehicle types having different sizes and characteristics were converted into a standard unit called Passenger Car Unit (PCU). PCUs for various vehicles are adopted based on recommendations of Indian Road Congress prescribed in “Guidelines for Capacity of Urban Roads in Plain Areas”, IRC-64-1990.

Table 17: PCU Factors Adopted for the Study (IRC:64)

Sl. No.	Vehicle Type	PCU Factor
	Fast Moving Vehicles	
1	Two Wheelers, Motorcycle, Scooter, etc.	0.5
2	Passenger Car, Pick-up Van	1.0
3	Auto Rickshaw	1
4	Light Commercial Vehicle	1.5
5	Minibus	1.5
6	Truck/Bus	3
7	Multi Axle Vehicle	4.5
8	Agricultural Tractor Trailer	4.5
	Slow Moving Vehicles	
9	Bicycle	0.5
10	Cycle Rickshaw	2
11	Hand Cart	3
12	Animal Drawn Cart	6

The peak hour traffic of an intersection is the key parameter considered in the estimation of the intersection capacity and provides for a measure of its level of service. It is also the key parameter in warranting for recommendation of grade separated junctions. The peak hour traffic volume as observed at the surveyed location is shown in the table below.

Table 18: Peak Hour Traffic at Bhander Junction

Sl. No.	Survey Location	Peak Hour Traffic (PCU)	Peak Hour
1	Bhander Junction	1,524	10:00 – 11:00

The total peak hour traffic volume at Bhander Junction has been observed to be 1,524 PCUs between 10:00 hrs. and 11:00 hrs.

4.1.3.1.2. Pedestrian Count Survey

The number of pedestrians walking along and across at intersections of the corridor has been recorded at one location (at Parashuram Hanuman Mandir Junction). It has been observed that there is significant presence of pedestrians in the peak hour at this location, and this points to the need for footpath and crossing facilities at the location. It is recommended that the minimum width of the footpath should be at least 2.5m wide with proper crossing facility.

Table 19: Peak Hour Pedestrian Count at Parashuram Hanuman Mandir Junction

Sr. No.	Location	Approach Road	Peak Hour Pedestrian Volume	Peak Hour

1	Parashuram Hanuman Mandir Junction	From Indergarh	59	07:00 – 08:00
		From Jhansi	74	07:00 – 08:00
		From Hanuman Mandir	95	07:00 – 08:00

4.1.3.1.3. PV2 Analysis

Pedestrian crossing warrants are guidelines that suggest the kind of pedestrian crossing facility which should be provided under the given traffic and site conditions. These warrants help in identifying the most appropriate type of crossing facility to be provided at a particular location based on certain factors.

In India, planning and design of pedestrian facilities is based on the guidelines provided by the Indian Roads Congress document IRC:103 (2012) entitled "Guidelines for Pedestrian Facilities". This document suggests that mid-block crossings may be warranted when one or more of the following conditions exist:

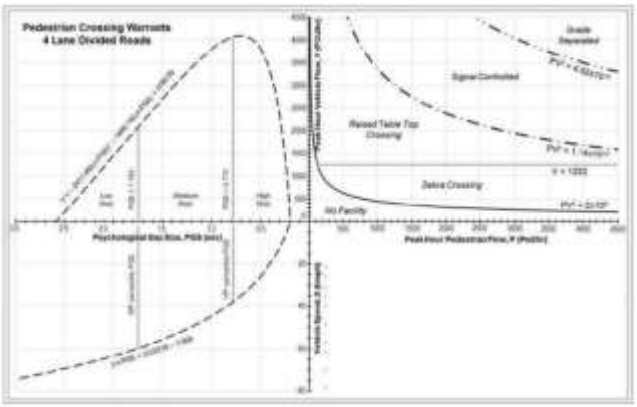
5. Peak hour volume of pedestrians (P) and vehicles (V) are such that PV2 > 1 x 10^8 for undivided carriageways and PV2 > 2 x 10^8 for divided carriageways.
6. Approach speeds of vehicles exceed 65 kmph.
7. Waiting time for pedestrian/vehicle becomes too long.
8. Accident records indicate 5 or more injuries to pedestrian in a year due to collision with vehicles.

The nomograph for planning pedestrian crossings is presented in the figure below (based on IRC:103 - Guidelines for Pedestrian Facilities (Draft)). These can be used to decide upon the type of crossing facility that shall be provided at a location.

Crossing facility**	PV^2 value ranges*		
	2-lane undivided	4-lane divided	6-lane divided
No facility	< 1.00×10^8	< 2.00×10^8	< 2.00×10^8
Zebra crossing	1.00×10^8 – 6.41×10^8	2.00×10^8 – 1.14×10^{10}	2.00×10^8 – 2.78×10^{10}
Signalized crossing	6.41×10^8 – 2.66×10^{10}	1.14×10^{10} – 4.92×10^{10}	2.78×10^{10} – 1.17×10^{11}
Grade separated crossing	> 2.66×10^{10}	> 4.92×10^{10}	> 1.17×10^{11}

*Where "P" is the peak hour pedestrian flow & "V" is the peak hour vehicle flow of both directions for 2 lane undivided roads and of one direction for 4 lane and 6 lane divided roads. Pedestrian flow is defined as the number of pedestrians passing a given point per unit time expressed as pedestrians per hour or pedestrian per minute or pedestrians per 15 minutes. Vehicle flow is defined as the total number of vehicles that pass over a given point of a street in a given interval of time. It is expressed as PCU per hour.

Source: IRC:103 - Guidelines for Pedestrian Facilities (Draft)



The above warrant charts and PV^2 value ranges can be used to identify the need of a pedestrian crossing facility as well as the most appropriate crossing facility for the corridor based on the peak hour pedestrian and vehicular volumes. From the pedestrian count survey, PV^2 analysis has been carried out at one location and presented below.

Approach Road	No. of Lanes	Peak hour Pedestrian Flow (P)	Peak Hour Vehicle Flow (V)	PV^2	Existing Facility	IRC Recommendation
Parashuram Hanuman Mandir Junction:						
From Indergarh	4-Lane Divided	51	549	0.153 x 10^8	None	No Facility

From Jhansi	4-Lane Divided	48	549	0.144×10^8	None	No Facility

As per IRC:103 - Guidelines for Pedestrian Facilities (Draft), no pedestrian facility is required. However, it is suggested to provide zebra crossings with a proper opening and a flashing amber signal in the median which is to be at the same level as the carriageway on either side of the median to seek the driver's attention and ensure pedestrian safety. At present, Parashuram Hanuman Mandir Junction is an unsignalized junction with no existing pedestrian crossing facility. Due to large movement of pedestrians along and across the junction, it is recommended to provide refuge island at the junction along with zebra crossings. For pedestrian safety, traffic calming measures are recommended to be provided before crossing. The recommendations are listed below.

Parashuram Hanuman Mandir Junction-	**Zebra Crossing + Median Refuge Island**

4.1.3.2. Audit Observations

4.1.3.2.1. Street Elements

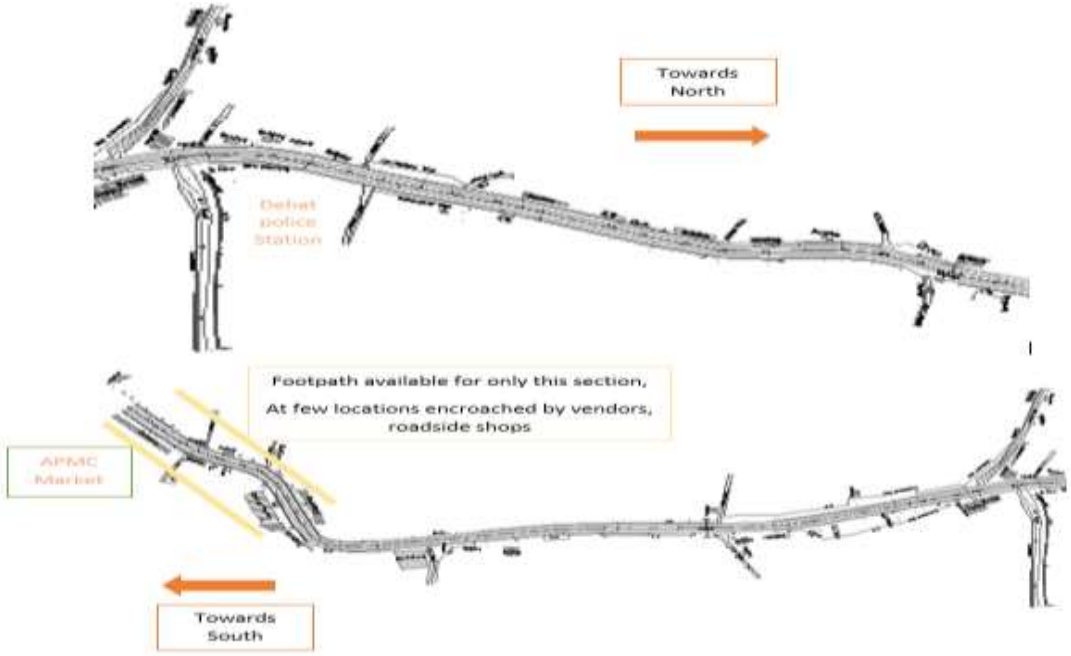
A. Footpath

Field Observations:

- Due to lack of facilities to walk along the roadside, it is seen the pedestrians are fully or partially using the traffic lane to walk along the road. This increases the pedestrian's exposure with the motorized traffic.

- Along the stretch, footpath is available for only 300-meter length of study stretch (20% of stretch) at the southern end, which is also encroached by street vendors, roadside shops for parking motorcycles, placing boards. Footpaths are not continuous.

Footpath Availability:



Pedestrians are forced to walk on road, as footpaths are not available.

Footpath encroached by street vendor and vehicles.

Discontinuous footpath.

B. Carriageway

Field Observations:

- The divided carriageway on both sides of the corridor has approximately 2 lanes of width.
- Paved shoulder for parking vehicle in case of emergency/breakdown is not available throughout the stretch.
- Carriageway boundary is not clearly defined through curbs.
- Road surface quality is very poor at many locations on the stretch.
- At many locations, kerb stones in median have been removed to create illegal gap-in-medians.
- Domestic animals were noticed on travel lane.

Sufficient paved shoulder not available throughout the stretch.

Poor road surface quality noticed at many locations on the stretch.

Illegal Gap-in-Median

Curb stone in travel lane is serious safety hazard.

Domestic animals on travel lane.

C. Street Vending

Field Observations:

- Street vendors were observed at south end of the stretch and at intersection of Dehat police station.

Street Vendors Availability:

D. Street Furniture

Field Observations:

- Dustbins were present at some locations but are not in use by the road users.
- Streetlights were present in the median of the corridor.
- At some locations, vegetation in median is very dense and high, which creates vision obstruction at gap in medians.
- Bollards and railings were not observed throughout the stretch for pedestrian safety.
- Toilets were not observed on the road.

Dustbins available on roadside

Streetlights available in median

Dense plantation in median causing vision obstruction

E. Utilities

Field Observations:

- At some places, presence of open drain was noticed on the side of the road on carriageway going towards north. Carriageway going towards south doesn't have drainage on the roadside.
- At few locations on stretch, water from nearby residential and commercial area travels on road and gets accumulated on road which deteriorates the surface quality of the road and can create road safety hazard for motorcyclists.
- At one location electric pole was tilted and it was projecting inside travel lane.

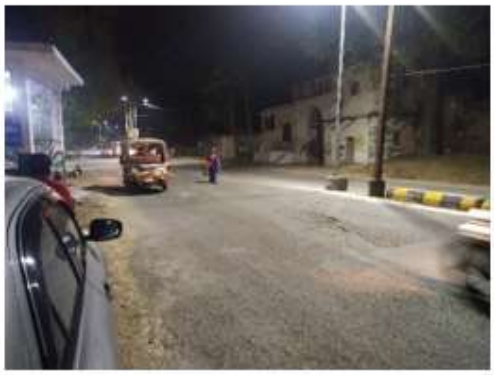
Open drainage

Water gets accumulated on road

Electric pole tilted in travel lane

4.1.3.2.2. Safety Elements

A. Pedestrian Crossing
Field Observations: • Pedestrian crossing facilities (such as zebra cross marks, refuge islands, tabletop crossing etc.) are not available throughout the stretch neither at intersection nor at midblock. • Informal crossing points are created at some locations which are used by pedestrians.



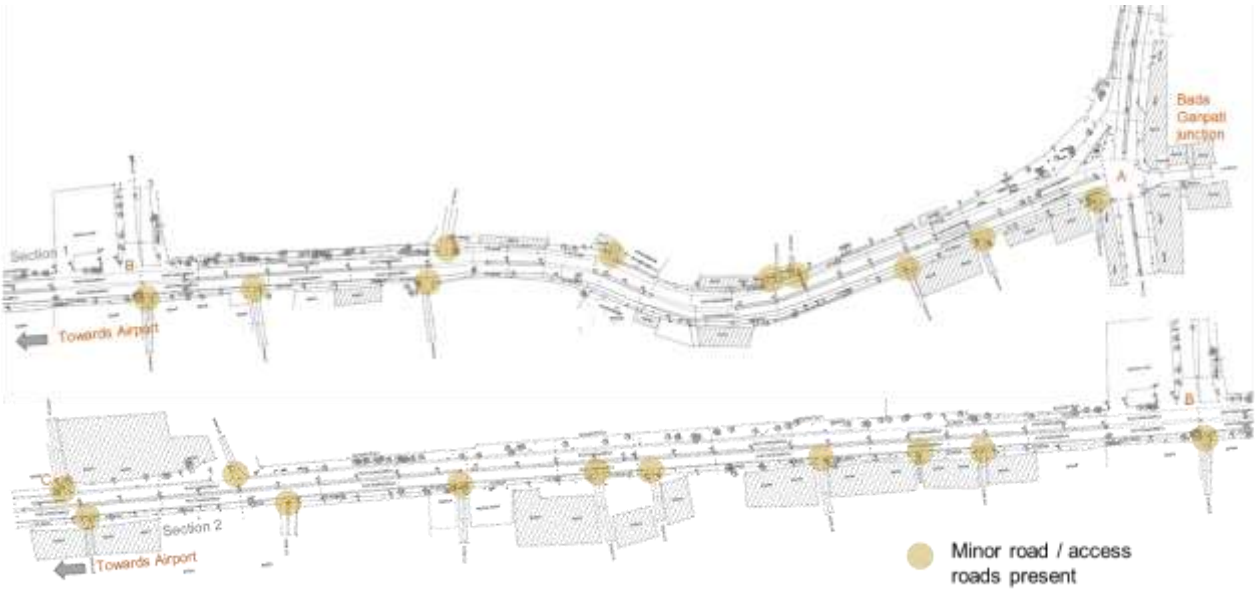

Due to lack of pedestrian crossing facilities, informal crossing points have been formed

B. Traffic Calming Measures

Field Observations:

- Multiple access openings are present along the road without any traffic calming measures, creating multiple conflict points between the vehicles accessing the opening and high-speed traffic. This could result in front-side, rear-end and head-on type of collisions.
- There are chances of conflict between the pedestrians and motorized vehicles moving at high speed.

Minor road or access roads existing:



No traffic calming measures available at locations of frequent pedestrian crossings.

Pedestrian crossing not available at junctions.

C. Traffic Signages

Field Observations:

- Lack of traffic signages throughout the stretch. No signages are seen on the stretch except one or two. Only Information signage/ advance direction signs were there.
- Various minor junctions leading to nearby residential areas are present without any proper signage and safety measures for the road users.
- There is no warning signage with respect to use of road by pedestrians, bicyclists.
- No standard speed limit post signs were observed at any location.

No Signage for the intersection.

Information signage available on the road, intersection.

D. Traffic Markings

Field Observations:

- Road markings like centerline and edge line markings are not continuous throughout the stretch on carriageway going towards north.
- Road markings including stop line treatment are not available at intersections.
- Zebra crossing marks are not available.

Road markings are not available on midblock sections.

Road markings are faded.

Road markings are not available at intersection, zebra cross marks are not available.

4.1.3.2.3. Universal Accessibility

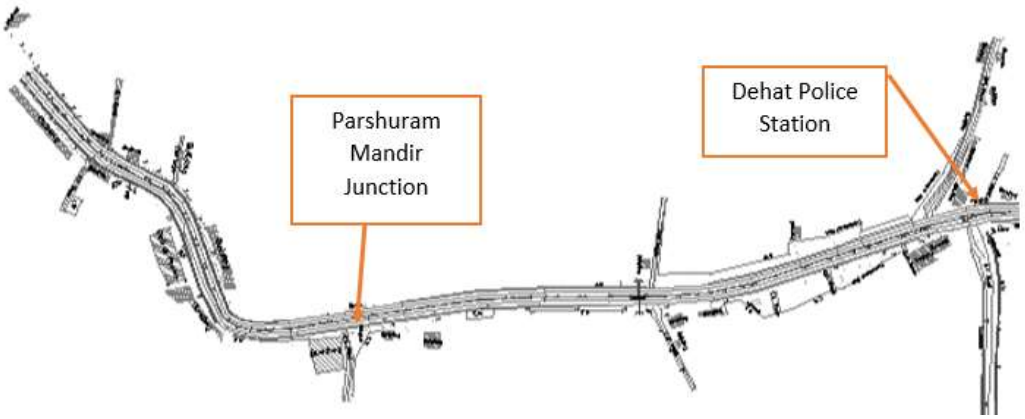
Universal accessibility and barrier free design elements
Field Observations: • No disabled friendly accessibility facilities were observed throughout the corridor.

4.1.3.2.4. Intersections

A. Major Intersections
Field Observations: **Dehat Police Station** • This is biggest intersection on the stretch. • There is roundabout at the intersection, which is not correctly located. Majority section of roundabout is in corridor towards south direction. • Haphazard movement of motorist and non-motorists around the roundabout. • On Dehat police roundabout, significant traffic volume gets added, subtracted from road going toward Bhander. • Presence of an uncontrolled intersection creating several conflict points, causing potential speeding related crashes as the road users are not guided at the intersection. • Encroachment by vendors is visible at the corner of the junction. • There are no facilities available at this intersection for pedestrians walking alongside road and pedestrians crossing. • There are no reflectors on round about structure and color on curbstone is also faded which makes it less visible in the dark.




Major Intersections:



Junction at Parshuram Mandir

- Parshuram mandir intersection witness both, pedestrian and motorized traffic.
- There are no markings and signages at intersection.
- There are no facilities available at this intersection for pedestrians walking alongside road and pedestrians crossing.
- No speed calming measures are available on this intersection.
- Median divider on the south is terminated before the access road to the Parshuram Mandir and leaves a wide-open median opening.


4.2. Baseline Environment and Social Conditions

4.2.1.1. Urban Corridor, Indore

4.2.1.1.1. Corridor of Impacts (COI) and Project Influence Area (PIA)

Based on the proposed mitigation designs a preliminary assessment of impacts was done. The project influence area was taken to 10 m. from center line on either side of the project road. Titleholders along the project corridor are not impacted, even in this buffer zone.

4.2.1.1.2. Topography and Physiography

The selected corridor is urban with plain terrain.

4.2.1.1.3. Drainage Pattern

There are no major water bodies crossing the Corridor.

4.2.1.1.4. Soil Types

The soil of Indore area is medium black soil.

4.2.1.1.5. Water Environment

Commercial is the main land use. There is no major source of contamination for surface and ground water along the project road.

4.2.1.1.6. Climatic Conditions

Temperature

The average daily temperature during the year varies between 32.7^{O}C and 19.0^{O}C. The district experiences pleasant winters and hot and rainy summers. The hot season extends from March to May, during which the daily maximum temperature often shoots up to 41.1^{O} C.

Rainfall

The average annual rainfall recorded in the district is 1033 mm

4.2.1.1.7. Ambient Air Quality

The existing project road is a part of Aerodrome Road with four lane divided carriageway. The nearest Air Quality monitoring station is in the city of Indore. The AQI Index = 127 is recorded on 30th May 2022, as per the data form the monitoring station. Such level is considered as moderately unsafe

4.2.1.1.8. Noise Environment

The major source of noise pollution along the corridor is vehicular traffic.

4.2.1.1.9. Biological Environment

Forest

There is no forest land diversion involved in the project and there are no forest sections in the near vicinity of the project corridor.

Protected Area

There are no notified National parks and Wildlife sanctuary identified within the boundary of 5 kms from the proposed project corridor.

Wild Fauna

There are no endangered, critically endangered, and threatened categories of fauna in the nearby vicinity of the project corridor.

4.2.1.2. Urban Corridor, Dhar

4.2.1.2.1. Corridor of Impacts (COI) and Project Influence Area (PIA)

Based on the proposed mitigation designs a preliminary assessment of impacts was done. The project influence area was taken to 10 m. from center line on either side of the project road. Titleholders along the project corridor are not impacted, even in this buffer zone.

4.2.1.2.2. Topography and Physiography

The selected corridor is urban with plain terrain.

4.2.1.2.3. Drainage Pattern

There are no major water bodies crossing the SCDP Corridor.

4.2.1.2.4. Soil Types

The soil of the area is medium black soil.

4.2.1.2.5. Water Environment

Surface water and Ground Water of the Pithampur Industrial area is being deteriorated due to the presence of multiple industries.

4.2.1.2.6. Climatic Conditions

Temperature

The variation in the maximum temperature during the year ranges from 41.1OC to 28.2OC and minimum from 16.3OC to 28.4OC. The district experiences pleasant winters and hot and rainy summers. The hot season extends from March to May, during which the daily maximum temperature often shoots up to 41.1O C.

Rainfall

The average annual rainfall recorded in the district is 833.6 mm.

4.2.1.2.7. Ambient Air Quality

The existing project road is a part of State Highway 38 with two lanes without paved shoulder. The nearest Air Quality monitoring station is located near Pithampur. The AQI Index = 131 is recorded on 19th May 2022, as per the data form the monitoring station.

4.2.1.2.8. Noise Environment

The major source of noise pollution along the corridor is vehicular traffic.

4.2.1.2.9. Biological Environment

Forest

There is no forest land diversion involved in the project and there are no forest sections in the near vicinity of the project corridor.

Protected Area

There are no notified National parks and Wildlife sanctuary identified within the boundary of 5 kms from the proposed project corridor.

Wild Fauna

There are no endangered, critically endangered, and threatened categories of fauna in the nearby vicinity of the project corridor.

4.2.1.3. Urban Corridor, Datia

4.2.1.3.1. Corridor of Impacts (COI) and Project Influence Area (PIA)

Based on the proposed mitigation designs a preliminary assessment of impacts was done. The project influence area was taken to 10 m. from center line on either side of the project road. Titleholders along the project corridor are not impacted, even in this buffer zone.

4.2.1.3.2. Topography and Physiography

The selected corridor is urban with plain terrain.

4.2.1.3.3. Drainage Pattern

There is one lake (Karan Sagar) along the stretch. The construction will have minimal to no impact on the water quality of the area.

4.2.1.3.4. Soil Types

The soil of the area is alluvial soil.

4.2.1.3.5. Water Environment

There is one lake (Karan Sagar) along the stretch. The construction will have minimal to no impact on the water quality of the area.

4.2.1.3.6. Climatic Conditions

Temperature

The variation in the temperature during the year ranges from 47°F to 106°F. The district experiences pleasant winters and hot and rainy summers. The hot season extends from April to June, during which the daily maximum temperature is often above 99°F.

Rainfall

The average annual rainfall recorded in the district is about 842 mm.

4.2.1.3.7. Ambient Air Quality

The nearest Air Quality monitoring stations are in Jhansi and Gwalior. The AQI Index = 30 is recorded on 13th July 2022, as per the data form the monitoring station. Such level is considered as fair.

4.2.1.3.8. Noise Environment

The major source of noise pollution along the corridor is vehicular traffic.

4.2.1.3.9. Biological Environment

Forest

There is no forest land diversion involved in the project and there are no forest sections in the near vicinity of the project corridor.

Protected Area

There are no notified National parks and Wildlife sanctuary identified within the boundary of 5 kms from the proposed project corridor.

Wild Fauna

There are no endangered, critically endangered, and threatened categories of fauna in the nearby vicinity of the project corridor.

5. Analysis of Alternatives

5.1. “With” and “Without” Scenario

The selected road stretches in pilot districts carry both passenger and freight traffic. The no action scenario will allow an increase in accidents and a deteriorating road safety condition throughout the stretch.

As a part of development of the urban model corridor, the road safety assessment has been completed to propose corridor wide road safety measures for improving the safety along the selected stretch. While the entire corridor has been inspected and safety recommendations provided, emphasis has been put on the safety deficient locations that were observed during the road safety assessment. Accordingly, all the safety deficient locations were examined at site for the nature of the safety problems and a set of recommendations have been provided for implementation in respect of each such location to improve the road safety throughout the corridor.

6. Consultation with key Stakeholders

6.1. Definition of stakeholders

Project stakeholders are defined as individuals, groups or other entities who:

(i) are impacted or likely to be impacted directly or indirectly, positively or adversely, by the Project (also known as 'affected parties')

(ii) may have an interest in the project including individuals or groups whose interests may be affected by the project and who have the potential to influence the project outcomes in any way.

6.2. Objective of Stakeholders consultations

The objective of stakeholder consultation is to look into the likely impacts of road improvement on the communities, and the likely mitigation aspects of the impacts.

6.3. Types and categories of stakeholders

6.3.1. Institutional

The institutional stakeholder of the project includes the government authorities involved in the project including Madhya Pradesh Road Development Corporation, Madhya Pradesh Industrial Development Corporation, Indore Municipal Corporation, Police, World Bank, Madhya Pradesh Rural Road Development Authority & project management consultancy.

6.3.2. Road Users

All the categories of road users including pedestrians, bus drivers, 2-wheeler drivers, four-wheeler drivers truck operators as well as the communities living along the stretch including the female residents were involved in the consultations

6.3.3. Vulnerable groups

There are no vulnerable groups who are impacted because of the proposed interventions in the project.

6.4. Stakeholder Consultations

6.4.1. Urban Corridor, Indore

Social Impact Assessment was carried out for the project roads. The SIA study looked into the likely impacts of road improvement on the communities, and the likely mitigation aspects of the impacts. The SIA findings are summarized into (i) analysis of outcome of consultations of the various stakeholders and (ii) analysis of data/information finally put forth as how these outcomes have been incorporated into designs and Action Plans.

The project involves improvement of 2.8 km stretch, which comprises of three major habitation areas. Social consultations have been conducted at one major junction and bus stop and the observations of the same have been summarized.

Figure 5: Focus Group Consultation at Bada Ganpati Junction

6.4.2. Urban Corridor, Dhar

A detailed consultation has been carried out to understand the general assessment of the people and their perspective on the proposed design.

Figure 6: Snapshots of Consultation along the stretch

6.4.3. Urban Corridor, Datia

A detailed consultation has been carried out to understand the general assessment of the people and their perspective on the proposed design.

Figure 7: Snapshot of Consultation along the stretch

- Respondents indicated that that there is a lack of availability of proper road spaces for various road user categories such as motorcyclists, bicyclists, and pedestrians. Facilities including footpath and pedestrian crossings at several locations have been provided to counter this issue.
- Respondents indicated the presence of sharp curvature and blind turns along the stretch, which is one of the major cause of accidents along the stretch. The treatments for the improvement and delineation of curve have been provided to counter this issue.

6.5. Stakeholder Analysis Matrix

The below table details out the stakeholder wise consultation matrix conducted at three critical locations on the corridor, indicating their concerns, steps suggested and the proposed measures in the improvement plan.

Table 20: Stakeholder consultation matrix

S No.	Location	Issues Discussed	Steps Suggested by Participants	Remarks
1	Bada Ganpati Junction	There is no availability of car parking for the pilgrims who are coming to visit the Bada Ganpati temple. Thus, illegal parking of those vehicles is one of the reasons for congestion.	Designing and construction of specialized car parking for the devotees in the area available with the temple authorities.	Construction of car parking in the land owned by Bada Ganpati temple does not come under the scope of this project. However, car parking is being constructed for private as well as public vehicles in an attempt to reduce congestion on the junction.
		Illegal parking of autos and other public vehicles creates congestion and confusion as the path of pedestrians is often	Some vehicle parking measures should be implemented as part of this urban model street plan.	Specialized car parking for public vehicles has been designed in the development plan for improved facilities and smoother passage of

		blocked by these vehicles.		traffic as well as pedestrians.
		Bus stops are not strategically placed, and not at all present in some of the cases. That is the reason why passengers wait sporadically at different places.	New bus stops should be set up, while the current ones should also be relocated strategically.	There is provision for setting up new bus stops as part of the Urban Model Street design. The objective is to establish bus stops keeping road safety in mind.
		The traffic here comprises mainly of two wheelers and four wheelers, while the traffic of commercial vehicles is on the lower side as far as the given stretch is concerned.	Junction design should be done keeping this in mind.	Junction improvement is proposed in accordance with the MORT&H specifications and therefore, all the requirements for road safety have been taken into consideration.

7. Potential Project Impact

7.1. Identified Environmental and Social issues and Impacts

The project impacts during various phases of the implementation on the environment along with the mitigation measures are discussed in this chapter.

7.1.1.1. Climate

Anticipated Environmental Impacts

During construction, air quality along the project road alignment will be adversely impacted at major settlements and junctions. These areas will be impacted by air emissions like oxides of sulphur, oxides of Nitrogen, Carbon monoxide and hydrocarbon from construction vehicles. Dust from stone crushing unit operations at stone quarries and handling and storage of aggregates and sand at batching plants; construction activities like loading and unloading of raw materials; cutting and filling. Emissions from the hot mix plants from where hot mix is procured will also impact on the air quality at hot mix plant locations. However, construction activity in this project is rather limited and all materials can be procured from existing crushers operating in the area.

Operation stage impacts on air quality will be reduced as the project proposals are aimed at facilitating the easy movement of vehicles by widening of the existing narrower carriage way; segregation of traffic by median construction; realignment to make the entry and exit of the traffic perpendicular to the main carriage way. Pedestrian safety will be ensured by proposing raised pedestrian crossings across the major junctions. In addition, these proposals will discipline the road users and reduces unnecessary application of accelerations along the highway reducing impact on the air quality.

Mitigation Measures

- Consent for Establishment (CFE) and Consent for Operation (CFO) shall be obtained for construction establishments such as hot mix plants, batching plants and stone crushers from the SPCB. In case the contractor is procuring the materials from third party, he has to ensure that they are procured from approved sources only.
- All vehicles and construction equipment operating for the contractor and the consultant shall obtain “Pollution Under Control” (PUC) Certificates. Good maintenance of all vehicles and machines used in construction activities must be conformed to the National standards.
- Vehicles deployed for borrow material, sand and aggregate haulage shall be covered with tarpaulins to be spillage proof.
- Location of all construction establishments such as hot mix plants, WMM plants, crusher plants, construction camps and offices shall be located at least 1 km away from the human habitations and preferably on the leeward side ensuring all legal requirements and standards.
- In order to curb the increased fugitive dust emissions in the area due to excavations, loading, unloading, vehicular movement and raw material transport, provisions shall be made for periodical sprinkling water on all the haul roads on a regular basis during the entire construction period.
- Pollution control devices such as cyclone separators /scrubbers shall be installed to control emissions from hot mix plants, crushing units and concrete batching plants. Height of the stacks shall be as per the statutory requirements.
- Construction labours shall be provided with nose masks and other personnel protective equipment.
- LPG or low sulphur diesel shall be used in the diesel generator sets and DGs are fitted with the chimney stack of required height.
- To ensure the efficacy of the mitigation measures suggested, all operational areas (work sites, haul roads, hot mix plants, quarries, borrow sites and disposal sites) under the road construction works are to be regularly monitored for air quality parameters so that suitable mitigation measures can be taken up if any of the parameters exceed the prescribed limit.
- During operation stage of the project, vehicular emissions of pollutants (SPM, RSPM, CO, SO2, NOx and Pb) shall be monitored for sensitive locations upon the instruction of engineer concerned. Regular monitoring of air quality along the project area should help to ensure air pollutants within permissible limits.

7.1.1.2. Noise Environment

Anticipated Environmental Impacts

Various activities of road construction will increase noise levels at junction improvement locations along the project corridor. The construction activities such as excavation and grading of the site and movement of heavy vehicles, loading, transportation and unloading of construction materials contributes for the increase in noise levels. Impact of increase in noise levels will be pronounced especially at junctions.

Although increase in noise levels depends on many key factors such as traffic intensity, type and condition of the vehicles plying on the road, acceleration/deceleration/gear changes by the vehicles depending on the level of congestion and smoothness of road surface, the proposed measures for the project corridor will reduce the noise levels during operational phase.

Mitigation Measures

The adverse impacts from the increase of noise during construction phase on the nearby community will be reduced by several construction phase mitigation plans. All possible mechanical and administrative controls shall be practiced reducing the adverse impacts on the workers.

- Use of enclosures, walls, installation of mufflers around noisy equipment and the noise sources reduce noise generated during construction.
- Substituting quieter equipment or construction methods; minimizing time of operation and locating equipment farther from sensitive receptors.
- Timing of noisier construction and demolition activities to between 6 AM and 10 PM would reduce construction noise impacts during night.
- Detouring construction trucks away from noise-sensitive areas such as schools and hospitals would eliminate construction truck noise from those areas.
- Personnel Protective Equipment (PPE) such as ear plugs, and earmuffs shall be provided to the workers operating or working near noise generating machines.
- Turning off construction equipment during the prolonged periods of nonuse eliminates noise from construction equipment during those periods.
- Regular maintenance of all equipment and training to equipment operators would reduce noise levels and increase efficiency of equipment.
- Locating stationary equipment away from sensitive receptors would decrease noise considerably.

7.1.1.3. Water Environment

Anticipated Environmental Impacts

During construction, if the water required for construction is drawn from the community water resources it will impact the community for the duration of construction.

Mitigation Measures

- No construction waste shall be disposed of into the water bodies.
- The construction vehicles are prohibited from entering the water bodies for any purpose (including for cleaning) other than any legitimate requirements to avoid major pollution points due to oils and lubricants used in vehicles and construction equipment.
- All the water resources and water supply connections such as bore wells, taps, water cisterns, and pipelines being impacted by the project shall be relocated in such a manner that it should not hamper the access to drinking water. Relocation of bore wells shall be done with consent of concerned water supply authority or the owner.
- Water for construction shall not be tapped from the surface water resources like non-perennial rivers, lakes and water tanks which are being utilized for drinking purposes.
- Appropriate location should be sited for the construction camp, workers camp, etc. to prevent the wastewater from entering these water resources and prevent incidence of spreading of communicable diseases through water. Provision for treatment of wastewater shall be made.
- Cleaning of construction vehicles and construction equipment shall be prohibited at water bodies along the demonstration corridor.

7.1.1.4. Land environment

Anticipated Environmental Impacts

The impact on the land environment will be minimal as the construction materials like murrum, aggregate, sand, and asphalt required for the project proposals are very less. The major land use in the project area is extensive agriculture and existence of settlements at locations of Bakaner, Tawlai, Tonki, Azandiman, Thangaon, and Zhirvi with commercial and economic activity along the roadside.

At secondary construction sites like borrow areas, quarry sites and water resource points land use will be impacted depending upon the demand for material availability. These activities will cause disturbance to the nearby agricultural area, human habitations, etc.

Mitigation Measures

- Special transport facilities are required to transport bituminous material from the refineries to work sites, as these require special measures to control accident spills, as these materials are highly inflammable.
- Proper protection measures need to be worked out for the minimizing the impacts during the haulage of borrow materials.

7.1.1.5. Biological Environment – Flora and Fauna

Mitigation Measures

- No tree shall be cut down.

7.2. Negative Impacts

The negative social impacts and risks during the operation and maintenance phase are mostly associated with noise and road accidents. The ESMP, mentioned earlier, includes measures to address the above impacts, including a chance finds procedure for archaeological, historical and sacred sites. In addition, to address any impacts on the vulnerable groups that exist in the area, the ESMP plan proposes appropriate mitigation measures to be implemented during the construction as well as O&M phases.

7.3. Adverse Social Impacts

Adverse social risks and impacts during the construction phase include vehicle congestion on road due to temporary restriction on using the shoulders. The construction activities are not required in the entire stretch and the needed location of construction sites have been already identified. At a time, the entire stretch will not be affected but only the identified location will be treated and renovated as per the laid specification. Therefore, in doing so there will be minimal adverse social risk impact. The contractor will follow all the road safety guidelines and do not hamper the accessibility to schools and healthcare facilities. The potential labor influx and the conduct of road workers during construction will be taken care of by the contractor and will be monitored by MPRDC/IMC district officials.

In case of Urban Corridor, Indore, based on the proposed mitigation designs a preliminary assessment of impacts was done. The project influence area was taken to be 10 meters from center line on either side of the project road. Titleholders along the project corridor are not impacted, even in this buffer zone. However, it will have the likely impacts on about 34 petty shops (encroachers/squatters), including temporary structures and staircases in some cases and 1 small idol of goddess. Even in such cases, our current design does not completely affect non-titleholders present in the buffer zone.

In case of Urban Corridor, Dhar, based on the proposed mitigation designs a preliminary assessment of impacts was done. The project influence area was taken as 10 m. from center line on either side of the project road. There are no titleholders impacted along the project corridor. However, there is minor impact on about 35 petty shops (encroachers/squatters), including temporary structures and sheds in some cases and 1 small idol of goddess. Even in such cases, the proposed design does not completely affect non-titleholders present in the buffer zone.

In case of Urban Corridor, Datia, based on the proposed mitigation designs a preliminary assessment of impacts was done. The project influence area was taken as 10 m. from center line on either side of the project road. There are no titleholders impacted along the project corridor. However, there is minor impact on about 4 petty shops and 5 houses (encroachers/squatters), including temporary structures, extended staircase, and sheds in some cases. Even in such cases, our current design does not completely affect non-titleholders present in the buffer zone.

Table 21:List of features identified under project influence area on both side from the Road Edge-Indore

Sr.No.	Name of PAP	Male/ Female	Category	Titleholder/Non-titleholder	Encroachers /Squatters	Type /Losses	Permanent/ Temporary	Remark
1	Bhupendra Diwan	Male	Gen	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	
2	Deepak Jain	Male	Gen	Non-titleholder	Encroachers	Extended Platform	Permanent	
3	Shivam Dikshit	Male	Gen	Non-titleholder	Encroachers	Extended Platform	Permanent	
4	Rupesh Jain	Male	Gen	Non-titleholder	Encroachers	Extended Platform & Extended Tin Shed	Permanent	
5	Neelesh Choudhari	Male	Gen	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	
6	Deepak Ralyawana	Male	OBC	Non-titleholder	Encroachers	Extended Platform	Permanent	
7	Bharat Prajapati	Male	SC	Non-titleholder	Encroachers	Extended Shop counter	Temporary	
8	Harikishan Gupta	Male	Gen	Non-titleholder	Encroachers	Extended Shop counter	Temporary	
9	Rohit Rajabat	Male	OBC	Non-titleholder	Encroachers	Extended Shop counter	Temporary	
10	Deepak Parmal	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
11	Asha Sonpaliya	Female	OBC	Non-titleholder	Encroachers	Extended Tin Shed & Counter	Temporary	
12	Ayush Yadav	Male	OBC	Non-titleholder	Encroachers	Extended Platform	Permanent	
13	Vishal Chhawada	Male	OBC	Non-titleholder	Encroachers	Extended Platform	Permanent	
14	Sandeep Prapan	Male	OBC	Non-titleholder	Encroachers	Extended Platform	Permanent	

15	Anwar Khan	Male	Gen	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	
16	Kamal Suryavanshi	Male	OBC	Non-titleholder	Encroachers	Shed	Temporary	
17	Vijay Pal	Male	OBC	Non-titleholder	Encroachers	Shed	Temporary	
18	Ramgopal Suryabansh	Male	SC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
19	Gopal Kushwaha	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
20	Lakhan Verman	Male	SC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
21	Champa Bai	Female	SC	Non-titleholder	Squatters	Potter	Temporary	
22	Mukesh Gendalal	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
23	Nikesh Nalge	Male	SC	Non-titleholder	Squatters	Juice Hand Cart	Temporary	
24	Jamuna Suryavanshi	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
25	Rajesh Kushwah	Male	OBC	Non-titleholder	Encroachers	Extended Tin Shed & Counter	Temporary	
26	Laluram	Male	OBC	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	
27	Nirmal Sankala	Male	OBC	Non-titleholder	Encroachers	Extended Tin Shed & Counter	Temporary	
28	Sanjay Kothari	Male	Gen	Non-titleholder	Encroachers	Extended Tin Shed & Extended Platform	Permanent	
29	Rahul Yadav	Male	OBC	Non-titleholder	Encroachers	Extended Tin Shed & Extended Platform	Permanent	
30	Amrit Yadav	Male	OBC	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	
31	Kishan Rathor	Male	OBC	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	

32	Rakesh Yadav	Male	OBC	Non-titleholder	Encroachers	Paan Kiosk	Temporary	
33	Abhisekh Rathor	Male	OBC	Non-titleholder	Encroachers	Extended Platform	Permanent	
34	Pappu Soni	Male	Gen	Non-titleholder	Encroachers	Extended Tin Shed	Temporary	

Table 22:List of features identified under project influence area on both side from the Road Edge-Dhar

Sr.No	Name of PAP	Male/ Female	Category	Titleholder/Non-titleholder	Encroachers /Squatters	Type /Losses	Permanent/ Temporary	Remark
1	Malti Rai	Female	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	RHS
2	Suresh Kaushal	Male	SC	Non-titleholder	Squatters	Juice Hand Cart	Temporary	
3	Nandini Porwal	Female	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
4	Mohit Saini	Male	SC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
5	Sushila Chouksey	Female	Gen	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
6	Dharmesh Sarvate	Male	SC	Non-titleholder	Encroacher	Extended Shed	Temporary	
7	Rohit Zariya	Male	OBC	Non-titleholder	Encroachers	Extended Shed	Temporary	
8	Mustaq Qureshi	Male	OBC	Non-titleholder	Encroachers	Extended Shed	Temporary	
9	Manish Sharma	Male	General	Non-titleholder	Encroachers	Extended Shed and Chairs	Temporary	
10	Rajbahadur Rai	Male	OBC	Non-titleholder	Squatters	Juice Hand Cart	Temporary	
11	Raja Suryawanshi	Male	SC	Non-titleholder	Squatters	Tea Hand Cart	Temporary	
12	Deepak	Male	General	Non-titleholder	Squatters	Snacks Hand Cart	Temporary	

13	Prem Bai	Female	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
14	Sandip Patel	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
15	Rohit	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
16	Vijay Chauhan	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
17	Suraj Bhan	Male	OBC	Non-titleholder	Squatters	Hand Cart	Temporary	
18	Prashant Rai	Male	General	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
19	Satyendra Rai	Male	General	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
20	Raghunath Male	Male	OBC	Non-titleholder	Squatters	Hand Cart	Temporary	
21	Ramesh	Male	OBC	Non-titleholder	Squatters	Cloth Cart	Temporary	
22	Lokendra	Male	OBC	Non-titleholder	Squatters	Hand Cart	Temporary	
23	Damer Singh	Male	SC	Non-titleholder	Squatters	Hand Cart	Temporary	
24	Sandeep Patel	Male	OBC	Non-titleholder	Squatters	Cloth Hand Cart	Temporary	
25	Shivam	Male	SC	Non-titleholder	Squatters	Cloth Hand Cart	Temporary	
26	Kamla Patiya	Female	SC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
27	Rakesh Puniya	Female	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
28	Kanhaiya Lal Pal	Male	General	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
29	Rahul Tejpal	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	LHS

30	Rohit Tejpal	Male	OBC	Non-titleholder	Encroachers	Fruit Hand Cart	Temporary	
31	Malti Chouksey	Female	OBC	Non-titleholder	Squatters	Snacks Hand Cart	Temporary	
32	Rahul Raghuwanshi	Male	SC	Non-titleholder	Squatter	Paan Kiosk	Temporary	
33	Abhisekh Rai	Male	OBC	Non-titleholder	Encroacher	Mullti-Item Kiosk	Temporary	
34	Vishal Raghuwanshi	Male	SC	Non-titleholder	Squatters	Soda Truck	Temporary	
35	Dandram	Male	ST	Non-titleholder	Squatters	Snacks Hand Cart	Temporary	

Table 23:List of features identified under project influence area on both side from the Road Edge-Datia

S. No	Name of PAP	Male/ Female	Category	Titleholder/Non-titleholder	Encroachers /Squatters	Type /Losses	Permanent/ Temporary	Remark
1	Ratan Ram Kuswaha	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	LHS
2	Rakesh Sahu	Male	OBC	Non-titleholder	Squatters	Fruit Hand Cart	Temporary	
3	Mani Ram	Male	SC	Non-titleholder	Squatters	Snacks Hand Cart	Temporary	
4	M.S. Mechanics	-	-	Non-titleholder	Squatters	Fruit Hand Cart	Permanent	
5	Saurabh Gupta	Male	General	Non-titleholder	Encroachers	Lower Staircase	Permanent	
6	Jai Shivnarayan	Male	OBC	Non-titleholder	Encroacher	Extended Shed	Temporary	
7	Ravi Raikwar	Male	OBC	Non-titleholder	Encroachers	Extended Shed	Temporary	
8	Makhan Kuswaha	Female	OBC	Non-titleholder	Encroachers	Extended Shed	Permanent	
9	Janak Dulari	Female	OBC	Non-titleholder	Encroachers	House Extension	Temporary	

8. Environmental and Social Management Plan

8.1. Outline of ESMP

The Environmental and Social Management Framework (ESMF) is created to serve as a tool for guiding Implementing Agencies in carrying out appropriate environmental and social safeguards during project design and execution.

The primary goal of this document is to offer specifics on the environmental and social obligations, management, and monitoring standards that must be met by project contractors during the projects to achieve the following.

1. Try to avoid or reduce any possible negative environmental or social consequences of Project implementation.

2. To implement a mitigation hierarchy to foresee and mitigate risks and repercussions to employees, affected communities, and the environment, or to minimise impacts where prevention is not practicable and compensate or offset impacts where they persist.

3. Maximize good outcomes while reducing unavoidable negative impacts to a level that is acceptable to the receiving environment and communities.

4. Satisfy environmental and social commitments and measures, as well as applicable policies and management systems.

5. Conform with national regulations as well as World Band ESMF Policy and Standards.

8.2. Environmental and Social Management Plan for construction Stage

The ESMP envisages the plans for the proper implementation of management measures to reduce the adverse impacts arising out of the project activities. The proposed work has been subjected to a regulatory application study, which considered the construction/improvement methods, material requirements, sourcing, and timing. The mode of transportation, waste creation, and the circumstances of the recipient environment are all factors to consider.

Table 24:Environmental and Social Management plan for Construction stage

Project Activities	Potential Issues	Mitigation Measures	Location
A. Detailed Design & Pre-construction			
A01 Finalization of RoW: Non -forest areas	Widening or geometric improvements leading to loss of agricultural land and or destruction of trees	Limiting the RoW to construction width to avoid acquisition of excess land Avoiding concentric widening in green tunnels to save trees of one side	Entire Stretch
A02 Appropriate drainage provisions	▪ Raised embankment and inadequate drainage facilities causes water logging, which damage pavement and obstructs movement of people and vehicles. ▪ Natural hazards such as flooding	▪ Provision of adequate no. of cross drainage structures. ▪ Increase (vent and height) in waterway of existing structures. ▪ Provisions of roadside drains with suitable outfalls. ▪ Drainage system including surface and subsurface drains shall be provided as per IRC Codes. ▪ All culverts have been designed for 50 years HFL return period and bridges designed for 100-year HFL return period	Entire stretch

Project Activities	Potential Issues	Mitigation Measures	Location
		▪ Embankment height to be raised along low lying/ potential waterlogged areas	
A03 Safety Arrangement prior to start of construction	Inadequate safety arrangements in pre-construction stage results increased risk in both preconstruction and construction phase Visibility loss of the construction area during the night hours	▪ Safety barriers shall be provided where high embankment (> 3.0 m) and deep trenches (>1.5 m) are to be constructed. ▪ Provision of retro-reflective warning sign boards near school, hospital and religious places ▪ Signs and marking viz., cat's eyes, delineators, object markers, hazard markers, safety barriers at hazardous locations ▪ Horizontal and vertical geometry as per IRC Specification	Entire stretch
A04 Tree Felling	▪ Loss of trees ▪ Pruning of tree ▪ Loss of habitat of avifauna	▪ Tree clearing to be restricted to construction width only in adequate manner ▪ Trees to be felled shall be clearly marked. ▪ Obtain prior tree felling permission from State Forest Department as per applicable rules ▪ Stacking, transport and storage of the wood will be done as per the relevant norms. Systematic corridor level documentation for the trees to be felled and those saved will be maintained by the MPRDC.	Entire stretch Number of affected trees= **145**
A05(i) Sitting of Project infrastructure: Construction Camps	Inappropriate location such (near settlements or eco-sensitive zones, biodiversity hotspots and human settlements) can lead to conflicts with community or potential impacts on natural habitats	Camps to be established with prior permission from authority. Camps to maintain minimum distance from following: # 500 m from habitation, water bodies and traffic route #1000 m from Eco-sensitive zones #500 from community reserves/conservation areas	All camps
A05 (ii) Sitting of Project infrastructure: Plant & Machinery	Potential impact from air pollution on natural habitats and resources located in sensitive areas legally	▪ Batching, WMM, HMP and crushers at downwind (1km) direction from nearest town and 500 m from villages. ▪ Location of the plants should be based on State Pollution Control Board guidelines. ▪ Consent To Establish (**CTE**) must be obtained from State pollution control board before setting up of plant.	All plant sites
A06 Procurement of machinery	Potential sources of impacts on air and noise environment	▪ Procure/ Hire machinery which complies with the Emission Standards suggested by CPCB. ▪ All diesel generators procured or hired for the project to comply with the standards prescribed by CPCB	All machineries
A07(i) Location of Quarry Sites	Potential impacts on natural habitats and resources located in sensitive areas legally	▪ Only existing or new approved sites (having necessary statutory clearances) to be considered for procurement of quarry material ▪ Crushers to obtain Consent to establish from SPCB ▪ Only waste land to be used for dumping of debris, no agricultural land shall be used even for temporary dumping	All Quarries

Project Activities	Potential Issues	Mitigation Measures	Location
A07 (ii) Location of borrow areas		▪ Location in area with Stable soil and preferably away from agricultural land ▪ Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents. ▪ Follow IRC recommended practice for borrow area (IRC:SP:108:2015) for identification of location, ▪ Should be sited away from inhabited areas.	All borrow areas
A08 Cultural Heritage (Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010)	Construction and excavation Activity would be damaging the aesthetic view of the site	▪ Before start of construction, joint inspection by contractor and Implementing Agency IA, of site ▪ Workplan will be prepared to ensure no direct/indirect impact from work. ▪ Labour interference or labour access to the site will be prohibited ▪ ASI rules for visit to site or any other ▪ regulation will be strictly adhered to ▪ Training and awareness of labour to cover protection of site provisions from the act. ▪ However intangible cultural heritage aspects will be addressed under ESMP where applicable.	Impacts to cultural heritage at all stages of the project cycle
Vulnerable Groups	Impacts on Vulnerable Groups	• The use of access roads should be planned in a way that does not jeopardize the travel safety of shuttle vehicles in villages with bussed training, and traffic measures (warning signs, speed limits, and information about settlements and schools for the periods when large and dangerous goods will be transported) should be taken. • Passages should be structured to allow safe passage of humans and animals. When bovine and ovine are not under shepherd management and children are not under adult supervision, measures should be taken to prevent entry into the railway route. • Occupational health and safety measures should be taken at the construction sites and construction activities. • Construction Impacts Management Plan and Pollution Prevention Plan should be implemented, taking waste management and health controls into consideration. • Necessary measures should be taken for the safety of maintenance and repair activities, teams and local people. • The grievance mechanism should be actively and efficiently operated.	Throughout the stretch
Labor and Working Conditions	Impacts on Labor and Working Conditions	• All workers, direct, contracted and others in the supply chain should have the right to organize. In this regard, grievance mechanism have an important part. A secure grievance mechanism system should be established that workers of all levels can benefit form. A fair and transparent employment procedure should	all stages of the project cycle

Project Activities	Potential Issues	Mitigation Measures	Location
		be adopted. Positive discrimination should be practiced for disadvantaged groups. In case all measures are taken, remaining impact would be negligible. • Ensure compliance with Workers' accommodation: processes and standards for accommodation; including clean and safe areas that ensure the minimum space requirements, air-conditioning and ventilation that is appropriate for the existing climatic conditions, gender based accommodation facilities, etc.) • Ensure compliance with Workers' accommodation: processes and standards for onsite facilities (canteen, sanitary facilities, adequate amenities for socialization and resting, etc.). • Survey accommodation facilities to be provided off-site (if any) and ensure they are also in compliance with Project standards. • Ensure drinking and utility water to be supplied meet the requirements of the Turkish Regulation on Water Intended for Human Consumption and WHO Guidelines for Drinking Water Quality. • Provide all accommodation sites with sufficient emergency response equipment such as first aid kits and fire-fighting equipment and conduct periodic checks to ensure they are in working condition. • Provide trainings to personnel on general waste management, housekeeping, first aid practices and communicable diseases. • Conduct visual checks on site to ensure proper housekeeping. • Ensure proper first aid equipment is kept on site, at various related locations. • Conduct periodic medical checks for personnel and provide vaccination and/or other mitigating measures when required. • Establish adequate medical rooms at the camp sites, provide sufficient human resources and keep a suitable patient transport vehicle on site.	

8.3. Clause for Nonconformity to ESMP

The project has no non-confirmatory action because it is now functioning on the existing route with certain specific measures that require no more land and no work with an environmental impact. There are no long-term effects from the activity, but there may be short-term consequences during construction, which are addressed by making adequate arrangements on the site.

In addition, the contractor is required to understand and adhere to labour safety, traffic speed, and safety markings on the job site, and the labourers are periodically updated on the safety measures. Environmental certification of vehicles issued by the Pollution Control Board, has been ensured. Also, no dust problem during construction in the community, it has been verified that water sprinkling is done.

Shifting of electric poles coming into the road shoulder and relocating them properly is required, as well as hazard marking colour on them. The contractor must ensure that the machinery are retained and the site is returned to its original condition when the work is completed, and that all construction and demolition waste from the site is properly removed.

8.4. Performance Monitoring Indicators

The relevant / applicable sections of following acts, policy guidelines, regulations and legislations framed by the Government of India / Government of Maharashtra for environmental safeguards are to be followed:

- Environment (Protection) Act and Rules, 1986
- EIA Notification, 14th September 2006, and its subsequent amendments
- The Water (Prevention and Control of Pollution) Act and Rules, 1974, 1975
- The Air (Prevention and Control of Pollution) Act, Rules, and Amendment, 1981, 1982, 1983, 1987
- Noise Pollution (Regulation & Control) Rules, 2003 and amended in 2010
- Forest (Conservation) Act, 1980 and its amendments
- The Schedule Tribes and other Traditional Forest Dwellers (Recognition of Forest Rights) Amendment Rules, 2012
- Wildlife (Protection) Act, 1972 and its amendments
- Solid Waste Management Rules, 2016 and amendments
- Construction and Demolition Waste Management Rules, 2016
- Hazardous and Other Waste (Management and Trans-boundary Movement) Rules, 2016
- Plastic Waste Management Rules, 2016, as amended, 2021-2022
- Chemical Accident (Emergency Planning, Preparedness and Response) Rules, 1996
- Ancient Monuments and Archaeological Sites and Remains (Amendment and Validation) Act, 2010
- The Motor Vehicles Act, 1988
- The Motor Vehicles (Amendment) Bill, 2015
- The Explosive Act, 1984
- Public Liability Insurance Act, 1991
- The Mines Act. 1952

The physical, biological, and social components identified to be particularly significant in affecting the environment at critical locations have been suggested as Performance Indicators. The Performance Indicators shall be evaluated under three heads as:

a) Environmental condition indicators to determine efficiency of environmental management measures in control of air, noise, water, waste, and soil pollution.
b) Environmental management indicators to determine compliance with the suggested environmental management measures.

Operational performance indicators that have been devised to determine efficiency and utility of the proposed mitigation measures.

Table 25: Performance Monitoring Indicators

S.N.	Details	Indicators	Stage	Responsibility
A.	**Pre-Construction Stage: Environmental Management Indicators and Monitoring Plan**			
1.	The location of construction camps must be determined, and environmental parameters in the vicinity must be documented.	Construction camp	Pre-construction	Contractor
2.	Borrowing areas must be finalized, and environmental factors in the region must be documented.	Borrow areas	Pre-construction	Contractor
3.	Location of Quarry and Stone Crusher sites have to be finalized and parameters indicative of environment in the area has to be reported.	Quarry and Stone Crusher sites	Pre-construction	Contractor

S.N.	Details	Indicators	Stage	Responsibility
4.	Locations for Debris Disposal Site must be identified and parameters indicative of environment in the area has to be reported.	Debris Disposal Site	Pre-construction	Contractor
5.	Progress of tree removal marked for cutting is to be reported	Site clearing	Pre-construction	Contractor
B.	**Construction Stage: Environmental Condition Indicators and Monitoring Plan**			
1.	The parameters to be monitored as per frequency, duration & locations of monitoring specified in the Environmental Monitoring Program prepared	Air quality	Construction	Testing should be doing through NABL approved monitoring lab.
		Noise level	Construction	
		Ground Water quality	Construction	
		Surface Water quality	Construction	
		Soil quality	Construction	
2.	Progress of measures suggested as part of the strategy is to be reported	Tree plantation	Construction	Contractor
3.	Contractor shall report implementation of the measures suggested for topsoil conservation	Topsoil Conservation	Construction	Contractor
4.	Contractor shall report implementation of the measures suggested for slope stabilization and sediment control	Slope Stabilization and Sediment Control	Construction	Contractor
5.	Contractor shall report implementation of the measures suggested for waste management	Waste Management Plan	Construction	Contractor
6.	Contractor shall report implementation of the guideline to ensure worker's safety during construction	Worker's Safety during Construction	Construction	Contractor
C.	**Operation Stage: Management & Operational Performance Indicators**			
1.	The number of trees surviving during each visit will be compared with the number of saplings planted	Survival rates of trees	Operation	Environmental Specialist up to construction period
2.	Environmental Specialist will undertake joint site visit with the Contractor to determine whether the Borrow areas, Quarry areas, Debris disposal site have been rehabilitated in line with Guidelines	Rehabilitation of Borrow areas, Quarry area, Debris Disposal site	Operation	Environmental Specialist

8.5. Environmental and Social Management Plan for Operation Stage

The ESMP for operation stage is mentioned below:

Table 26: Environmental and Social Management Plan for Operation Stage

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
Operation stage				
B01 (i) Site Clearance: Clearing and Grubbing	▪ Impact on Roadside Vegetation ▪ Dumping of debris can affect the quality of the soil if	▪ No tree shall be felled without the permission of the forest department. ▪ Debris should not be placed on agricultural land even temporarily.	All stretches	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
	dumped on agricultural land	Debris to be placed on designated disposal sites only ▪ Debris should be used for backfilling ▪ The root stump shall not be place on the edge of the carriageway as it would pose hazard for both the local community and the traffic		
B01 (ii) **Site Clearance** Dismantling of existing culverts and structures if any	▪ Dumping of debris on drainage will result flooding ▪ Diversions of drainage channel can affect normal flow ▪ Quality of the soil would degrade if debris dumped on agricultural land	▪ None of the debris should be placed inside any drainage channel ▪ Provision of diversion channels and/or scheduling construction of culverts preferably in dry months ▪ Debris shall be dumped only at specified dumping area	All culvert locations	Contractor
B01 (iii) **Site Clearance:** Traffic diversion	Loss of vegetation Loss of topsoil	▪ No trees would be cut down for the creation of diversions without appropriate permissions. ▪ The topsoil shall be removed and stored separately for reclamation of the diversion road.	Places requiring traffic diversion	Contractor
B02 (i) **Worker's Camp** Operation of Construction Camp	▪ Wastewater & runoff from Camp will cause contamination of receiving water bodies ▪ Runoff from camp contaminating surface water body ▪ Contamination of soil and ground water from oil ▪ Indiscriminate dumping of Solid waste from construction map will lead to contamination of nearby agricultural fields.	▪ Water pollution control measures to be provided: i.) adequate number of toilets and bathrooms to be provided ii) soak pits and septic tank to be provided; iii) no wastewater to flow out of the camp ▪ Runoff from camp routed through i) peripheral drain ii) sedimentation tank ▪ All oil and bitumen to be stored i) on impervious platform ii) storage areas to be bunded and iii) runoff from the areas to be routed through oil-water separator ▪ The i) Camp shall be fenced; ii) Access to Camp to be restricted ▪ Composing facilities to be provided for biodegradable waste; non-biodegradable waste to be recycled to maximum possible extent and remaining waste should either be disposed at approved disposal ground or through licensed waste operators	All Construction camps, laydown areas, material storage yards etc	Contractor
B02 (ii) **Worker's Camp** Camp Facilities	Inappropriate facilities for workers lead to unsafe working conditions, which may affect health of workers.	▪ The location, layout and basic facility provision of each labor camp will be submitted to IE for approval. ▪ The contractor will maintain necessary living accommodation and ancillary facilities in functional and hygienic manner. ▪ Adequate water and sanitary	All camps	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
		latrines with septic tanks with soak pits shall be provided. ▪ To provide first aid facility for workers and emergency response system. ▪ To conduct workshop on HIV / AIDS for all laborers at camps at least twice a year ▪ To conduct biannual health check-ups of all laborers through registered medical practitioner ▪ Waste disposal facilities such as dust bins must be provided, and regular disposal of waste must be carried out. ▪ To take all precautions to protect the workers from insect and pest bites to reduce health risk. However, use of insecticides should comply with local regulations, if any. ▪ LPG should be used as fuel source in construction camps instead of wood		
B03 (i) Materials Borrow Areas Operation	▪ Illegal Procurement of Soil ▪ Loss of topsoil ▪ Formation of stagnant water pools due to borrowing/ quarrying ▪ Particulate emission from excavation ▪ Safety of the adjoining private or Public Property	▪ The Borrow Areas to obtain requite licenses and permission ▪ The topsoil shall be removed and stored separately for reclamation of the diversion road. ▪ Excavation operations to adopt measures: i) consider the wind direction during operation ii) reducing drop height during loading iii) water sprinkling depending on water availability. ▪ The extent of borrow areas should be sited away from settlements. ▪ Depths of borrow pits to be regulated and sides not steeper than 25%. ▪ At least 10% of the acquired area shall be kept for stockpiling of fertile topsoil. The piles shall be covered with gunny bags / tarpaulin. ▪ Slope of stockpile shall not exceed 1:2 (V:H) and edge of pile shall be protected by silt fencing ▪ Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. Else, it shall be converted into fishpond.	All Borrow areas in the project	Contractor
B03 (ii) Materials Quarry Operation (Stone and	▪ Illegal Procurement of Stones ▪ Noise and Vibrations from	▪ Consent to Operate (CTO) must be obtained from State Pollution control board for crusher units	All new and existing quarry	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
Sand) including stone crusher	Blasting resulting in damages ▪ Air pollution from Stone crushers ▪ Erosion of sediments from the Stacked material	▪ The conditions of CTO must be complied and regular reported to RSPCB as per the stipulations ▪ In case of exiting quarry, the same must be obtained from the owners. ▪ The charge of the blasting to be decided in conformity with DGMS circular. ▪ Air quality & noise levels should be within the stipulated standards ▪ Dry and Wet method of dust suppression should be placed ▪ Erosion control measures to prevent sediment being washed to nearby properties		
B03 (iii) Material Transport	Deterioration of Air Quality due to: i) Dust emission from Haul roads ii) Fugitive emission from trucks	▪ Water sprinkling on haul roads (in case of water scarcity dust suppressant may be used) ▪ Speed of the truck on haul roads not to exceed 15 kmph ▪ All truck carrying a) excavated soil, b) sand, c) cement shall be covered with tarpaulin sheets	All materials	Contractor
B03 (iv) Material Handling (Soil, Aggregates Bitumen, Oils)	▪ Fugitive emission from loose material deteriorating air quality ▪ Erosion from stockpiling causing sedimentation ▪ Contamination of surface and ground water from oil and bitumen ▪ Health & Safety concerns of workers ▪ Risk of injury from vehicle and equipment	▪ Storage against wind break and windrow in the direction of the wind ▪ Cement to be stored in closed area ▪ All stockpile to have garland drains along with sedimentation tank ▪ All oil and bitumen to be stored i) on impervious platform ii) storage areas to be bunded and iii) runoff ▪ from the areas to be routed through oil-water separator ▪ Workers involved in material transport should be provided with PPE's	All Borrow areas and during procurement of material	Contractor
B04(i) Earthwork Operation of Equipment and Machinery	▪ Compaction of the agricultural land ▪ Emission resulting in air quality deteriorations ▪ High noise levels ▪ Accidental spillage of fuel and machine oils ▪ Risk of Injury to workers ▪ Safety of the public	▪ Restrict the equipment and machinery within the designated work site ▪ All vehicle to have "Pollution Under Control" Certificates; ▪ Regular Maintenance of Equipment and Vehicle ▪ Safety measures for workers e.g. i) posting of flagman ii) reverse alarm on vehicles iii) reflective jackets and high reflective material to be work by workmen ▪ Contractor to prepare traffic management and dust suppression plan duly approved by AE ▪ Water Sprinklings for dust suppression as necessary	`	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
		▪ Safety Measures e.g. i) Traffic Marshals (Flagman) to control traffic ▪ Batching, WMM, HMP and crushers at predominant downwind (1km) direction from the nearest settlement. ▪ All plants shall be used after obtaining Consent to Operate (CTO) from RSPCB and compliance to stipulated conditions must be adhered to. ▪ Crusher Plant should have a combination of dry and wet type control system to minimize deterioration air quality ▪ Construction equipment and machinery to be fitted with silencers and maintained properly. ▪ Near School, noisy construction activities shall be carried out after closing of school and in the weekends / holidays only ▪ Manage smooth traffic flow to avoid traffic jams and honking. ▪ Restrict construction activities near built up areas during day time. ▪ Noise limits for construction equipment such as compactors, rollers, front loaders, concrete mixers, cranes (moveable) etc. shall not exceed 75 dB(A) at a distance of 11 m from its source ▪ To avoid soil contamination Oil-Interceptors shall be provided at wash down and refuelling areas. ▪ Waste oil and oil soaked cotton / cloth shall be stored in containers labelled 'Waste Oil' and 'Hazardous' sold off to MoEF / RSPCB authorized vendors ▪ Workers involved should be provided with PPE's		
B04(ii) Earthwork Excavation	▪ Discharge of water from excavation increasing sediment ▪ load in receiving water body ▪ Erosion of Cut Slopes ▪ Public safety issues	▪ Water to be routed through sedimentation tank before discharge, ▪ Feasibility of reusing the water for construction ▪ Slope stabilization measures as seeding, mulching & bio-engineering techniques ▪ Safety Measures e.g. i) barricading of worksites ii) dedicated walkways and crossover points ii) illumination of work area in settlement ▪ Un-used non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and	All stretches involving excavation	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
		covered with a layer of topsoil conserved from opening the pit. ▪ Bituminous wastes (if any) will be disposed-off in an identified dumping site approved by the State Pollution Control Board ▪ Other applicable emission control mechanisms mentioned in EMP Matrix (refer Point B04 (i) above)		
B04(iii) Earthwork Embankment Construction	▪ Erosion causing impact on embankment/slope stability ▪ Contamination of water bodies/ water courses	▪ Encroachment into any water body is discouraged. ▪ Slope stabilization measures as seeding, mulching & bio-engineering techniques. ▪ Construction of temporary erosion control structures as per requirements ▪ Control measures as silt fencing, vegetative barriers ▪ Avoiding disposal of liquid wastes into natural water courses ▪ Side slopes of all cut and fill areas will be graded and covered with stone pitching, turfing. Care should be taken that the slope gradient shall not be greater than 2:1. ▪ The earth stockpiles to be provided with gentle slopes to soil erosion. ▪ Other applicable emission control mechanisms mentioned in EMP Matrix	All Embankment locations	Contractor
B04(iv) Earthwork Culvert and Minor Bridge Works	▪ Interruption of flows ▪ Pollution of water channel during construction ▪ Debris contaminating the soil and water ▪ Occupational Health and safety of workers ▪ Community Health and safety	▪ Diversion channels to prevent stoppage of the flow of water ▪ Construction wastewater or water in excavation to be disposed through sedimentation tank ▪ Batching plant and Transit mixer wash waste i) not to be disposed on agricultural land ii) to be reused in paving of roads ▪ PPE to be provided to workers involved in bar bending and casting operations ▪ Traffic Marshall to guide traffic during the movement of transit mixers in and out of the casting site. ▪ Other applicable emission control mechanisms mentioned in EMP Matrix	All culverts and bridge location	Contractor
B05(i) Surfacing Bituminous Surfacing	▪ Deterioration of air quality ▪ Contamination of Soil from Bituminous Waste ▪ Worker's safety ▪ Community Safety	▪ Air Pollution Control Measures: i) No open burning of wood / burned for bitumen works; ii) Hot- mix plants to have air pollution control ▪ Bitumen waste and off-spec material not to be thrown on agricultural land	Entire stretch having flexible pavement	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
		▪ PPE's to be provided to workers ▪ Traffic Marshall to guide traffic during the movement of vehicle carrying hot mix to and from the surfacing site ▪ Other applicable emission control mechanisms mentioned in EMP Matrix		
	▪	▪		
	▪	▪		
B05(i) Surfacing Concrete Surfacing	▪ Contamination of soil and water from concrete ▪ Stress on water resources in water scarce areas	▪ Batching plant and Transit mixer wash waste i) not to be disposed on agricultural land ii) to be reused in paving of roads ▪ Construction wastewater to be used for curing ▪ Admixture to be used for reducing water requirement in curing	Entire stretch having rigid pavement	Contractor
B06(i) Shoulder Shoulder Protection	Erosion of adjoining areas leading sedimentation of water bodies	Erosion control measures of shoulders especially in areas with higher slopes.	Entire stretch	Contractor
B06(ii) Shoulder Plantation	▪ Shifting sand dunes affecting infrastructure ▪ Impact on Species Diversity	▪ Stabilization of Sand Dunes using vegetative cover (grasses and Trees) ▪ Selection of local species drought resistant species ▪ Green belt development in surplus land of existing right of way	Rural stretches	Contractor
B06(iii) Shoulder Signage	▪ Safety of local population and traffic ▪ Collision with Wildlife	▪ Safety Features to be included as per Traffic Study findings. ▪ Road Signage to be provided as per IRC Code ▪ Safety features to be included considering the outcomes of the Wildlife Surveys	All traffic junctions and wildlife crossings	Contractor
Post Construction Decommissioning				
C01 Clearing of Construction Camps	▪ Debris Contaminating the Soil and Water ▪ Loss of productive land	▪ All Debris to be removed and disposed at designated sites ▪ All construction zones including riverbeds, culverts, road-side areas, camps, hot mix plant sites, crushers, batching plant sites and any other area used/affected by the project will be left clean and tidy ▪ Reutilization of debris for strengthening of the shoulder of approach roads ▪ Restoration of conserved Topsoil	Entire Stretch, and lands used by camps, plant sites borrow & quarry areas etc.	
Vulnerable Groups	▪ Impacts on Vulnerable Groups	• The use of access roads should be planned in a way that does not jeopardize the travel safety of shuttle vehicles in villages with bussed training, and traffic measures (warning signs, speed	Throughout the stretch	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
		limits, and information about settlements and schools for the periods when large and dangerous goods will be transported) should be taken. • Passages should be structured to allow safe passage of humans and animals. When bovine and ovine are not under shepherd management and children are not under adult supervision, measures should be taken to prevent entry into the railway route. • Occupational health and safety measures should be taken at the construction sites and construction activities. • Construction Impacts Management Plan and Pollution Prevention Plan should be implemented, taking waste management and health controls into consideration. • Necessary measures should be taken for the safety of maintenance and repair activities, teams and local people. ▪ The grievance mechanism should be actively and efficiently operated.		
Labor and Working Conditions	▪ Impacts on Labor and Working Conditions	• All workers, direct, contracted and others in the supply chain should have the right to organize. In this regard, grievance mechanism have an important part. A secure grievance mechanism system should be established that workers of all levels can benefit form. A fair and transparent employment procedure should be adopted. Positive discrimination should be practiced for disadvantaged groups. In case all measures are taken, remaining impact would be negligible. • Ensure compliance with Workers' accommodation: processes and standards for accommodation; including clean and safe areas that ensure the minimum space requirements, air-conditioning and ventilation that is appropriate for the existing climatic conditions, gender based accommodation facilities, etc.) • Ensure compliance with Workers' accommodation: processes and	all stages of the project cycle	Contractor

Project Activities	Potential Issues	Mitigation Measures	Location	Implementation
		standards for onsite facilities (canteen, sanitary facilities, adequate amenities for socialization and resting, etc.). • Survey accommodation facilities to be provided off-site (if any) and ensure they are also in compliance with Project standards. • Ensure drinking and utility water to be supplied meet the requirements of the Turkish Regulation on Water Intended for Human Consumption and WHO Guidelines for Drinking Water Quality. • Provide all accommodation sites with sufficient emergency response equipment such as first aid kits and fire-fighting equipment and conduct periodic checks to ensure they are in working condition. • Provide trainings to personnel on general waste management, housekeeping, first aid practices and communicable diseases. • Conduct visual checks on site to ensure proper housekeeping. • Ensure proper first aid equipment is kept on site, at various related locations. • Conduct periodic medical checks for personnel and provide vaccination and/or other mitigating measures when required. • Establish adequate medical rooms at the camp sites, provide sufficient human resources and keep a suitable patient transport vehicle on site.		

8.6. Environmental Management-Budget

The environmental budget will comprise itemized estimate of trees, various water structure and water source improvements, drainages with footpath etc. The quantity of environmental protection is assessed based on this estimate by adding it to the amount of road construction. Based on these estimates the consultant shall prepare a request for funds and submit the same through the Project Director. The World Bank's loan will be available for costs such as works, purchase of goods, and, if required.

Project Management provides budget towards afore-mentioned items/activities covering:

(i) PMU coordination of E&S activities by the Implementing Agencies of the project, supported by an Engineering and Management Consultant

(ii) Hiring of E&S experts on a contractual basis

(iii) PMU will provide adequate budget for preparation and implementation of all safeguard instruments from the counterpart funding, besides for conducting trainings, exposure visits and capacity building events.

(iv) ESMF budget has been estimated about 3% of the total project costs and will be used by contractor with the consent PMU however, the budget amount may vary based on the need of the project. Costs of ESMP implementation would be included within each dam ESMP and their break-up would depend on the nature of activities, extent of impacts and proposed mitigation measure. World Bank's funding will be available for costs such as works, purchase of goods and services, where required.

9. Institutional Arrangement

9.1. Institutional arrangements for environmental and social management

Institutional arrangements are intended to achieve certain level of quality in the project during implementation of various project components.

The Environment Management Plan has been prepared for the construction and operation phases of the project. The Environmental issues or aspects, measures for mitigation of impacts and responsibilities during execution and supervision have been allocated in the EMP.

9.2. Grievance Redressal Mechanism

A Grievance Redressal Mechanism (GRM) has been established to help record, assess, and resolve grievances and complaints during the implementation of the proposed project.

The GRM prepared for the proposed project is based on key principles that protect the rights and interest of affected stakeholders, ensure that their concerns are addressed in a prompt and timely manner, and that entitlements are provided in accordance with ESS policies. The safeguards unit of MPRDC will ensure that communities directly affected by the Project have a full understanding of the GRM and ways to access it especially on: (i) the concept of compensation for any involuntary acquisition of land and/or assets; and (ii) ensuring environmental and social mitigation measures in this ESMP's are implementedas planned.

Already during the community consultation phase the GRC have been constituted and the community was made aware of the process od addressing the grievances. The GRM procedures to be followed have been translated and it will be prepared in local language as needed so that they are easily accessible to all stakeholders and made available by the MPRDC. Information on the steps to be followed in handling grievances has been incorporated into the consultation process with local community.

- Grievances registered related to delivery of project benefits that are addressed.
- Grievances responded and/or resolved within the stipulated service standards.
- Project-supported organization(s) publishing periodic reports on GRM and how issues were resolved (including resolution rates);

Annexures

Environmental Impact checklist

Indore

Community Participation Road Safety Programme (CPRSP) Environmental Impact Checklist (EIC)					
SN	**Features**			**Responses**	
A	**District- Indore**	**Date- 15/05/22**			
B	**Block-**	**Population -**			
C	**Name of the stretch**		**Bada Ganpati Junction to Kalani Nagar Junction**		
D	**Location Chainage/Milestone**				
E	**Length (km)**		**1.9 km**		
F	**Features (please □mark)**		**Market**	**Built-up area**	**Semiurban a**
G	**Terrain (please □mark)**		**Plain a**	**Rolling**	**Hilly**
			Plain	**-**	**-**
H	**Climatic condition**		**Min**	**Max**	
	Rainfall		1033mm		
	Temperature		16	45	
	Water Body	**Chainages (m)**	**Dry**	**Perennial**	**Seasonal**
1	**Lake/Swamp/ River**	-			
2	**Pond**	-			
3	**Nala Crossing /Drainage**	4400-4500, 9000-9200 9400-9500			
4	**Built-up area with chainage**	0-2000 both side			
6	**Agriculture Field Chainage**	-			
7	**Garden along the road Chainage**	Nil			
8	**Fellow land location chainages**	Nil			
9	**Total no. of Existing CD structures chainages and Condition**	**No.1**		**Good**	**Poor**
10	**CD structure Type (FCW, VCW,FD etc.)**	0			
11	**Chainages of stormwater crossings**	Man River- 12700-12800			
12	**Water logged area Chainages**	None			
13	**Utilities**				
13.1	**Total Number of Over the ground utilities**				
13.2	**Eps**	29 Left Side (2 Shifting required) and 32 right sides (3 need to protect			
13.3	**HPs**	0			
13.4	**Transformer**	7 (1 TP shifting required)			
13.5	**Tap water**	0			
13.6	**Borewell**	0			

13.7	Telephone line	Nil	
13.8	Drainage line	0	
14	Number of Underground Utilities		
14.1	Water duct	0	
14.2	PHE pipeline	2	
14.3	Electric line (if any)	Both Side along the road	
14.4	OFC cable	1	
14.5	LPG gas pipeline	0	
15	Total No of trees on both sides from centerline to 15m	Left	Right
15.1	Total No of trees: 65 trees	12	53
15.2	No. of tree loss affected (A)/to be saved by safety provision (B)	Nil, 2 needs to protect	3 needs to protect
16	Number of Community structures		
16.1	Temple and another religious place	1	
16.2	Govt. Toilets (Sulabh Sauchalay)	0	
16.3	Govt. Buildings (Panchayat, Anganwadi, PHC etc.)	-	
17	Encroachment		
17.1	Temporary/Permanent	Temporary	
17.2	No. of Footpath shops left and right	72	
17.3	Taxi stand/ Bus Stop available	8	
17.4	Unauthorized parking	2	
17.5	Shop (Movable-Stationary)	13	
17.6	Shop enhancement (Shades, platform)	48	
18	House/Structure extension		
18.1	Boundary wall extension of house/Fencing/Shades	0	
20	Footpath Width on left/right	1 – 2.5 m across the stretch	
21	Location of public/people crossings road chainages		
22	The average speed of the traffic on this stretch and PCU value		
23	Junction location chainages	0, 1900-2000, 5500-5600, 8400-8500, 9700-9800, 9900-10000, 10400-10500, 15600-15700, 16000-16100, 18000 m	
24	Each location photographs (Yes/No)	Yes	
25	Community consultation (Yes/No)	Yes	
26	Minutes of community consultation (Yes/No)	Community wants Jam-free and accident-free traffic, required speed breakers near the crossings, long divider needs to access the path	
27	What Community suggested- Note down	Community wants Jam-free and accident-free traffic, required speed breakers near the crossings, long divider needs to access the path	
28	Remarks (any accidents/special attention/social environmental disputes etc.)	Small Idol of Goddess -	

Photo Plates

Tree at the road shoulder

Tree at the road shoulder

Nala at the alignment

Dhar

Community Participation Road Safety Programme (CPRSP) Environmental Impact Checklist (EIC)			
SN	**Features**		**Responses**
A	**District- Dhar**	**Date- 25/05/22**	
B	**Block-**	**Population -**	
C	**Name of the stretch**	Eicher Chauraha-Rau Pithampur Road	

D	**Location Chainage/Milestone**				
E	**Length (km)**		**1.5 km**		
F	**Features (please □mark)**		**Market**	**Built-up area ✔**	**Semiurban**
G	**Terrain (please □mark)**		**Plain ✔**	**Rolling**	**Hilly**
			Plain	**-**	**-**
H	**Climatic condition**		**Min**	**Max**	
	Rainfall				
	Temperature				
	Water Body	**Chainages (m)**	**Dry**	**Perennial**	**Seasonal**
1	**Lake/Swamp/ River**	-			
2	**Pond**	-			
3	**Nala Crossing /Drainage**	-			
4	**Built-up area with chainage**	0-2000 both side			
6	**Agriculture Field Chainage**	-			
7	**Garden along the road Chainage**	Nil			
8	**Fellow land location chainages**	Nil			
9	**Total no. of Existing CD structures chainages and Condition**	**No.1**		**Good**	**Poor**
10	**CD structure Type (FCW, VCW, FD etc)**	0			
11	**Chainages of stormwater crossings**	-			
12	**Waterlogged area Chainages**	None			
13	**Utilities**				
13.1	**Total Number of Over the ground utilities**				
13.2	**Eps**				
13.3	**HPs**	0			
13.4	**Transformer**				
13.5	**Tap water**	0			
13.6	**Borewell**	0			
13.7	**Telephone line**	Nil			
13.8	**Drainage line**	0			
14	**Number of Underground Utilities**				
14.1	**Water duct**				
14.2	**PHE pipeline**				
14.3	**Electric line (if any)**	Both Side along the road			
14.4	**OFC cable**				
14.5	**LPG gas pipeline**				
15	**Total No of trees on both sides from centerline to 10m**		Left		Right
15.1	**Total No of trees**				
15.2	**No. of tree loss affected (A)/to be saved by safety provision (B)**				
16	**Number of Community structures**				
16.1	**Temple and another religious place**		2		
16.2	**Govt. Toilets (Sulabh Sauchalay)**		1		
16.3	**Govt. Buildings (Panchyat, Anganwadi, PHC etc)**		-		
17	**Encroachment**				
17.1	**Temporary/Permanent**		Temporary		
17.2	**No. of Footpath shops left and right**				

17.3	Taxi stand/ Bus Stop available	1
17.4	Unauthorized parking	Yes
17.5	Shop (Movable-Stationary)	
17.6	Shop enhancement (Shades, platform)	
18	House/Structure extension	
18.1	Boundary wall extension of house/Fencing/Shades	0
20	Footpath Width on left/right	1 – 2.5 m across the stretch
21	Location of public/people crossings road chainages	0+630 km
22	The average speed of the traffic on this stretch and PCU value	Average Speed:32 KMPH Peak Hour PCU: 3577
23	Junction location chainages	
24	Each location photographs (Yes/No)	Yes
25	Community consultation (Yes/No)	Yes
26	Minutes of community consultation (Yes/No)	Yes
27	What Community suggested- Note down	Community wants Jam-free and accident-free traffic, required speed breakers near the crossings.
28	Remarks (any accidents/special attention/social environmental disputes etc)	-

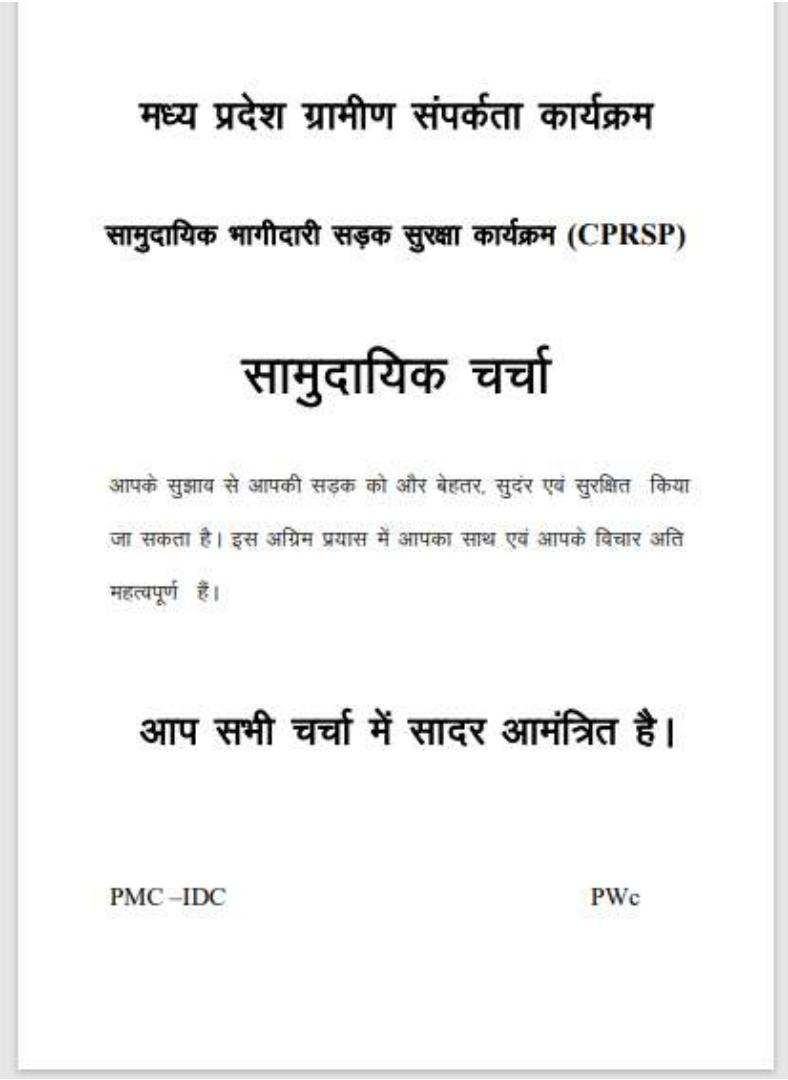
Datia

Community Participation Road Safety Programme (CPRSP) Environmental Impact Checklist (EIC)					
SN	Features		Responses		
A	District- Datia	Date- 29/06/22 – 30/06/22			
B	Block- Datia city	Population – 1,00,284			
C	Name of the stretch		Krishi Upaj Mandi to Ritika Marriage Hall		
D	Location Chainage/Milestone		-		
E	Length (km)		1.5 km		
F	Features (please □mark)		Market	Built-up area	Semiurban √
G	Terrain (please □mark)		Plain	Rolling	Hilly
			Plain	-	-
H	Climatic condition		Min	Max	
	Rainfall				842 mm
	Temperature		8.9	41.3	
	Water Body	Chainages (m)	Dry	Perennial	Seasonal
1	Lake/Swamp/ River	Karan Sagar Lake		Yes	
2	Pond	-			
3	Nala Crossing /Drainage				
4	Built-up area with chainage	0+205			
		1+055			
5	Market area Chainage	-			
		-			
6	Agriculture Field Chainage	Nil			
7	Garden along the road Chainage	-			
8	Fellow land location chainages	Nil			

9	**Total no. of Existing CD structures chainages and Condition**	**1**	**Good – 1**	**Poor – 0**
10	**CD structure Type (FCW, VCW, FD, HPC etc)**	1 – HPC	Good	
11	**Chainages of stormwater crossings**			
12	**Waterlogged area Chainages**			
13	**Utilities**			
13.1	**Total Number of Over the ground utilities**			
13.2	**Eps**	LHS- 20 & RHS- 29		
13.3	**HPs**	-		
13.4	**Transformer**	-		
13.5	**Tap water**	0		
13.6	**Borewell**	0		
13.7	**Telephone line**	2		
13.8	**Drainage line**	2		
14	**Number of Underground Utilities**			
14.1	**Water duct**	0		
14.2	**PHE pipeline**	-		
14.3	**Electric line (if any)**	Both Side along the road		
14.4	**OFC cable**	-		
14.5	**LPG gas pipeline**	0		
15	**Total No of trees on both sides from centerline to 15m**	Left	Right	
15.1	**Total No of trees Total no. of trees**	9	2	
15.2	**No. of tree loss affected (A)/to be saved by safety provision (B)**	-		
16	**Number of Community structures**			
16.1	**Temple and another religious place**	1		
16.2	**Govt. Toilets (Sulabh Sauchalay)**	0		
16.3	**Govt. Buildings (Panchyat, Anganwadi, PHC etc)**	2		
17	**Encroachment**			
17.1	**Temporary/Permanent**	4		
17.2	**No. of Footpath shops left and right**	-		
17.3	**Taxi stand/ Bus Stop available**	-		
17.4	**Unauthorized parking**	Yes		
17.5	**Shop (Movable-Stationary)**	4		
17.6	**Shop enhancement (Shades, platform)**	4		
18	**House/Structure extension**			
18.1	**Boundary wall extension of house/Fencing/Shades**	5		
20	**Kaccha footpath length and left/right**			
21	**Location of public/people crossings road chainages**	NA		
22	**The average speed of the traffic on this stretch and PCU value**	Peak Hour PCU-1524 Average Speed: 32 kmph		
23	**Junction location chainages**	0+436 1+034		
24	**Each location photographs (Yes/No)**	Yes		
25	**Community consultation (Yes/No)**	Yes		
26	**Minutes of community consultation (Yes/No)**	Yes		
27	**What Community suggested- Note down**	Community suggested to add footpath on the roadside and traffic calming measures. Citizens		

		suggested to improve visibility at Sundrani Petrol pump.
28	**Remarks (any accidents/special attention/social environmental disputes etc)**	There are two accident prone locations on the stretch, one in front of Sundarani petrol pump and other is at sharp curve near garden, in front of Raj auto center.

Banner Used During the Consultation



मध्य प्रदेश ग्रामीण संपर्कता कार्यक्रम

सामुदायिक भागीदारी सड़क सुरक्षा कार्यक्रम (CPRSP)

सामुदायिक चर्चा

आपके सुझाव से आपकी सड़क को और बेहतर, सुदंर एवं सुरक्षित किया जा सकता है। इस अग्रिम प्रयास में आपका साथ एवं आपके विचार अति महत्वपूर्ण हैं।

आप सभी चर्चा में सादर आमंत्रित है।

PMC –IDC PWc