Initial Environmental Examination

March 2015

IND: Madhya Pradesh District Connectivity Sector Project

Rajpur Khetia Road

Prepared by Madhya Pradesh Road Development Corporation for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 31 March 2015)

Currency unit	–	Indian rupees (INR/Rs)
Rs1.00	=	$ 0.016
$1.00	=	Rs 62.5096

ABBREVIATIONS

AAQ	–	ambient air quality
AAQM	–	ambient air quality monitoring
ADB	–	Asian Development Bank
APHA	–	American Public Health Association
BGL	–	below ground level
BOD	–	biological oxygen demand
BOQ	–	bill of quantity
CO	–	carbon monoxide
COD	–	chemical oxygen demand
CPCB	–	Central Pollution Control Board
CSC	–	construction supervision consultant
MPRDC	–	Madhya Pradesh Road Development Corporation
DG	–	diesel generating set
DO	–	dissolved oxygen
DPR	–	detailed project report
E&S	–	environment and social
EA	–	executing agency
EAC	–	Expert Appraisal Committee
EIA	–	environmental impact assessment
EMP	–	environmental management plan
EMOP	–	environmental monitoring plan
GHG	–	greenhouse gas
GIS	–	geographical information system
GOM	–	Government of Madhya Pradesh
GRC	–	grievance redress committee
GRM	–	grievance redress mechanism
HFL	–	highest flood level
IEE	–	initial environmental examination
IMD	–	Indian Meteorological Department
IRC	–	Indian Road Congress
LHS	–	left hand side
LPG	–	liquefied petroleum gas
Max	–	Maximum
Min	–	Minimum
MJB	–	major bridge
MNB	–	minor bridge
MORT&H	–	Ministry of Road Transport and Highways
MOEF	–	Ministry of Environment and Forests
MPRSD	–	Master Plan Road Sector Development
N, S, E, W,	–	Wind Directions (North, South, East, West or NE, SW, NW combination of two directions like South West, North West)
NGO	–	nongovernmental organization

NH	–	national highway
NIC	–	National Information Centre
NOC	–	No Objection Certificate
NOx	–	oxides of nitrogen
OBC	–	other backward classes
PCC	–	Portland Cement Concrete
PCU	–	Passenger Car Units
PD	–	Project Director
PFR	–	project feasibility report
PIU	–	project implementation unit
PPE	–	personal protective equipment
PPT	–	parts per trillion
PWD	–	Public Works Department
RCC	–	reinforced cement concrete
REA	–	rapid environmental assessment
RHS	–	right hand side
ROW	–	right of way
RSPM	–	respiratory suspended particulate matter
SH	–	state highway
SOI	–	Survey of India
SO2	–	Sulphur Dioxide
SPCB	–	State Pollution Control Board
SPL	–	sound pressure level
SPM	–	suspended particulate matter
SPS	–	ADB Safeguard Policy Statement, 2009
TA	–	technical assistance
UT	–	Union Territories
WHC	–	Water holding capacity

WEIGHTS AND MEASURES

dB (A)	–	A-weighted decibel
ha	–	Hectare
km	–	Kilometer
km2	–	square kilometer
KWA	–	kilowatt ampere
Leq	–	equivalent continuous noise level
µg	–	Microgram
m	–	Meter
MW	–	Megawatt
PM 2.5 or 10	–	Particulate Matter of 2.5 micron or 10 micron size

NOTE

In this report, "$" refers to US dollars.

In preparing any country program or strategy, financing any project, or by making any designation of or reference to a particular territory or geographic area in this document, the Asian Development Bank does not intend to make any judgments as to the legal or other status of any territory or area..

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A. Introduction

1. The Madhya Pradesh District Connectivity Sector Project will improve transport connectivity in the state by rehabilitating and upgrading Major District Roads (MDRs). The Project constitutes: (i) rehabilitating and upgrading about 1,600 km of MDRs, (ii) improving road maintenance and asset management, and (iii) developing an efficient accident response system. MPRDC specifically targets MDRs to form key linkage between rural, semi urban and urban areas and complete the state roads connectivity.

2. Madhya Pradesh Road Development Corporation Ltd (MPRDC), the Government of Madhya Pradesh, has started the improvements of State highway and Major District Roads network for meeting the supply-demand gap of the traffic in near future. As a part of this strategy MPRDC has taken up the up-gradation of Rajpur Khetia Road. The main objectives are to improve the regional as well as inter- and intra-state transport flows to improve access to services and making the State attractive to developers and investors. To fulfill the above objectives and due considerations to environmental feasibility of above road section, this initial environmental examination (IEE) was carried out for this section.

3. Since the project is following the sector loan modality four subprojects were selected as which is one of the sample roads. This subproject is categorized as Category "B" and hence, an initial environmental examination (IEE) has been undertaken. The IEE is carried out in accordance applicable laws and regulations of the Government of India and in ADB's Safeguard Policy Statement (SPS), 2009. The report is also consistent with the requirements of the Environment Assessment and Review Framework (EARF) which was prepared for the sector loan. Since the project road will be upgraded within existing available RoW, no Environmental Clearance is required for the proposed road widening project as per EIA Notification 2006.

B. Description of Project

4. The Project Road Rajpur-Khetia Road starts at existing CH.00+00 of MP-MDR-22-05 at Rajpur & terminates at Khetia CH. 42+60 (New Km. Stone) .

5. The project road passes through several villages/settlement. They are Ranod, Upla, Sigdi, Palsood, Berali Khurd, Barjhar , Niwali etc. The Project Road as described in the terms of References is 42.60 Km. Actual design length is 41.165 Km.

6. The existing carriageway is single lane having flexible pavement, with widths varying between 6.5 m to 7.0 m along the entire length of project road. The project involves widening & Strengthening of existing road within available ROW. Unpaved shoulders will be provided on both sides of carriageway with soil having CBR of 12% or more.

C. Description of Environment

7. The Rajpur Kheti Road is located at Indore district of Madhya Pradesh.

8. The region has a tropical climate characterized by hot summer season, except during the southwest monsoon season. It has four seasons: cold from December to February, hot from March to mid-June, southwest monsoon from mid-June to September, and post monsoon from October and November. The maximum temperature during summers ranges from 35ºC to 45ºC

while minimum temperature from 30ºC to 19ºC. During winter season, temperature ranges between of 25ºC to 10ºC. The monsoon season spreads from June to September with average rainfall of 1000 mm in the west to 1500 mm in the east parts of the state. The mean annual rainfall in the state is 1200 mm.

9. Baseline data on ambient air quality including noise levels meet the national air quality standards. Water quality from hand pumps along the project road complies with the drinking water standards.

10. There is no section of the road passes through forest land but the available ROW *is* adequate and will not require forestland conversion. The project Road does not pass through any protected area, wildlife sanctuary, national park, or bio-reserve and its buffer zones. Approximately 351 trees will be cleared within the right-of-way to accommodate needed road upgrading. No Rare or Endangered species were found along the subproject road's impact area. There are no archaeological and historical monuments along or near the road. No community religious properties will be affected by during road widening.

D. Anticipated Environmental Impacts and Mitigation Measures

1. Design and Construction Phase

a. Impact on Physiographic and Topography

11. Since proposed project is only widening of existing road within available ROW without any land acquisition, impact on the physiographic of the area is not significant. The design will consider the improvement of roadside drainage conditions through the improvement of cross drainage structures. Design of the cross drainage structures will follow IRC Guidelines (IRC, 1995).

b. Potential Environmental Impacts on Soil

12. **Loss of Productive Soil.** All activities will occur within the available ROW, no adverse environmental impact is anticipated on the productive soil. Lands taken on lease for access road and for construction camp will be restored its original land use.

13. **Soil Erosion**. Land clearing and grubbing will remove vegetation and soil cover which may cause some soil erosion during monsoon. Excavations in borrow pits may lead to loss of top soil and soil erosion. The risks of stream and river bank erosion near bridges and cross drainage works are significant. To avoid or minimize erosion, land clearing and grubbing will be conducted during dry season, productive top soils from borrow pits will be stored and reused in road embankment slope protection. Erosion control measures like silt screens will be installed along rivers and Nallahs.

14. **Contamination of Soil**. There is the risk of contamination of soil from construction material and oil spills. Contractors are required to ensure proper handling materials and able to implement spills containment. Oil contaminated waste will be properly collected, stored disposed through 3rd party service providers. All fuel and lubricant storage and handling area will be located at least 500 meters from the nearest water body and provided with perimeter interceptor drains. All construction debris will disposed by the Contractor on pre-designated area as identified by the CSC-Environmental Specialist.

c. Impact on Water Resources and Drainage

15. Deterioration of water quality may occur near the construction camp and active construction camps. This will be minimized by timing land clearing and earthmoving during the dry season; proper handling of materials including oil, and lubricants; prohibiting the disposal of untreated sewage; and proper erosion control near rivers and Nallahs.

d. Impact on Ambient Air Quality

16. Significant amount of dust will be generated during project construction. The following mitigation measures will also be undertaken:

a. Asphalt and hot-mix plants will be located at least 1 km away from any inhabited urban and rural stretches along the road with the clearance from MP Pollution Control Board.
b. Sprinkling of water on the active construction fronts and construction yard.
c. Regular maintenance of machinery and equipment.

17. Substantial noise will be generated from the use of heavy equipment and processing of rocks and asphalt. Adequate distance separating the rock crusher and Hotmix plants will be required and the sourcing of “readymade” gravel and asphalt will be promoted to avoid the establishment of these plants. Along the road particularly near sensitive sites like schools and hospitals, the use of less noisy equipment, scheduling of noisy activities, and provision of noise barriers will be implemented by the contractor to minimize disturbance.

e. Impact on Flora, Fauna and Ecosystem

18. Clearing and grubbing activities will result to the removal of shrubs, grasses, and an estimated 51 trees, majority of which are Babul or *Acacia nilotica* species. All cut trees will be compensated at the rate of 1:10 with preference to fast growing local species that are more efficient in absorbing carbon emissions.

f. Construction Workers’ Camp

19. As the Contractor are required to source labor from the local communities along the subproject road, the size of the construction camps will be relatively small. It is the contractual responsibility of the Contractors to maintain a hygienic camp with adequate water and electric supply; toilet facilities located away from the water bodies and wells; proper disposal of domestic refuse; temporary medical facilities; pest control; clean and adequate food; and security.

g. Impacts on Social Environment

20. Construction and operation phases of project road will have some beneficial impact on social environment. Some increase in income of local people is expected as local unskilled, semiskilled and skilled persons may gain direct or indirect employment during construction phase. Since the immigration of work force during construction phase is likely to be very small, the social impacts on literacy, health care, transport facilities and cultural aspects are expected to be insignificant.

h. Operation Phase

21. Increase in vehicular emissions, noise level, road crashes due to higher speed vehicular speed, and oil contaminated road surface runoff will occur during project operation phase. The impact on air quality is not expected to be significant given the low projected traffic. Community safety is enhanced through the crash barriers, speed brakes, traffic signs, and pavement markers. Oil contamination will occur but expected to be in trace amounts based on the low level vehicular traffic. To control the anticipated increase in noise level the following measures will be implemented; good road surface will reduce the road-tire noise, prohibition of horns along sensitive areas, road widening will increase capacity and decrease congestion of vehicles, and compensatory tree plantation will be located near sensitive areas.

E. Public Consultation and Information Disclosures

22. Public consultations have been carried out in the project area during the feasibility as well as detailed design stage. Key issues raised during the consultations were:

a. Provision of suitable drainage in the settlements areas.
b. Provisions of safety measures in school and settlement areas.
c. Suitable mitigation measures to address air and noise pollution.
d. Provision of safety signage near school.
e. Avoid sourcing water for construction from public water sources.
f. Minimize the cutting of trees.
g. Construction labour camps should not be located near settlements area.
h. Avoid borrow of earth near settlement and schools.
i. Start tree plantation during construction phase.

F. Environmental Management Plan and Grievance Redress Mechanism

1. Environmental Management Plan

23. The Rajpur Khetia Road specific Environment Management Plan has been formulated which consists mitigation and monitoring measures, and clear definition of roles and responsibilities. The project will have one grievance redress mechanism for social and environment issues comprising a village level and district level committee. The nodal officer under the PIU will be the key person to coordinate the receiving of complaints and addressing them.

2. Environmental Monitoring Program (EMoP)

24. A comprehensive monitoring plan has been prepared for all stages of the project. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. Construction Stage Monitoring to be carried out by contractor under supervision of construction supervision consultant (CSC).

25. Monitoring will focus on air, water, noise, soil erosion, drainage congestion and compensatory tree plantation. For tree plantation, the 75% survival rate of re-plantation shall be monitored for three years of the operation phase.

3. Institutional Arrangement and Capacity Building

26. The implementation arrangements basically follow the ongoing MPSRSP-II with the following improvements: i) expansion of the Environmental and Social cell (ESC) staff from 1 to

4 with the recruitment of two social safeguard and one environmental safeguard officers; ii) MPRDC ten division offices acting as Project Implementation Units (PIUs) will appoint a social and environment safeguards focal person; and iii) Construction Supervision Consultant's environmental specialist from the CSC will provide technical support to MPRDC and the PIU for implementation of environment safeguards.

27. To enable MPRDC officials to implement for environmental safeguard requirements effectively, a training programme will be conducted for the EA and IA of the sector loan to improve environmental awareness, construction practices, legislative compliance requirements, EMP and EMoP implementation requirements, and roles and responsibilities.

G. Conclusions and Recommendations

28. The findings of the IEE show that overall the project has limited and short term Environmental Impacts. Effective EMP implementation will ensure elimination and minimization of identified adverse impacts. MPRDC shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. If there is any change in the project design the EMP and EMOP will accordingly. MPRDC needs capacity building and practical exposure. Adequate training shall be imparted as proposed under environmental management plan to enhance the capability of concerned EA and IA officials.

I. INTRODUCTION

A. Project Background

1. The Madhya Pradesh District Connectivity Sector Project (MPDCSP) will improve transport connectivity in the state by rehabilitating and upgrading Major District Roads (MDRs). The Project constitutes (i) rehabilitating and upgrading about 1600 km of MDRs (ii) improving road maintenance and asset management and (iii) developing an efficient accident response system. MPRDC specifically targets MDRs to form key linkage between rural, semi urban and urban areas and complete the state roads connectivity. A consulting service will be provided to supervise the implementation of civil works and a piggy-backed technical assistance (TA) will support the development of an accident response system and a computerized road asset management system (RAMS). A sector lending modality is preferred considering the large number of distributed MDRs and MPRDC has the requisite institutional capacity to prepare and implement a sector development plan and prepare the individual road packages.

2. Government of Madhya Pradesh (GoMP) has been using a combination of budgetary, PPP, and ADB financing, to improve state highways. Rural roads are specifically addressed through MPRRDA and funds are made available from the *Pradhan Mantri Gram Sadak Yojana* (PMGSY) which is the national rural roads plan. ADB's funds are made available to the rural roads in the state through past loans to the central line ministry. However, the intermediate tier – the major district roads or MDRs – have not been specifically targeted for improvement. MDRs form the key linkage between rural, semi urban and urban areas and needs to be developed to complete state road connectivity. The GoMP is now proposing to improve the MDRs through the plan indicated in Table 1.

Table 1: Proposed Improvement Plan for MDRs

Total MDRs in Madhya Pradesh	**(Km) 19,574**
Under construction by MPPWD (Under Central Road Fund Scheme)	5,398
(Under Major District Roads Scheme)	1,134
Under Construction by MPRDC (Under build operate transfer (BOT) Toll + Annuity & Annuity Scheme)	1,992
Total Under Construction	8,524
Balance to be constructed	11,050
Proposed under the Project [a]	**1600**

The actual estimates will depend on the assessment from the DPRs.
Source: MPRDC

3. Since the project will follow a sector loan modality, the following four sample MDRs were selected to screen significance of potential impacts and determine the environmental assessment required to address the safeguard issues, and needed disclosure and consultation requirements. These sample roads were selected to reflect the widest geographical dispersion of roads across the state to capture the range of environmental settings and anticipate the environmental impacts of the succeeding subprojects under the sector loan.

Sr. No.	Package No.	MDR No.	Section	Chainage	State	Length in KM
1	2	3	4	5	6	7
1.	Indore Division	MDR-22-05	Rajpur-Khetia Road	00+00 to 42+60	MP	42.60 Km

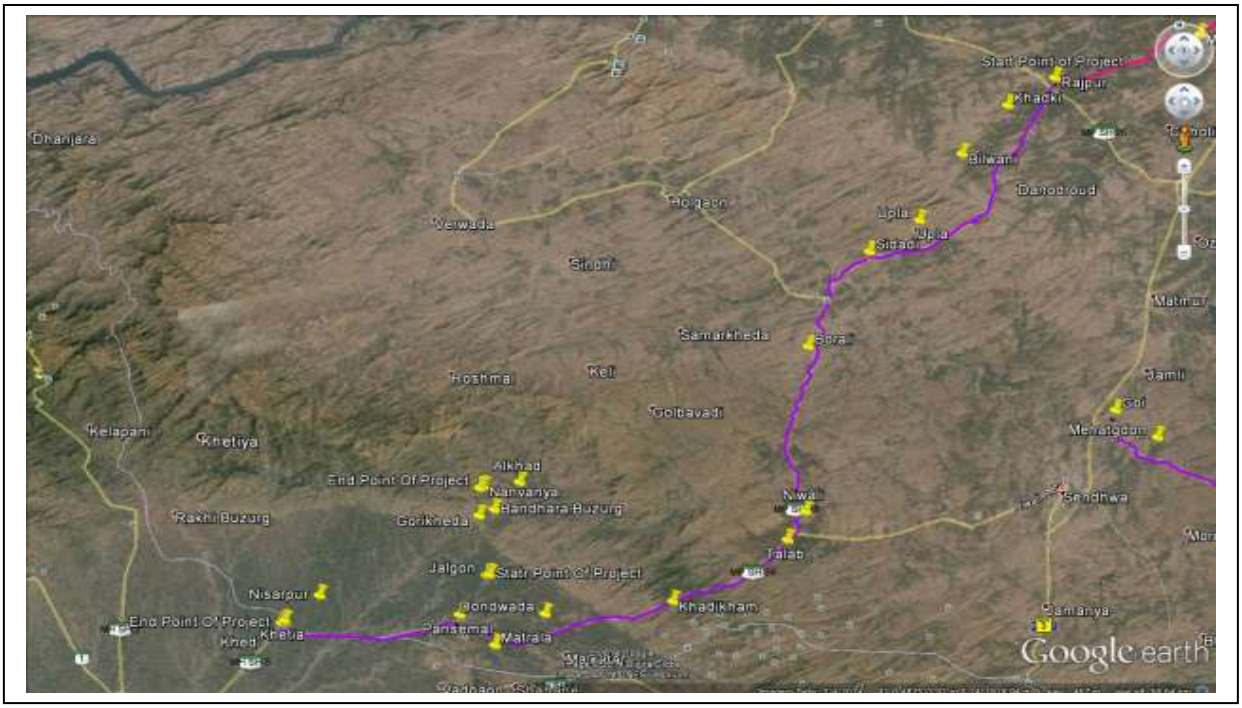


Figure 1: Location of Sample Roads for MPDCSP

4. Individual IEE reports were prepared for each of the sample project. At the time of writing, the remaining non-sample roads are at various stages of planning and designing and the technical details are being finalized. An environmental assessment and review framework (EARF) has been prepared separately for the entire project to guide the final selection of non3 sample subprojects, preparation of IEE or EIA reports and implementation of all environment safeguards requirements in accordance with relevant policies and regulations of the Government of India, GoMP, and the ADB Safeguard Policy Statement 2009 (SPS). These IEE reports and the EARF are disclosed in the MPRDC and ADB websites.

5. This report focuses on the Rajpur Khetia Road.

B. Nature, Size and Location of the Project

6. The Project Road Rajpur-Khetia Road starts at existing CH.00+00 of MP-MDR-22-05 at Rajpur & terminates at Khetia CH. 42+60 (New Km. Stone) . The project road passes through several villages/settlement. They are Ranod, Upla, Sigdi, Palsood, Berali Khurd, Barjhar , Niwali etc. The Project Road as described in the terms of References is 42.60 Km. Actual design length is 41.165 Km.

C. Purpose and Scope of the Study

7. This IEE report documents the environmental assessment of the Rajpur Khetia Road subproject and identifies the environmental issues to be considered in the project planning and design stages. In this report, the different activities that are likely to take place to achieve the project objectives have been analyzed and the potential impacts that may accompany them have been identified, assessed for significance, and concomitant avoidance, mitigation, and compensation measures were prepared in consultation with stakeholders to be incorporated on the engineering design and project implementation. The IEE addresses the environmental management requirements of the Government of India (GOI) and Asian Development Bank. Specifically, this report:

a) Provides information about the baseline environmental setting of the subproject;
b) Provides information on potential environmental impacts of the proposed subproject activities with its magnitude, distribution and duration.
c) Provides information on required mitigation measures with cost to minimize the impacts.
d) Analyses the alternatives options considering alternative locations, designs, management approaches for selection of most feasible and environmental acceptable options.
e) Provides details of stakeholder's consultations.
f) Designs an environmental management and monitoring plan with institutional measures for effective implementation of mitigates measures proposed and addressing grievances.

8. The IEE was based on proposed road alignment and key construction activities such as site clearing, removal of trees, excavation, filling, grading and embankment formation, excavation for utility trenches, sub grade preparation, base course and asphalt overlay, shoulder, and construction of permanent structures like retaining walls, culverts and drains. The IEE also covered ancillary activities like camp site establishment and maintenance, sourcing of materials, and operation of equipment like rock crusher and hot mix plant. The corridor of impact is taken as 10 meters either side of the alignment. However, the study area impact zone is considered up to 5 km on both sides of road alignment to allow for coverage of indirect and induced impacts and a larger analysis of land use and other environmental features. Assessment is carried out on the following environment components: terrestrial and aquatic ecology, soil, water, air, noise, and socio economic aspects.

9. This IEE report is presented in eight chapters as follow:

Chapter 1 - Introduction
Chapter 2 - Policy, Legal and Administrative Framework
Chapter 3 - Description of Project
Chapter 4 - Description of Environment
Chapter 5 - Anticipated Impacts and Mitigation Measures
Chapter 6 - Information Disclosure, Consultation, and Participation
Chapter 7 - Environment Management Plan and Grievance Redress Mechanism
Chapter 8 - Conclusion and Recommendation

D. Methodology

10. The methodology for IEE adopted complies with the *ADB Safeguard Policy Statement*

(SPS) 2009 and environmental guidelines. The study was carried out using reconnaissance survey, field visits, consultation with stakeholders, review of existing data, identification of adverse impacts and preparation of environmental management and monitoring plans. The stepwise activities carried out include:

- Review of legal requirements
- Review of feasibility study
- Reconnaissance survey for identification of key issues data requirement and preliminary consultation
- Primary and secondary data collection
- Consultation with stakeholders
- Identification of impacts and mitigation measures

1. Data Collection

11. Primary and secondary data on the Physical, Ecological, and Socio-economic resources were collected to provide baseline conditions to be used in impact assessment and monitoring plan design. The type and source of information compiled in this IEE are below:

Table 2: Primary and Secondary Information Sources Information Sources

Information	Sources
Technical information on existing road features and proposed Rehabilitation work. Inventorisation of road features; viz. water bodies community structures, environmental sensitive location areas, congested locations, etc	MPRDC Design Consultant Ground physical surveys and graphics consultants
Climatic Condition	Indian Meteorological Department, ENVIS Website, NIC, primary data Collection
Geology, Seismicity, Soil and Topography	Geological survey of India, SOI Top sheets, Primary data collection
Land Use/ Land Cover	Survey of India (SoI) Topo-sheet, Observation during survey.
Drainage Pattern	Survey of India Topo sheet and field Observation
Status of forest areas, Compensatory afforestation norms etc.	Divisional Forest Office, Indor Division.
Status of Fishing Activity	District Fisheries Offices at Indor District
Air quality Noise, Soil and Water	Onsite monitoring and Analysis of Field samples during field visit
Borrow Areas, Quarries and other construction material source	
River geo-morphology, hydrology, drainage, flood Patterns	Feasibility report, field observations
Socioeconomic Environment	Primary Census Abstract of Indoor District 2011. Official websites maintained by state Govt., and Public Consultation during the Field survey

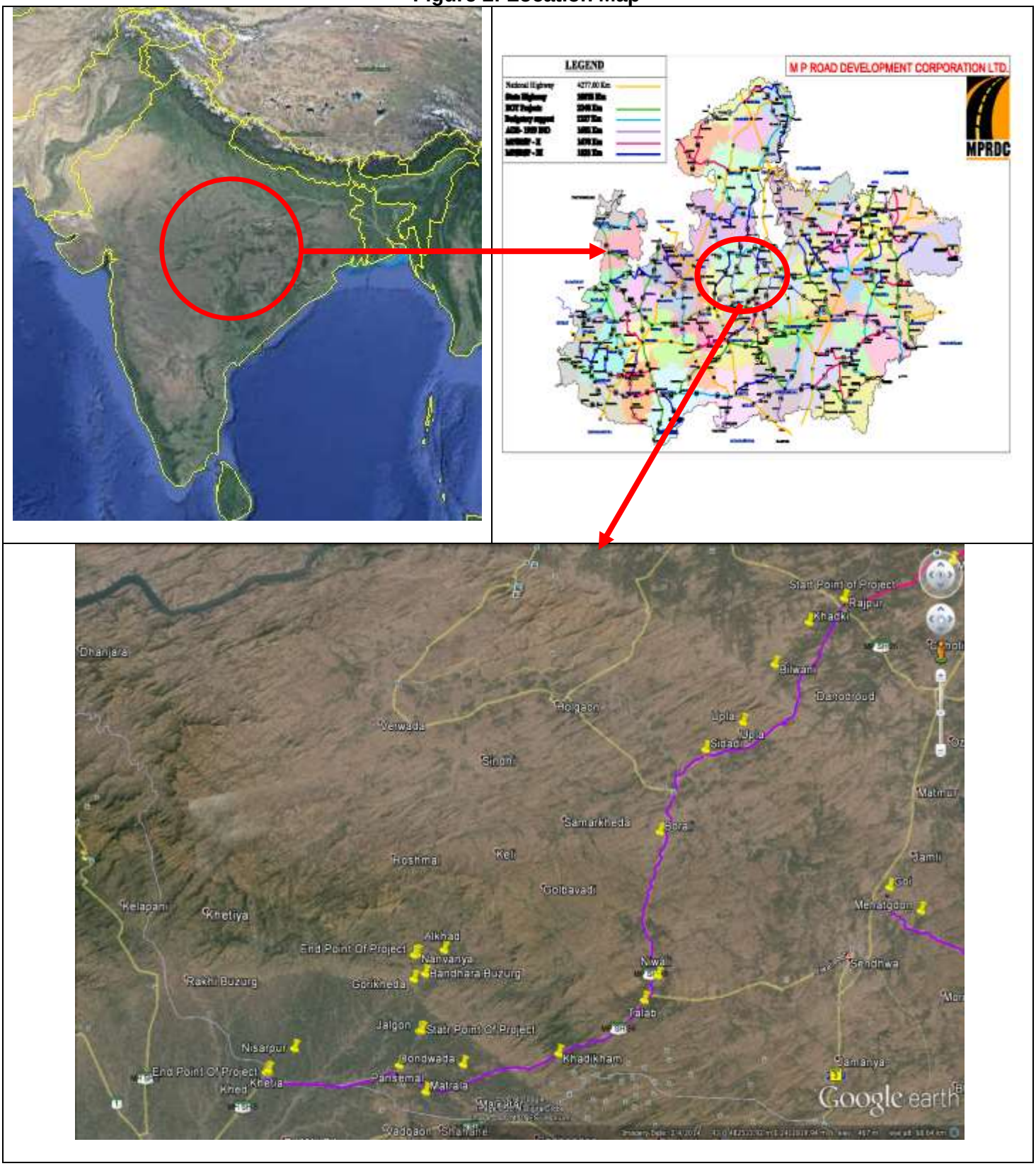
2. Public Consultation

12. Extensive consultations were held during different stages (reconnaissance, detailed design and design review) with key stakeholders that includes local and beneficiary population, government departments/agencies, road users, and project-affected persons. These consultations allowed the interaction between the stakeholders and road designers to identify road features and construction methods that will enhance road upgrading and minimize potential impacts. Information gathered were integrated in the project design and formulating mitigation measures and environmental management plan. Detailed description of public consultation is presented in Chapter 6.

E. Organizational Setting of Implementing Agency

13. The Madhya Pradesh Road Development Corporation (MPRDC) is mandated for construction and maintenance of roads in behalf of the Government of Madhya Pradesh. MPRDC is the executing agency (EA) for this project and a PIU is created within MPRDC at headquarter which is responsible for the proper implementation of all ADB funded road projects. The EA capability for effective implementation of Environmental Management Plan (EMP) has been assessed and presented in Chapter 7.

Figure 2: Location Map



II. POLICY AND LEGAL FRAMEWORK

14. India has well defined institutional and legislative framework. The legislation covers all components of environment viz air, water, soil, terrestrial and aquatic flora and fauna, natural resources, and sensitive habitats. The environmental legislations in India are framed to protect the valued environmental components and comply with its commitment to international community under various conventions and protocols as well. Asian Development Bank has also developed interventions to guide social and environment safeguards, in their Safeguard Policy Statement, 2009. This assessment is about the applicability of above laws and regulations, and safeguards. This chapter summarizes the following:

a. Applicability of ADB safeguards policies and categorization of the project.
b. Applicability of various National and local laws and regulations at different stages of project implementations

A. Country's Legal Framework and Regulatory Requirements for the Project

15. The legal framework of the country consists of several acts, notifications, rules, and regulations to protect environment and wildlife. Key policies, acts and regulations relevant for the project are provided in table 4 below.

Table 3: Summary of Relevant Environmental Legislation

Act	Objective	Responsible Institution
Environment (Protection) Act (1986) and Rules (1986)	To protect and improve the overall environment	MoEF
Pre-construction Stage		
Environmental Impact Assessment (EIA) Notification under Environmental Protection Rules (2006, 2009, 2011) and relevant Office Memorandums (OM)	To provide guidance on environmental clearance requirements and clarification on related specific technical issues	MoEF
Wildlife Protection Act (1972 and amended in 1993)	To protect wild animals and birds through the creation of National Parks and Sanctuaries	MoEF
The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988) and Rules 1974	To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	CPCB
The Air (Prevention and Control of Pollution) Act, 1981(Amended 1987) and Rules 1982	To provide for the prevention, control and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	CPCB and Road Authorities
Hazardous Waste (Management, Handling and Trans-boundary Movement) Rules 2008 (Amended 2009),	To protection the general public against improper handling, storage and disposal of hazardous wastes	State Pollution Control Board
The Forest (Conservation) Act 1980 (Amended 1988) and Rules 1981 (Amended 2003)	To protect and manage forests	MoEF

Act	Objective	Responsible Institution
Central Motor Vehicle Act (1988) and Rules (1988)	To control vehicular air and noise pollution. To regulate development of the transport sector, check and control vehicular air and noise pollution.	State Transport Department
Ancient Monuments and Archaeological Sites and Remains Act (1958)	Conservation of Cultural and historical remains found in India.	Archaeological Dept. GOI
Building and Other construction workers (Regulation and the Employment and conditions of service) Act, 1996	To regulate the employment and conditions of service of building and other construction workers and to provide for their safety, health and welfare measures	Ministry of Labour and Employment
Child labour (Prohibition and Regulation) Act, 1986	To regulate the employment of children including age limits, type of employment, timing of work, information disclosure and health and safety.	Ministry of Labour and Employment

1. Requirement of Environmental Clearance

16. As per provisions of Environmental Impact Assessment Notification 2006 amended 2009), and its amendments, vide notification S.O.3067(E), dated the 1st December 2009 all State Highway expansion projects, except those in hilly terrain (above 1000 m AMSL) and ecologically sensitive areas, have been exempted from Environmental Clearances.

17. Since, the project road is a major district road and not a state, the above EIA Notification, 2006 (amended till date) promulgated under Environment (Protection) Act 1986 is not applicable for the project road and hence no Environmental Clearance is required for the proposed road widening project.

2. Forests Clearance

18. As per Indian Forests Conservation Act (1980), any project requiring diversion of frosts land for non-forestry purposes require forest clearance from MoEF for the same. The forestry clearance is granted through two stages process.

19. Since no diversion of forestland is involved in Rajpur Khetia road only NOC from the forest department for clearance in forest area is required, no forest clearance is required for this road. Only permission for tree cutting will be required from the revenue department.

3. Permission to Withdraw Ground Water

20. As per the power Granted under Environmental Protection Act, 1986, Permission from Central Ground Water Authority is required for extracting ground water for construction purposes, from areas declared as critical or semi critical from ground water potential prospective.

4. Required Clearances/Permissions

21. For up-gradation of the project road, required clearances/ permissions related to environment has been summarized in Table 5.

Table 4: Permissions/Clearances Required for the Subproject

Sl.No.	Permissions/ Clearances	Acts/ Rules/ Notifications/Guidelines	Concerned Agency	Responsibility
A. Pre-construction Stage				
1	Permission for cutting of trees	Forest Conservation Act (1980) Procedural Guidelines developed by the Department of Environment, Government of M. P. under the orders of the Honorable High Court Tree removal will be guided as per state government rules.	District Forest Office/State Forest Department for trees felling in forest areas and District Authorities in non-forests Areas (Compensatory tree plantation to be made 1:10 as per the permission granted)	MPRDC
B. Implementation Stage				
2	Consent to operate hot mix plant, Crushers, Batching plant	Air (Prevention and Control Pollution) Act of 1981	M.P. State Pollution Control Board (To be obtained before installation)	Contractor
3	Authorization for Disposal of hazardous waste	Hazardous Waste (Management and Handling) Rules 1989	M.P. State Pollution Control Board (To be obtained before generation)	Contractor
4	Consent for Disposal of sewage from labor camps	Water (Prevention and Control of Pollution) Act 1974	M.P. State Pollution Control Board (Before setting up the camp)	Contractor
5	Pollution Under Control Certificate	Central Motor and Vehicle Act 1988	Department of Transport, Government of M. P. authorized testing centers	Contractor
6	Employing Labour/Workers	The Building and Other Construction Workers (Regulation and Employment Conditions of Service) Act, 1996	District Labour Commissioner	Contractor

B. International Agreements

22. India has been playing an active role in environmental conservation since the first United Nations (UN) conference on Human Environment in Stockholm in 1972 and recognizes that protection of environment is closely linked to combating poverty. Key international agreements that India is signatory to and relevant for the project are provided below:

a) Convention Relative to the conservation of Flora and Fauna in their Natural State (1933)

b) International Plan Protection Convention (1951)
c) Convention on Wetlands of International Importance, Especially as Waterfowl Habitat (Ramsar,1971)
d) Convention concerning the Protection of the World Cultural and Natural Heritage (Paris, 1972)
e) Convention in International Trade in Endangered Species of Wild Fauna and Flora (Washington, 1973)
f) Convention on Migratory Species of Wild Animals (Bonn, 1979)
g) Convention on the Prior Informed Procedure for Certain Hazardous Chemicals and Pesticides in International Trade (PIC or Rotterdam, 1990)
h) United Nations Framework Convention on Climate Change (Rio De Janeiro, 1992) Convention on Biological Diversity (Rio De Janeiro, 1992)
i) Protocol to the United Nations Convention on Climate Change (Kyoto,1997)

23. The above list of international conventions served as requirements for the project to comply. However, due to the limited scale of the road upgrading and the predicted traffic increase during operation, the expected environmental issues that are governed by these international conventions would be insignificant.

C. Asian Development Bank Safeguard Policies

24. The Asian Development Bank has defined its safeguard requirements in the *Safeguard Policy Statement 2009 (SPS)*. The prime objectives of these safeguard policies are to: (i) avoid adverse impacts of projects on the environment and affected people, where possible; and (ii) minimize, mitigate, and/or compensate for adverse project impacts on the environment and affected people when avoidance is not possible.

D. Category of the Project as per SPS

25. Using the prescribed ADB Rapid Environmental Assessment Checklist (see Appendix 1), Rajpur Khetia Road was classified as environmental category “B.” This categorization was primarily based on the following considerations:

a) Subproject road does not pass through or located within 10 km from any wildlife sanctuary, national park, or any other environmentally sensitive or protected areas.
b) Anticipated impacts from road upgrading on relatively flat terrain along agricultural land are mostly site specific and easily mitigated through proper design and good construction practices.
c) Majority of the activities have short-term duration co-terminus with the construction phase.
d) Subproject road does not pass through or located within 10 km from any wildlife sanctuary, national park, or any other environmentally sensitive or protected areas.

III. PROJECT DESCRIPTION

A. Rationale and Project Settings

26. The Project Road Rajpur-Khetia Road starts at existing CH.00+00 of MP-MDR-22-05 at Rajpur & terminates at Khetia CH. 42+60 (New Km. Stone) . The project road passes through several villages/settlement. They are Ranod, Upla, Sigdi, Palsood, Berali Khurd, Barjhar , Niwali etc. The Project Road as described in the terms of References is 42.60 Km. Actual design length is 41.165 Km.

27. The project road Starts N 21°56`24.78''& E 75°08`08.02'' and end N 21°40`15.49'& E 74°35`01.90' the project rood starts from Rajpur T junction, 0+000 chanage and end at Khetia in chanage km 42+60.

28. The existing carriageway is single lane having flexible pavement, with widths varying between 6.5 m to 7.0 m along the entire length of project road. The existing road passes through predominantly agriculture / cultivation lands and scattered urban and village settlements. The condition of the pavement is fair to poor. The condition of shoulders is also poor covered with vegetation. ROW available for the entire project road is around 20 to 22 meters including both side except in built up areas where it is noted as low as 10 m. The project involves widening & Strengthening of existing roads within available ROW

29. The salient Features of the road Rajpur-Khetia is given at Table 6.

Table 5: Summary Road Components and Design Standard

Road Length	42.60 km. length
Alignment	Follow the exits road alignment. Except some of the locations where geometric improvements is required.
Flyovers/overpasses/ ROB	There is no flyovers/overpasses/ ROB in the alignment.
Bridges	Two Minor Bridges
Other Structures	Total Culvert = 17, Nos.HPC = 26 Nos. Slab Culvert =1 Minor Bridge = 2, Box Culvert = Nil VCW = 2 Nos.
Embankment Design	Embankment height established for 1m free board on 20 years frequency HFL Embankment height up to 3.0 m with 2H: 1V for embankment height from 3.0 m to 6.0 m with 15H: 1V. Construction of embankment of height more than 3.0 m, using borrow soil is recommended. However high embankment have been restricted within Row providing returning walls
Design Standard	As per IRC Codes and MORSTH Guidelines. Vertical Clearance 0.60 m above HFL for bridges upto 30 m length 0.90m above HFL for bridges above 30 m length The discharges for which the bridge has been designed are maximum flood discharge on record for a period of 100 years for major bridges and 50 years for minor bridges.
Speed	65Kmph to 80Kmph.
	Permissible : 80 km/h
Horizontal Controls	As per IRC: 73 -1980

	Maximum value of 7% for super elevation and 15% for side friction factor, the minimum radius for horizontal curves is 230m for design speed 80Km/hr
Vertical Controls	Grade break of 0.5%, vertical curves will be provided. Length of vertical curve will be restricted to minimum 50m
Carriageway	Carriageway: 7m Cross fall will be 2.5% for pavement and 3% for earthen shoulder.

B. Characteristics of Existing Road

30. The existing road passes through plain terrain predominantly agricultural lands and scattered urban and village settlement like Danod, Upla, Sigdi, Palsood, Berali khurd, wazhar and Niwali. (Table 6)

Table 6: Existing town / Settlement of Section

Chainage		**Length**	**Land Use**		**Villages**
From	To	in (m)	RHS	LHS	
0+000	0+600	0.6	Built Up	Built Up	Rajpur
0+600	6+500	5.9	AG Land	AG Land	
6+500	6+800	0.3	Built Up	Built Up	Danod
6+800	10+500	3.7	AG Land	AG Land	
10+500	14+500	4.0	Barran Land	Barran Land	
14+500	16+600	2.1	AG Land	AG Land	
16+600	17+500	0.9	Built Up	Built Up	Upla
17+500	20+000	2.5	AG Land	AG Land	
20+000	22+700	2.7	Barran Land	Barran Land	
22+700	23+200	0.5	Built Up	Built Up	Sigdi
23+200	24+300	1.1	AG Land	AG Land	
24+300	26+200	1.9	Built Up	Built Up	Palsood
26+200	30+200	4.0	AG Land	AG Land	
30+200	30+500	0.3	Built Up	Built Up	Berali Khurd
30+500	37+700	2.2	AG Land	AG Land	
37+700	38+600	0.9	Built Up	Built Up	Wazhar
38+600	40+900	2.3	AG Land	AG Land	
40+900	43+800	2.9	Built Up	Built Up	Niwali

31. The pavement type is flexible throughout the length of project road. The condition of the pavement is generally poor. The condition of shoulders is also poor and now covered with vegetation. There is no formal drainage system along the Rajpur and Khetia road and the existing shoulders slope does not facilitate proper drainage. On an average the project road traverses through 0.50m to 2.0m embankment. Suitable measures will be carried out by site specific drainage deigns. Stretches of telephone and electric utilities need to shifted to allow planned upgrading.

Table 7: Stretches for Improvements

S. No	Extending Change		Length (Km)	Carriageway width(m)	Formation with (m)	Type of Road	Condition
	From	To					
1	0.00	42+60	42.60	7	10	BT	Fair to Poor

C. Current and Projected Daily Traffic

32. Based on Classified Volume Count (CVC), Turning Movement Count (TMC), Origin Destination, and Axle Load Surveys conducted for project and consistent with applicable IRC Guidelines1 the average annual daily traffic at the monitoring stations between Rajpur and near khetia (ch 42+60 km) ADT 450 and PCU 225. As per new circular provided by GOI, Ministry of Shipping, Road Transport & Highways, (18th January, 2008 reference no. RW/NH-37011/57/2006-PIC), 5% traffic growth rate is the default value for traffic projection, determination of lane requirement and financial analysis. The actual and projected traffic data for the Rajpur Khetia road are provided in the succeeding Tables.

Table 8: Summary of ADT in Numbers

Vehicle Category	At Km 6+000
	ADT
Two Wheeler	933
Three Wheeler	0
Car / Jeep / Van / Taxi	175
Mini Bus	0
Full Bus	82
LCV	16
2 - Axle Truck	16
3 - Axle Truck	9
Multi Axle Truck	9
Tractor with Trailer	65
Tractor without Trailer	4
Total Motorized Vehicles	**1309**
Cycles	144
Cycle Rickshaw	0
Bullock Cart	0
Horse Drawn	0
Hand Cart	0
Total Non-Motorized Vehicles	**144**
TOTAL	**1453**

Table 9: Summary of Average Daily Traffic for All Locations of Rajpur- Khetia Road
Section: Rajpur-Khetia Road
Direction: Bothways

Toll Plaza Location	Motorised Traffic											Non-Motorised Traffic				Grand Total	
	Passenger Vehicles					Goods Vehicles				Agricultural		Passenger		Goods Vehicles			
	Two Wheeler	Three Wheeler	Car/Jeep	Mini Bus	Bus	Tempo / LGV	Ord. Trucks			Tractor with Trailor	Tractor	Cycle	Cycle Rickshaw	Animal Drawn		Hand Cart	Vehicle (No.)
							2 Axle	3 Axle	M Axle					Animal Drawn	Horse Drawn		
PCU Factor	0.5	0.5	1.0	1.5	3.0	1.5	3.0	4.5	4.5	4.5	1.5	0.5	2.0	6.0	6.0	3.0	
Km ---	933	0	175	0	82	16	16	9	9	65	4	144	0	0	0	0	**1453**
Average	**933**	**0**	**175**	**0**	**82**	**16**	**16**	**9**	**9**	**65**	**4**	**144**	**0**	**0**	**0**	**0**	**1453**

33. The traffic growth rate for the projected traffic is taken as 7.5%. As per the projected traffic, the values of PCU are very less due to discontinuity of Project road and intermediate lane with poor pavement. After development of road, the traffic intensity will increase because of diverted traffic from adjacent roads. Therefore the project highway is proposed to widen to two lane with granular shoulder 2.5m wide.

Table 10: Summary of Projected Total Traffic Volume

Section	Year			
	2014	2020	2025	2030
8+000	1453	1705	2193	2778

D. Proposed Improvement

34. Rajpur Khetia Road will receive the following upgrades under the project:

a. Curvature improvement and realignment
b. Widening
c. Flexible pavement
d. Rearrangement of junctions
e. Road side drains
f. Bridge and cross drainage structures
g. User facilities
h. Traffic control and safety measures

1. Realignment and Curvature Improvement

35. Based on approved geometric standards the alignment plan of the existing road requires correction of sub-standard geometry at various locations. In plain or rolling terrain, a minimum curve radius of 230 m has been attempted to achieve design speed, however an absolute minimum radius of 155 m is used at location with space constraints like urban areas, structure approach, and forest area.

36. On sections with substandard geometry, improvements will require merging two or more existing curves resulting to a minor geometric realignment to achieve the desired geometric standards. Reverse curves will be modified to accommodate required rate of super elevation

and provide smooth riding quality. However, at locations with space constraints design speed has been restricted as low as 65 km/h.

S. No.	Design			Remarks
	Chainage	Radii	Speed	
1.	8+000	mt	Kmph	
		80	45	

2. Proposed Cross Section Details

37. **Carriageway Width**. The carriageway configuration of two lanes with hard shoulder is proposed for the project road having a 7.0m carriageway width.

38. **Hard Shoulder**. Hard shoulders are proposed to be 2.5m wide both sides of the proposed main carriageway for rural plain and rolling terrains.

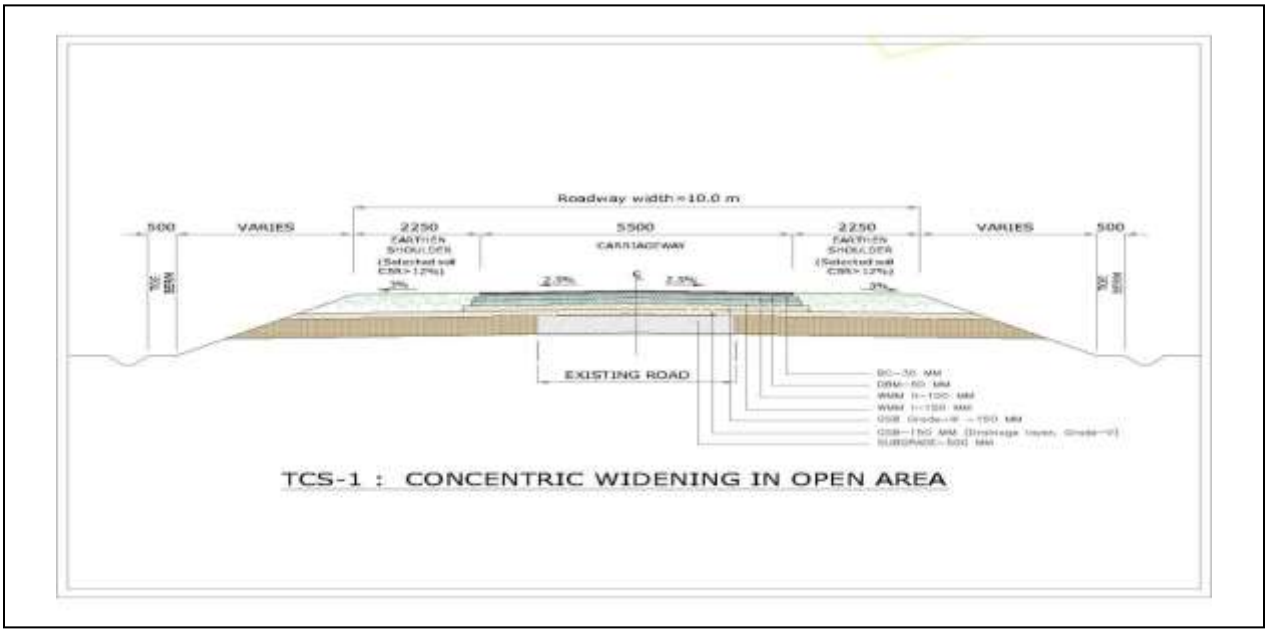
39. **Footpath.** The minimum width of footpath in urban stretches is proposed to be 1.50m. The side drain in such stretches may be accommodated under the footpath.

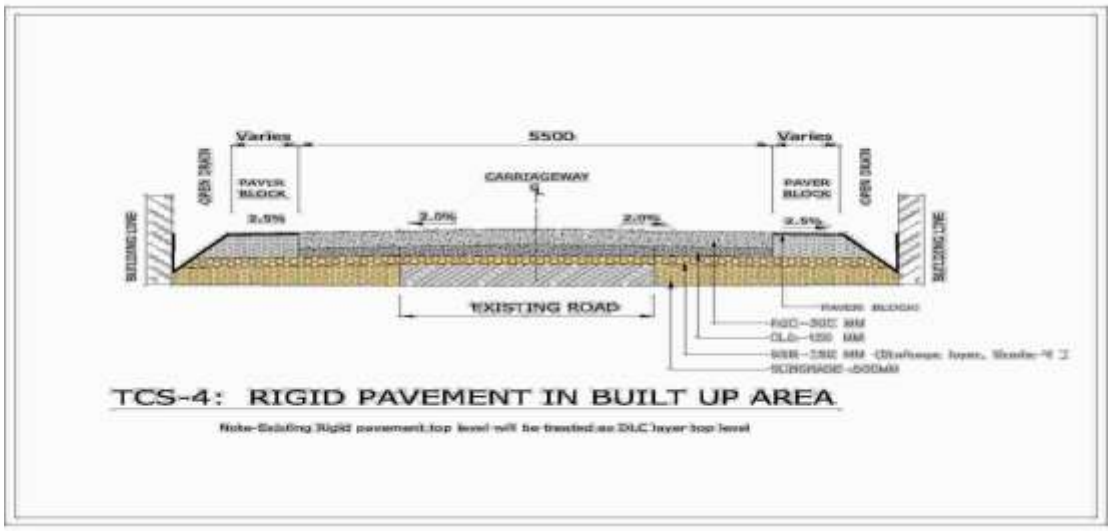
40. **Utility Corridor**. Minimum width of utility corridor for rural sections will be 2.0m and for urban/ built-up sections will be 1.00m.

41. **Embankment Slopes**. Side slopes shall not be steeper than 2H: 1V unless soil is Retained by suitable soil retaining structures.

42. The typical Cross Section for the proposed project road is as given in Figure 3.

Figure 3: Typical Cross Section





3. Widening Proposal

43. In order to meet future traffic requirements, the existing carriageway is proposed to be upgraded to two-lane with hard shoulder in rural areas and with cover drain and footpath in urban areas. Concentric widening scheme is followed to minimize land acquisition issues and to ensure maximum utilization of existing configuration. The chainage-wise details of widening scheme is given at Table 11.

Table 11: Proposed Widening Scheme

S.No.	Chainage		Carriageway Width	Pavement Type	Pavement Condition
	From	To			
1	0+000	0+600	7.50	CC	Fair
2	0+600	24+300	3.75	BT	Fair
3	24+300	26+200	7.60	CC	Fair
4	26+200	43+400	3.75	BT	Fair
5	43+400	43+800	6.0	CC	Fair

4. Realignment

44. There is no Realignment was proposed in Rajpur Khetia Road.

5. Intersections

45. All intersections have been studied to allow safe connection to the corridor and minimum interference to traffic. Details of intersection improvement are tabulated at Table 12.

Table 12: Intersection

Sr. No.	Existing Chainage (Km)	Link	Surface Type	Junction Type	Width (m)	Junction	Type of Road (NH/SH/MDR/ODR)
1	0+000	L/S	WBM	T		Julwaniya	Village Road
2	0+000	R/S	WBM	T		Badwani	Village Road

Sr. No.	Existing Chainage (Km)	Link	Surface Type	Junction Type	Width (m)	Junction	Type of Road (NH/SH/MDR/ODR)
3	7+000	R/S	WBM	T		Bilwani	Village Road
4	9+700	L/S	WBM	T		Chotariya	Village Road
5	14+400	L/S	WBM	T		Gatli	Village Road
6	18+100	L/S	WBM	+		Ekalvara	Village Road
7	18+100	R/S	WBM	+		khada kheda	Village Road
8	24+700	R/S	WBM	T		Silawad	Village Road
9	24+800	L/S	WBM	T		Palsood	Village Road
10	31+800	R/S	WBM	Y		Bhurakhnwa	Village Road
11	34+400	R/S	WBM	T		Umedra	Village Road
12	37+400	L/S	WBM	T		Fulwari	Village Road
13	37+600	R/S	WBM	T		Kajal mata	Village Road
14	40+000	R/S	WBM	T		Sulgoun	Village Road
15	40+300	L/S	WBM	T		Mansoor	Village Road
16	44+000	L/S	WBM	+		Sendhwa	Village Road
17	44+000	R/S	WBM	+		Umdia	Village Road

6. Design of Road Side Drains

46. The following drainage improvement have been incorporated in the design:

- Road-side earthen drains of trapezoidal sections (please refer Typical Drawings) on both sides along the entire length,
- Open chute drain in RCC on slopes of high embankment and as rapids on high cut sections. Further dissipation basins are provided at the toe of high embankments to reduce the velocity of water flow, especially where pitching is proposed.
- Road-side RCC covered drains for urban areas.
- Open lined drain in RCC on hill side in mountainous terrain.

Table 13: Cement Concrete Lined Drain

Design Chainage		Length in (m)	Villages
From	To		
0+000	0+600	0.6	Rajpur
6+500	6+800	0.3	Danod
16+600	17+500	0.9	Upla
22+700	23+200	0.5	Sigdi
24+300	26+200	1.9	Palsood
30+200	30+500	0.3	Berali Khurd
37+700	38+600	0.9	Wazhar
40+900	43+800	2.9	Niwali

7. Pavement Design

47. The project road envisages two lane carriageways with hard shoulders and upgrading of the existing pavement to carry the anticipated traffic over the design period. This would involve the construction of new pavement on the widened side and strengthening and rehabilitation of

the existing pavements. Flexible asphalt pavement is proposed for the entire length of project road. The applicable IRC Guidelines would be used for this purpose, but using other internationally accepted design method(s) to ensure that the recommended design is the most appropriate one would further check the design.

8. Traffic Control and Safety Measures

48. In addition to adequate provisions for roadway width, geometric elements and junction improvement, the following provisions will enhance the safety of road users. Due consideration has been made for the provisions contained in IRC: SP 44-1994, “Highway Safety Code”. Also, various measures have been proposed to increase traffic control for the High-speed highway.

a. Road Signs

49. Adequate road signs are proposed for the project road in order to provide advance information to regulate/control traffic flow and ensure safety of operations. All road signs are provided in accordance with IRC 67.

50. Appropriate road markings are provided with stop signs, give-way signs, traffic merging and diverging signs, lane closure signs, compulsory keep left/right signs or any other signs as per IRC-67. Advance cautionary signs will be installed on sharp curves along with chevron signs at the outer edge of the curves. In hilly areas, curve-ahead signs are accompanied with appropriate delineators.

51. The signs will be of retro reflective sheeting of high intensity grade with encapsulated lens and fixing details as per clause 801 of MoRT&H Specifications for Road and Bridge Works, 2001 (4th Revision, latest reprint).

9. Pavement Markings

52. In project road, pavement will comply with the IRC: 35-1997, “Code of Practice for Road Marking” with centre-line, edge line, continuity line, stop line, give way lines, diagonal/chevron markings and zebra crossings. The pavement marking shall be of hot applied thermoplastic paint with glass beads as per the MORT&H specification for Road and Bridge Works, 2001(4th Revision, latest reprint).

10. User Facilities

a. Bus Stop

53. There is no Bus stop is proposed on this road.

11. Improvement Proposal for Bridges and Drainage Structure

54. There are 17 culverts. Existing bridges, culverts, causeways are to be widened for two lane clear carriageway 7.5m and total width of 8.4m.

E. Material Investigation

1. Borrow Soil

55. Investigation of borrow areas to source embankment fill and sub grade materials resulted to the identification of several locations as shown in Figure 3.

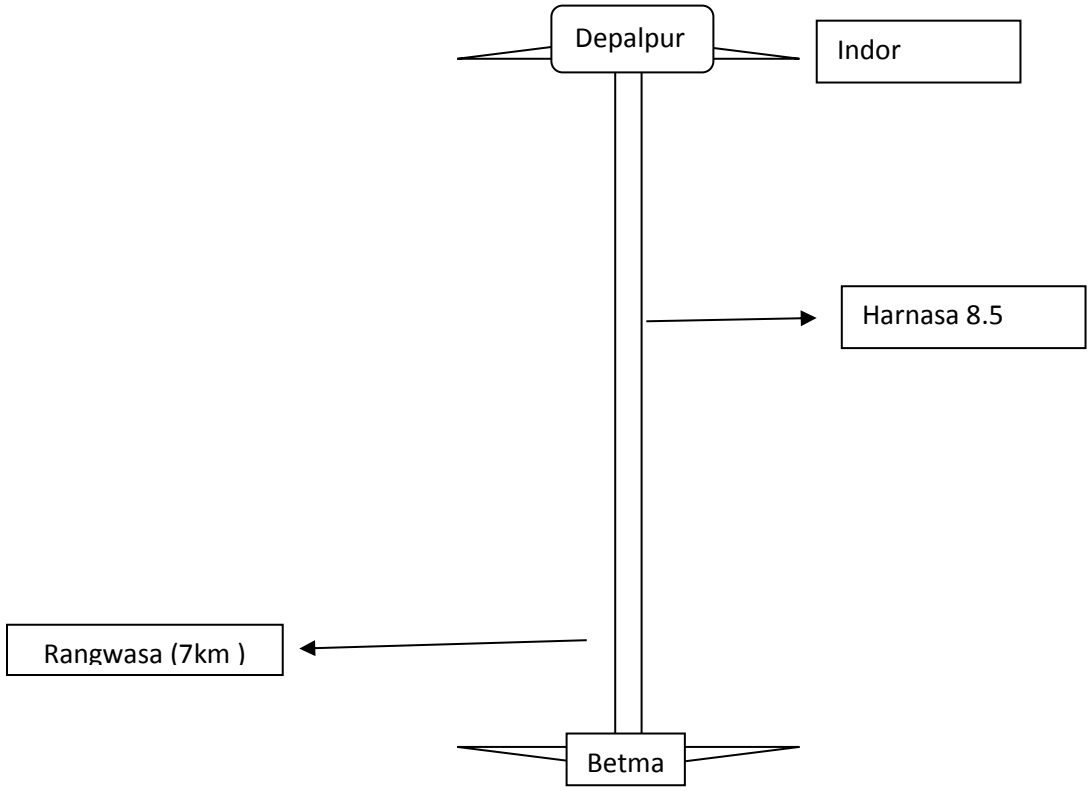


Figure 4: Identification of Locations

2. Aggregate Quarry

56. Three crushers are located on the project road at km 20/500 having lead distance of approx 12 km towards Khetia Town.

3. Granular Material

57. Granular material is used for the Drainage layer (GSB) in the pavement crust. This layer is laid up to the formation width level of the pavement for effective drainage. Granular material used in the GSB layer should have liquid limit and plasticity index restricted to 25% and 6%, respectively. In case of non-availability of suitable granular material in vicinity of project area within the reasonable lead distance, Soil, Sand and Aggregate are to be blended with suitable proportion (preferably 60:10:30) so as to achieve specified test value and gradation as per the clause 401 of MORTH specification.

4. Sand

58. Sand is generally used in the concrete work in construction. The major source of sand is the River Narmada. Property of sand varies from time to time.

5. Cement

59. There are many cement producing factories located in Madhya Pradesh State. The ACC Cement plants are located at Keymore, Madhya Pradesh.

6. Bitumen

60. Nearest source of Bitumen is Koyali Refinery, Vadodara. Mumbai refinery in Maharashtra can also be used as a source of bitumen.

7. Steel

61. There are a number of steel rolling factories in Madhya Pradesh with availability of various grade of steel. The required type of Steel is to be procured from the open market.

8. Water

62. Ground water and surface water in the vicinity of the project road is considered as a source of water. The water for construction can be made available by constructing bore at plant site with prior consents from state and local authorities.

F. Construction Schedule

63. The upgrading of Rajpur Khetia road is planned to be completed within 24 months from the construction start date.

IV. DESCRIPTION OF THE ENVIRONMENT

A. Introduction

64. The collection of baseline information on biophysical, social and economic aspects of the project area is the most important reference for conducting Initial Environmental Examination (IEE) study. The description of environmental settings includes the characteristic of area in which the activity of the project road would occur and cover area affected by all impacts. The existing baseline line conditions has been analyzed based on primary data collection with regard to air quality, water quality, noise, soil, biodiversity and socio- economic aspects and secondary data collection from published source and various government agencies.. Efforts have been made to collect the latest information both at regional as well as local level especially along the project roads alignment. The primary survey for water, air, noise and soil was carried out during May 2014. The sampling has been done along the project alignment. The existing baseline data and analysis around Rajpur Khetia Road is presented in the following sections.

B. Physical Environment

1. Topography, Geology & Soil

65. Madhya Pradesh nicknamed the "heart of India" due to its geographical location in India is bordered by Uttar Pradesh to the northeast, Chhattisgarh to the southeast, Maharashtra to the south, Gujarat to the west, and Rajasthan to the northwest. Madhya Pradesh the second largest state of the country has a geographic area of 30.82 million hectare, which constitutes 9.37% of the land area of the country. Geologically the State is divided in two zones; Central Plateau and Hill Region, and the Western Plateau and Hill Region. The Central Plateau and Hill Region is further divided into 7 sub-regions, namely: Bundelkhand, Madhya Pradesh Hills, Keymore Plateau and Satpura Hills, Vindhya Plateau, Satpura Plateau, Central Narmada Valley, and Gird. The Western Plateau and Hill Region hasn 2 sub-regions: Jhabua Hills, and Malwa and Nimar Plateau.

Table 14: Geological features of the State

Zone	Sub-group (Region)	District covered	Rainfall (mm)	Climate	Type of Soil
Central Plateau and Hill Region	Bundelkhand	Chatterpur, Datia, Tikamgarh	700	Dry sub humid	Mixed red & Black
	Madhya Pradesh Hills	Mandla, Dindori	1570	Moist sub humid	Red & Yellow
	Keymore Plateau & Satpura Hills	Jabalpur, Panna, Satna, Rewa, Sidhi, Seoni, Katni, Balaghat, Shahdol, Anooppur, Umariya	1100	Dry sub humid	Medium Black
	Vindhya Plateau	Bhopal, Damoh, Raisen, Sagar, Sehore, Vidisha	1130	Dry subhumid	Shallow to Medium Black
	Satpura Plateau	Betul, Chhindwara, Narsinghpur	1220	Dry subhumid	Shallow to Medium Black
	Central Narmada Valley	Hosangabad, Harda	1300	Dry subhumid	Deep Black

Zone	Sub-group (Region)	District covered	Rainfall (mm)	Climate	Type of Soil
	Gird	Morena, Bhind, Gwalior, Guna, Shivpuri, Ashoknagar, Sheopur	670	Semi-arid	Medium Black alluvial
Western Plateau and Hill Region	Jhabua Hills	Jhabua	988	Semi-arid	Medium to deep black
	Malwa & Nimar Plateau	Indore, Dhar, Ujjain, Ratlam, Dewas, Mandsaur, Rajgarh, Shajapur, Khandwa, Khargone, Neemuch, Badwani, Burhanpur	874	Semi-arid	Medium to deep black

66. Figure 5 and Figure 6 show the geological and soil map of MP.

Figure 5: Geological Map of MP

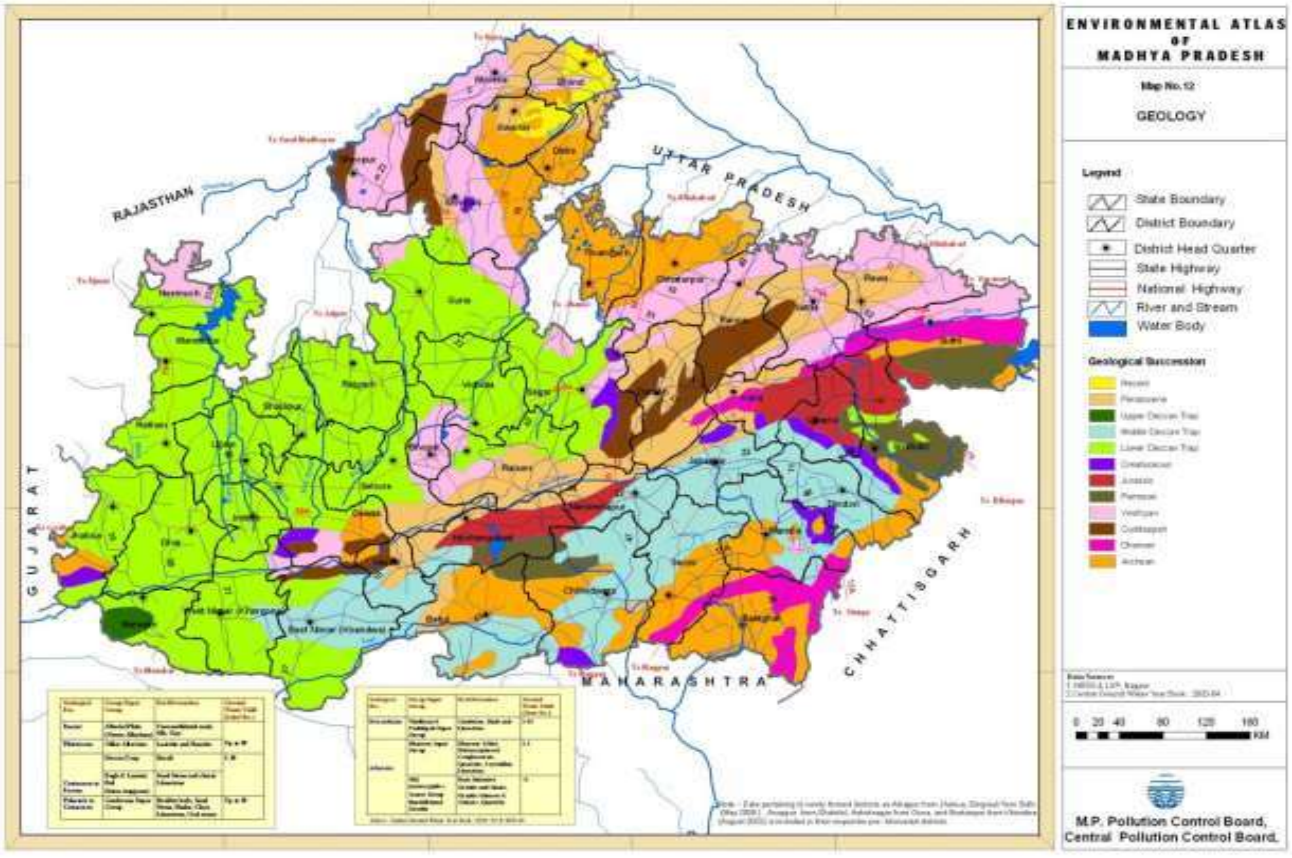
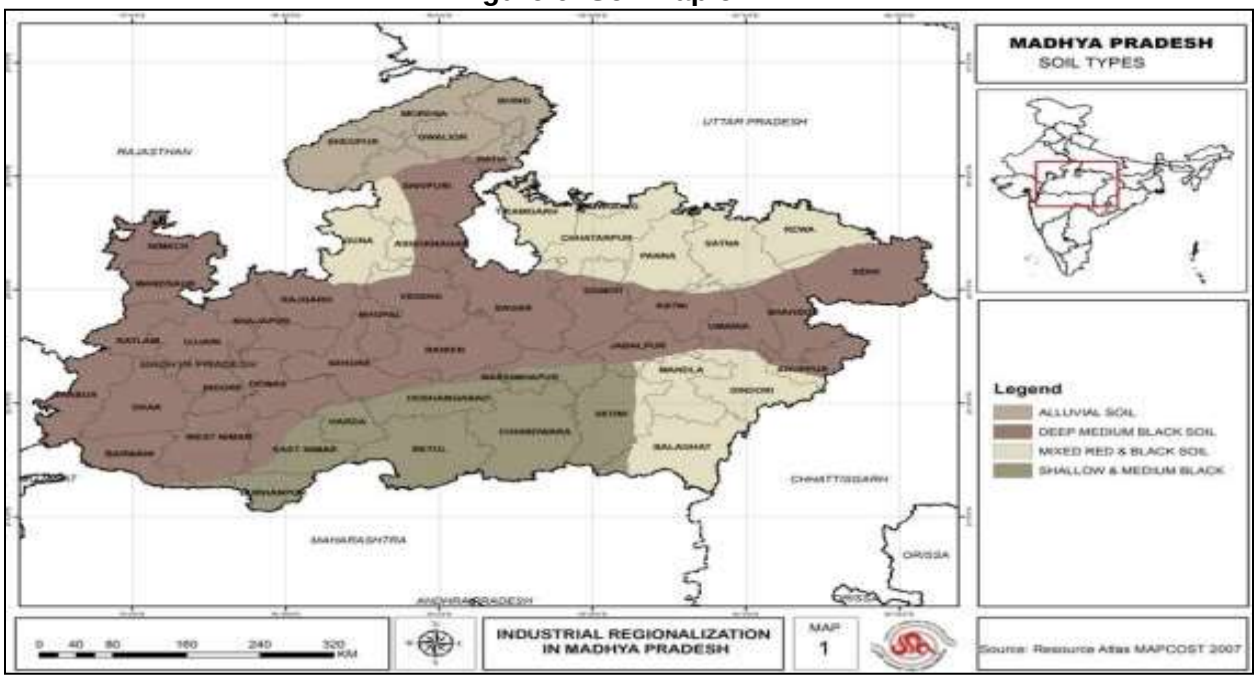


Figure 6: Soil Map of MP



67. The proposed Rajpur Khetia project road between is situated on the North East and Hill Region agro climate zone and forms Gird sub-group. The soil type in the area is Medium Black. Collected soil samples along the project corridor were analyzed and results are presented in Table 14. The results show that pH of the soil is alkaline, and available nutrients indicated medium nitrogen, low phosphorus, and high potassium contents.

Table 15: Soil Quality along the Project road

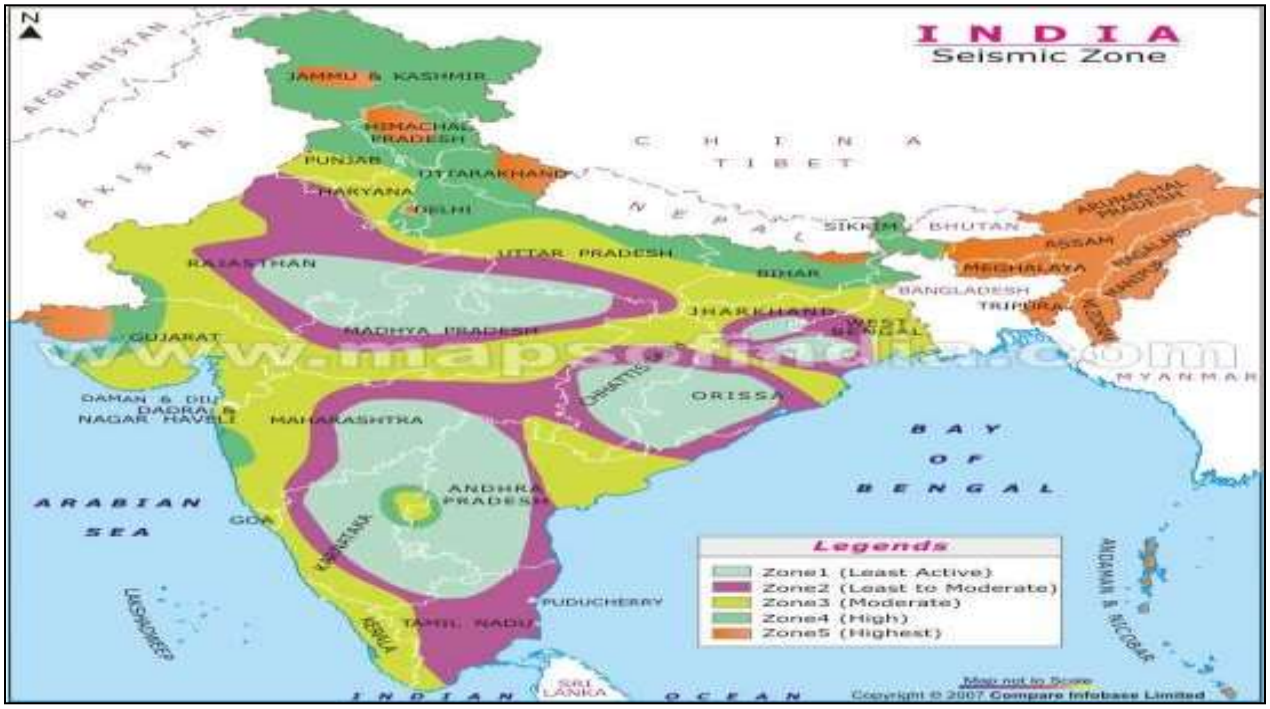
Sr. No.	Parameters	Test method	Unit	Danod (km 6+600)	Upla (km17+00)	Palsood (km 25+00)	Wazhar (38+00)
1.	pH(1:5 suspension)	IS:2720 (Part-26)	-	7.62	8.35	8.16	8.43
2.	Electrical Conductivity at 25^{O}C (1:5 suspension.)	IS:2720(Part-21)	µmhos/cm	23	26.8	22.4	28.6
3.	Sand	STP/SOIL	% by mass	62	58	55	52
4.	Clay	STP/SOIL	% by mass	24	26	34	44
5.	Silt	STP/SOIL	% by mass	14	16	11	14
6..	Texture	STP/SOIL	-	Sandy Clay Loam	Sandy Clay Loam	Sandy Clay Loam	Sandy Loam
7.	Bulk Density	STP/SOIL	gm /cm^3	1.423	1.562	1.431	1.342
8.	porosity	STP/SOIL	mg/1000 g	32.2	33.2	31.4	32.6
9.	Permeability	STP/SOIL	mg/1000 g	2.42	2.46	2.25	2.24
10.	Water Holding Capacity	STP/SOIL	% by mass	27.42	26.30	26.42	26.40
11.	Organic Carbon	STP/SOIL	% by mass	0.26	0.25	0.24	0.25
12.	Cation Exchange Capacity	STP/SOIL	mg/ kg	5.34	5.87	5.82	4.16

13.	Nitrogen	STP/SOIL	mg/1000 g	1038.5	1118.6	1040.6	1114.4
14.	Potassium (as K)	STP/SOIL	mg/kg	145.43	146.42	143.55	134.43
15.	Phosphorus	STP/SOIL	mg/1000 g	26.54	25.57	26.43	24.66
16.	Lead	STP/SOIL	mg/1000 g	0.02	0.02	0.01	0.02
17.	Iron	STP/SOIL	mg/1000 g	2.57	2.54	2.44	2.58

a. Seismicity

68. The entire Madhya Pradesh falls under zone least active to moderate zone as per seismic map of India. In the moderate damage risk zone structures are at risk of a Medvedev–Sponheuer–Karnik (MSK) scale VII with very strong earthquake where most people are frightened and try to run outdoors causing serious damage to older buildings, masonry chimneys collapse and small landslides. In the least active zone an MSK VI or less and is classified as the Low Damage Risk Zone where earthquake can frighten most people dishes and glassware may break and visible damage to masonry structures, cracks in plaster may occur. Figure 7 shows seismic Zone map of India.

Figure 7: Seismic Zone Map of India



Source: IS1893(Part1)2002

2. Climate

69. The region experiences typical tropical climate. It is characterized by hot summer season and general dryness except in the southwest monsoon season. The year may be divided into four seasons; cold season from December to February is followed by the hot season from March to about the middle of June. The periods from mid-June to September is the southwest monsoon season, and from October to November constitute the post monsoon or retreating monsoon season. The maximum temperature during summers ranges from 30ºC to 44ºC while minimum temperature from 30ºC to 19ºC. The temperature during the winter season

ranges between of 27ºC to 10ºC. The monsoon season spreads from the month of June to September with average rainfall of 1000 mm in the west to 1500 mm in the eastern part of state. The mean annual rainfall in the state is 1200 mm. Table: 16 shows the climate condition of Indoor district.

70. The salient climatic features of the state are as follow:

Average Annual Rainfall	-	1200 mm
Concentration of precipitation	-	June to September
Humidity	-	25 to 75 %
Cloudiness	-	Heavily clouded in monsoon
Wind	-	Generally light
Mean Temperature	-	summer 29_0C
	-	Winter 9^0

Table 16: Climate Condition of project district

Indore District	
Climate	Sub-tropical, Warm
Maximum Tem	45° C in May.
Minimum Tem	9° C In Dec. Jan
Average Rainfall	1100mm

3. Surface and Ground Water Hydrology

a. Surface Water Hydrology

71. There are ten major rivers that originate from the State. As Madhya Pradesh is located in the center of India, most of the rivers are interstate rivers. The rivers namely Chambal, Sindh, Betwa, Ken flow northward and meet with Yamuna whereas the river Sone falls directly into Ganga. Narmada, Tapti and Mahi rivers flow westward and meet Arabian Sea whereas Wainganga and Pench rivers meet Godavari in the south. Rivers in Madhya Pradesh are mostly seasonal and rain fed, receiving maximum water flow during the monsoon season. The non - monsoon flow in some perennial rivers is mainly due to flow from groundwater.

b. Ground Water Hydrology

72. Ground water is the major water source in the area for drinking purpose. The source of recharging of ground water is mostly from rainfall and canals. Hand pumps are commonly used to draw the water from ground in the villages. Static water levels vary along the stretch of the sample roads. First or upper ground water aquifer lies in the range of 12 to 18 m below ground level (bgl). The ground water levels in the area show a decline of 0.8 m to 1.2 m from post monsoon to pre monsoon period. The details of water bodies along the project road are given in Annexure I.

Table 17: Water Bodies along the Project road

S. No	Chainage	Distance	Left	Right	Crossing	Type of water bodies	Reference
1	0.7				Crossing	Culvert	
2	1.2				Crossing	Culvert	
3	1.9				Crossing	Culvert	
4	3.7				Crossing	Culvert	
5	4.3	12	Left			Hand pump	

S. No	Chainage	Distance	Left	Right	Crossing	Type of water bodies	Reference
6	4.6	10		Right		Hand pump	
7	4.9				Crossing	Culvert	
8	5.3				Crossing	Culvert	
9	5.9				Crossing	Canal	Working
10	6.8	10	Left			Hand pump	
11	6.9				Crossing	Culvert	
12	6.9	15	Left			Tube well	Near Temple
13	7.1	10	Left			Hand pump	
14	7.4				Crossing	Culvert	
15	7.5				Crossing	Culvert	
16	7.6				Crossing	Culvert	
17	9	10		Right		Hand pump	
18	9.2	8	Left			Hand pump	
19	9.7				Crossing	Culvert	
20	10.1				Crossing	Culvert	
21	10.1	8	Left			Hand pump	
22	10.8				Crossing	Culvert	
23	11.8				Crossing	Culvert	
24	12.7	4.5		Right		Handpump	
25	12.9				Crossing	Culvert	
26	13.1				Crossing	Culvert	
27	13.5					Retaining Wall	
28	15				Crossing	Culvert	
29	15	7		R		Handpump	
30	15.5	6		R		Handpump	
31	15.7	7	Left			Handpump	Dry
32	16	6	Left			Handpump	
33	16.4				Crossing	Culvert	
34	16.5	15		r		Handpump	Dry
35	16.6	10		R		Handpump	
36	16.8				Crossing	Culvert	
37	17.2	5		R		Handpump	
38	17.2	5		R		Tubewell	
39	17.2	7	Left			Handpump	
40	17.3	8	Left			Handpump	
41	17.3	7	Left			Handpump	
42	17.5				Crossing	Culvert	
43	17.6	7		R		Handpump	
44	17.8	6	Left			Handpump	
45	18.3				Crossing	Culvert	
46	18.3	15		R		Handpump	
47	19.2				Crossing	Culvert	
48	19.5				Crossing	Culvert	
49	20.6				Crossing	Culvert	
50	21.1	5		R		Handpump	
51	22.8	6		R		Handpump	
52	23.3	30	Left			Handpump	
53	23.5	8		R		Handpump	
54	23.6				Crossing	River	Goi River
55	25.2				Crossing	Culvert	
56	26				Crossing	Culvert	
57	26.5				Crossing	Culvert	

S. No	Chainage	Distance	Left	Right	Crossing	Type of water bodies	Reference
58	26.6	6		R		Handpump	
59	27.2				Crossing	Culvert	
60	27.5				Crossing	Culvert	
61	27.8				Crossing	Culvert	
62	27.9				Crossing	Culvert	
63	28.7	8	Left			Handpump	
64	29.3				Crossing	Culvert	
65	29.7	9		R		Handpump	
66	29.8	6		R		Handpump	
67	29.8				Crossing	Culvert	
68	30.1	8	Left			Handpump	
69	30.2	6	Left			Handpump	
70	30.3	6		R		Handpump	
71	31.1	10		R		Handpump	
72	31.6				Crossing	Culvert	
73	32				Crossing	Culvert	
74	32.6				Crossing	Culvert	
75	33.3				Crossing	Culvert	
76	33.4				Crossing	Culvert	
77	33.5	8	Left			Handpump	
78	34				Crossing	Culvert	
79	35	6	Left			Handpump	
80	35.3				Crossing	Culvert	
81	35.7				Crossing	Culvert	
82	35.8				Crossing	Culvert	
83	37.3	7	Left			Handpump	Wazhar
84	37.4	7		R		Handpump	Wazhar
85	37.6	8		R		Handpump	Near Temple
86	37.6				Crossing	Culvert	
87	37.8	5	Left			Handpump	Wazhar
88	37.9				Crossing	Culvert	
89	38.2	10	Left			Handpump	Dry
90	38.3	10	Left			Water tank	Near high school
91	38.3				Crossing	Culvert	
92	38.8				Crossing	Culvert	
93	39	8	Left			Well	
94	39.2	6	Left			Handpump	
95	39.3				Crossing	Culvert	
96	39.7				Crossing	Culvert	
97	40.2				Crossing	Culvert	
98	40.2				Crossing	Culvert	
99	40.5				Crossing	Culvert	
100	40.6	8		R		Handpump	
101	40.7	20	Left			Handpump	
102	40.8				Crossing	Culvert	
103	41.2				Crossing	Culvert	
104	41.8				Crossing	Culvert	
105	42.5				Crossing	Culvert	
106	42.8				Crossing	Steel Bridge	Niwali
107	43				Crossing	Culvert	

1. Water Quality

73. Water quality along the sample roads were sampled and analyzed for a physicochemical Characteristics based on procedures specified in 'Standard Methods for the Examination of Water and Wastewater' published by American Public Health Association (APHA). Results were compared to the standards for drinking water as per IS: 10500 and were all found suitable for drinking water and all parameters are within desirable limit.

Table 18: Water Quality

S. No	Test Parameters	Units	Method No.	Requirement as per IS_10500 2012		Danod (km6+600)	Upla (km17+00)	Palsood (km 25+00)	Wazhar (38+00)
				Desirable limits	Permissible limits				
1	pH		4500	6.5 to 8.5	No relaxation	7.82	7.97	7.67	7.87
2	Turbidity	NTU	2130	5	10	<5	<5	<5	<5
3	Conductivity	µmhos/cm	2510			890.00	890.69	892.92	889.91
4	Chlorides as Cl	mg/lit	4500	250	1000	78	76	81	82
5	Alkalinity	mg/lit	2320	200	600	266	269	256	285
6	Total Hardness as $CaCO_3$	mg/lit	2340	300	600	329.00	332.00	331.00	333.00
7	Ca Hardness as $CaCO_3$	mg/lit	3500			247	248	251	250
8	Mg Hardness as$CaCO_3$	mg/lit	3500			82	84	78	76
9	Total Dissolved solids	mg/lit	2540	500	2000	579.08	578.95	572.85	570.81
10	Sulphat as SO4	mg/lit	4500	200	400	48	45	46	41
11	Iron as Fe	mg/lit	3500	0.3	1	0.2	0.2	0.2	0.2
12	Nitrate as NO_3-N	mg/lit	4500	45	100	4.3	4.1	4.2	4.4
13	Nitrate as NO_2-N	mg/lit	4500			0.01	0.02	0.02	0.02
14	Calcium as Ca	mg/lit	3500	75	200	15	14	12.4	15
15	Magnesium as Mg	mg/lit	3500	30	100	12	10	11.	12
16	Phosphate as P	mg/lit	3500			<0.1	<0.1	<0.1	<0.1
17	Sodium as Na	mg/lit	3500			47	48	42	48
18	Potassium as K	mg/lit	3500			2.1	2.2	2.3	2.2
19	Fluoride as F	mg/lit	4500	1	1.5	0.1	0.1	0.1	0.1
20	Manganese as Mn	mg/lit	3500	0.1	0.3	0.1	0.1	0.1	0.1
21	Copper as Cu	mg/lit	3500	0.05	1.5	0.1	0.1	0.1	0.1
22	Chromium as Cr	mg/lit	3500	0.05	No relaxation	0.1	0.1	0.1	0.1
23	Ammonia as NH3-N	mg/lit	4500			0.1	0.1	0.1	0.1
24	E- Coli	No. per 100 ml	IS:15185	Nil	Nil	2	2	2	2

Table 19: Ground water quality along the project road (Microbiological Requirement)

S. no	Parameter	Test method	Required as per Is 10500:2012	Danod (km6+600)	Upla (km17+00)	Palsood (km 25+00)	Wazhar (38+00)
1	**Fecal Coliform**	IS-1622	0	Absent/100 ml	Absent/100 ml	Absent/100ml	Absent/100ml
2	**Total Coliform**	IS-1622	10 Max	Absent/100 ml	Absent/100 ml	Absent/100ml	Absent/100ml

2. Ambient Air Quality

74. The baseline status of the ambient air quality has been established through ambient air quality monitoring at selected points along the project roads. The ambient air quality has been monitored at 4 along the project road for particulate matter (PM2.5 and PM10), sulphur dioxide (SO2), oxides of nitrogen (NOX); and carbon monoxides (CO) using standard analysis technique (Table 19).

Table 20: Techniques Used for Ambient Air Quality Monitoring

Sl. No.	Parameter	Technique	Minimum Detectable Limit (ug/m3)
1.	Particulate Matter (PM2.5)	Gravimetric Method	1.0
2.	Particulate Matter (PM10)	Gravimetric Method	1.0
3.	Sulphur dioxide	Modified West and Gaeke	5.0
4.	Nitrogen Oxide	Modified Jacob & Hochheiser	5.0
5.	Carbon Monoxide	Non Dispersive Infrared Spectroscopy (NDIR)	1

75. Ambient air quality monitoring results for PM2.5, PM10, SO2, NOx and CO concentrations are given in Table 21 and summarized below. The monitored values are compared with National Ambient Air Quality Standards prescribed by Central Pollution Control Board (CPCB) for residential, rural and other areas. The Ambient air quality levels meet the National air quality standards for rural, residential and industrial area all along the project road.

- **PM2.5**: The mean PM2.5 concentration at ambient air quality monitoring locations varies from 28 to 37µg/m3. The value is highest at Danod (km 6+600).
- **PM10:** The mean PM10concentration at ambient air quality monitoring locations varies from 69 to 83µg/m3. The values are within the permissible limit at all the stations.
- **SO2:** The mean concentrations of SO2at all ambient air quality monitoring locations varies from 8 to 12 µg/m3. The values are within the permissible limit at all the stations.
- **NOx:** The mean concentrations of NOx at all AAQM locations range from 9 to 13 µg/m3. The values are within the permissible limit at all the stations.
- **CO:** The mean concentrations of CO at all AAQM locations range from 427 to 549 mg/m3. The values are within the permissible limit at all the station.

Table 21: Ambient Air Quality along the Project Road

S. no	Parameters	Test Method	Units	Limits as per Env. (Pro. Act.)	Danod (km6+600)	Upla (km17+00)	Palsood (km 25+00)	Wazhar (38+00)
1	Particulate Matter (PM10)	IS:5182 Part-XXIII	µg/m3	100.0	83	78	75	69
2	Particulate Matter (PM2.5)	CPCB Volume - 1/Grav	µg/m3	60.0	37	33	34	28
3	Sulphar Dioxide	IS:5182 Part II	µg/m3	80.0	8	9	12	10
4	Nitrogen Dioxide	IS:5182 Part VI	µg/m3	80.0	10	12	9	13
5	Carbon Monoxide	IS:5182 Part X	µg/m3	04.0	427	510	519	549

3. Noise Measurements

76. Preliminary reconnaissance survey was undertaken to identify the major noise generating sources in the area. The noise at different noise generating sources has been identified based on the industrial, commercial and residential activities, traffic and noise at sensitive areas. Sound Pressure Level (SPL) measurements were undertaken at all locations, with an interval of about 5 seconds over a period of 10 minutes per hour for 24 hr. The day noise level has been monitored during 6 AM to 10 PM and night levels during 10 P.M. to 6 AM at all locations. Day and night-time Leq have been calculated from hourly Leq values and compared with the stipulated standards. Table 26 gives the day and night-time Leq noise levels. Measured Leq noise levels exceed prescribed standards during the day time due to various commercial activities and the location of monitoring points close to the road.

Table 22: Day and Night Time Leq in the Area

Location	Day time dB(A)	Night Time dB (A)	Prescribed Standards dB(A)	
			Day Time	Night Time
Danod(km6+600)	58	43	55	45
Upla(km17+00)	59	44	55	45
Palsood(km 25+00)	54	41	55	45
Wazhar(38+00)	51	39	55	45

4. Land Use

77. The most of the geographical area of the state or 307,560 sq. km or about 98% is available for utilization. Major portion of the land use is under agriculture followed by forest cover (about 48 per cent). About 28% is under forest cover. Agriculture is the major land use in state followed by forests. The area under various land uses in the state is presented in the Table 23.

Table 23: Land Use Pattern in the State

Land Use	Area in '000 ha	Percentage
Total Geographical area	30,825	-
Reporting Area for land utilization	30,756	100.00
Forests *	8699	28.28

Land Use	Area in '000 ha	Percentage
Not available for cultivation	3398	10.05
Permanent Pasture & Grazing land	1348	4.38
Land under misc. tree crops & groves	19	0.06
Cultivable waste land	1177	3.83
Fallow land other than current fallows	612	1.99
Current fallows	769	2.50
Net area Sown	14735	47.91

Source: Land Use Statistics Ministry of Agriculture, GOI 2006

Table 24: Land Use Pattern along the project road

Chainage		Length	Land Use		Villages
From	To	in (m)	RHS	LHS	
0+000	0+600	0.6	Built Up	Built Up	Rajpur
0+600	6+500	5.9	AG Land	AG Land	
6+500	6+800	0.3	Built Up	Built Up	Danod
6+800	10+500	3.7	AG Land	AG Land	
10+500	14+500	4.0	Barran Land	Barran Land	
14+500	16+600	2.1	AG Land	AG Land	
16+600	17+500	0.9	Built Up	Built Up	Upla
17+500	20+000	2.5	AG Land	AG Land	
20+000	22+700	2.7	Barran Land	Barran Land	
22+700	23+200	0.5	Built Up	Built Up	Sigdi
23+200	24+300	1.1	AG Land	AG Land	
24+300	26+200	1.9	Built Up	Built Up	Palsood
26+200	30+200	4.0	AG Land	AG Land	
30+200	30+500	0.3	Built Up	Built Up	Berali Khurd
30+500	37+700	2.2	AG Land	AG Land	
37+700	38+600	0.9	Built Up	Built Up	Wazhar
38+600	40+900	2.3	AG Land	AG Land	
40+900	43+800	2.9	Built Up	Built Up	Niwali

C. Ecological Resources

1. Forests

78. The forest cover has been classified as dense forest and open forest. The latest estimates of Forest Survey of India (FSI), published in the State of Forest Report (SFR) 2003, suggest that the total forest cover of M.P. is 76,429 sq. km., constituting 24.79% of the State's total land area. Of the total forest cover, dense forest accounts for 13.57% and open forest about 11.22%. Central, eastern, and southern parts of the state are rich in forest cover. Figure 8 show the forest map of the state.

79. The project districts in general have little forest with only 0.47% of the total geographical area of the Shajapur district and 0.49% in Ujjain district having forest cover. In contrast, 27.05% of the Dewas district are forested. At the project level, from Ch 6.400km to Ch. 7.800km is passing through forest area where forest pillars are located within 12-15m from existing road centerline. However, no forest land diversion is required for the proposed widening.

Figure 8: Forest Cover in the District of Madhya Pradesh

2. Wild Life and Protected Areas

80. The project road does not pass through any protected area such as Wildlife Sanctuary, National park or bio –reserve. There is no wildlife sanctuary Wildlife Sanctuary, National park or bio –reserve within 10 km from the project road.

3. Trees

81. Moderate tree density is observed all along the Rajpur Khetia road. The main tree species observed are, Babool, Plash, Eucplitus, Neem,. An estimated 351 trees will be cleared accommodate the require road upgrading of which 26 % is Babool (*A. nelotica) tree. The change wise Tree inventory is in Annexure2*

Table 25: List of Trees within Proposed Corridor

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
1	0	5	240	10	Left		Neem	*A.indica*	
2	0	5	80	8	Left		Neem	*A.indica*	
3	0	5	80	7		Right	Neem	*A.indica*	
4	0	5	70	6		Right	Neem	*A.indica*	
5	0	5	80	7		Right	Neem	*A.indica*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
6	0	5	60	8		Right	Neem	*A.indica*	
7	0	5.5	180	8		Right	Pipal	*A.indica*	
8	0.1	5.5	200	7		Right	Neem	*A.indica*	
9	0.1	5.5	220	8		Right	Neem	*A.indica*	
10	0.1	5.5	230	9		Right	Neem	*A.indica*	
11	0.1	5.5	240	9		Right	Neem	*A.indica*	
12	0.1	5.5	220	8		Right	Neem	*A.indica*	
13	0.6	5.5	80	5	Left		Babul	*A.nilotica*	
14	0.6	5.5	80	5	Left		Babul	*A.nilotica*	
15	0.9	5.5	80	3	Left		Babul	*A.nilotica*	
16	0.9	5.5	70	8	Left		Babul	*A.nilotica*	
17	1.1	5.5	50	8	Left		Babul	*A.nilotica*	
18	1.4	5.5	100	8		Right	Neem	*A.indica*	
19	1.5	5.5	100	8		Right	Babul	*A.nilotica*	
20	1.9	4.5	100	4		Right	Babul	*A.nilotica*	
21	4.2	5.5	100	5		Right	Babul	*A.nilotica*	
22	4.6	5.5	100	5		Righ	Babul	*A.nilotica*	
23	5.4	5	80	7		Right	Babul	*A.nilotica*	
24	5.5	5.5	80	7		Right	Babul	*A.nilotica*	
25	10.5	5	50	7		Right	Babul	*A.nilotica*	
26	10.7	5	60	4		Right	Babul	*A.nilotica*	
27	10.8	4	70	4	Left		Babul	*A.nilotica*	
28	10.8	4	70	5	Left		Babul	*A.nilotica*	
29	10.9	4.5	50	5	Left		Neem	*A.indica*	
30	10.9	5	60	6		Right	Gular	*P.glumarata*	
31	10.9	4.5	80	6	Left		Neem	*A.indica*	
32	10.9	3	80	7	Left		Babul	*A.nilotica*	
33	11	5	40	6		Right	Babul	*A.nilotica*	
34	11	5	40	7		Right	Babul	*A.nilotica*	
35	11	5	30	7		Right	Neem	*A.indica*	
36	11	5	30	7		Right	Neem	*A.indica*	
37	11.1	4.5	30	7	Left		Babul	*A.nilotica*	
38	11.2	4.75	30	8	Left		Babul	*A.nilotica*	
39	11.2	4.75	30	8	Left		Babul	*A.nilotica*	
40	11.2	4.75	30	8	Left		Neem	*A.indica*	
41	11.2	5	40	6	Left		Babul	*A.nilotica*	
42	11.2	5	40	7	Left		Babul	*A.nilotica*	
43	11.2	5	40	7	Left		Babul	*A.nilotica*	
44	11.2	5	40	7	Left		Babul	*A.nilotica*	
45	11.2	5	60	7	Left		Beri	*Zizyphus mauritiana*	
46	11.2	5	60	8		Right	Babul	*A.nilotica*	
47	11.3	5	40	8		Right	Subabul	*Leucaena leucocephala*	
48	11.4	4.5	80	6	Left		Babul	*A.nilotica*	
49	11.4	4.5	80	6	Left		Neem	*A.indica*	
50	11.5	4.5	80	6	Left		Neem	*A.indica*	
51	11.5	5	40	7		Right	Beri	*Zizyphus mauritiana*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
52	11.5	5	50	7		Right	Babul	*A.nilotica*	
53	11.7	3.5	60	6		Right	Babul	*A.nilotica*	
54	11.7	5.5	70	6	Left		Beri	*Zizyphus mauritiana*	
55	11.9	5	50	6	Left		Palash	*B.monosparma*	
56	11.9	4.5	30	6		Right	Sagon	*T.grandis*	
57	11.9	4.5	30	6		Right	Jayant	*T.grandis*	
58	11.9	4.5	30	6		Right	Babul	*A.nilotica*	
59	11.9	4.5	30	6		Right	Beri	*Zizyphus mauritiana*	
60	11.9	4.5	30	5		Right	Beri	*Zizyphus mauritiana*	
61	11.9	4.5	30	5		Right	Beri	*Zizyphus mauritiana*	
62	11.9	4.5	30	5		Right	Beri	*Zizyphus mauritiana*	
63	11.9	4.5	30	5		Right	Beri	*Zizyphus mauritiana*	
64	12	5	40	5	Left		Babul	*A.nilotica*	
65	12	5	30	5		Right	Beri	*Zizyphus mauritiana*	
66	12	5	30	5		Right	Beri	*Zizyphus mauritiana*	
67	12	5	30	5		Right	Beri	*Zizyphus mauritiana*	
68	12	5	30	5		Right	Beri	*Zizyphus mauritiana*	
69	12	5	30	4		Right	Beri	*Zizyphus mauritiana*	
70	12	5	50	7		Right	Pipal	*P.relegosa*	
71	12	3	50	7	Left		Beri	*Zizyphus mauritiana*	
72	12	4	50	7		Right	Gular	*P.glumarata*	
73	12.1	4	50	6	Left	Right	Babul	*A.nilotica*	
74	12.1	4	50	6		Right	Gular	*P.glumarata*	
75	12.1	4.5	40	6		Right	Beri	*Zizyphus mauritiana*	
76	12.1	4.5	30	6		Right	Beri	*Zizyphus mauritiana*	
77	12.1	5	35	6	Left		Babul	*A.nilotica*	
78	12.4	5	50	6	Left		Babul	*A.nilotica*	
79	12.4	4.5	40	6	Left		Palash	*B.monosparma*	
80	12.4	5	40	6		Right	Bilayti Imli	*Pithecellobium Dulce*	
81	12.4	5	40	6		Right	Gular	*P.glumarata*	
82	12.5	5	40	6		Right	Sagon	*T.grandis*	
83	12.5	5	50	6		Right	Neem	*A.indica*	
84	12.5	5	40	6		Right	Bilayti Imli	*Pithecellobium Dulce*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
85	12.6	5	50	6		Right	Bilayti Imli	*Pithecellobium Dulce*	
86	12.6	5	50	6		Right	Bilayti Imli	*Pithecellobium Dulce*	
87	12.6	5	40	6		Right	Bilayti Imli	*Pithecellobium Dulce*	
88	12.6	5	40	6		Right	Bilayti Imli	*Pithecellobium Dulce*	
89	12.6	5	30	6		Right	Bilayti Imli	*Pithecellobium Dulce*	
90	12.6	5	50	6		Right	Neem	*A.indica*	
91	12.6	4.5	40	6	Left		Beri	*Zizyphus mauritiana*	
92	12.7	5	50	6		Right	Gular	*P.glumarata*	
93	12.8	5	40	6		Right	Sagon	*T.grandis*	
94	12.8	5	50	6	Left		Babul	*A.nilotica*	
95	12.8	5	40	6	Left		Babul	*A.nilotica*	
96	12.8	5	50	6	Left		Palash	*B.monosparma*	
97	12.8	5	50	6		Right	Sagon	*T.grandis*	
98	12.8	5	50	6		Right	Sagon	*T.grandis*	
99	12.8	5	50	6		Right	Sagon	*T.grandis*	
100	12.9	5	80	5	Left		Babul	*A.nilotica*	
101	12.9	5	40	7		Right	Palash	*B.monosparma*	
102	12.9	5	30	4		Right	Palash	*B.monosparma*	
103	12.9	5	30	4		Right	Palash	*B.monosparma*	
104	12.9	5	30	4		Right	Palash	*B.monosparma*	
105	12.9	5	40	7		Right	Palash	*B.monosparma*	
106	12.9	5	30	6		Right	Palash	*B.monosparma*	
107	12.9	5	30	6		Right	Palash	*B.monosparma*	
108	13.1	5	50	7-Jan	Left		Babul	*A.nilotica*	
109	13.1	4.5	80	5	Left		Babul	*A.nilotica*	
110	13.1	4.5	70	4		Right	Palash	*B.monosparma*	
111	13.2	4.5	50	5		Right	Palash	*B.monosparma*	
112	13.2	5	40	5	Left		Palash	*B.monosparma*	
113	13.2	5	30	5		Right	Palash	*B.monosparma*	
114	13.2	5	40	5		Right	Palash	*B.monosparma*	
115	13.2	5	40	5		Right	Palash	*B.monosparma*	
116	13.2	5	30	5		Right	Palash	*B.monosparma*	
117	13.5	4.5	40	5		Right	Palash	*B.monosparma*	
118	13.8	4.5	80	5		Right	Babul	*A.nilotica*	
119	14.4	5	30	5		Right	Sagon	*T.grandis*	
120	14.4	5	30	5		Right	Sagon	*T.grandis*	
121	14.4	5	40	5		Right	Sagon	*T.grandis*	
122	14.4	5	40	5		Right	Sagon	*T.grandis*	
123	14.4	5	40	6		Right	Sagon	*T.grandis*	
124	14.4	5	100	6	Left		Babul	*A.nilotica*	
125	14.5	5.8	150	7		Right	Babul	*A.nilotica*	
126	14.5	5	50	5		Right	Babul	*A.nilotica*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
127	14.6	4.5	40	5		Right	Babul	*A.nilotica*	
128	14.6	4.5	40	5		Right	Babul	*A.nilotica*	
129	14.7	4.5	40	5		Right	Bilayti Imli	*Pithecellobium Dulce*	
130	14.8	4.5	60	5		Right	Babul	*A.nilotica*	
131	15	5.5	80	5		Right	Babul	*A.nilotica*	
132	15	5.5	80	5		Right	Babul	*A.nilotica*	
133	15.4	5	90	7		Right	Ashok	*A.indica*	
134	15.4	5.5	350	12	Left		Bamboo	*Dendrocalamus strictus*	
135	15.4	5.5	300	18	Left		Bamboo	*Dendrocalamus strictus*	
136	15.4	5.5	350	15	Left		Bamboo	*Dendrocalamus strictus*	
137	15.4	5.5	350	18	Left		Bamboo	*Dendrocalamus strictus*	
138	15.4	5.5	300	18	Left		Bamboo	*Dendrocalamus strictus*	
139	15.4	5	60	5		Right	Sagon	*T.grandis*	
140	15.4	5	30	3	Left	Right	Sitaful	*Annona reticulata*	
141	15.4	5	30	3	Left	Right	Sitaful	*Annona reticulata*	
142	15.4	5	30	3		Right	Sitaful	*Annona reticulata*	
143	15.4	5	50	3		Right	Babul	*A.nilotica*	
144	15.4	5	30	2.5		Right	Sagon	*T.grandis*	
145	15.4	5	30	3		Right	Sagon	*T.grandis*	
146	15.4	5	30	3		Right	Sagon	*T.grandis*	
147	15.4	5	30	3		Right	Sagon	*T.grandis*	
148	15.4	5	30	2.5		Right	Sagon	*T.grandis*	
149	15.4	5.5	60	4		Right	Neem	*A.indica*	
150	16.5	4.5	90	5		Right	Babul	*A.nilotica*	
151	16.6	4.5	90	6		Right	Babul	*A.nilotica*	
152	16.8	5	40	3	Left		Babul	*A.nilotica*	
153	16.8	3.5	60	3.5		Right	Babul	*A.nilotica*	
154	16.9	4	60	3.5		Right	Babul	*A.nilotica*	
155	17.1	4.5	100	7		Right	Babul	*A.nilotica*	
156	17.5	5.5	30	2.5		Right	Babul	*A.nilotica*	
157	17.5	5.5	50	3.5		Right	Babul	*A.nilotica*	
158	17.5	5.5	40	3.5		Right	Babul	*A.nilotica*	
159	17.5	5.5	40	3.5		Right	Babul	*A.nilotica*	
160	17.5	5.5	50	4		Right	Babul	*A.nilotica*	
161	18.3	2.5	150	6		Right	*Murenga*	*Moringa oleifera*	
162	19.2	4.5	40	3.5	Left		Babul	*A.nilotica*	
163	19.2	4.5	40	4.5		Right	Babul	*A.nilotica*	
164	19.4	5.2	80	5		Right	Kher	*A.catachu*	
165	19.4	5.2	30	2		Right	Palash	*B.monosparma*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
166	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
167	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
168	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
169	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
170	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
171	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
172	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
173	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
174	19.4	5.2	30	2		Right	Palash	*B.monosparma*	
175	19.4	5	50	4	Left		Babul	*A.nilotica*	
176	21.3	4.5	60	3	Left		Babul	*A.nilotica*	
177	21.4	4.5	50	3		Right	Babul	*A.nilotica*	
178	21.4	4.5	40	3.5		Right	Babul	*A.nilotica*	
179	21.4	4.5	40	3		Right	Babul	*A.nilotica*	
180	23.3	4.5	40	4		Right	Babul	*A.nilotica*	
181	23.3	4.5	60	5		Right	Babul	*A.nilotica*	
182	23.3	4.5	60	4.5		Right	Babul	*A.nilotica*	
183	23.3	4.5	50	4.5		Right	Babul	*A.nilotica*	
184	23.3	4.5	40	5		Right	Babul	*A.nilotica*	
185	23.3	4.5	50	5		Right	Babul	*A.nilotica*	
186	23.3	4.5	50	5		Right	Babul	*A.nilotica*	
187	23.3	4.5	40	4		Right	Babul	*A.nilotica*	
188	24.3	5.5	150	9		Right	Subabul	*L. leucocephala*	
189	24.3	5	150	10		Right	*Euckliptus*	*E. globulus*	
190	24.5	5.5	150	10	Left		*Gulmohar*	*Delonix regia*	
191	24.5	5	90	8		Right	Babul	*A.nilotica*	
192	24.5	5	150	10		Right	*Euckliptus*	*E. globulus*	
193	24.5	5.5	200	10	Left		*Euckliptus*	*E. globulus*	
194	24.5	5	130	9		Right	Babul	*A.nilotica*	
195	24.6	4	250	10		Right	Pipal	*P.relegosa*	
196	24.6	4.5	150	8		Right	Pipal	*P.relegosa*	
197	24.6	4	100	10	Left		Pipal	*P.relegosa*	
198	24.7	5	250	9		Right	Neem	*A.indica*	
199	24.8	4.5	100	8		Right	Mitha Neem	*Melia azedaarach*	
200	24.9	3	250	10		Right	Neem	*A.indica*	
201	25	4	150	10		Right	Neem	*A.indica*	
202	25.2	5.5	100	6	Left		*Pipal*	*P.relegosa*	
203	25.2	5	100	4		Right	*Neem*	*A.indica*	
204	25.2	5.5	100	9	Left	Right	*Euckliptus*	*E. globulus*	
205	25.4	5	100	10		Right	*Euckliptus*	*E. globulus*	
206	25.4	5	110	10		Right	*Euckliptus*	*E. globulus*	
207	25.4	5	90	10		Right	*Euckliptus*	*E. globulus*	
208	25.4	5	100	10		Right			
209	25.4	5	110	10		Right	*Euckliptus*	*E. globulus*	
210	25.5	5	100	9		Right	*Euckliptus*	*E. globulus*	
211	25.5	5	100	9		Right	*Euckliptus*	*E. globulus*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
212	25.5	5	90	10		Right	*Euckliptus*	*E. globulus*	
213	25.5	5	100	10		Right	*Euckliptus*	*E. globulus*	
214	25.6	5	90	5	Left		*Neem*	*A.indica*	
215	25.7	5	100	5		Right	*Murenga*	*Moringa oleifera*	
216	26.1	5	90	5		Right	Babul	*A.nilotica*	
217	26.2	5	90	5		Right	Babul	*A.nilotica*	
218	26.3	5	90	5		Right	Babul	*A.nilotica*	
219	26.4	5	90	5		Right	Babul	*A.nilotica*	
220	26.7	4	90	5		Right	Babul	*A.nilotica*	
221	27	5.3	120	5	Left		Babul	*A.nilotica*	
222	28.2	5	100	5	Left		Babul	*A.nilotica*	
223	28.5	5	30	4	Left		Babul	*A.nilotica*	
224	29.3	5	40	4		Right	Babul	*A.nilotica*	
225	29.3	5	40	4		Right	Babul	*A.nilotica*	
226	29.3	5	40	4		Right	Babul	*A.nilotica*	
227	29.3	5	40	4	Left		Babul	*A.nilotica*	
228	29.3	5	40	4	Left		Babul	*A.nilotica*	
229	29.7	5.5	120	6		Right	Palash	*B.monosparma*	
230	30.8	3.2	150	8		Right	Babul	*A.nilotica*	
231	30.8	4	80	5		Right	Babul	*A.nilotica*	
232	30.9	4	100	6	Left	Right	Babul	*A.nilotica*	
233	30.9	4.5	80	4	Left	Right	Babul	*A.nilotica*	
234	31.1	5	50	3	Left		Palash	*B.monosparma*	
235	31.3	5	80	5		Right	Babul	*A.nilotica*	
236	31.4	5	40	4.5		Right	Babul	*A.nilotica*	
237	31.4	5	40	4.5		Right	Babul	*A.nilotica*	
238	31.4	5	50	4.5		Right	Babul	*A.nilotica*	
239	31.4	5	50	4.5		Right	Babul	*A.nilotica*	
240	31.4	5	40	4.5		Right	Babul	*A.nilotica*	
241	31.4	5	70	7		Right	Babul	*A.nilotica*	
242	31.5	5	80	6		Right	Babul	*A.nilotica*	
243	31.5	5	90	7		Right	Babul	*A.nilotica*	
244	31.5	5	80	6		Right	Babul	*A.nilotica*	
245	31.5	5	90	7		Right	Babul	*A.nilotica*	
246	32	5	100	7		Right	Palash	*B.monosparma*	
247	32	5	110	7		Right	Palash	*B.monosparma*	
248	32	5	100	6		Right	Palash	*B.monosparma*	
249	32	5.5	100	6	Left		Palash	*B.monosparma*	
250	32.2	4.5	100	6	Left		Babul	*A.nilotica*	
251	32.8	3	100	7	Left		Babul	*A.nilotica*	
252	32.8	3	80	6	Left		Babul	*A.nilotica*	
253	33.3	3.5	100	5		Right	Babul	*A.nilotica*	
254	33.3	3.5	80	5		Right	Babul	*A.nilotica*	
255	33.4	3.5	100	6		Right	Babul	*A.nilotica*	
256	33.4	3.5	90	6		Right	Babul	*A.nilotica*	
257	33.4	4	100	6	Left		Pipal	*P.relegosa*	
258	33.5	5	100	6		Right	Babul	*A.nilotica*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
259	35.8	5	50	4	Left		Palash	*B.monosparma*	
260	35.8	5	60	5	Left		Palash	*B.monosparma*	
261	35.8	5	70	5	Left		Palash	*B.monosparma*	
262	35.8	5	70	5	Left		Palash	*B.monosparma*	
263	35.8	5	60	4	Left		Palash	*B.monosparma*	
264	35.8	5	70	4.5	Left		Palash	*B.monosparma*	
265	35.8	5	70	4.5	Left		Palash	*B.monosparma*	
266	35.8	5	60	5	Left		Palash	*B.monosparma*	
267	35.8	5	70	5	Left		Palash	*B.monosparma*	
268	35.8	5	60	5	Left		Palash	*B.monosparma*	
269	36.3	3	70	4	Left		Babul	*A.nilotica*	
270	36.3	3	50	3	Left		Babul	*A.nilotica*	
271	37	4	100	6	Left		Babul	*A.nilotica*	
272	37.1	5	50	4	Left		Babul	*A.nilotica*	
273	37.1	5	50	5	Left		Babul	*A.nilotica*	
274	37.1	5	50	5	Left		Babul	*A.nilotica*	
275	37.2	4.5	70	5		Right	Babul	*A.nilotica*	
276	37.2	4.5	60	5		Right	Babul	*A.nilotica*	
277	37.2	4.5	90	5		Right	Babul	*A.nilotica*	
278	38.7	5	70	5	Left		Babul	*A.nilotica*	
279	38.7	5	60	5	Left		Babul	*A.nilotica*	
280	38.7	5	60	5	Left		Babul	*A.nilotica*	
281	38.7	5	70	5	Left		Babul	*A.nilotica*	
282	38.8	4.5	40	5	Left		Beri	*Zizyphus mauritiana*	
283	38.8	4.5	40	5	Left		Beri	*Zizyphus mauritiana*	
284	38.8	4.5	40	5	Left		Beri	*Zizyphus mauritiana*	
285	38.8	5	40	5	Left		Babul	*A.nilotica*	
286	38.9	5	50	4	Left		Babul	*A.nilotica*	
287	39.2	4	90	5		Right	Babul	*A.nilotica*	
288	39.5	5.5	90	6	Left		Babul	*A.nilotica*	
289	40.2	4	90	5		Right	Babul	*A.nilotica*	
290	40.3	4	80	5	Left		Babul	*A.nilotica*	
291	40.3	4.5	60	5	Left		Babul	*A.nilotica*	
292	40.3	4.5	350	8	Left		Bamboo	*Dendrocalamus strictus*	
293	40.5	4	100	7	Left		Babul	*A.nilotica*	
294	40.5	3.5	100	7	Left		Babul	*A.nilotica*	
295	40.5	4.5	80	5		Right	Palash	*B.monosparma*	
296	40.5	4.5	70	6		Right	Palash	*B.monosparma*	
297	40.6	3.5	80	5		Right	Neem	*A.indica*	
298	40.6	3.5	80	5		Right	Neem	*A.indica*	
299	41	5.5	90	6		Right	Palash	*B.monosparma*	
300	41	5.5	80	6		Right	Palash	*B.monosparma*	
301	41.8	3	120	7		Right	Gular	*P.glumarata*	
302	42.4	4	90	6		Right	Babul	*A.nilotica*	
303	42.5	4.5	80	7		Right	Babul	*A.nilotica*	

S. No.	Chanage	Distance from center of existing road	Girth (cm)	Approx. Ht. (m)	Left	Right	Local name	Botanical Name	Reference
304	42.5	4.5	70	7		Right	Babul	*A.nilotica*	
305	42.5	4.5	70	7		Right	Babul	*A.nilotica*	
306	42.5	4.5	70	7		Right	Babul	A.nilotica	
307	42.5	4.5	70	7		Right	Babul	A.nilotica	
308	42.5	4.5	80	6		Right	Babul	A.nilotica	
309	42.5	4.5	80	7		Right	Babul	A.nilotica	
310	42.6	4.5	70	6		Right	Babul	A.nilotica	
311	42.6	4.5	70	6		Right	Babul	A.nilotica	
312	42.6	4.5	80	5		Right	Babul	A.nilotica	
313	42.7	5.5	80	6		Right	Babul	A.nilotica	
314	42.7	5.5	80	6		Right	Babul	A.nilotica	
315	42.7	5.5	80	6		Right	Babul	A.nilotica	
316	42.7	5.5	80	6		Right	Babul	A.nilotica	
317	42.7	5.5	80	7		Right	Babul	A.nilotica	
318	42.7	5.5	80	6	Left		Babul	A.nilotica	
319	42.7	5.5	80	7	Left		Babul	A.nilotica	
320	42.8	4	130	8		Right	Babul	*A.nilotica*	
321	42.9	4	40	6		Right	Babul	*A.nilotica*	
322	42.9	4	40	6		Right	Babul	*A.nilotica*	
323	52.9	4	50	6	Left		Babul	*A.nilotica*	
324	42.9	4	50	6	Left		Babul	*A.nilotica*	
325	42.9	4.5	80	8		Right	Babul	*A.nilotica*	
326	42.9	4.5	100	9	Left		*Gulmohar*	*Delonix regia*	
327	42.9	4.5	100	8		Right	*Babul*	*A.nilotica*	
328	43	5	100	8	Left		*Babul*	*A.nilotica*	
329	43	5	110	10		Right	*Gulmohar*	*Delonix regia*	
330	43	5	100	10		Right	*Gulmohar*	*Delonix regia*	
331	43	5	120	10		Right	*Babul*	*A.nilotica*	
332	43.1	5.5	120	10	Left		*Gulmohar*	*Delonix regia*	
333	43.1	5.5	120	10	Left		*Gulmohar*	*Delonix regia*	
334	43.1	5.5	100	9		Right	Babul	*A.nilotica*	
335	43.1	5.5	110	9		Right	Babul	*A.nilotica*	
336	43.1	5.5	100	8		Right	Babul	*A.nilotica*	
337	43.2	5.5	100	9	Left		*Gulmohar*	*Delonix regia*	
338	43.2	5.5	120	10	Left		*Gulmohar*	*Delonix regia*	
339	43.2	5.5	110	9	Left		*Gulmohar*	*Delonix regia*	
340	43.2	5.5	110	10	Left		*Gulmohar*	*Delonix regia*	
341	43.2	5.5	100	9	Left		*Gulmohar*	*Delonix regia*	
342	43.2	5.5	120	10	Left		*Gulmohar*	*Delonix regia*	
343	43.2	5.5	140	9	Left		*Gulmohar*	*Delonix regia*	
344	43.2	5.5	110	10	Left		*Gulmohar*	*Delonix regia*	
345	43.2	5	120	10	Left		Babul	*A.nilotica*	
346	43.2	5	110	10	Left		Babul	*A.nilotica*	
347	43.3	5	110	9		Right	Babul	*A.nilotica*	
348	43.3	5	110	9		Right	Babul	*A.nilotica*	
349	43.3	5	100	9		Right	Babul	*A.nilotica*	
350	43.3	5	120	10		Right	Ukliptus	*E.golobulus*	
351	43.5	5.5	60	5	Left		Neem	*A.indica*	

4. Aquatic Ecology and Fisheries

82. There is 1 rivers and 1 nala with season flows along the subproject road crossed by project road where water is available during rainy season only and dry the rest of the year. There is 2 minor bridges, and 17 culverts along the Rajpur Khetia road.

a. Rare or Endangered Species

83. No rare or endangered species found in corridor of impact along the project road.

b. Fauna and Wild life

84. The project road traverses mainly through agricultural fields and during field survey no wild animals were spotted. However in discussion with the Forestry Department and during the public consultations, it was found that common fauna in the study area are Neelgai /Nilgai (Boselaphus tragocamelus); chital or Indian Spotted Deer (*Axis axis*); monkey (*Rhesus macaque*), and hare (*Lepus nigricolis*) are listed as least concern by the IUCN based on the wide range of occurrence. Also documented to occur in the project area are threthened species of Jackal (*Canis aureus indicus*); jungle cat (*Felix chaus*), fox (*Vulpes bengalensis*),and king cobra (*Binocellate cobra*).

D. Economic Development

85. The economy of Madhya Pradesh depends mainly on the agricultural sector as more than 80% of the people of the state depend on this sector for their livelihood. The agricultural sector contributes around 46% to the state's economy. The various kinds of crops grown in the state of Madhya Pradesh are rice, pulses, wheat, oilseeds, grams, soybeans, and maize. The state contributes 20% to the total production of pulses in the country. In Madhya Pradesh, the total production of food grain was around 14.10 million metric tonne in 2004- 2005. This sector has given a major boost to the economy in Madhya Pradesh.

86. The economy in the state of Madhya Pradesh also gets its revenue from the forest products sector as the state has a forest cover of around 1.7 million hectares. The various kinds of forest products available in the state of Madhya Pradesh are teak wood, Sal wood, and bamboos. These products are sold all over the country thus contributing to the Economy in Madhya Pradesh. The economy of Madhya Pradesh gets its revenue from the industrial sector which contributes 26% to the state's economy. The main industries in the state are of telecommunications, information technology, automobiles, and electronics. Madhya Pradesh is the 2nd biggest cement producer in the country for it contributes 13% to the total cement production in India. This sector has contributed a great deal to the growth of the economy in Madhya Pradesh.

87. Madhya Pradesh economy also depends for its revenue on the mineral resources sector for the state has a rich storehouse of minerals. The various kinds of minerals found in the state are dolomite, limestone, copper ore, bauxite, coal. Madhya Pradesh produced 52683 thousand metric tonne of coal. The mineral sector has helped to boost the Economy of the state of Madhya Pradesh. The economy of Madhya Pradesh gets its revenue from the cottage industry of the state. The various kinds of cottage industry products found in Madhya Pradesh are clay toys, leather toys, wool products, hand loom cloth, and chanderi sarees. The cottage industry sector has thus helped the economy of Madhya Pradesh to grow.

1. Agriculture

88. Madhya Pradesh is predominantly an agrarian economy with agriculture, animal husbandry and fisheries being the nucleus of the primary sector in the state. The state has greater dependence on agriculture, both from an economic as well as employment perspective. Between 2006-07 and 2010-11, the sector's contribution to GSDP at current prices grew at 13.5%. While the absolute growth of the sector at current prices shows an increasing trend, the rate of growth across different years has been highly fluctuating. Further, between 2006-07 and 2010-11, secondary and tertiary sectors grew at a higher pace than agriculture - consequently, the relative contribution of agriculture sector to the state economy, reduced from 23.85% to 20.93%.

89. Some of the important food and cash crops that are vital to agriculture in Madhya Pradesh are Rice, Wheat, Jowar, Gram, Soyabean, Pulses etc.

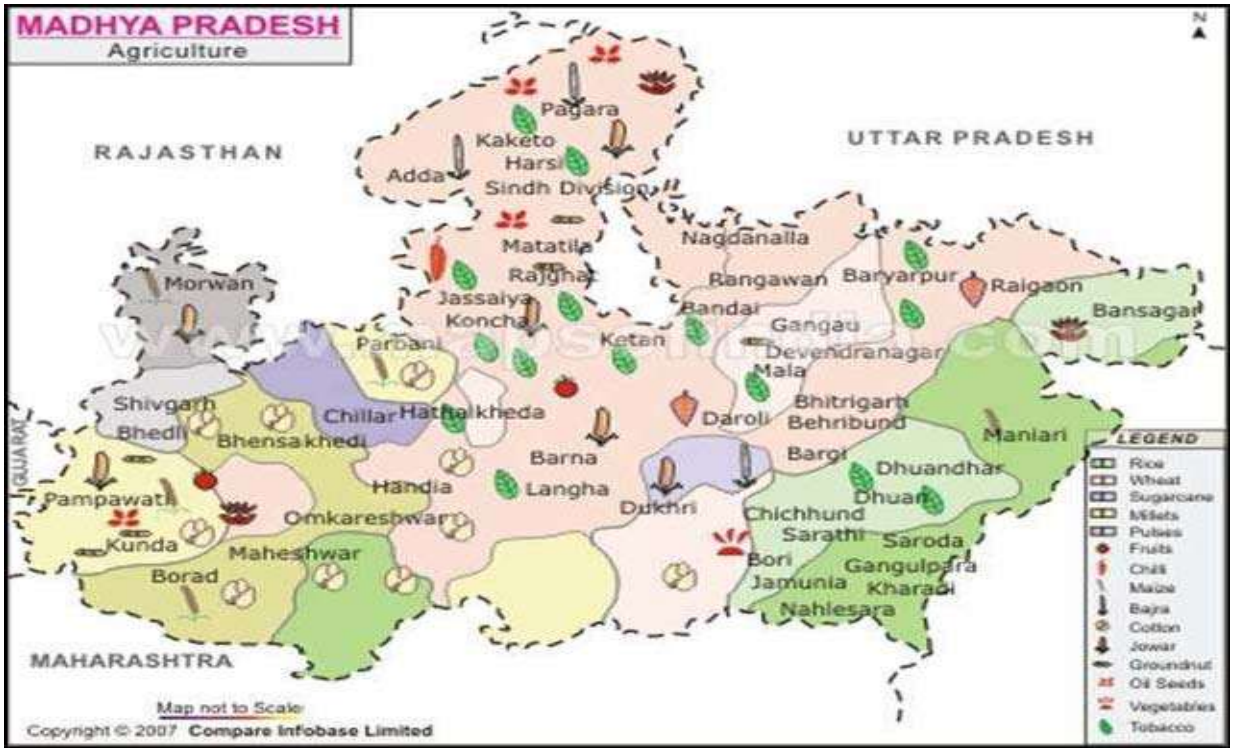


Figure 9: Agriculture Map of Madhya Pradesh

2. Social and Cultural Environment

90. Madhya Pradesh is a land-locked state in the central part of country with a population of about 60.3 million with more than 74 percent of the population living in the rural areas. The State has 50 districts consisting of 313 blocks and 55393 villages. The human population density is 196 persons/km$_2$ compared to 32.25 persons/km2 for the entire country. Sex ratio is 920 against the 933 in the country. The demographic feature of Madhya Pradesh is unique in 37 that there are many recognized tribes (about 40 percent of country), which inhabit mostly the remote areas and each with distinct culture, ethos, and traditional knowledge systems. The major minority groups in the state namely Gonds, Bhils and Oraons. The majority of the people survive on subsistence economy based mainly on the agriculture, supplemented with forest products, animal husbandry, and crafts/handloom.

91. Total population of Madhya Pradesh as per 2011 census is 72,626,809 of which male and female are 37,612,306 and 35,014,503 respectively The state has a growth rate of about 20 percent which is above the national average of about 17 and thus the population of them state is rising considerably given the progress in the state

92. About 73% of the state's population resides in rural areas. The state also has one of the largest tribal populations with 18 districts being predominantly tribal districts in the country. The share of schedule tribes and the schedule castes is 20.27% and 15.17% respectively. The overall literacy ratio in the state is 69.32 with male literacy being 78.73% and female literacy of 63.74%.

93. The BPL survey of 2002-03 with updated figures to October 2010 highlight that 46.48 lakh (47.4 percent) of households of rural Madhya Pradesh are living below the poverty line. The state accounts for nearly 11 percent of the total rural population in the country. The tribal households are the poorest among the most deprived social groups in India. In rural areas, 58.6 percent of the tribal population was found to be poor as compared to 42.8 percent among the SC in Madhya Pradesh.

94. The total BPL households/families comprise of 23.1 percent of SC, 33.4 percent of ST and 34.4 percent of Other Backward Class (OBC) and the remaining from the general category.

Table 26: Demographic Profile of the State Madhya Pradesh and the Project Districts

	Madhya Pradesh	Indore
Total Population	72,626,809	2376697
Rural Population	52557404	848988
Urban Population	20069405	2427709
Male Population	37,612,306	1699629
Female Population	35,014,503	1577070
Sex Ratio	931	940
Population Density (Sq/Km)	236	185
Population Growth % (01-11)	20.35	22.30
Literacy Rate %	69.32	76.5
Literacy Rate of Male %	78.73	
Literacy Rate of Female%	54.49	67
ST Population	20.27 %	
SC Population	15.17 %	

3. Archaeological and Historical Monuments

95. No archaeological and historical monument is located along the project road

4. Sensitive Receptors

96. During the environmental and social screening survey, it was observed that many small religious structures, school etc are located along the project road. However, no religious structures will be directly affected during widening of the project road. Details of sensitive receptors/community structure along the project road are shown in Table 27**.**

Table 27: Details of Sensitive Receptors/community structure

	Chainage	Length	Distance	Left	Right	Type of Body	Reference
1	0.2	15	6	Left		Temple	Naag Dev
2	0.3	75	6		Right	Govt Girls School	Rajpur
3	0.8	12	10		Right	Saraswati sisu Mandir	Rajpur
4	0.9	5	8	Left		Temple	Naag Dev

E. Anticipated Environmental Impacts and Mitigation Measures

97. Impact identification, screening for significance, and recommended mitigation measures for Rajpur Khetia Road was guided by the use of ADB Rapid Environmental Assessment (REA) Checklist for Roads and Highways as provided in Appendix 1. The environmental screening of MC Road revealed the following the entire alignment is located inside or near a cultural heritage site, protected area, wetland, mangrove, estuarine, buffer zone of protected area or special area for protecting biodiversity.

98. The potential impacts of the proposed upgrading includes: removal of avenue trees, increase in ambient dust concentration, increase in noise, generation of construction debris and camp wastes, and loss of community structures

F. Impact on Physical Environment Design Stage

1. Natural Hazard

99. The entire Madhya Pradesh falls under zone least active to moderate zone as per seismic map of India and therefore the risk of damage to the project road due to earthquake is minimal. Nonetheless, relevant IS codes were adopted in the design the civil structures

2. Road Widening, Utilities shifting and Safety Planning

100. The entire road section has enough available ROW to accommodate the proposed road improvement works and will be undertaken along the existing alignment. Road widening will result to shifting of utilities and encroaching structures. Poor coordination with local authorities and communities will increase the risk of accidental damage to drainage canals and temporary disruption of water and electric supplies along active construction fronts. The further contraction of the useable carriageway during construction will exacerbate traffic and will hinder direct access across the road by residents along the road. Temporary detention of sewage on depressed areas during the reconstruction of drainage canals may occur.

101. Road formation widening will be made on the basis of minimizing tree cutting, utility shifting, and damage to community properties. Road design has incorporates the drainage system to avoid accumulation of sewage and surface run-off. Temporary pits will constructed side-and cross drains to collect sewage from demolished or damage drainage canals which will either be hauled for off-site treatment through septic tanks prior to disposal or land application.

102. Adequate safety provisions like crash barriers on accident prone areas rumble strips in community areas to regulate speed, retro-reflective warning sign boards near school, hospital, and religious places are incorporated in the design. All utilities requiring shifting shall be largely made before start of construction. Prior to shifting, the Contractor will coordinate with the concerned agencies regarding the time and extent of shifting and community affected will be informed of potential service disruption at least 1 week in advance.

3. Terrestrial Ecology

103. There is no national park, wildlife sanctuaries or any other similar eco-sensitive areas within 10 km distance of the project area. However, 351 trees are likely to be affected. The impact and mitigation due to tree cutting has been discussed in following paragraphs.

104. The road has direct bearing on tree resources. Road widening option is made to minimize the cutting of tree. However efforts have been made in designing to reduce the tree cutting to only six meter from the central line of the existing road. Compensatory plantation of 1:10 has been planned under the project to address this impact.

G. Construction Stage

1. Air Quality

105. The potential sources of air emission during the construction phase of the project are: dust re-suspension from earthworks including materials loading and unloading; (ii) quarrying and rock crushing; (iii) operation of construction equipment and machines; (iv) fugitive emissions from unpaved road travel; and (v) combustion of fuels from equipment, machineries, and vehicles. Particulate matter, comprising the majority from road construction, Particle size distribution from road construction is dominantly large, with 85.5% > 10um and 55% > 20 um2 which can settle within close proximity of the source.Hot mix plant will generate carbon monoxide (CO), un-burnt hydrocarbon, sulphur dioxide, particulate matters, and nitrogen oxides (NOx) emissions. This may affect the air quality of nearby areas especially due to emission discharge from low height stack. The deterioration of the air quality within the immediate vicinity of the road construction activities will be significant but temporary.

106. Mitigation Measures. Following measures are proposed to minimize the dust and emission generation: Vehicles delivering loose and fine materials like sand and aggregates shall be covered.

- Loading and unloading of construction materials in project area or provisions of water fogging around these locations.
- Storage areas should be located downwind of the habitation area.
- Water shall be sprayed on earthworks and unpaved haulage roads regularly.
- Regular maintenance of machinery and equipment. Vehicular pollution check shall be made mandatory.
- Explore the potential for using readymade asphalt and crushed rocks to avoid or minimize the use of hot mix and rock crushing plants
- Mixing plants and asphalt (hot mix) plants shall be located at least 1 km downwind of the human settlements. The asphalt plants, crushers and the batching plants shall be sited at least 500m in the downwind direction from the nearest settlement and after securing a No-Objection
- Certificate (NOC) from the SPCB. Hot mix plant shall be fitted with stack of adequate height as may be prescribed by SPCB to ensure enough dispersion of exit gases.
- LPG should be used as fuel source in construction camps instead of wood. Tree cutting shall be restricted.
- Mask and other PPE shall be provided to the construction workers.
- Diesel Generating (DG) sets shall be fitted with adequate height as per

regulations (Height of stack = height of the building + 0.2 KVA.

- Low sulphur diesel shall be used in DG sets as well as machineries.
- Air quality monitoring should be carried out during construction phase. If monitored parameters are above the prescribed limit, suitable control measures must be taken

2. Noise

107. The scale of the construction necessary to upgrade the road and the corresponding slight increase in traffic are not expected to generate adverse impacts. Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops and vehicles and earthmoving equipment. These construction activities are expected to generate noise levels in the range of 80 – 95 dB(A) at a distance of about 5 m from the source.

108. Although this level of noise is higher than the permissible limit for ambient noise level for residential/commercial levels but will occur only intermittently and temporary. This noise level will attenuate with increase in distance from noise source, decreasing by 10dB at a distance of about 55m and 20 dB at 180 meters. Impact due to noise during construction activities will be minimal to communities as construction camps are located at least 50 meters from community areas.

109. Along the project road, a number of noise sensitive places are located which includes schools and temples. Noise impacts during project construction will be significant and temporary.

110. Mitigation Measures. Since the baseline noise levels already exceed prescribed standards the target for the operational stage monitoring will be to ensure that the noise levels do not exceed baseline levels.

111. All equipment shall be fitted with silencers and will be properly maintained to minimize its operational noise. Noise level will be one of the considerations in equipment selection, which will favor lower sound power levels. Stationary noise making equipment shall be placed along uninhabited stretches.

112. In addition to preferring less noise generating equipment, the timing of operation can be scheduled to avoid disruption of activities like school and prayer times. Finally, provision of temporary noise barriers will be made near identified sensitive locations or near the noise source during construction.

113. To protect workers operating in noisy environment, ear plugs or ear muffs will be provided by the Contractor to the workers and occupational exposure limits will be strictly implemented

3. Impact on Land and Soil

114. Borrow areas may lose its productivity if top soil is not preserved. Similarly, land area used for locating construction camp may lose its productivity, if it is not restored to its original stage after disbanding the construction camp.

115. **Mitigation Measures**. The top soil from the productive land shall be preserved and

reused for plantation purposes. It shall also be used as top cover of embankment slope for growing vegetation to protect soil erosion. It shall be ensured that the land taken on lease for access road and construction camp is restored back to its original land use before handing it over back

4. Soil Erosion

116. Soil erosion may take place at locations of sharp bend near bridge construction locations, along steep and incompact embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect *viz.* siltation, embankment damage, and drainage problem. Loss of soil due to run off from earth stock-piles may also lead to siltation of nearby water bodies. The intensity of soil erosion at different locations will be influenced by the litho logy, topography, soil type and climatic condition (mainly rainfall) and drainage pattern.

117. **Mitigation measures**. Following mitigation measures are proposed for prevention of soil erosion:

- Bank protection measures shall be taken at erosion prone areas. The protection measures may include use of geo-textiles matting, bio (vegetative) – turfing
- Provision of side drain to guide the water to natural outfalls.
- Stone pitching wherever necessary.
- When soil is spread on slopes for permanent disposal, it shall be buttressed at the toe by retaining walls.
- Side slopes of the embankment shall not be steeper than 2H:1V. Turfing of embankment slopes shall be done along the stretch.
- Shrubs shall be planted in loose soil area.
- In rural stretches, longitudinal side drains shall be intercepted by drains serving as outlet channels to reduce the erosion
- IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration.
- Soil erosion shall be visually checked on slopes and high embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion further including bio-turfing.
- While planning or executing excavations, the Contractor will take all adequate precautions against soil erosion as per MoRTH 306.
- The earth stockpiles to be located downwind and provided with gentle slopes to prevent soil erosion

5. Borrow Areas and Quarries

118. The project area is flat terrain. Farmers are willing to provide earth from their field up to certain depth on adequate compensation; it is recommended that borrowing from agricultural land shall be minimized to the extent possible.

119. Borrow areas if left un-rehabilitated may pose risk to people, particularly children and animals of accidentally falling into it as well as become potential breeding ground for mosquitoes and vector born disease

120. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution. Opening of new quarries is not envisaged due to the proposed project.

Quarry material will be sourced from existing nearby quarries.

121. **Mitigation measures**. Borrow pits shall be selected from barren land/wasteland to the extent possible. Borrow areas should not be located on cultivable lands except in the situations where land owners desires to level the land. The top soil shall be preserved and depth shall be restricted to the desired level.

122. Borrow areas should be excavated as per the intended end use by the owner. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed.

123. The depths in borrow pits to be regulated so that the sides shall not be steeper than 25%. To the extent possible, borrow areas shall be sited away from inhabited areas. Borrow areas shall be leveled with salvaged material or other filling materials which do not pose contamination of soil. In addition, it shall be converted into fishpond in consultation with fishery department and if desired by land owner/community. The borrow shall be

124. Rehabilitated following the broad guidelines given at Appendix 2.

125. Aggregates will be sourced from existing licensed quarries. Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to EO, PIU. The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of the approval to EA if new quarries are opened.

6. Compaction and Contamination of Soil

126. Soil in the adjoining productive lands beyond the ROW, haulage roads, and construction camp area may be compacted due to movement of construction vehicles, machineries and equipment, and due to sitting of construction camps and workshops. Approach road either paved or unpaved is available for most the bridge approaches. However, for some bridges approach road has to be constructed.

127. Soil may be contaminated due to inappropriate disposal of liquid waste, (lubricating oil and fuel spills, waste oil and lubricant and vehicle/equipment washing effluent) and solid waste (fuel filters, oily rags) likely to be generated from repair and maintenance of transport vehicles, construction equipment and machinery. Soil may be contaminated due to inappropriate disposal of domestic solid waste and sewage from construction camps.

128. **Mitigation Measures.** Fuel and lubricants shall be stored at the predefined storage location and away from drainage channels. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil.

129. All efforts shall be made to minimize the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, oil interceptors shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labeled containers (Labeled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized Waste Oil Recycler.

130. To prevent soil compaction in the adjoining productive lands beyond the ROW, the

movement of construction vehicles, machinery and equipment shall be restricted to the designated haulage route.

- Approach roads shall be designed along the barren and hard soil area to reduce the compaction induced impact on soil.
- The productive land shall be reclaimed after construction activity.
- Septic tank or mobile toilets fitted with anaerobic treatment facility shall be provided at construction camp.
- Domestic solid waste at construction camp shall be segregated into biodegradable and non-biodegradable waste. The non-biodegradable and recyclable waste shall be sold off.
- Efforts shall be made that biodegradable waste shall be composted in the mechanized and movable composter by the contractor. Non bio-degradable and non-saleable waste shall be disposed off to authorized land fill site. Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit.
- Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board

131. Construction waste constitutes debris, which are generated due to dismantling of pavement (though involved only for few kilometer in DBH Road), quarry dust and unused iron bars or damaged support structures. Uncontrolled disposal of these wastes may affect soil and even receiving water bodies may cause contamination of soil, and landscape of the area.

132. **Mitigation Measures.** Construction waste shall be disposed of in environmentally acceptable manner. Some of the measures are as follows:

- The existing bitumen surface can be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. All excavated materials from roadway, shoulders, drains, cross drainage should be used for backfilling embankments, filling pits, and landscaping. Unusable debris material should be suitably disposed off at pre designated disposal locations, with approval of the concerned authority.
- The bituminous wastes shall be disposed in secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal MoRTH guidelines should be followed.
- The locations of dumping sites should be selected with following Away from residential areas and located at least 1000 m downwind side of these locations,
- Dumping sites do not contaminate any water sources
- Dumping sites have adequate capacity equal to the amount of debris generated.
- Public perception and consent from the village Panchayats about the location of debris disposal site shall be obtained before finalizing the location considerations.
- Unproductive/wastelands shall be selected for dumping sites.
- Away from residential areas and located at least 1000 m downwind side of these locations,
- Dumping sites do not contaminate any water sources
- Dumping sites have adequate capacity equal to the amount of debris generated.
- Public perception and consent from the village Panchayats about the location of debris disposal site shall be obtained before finalizing the location.

7. Groundwater

133. Contamination of groundwater is not envisaged since construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp.

134. **Mitigation Measures.** Requisite permission as applicable shall be obtained for abstraction of groundwater. The contractor shall make arrangements for water required for construction in such a way that the water availability and supply to nearby communities remain unaffected. Water intensive activities shall not be undertaken during summer season.

8. Surface Water Bodies

135. Temporary pollution of water bodies may occur due to spillage of chemicals and oil at construction sites and disposal of waste from construction camps. Installation of a haul road or temporary access across the river/nala maybe required while construction work is ongoing in the existing minor bridges and culverts. This may cause sedimentation and other disturbances to the water body.

136. **Mitigation Measures.** To prevent siltation of road side ponds, provision of retaining wall is made along the road for the ponds located next to the road. As enhancement measures, efforts shall be made to increase the water holding capacity of the ponds (other than those affected) in the region by using the bed material as borrow earth. Following measures shall be followed additionally:

- Bridge construction activity including piling is recommended during non-monsoon (October to End of May) period.
- Check dams must be created during construction to catch the silt or debris generated from construction activities across the water channels
- All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection.
- All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up.
- Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors.
- Silt fencing and/or brush barrier shall be installed along drainage path, erosion prone areas for collecting sediments before letting them into the water body. Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated.
- All wastes arising from the construction should be disposed in an environmentally accepted manner so as not to block the flow of water in the channels. The wastes should be collected, stored and transported to the approved disposal sites.
- No vehicles or equipment should be parked or refueled near water bodies, so as to avoid contamination from fuel and lubricants
- Substructure construction should be limited to the dry season.
- Construction camps shall be located away from habitation (at least 1 Km Away) and water bodies. Sewage from labour camps will be treated through septic tanks. No untreated/treated sanitary wastewater shall be discharged into surface water bodies as these are used for bathing and washing purpose.
- The borrow areas may also be converted into ponds with the concurrence of the

land owners. Fisheries activity can be encouraged in such ponds through institutional support from concerned department

9. Hydrology and Drainage

137. Construction material and waste may contaminate or clog the small drains if stored or disposed close to water body.

138. **Mitigation Measures**. Adequate cross drainage structures shall be provided. Additional balancing culverts shall be provided in flood prone areas. The embankment height shall be designed consistent with the existing topography of the region and shall be higher than the HFL. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment and to ensure minimum disturbance to natural drainage of surface and subsurface water of the area.

139. The design of drainage system such as surface and sub-surface drainage shall be carried out as per IRC: SP: 42 and IRC: SP: 50. Surface runoff from the main highway, embankment slopes and the service roads shall be discharged through longitudinal drains, designed for adequate cross section, bed slopes, invert levels and the outfalls. If necessary, the walls of the drains shall be designed to retain the adjoining earth.

140. IRC: 34-1970: Recommendations for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments shall be referred.

141. No construction material will be stored or disposed near any water body except for reusing it for enhancement measures such as embankment raising.

10. Impact on Biological Environment

a. Terrestrial Ecology

142. There is no national park, wildlife sanctuaries or any other similar eco-sensitive areas within 10 km distance of the project area. However, some trees are likely to be affected. The impact and mitigation due to tree cutting has been discussed in following paragraphs.

143. One month before the construction starts, clearing and grubbing will be performed by the contractor. All trees within the ROW with 300 mm diameter at 1m above the ground will be cut, including the removal of stumps. A total of 351 trees are likely to be affected due to the proposed project. The cutting of trees will have minor to negligible impact on local environment.

144. **Mitigation Measures.** Requisite permission from Forest Department shall be obtained for cutting of roadside trees located in forest land otherwise; permission will be taken from district commissioner.

145. One month before the construction starts, clearing and grubbing will be performed by the contractor. All trees within the ROW with 300 mm diameter at 1m above the ground will be cut, including the removal of stumps. A total of 351 trees are likely to be affected due to the proposed project. The cutting of trees will have minor to negligible impact on local environment.

146. **Mitigation Measures*.*** Requisite permission from Forest Department shall be obtained for cutting of roadside trees located in forest land otherwise; permission will be taken from

district commissioner.

147. The project envisages plantation of approximately 3510 trees along both sides of road as per IRC SP: 21 specifications. This will include the compensatory plantation as per prevailing guidelines of States forest department on 1:10 basis replacement rate or as per permission granted by district authorities for cutting of tree located on non-forest land, which vary from 1:3 to 1;10. Besides, additional plantation shall be done on banks of water bodies near bridge sites to enhance the aesthetics and check soil erosion. All tree plantations will be carried out through forest department, local community or the civil works contractor. Tree species selected for plantation must be suitable for local climatic conditions and be equal to or better in sequestering carbon than the the trees removed/be good for sequestering carbon (only for roads where there is no tree cutting). Necessary advise maybe sought from the local Forestry office in the selection of tree species.

148. A range of 10-15 m Centre-to-Centre is recommended for spacing of trees (parallel to the road). Setback distance of trees in different situations shall be based on IRC: SP: 21 and IRC: 66. The distance between the kerb, if any, and the nearest edge of tree trunk shall be at least 2 m. The plantation in median shall comprise shrubs whose height would normally not exceed 1 -1.5 m and shall be as per IRC SP: 21.

149. For safe traffic operation, vertical clearance between the crown of the carriageway and lowest part of overhang of the tree available across the roadway shall conform to the standards laid down in IRC: SP: 21. The pit size, fencing, watering, and manuring requirements shall also conform to the above standard. The use of pesticides shall be avoided or minimized to the extent possible. Planting shall be such that it does not obstruct the visibility of traffic from any side and shall be pleasing in appearance.

a. Aquatic Ecology

150. Temporary sedimentation and water quality deterioration is expected from the project during the construction stage. Accidental spill of materials, chemicals, and fuels may also deteriorate receiving water quality and hence the aquatic ecology.

151. **Mitigation measures**. It is proposed to undertake construction activities near water bodies during summer season when most of water bodies are practically dry. Best construction practices shall be adopted to prevent increase in siltation level of the water. All precautionary efforts shall be taken as given under surface water section to prevent accidental damage of water quality.

11. Socio-Economic Impact

152. Rajpur Khetia road project will have both positive and negative impact on socioeconomic aspects as narrated below.

a. Positive Impacts

153. Economic activities supporting transport like fuel stations, automotive repair shops, lodging, and restaurants are expected to increase with increase of traffic and induced development of the area. The improved road will provide better connectivity which will result in (i) Reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, educational and other infrastructural facilities (iv) enhanced tourism

activities in the area and state which in many terms will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

b. Anticipated Negative Impacts

154. The other impacts are expected due to sitting and operation of construction camp during construction.

12. Labour and Construction Camp

155. Construction workers expected to be about 150 per day per package are likely to be employed during construction. Most of the workers will be employed locally. However, some may be from nearby areas. This will cause additional burden on local resources. However, this impact will be temporary and will not have the potential for changes in the demographic scenarios of the area. The outside workers will be housed at the construction camp, which is expected to one per package. Poor sitting and improper management of construction camp may lead to several adverse impacts on environment viz. (i) loss of vegetation due to use of wood as fuel source for cooking (ii) deterioration in nearby surface water bodies" quality (iii) compaction and contamination of soil due to uncontrolled disposal of solid waste (iv) Poor sanitation may result to transmission of communicable diseases among the workers and the host communities. This includes the possible spread of sexually transmitted disease, diseases from improper handling and supply of foodstuffs, poor water supply, and insect-borne diseases.

156. **Mitigation Measures**. Construction camp shall be sited at such locations so as to utilize the existing infrastructure. No productive land should be utilized for construction camp. All sites must be graded, ditched and rendered free from depressions to avoid water stagnation. Accommodation and ancillary facilities including recreational facility for workers shall be erected and maintained to standards and scales approved by the resident engineer. All camps should maintain minimum distance of 1000 m from habitation and water bodies.

157. All construction camps shall be provided sanitary latrines and urinals with provision of septic tanks attached with soak pits or mobile toilets fitted with anaerobic digestion system. Storm water drains shall be provided for the flow of used water outside the camp. Drains and ditches shall be treated with bleaching powder on a regular basis. Garbage bins must be provided in the camp and regularly emptied and disposed of in a hygienic manner. LPG cylinders shall be provided as fuel source for cooking to avoid any tree cutting.

158. The Contractor will ensure the following:

- The good health and hygiene of all workers to prevent sickness and epidemics. These include the HIV/AIDS prevention program to reduce the risk and transfer of HIV virus between and among the workers and community, promote early diagnosis and assist affected individuals. Activities under the program include monthly information, education, and consultation communication campaigns to workers, drivers, delivery crew, and communities on the risk, dangers, and impacts of STD and HIV/AIDS. Contractor will also provide first aid facilities at the camp and organize regular health check-up camps as well.
- Availability of safe drinking water and sufficient supply of suitable and hygienically prepared food at reasonable price is available to the workers.
- Adoption of all precautions to protect the workers from insect and pest to reduce

the risk to health. This includes the use of insecticides, which should comply with local regulations.

- Prohibition on supply or availability of alcoholic liquor or prohibited drugs at the camp.
- Regular health check-up and immunization camps shall also be organized for the workers and nearby population.

13. Safety

159. The road construction activities may create various unsafe situations. This will require attention to the following safety aspects viz.

a) Safety of construction workers,
b) Safety of road users including pedestrians and cyclists
c) Safety to cattle;
d) Safety of local community
e) Unsafe/ hazardous traffic conditions due to construction vehicle movement need to be considered during design and construction stage and
f) Conduct of safety audit.

160. **Mitigation measures.** During the construction phase, contractors shall be required to adopt and maintain safe working practices. Internationally accepted and widely used safety procedures should be followed during (i) road works (ii) handling of large construction equipment and machineries, (iii) handling of chemicals and hazardous materials and inflammable substances (iii) welding and (iv) electrical works. Contractor shall also arrange required PPEs for workers, first aid and firefighting equipment at construction sites. Contractor will also prepare an emergency preparedness plan, which shall be duly approved by EA to respond to any emergency and unsafe conditions. To avoid disruption of the existing traffic due to construction activities, comprehensive traffic management plan shall be drawn up by the contractor. Retro-

161. Reflector zed traffic caution signs shall be used during construction. Regular safety audit or periodic review shall be made to assess the effectiveness of safety measures adopted during construction.

162. Adequate caution signage near school, sensitive locations, speed control, caution notes shall be fixed at appropriate locations. These shall be preferably of PCC with Retro reflective paints. Steel base signage shall be avoided to prevent theft of the same. Crash barrier shall also be installed at appropriate locations particularly near school to provide safety to school children. Provision of sped breakers shall be made near schools and religious places.

H. Impacts during operation stage

163. The subproject road is located in vast open agricultural land, which will provide adequate dispersion of gaseous emission from vehicle. Further, proposed plantation will ameliorate/enhance the micro climate. No adverse climatic changes/impacts are anticipated during operation stage other than GHG (CO2) emission due to increased traffic, which would be largely offset with better fuel efficiency and reduced vehicle idling due to improved road conditions.

1. Air Quality

164. Vehicular emissions will be the principle source of pollution during operation stage. The subproject road is mostly located in vast open agricultural land, which will provide adequate dispersion dynamics of gaseous pollutants. Moreover, majority of the traffic on the subproject will be diverted traffic from the existing highways.

165. **Mitigation Measures.** Plantation is one of the preferred solutions to check air pollution. Plants serve as a sink for pollutants, reduce the spread of dust. Tree plantation along roadsides and other places shall include pollution absorbent species. Awareness signboards shall be installed at prominent location to educate drivers for good driving and vehicle maintenance practices.

2. Noise

166. During the operational Stage, movement of traffic will be the prime source of noise. Traffic congestion and pedestrian interferences increase the use of horns. This may result in increased noise levels at nearby schools and religious places.

167. **Mitigation Measures.** Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch. Speed limitation and honking restrictions may be enforced near sensitive locations. Increased plantation along the road and boundary wall will also work as noise barrier. Since most of the schools buildings are away from the road, therefore impact of noise is expected to be insignificant. Since improved road conditions and multi-layered plantation will be helpful in attenuation of noise levels, the effectiveness of the measures shall be monitored. If noise levels are still found higher than the prescribed ambient noise standards at these sensitive receptors, adequate noise barrier shall be fixed.

3. Land and Soil

168. The better access can lead to conversion of agriculture land for residential and commercial purposes close to roads and especially in rural and urban area.

169. **Mitigation Measures.** The EA may explore the feasibility of restricting about 30 m area either side of the road as no development zone on the line restriction are imposed for National Highways authority of India.

4. Soil Erosion

170. No impact on soil is anticipated during operation phase of the project except bridge approaches where unexpected rainfall may erode the embankment formation and deterioration of borrow areas if not rehabilitated properly.

171. **Mitigation measures.** Embankment stabilization shall be check periodically during operation stage and suitable stabilization measures shall be taken wherever any erosion is identified. Borrow areas will also be rehabilitated following the guidelines given at Appendix 2.

5. Ground Water

172. No impact is anticipated on groundwater due to the project during operation phase of the project hence, no specific mitigation measure is proposed.

6. Surface Water Bodies

173. No major or long-term impact is anticipated during the operation phase on the surface water bodies due to the project implementation activities. Oil contaminated runoff from the road during monsoon will have minimal impacts considering their low concentration.

7. Hydrology and Drainage

174. Regular removal/cleaning of deposited silt shall be done from drainage channels and outlet points before the monsoon season. Rejuvenation of the drainage system by removing encroachments/ congestions will be regularly conducted.

8. Impact on Biological Environment

a. Terrestrial ecology

175. Positive impacts on terrestrial ecology are expected during the project operation stage due to the increase in vegetation and landscaping along the road. The project will coordinate with the local communities to maintain and enhance the trees planted along the state road. ”No adverse impact is anticipated during operation stage except accidental damages or absence of proper tree management.

176. **Mitigation Measures.** Arrangement shall be made to ensure survivability of the tree plantation. The tree survivability audit shall also be conducted at least once in a year to assess the effectiveness of the programme.

b. Aquatic Ecology

177. No impact is envisaged during operation phase of the project and hence no mitigation proposed. However, periodic surveillance shall be conducted to check erosion and siltation in major water bodies.

9. Community Health and Safety

178. During operation phase, the projected increase in the number of motorized road users traveling at higher speeds also increases the chances of injuries and fatalities from road crashes.

179. **Mitigation Measures.** Adequate caution signage near school, sensitive locations, speed control, caution notes shall be fixed at appropriate locations. These shall be preferably of PCC with Retro-reflective paints. Steel base signage shall be avoided to prevent theft of the same.

180. Crash barrier shall also be installed at appropriate locations particularly near school to provide safety to school children. Provision of speed breakers shall be made near schools and religious places.

I. Climate Change Impacts and Risks

1. Climate Change Mitigation

181. The Transport Emissions Evaluation Model for Projects (TEEMP)3 developed by Clean

Air Asia[4] was utilized to assess the CO2 gross emissions with and without the project improvements. The main improvement from the project that was considered for the model is better surface roughness which was translated into impacts on traffic speed and hence fuel consumption. The model also allows for the inclusion of impacts related to traffic congestion with and without project through provisions for inserting data on the traffic numbers, lane width, number of lanes and volume/capacity saturation limit.

182. Information that was fed into the model for projecting the CO2 emissions were:

a) The road will rehabilitate 42.60 km of major district roads;
b) The existing road having 2 lane with a 3.5 m carriageway width will be improved and maintained to the same number of lanes and carriageway width with asphalt concrete surface;
c) Road roughness will decrease from the general condition of 16 m/km to 2.5 m/km;
d) Construction will take place over a period of 12 months in 2015 and road operations will begin in 2016.
e) The design life of the road is 20 years. Hence the midpoint of the design life is after 10 years or 2025.
f) Other improvements include the repair or reconstruction of damaged culverts, introduction of lined longitudinal and cross drains for the road and removal of irregularities on the existing vertical profile and road safety appurtenances.

183. The volume/capacity saturation limit was taken at 2.0 or twice the designed road capacity and beyond which traffic congestion will result to less than optimum travel speed and increase in fuel consumption. Emission factors were taken from the CBCP/MOEF (2008) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as follows:

184. The traffic forecast data was taken from the traffic studies and economic analysis for the road disaggregated into vehicle types and annual average daily traffic. Key vehicle categories considered for the road and the annual average daily traffic in 2014 (baseline scenario) without project and in 2030 with the project is given in the table below.

185. TEEMP is an excel-based, free-of-charge spreadsheet models to evaluate emissions impacts of transport projects.

186. A network of 250 organizations in 31 countries established by the Asian Development Bank, World Bank, and USAID to promote better air quality and livable cities by translating knowledge to policies and actions that reduce air pollution and greenhouse gas emissions from transport, energy and other sectors.

Table 28: Annual Average Daily Traffic for different vehicle categories

Vehicle Category	2014(Without the Project)	2030 (With Project)
2-wheelar	933	1784
3-whelar	0	0
Car/ Jeep/ Taxi/ Van	175	335
Light Commercial Vehicle	16	31
Minibus, Standard bus	82	157

Vehicle Category	2014(Without the Project)	2030 (With Project)
Heavy Commercial Vehicle	103	197
Total	**1309**	**2504**

187. The volume/capacity saturation limit was taken at 2.0 or twice the designed road capacity and beyond which traffic congestion will result to less than optimum travel speed and increase in fuel consumption. Emission factors were taken from the CBCP/MOEF (2008) Draft Report on Emission Factor Development for Indian Vehicles, the Automotive Research Association of India, and C. Reynolds et.al (2011) Climate and Health Relevant Emissions from in-Use Indian for three-wheelers rickshaw as follows:

Vehicle Type	Gas/Petrol(Kg/l)	Diesel(Kg/l)
2-wheel	2.28	
3- Wheel		2.63
Car /Car/Jeep	2.59	2.68
LVC		3.21
Bus		3.61
HVC		3.50

188. Emissions from road construction were also calculated using estimates of the total quantity of materials that will be used to rehabilitate the road which is 38 tons of steel, 320 tons of cement and 2550 tons of bitumen.

189. **Estimated carbon emissions**. The proposed road upgrading resulting to surface roughness and road capacity improvements have implications in CO2 emissions. Improved roughness results to higher speed and lesser emissions while increase road users increases emissions. These factors are further affected by traffic congestion once the volume/capacity saturation limit.

190. CO2 emissions will also result from the processing and manufacturing of raw materials needed to upgrade the road and in the case of Rajpur Khetia road, a total of 320 tons of cement, 38 tons of steel, and 2,550 tons of bitumen will be needed. These construction materials will produce an estimated 508 tons of CO2.

191. The Figure below presents the impacts on emissions due to road improvements. Total CO2 emission at business-as-usual scenario was estimated at 13,742 tons for the entire project life and without-and with-induced traffic are 15,260 and tons respectively. These values are below the 100,000 tons per year threshold set in the ADB SPS 2009. Therefore it is not necessary to implement options to reduce or offset CO2 emissions under the project.

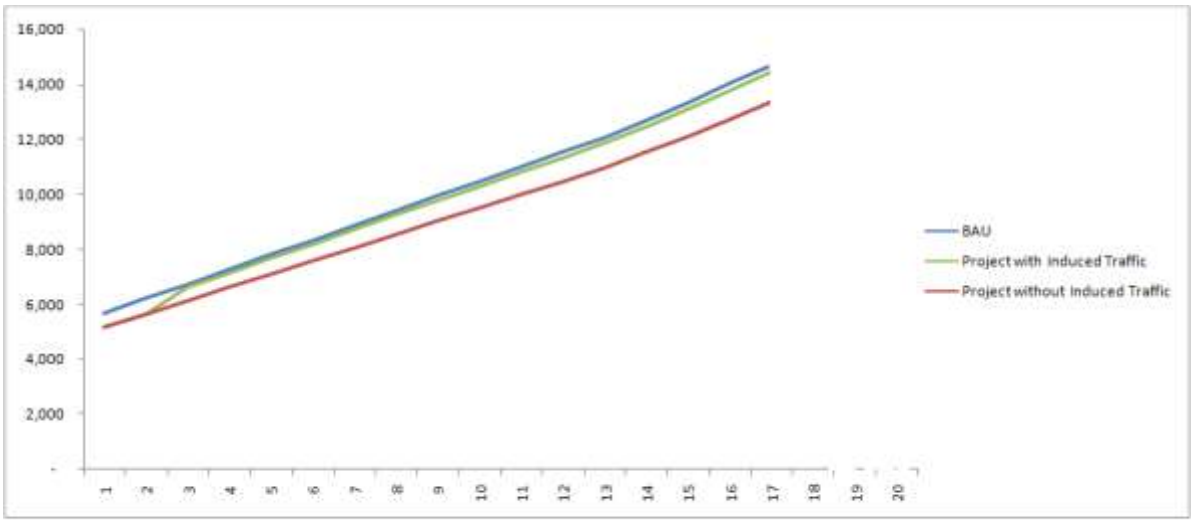


Figure 10: Impacts on Emissions

192. The design life of the roads is 20 years. The project's CO2 emission intensity indicators are provided in the succeeding Table 29.

Table 29: CO2 Emission Intensity Indicators

Details	CO2		
	Business-As-Usual	Project (without Induced Traffic)	Project (with Induced Traffic)
tons/km	3,155.43	2874.71	3,096.82
tons/year	10,004.56	9,114.52	9,818.75
tons/km/year	185.61	169.10	182.17
g/pkm	105.59	96.19	96.17
g/tkm	48.93	44.58	44.57

2. Climate Risks and Adaptation needs

193. Climate risks were identified following both top down and bottom up approaches. Under the top down approach changes of key climate parameters, mainly temperature and precipitation were projected for 2050 using an ensemble of Global Climate Models (GCMs). Given the projected variations of temperature and precipitation the project roads were screened for 9 types of climate risks:

- Landslide triggered by increased precipitation
- Fire
- Flood
- Drought
- Tsunami
- Cyclone wind
- Cyclone surge
- Sea level rise
- Coastal erosion

194. Climate risk maps based on information from the GCMs were created for the project

area using Geographic Information System (GIS) maps. After overlaying the road locations on the climate risk maps low to medium risks identified for the project roads were flooding, landslides triggered by precipitation, coastal erosion and tsunami.

195. The overall climate change risk level identified from the above exercise is low. The key risk identified is flooding (increased storminess). Bridges and road embankments are the main project components that will be prone to flooding. Increase in temperature may also affect road safety.

196. Under the bottom up approach the flood prone areas in the project road were identified based on field surveys for the engineering design.

197. Key engineering measures taken to address the risk of flooding in the design are: increase in road embankment height in flood prone areas/sections, improvement and provision of lined longitudinal and cross drains and new culverts, improvement and new construction of minor and major bridges. Bridge heights have been designed to have a height of 0.6m above HFL for minor bridges and 0.9m above HFL for major bridges. Flood return period of 50 years for minor bridges and 100 years for major bridges have been considered.

J. Cumulative and Induced Impacts

198. According to the ADB Environment Safeguards Sourcebook[5] cumulative impact is described as: “The combination of multiple impacts from existing projects, the proposed project, and anticipated future projects that may result in significant adverse and/or beneficial impacts that cannot be expected in the case of a stand-alone project.” The sourcebook also describes induced impacts as: “Adverse and/or beneficial impacts on areas and communities from unintended but predictable developments caused by a project, which may occur at later or at a different location.

199. Economic activities supporting transport like fuel stations, automotive repair shops, lodging, and restaurants are expected to increase with increase of traffic and induce development in the project area. The improved road will provide better connectivity and result in (i) Reduction in travel time (ii) better mode and frequency of transport (iii) access to quality health care facilities, educational and other infrastructural facilities (iv) enhanced tourism activities in the area and state which in many terms will boost the local economy (v) better investment climate for industries creating more employment opportunities to local people.

200. In terms of environment safeguard issues the improved road surface is expected to result in less dust and noise due to traffic plying on the damaged roads. However, the increased traffic due to the improved road will generate more air pollution due to vehicle exhaust and noise. The smoother road conditions will also result in increase of traffic speeds, hence creating more risks for accidents amongst traffic users as well as the local communities in the project area.

201. For addressing the impacts of air pollution and noise, regular maintenance of the road surface, maintenance and monitoring of newly planted trees and installation of noise barriers where necessary have been included in the EMP for implementation during operation stage. For addressing safety related impacts, regular maintenance of the road furniture include safety related furniture, enforcing rules against encroachment of structures and sensitive structures (schools, temples etc.) inside the ROW and implementation of the emergency response system

has been included in the EMP for implementation during operation stage,

202. Information on future development projects along the project road was not available. Hence, it is difficult to assess cumulative impacts from other projects which may get implemented in the project area.

V. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

203. Meaningful consultations were held early and throughout the project development stage to allow the incorporation of relevant views of the stakeholders in the final project design, mitigation measures, implementation issues, and enhance the distribution of benefits. All the five principles of information dissemination, information solicitation, integration, co-ordination, and engagement into dialogue were incorporated in the consultation process. The analysis of environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially in the micro level by setting up dialogues with the village people from whom information on site facts and prevailing conditions were collected. The requirement of public consultation during the implementation of the project has been proposed as part of the mitigation plan.

A. Objectives of the Public Consultation

204. Stakeholder's consultations were held with intent to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design and implementation. Informal meetings, interviews were organized covering the entire project design stage. Consultations provide affected people a platform to ensure incorporation of their concerns in the decision making process and foster co-operation among officers of MPRDC, the community and the stakeholders to achieve a cordial working relationship for smooth implementation of the project. It inculcates the sense of belongingness in the public about the project.

205. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project to which their opinions was required particularly in identifying and mitigating any potential adverse impact.

B. Methodology for Consultations

206. Consultation with the stakeholders, beneficiaries, and community leaders were carried out using standard structured questionnaires as well as unstructured questionnaires. Questionnaire survey/ discussions were designed to obtain background information and details of general environmental issues that concern people in the project area. In addition, environmental issues were discussed with relevant organizations, government officials, beneficiaries, community leaders and experts. In addition, personal discussions with officials, on site discussion with affected stakeholders, and reconnaissance visits have also been made to the project area. Public consultations have been carried out at seven locations during initial surveys as shown in table 30. The total numbers of participants in the consultations are 80.

Table 30: List of Public consultation and Date

S .No	Village	Date	Chanage	No of Participants
1	Jhakar	O7/9/2014	-	10
2	Palsood	08/9/2014	25+00	12
3	Upla	08/9/2014	17+00	10
4	Niwali	07/9/2014	42+00	10
5	Danod	09/9/2014	6+00	8
6	Naravla	09/9/2014	-	9
7	Rajpur	10/9/2014	0+400	8
8	Borali	11/9/2014	-	8

S .No	Village	Date	Chanage	No of Participants
9	Wazhar	11/9/2014	38+00	8
10	Sindadi	12/9/2014	-	10

1. Project Stakeholders

207. All types of stakeholders were identified to ensure as wide coverage as possible.

- Residents, shopkeepers and businesspeople who live and work along the road specially the project affected persons
- All type of road users/commuters
- Executing Agency, Construction Supervision Consultant and Implementing NGOs
- Other government institutions whose remit includes areas or issues affected by the project (state environment and forest department, Pollution Control Board (PCB), Irrigation Department, Public Health Engineering (PHED) Department
- The beneficiary community in general

2. Consultation with Government Departments

208. Various officials consulted during IEE preparation included PWD Officials, State pollution control board for Air, Noise and Water quality information, IMD for the climatic data, statistical officer for Population and demographic profile, Panchyat department for village level information, Survey of India for the topo sheet requirement, Revenue department for the land record information, PHQ officers for hand pump relocation and quality assessment, MPSEB offices for electric pole shifting etc.

209. These departments helped to provide various project related data and information which helped preparation of reports and data analysis.

3. Consultation with Local People and Beneficiaries

210. The informal consultation generally started with explaining the project, followed by an explanation to potential impacts. Participant's views were gathered with regard to all aspects of the environment which may have direct or indirect impact on local people. Key Issues discussed are:

- Awareness and extent of the project and development components;
- Benefits of the project for the economic and social upliftment of community;
- Labour availability in the project area or requirement of outside labour involvement;
- Local disturbances due to project construction work;
- Necessity of tree felling etc. at project sites;
- Impact on water bodies, water logging and drainage problem if any;
- Environment and health
- Flora and fauna of the project area
- Socio-economic standing of the local people.

211. The project has immense acceptability among the local people. They perceive that in addition to providing all weather connectivity, the subproject road will bring positive socioeconomic changes in the area. Local people mainly discussed on the issues related to

flooding, rehabilitation, resettlement, and road safety issues. The lists of participant's views and outcome of the consultations have been summarized in Table 30.

212. The Details of Participants and Public Consultation photographs are attached in Appendix 8. In addition information on the GRM procedures and formats in local language i.e. Hindi was shared with the local people as provided in Appendix-9.

Table 31: Outcome of the Consultations

S. No.	Date and Location	Issues Discussed	Measures Taken	Participant
1	10/9/2014 Rajpur Chainage-0+400	• People are facing acute problem related to poor condition of the road. • Where the road passing through the settlements there should be • provision of Speed breakers Suggestion viz. (i) design shall take into hydrological aspects into consideration (ii) minimal loss of structures (iii) adequate settlement and rehabilitation measures including provision of jobs to land losers • Local people informed that present road in some sections of this area submerges during normal rainfall also. Adequate measures shall be taken to avoid water logging during normal rainfall. • They suggested that existing alignment shall also be improved and maintained properly. • Suggestion viz., Minimal loss of structures, Adequate	• Proposed widening and strengthening of the road will provide better level of services in terms of improved riding quality and smooth traffic flow. • There will be considerable reduction in the number of accident and level of pollution. • Accessibility to social health and educational infrastructure will increase through all-weather road. • Generation of employment during construction phase of the road. • The discussion generates. considerable awareness of the project • As the proposed road shall be a widened one, it shall provide an efficient public	Total Participants-8
2	09/9/2014 Danod Chainage- 6+600			Total Participants-8
3	08/9/2014 Upla Chainage-17+00			Total Participants-10
4	08/9/2014 Palsood Chainage-25+00			Total Participants-12
5	18/8/2014 Wazhar Chainage-38+00			Total Participants-8
6	11/9/2014 Borali			Total Participants-8
7	07/9/2014 Niwali Chainage-42+00			Total Participants-
8	12/9/2014 Sindadi			Total Participants-10
9	09/9/2014 Naravla			Total Participants-9

S. No.	Date and Location	Issues Discussed	Measures Taken	Participant
10	07/9/2014 Jhakar	rehabilitation and resettlement ,measures • Area is one of the congested stretches due to that problem of traffic jam and accident is common. • Stress was put by the community on adequate safety provisions to be made along the road particularly at locations of school, cattle underpass, provision of bus stop and provision of green belt development Compensation should be as per market value.	transportation system besides. • ensuring reduction in congestion level • The non-title holders shall also be compensated as per ADB guidelines. • Drainage system is mention in built-up area and earthen drainage for rural area. • Drainage system is mention in built-up area and earthen drainage for rural area. Road safety features like traffic signs, Overhead Sign Boards, Road Illumination, Delineators, pavement marking, pedestrian path and rumble strips has been included in the design. • Proper Rehabilitation measures will be taken for Project Affected Household's and compensation will be as per market rate.	Total Participants-10

213. Most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, tourism, boost economic development and thereby provide direct, or indirect, benefits to them.

C. Results of Consultation with Local People

214. Most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, tourism, boost economic development and thereby provide direct, or indirect, benefits to them. In order to access the existing environment and likely impacts on surrounding population, an interview survey was carried out. A sample of the population was interviewed through a designed questionnaire. Precaution has been exercised during the survey to ensure that the sample interviewed is truly representative of the affected groups and the questions are worded so as not to generate a bias response.

215. It is observed from the interview survey that there is increased environmental awareness among the people. It can also be seen from Table 37 that about 90 percent of the persons are in the opinion that an environmental condition of the area is good. About 90 percent of the people are agreed that the quality of air, in the area is good; whereas, only about 17 to 20 percent responded feel that the environmental quality is being deteriorated. Poor road condition and vehicular emissions are the major sources they feel responsible for this. People are unaware about presence of archaeological, historical and cultural sites.

216. There is no major history of natural disasters in the region and local people have mixed response about natural disasters. Overall, the general environmental conditions in the region are good and people have increased environmental awareness. Table 32 shows the result of public opinion survey carried out in the region.

Table 32: Peoples' Perception about Environmental Scenario

S.No.	Question Asked About	No. of People Interviewed	Positive Response	Negative Response	No Response
1	Water quality of rivers, ponds, wells, and canals	20	20	0	0
2	Noise quality of the area	20	20	0	0
3	Air quality of the area	20	20	0	0
4	Archaeological sites	20	20	0	0
5	Natural disaster	20	0	20	0
6	Rare species of animals and birds found	20	0	20	0
7	Cultural sites i.e. market, melas	20	20	0	0

D. Conclusion and Recommendation

217. Overall, most of the people interviewed strongly support the project. The people living in the entire project area expect the different project elements to facilitate transport, employment, tourism, boost economic development and thereby provide direct, or indirect, benefits to them. Construction camps may, however, put stress on local resources and the infrastructure in nearby communities. In addition, local people raised construction-process related grievances with the workers. This sometimes leads to aggression between residents and migrant workers. To prevent such problems, the contractor should provide the construction camps with facilities such as proper housing, health care clinics, proper drinking water and timely payment. The use of local laborers during the construction will, of course, increase benefits to local peoples and minimise these problems. Wherever possible, such people should be employed.

218. The following are the Consultants' initial findings in regard to likely positive and negative impacts.

Positive Impacts:

- The improved road: will reduce travel times, fuel consumption and emissions from base traffic volumes
- Drainage conditions will be considerably improved: this because of the provision of improved side drains, culverts and causeways;
- Economic development and access will be stimulated
- Health, Agricultural and Education facility will improve.

Negative Impacts

- Few tree loss which reduce the green cover but simultaneously plantation will take place to improve the green cover.
- Minor deteriorations in the present minimum levels of air, water and noise quality may be expected during construction-but this should be short-term and localized – in order to minimize the impacts, the mitigation measures recommended During construction the traffic will slow and messy. On the basis of available information, field visits over the entire length of the project road, discussions with the project authorities; other discussions amongst the project team, NGOs, local people and various governmental officials, it has been concluded that overall:
- All elements of the projects will be beneficial;
- All negative impacts, during and post construction, including those deemed "significant" can be properly mitigated. No comprehensive, broad, diverse or irreversible adverse impacts have been identified.

VI. ENVIRONMENTAL MANAGEMENT PLAN AND GRIEVANCE REDRESS MECHANISM

219. The environmental impacts associated with any development project are eliminated or minimized to an acceptable level through development of appropriate mitigation measures based on most suitable techno-economic options. The Environmental Management Plan (EMP) is a well-established tool to ensure effective implementation of the recommended mitigations measures throughout the subsequent project development stages. The EMP also ensures that the positive impacts are conserved and enhanced. An EMP provides location and time specific actions to be taken with defined responsibility. It also provides measures for institutional strengthening and effectiveness assessment through defined monitoring plan, reporting and corrective & preventive action planning.

A. Environmental Management Plan

220. The Rajpur Khetia Road specific Environment Management Plan has been formulated which consists of a set of mitigation; monitoring and institutional measures applicable to design, construction and operation stages of the project (Appendix 3). The components of this EMP includes (i) mitigation of potentially adverse impacts (ii) monitoring of impacts and mitigation measures during project implementation and operation (iii) institutional capacity building and training (iii) compliance to statutory requirements (iv) integration of EMP with project planning, design, construction and operation.

B. EMP Implementation Schedule

221. The EMP provided in Appendix 3 provides measures. However, specific mention is made for location specific measures. The package specific EMP costs are separately assessed. These EMP will form part of bidding document as well. The construction period for Rajpur Khetia road is considered as 24 months from the date of start of construction.

C. Emergency Response Plan

222. Assessment of nature, type and extent of project activities establishes that this project may have only one environmental emergency i.e. accidents on paved roads and consequent spillage due to damage of oil tank of the vehicle. It is suggested to develop a communication and response system to minimize the response time. The project authorities shall be prepared to counteract against such emergency either by developing in-house capabilities or by associating with any competent agency.

D. Environmental Monitoring Plan (EMoP)

223. The purpose of the environmental monitoring program is to ensure that the envisaged objectives of the project are achieved and result in desired benefits. To ensure the effective implementation of the mitigation measures and Environmental Management Plan (EMP), it is essential that an effective monitoring program be designed and carried out. The board objectives of environmental monitoring plan are:

- To evaluate the performance of mitigation measure proposed in the EMP,
- To evaluate the adequacy of Environmental Assessment
- To suggest improvements in management plan, if required,
- To assess change in environmental quality,

224. A comprehensive monitoring plan has been prepared for all stages of the project and provided as Appendix 4. This includes parameters to be measured, methods to be used, sampling locations, frequency of measurements, detection limits, cost and responsibility for implementation and supervision. The monitoring programme is designed for monitoring during construction and operation stages with details on budget and responsible agencies:

- Construction Stage: (three years of construction period)
- Monitoring to be carried out by construction supervision consultant (CSC). The costs to form part of CSC budget.
- Six Monthly monitoring by external agency to be arranged by PIU ADB from Project cost budget. This report will be directly submitted by agency to MPRDC.
- Monitoring Programme and schedule for Key Performance Indicators (Physical, biological and environmental management components identified as of particular significance) are given in the following section:

1. Ambient Air Quality (AAQ) Monitoring

225. Ambient air quality parameters recommended for road transportation developments are Fine Particular Matter (PM2.5), Respirable Particular Matter (PM10), Carbon Monoxide (CO), Oxide of Nitrogen (NOx) and Sulphur Dioxide (SO2). These are to be monitored at designated locations starting from the commencement of construction activities. Data should be generated twice in a week at all identified locations in accordance to the National Ambient Air Quantity Standards (Appendix 5). The locations and environmental parameters to be monitored are detailed out in the Environmental Monitoring Plan (Appendix 4).

2. Water Quality Monitoring

226. The physical and chemical parameters recommended for analysis of water quality relevant to road development project are pH, total solids, total dissolved solids, total suspended solids, and oil & grease. The monitoring of the water quality is to be carried out at all identified locations in accordance to the Indian Standard Drinking Water Specification – IS 10500 (Appendix 6). The locations, duration and the pollution parameters to be monitored are detailed in the Environmental Monitoring Plan (Appendix 4).

3. Noise Levels Monitoring

227. The measurements for monitoring noise levels would be carried out at designated locations in accordance to the ambient Noise Standards formulated by Ministry of Environment and Forests (MoEF) as given (Appendix 7). Noise level would be monitored on a twenty-four hours basis. Noise should be recorded at “A” weighted frequency using a slow time response mode of the measuring instrument. The measurement location, duration and the noise pollution parameters to be monitored and the responsible institutional arrangements are detailed in the Environmental Monitoring Plan (Appendix 4).

4. Tree Plantation

228. The 75% survival rate of re-plantation shall be monitored for three years of the operation phase. If the survival rate is found below 75%, additional compensatory plantation shall be carried out by agency responsible for plantation and maintenance. The survival rate monitoring

shall be again taken up after 1 year again. This cycle should continue until the 75% survival rate is achieved. Since tree plantation would be made through forest department, monitoring would be carried out through MPRDC.

5. Soil Erosion and Drainage Congestion

229. No significant soil erosion problem is anticipated due to the project either in the construction phase or in the operation phase. However, in the construction phase, some localized soil erosion may be noticed owing to construction activities. However, if soil erosion is noticed during construction and operation phase, the corrective action shall be initiated and frequency of check be increased to assess the tendency of occurrence.

E. Institutional Setting and Proposed Implementation Arrangement

230. The Executing Agency for the project will be GoMP through MPRDC. MPRDC is wholly owned by GoMP and has been equipped with adequate capacity to implement the project. The implementation arrangements basically follow the ongoing MPSRSP-II. A General Manager (GM) at MPRDC headquarter has been designated as person in charge for project implementation. The Environmental and Social cell (ESC) at MPRDC headquarters, reporting to the General Manager, will be responsible for ensuring compliance with environmental and social safeguards of project roads. This cell currently has only one officer to cover both social and environment safeguards. To support this officer, two more social safeguard officers and one environmental safeguard officer will be appointed or recruited. This will allow the ESC to have a total of four officers, 2 for social safeguards and 2 for environment safeguards.

231. MPRDC has ten division offices (Bhopal, Jabalpur, Sagar, Gwalior I, Gwalior 2, Ujjain , Indore I, Indore II, Rewa I, and Rewa II) acting as Project Implementation Units (PIUs). Each PIU is headed by a Divisional Manager (Tech.) who is responsible for project implementation at the field level. Each PIU will be responsible for one to two contracts depending on the location of the sub projects, and one project manager will be assigned for each contract package. The project manager will be delegated adequate technical and administrative authority for expeditious project implementation. In each PIU one of the Assistant Engineers or Managers under the Divisional Manager will be appointed as the social and environment safeguards focal person. MPRDC will engage Construction Supervision Consultants to act as the engineer for the construction contracts. An environmental specialist from the CSC will provide technical support to MPRDC and the PIU for implementation of environment safeguards under the project. The engineer will be responsible for approving plans, engineering drawings, release of payments to contractor etc. while the CSC environmental specialist or environmental officer will be responsible for providing recommendations to “the engineer” for approving activities specific to environment safeguards. Environmental awareness and EMP implementation training will be held for MPRDC staff, contractors and CSC.

232. Six monthly monitoring reports will be prepared by the CSC environmental specialist to report on compliance with construction contracts, effectiveness of mitigation measures, and complaints (also known as project performance monitoring), and the state and health of nearby environmental resources (also known as ambient environmental monitoring).

233. Monitoring during operation shall be conducted for five years (once a year basis) as part of CSC contract and budget as this project will have a five year performance based maintenance works to be implemented by the contractor. Thereafter it will be done on an as-needed basis depending on the design or change in project activity.

234. The detailed responsibilities of MPRDC, PIUs, CSC, Contractor, and ADB are provided:

1. MPRDC's Responsibilities

- Ensure that Project complies with ADB's SPS and GOI's laws and regulation
- Ensure that the project complies with all environment safeguard requirements as given in this EARF
- Prepare IEE reports including EMP as may be required and hire an environmental consultant as required
- Prepare the Rapid Environmental Assessment screening checklist and forward this checklist to ADB for evaluation and confirmation of the project category;
- Based on the confirmation of the environmental categorization of the subprojects, prepare TORs to conduct IEE studies including preparation of EMP and Environmental Monitoring Plan in accordance with the environmental policy principles and safeguard requirements under the ADB SPS;
- Ensure that the preparation of environmental studies will be completed with meaningful consultations with affected people and other concerned stakeholders, including civil society throughout the project preparation stages as required by the ADB SPS
- Undertake initial review of the IEE and EMP reports to ensure its compliance with the Government's and ADB's requirement;
- Review the budgetary needs for complying with the Government's and ADB's requirements on environment safeguards
- Obtain necessary consents or permissions (e.g. environment permission, forest clearance) from relevant Government Agencies to minimize risks to the environment and mitigate environmental impacts associated. Also ensure that all necessary regulatory clearances will be obtained prior to commencing any civil work of the subproject;
- Submit to ADB the final IEE including EMP reports with consent letter for disclosure of the report on the ADB website
- Ensure that the EMP which includes required mitigation measures and monitoring requirements forms part of bidding document after seeking concurrence from ADB. EMP items may be included in the Bill of Quantities (BOQ) as necessary. For example if a subproject is required to construct noise barriers, the costs will need to be included in the BOQ;
- Ensure that contractors have access to the IEE report including EMP of the subprojects;
- Organize training and awareness programs on implementation of environment safeguards for relevant staff of MPRDC, PIU, CSC and contractors
- Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities
- Ensure and Monitor that the EMP including Environmental Monitoring Plan will be properly implemented;
- In case of unanticipated environmental impacts during project implementation stage arrange to prepare and implement an updated EMP to account for such impacts after seeking concurrence from ADB. The updating shall be carried out after due consultation with the stake holders; In case during project implementation a subproject needs to be realigned, review the environmental classification and revise accordingly, and identify whether supplementary IEE

study is required. If it is required, prepare the TOR for undertaking supplementary IEE and hire an environment consultant to carry out the study;

- Ensure that construction workers work under safe and healthy working environment in accordance with the World Bank EHS guidelines relating to occupational health and safety;
- Ensure effective implementation of Grievance Redress Mechanism to address affected people's concerns and complaints, promptly, using understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people;
- Submit semi-annual monitoring reports for all sub-projects on the implementation of EMPs to ADB for disclosure on the ADB website.
- Ensure proper implementation of corrective action plan if identified in the monitoring report; and
- Disclose information as defined in this EARF.

2. PIU Responsibilities

- Ensure that Project complies with ADB's SPS and GOI's laws and regulations
- Ensure that the project complies with all environment safeguard requirements as given in this EARF
- Obtain necessary consents or permissions (e.g. forest clearance, no objection certificate) from relevant Government Agencies. Also ensure that all necessary regulatory clearances will be obtained prior to commencing any civil work of the subproject;
- Ensure that contractors have access to the IEE report including EMP of the subprojects;
- Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities
- Participate in training and awareness programs on implementation of environment safeguards and organize further on the job or subject specific training for the contractor during project implementation as necessary with the support of the CSC environmental specialist
- Conduct regular on site monitoring to ensure proper implementation of the EMP including Environmental Monitoring Plan;
- Verify and approve monitoring checklists and/or reports that will be prepared and submitted by the CSC
- In case of unanticipated environmental impacts during project implementation stage, identify the need to prepare and implement an updated EMP to account for such impacts after seeking concurrence from ADB.
- Ensure that construction workers work under safe and healthy working environment in accordance with the World Bank EHS guidelines relating to occupational health and safety;
- Ensure effective implementation of Grievance Redress Mechanism in accordance with the steps given in figure 1 to address affected people's concerns and complaints, promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people; Ensure timely submission of semi-annual monitoring reports for all sub-projects on the implementation of EMPs to MPRDC for further submission to ADB for disclosure on the ADB website; and

- Ensure proper implementation of corrective action plan if identified in the monitoring report

3. CSC Responsibilities

- Ensure that Project complies with ADB's SPS and GOI's laws and regulations
- Ensure that the project complies with all environment safeguard requirements as given in this EARF
- Provide necessary technical advice and support to the PIU and/or contractor to obtain consents or permissions (e.g. forest clearance, no objection certificate) from relevant Government Agencies. Also ensure that all necessary regulatory clearances will be obtained prior to commencing any civil work of the subproject;
- Ensure that contractors have access to the IEE report including EMP of the subprojects;
- Ensure that contractors understand their responsibilities to mitigate environmental problems associated with their construction activities
- Closely coordinate and communicate with the contractor to facilitate implementation of all mitigation measures identified in EMP
- Conduct training and awareness programs on implementation of environment safeguards for MPRDC, PIU and the contractors during the pre-construction stage and further organize on the job or subject specific training for the contractor during project implementation as necessary
- Conduct regular on site monitoring to ensure proper implementation of the EMP including Environmental Monitoring Plan;
- Prepare monitoring checklists and/or reports based on the site monitoring and submit them to the PIU for approval
- In case of unanticipated environmental impacts during project implementation stage, upon the advice from the PIU and/or MPRDC prepare an updated EMP to account for such impacts after seeking concurrence from ADB.
- Ensure that construction workers work under safe and healthy working environment;
- Facilitate effective implementation of the Grievance Redress Mechanism in accordance with the steps given in figure 1 to address affected people's concerns and complaints, promptly, using an understandable and transparent process that is gender responsive, culturally appropriate, and readily accessible to all segments of the affected people;
- Prepare semi-annual monitoring reports for all sub-projects on the implementation of EMPs for submission to PIU and MPRDC and further submission to ADB for disclosure on the ADB website

4. Contractor's Responsibilities

- Ensure that adequate budget provisions are made for implementing all mitigation measures specified in the EMP
- Participate in training and awareness programs on implementation
- Identify further needs for conduction of on the job or subject specific training during project implementation by the CSC or MPRDC or PIU
- Obtain necessary environmental permission etc. from relevant agencies as specified by EARF for project road works, quarries, hot-mix plant etc. prior to commencement of civil works contracts

- Implement all mitigation measures as given in the EMP in the contract documents
- Ensure that all workers, site agents, including site supervisors and management participate in training sessions organized by the PIU, MPRDC or CSC.
- Ensure compliance with environmental statutory requirements and contractual obligations
- Respond promptly to grievances raised by the local community or any stakeholder and implement environmental corrective actions or additional environmental mitigation measures as necessary.
- Based on the results of EMP monitoring, cooperate with the PIU and CSC to
- Implement environmental corrective actions and corrective action plans, as necessary.

5. ADB's Responsibilities

- Review REA checklist and endorse or modify the project classification proposed by the MPRDC;
- Review IEE reports, including this environmental assessment and review framework, and disclose draft and final reports through ADB's website as required;
- Issue subproject's approval based on the respective IEE reports;
- Monitor implementation of environment safeguard requirements under the project through due diligence missions;
- Provide assistance to MPRDC, if required, in carrying out its responsibilities for implementing environment safeguards and for building capacity for safeguard compliance;
- Review and approve semi-annual environmental monitoring reports submitted by MPRDC and disclose them on the ADB website
- Monitor MPRDC's commitments under EARF

F. Institutional Capacity Building

235. To ensure that all parties clearly understand their role and responsibilities for implementing environment safeguards under the project, the following training and awareness programme is proposed:

- Awareness programme on environmental issues associated with construction and improvement of road projects and legislative compliance requirements.
  Target audience: designated engineers from field units, contractor's
  Faculty: Environmental Expert and Environment Expert of CSC.
  No of Programmes: Minimum one per contract package
- EMP and EMoP implementation requirements, its benefits and roles of different level and functions.
  Target audience: designated engineers from field units, contractor's officials, and key workers, other officials of MPRDC associated for the project.
  Faculty: EE and Environment Expert of CSC.
  No of Programmes: Minimum one per contract package

G. Grievance Redress Mechanism

236. Grievances related to the implementation of the project, particularly regarding the environmental management plan will be acknowledged, evaluated, and responded to the complainant with corrective action proposed. The outcome shall also form part of six monthly compliances report to ADB. Complaints maybe lodged verbally directly to the contractor or CSC or PIU at the site level. To the extent possible efforts will be made by the contractor, CSC or PIU to address these complaints immediately on site. Only those complaints that cannot be addressed immediately at the site level will be submitted to the Grievance Redress Committee (GRC). Necessary assistance for completing the complaint form or lodging a written complaint will be made to illiterate complainants by the respective receiver of the complaint. Grievance Redress Committee (GRCs) should be established at the MPRDC state level and PIU level to assure accessibility for APs .The GRCs are expected to resolve the grievances of the eligible persons within a stipulated time. The decision of the GRCs is binding, unless vacated by the court of law. The GRC will be constituted at MPRDC level and at the PIU level.

237. The State level GRC will comprise of the :

i. General Manager, MPRDC, Bhopal
ii. Superintended Engineer, PWD, Bhopal
iii. DGM, MPRDC, Bhopal
iv. Manager (Environment & Social) , MPRDC, Bhopal

238. The PIU level GRC will comprise of the:

i. Divisional Manager
ii. A representative from local NGOs or a local person of repute and standing in the society, elected representative from Zila Parisad /District Council.
iii. Two representatives of affected persons including vulnerable groups and women in the committee.

239. The GRC will continue to function, for the benefit of the APs, during the entire life of the project including the five year maintenance period. The following flow chart defines the process of GRM. The details of GRM, procedures and formats in local language i.e. Hindi are provided in Appendix-9.

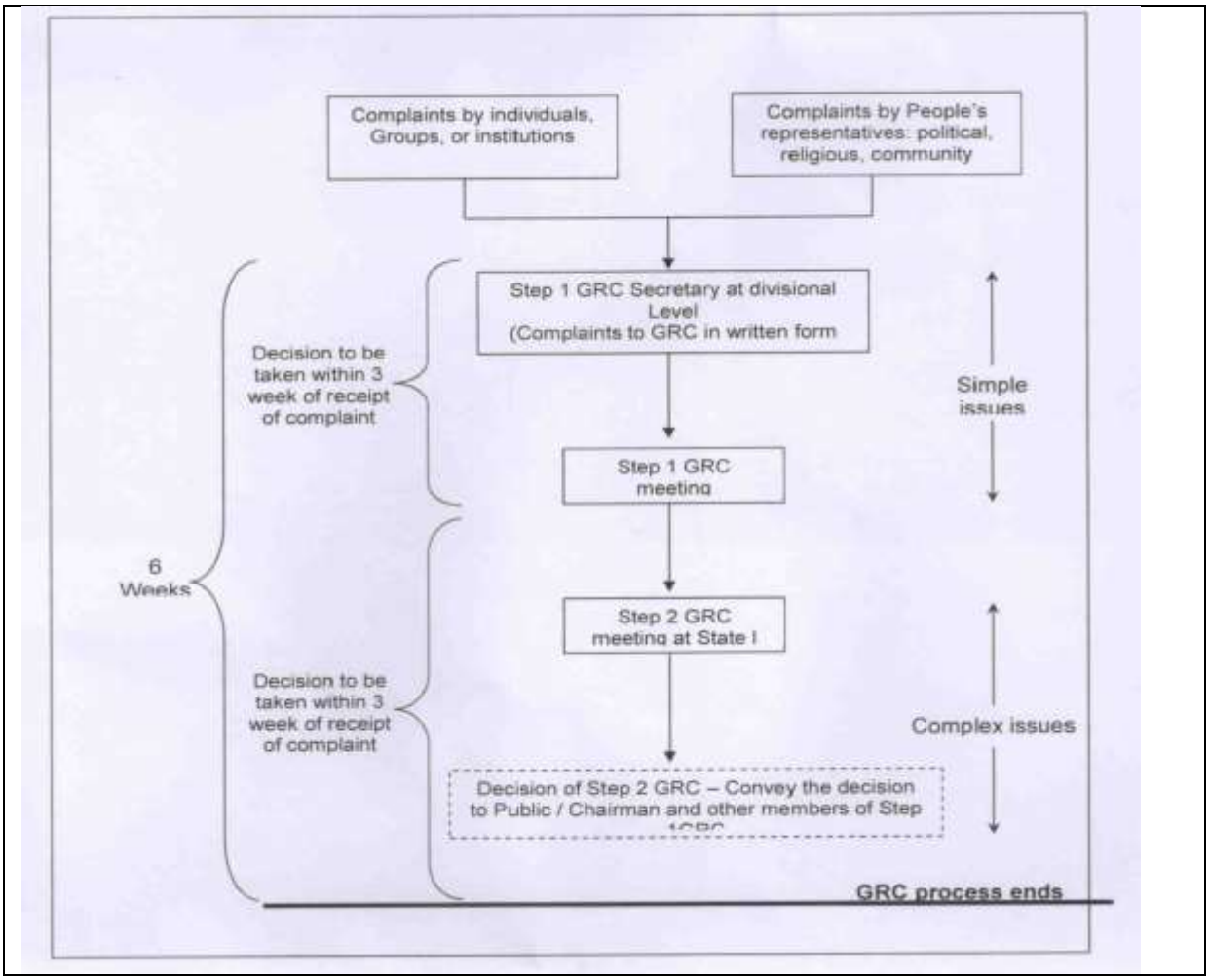


Figure 11: GRC Process

H. Cost for EMP, Training and Environmental Monitoring

240. The cost of EMM and training programme is given in Table 33.

Table 33: Environment Management, Monitoring and Training Programme Costs

	Parameters / Components	Parameter to be monitored	Guidelines	Unit Cost (Rs)	Total Cost(Rs)
1	Ambient Air Monitoring: 3 times in a year for 3 years or construction period at 3 sites & Five years during operation/ defect liability period ,once in a year at three sites	PM10, PM2.5, SO2, NOx & CO	High Volume samplers to be used and located 50 m from the construction site	9000	378000

	Parameters / Components	Parameter to be monitored	Guidelines	Unit Cost (Rs)	Total Cost(Rs)
2	Water Monitoring: 3 times in a year for 3 years or construction period At 3 locations	pH, BOD, COD, TDS, TSS, DO, Total coliform, Conductivity, Oil & Grease	Analyze as per the standard methods for examination of water and waste water	5000	135000
3	Noise Monitoring: 3 times in a year for 3 years or construction period , 3 locations & Five years during operation/ defect liability period ,once in a year at three sites	Noise levels on dB (A) scale	Using an integrated noise level meter kept at a distance of 15 m from the construction site	3000	126000
	Total Monitoring Cost				**639000**
4.	Opening, running and restoration of stone quarry/sand extraction pits along the entire project length		IRC Code of Practice and MoSRT&H manual	LS	Engineering cost
5.	Gabion walls (above height 4 m) along elevated embankment		IRC Code of Practice and MoSRT&H manual	LS	Engineering cost
6.	Dust Suppression along the entire project length Three tankers in a days for 240 Days		IRC Code of Practice and MoSRT&H manual	Rs2000/- per day per tanker	1440000/-
7.	Solid Waste management during entire project period		As per MoEF guidelines	3000/ month	108000/
*88.	Erosion Control Measures (Turfing / Pitching / Seeding & Mulching) Provision of Cross drainage & side drainage structures General Borrow area management and maintenance of haul roads related to borrow areas Air/noise pollution control measures in construction equipment Management and disposal of scarified waste bituminous material Provision of Informatory Signs Bus shelters Construction of Speed Humps Management of quarries Redevelopment of Borrow Areas Construction Camp Management Costs Safety measures for workers		As per IRC Guidelines	Shall be included in contractor's quoted rates	Engineering cost
	Total Mitigation Cost (B)				**1548000/**
	Total Environmental Cost (A+B+C)				**2337000/**

VII. CONCLUSIONS AND RECOMMENDATIONS

241. The assessment of environment impacts for the sub-project shows that there are no significant, long term impacts. Most impacts are short term and limited to the construction stage. Key conclusions on the environmental implications of the project are given in the paras below.

A. Environmental Gains Due to Proposed Work Justifying Implementation

242. The project entails various impacts on the project setting. There are many impacts bearing benefits to the area against the limited number and magnitude of negative impacts. These include the following: (i) the project will substantially improve the transport efficiency on the roads. (iii) the project once implemented will improve the overall environmental conditions with better roads, fuel efficiency and environmental protection measures (iv) will reduce traffic congestion particularly at junctions hence, air pollution due to idling of the vehicles.

B. Potential Impacts and Mitigation

243. The finding of IEE indicates that project is unlikely to cause any significant adverse environmental impacts. While some of the impacts are negative, there are many bearing benefits to the area. Most of the impacts are likely to occur during construction stage and are temporary in nature. Anticipated minor impacts will be mitigated through the implementation of mitigation measures summarized in the Environmental Management Plan.

244. Factors contributing to minimal impacts include, widening of the project road confined within the available RoW, presence of no sensitive environmental issue like wildlife sanctuary, national park, bio reserve, with 10 km from the project road and most of water body crossed by the road are non-perennial in nature except one which is already bridged. However, some of the impacts are unavoidable. These impacts with mitigation measures are indicated below:

- About 351 trees will need be cut with prior permission of district or forest authorities. Compensatory Tree plantation on the basis of 1:10 will be made to compensate this loss. Preventive measures shall be taken into consideration during construction phase especially in rainy months, to prevent soil erosion because of tree cutting and alteration of ground flora.
- Air pollution due to construction activities and operation of hot mix plant will be controlled through adoption of dust suppression measures and provision of high stack for good dispersion of gaseous emission from hot mix plant.
- Noise levels may increase during the construction phase due to operation of construction machineries. All the construction equipment and DG set will be well maintained and fitted with silencers.
- Waste materials generated during construction phase may contaminate soil, surface and ground water resources. Waste shall be segregated and reused or disposed off in environmentally acceptable manner.
- Along the project stretch, few religious structures are located. Appropriate design options are exercised to minimize the loss of such structures.
- The social issues are addressed through Social Safeguards Due Diligence reports prepared as per SPS of ADB.

C. Irreplaceable Resources

245. The project does not pass through any protected areas, or eco sensitive areas. The

construction material will also be sourced from identified and approved sources. As such, there are no environmental sensitive resources found in the project area, which is likely to be affected due to the project.

D. Post IEE Surveillance and Monitoring

246. While an IEE is meant to provide a comprehensive understanding of the environment status of the area under the study, post IEE surveillance is the means to ensure that the significant impacts identified are adequately mitigated as per the proposed mitigation plan. A detailed monitoring plan has been provided as part of the Environmental Management Plan. Air, water quality, noise, soil erosion, and tree survival rate monitoring and reporting along with the follow up actions in case of deviation from the norms have been detailed out. The frequency has been set in consideration of the likely impacts.

E. Public Consultations

247. The project received support and consent from most of local people. The local people did not perceive any adverse impact due to the proposed project. Environmental awareness and likewise concern were found generally low. People, however expressed the desire of minimizing the tree cutting.

F. Recommendations

248. Adequate mitigations shall be taken up both during construction and operation stage of the project to avoid/minimize adverse environmental impacts due to this event and any such event in future as suggested in IEE.

249. Effective EMP implementation is essential for elimination or minimization of the identified impacts. The MPRDC shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. The same shall be revised if necessary during project implementation or if there is any change in the project design.

250. MPRDC needs capacity building and practical exposure. Adequate training shall be imparted as proposed under environmental management plan to enhance the capability of concerned EA officials.

APPENDIX 1: RAPID ENVIRONMENTAL ASSESSMENT CHECKLIST ROADS AND HIGHWAYS

Instructions:

(i) The project team completes this checklist to support the environmental classification of a project. It is to be attached to the environmental categorization form and submitted to the Environment and Safeguards Division (RSES), for endorsement by Director, RSES and for approval by the Chief Compliance Officer.

(ii) This checklist focuses on environmental issues and concerns. To ensure that social dimensions are adequately considered, refer also to ADB's (a) checklists on involuntary resettlement and Indigenous Peoples; (b) poverty reduction handbook; (c) staff guide to consultation and participation; and (d) gender checklists.

(iii) Answer the questions assuming the "without mitigation" case. The purpose is to identify potential impacts. Use the "remarks" section to discuss any anticipated mitigation measures.

Country / Project Title:	India: Madhya Pradesh District Connectivity Sector Project: Subproject : **Rajpur Khetia** road
Sector Division:	South Asia Transport and Communications Division

Screening questions	**Yes**	**No**	**Remarks**
A. Project Siting			
Is the project area adjacent to or within any of the following environmentally sensitive areas?		X	No environmentally sensitive site is located within the Rajpur Khetia road
Cultural heritage site		X	No archaeologically protected monument or cultural heritage site is located within the road.
Protected Area		X	No protected area is located close to roads and nearby.
Wetland		X	No protected or classified wet land is located close to the
Mangrove		X	Project road is not located in Coastal areas.
Estuarine		X	No Estuarine is located in the Project area.
Buffer zone of protected area		X	No such area is located in the Project vicinity.
Special area for protecting biodiversity		X	No such area is located in the project vicinity.
B. Potential Environmental Impacts			
Encroachment on historical/cultural areas; disfiguration of landscape by road embankments, cuts, fills, and quarries?		X	The topography of project road is mainly plain. There is no encroachment of historical places. However, some small temples exist along the project road which may get impacted. Since road widening will be confined to available ROW, no change in landscape is expected. Opening of new Quarries is not envisaged. Only operational and licensed quarry will be used for road construction. Earth material will be sourced from pre identified areas (located within 15 to

Screening questions	Yes	No	Remarks
			20 Km from the road) and with the consent of landowner. All borrow areas will be suitably rehabilitated.
Encroachment on precious ecology (e.g Sensitive or protected areas)?		X	There is no National Parks, Wild Life sanctuaries or any other similar eco-sensitive areas in and around the project area. Only cutting of 351 roadside trees is involved. Attempts have been made to minimizing the cutting of trees while finalizing the road widening options.
Alteration of surface water hydrology of waterways crossed by roads, resulting in increased sediment in streams affected by increased soil erosion at construction site?		X	The proposed alignment is crossing only small natural drains. All drainage courses will be maintained to avoid alteration in surface water hydrology so that water courses are not affected. The temporary soil stockpiles will be designed so that runoff will not induce sedimentation of waterways. Silt fencing during construction will be provided.
Deterioration of surface water quality due to silt runoff and sanitary wastes from worker-based camps and chemicals used in construction?		X	Adequate sanitary facilities including Soak pits treatment facilities will be provided at construction camps, which will be set-up away from habitat and water bodies. No harmful ingredients are likely to be used in the construction activities. Surface water quality is not impacted due to construction. Measures like embankment slop stabilization, RCC retaining walls are proposed to prevent siltation of ponds located next to the road due to surface runoff.
Increased local air pollution due to rock crushing, cutting and filling works, and chemicals from asphalt processing?	X		Localized air pollution level is likely to increase for short duration during construction period due to construction vehicle movement and asphalt processing. The asphalt mixing plant (hot mix plant) will be located away from habitat areas with adequately high stack for effective dispersion of likely emissions Dust. separation measures like spraying of water on unpaved vehicle movement areas are proposed to minimize the dust generation.
Risks and vulnerabilities related to occupational health and safety due to physical, chemical biological, and radiological hazards during project construction and operation?	X		Workers may get exposed to dust and noise during construction activities. However the exposure levels are likely to be short and insignificant. Workers will be provided requisite PPEs to minimize such exposure and associated harmful occupational health effects. Traffic on the road is expected to be low and as such, no occupational health hazard is anticipated during operation phase.

Screening questions	Yes	No	Remarks
Noise and vibration due to blasting and other civil works?		X	No blasting is involved. No significant noise generation is expected during construction activities except normal construction equipment operational noise. These noise levels will be impulsive in nature and its impact will be confined within few meters of either side of the road. All stationary noise making sources equipment like DG set, compressors will be installed with acoustic enclosures. There are few noise sensitive locations especially schools close to the alignment where noise level may increase due to increased traffic during operation stage.

APPENDIX 2: GUIDELINES FOR BORROW AREAS MANAGEMENT

A. Selection of Borrow Areas

1. Location of borrow areas shall be finalized as per IRC: 10-1961 guidelines. The finalization of locations in case of borrows areas identified in private land shall depend upon the formal agreement between landowners and contractor. If, agreement is not reached between the contractor and landowners for the identified borrow areas sites, arrangement for locating the source of supply of material for embankment and sub-grade as well as compliance to environment requirements in respect of excavation and borrow areas as stipulated from time to time by the Ministry of Environment and Forests, Government of India, and local bodies, as applicable shall be the sole responsibility of the contractor. The contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations.

- The borrow area should not be located in agriculture field unless unavoidable i.e. barren land is not available.
- The borrow pits preferably should not be located along the roads
- The loss of productive and agriculture soil should be minimum.
- The loss of vegetation is almost nil or minimum.
- The Contractor will ensure that suitable earth is available.

B. Contractor's Responsibility

2. The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing programme approved by the Engineer. It shall be ensured that the sub-grade material when compacted to the density requirements shall yield the design CBR value of the sub-grade. Contractor shall begin operations keeping in mind following;

a. Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plants is operating at the place of deposition.
b. No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then shall make consequent deficit of material arising there from.
c. Where the excavation reveals a combination of acceptable and unacceptable materials, the Contractor shall, unless otherwise agreed by the Engineer, carry out the excavation in such a manner that the acceptable materials are excavated separately for use in the permanent works without contamination by the un-acceptable materials. The acceptable material shall be stockpiled separately.
d. The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants are siting of temporary buildings or structures.

C. Borrowing from Different Land-Forms

1. Borrow Areas located in Agricultural Lands

a) The preservation of topsoil will be carried out in stockpile.
b) A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
c) Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.
d) Borrowing of earth will not be done continuously throughout the stretch.
e) Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
f) Small drains will be cut through the ridges, if necessary, to facilitate drainage
g) The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).
h) The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

2. Borrow Areas located in Elevated Lands

a. The preservation of topsoil will be carried out in stockpile.
b. A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
c. At location where private owners desire their fields to be levelled, the borrowing shall be done to a depth of not more than 1.5m or up to the level of surrounding fields

3. Borrow Areas near River Side

a. The preservation of topsoil will be carried out in stockpile.
b. A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
c. Borrow area near to any surface water body will be at least at a distance of 15m from the toe of the bank or high flood level, whichever is maximum.

4. Borrow Areas near Settlements

a. The preservation of topsoil will be carried out in stockpile.
b. A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
c. Borrow pit location will be located at least 0.75 km from villages and settlements. If un-avoidable, the pit will not be dug for more than 30 cm and drains will be cut to facilitate drainage.
d. Borrow pits located in such location will be re-developed immediately after borrowing is completed. If spoils are dumped, that will be covered with a layers of stockpiled topsoil in accordance with compliance requirements with respect MOEF/SPCB guidelines.

5. Borrow Pits along the Road

a. Borrow pits along the road shall be discouraged and if deemed necessary and permitted by the Engineer; following precautions are recommended
b. The preservation of topsoil will be carried out in stockpile.
c. A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal).
d. Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
e. Small drains shall be cut through the ridges of facilitate drainage.
f. The depth of the pits shall be so regulated that there bottom does not cut an Imaginary line having a slope of 1 vertical to 4 horizontal projected from the edge of the final section of bank, the maximum depth of any case being limited to1.5m.
g. Also, no pit shall be dug within the offset width from the toe of the embankment required as per the consideration of stability with a minimum width of 10m.

6. Rehabilitation of Borrow Areas

a. The objective of the rehabilitation programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit floor to approximately the access road level.
b. Re-development plan shall be prepared by the Contractor before the start of work in line with the owners will require and to the satisfaction of owner. The Borrow Areas shall be rehabilitated as per following;
c. Borrow pits shall be backfilled with rejected construction wastes and will be given a vegetative cover. If this is not possible, then excavation sloped will be smoothed and depression will be filled in such a way that it looks more or less like the original round surface.
d. Borrow areas might be used for aquaculture in case landowner wants such development. In that case, such borrow area will be photographed after their post use restoration and Environment Expert of Supervision Consultant will certify the post use redevelopment.
e. The Contractor will keep record of photographs of various stages i.e., before using materials from the location (pre-project), for the period borrowing activities (construction Phase) and after rehabilitation (post development), to ascertain the pre and post borrowing status of the area.

APPENDIX 3: ENVIRONMENTAL MANAGEMENT PLAN FOR RAJPUR-KHETIA ROAD

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Cost	Institutional Responsibility	
							Implementation	Supervision
Pre-construction and Design Stage								
1. Alignment								
1.1 Pavement damage and inadequate drainage provisions in habitat areas	• Construction of concrete pavement in habitat areas considering alignment level and drainage. • Raise road level above the nearby areas with provision of adequate side drains to evacuate the rain water and domestic discharges (drained by habitats occasionally) to prevent damage to road and rain water entry to habitats' houses. • Provision of adequate no. of cross drainage structures based on drainage pattern around the alignment.	Design requirement	All habitat Areas throughout the alignment	Design of both cross & side drains ,no. of slab/box culverts ,no & size of Hume pipes	Review of detail Design documents & drawings	Included in construction cost	Design Consultant	MPRDC (SQC)
1.2 Safety along the proposed alignment	• Make provisions of crash barriers at accident prone areas as identified in the road safety studies. • Provision of rumble strips in habitat areas to regulate speed. • Provision of retro-reflective warning sign boards nears school, hospital, religious places and forests areas. • Provision of proper sidewalks/pedestrian zone along the road near habitat areas, school, hospital, religious places and forests. • Compliance with norms specified in IRC codes for state highway for curvature and grading • Provision of safety kerb at all bridges. • The design should attempt to equalize cut and fill. • Minimize the cutting in hill areas. Incorporate slope stabilization measures to prevent any land slide situation.	Design requirement	Places where height of embankment is more than 3.0 m.	No. of accident & Vehicle collision	Field observation , interview of locals	Included in construction cost	Design Consultant	MPRDC (SQC)
2. Natural Hazards								
2.1 Protection for damage from Earthquake	• Design considering relevant IRC guidelines for earthquakes in bridges		Throughout the stretch	Incorporation of IRC guidelines for earthquake in bridge design	Review of bridge design	Project preparation Cost	Design Consultant	MPRDC (SQC)

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Cost	Institutional Responsibility	
							Implementation	Supervision
2.2 Protection of road embankment in Flood prone Areas.	• Raise embankment height above the HFL levels in the flood prone areas. • Provision of adequate balancing culverts. • Improvement in existing culverts/ Bridges to increase their carrying capacity.	IRC:34 Recommendations for road construction in waterlogged area and IRC: 75 and MORT&H guidelines for Design of High Embankments	All the existing culverts/bridges	Design of both cross & side drains , no. of slab/box culverts ,no & size of Hume pipes.		Included in construction cost	Design Consultant	MPRDC (SQC)
3. Shifting of utility structures								
3.1 Disruption of utility services to local community	• All telephone and electrical poles/wires and underground cables should be shifted before start of construction. • Necessary permission and payments should be made to relevant utility service agencies to allow quick shifting and restoration of utility services. • Local people must be informed through appropriate means about the time of shifting of utility structures and potential disruption of services if any	Project requirement	Throughout the corridor	Utility shifting plan Complaints from local people Status of local utility services	Interaction with concerned utility authorities and local public	Included in construction	Contractor/SQ C	MPRDC (SQC)/CSC
B. Construction Stage								
1. Air Quality								
1.1Dust Generation due to construction activities and transport, storage and handling of construction materials	• Transport, loading and unloading of loose and fine materials through covered vehicles. • Paved approach roads. • Storage areas to be located downwind of the habitation area. • Water spraying on earthworks, unpaved haulage roads and other dust prone areas. • Provision of PPEs to workers.	MORT&H Specifications for Road and Bridge works Air (P and CP) Act 1974 and Central Motor and Vehicle Act 1988	Throughout Project corridor.	PM10 level measurements Dust pollution or complain of lo	Standards CPCB methods Observations Public consultation	Included in project cost	Contractor	MPRDC (SQC)/CSC
1.2 Emission of air pollutants (HC, SO2, NOX, CO etc) from vehicles due to traffic congestion and use of equipment and machinery	• Regular maintenance of machinery and equipment. • Batching, asphalt mixing plants and crushers at downwind (1km) direction from the nearest settlement. • Only crushers licensed by the PCB shall be used • DG sets with stacks of adequate height and use of low sulphur diesel as fuel. • Ambient air quality monitoring	The Air (Prevention and Control of Pollution) Act, 1981(Amended 1987) and Rules 1982	Asphalt mixing plants, crushers, DG sets locations	Monitoring of ambient air quality & checking PUC certificates	Standards CPCB methods	Included in project cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Cost	Institutional Responsibility	
							Implementation	Supervision
	• Follow traffic management plan as given in Section 8.							
2. Noise								
2.1 Noise from Construction vehicle, equipment and machinery.	• All equipment to be timely serviced and properly maintained. • Bottlenecks to be removed. • Construction equipment and machinery to be fitted with silencers and maintained properly. • Only IS approved equipment shall be used for construction activities. • Timing of noisy construction activities shall be done during night time and weekends near schools and selected suitable times near temples when there are no visitors, concurrent noisy operations may be separated to reduce the total noise generated, and if possible re-route traffic during construction to avoid the accumulation of noise beyond standards. Else provision of temporary noise barrier at sensitive locations or near sources. • Time regulation near residential, built up and forest areas construction shall be restricted to daylight hours. • Initiation of multi layered plantation, to serve as mitigation option for operation phase • Honking restrictions near sensitive areas\ • PEs to workers. • Noise monitoring as per EMoP.	Legal requirement Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof + Clause No 501.8.6. MORT&H Specifications for Road and Bridge works	Throughout project section especially at construction sites, residential and identified sensitive locations.	Noise levels Measurements Complaints from local people	As per Noise rule, 2000 Consultation with local people	Included in Project Cost Plantation cost is separate	Contractor	MPRDC (SQC)/CSC
3. Land and Soil								
3.1 Land use Change and Loss of productive/top soil	• Non-agricultural areas to be used as borrow areas to the extent possible. • If using agricultural land, top soil to be preserved and laid over either on the embankment slope for growing vegetation to protect soil erosion.	Project requirement	Throughout the project section and borrow areas	Borrow pit Locations Top soil storage area	Review borrow area plan, site visits	Included in construction cost	Contractor	MPRDC (SQC)/CSC
3.2 Slope failure and Soil erosion due to Construction activities, earthwork, and cut and fill, stockpiles etc.	• Bio-turfing of embankments to protect slopes. • Slope protection by providing frames, dry stone pitching, masonry retaining walls, planting of grass and trees. • The side slopes of all cut and fill areas will be graded and covered with stone pitching, grass and shrub as per design specifications. Care should be taken that the slope gradient shall not be greater than 2:1 • The earth stockpiles to be provided with gentle	IRC: 56 -1974 recommended practice for treat-ment of embank-ment slopes for erosion control Clause No.306 and 305.2.2 MORT&H Specifications for	Throughout the entire project road especially along hilly areas	Occurrence of slope failure or erosion issues	Review of design documents and site observation	Included in Construction cost	Design consultant and Contractor,	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Cost	Institutional Responsibility	
							Implementation	Supervision
	slopes to prevent soil erosion.	Road and Bridge works Guidelines IX for Soil erosion						
3.3 Borrow area management	• Non-productive, barren lands, upland shall be used for borrowing earth with the necessary permissions/consents. • Depths of borrow pits to be regulated and sides not steeper than 25%. • Topsoil to be stockpiled and protected for use at the rehabilitation stage. • Transportation of earth materials through covered vehicles. • IRC recommended practice for borrow pits (IRC 10: 1961). • Borrow areas not to be dug continuously. • To the extent borrow areas shall be sited away from habituated areas. 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 in consultation with fishery department and land owner/community. Rehabilitation of the borrow areas as per Guidelines for redevelopment of Borrow Areas.	IRC Guidelines on borrow areas and for quarries (Environmental Protection Act and Rules, 1986; Water Act, Air Act) + Clause No. 305.2.2 MORT&H Specifications for Road and Bridge works Guidelines V for Borrow Areas management	Borrow sites location	Existence of borrow areas in inappropriate unauthorized locations. Poor borrow area Management practices. Incidents of accidents. Complaints from local people.	Review of design documents and site observation	Included in Construction cost	Design consultant and Contractor,	MPRDC (SQC)/CSC
3.4 Quarry Operations	• Aggregates will be sourced from existing licensed quarries. • Copies of consent/ approval / rehabilitation plan for a new quarry or use of existing source will be submitted to EO, MPRDC. • The contractor will develop a Quarry Redevelopment plan, as per the Mining Rules of the state and submit a copy of he approval to EA.	Clause No. 111.3 MORT&H Specifications for Road and Bridge works Guidelines VI for Quarry Areas Management	Quarry area locations	Existence of licenses for all quarry areas from which materials are being sourced Existence of a Quarry redevelopment plan	Review of design documents, contractor documents and site observation	Included in Construction cost	Contractor	MPRDC (SQC)/CSC
3.5 Compaction of soil and impact on quarry haul roads due to movement of vehicles and equipment	• Construction vehicles, machinery, and equipment to be stationed in the designated ROW to avoid compaction. • Approach roads/haulage roads shall be designed along the barren and hard soil area to reduce the compaction. • Transportation of quarry material to the	Design requirement	Parking areas, Haulage roads and construction yards.	Location of approach and haulage roads Presence of destroyed/compacted agricultural	Site observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Cost	Institutional Responsibility	
							Implementation	Supervision
	dumping site through heavy vehicles shall be done through existing major roads to the extent possible to restrict wear and tear to the village/minor roads. • Land taken for construction camp and other temporary facility shall be restored to its original conditions.			land or land which has not be restored to its original condition				
3.6 Contamination of soil due to leakage/ spillage of oil, bituminous and non bituminous debris generated from demolition and road construction	• Construction vehicles and equipment will be maintained and refueled in such a fashion that oil/diesel spillage does not contaminate the soil. • Fuel storage and refueling sites to be kept away from drainage channels. • Unusable debris shall be dumped in ditches and low lying areas. • To avoid soil contamination Oil-Interceptors shall be provided at wash down and refueling areas. • Waste oil and oil soaked cotton/ cloth shall be stored in containers labeled 'Waste Oil' and 'Hazardous' sold off to MoEF/SPCB authorized vendors • Non-bituminous wastes to be dumped in borrow pits with the concurrence of landowner and covered with a layer of topsoil conserved from opening the pit. • Bituminous wastes will be disposed off in an identified dumping site approved by the State Pollution Control Board	Design requirement	Fuelling station, Construction sites, and construction camps and disposal location.	Quality of soil near storage area Presence of spilled oil or bitumen in project area	Site observation	Included in construction cost.	Contractor	MPRDC (SQC)/CSC
4. Water Resources								
4.1 Sourcing of water during Construction	• Requisite permission shall be obtained for abstraction of groundwater from Central Groundwater Authority • Arrangements shall be made by contractor that the water availability and supply to nearby communities remain unaffected.	-	Throughout the Project section	Approval from competent authority Complaints from local people on water availability	Checking of documentation on Talk to local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
4.2 Disposal of water during construction	• Provisions shall be made to connect road side drains with exiting nearby ponds otherwise make provision of water harvesting pits intermittently.	Clause No. 1010 EP Act 1986 MORT&H Specifications for Road and Bridge works	Throughout the Project section	Design of road side drains Existence of proper drainage	Standards methods Site observation and review of documents	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Cost	Institutional Responsibility	
							Implementation	Supervision
				system for disposal of waste water				
4.3 Alteration in surface water hydrology due to embankment	• Existing drainage system to be maintained and further enhanced. • Provision shall be made for adequate size and number of cross drainage structures esp. in the areas where land is sloping towards road alignment. • Road level shall be raised above HFL level wherever road level is lesser than HFL.	Design requirement, Clause No 501.8.6. MORT&H Specifications	Near all drainage channels, river crossings etc.	Design of road side drains	Review of design documents Site observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC
4.4 Siltation in water bodies due to construction activities/ earthwork	• Embankment slopes to be modified suitably to restrict the soil debris entering water bodies. • Provision of Silt fencing shall be made at water bodies. • Silt/sediment should be collected and stockpiled for possible reuse as surfacing of slopes where they have to be re-vegetated. • Earthworks and stone works to be prevented from impeding natural flow of rivers, streams and water canals or existing drainage system.	Design requirement , Clause No 501.8.6. MORT&H Specifications for Road and Bridge works (CP and CP) and worldwide best practices	Near all water bodies, river embankment slopes.	Siltation of rivers, streams, ponds and other water bodies in project area	Field observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC
4.5 Deterioration in Surface water quality due to leakage from vehicles and equipments and waste from construction camps.	• No vehicles or equipment should be parked or refueled near water-bodies, so as to avoid contamination from fuel and lubricants. • Oil and grease traps and fuelling platforms to be provided at re-fuelling locations. • All chemicals and oil shall be stored away from water and concreted platform with catchment pit for spills collection. • All equipment operators, drivers, and warehouse personnel will be trained in immediate response for spill containment and eventual clean-up. Readily available, simple to understand and preferably written in the local language emergency response procedure, including reporting, will be provided by the contractors. • Construction camp to be sited away from water bodies. • Wastes must be collected, stored and taken to approve disposal site only. • Water quality shall be monitored periodically	The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof.	Water bodies**,** refueling stations, construction camps.	Water quality of ponds, streams, rivers and other water bodies in project Presence of oil floating in water bodies in project area	Conduction of water quality tests as per the monitoring plan Field observation	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implementation	Supervision
5. Flora and Fauna								
5 .1 Vegetation loss due to site preparation and construction activities and	• Minimize tree cutting to the extent possible. • Roadside 351 trees to be removed with prior approval of competent authority. • Compensatory plantation at 1:10 basis and additional plantation as per the IRC guidelines in consultation with Forest Department. • Regular maintenance of all trees planted. • Provision of LPG in construction camp as fuel source to avoid tree cutting, wherever possible. • Plantation of trees on both sides of the road. Integrate vegetation management (IVM) with the carriage way completely clear of vegetation. From the edge of the road to the boundary of ROW, vegetation structured with smaller plants near the line and larger trees further away to avoid costly and provide habitats for a wide variety of plants and animals. Additional plantation near river banks to check erosion as part of compensatory plantation. • In the event of design changes during the construction stages additional assessments including the possibility to save trees shall be made by the EA. • Road side Plantation Strategy as per IRC specifications including manuring. Control use of pesticides/ fertilizers	Forest Conservation Act 1980 & IRC SP: 21 and IRC SP:66	Throughout project corridor	ROW width Number of trees for felling Compensatory plantation plan Number of trees replanted	Review of relevant documents – tree cutting permit, compensatory plantation plan Field observations	Road side Plantation cost is included in project costs.	Relevant agency specialized in a forestation	MPRDC (SQC)/CSC
6. Construction Camps								
6.1 Impact associated with location	▪ All camps should maintain minimum distance from following: # 500 m from habitation # 500 m from forest areas where possible # 500 m from water bodies where possible # 500 m from through traffic route where possible ▪ The average distance between two camps should be 50 km	Design Requirement	All construction camps	Location of campsites and distance from habitation, forest areas, water bodies, through traffic route and other construction camps	On site Observation Interaction with workers and local community	Included in construction cost	Contractor and EO	MPRDC (SQC)/CSC
6.2 Worker's Health in construction camp	• The location, layout and basic facility provision of each labor camp will be submitted to SQC prior to their construction. The construction shall commence only after approval of SQC. • The contractor will maintain necessary living	The Building and Other Construction workers (Regulation of	All construction camps	Camp health Records Existence of proper first aid kit	Camp Records Site Observation	Part of the Contractors costs	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implementation	Supervision
	accommodation and ancillary facilities in functional and hygienic manner as approved by the EA. • Adequate water and sanitary latrines with septic tanks attached to soak pits shall be provided. • Preventive medical care to be provided to workers including a First-Aid kit that must be available in the camp. • Waste disposal facilities such as dust bins must be provided in the camps and regular disposal of waste must be carried out . • The Contractor will take all precautions to protect the workers from insect and pest to reduce the risk to health. This includes the use of insecticides hitch should comply with local regulations. • No alcoholic liquor or prohibited drugs will be imported to, sell, give, and barter to the workers of host community. • Awareness raising to immigrant workers/local community on communicable and sexually transmitted diseases.	Employment and Conditions of Service) Act 1996 and The Water (Prevention and Control of Pollution) Act, 1974 and amendments thereof		in camp site Complaints from local people	Consultation with local people living nearby			
7. Management of Construction Waste/Debris								
7.1 Selection of Dumping Sites	• Unproductive/wastelands shall be selected for dumping sites. • Away from residential areas and water bodies • Dumping sites have adequate capacity equal to the amount of debris generated. • Public perception and consent from the village Panchayats has to be obtained before finalizing the location.	Design Requirement and MORT&H guidelines	At all Dumping Sites	Location of dumping sites Public complaints	Field survey and interaction with local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
7.2 Reuse and disposal of construction and dismantled waste	• The existing bitumen surface shall be utilized for paving of cross roads, access roads, and paving works in construction sites and camps, temporary traffic diversions, and haulage routes. • All excavated materials from roadway, shoulders, verges, drains, cross drainage will be used for backfilling embankments, filling pits, and landscaping. • Unusable and non-bituminous debris materials should be suitably disposed off at pre-designated disposal locations, with approval of the concerned authority. The bituminous wastes shall be disposed in	MORT&H guidelines	Throughout the project corridor	Percentage of reuse of existing surface material Method and location of disposal site of construction debris	Contractor Records Field Observation Interaction with local people		Contractor	

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implementation	Supervision
	secure landfill sites only in environmentally accepted manner. For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. • Unusable and surplus materials, as determined by the Project Engineer, will be removed and disposed off-site.							
8.1 Management of existing traffic and safety	• Temporary traffic diversion shall be planned by the contractor and approved by the 'Engineer'. • The traffic control plans shall contain details of diversions; traffic safety arrangements during construction; safety measures for night time traffic and precautions for transportation of hazardous materials. Traffic control plans shall be prepared in line with requirements of IRC's SP 55 document'. • The Contractor will ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow. • On stretches where it is not possible to pass the traffic on the part width of existing carriageway, temporary paved diversions will be constructed. • Restriction of construction activity to only one side of the existing road. • The contractor shall inform local community of changes to traffic routes, and pedestrian access arrangements with assistance from "Engineer". • Use of adequate signage's to ensure traffic management and safety. Conduct of regular safety audit on safety measures.	Design requirement and IRC SP:55	Throughout the project corridor especially at intersections.	Traffic management plan Safety signs on Site Number of traffic accidents	Review traffic management plan Field observation of traffic management and safety system Interaction with people in vehicles using the road	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implementation	Supervision
8.2 Pedestrians, animal movement	• Temporary access and diversion, with proper drainage facilities. • Access to the schools, temples and other public places must be maintained when construction takes place near them. • Fencing wherever cattle movement is expected. • To avoid the need for cattle underpasses, some of the proposed culverts `near habitations may be widened to facilitate cattle movement.	Design requirement And IRC: SP: 27 -1984 IRC:SP: 32 -1988 Road Safety for Children (5-12 Years Old) IRC:SP: 44 -1994 Highway Safety Code IRC: SP: 55 -2001 Guidelines for The Building and other Construction workers Act 1996 and Cess Act of 1996 Factories Act 1948	Near habitation on both sides of schools, temples, hospitals, graveyards, construction sites, haulage roads, diversion sites.	Road signage & drainage as per IRC guideline Complaints from local people	Field observation Interaction with local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
8.3 Safety of Workers and accident risk from construction activities	• Contractors to adopt and maintain safe working practices. • Usage of fluorescent and retroflectory signage, in local language at the construction sites • Training to workers on safety procedures and precautions. • Mandatory appointment of safety officer. • All regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress shall be complied with. • Provision of PPEs to workers. • Provision of a readily available first aid unit including an adequate supply of dressing materials. • The contractor will not employ any person below the age of 18 years for any work • Use of hazardous material should be minimized and/or restricted. • Emergency plan (to be approved by engineer) shall be prepared to respond to any accidents or emergencies. • Accident Prevention Officer must be appointed by the contractor.		Construction sites	Availability of Safety gears to Workers Safety signage Training records on safety Number of safety related accidents	Site Observation Review records on safety training and accidents Interact with construction workers	Included in construction cost	Contractor	MPRDC (SQC)/CSC

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implementation	Supervision
8.4 Accident risk to local community	• Restrict access to construction sites to authorized personnel. • Physical separation must be provided for movement of vehicular and human traffic. • Adequate signage must be provided for safe traffic movement		Construction sites	Safety signs and their location Incidents of Accidents Complaints from local people	Site Inspection Consultation with local people	Included in construction cost	Contractor	MPRDC (SQC)/CSC
9. Site restoration and rehabilitation								
9.1 Clean-up Operations, Restoration and Rehabilitation	• Contractor will prepare site restoration plans, which will be approved by the 'Engineer'. • The clean-up and restoration operations are to be implemented by the contractor prior to demobilization. • All construction zones including river-beds, 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, at the contractor's expense, to the satisfaction of the Environmental officer. • All the opened borrow areas will be rehabilitated and 'Engineer' will certify in this regard.	Project requirement	Throughout the project corridor, construction camp sites and borrow areas	Clean and restored camp sites Presence/absence of construction material/debris after completion of construction works on construction site	Site Observation Interaction with locals Issue completion certificate after restoration of all sites are found satisfactory	Included in construction cost	Contractor	MPRDC (SQC)/CSC
C. Operation stage								
1. Air quality								
1.1 Air pollution due to due to vehicular movement	• Roadside tree plantations shall be maintained. • Regular maintenance of the road will be done to ensure good surface condition. • Vehicular air pollution will be managed and monitored. • Ambient air quality monitoring. If monitored parameters are above the prescribed limit, suitable control measures must be taken. • Technological and behavioral changes Road signs shall be provided reminding the motorist to properly maintains their vehicles to economize on fuel consumption and unprotect the environment.	Environmental Protection Act, 1986; The Air (Prevention and Control of Pollution) Act, 1981	Throughout the Corridor	Ambient air quality (PM10, CO, NOx) Survival rate of trees planted	As per CPCB requirements Site inspection	Included in Operation/ Maintenance cost	MPRDC (SQC)	

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implement ation	Supervision
2. Noise								
2.1 Noise due to movement of traffic	• Effective traffic management and good riding conditions shall be maintained to reduce the noise level throughout the stretch and speed limitation and honking restrictions may be enforced near sensitive locations. • The effectiveness of the multilayered plantation should be monitored and if need be, solid noise barrier shall be placed. • Create awareness amongst the residents about likely noise levels from road operation at different distances, the safe ambient noise limits and easy to implement noise reduction measures while constructing a building close to the road.	Noise Pollution (Regulation and Control) Rules, 2000 and amendments thereof	Sensitive receptors	Noise levels	Noise monitoring as per noise rules ,2000 Discussion with people in sensitive receptor sites	Included in Operation/ Maintenance cost	MPRDC (SQC)	
3. Land and Soil								
3.1 Soil erosion at embankment during heavy rain fall.	• Periodic checking to be carried to assess the effectiveness of the stabilization measures viz. turfing, stone pitching, river training structures • etc. • Necessary measures to be followed wherever there are failures	Project requirement	At bridge locations and embankment slopes and other probable soil erosion areas.	Existence of soil erosion sites Number of soil erosion sites	On site observation	Included in Operation/ Maintenance cost	MPRDC (SQC)	
4. Water resources/Flooding and Inundation								
4.1 Siltation	• Regular checks shall be made for soil erosion and turfing conditions of river training structures for its effective maintenance.	Project requirement	Near surface Water bodies	Water quality	Site observation	Included in Operation/ Maintenance cost	MPRDC (SQC)	
4.2 Water logging due to blockage of drains, culverts or streams	• Regular visual checks and cleaning of drains shall be done along the alignment to ensure that flow of water is maintained through cross drains and other channels/streams. • Monitoring of water borne diseases due to stagnant water bodies	Project requirement	Near surface Water bodies	Presence of flooded areas or areas with water stagnation	Site observation	Included in Operation/ Maintenance cost	MPRDC (SQC)	
4.3 Road inundation due to choking of drainage channels	• MPRDC will ensure that all drains (side drains and all cross drainages) are periodically cleared especially before monsoon season to facilitate the quick passage of rainwater and avoid flooding.	Project requirement	Flood prone sections	Incidents of flooding and road inundation with details on chainage	Field observation Interaction with local community	Included in Operation/ Maintenance cost	MPRDC (SQC)	

Environmental Issue/ Component	Remedial Measure	Reference to laws /guidelines	Location	Monitoring indicators	Monitoring Methods	Mitigation Coast	Institutional Responsibility	
							Implementation	Supervision
5. Flora								
5.1 Vegetation	• Planted trees, shrubs, and grasses to be properly maintained. • The tree survivalist audit to be conducted at least once in a year to assess the effectiveness	Forest Conservation Act 1980	Project tree plantation sites	Minimum of 70% of tree survival	Records and fields observations	Operation and Maintenance Cost	MPRDC (SQC)	
6. Maintenance of Right of Way and Safety								
6.1 Accident Risk due to uncontrolled growth of vegetation	• Efforts shall be made to make shoulder completely clear of vegetation. • Regular maintenance of plantation along the road side. • Invasive plant not to be planted near the road.	Project requirement	Throughout the Project route	Presence of and extent of vegetation growth on either side of road Accident data	Visual Inspection Accident records	Included in operation/ Maintenance cost	MPRDC (SQC)	
6.2 Accident risks associated with traffic movement.	• Traffic control measures, including speed limits, will be enforced strictly. • Further encroachment of squatters within the ROW will be prevented. • No school or hospital will be allowed to be established beyond the stipulated planning line as per relevant local law • Monitor/ensure that all safety provisions included in design and construction phase are properly maintained • Highway patrol unit(s) for round the clock patrolling. Phone booths for accidental reporting and ambulance services with minimum response time for rescue of any accident victims, if possible. • Tow-away facility for the break down vehicles if possible.	IRC:SP:55	Throughout the Project route	Police records on Accident Condition and existence of safety signs, rumble strips etc. on the road Presence/absence of sensitive receptor structures inside the stipulated planning line as per relevant local law	Review accident records Site observation	Included in operation/ Maintenance cost	MPRDC (SQC)	
6.3 Transport of Dangerous Goods	• Existence of spill prevention and control and emergency responsive system • Emergency plan for vehicles carrying hazardous material		Throughout the project stretch	Status of emergency system – whether operational or not	Review of spill prevention and emergency response system	Included in operation/ Maintenance cost.	MPRDC (SQC)	

Notes: EA: Executing Agency, MPRDC: Madhya Pradesh Road Development Corporation, SQC: Supervision Quality Controller, EO: Environmental Officer, IRC: Indian Road Congress

a) The "Project engineer" or "the engineer" is the team of Construction Supervision Consultants (CSC) responsible for approving the plans, engineering drawing, release of payments to contractor etc. on behalf of the employer (MPRDC). It is usually the team leader of the CSC that takes the responsibility of signing approval documents on behalf of the CSC team.

b) The "environmental officer" is the environmental specialist under the CSC who is responsible for providing recommendations to the CSC team leader for approving activities specific to environment safeguards on behalf of "the engineer".

APPENDIX 4: ENVIRONMENTAL MONITORING PROGRAMME

Environmental Components	Monitoring					Institutional Responsibility	
	Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Air	PM2.5, PM10, SO2, NOX, CO	As per CPCB guidelines	The Air (Prevention and Control of Pollution) Rules, CPCB, 1982	At sites where hot mix plant / batching plant is located	3 times in a year for 3 years or construction period at 3 sites & once in year for five years at 3 sites during operation/defect liability period	Contractor through approved monitoring agency	PIU, MPRDC, SC
Water	pH, BOD, COD, TDS, TSS, DO, Total coliform, Conductivity, Oil & Grease	Grab sample collected from source and analyze as per standard methods for examination of water and wastewater	Water quality standards by CPCB	river tributaries, roadside ponds and ground water at construction camp sites	Once during pre-construction stage 3 times in a year for 3 years or construction period At 3 locations	Contractor through approved monitoring agency	PIU, MPRDC, SC
Noise Levels	Noise level for day and night on dB(A) scale	In free field at 1m distance from the equipment to be monitored	Noise standard by CPCB	At equipment yards, camp and villages along the alignment.	3 times in a year for 3 years or construction period , 3 locations & once in a year for 5 years at 3 sites during operation/defect liability period.	Contractor through approved monitoring agency	PIU, MPRDC, SC
Soil quality	Monitoring of NPK &heavy metals and grease		As per IRC code of practice	Ad hock if accident / spill locations involving bulk transport of carrying hazardous materials	-	PIU through an approved agency	PIU, MPRDC

Environmental Components	Monitoring					Institutional Responsibility	
	Parameters	Special Guidance	Standards	Location	Frequency	Implementation	Supervision
Road side plantation	Monitoring of felling of trees	It should be ensured that the marked trees are felled only	As given in the IEE report	All along the corridor	During the felling of trees	Forest department	PIU, MPRDC
	Survival rate of trees, success of re-vegetation	The number of trees surviving during each visit should be compared with the number of saplings planted	The survival rate should be at- least 75% below which re plantation should be done	At locations of compensatory afforestation	Every year for 3 years	PIU	PIU, MPRDC

APPENDIX 5: NATIONAL AMBIENT AIR QUALITY STANDARDS

Concentration in Ambient Air				
Sl. No.	**Pollutant**	**Time Weighted Average**	**Industrial Residential, Rural & Other Areas**	**Ecologically Sensitive Area (Notified by Central Government)**
1.	Sulphur dioxide (SO_2)(ug/m^3)	Annual Average*	50	20
		24 Hours**	80	80
2.	Oxides of Nitrogen (NO_x) (ug/m^3)	Annual Average*	40	30
		24 Hours**	80	80
3.	Particulate Matter (Size Less than 10 mm) or PM_{10} (ug/m^3)	Annual Average*	60	60
		24 Hours**	100	100
4.	Particulate Matter (Size Less than 2.5 mm) or $PM_{2.5}$ (ug/m^3)	Annual Average*	40	40
		24 Hours**	60	60
5.	Ozone O_3 (ug/m^3)	8 Hours*	100	100
		1 Hours**	180	180
6.	Lead (Pb) (ug/m^3)	Annual Average*	0.5	0.5
		24 Hours**	1.0	1.0
7.	Carbon Monoxide (CO) (ug/m^3)	8 Hours*	2	2
		1 Hours**	4	4
8.	Ammonia (NH_3) (ug/m^3)	Annual Average*	100	100
		24 Hours**	400	400
9.	Benzene (C_6H_6) (ug/m^3)	Annual*	5	5
10.	Benzo (a) Pyrane (BaP) particulate phase only(ug/m^3)	Annual*	1	1
11.	Arsenic (As) (ug/m^3)	Annual*	6	6
12.	Nickel (Ni) (ug/m^3)	Annual*	20	20

Note:

* *Annual arithmetic mean of minimum 104 measurements in a year taken twice a week 24 hourly at uniform interval.*

* *24 hourly or 8 hourly or 1 hourly monitored values, as applicable shall complied 98% of the time in a year. However 2% of the time, it may exceed but not on two consecutive days.*

APPENDIX 6: INDIAN STANDARD DRINKING WATER SPECIFICATION-IS 10500:1991

S.no	Parameters	Essential Standards	Relaxed Standards
1.0	**Physical Standards**		
1.1	Colour (Hazen units)	10	50
1.2	Taste	Agreeable	Agreeable
1.3	Odour	Unobjectionable	Unobjectionable
1.4	PH	6.5-8.5	6.5-8.5
1.5	Turbidity (NTU)	10	25
1.6	TDS (mg/l)	500(without treatment)	1500(with treatment)
1.7	Total Hardness (mg/l)	300	600
2.0	**Inorganic Parameters**		
2.1	Ca (mg/l)	75	200
2.2	Mg (mg/l)	30	100
2.3	Fe (mg/l)	0.3	1
2.4	Mn (mg/l)	0.1	0.5
2.5	Cl (mg/l)	250	1000
2.6	SO4 (mg/l)	150	400 if Mg<30mg/l
2.7	NO3 (mg/l)	45	45
2.8	F (mg/l)	0.6-1.2	1.5
2.9	Free Cl (mg/l)	0.2	0.5
3.0	**Heavy Metals**		
3.1	Hg (mg/l)	0.001	0.001
3.2	Cd (mg/l)	0.01	0.01
3.3	Se (mg/l)	0.01	0.01
3.4	As (mg/l)	0.05	0.05
3.5	Pb (mg/l)	0.1	0.1
3.6	Zn (mg/l)	5	10
3.7	Cr +6 (mg/l)	0.05	0.05
3.8	Cu (mg/l)	0.05	1.5
4.0	**Other Parameters**		
4.1	Phenolic Compounds (mg/l) (as C6H5HO)	0.001	0.002
4.2	CN (mg/l)	0.05	0.05
4.3	Anionic Detergents (mg/l) (as MBAS)	0.2	1.0
4.4	Mineral Oil (mg/l)	0.01	0.03
4.5	Pesticides	Absent	Absent
5.0	**Microbiological Parameters**		
5.1	Mean Probable Number	50 without treatment	
	Of Total Coliforms	500 outdoor bathing	
	(Number/100 ml)	5000 with treatment	
6.0	**Radiological Parameters**		
6.1	Gross alpha (uc/ml)	10-6	
6.2	Gross beta (uc/ml)	10 -7	

APPENDIX 7: AMBIENT AIR QUALITY STANDARDS IN RESPECT OF NOISE

Area	Category of Area	Leq. Limits in dB(A)	
Code		Day Time	Night Time
A	Industrial Area	75	70
B	Commercial Area	65	55
C	Residential Area	55	45
D	Silence Zone	50	40

1. Night time shall mean from 10.00 p.m. to 6.00 a.m.
2. Day time shall mean from 6.00 a.m. to 10.00 p.m.
3. Silence zone is defined as an area comprising not less than 100 meters around hospitals, educational institutions and courts. The silence zones are zones, which are declared as such by the competent authority.

APPENDIX 8: PHOTOGRAPHS

Village-Rajpur

Village-Naravla

Village-Upla

Village-Palsood

Village-Wazhar

Village-Niwali

Village-Borali

Village-Sindadi

Village-Danod

Village-Jhakar

Rajpur - Niwali

लोक सहमति दिनांक 12/09/19

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान सड़क चौराहे के पास

ग्राम सिंदड़ी

विकासखंड/ जिला राजपुर / बड़वानी

बैठक कार्यवाही विवरण ग्राम सिंदड़ी मे सहज चर्चा के निम्न विषय रहे :-

→ वर्तमान रोड़ से हो रही पर्यावरणीय व स्वास्थ्य समस्या।

→ रोड़ के बनने के समय उत्पन्न समस्या व स्थानीय समाधान

→ MPRDC और ADB के शिकायत निवारण तंत्र।

उन विषयो पर चर्चा के बाद लोगो ने सड़क बनाने की सहमति देने के साथ सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	गंगाराम भिलाला	गंगाराम	
2	गोपाल प्रसाद	गोपाल	
3	लड़ड़ सिंह यादव	लड़ड़सिंह	
4	चंपालाल नरे	चंपालाल	
5	अश्विन बोराले	अश्विन पावरे	
6	शिव कुमार	Shiv	
7	महेश	महेश	
8	दीनदयाल रघुवंशी	दीनदयाल	
9	अशोक यादव	Ashok	
10	स्वचीन		
11	रामकुमार यादव	R. kumar	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpura - Niwali

लोक सहमति दिनांक 11/09/14

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान मुख्य सड़क के पास

ग्राम वज्जर

विकासखंड/ जिला निवाली / बड़वानी

बैठक कार्यवाही विवरण ग्राम वज्जर मे सहज चर्चा के निम्न विषय रहे।

→ वर्तमान रोड से हो रही पर्यावरणीय व स्वास्थ्य समस्या।

→ रोड के बनने के समय उत्पन्न समस्या व स्थानीय समस्या।

→ MPRDC और ADB के शिकायत निवारण तंत्र।

इन विषयो पर चर्चा के बाद लोगो ने रोड बनाने की अनुमति के साथ सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	कमल डावर	कमल	
2	अशोक डावर	Ashok	
3	सुरेश चाटल	सुरेश चाटल	
4	मनीराम आदीवासी	मनीराम	
5	सदानंद रावजी	सदानंद	
6	नंदलाल यादव	Nandlal	
7	कृष्ण कुमार डावर	कृष्ण	
8	यशवंत	यशवंत	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpur - Nivali

लोक परामर्श /सहमती

दिनांक 11/09/14

1:50 PM

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान पेटलं फाल्या बोरार्डी

गाम बोरार्डी

विकासखंड/ जिला राजपुर | बड़वानी

बैठक कार्यवाही विवरण ग्राम बोरार्डी मे सड़क चर्चा के निम्न विषय रहे :-

→ वर्तमान रोड़ से हो रही पर्यावरणीय व स्वास्थ्य समस्या।

→ रोड़ के बनने के बाद समय उत्पन्न समस्या व स्थानिय समाधान।

→ MPRDC और ADB के शिकायत निवारण तंत्र।

इन विषयो पर चर्चा के बाद लोगो ने सड़क बनाने की अनुमति के साथ सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	नंदलालराम		
2	सुकदेव		
3	श्रीमान राजेंद्र रतनो		
4	श्रीमान प्रदीप राठोड़		
5	रूपराम नरवर		
6	श्रीदलीप राठोड़		
7	श्रीमान कांतिलाल पेटल		
8	बिलगीरसिंग उमाति		
9	तोहन बड़		
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpur - Niwali

लोक परामर्श /सहमती

दिनांक 10/09/2014

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान पालसुद रोड़ राजपुर

ग्राम राजपुर

विकासखंड/ जिला राजपुर / खड़वानी

बैठक कार्यवाही विवरण बैठक के दौरान लोगो से निम्न विषयो पर चर्चा हुई:-

→ MPRDC और ADB के सड़क संबंधित प्रस्तावित योजना।
→ वर्तमान सड़क की स्थिती और उससे उत्पन्न पर्यावरणीय समस्या।
→ समस्याओ के स्थानीय उपाय और सड़क बनने के बाद की स्थिती।
→ MPRDC और ADB के शिकायत निवारण तंत्र।

बैठक के बाद लोगो ने ना केवल सहमति बल्की सहयोग का भी आश्वासन दिया

क्र	नाम	हस्ताक्षर	रिमार्क
1	कोतवाल चौहान	कोतवाल	
2	बाहरिभा बरड़	बाहरिभा	
3	प्यारसिंग	प्यारसिंग	
4	दिलीप राठौड़	दिलीपराठौड़	
5	अशोक लोहार	अशोक	
6	अनिल जमरे.	अनिलजमरे	
7	काना भुवाद	काना	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpur - Nivali

लोक परामर्श /सहमती

दिनांक 09/09/14

2:30

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान पंचायत भवन

ग्राम नरावली

विकासखंड/ जिला राजपुर / बड़वानी

बैठक कार्यवाही विवरण ग्राम नरावली मे स्वछ्ह चर्चा के निम्न विषय रहे :-

→ वर्तमान रोड़ से हो रही पर्यावरणीय व स्वास्थ्य समस्या।

→ रोड़ के बनने के समय उत्पन्न समस्या व स्थानीय समाधान।

→ IMPROC और ADB के शिकायत निवारण तंत्र।

इन विषयो पर चर्चा के बाद लोगो ने सड़क बनाने की सहमति देने के साथ सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	श्री जगदीश	जगदीश	
2	श्रीमान चपालाल	चंदनलाल	
3	श्री दीपक ओंकार		
4	श्री रामेश्वरम ओंकार	रामेश्वरम	
5	श्री पेशीलाल	पेशीलाल	
6	श्री राजाराम कुशवाह	R. R. Kushwah	
7	श्री राजू गोपालाल	राजू	
8	पंचायत रामपाल गणपतराम वास्त		
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpura - Nivali

लोक परामर्श /सहमती

दिनांक 09/09/14

12:35

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान कन्नडपुरा

ग्राम पनोद

विकासखंड/ जिला राजपुर / जिला बड़वानी

बैठक कार्यवाही विवरण बैठक के दौरान लोगो से निम्न विषयो पर चर्चा हुई।

→ MPRDC और ADB के सड़क संबंधित प्रस्तावित योजना।

→ वर्तमान सड़क की स्थिती और उससे उत्पन्न पर्यावरणीय समस्या।

→ समस्याओ के स्थानिय उपाय और सड़क बनने के बाद की स्थिती।

→ MPRDC और ADB के शिकायत निवारण सेंट्र।

बैठक के बाद लोगो ने ना केवल सहमति बल्की सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	श्री अमर सिंह	अमरसिंह	
2	श्रीमान जगदीश	जगदीश	
3	श्रीमान रिनेश	Rinesh	
4	श्रीमान रामू	रामू	
5	श्रीमान बुधारिया	बुधारिया	
6	श्रीमान कैलाश	कैलाश.	
7	श्रीमतीकाबीराम	काबीराम.	
8	श्रीमान विक्रम	विक्रम.	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpur – Niwali

लोक परामर्श /सहमती

दिनांक 07/09/14

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान बस स्टैण्ड निवाली

ग्राम निवाली

विकासखंड/ जिला निवाली / बड़वानी

बैठक कार्यवाही विवरण ग्राम निवाली मे समूह चर्चा मे निम्न विषय रहे :-

→ वर्तमान रोड से हो रही पर्यावरणीय व स्वास्थ्य समस्या।

→ रोड के बनने के समय उत्पन्न समस्या व स्थानीय समाधान।

→ MPRDC और ADB के शिकायत निवारण सेल।

इन विषयो पर चर्चा के बाद लोगो ने सड़क बनाने की सहमति देने के साथ सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	अशोक साहू	अशोक	
2	नीरज गुप्ता		
3	हेमलाल महिरवार		
4	राधेश्याम यादव	राधेश्याम	
5	बलदेव यादव	बलदेव	
6	सुरेश सिलावट	सुरेश	
7	हीरालाल	हीरालाल	
8	श्याम यादव	श्याम	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpur - Nivali

लोक परामर्श /सहमती

दिनांक 08/09/14

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान उपला स्कूल के सामने

ग्राम उपला

विकासखंड/ जिला राजपुर / बड़वानी.

बैठक कार्यवाही विवरण ग्राम उपला मे सड़क चर्चा के निम्न विषय रहे :-

→ वर्तमान रोड से हो रही पर्यावरणीय व स्वास्थ्य समस्या ।

→ रोड बनने के समय उत्पन्न समस्या व स्थानीय समाधान ।

→ MPRDC और ADB के शिकायत निवारण तंत्र ।

इन विषयों पर चर्चा के बाद लोगो ने सड़क बनानेकी सहमति देने के साथ सहयोग का भी आश्वासन दिया ।

क्र	नाम	हस्ताक्षर	रिमार्क
1	श्री मांगीलाल चौहान	मांगीलाल	
2	श्रीमान असलम जी	असलम	
3	श्रीमान मगर सिंह	मगरसिंह	
4	श्रीमान धन्नु जी	धन्नु	
5	श्री मान बिरम	बिरम	
6	श्री गिरियाज	गिरियाज	
7	यशवंत		
8	रूपासिंह जी	रूपसिंग	
9	श्री सोमिया जी	सोमिया	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpura – Nivali

लोक परामर्श /सहमती

दिनांक 08/09/14

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान बस स्टैण्ड

ग्राम पलचूड

विकासखंड/ जिला राजपुर | जि वड़वानी

बैठक कार्यवाही विवरण बैठक के दौरान लोगो से निम्न विषय पर चर्चा हुई:-

→ MPRDC और ADB के सड़क संबंधित प्रस्तावित योजना।

→ वर्तमान सड़क की स्थिती और उससे उत्पन्न पर्यावरणीय समस्या।

→ समस्याओ के स्थानीय उपाय और सड़क बनने के बाद की स्थिती।

→ MPRDC और ADB के शिकायत निवारण तंत्र।

बैठक के बाद लोगो ने ना केवल सहमति बल्की सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	श्रीमान कादीर मोहम्मद		
2	सीताराम	सीताराम	
3	अनिल पामले	अनिल पामले	
4	सलीम	सलीम	
5	विजय राठौर	Rathore	
6	बसंत	बसंत	
7	उमेश गुप्ता		
8	श्याम वर्मा	श्याम	
9	रुमाल रावत	रुमाल	
10	राधेश्याम	राधेश्याम	
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सर्वेक्षण कर्ता के हस्ताक्षर

Rajpura - Niwadi

लोक परामर्श /सहमती दिनांक 07/09/14

(बैठक विवरण एवं उपस्थिती पत्रक)

स्थान ग्राम सैंड्स खाकर

ग्राम खाकर

विकासखंड/ जिला निवाली / बड़वानी

बैठक कार्यवाही विवरण बैठक के दौरान लोगो से निम्न विषयो पर चर्चा हुई:-

→ MPRDC और ADB के रोड़ संबंधित प्रस्तावित योजना।

→ वर्तमान रोड़ की स्थिती और उससे उत्पन्न पर्यावरणीय समस्या।

→ समस्याओ के स्थानिय उपाय और रोड़ बनने के बाद की स्थिती।

→ MPRDC और ADB के शिकायत निवारण तंत्र।

बैठक के बाद लोगो ने ना केवल सहमति बल्की सहयोग का भी आश्वासन दिया।

क्र	नाम	हस्ताक्षर	रिमार्क
1	श्रीमान दुधाराम जी	दुधाराम	
2	श्रीमान गेंदालाल जी	गेंदालाल	
3	श्रीमान सखाराम जी	सखाराम	
4	श्रीमान दिनेश जी	दिनेश	
5	श्रीमान डांगरसिंह जी	डांगरसिंह	
6	श्रीमान बल्ला जी	बल्ला	
7	श्रीमान कपला जी	कपला	
8	श्रीमान सागिरा जी.		
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सर्वेक्षण कर्ता के हस्ताक्षर

APPENDIX 9: GRM PROCEDURES IN HINDI

सहमति पत्र

(व्यक्तिगत रूप से हस्ताक्षर करने हेतु)

यह सहमति पत्र दिनांक .....2014 को श्री/श्रीमति ..... निवासी .....(जिन्हे बाद में प्रथम पक्ष कहा जायेगा) एवं मध्य प्रदेश रोड डेव्हलपमेंट कार्पोरेशन की तरफ से श्री.....(पद) .....(जिन्हे बाद में द्वितीय पक्ष कहा जायेगा) के मध्य हस्ताक्षरित किया गया।

गवाहों/साक्षी की उपस्थिति में यह दस्तावेज निष्पादित किया गया है।

1- यह कि प्रथम पक्ष दुकान का स्वामी/किरायेदार/अतिक्रमणधारी /फेरी वाला है। तथा वह अपना .....व्यवसाय पिछले .....वर्षो से इस स्थान पर चला रहा है। दुकानदार इस दुकान का पट्टेदार है/नही है। प्रस्तावित सड़क के निर्माण के दौरान व्यवसाय का स्वामी/पट्टेदार का व्यवसाय तथा आमदनी सड़क निर्माण के दौरान बाधित होने की आशंका है। यह कालावधी 30 दिन से अधिक नही होगी।

2- यह कि प्रथम पक्ष ने मध्य प्रदेश जिला कनेक्टीविटी क्षेत्र परियोजना (MPDCSP) की आवश्यकताओं के तहत आयोजित सार्वजनिक लोक सहमति में भाग लिया है, रोड निर्माण से प्राप्त होने वाले लाभ को समझ लिया है एवं रोड निर्माण हेतु सहमति दे दी है।

3- यह कि प्रथम पक्ष द्वारा अपनी मर्जी से ग्राम.....तहसील .....में MPDCSP अंतर्गत रोड़ निर्माण विकास हेतु आपनी आजीविका में संभावित अस्थायी व्यवधान को देखते हुये भी सहमति प्रदान की है।

4- यह कि प्रथम पक्ष रोड निर्माण से होने वाले अस्थायी आजीविका व्यवधान के खिलाफ किसी भी प्रकार के मुआवजे का दावा नही करेगा।

5- यह कि द्वितीय पक्ष को अस्थायी आजीविका व्यवधान संबंधित सहमति स्वीकार है।

(गवाह/साक्षी में गांव के सरपंच, ग्राम पंचायत के सदस्य, डी.पी.आर. कंसलटेंट के प्रतिनिधि, गैर शासकीय संगठनों के प्रतिनिधि तथा ग्राम के बुजुर्ग/वरिष्ठ नागरिकों को शामिल किया जा सकता है)

शिकायत निवारण तंत्र

5.1 सड़क निर्माण परियोजना से संबंधित विशेष शिकायत निवारण तंत्र (GRM) स्थापित किया जायेगा जिसके तहत विस्थापित व्यवसायिक इकाईयों, संबंधित शिकायतो, सामाजिक तथा पर्यावरण संबंधित शिकायतों का निराकरण करने की सुविधापरियोजना स्तर पर प्रदान की जायेगी, यह तंत्र सामाजिक तथा पर्यावरण संबंधी समस्या, शिकायत या शकाओं के निवारण में सहायक सिद्व होगा। यह परियोजना प्रभावित व्यक्तियों की शंकाओं तथा समस्या निराकरण करने के उद्देश्य से निर्मित किया गया है। GRM का उद्देश्य शासन की निवारण प्रक्रिया को नज़र अंदाज करना नही है बल्कि जन साधारण को निर्माण से होने वाले लाभ को बताना तथा पारदर्शिता के साथ समस्या तभा शंकाओं का निवारण करना है।

5.2 निवारण प्रक्रिया (RP) यह तंत्र प्रभावी तरीको से जन साधारण/लोक सामान्य को इस कार्य के लाभ बतलाते हुऐ सार्वजनिक सहमति प्राप्त करेगा शिकायत निवारण सहमति (GRC) एक समय सीमा में समस्या निवारण कार्य करेगी। कमेटी का निर्णय मा. न्यायालय के आदेश पूर्व बाहयकारी होगा इस समिति को MPRDC के प्रबंध संचालक की अध्यक्षता में गठित किया जायेगा। PIU स्तर पर प्रबंधक (PM) पुर्नवास अधिकारी, NGO के प्रतिनिधी, समाज के प्रतिष्टित व्यक्ति, जन प्रतिनिधी, जिला परिषद प्रतिनिधी, कमजोर तबके के व्यक्ति तथा 2 महिला प्रतिनिधी शमिल होगे जो परियोजना कार्य पूर्ण होने तक पदस्थ रहेंगे।

5.3 शिकायत निवारण समिति द्वारा शिकायत के 3 सप्ताह के दौरान प्रतिक्रिया करेगी। निर्माण कार्य के पूर्व समस्त शिकायतोंव शंकाओं का समाधान कर लिया जायेगा।

6- यह कि द्वितीय पक्ष निर्माण कार्य के दौरान रोड के समीप स्थित सभी व्यवसायिक इकाईयों को नुकसान से बचाने के लिये सभी संभव सावधनियां पूर्वक कार्य करेगा।

7- यह कि प्रथम पक्ष द्वारा द्वितीय पक्ष को यह आश्वासन दिया जाता है कि वह MPDCSP अंतर्गत रोड निर्माण को किसी प्रकार का नुकसान नही पहुँचायेगा, ना ही सार्वजनिक वाहनों के आवागमन में व्यवधान पैदा करेगा एवं ना ही ऐसे कार्यो में शामिल होगा।

8- यह कि दोनों पक्ष MPDCSP अंतर्गत प्रस्तावित इस रोड निर्माण हेतु सहमत है।

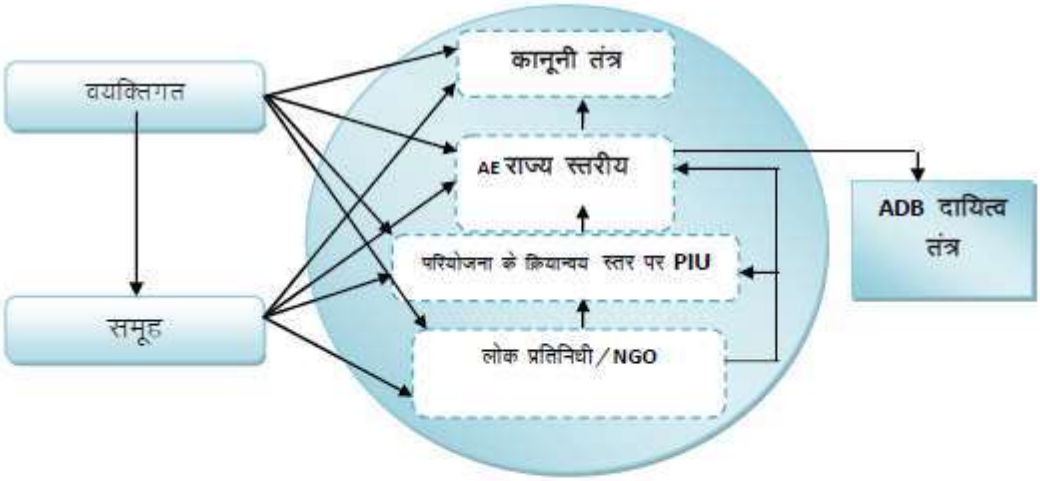
9- यह कि हस्ताक्षरित किये जाने की तारीख से यह सहमति पत्र प्रभावी होगा।

साक्षी/गवाहों की उपस्थिति में दोनों पक्षों ने उपर लिखित तारीख को इस पत्रक को हस्ताक्षरित किया है।

हस्ताक्षर प्रथम पक्ष	द्वितीय पक्ष की ओर से अधिकृत (मोहर सहित)
गवाह	गवाह
1- हस्ताक्षर.....	1- हस्ताक्षर.....
नाम –.....	नाम –.....
पूरा पता –.....	पूरा पता –.....
2-हस्ताक्षर.....	2. हस्ताक्षर.....
नाम –.....	नाम –.....
पूरा पता –.....	पूरा पता –.....

शिकायत निवारण समिति की बैठक 3 सप्ताह में कम से कम एक बार अवश्य होगी, माननीय न्यायालय के तहत स्वामित्व अधिकारी से संबंधित विवादो के अलावा यह समिति समस्त पुर्नवास स्थानांरतण, मुआवजे के भुगतान तथा अन्य सहायता हेतु चरण बद्ध कार्य करेगी।

शिकायत निवारण प्रक्रिया तंत्र



अनुलग्न 1

(A) लोक शिकायत प्रपत्र /प्रलेखन (शिकायत निवारण)

क्र	शिकायत का प्रकार	शिकायत प्राप्ति होने की तारीख	प्रभावित स्थान ग्राम/शहर	चैनेज 0.00 से लैण्ड मार्क	शिकायतकर्ता का नाम	पूरा पता एवं मोबाईल न0	रिमार्क की गई कार्यवाही का संक्षिप्त विवरण	स्थिति		
								निवारण हो गई	कार्य प्रगति पर है।	अपूर्ण लंबित
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अनुलग्न 1

(B) शिकायत का प्रकार

- घर की दीवार और छत को कंपन/विस्फोट/भारी वाहनों के कारण नुकसान
- उपयोग में आ रही सड़क, पुलिया, नहरो को नुकसान
- सड़क के उपयोग में आ रहे अवरोध
- निजी संपत्ति को नुकसान
- विस्फाट के कारण निजी या सार्वनिक जल स्त्रोतों में जल स्तर की कमी या जल में प्रदुषण
- व्यावसायिक इकाई को/ व्यावसायिक परिसर में नुकसान
- दूषित जल का जमाव या बाद
- घरो के समीप (सॉलिड) कचरे को फेंकना
- मूर्तिया अथवा स्मारको को नुकसान होने का भय
- विस्थापना की स्थिति में वैकलिपक भूमि या अधिग्रहित भूमि के मुआवजे के लिये अनुरोध पत्र
- भूमि स्वामित्व के अधिकार संबंधित किसी प्रकार का विवाद