

Initial Environmental Examination

August 2017

IND: Second Rural Connectivity Investment Program

Madhya Pradesh

Prepared by National Rural Road Development Agency, Ministry of Rural Development,
Government of India for the Asian Development Bank.

CURRENCY EQUIVALENTS

(as of 6 July 2017)

Currency unit	–	Indian Rupees (INR/Rs)
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ABBREVIATIONS

ADB	:	Asian Development Bank
BIS	:	Bureau of Indian Standards
CD	:	Cross Drainage
MPRRDA	:	Madhya Pradesh Rural Road Development Authority
CGWB	:	Central Ground Water Board
CO	:	Carbon Monoxide
COI	:	Corridor of Impact
DM	:	District Magistrate
EA	:	Executing Agency
EAf	:	Environment Assessment Framework
ECOP	:	Environmental Codes of Practice
EIA	:	Environmental Impact Assessment
EMAP	:	Environmental Management Action Plan
EO	:	Environmental Officer
FEO	:	Field Environmental Officer
FGD	:	Focus Group Discussion
FFA	:	Framework Financing Agreement
GOI	:	Government of India
GP	:	Gram panchyat
GSB	:	Granular Sub Base
HA	:	Hectare
HC	:	Hydro Carbon
IA	:	Implementing Agency
IEE	:	Initial Environmental Examination
IRC	:	Indian Road Congress
LPG	:	Liquefied Petroleum Gas
MFF	:	Multitranchise Financing Facility
MORD	:	Ministry of Rural Development
MORTH	:	Ministry of Road Transport and Highways
MOU	:	Memorandum of Understanding
NAAQS	:	National Ambient Air Quality Standards
NGO	:	Non Governmental Organisation
NOx	:	Nitrogen Oxide
NC	:	Not Connected
NGO	:	Non-Government Organization
NRRDA	:	National Rural Road Development Agency
PIU	:	Project Implementation Unit
PIC	:	Project Implementation Consultants
PRIs	:	Panchyati Raj Institutions
PMGSY	:	Pradhan Mantri Gram Sadak Yojana
POL	:	Petroleum, Oil and Lubricants
PPTA	:	Project Preparation Technical Assistance
ROW	:	Right-of-Way
RPM	:	Respirable Particulate Matter

RRP	:	Report and Recommendation of the President
SRRDA	:	State Rural Road Development Agency
SBD	:	Standard Bidding Documents
SO ₂	:	Sulphur di-Oxide
SPM	:	Suspended Particulate Matter
TA	:	Technical Assistance
TOR	:	Terms of Reference
TSC	:	Technical Support Consultants
UG	:	Upgradation
WBM	:	Water Bound Macadam
CGRRA	:	Madhya Pradesh Rural Road Development Agency
ZP	:	Zilla Parisad

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I. EXECUTIVE SUMMARY

1. Pradhan Mantri Gram Sadak Yojana (PMGSY) aims to provide all-weather road connectivity to currently unserved habitations in India's rural areas, where 70% of the population live. The government of India (GOI) launched "The Pradhan Mantri Gram Sadak Yojana (PMGSY) in year 2000. The objective of PMGSY is to provide all-weather road connectivity to all rural habitations with a population of more than 500 persons in plains and 250 persons in hill states. This program is being implemented through National Rural Road Development Agency (NRRDA) under ministry of rural development (MORD) at central level and through state rural road development authority/agencies (SRRDA) at state level.

2. The Second Rural Connectivity Investment Program (RCIP-2) is the continuation of Rural Connectivity Investment Program (RCIP) and is a Multitranche Financing Facility (MFF) that will be implemented in the states of Assam, Chhattisgarh, Orissa, Madhya Pradesh and West Bengal.

3. The Government of Madhya Pradesh is now planning to submit to ADB the first Periodic Finance Request (PFR) that includes the proposal for about 171 rural roads totalling to 2066.75 km in the state of Madhya Pradesh. Madhya Pradesh Rural Road Development Authority (MPRRDA) is the Implementing Agency. The preparatory works for the proposed roads under the first tranche have been completed for the state. As per the requirements of ADB, it is mandatory that the subprojects under the programme comply with ADB's environmental safeguards. The project as per classification of ADB has been categorised as 'Category B' project and therefore requires an Initial Environmental Examination (IEE).

4. A review of international agreements and conventions where India is a member were made to ensure compliance. These agreements are: Conventions on Wetlands of International Importance Especially as Water Fowl habitats (Ramsar), Convention concerning the protection of the World Cultural and Natural Heritage, Convention on International Trade in Endangered Species of Wild Fauna & Flora (CITES), Convention on the conservation of Migratory Species of Wild Animals (CMS 1979), and the United Nations Framework Convention on Climate Change, Convention on Biological Diversity.

A. Physical Environment

5. Madhya Pradesh has a topography that is crossed from north to south by plains separated by upland areas. The climate is extreme in the north of Madhya Pradesh. It is cool and breezy in the central parts and humid in the eastern and southern regions. Best time to visit is between September to February. The state has three main seasons: a) winter from November to February; b) summer, from March to May; and c) monsoon season, from June to September.

6. Most of the project area lies in vast open agricultural land and is largely free from air pollution sources other than traffic and few brick-kilns existing in the area. These are located in open area and operate only for few months. As such, the ambient air quality for major pollutants like SO₂, SPM and NO_x is expected to be within the limits.

7. There is neither significant industrial activity nor significant vehicular traffic contributing to ambient noise levels. The occasional vehicular movement on the unpaved roads contributes to increased noise levels over short duration and limited to daytime. The existing roads do not appear to have vehicular traffic at nighttime.

8. State of Madhya Pradesh is the second largest state of the country has covers an area of 30.82 million hectares, which constitute 9.37% of the land area of the country. Landlocked in the central part of the country, Madhya Pradesh has topography that is crossed from north to south by plains separated by upland areas. Geographically, Madhya Pradesh consists of a plateau with a mean elevation of 1600 ft above sea level, interspersed with the mountains of the Vindhya and the Satpura ranges with the Chhattisgarh plains to the east. The hills give rise to the main river systems - the Narmada and the Tapti, running from east to west, and the Chambal, Sone, Betwa, Mahanadi, and the Indravati west to east. Ground elevation varies from 270 m to 750 m above mean sea level.

9. The soils of state are rich and fertile. The state has a variety of soils ranging from rich clayey to gravelly. The major groups of soils found in the state can be divided in to following four categories i.e. alluvial, medium & deep black; shallow & medium black; and mixed red & black. Categorically state has two agro-climatic zones namely (i) Central Plateau & Hill Region and (ii) Western Plateau & Hill Region. These two zones have been further sub-grouped and the description regarding area and its soil & geological features.

B. Biological Environment

10. The project state lies in tropical climate zone. It has a medium range of flora and fauna. Flora, fauna and vegetation types found in the areas have been described separately below. However, none of the roads consists of any rare, endangered or threatened floral species.

11. Of the 171 roads proposed under tranche 1, 3 roads pass through forest area. None of them pass through reserve forest or wildlife sanctuaries. All of them are existing roads/tracks and the road improvement within the forest stretches will be within the existing road width. Still some trees might require felling during clearing up operations for construction of rural roads. In most of cases, tree cutting has been minimized by suitably modifying the alignment.

12. Madhya Pradesh has a total population of 60 Mn persons. It has one of the largest tribal populations in the country. Out of the 50 districts in the State, 19 are predominantly tribal. The State literacy rate presently is 70.6%, which is close to the national literacy rate of 74.04 %. About 18.8, Mn People is considered living below poverty line in Madhya Pradesh, which constitutes about 43% of total population. Agriculture is the main occupation in the state. About half of the land area is cultivable. The extent of availability of cultivable land varies depending on topography, rainfall, and soils. The larger cultivable land is found in the Chambal valley, Malwa Plateau, Rewa Plateau, and Chhattisgarh Plain. The prime crop of the state is Cereals (about 41%), followed by pulses (about 20%), oilseed (about 30%) and Vegetables, fruits, fodder and other horticultural crops (about 9%).

13. The state has various industrially developed estates. The major industrial produce includes cement, pigiron, steel ingots, news print, and sugar. Industrialization is low in the subproject areas. However, there is high potentiality for the growth of cottage and small industries in subproject areas.

C. Anticipated Enviromental Impacts and Mitigating Measures

14. Significant enviromental impacts were anticipated mostly during construction phase. Some of these significant impacts include a) impact on common utilities and community properties; b) loss of productive soil; c) impact on hydrology and drainage; d) compaction and contamination of soil; e) generation and management of construction debris and wastes; f)

increased air pollution level; g) increased noise level; h) impact on ground and surface water quality and availability; i) loss of trees; j) increased level of vehicle traffic; and k) health and economic hazards to the community. Mitigating measures were proposed in the environmental management measures to address all the anticipated environmental impacts.

15. Total annual emissions without the project (business as usual) at the middle of the design life of 7.5 years is estimated at 20,707.92 tons/year and with project scenario is estimated at 20,119.55 tons/year, for all 171 roads proposed for Tranche 1 of RCIP 2. The with project scenario is still far below the 100,000 tons per year threshold set in the ADB SPS 2009 and therefore not required to implement options to reduce or offset CO₂ emissions.

16. Key engineering measures to address climate risk variables such as extreme precipitation, high temperatures and vulnerability to landslides include a) increase in road embankment level road section located in low-lying and flood prone areas; b) erosion protection for areas prone to landslides; c) increase in capacity of spillways and culverts; d) embankment protection through tree plantings; and e) improvement of longitudinal ditches and drains. Provisions have also been made in the bidding documents for the contractor to prepare EMPs based on the final detailed design to address climate related risks and vulnerabilities.

17. **EMP implementation.** The Ministry of Rural Development (MoRD) the executing agency has the responsibility for monitoring implementation of the EMP for all subprojects and undertaking necessary due diligence. MoRD ensure this through its Nodal Agency NRRDA (National Rural Road Development Agency). NRRDA constituted by MoRD is the nodal agency for the implementation of the environmental management plan (EMP). SRRDA is the state level agency responsible for implementation of PMGSY program in the state. NRRDA has developed various guidelines and defined institutional arrangements for effective and timely implementation of PMGSY program, which also covers measures for environmental and social safeguards. In line with the defined institutional requirements, each SRRDA has set up district level project implementation units (PIUs). NRRDA also appoints Technical Support Consultant (TSC) to provide technical support for capacity building in SRRDA/PIUs, facilitating them for environmental and social safeguard compliance monitoring and due diligence. SRRDA appoints PIC (project implementation consultant) for supervision of construction work. PIC also helps PIU in monitoring the EMP.

18. **Environmental Management and Monitoring Plans.** The environmental monitoring program is prepared with aim to monitor the environmental performance of environmental management plan. For rural roads, Environmental Monitoring plan will be more observation oriented and it provides observation areas with frequency of monitoring at pre-construction aspects¹, construction stage and operation stage.

19. **Grievance Redress Mechanism.** Grievance redress mechanism will be implemented from the subproject to national levels. The PIU will designate a public disclosure and complaints contact person for each subproject to help address all concerns and grievances at the subproject level. Grievances, if any, will be considered at the village level by the Grievance Redress Committee (GRC) consisting of members of Gram Panchayat, and Pradhan / Up-Pradhan of Gram Panchayat. The GRC will meet for addressing grievances as needed. Grievances not resolved at the village level will be addressed through the district level GRC, with the following members: Executive Engineer of the PIU, member of Zilla Parishad, member of the grievance committee of the concerned GP; and representatives of affected people. Grievances at this level

¹ Aspects related to alignment selection for inclusion of new roads

need to be resolved prior to contract award. At the national level, NRRDA has made provision of registering complaint /suggestion through its website. NRRDA forwards these complains to concerned SRRDA for necessary actions. SRRDA directly or through concerned PIU initiate the appropriate action and update the complainant as well as NRRDA.

20. Public Consultation. Public consultation was undertaken consistent with the ADB requirements. All the five principles of information dissemination, information solicitation, integration, co-ordination and engagement into dialogue were incorporated in the consultation process. Stakeholders', including women, were consulted to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design. Informal meetings, interviews were organized covering the entire project stretch. Consultations with stakeholders will continue throughout project implementation as necessary at different levels, to update and address the concerns of affected people on environment related issues.

D. Conclusion and Recommendations

21. Conclusion. The proposed Rural Connectivity Investment Program Phase has been categorized as "B" for environment under SPS 2009. No categorization is made under the environmental legislation of India, since these small roads do not require any environmental clearance in accordance with Environment (Protection) Act and Rules, 1986 amended till date. The findings of environment assessment of sample roads indicate that impacts are mostly similar and subprojects are unlikely to cause any significant 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, are temporary in nature, and can be mitigated with minor to negligible residual impacts. All sample roads included under Tranche I were selected based on ecological and climate change consideration defined under EARF. Accordingly, none of the sample roads passes through protected areas or encroaches precious ecology (sensitive or protected areas) or any historical or archeologically protected areas.

22. Significant impacts are not considered adverse and typical to road constructions that are simple to mitigate. Impacts related to road siting in flood and erosion prone areas are mitigated through proper design. During construction, impacts can be mitigated through good engineering practices and compliance to permits and clearances issued by the regulatory agencies. The mitigating measures are institutionalized through the EMP and EMoP, and institutional arrangements were established to implement these plans.

23. Recommendations. Any major changes or any additional work other than the proposed project activities indicated in the IEE and Environment Checklist (formerly Environmental Code of Practice or ECOP) will require updates in the IEE. The updated Environment Checklists and IEE will have to be submitted to NRRDA and ADB for concurrence prior to commencement of civil works.

24. Executing agency shall ensure that updated road specific EMP forms part of DPR and is available to contractor at the time of bidding. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and sanitation facilities at construction camp and temporary office/material storage place as per EMP requirements. The same shall be revised if there is any change in the project design. Any such change shall be reported to ADB as well.

II. INTRODUCTION

A. Project Background

1. Pradhan Mantri Gram Sadak Yojana (PMGSY) aims to provide all-weather road connectivity to currently unserved habitations in India's rural areas, where 70% of the population live. The Government of India (GOI) launched "The Pradhan Mantri Gram Sadak Yojna (PMGSY) in year 2000. The objective of PMGSY is to provide all-weather road connectivity to all rural habitations with a population of more than 500 persons in plains and 250 persons in hill states. This program is being implemented through National Rural Road Development Agency (NRRDA) under Ministry of Rural Development (MORD) at central level and through State Rural Road Development Authority/Agencies (SRRDA) at state level.

2. The Second Rural Connectivity Investment Program (RCIP-2) is continuation of Rural Connectivity Investment Program (RCIP) and is a Multi-Tranche Financing Facility (MFF) that will be implemented in the states of Assam, Chhattisgarh, Orissa, Madhya Pradesh and West Bengal. Investments in rural roads will improve connectivity, cut transport costs, and provide enabling infrastructure to areas currently with poor access to markets and urban towns, and thus contribute to growth and equity in the country's largest sector.

3. The Government of Madhya Pradesh is now planning to submit to ADB the first Periodic Finance Request (PFR) that includes the proposal for about 171 rural roads totalling to 2066.75 km in the state of Madhya Pradesh. Madhya Pradesh Rural Road Development Authority (MPRRDA) is the Implementing Agency. The preparatory works for the proposed roads under the first tranche have been completed for the state. As per the requirements of ADB, it is mandatory that the subprojects under the programme comply with ADB's environmental safeguards. The project as per classification of ADB has been categorised as 'Category B' project and therefore requires an Initial Environmental Examination (IEE). The Initial environmental examination (IEE) report has been prepared by using environmental checklist for sample roads.

B. Project Roads Identification and Location

4. PMGSY has prepared specific guidelines for the selection of roads under this programme. The key requirements are that any road will be eligible for construction or up-gradation only if it is part of the Core Network² and satisfy the following environmental safeguards:

- i. The selected road shall not disturb any cultural heritage designated by the Government or by international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- ii. The selected road shall not pass through any designated wildlife sanctuaries, national parks, notified ecological sensitive areas or area of international significance (e.g., protected wetland designated by the Wetland Convention);

² Core Network is that minimal network of roads (routes) that is essential to provide access to essential social and economic services to all eligible habitations in the selected areas through at least single all-weather road connectivity. A core network comprises of through routes and link routes. Through routes are the ones, which collect traffic from several link roads or a long chain of habitations and lead it to marketing centres either directly or through the higher category roads i.e., the district roads or the state or national highways. Link routes are the roads connecting a single habitation or a group of habitations to through routes or district roads leading to market centres. Link routes generally have dead ends terminating on a habitation, while through routes arise from the confluence of two or more link routes and emerge on to a major road or to a market centre.

- iii. The sub projects shall only involve activities that follow Government of India laws and regulations and meets funding agency safeguard policies.

5. Summary of the proposed subprojects is as under:

- No. of districts where subprojects are located : 29
- Total number of roads proposed under batch I 171
- Total length of roads (Km) : 2,066.75

6. These districts are located all over the state covering 29 out of the 50 districts. In this batch of subprojects, the longest road is 42.66 km (T17- Barasiya to Khukariya road in Barasiya block of Bhopal district), while MRLT01- Manpur Beohari Road to Balhaund (1.10 km) in Manpur block of Umria district is the shortest. The average length of roads works out to 12.09 km.

C. ADB Safeguard Policies and Category of the Project

7. The Asian Development Bank has defined its Safeguard requirements under its 'Safeguard Policy Statement 2009' (SPS 09). The SPS 09 require environmental assessment, mitigation and commitment towards environmental protection. 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. ADB as per SPS 09 classifies a project into category A, B or C depending on potential adverse environmental impacts.

8. All environmentally sensitive components along each subproject is critically analysed to assess the magnitude and extent of likely impacts. These sample subproject roads stretches do not pass through any protected areas nor located near any archeologically important monument. As per selection guidelines, none of the selected subproject passes through reserved forests either. Few trees cutting though may be involved. The roads primarily pass through agricultural and residential areas. Most of the sample roads aligned along existing village roads and unpaved movement paths. As such, there is no land acquisition as the additional land required for the project is availed through voluntary donation from the affected persons. Hence, the project will fall under category B as per ADB Safeguard Policy Statement 2009.

9. No categorisation is made under environmental legislation since these small roads do not require any environmental clearance in accordance to Indian Environmental (Protection) Act and Rules, 1986 amended till date.

D. Objectives and Approach for Environmental Assessment

11. Since there is large number of subproject roads involved under second RCIP and magnitude of each road is small, preparation of individual IEE for each road will be difficult and time consuming. ADB had finalised Environmental Code of Practices (ECOP) checklist under RRSIIP and RCIP I, which is modified for second RCIP. Subprojects specific Initial Environmental Assessment (IEE) is carried out as per this ECOP checklist. Sample ECOP checklist with annexures on tree, utility and community structures, strip maps and photographs for each selected sample road is enclosed as

E. IEE Methodology and Content

13. The state specific IEE has been largely structured as per Safeguards Policy Statement, 2009. The IEE reports, including EMPs, monitoring plans, cover the most environmentally sensitive components in state as well as specific to subproject roads.

14. **Corridor of Impact:** The direct area of influence or the corridor of impact (COI) has been considered as, 10 m on either side of the proposed sample roads alignment based on the proposed cross-section.

15. **Field visits, Primary and Secondary Data Collection:** Each selected sample road was visited along with concerned PIU officials for environmental assessment and identification of associated environmental issues. Each road specific strip map was prepared during the field visit to capture the information related to tree inventory, utility and community structures located along the proposed road alignment, surface water bodies, and ecological sensitivities. Secondary environmental information pertaining to the environmental issues, protected area, forests areas were collected from various government and non-governmental / research institutions for assessment of the baseline environment of the project locations, district and state as a whole.

16. **Data Analysis, Impact identification and Mitigation Measures:** Information collected was analysed. The impacts were identified using expert's assessment and following established practices. Mitigative measures are proposed common to all roads under second RCIP and specific to the roads. EMP is prepared considering mitigative measures and institutional framework of SRRDA.

17. The IEE report includes following seven chapters including this introduction Chapter.

- Chapter 1- Introduction
- Chapter 2- Description of Project
- Chapter 3- Description of Environment
- Chapter 4- Anticipated Impacts and Mitigation Measures
- Chapter 5- Institutional Requirement and Environmental Monitoring Plan
- Chapter 6- Public Consultation and Information Disclosure
- Chapter 7- Conclusion and Recommendation

F. Legal Framework and Legislative Requirements:

18. 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. India is also a signatory to various international conventions and protocols.

19. As per Environment (Protection) Act, 1986; the Environmental Impact Assessment Notification, 2006; amended in 2009 defines the environmental impact assessment for defined development projects. All new or expansion of National and State Highways requires Environmental Impact Assessment and Environmental Clearance from central or state level Environmental Appraisal Authority. However, small roads projects as proposed under second RCIP do not require environmental assessment or clearance as per above notification.

20. In addition to above, new road construction or road improvement work attract many legislation including diversion of forest land, tree cutting, opening of new quarry, establishment of temporary workshops, construction camps, hot mix plants, and use of vehicles for construction. The legislation applicable for tranche 1 roads are listed below:

Sl. No.	Legislation	Applicability
1.	Environment (Protection) Act 1986-EIA Notification 2006 (Amended 2009)	Not applicable to rural roads. It is applicable only to National and State highways.
2.	Forests (Conservation) Act 1980 (Amended 1988), and Forest (Conservation) Rules, 1981, (Amended 2003)	As per above Act/Rules <i>Forest Clearance</i> from Department of Forests/Ministry of Environment and Forests Govt. of India is required for diversion of forest land (if any) for non-forest purpose. Prior permission is required from forests department to carry out any work within the forest areas and felling of roadside trees. Cutting of trees need to be compensated by compensatory afforestation as per permission condition.
3.	The Wildlife (Protection) Act, 1972 (Amended 1993); Not applicable in this case. Since No roads will be selected passing through protected areas or sanctuaries	Not Applicable, as no road passing through protected areas is selected
4.	The Water (Prevention and Control of Pollution) Act 1972 (Amended 1988), and the Water (Prevention and Control of Pollution) Rules, 1974	Placement of hot-mix plants, quarrying and crushers, batch mixing plants, discharge of sewage from construction camps requires <i>No Objection Certificate (Consent to Establish and Consent to Operate)</i> from State Pollution Control Board prior to start of construction or setting up specific facility. <i>Authorisation</i> will also be required for disposal of Hazardous Waste like waste oil etc. from State Pollution Control Board
5.	The Air (Prevention and Control of Pollution) Act, 1981, (Amended 1987), and the Air (Prevention and Control of Pollution) Rules, 1982	
6.	The Noise Pollution (Regulation and Control) Rules, 2000 (Amended 2002)	
7.	The Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008 (Amended 2009), and the Batteries (Management and Handling) Rule, 2001	
8.	Guidelines for Ground Water Extraction Prescribed by Central Ground Water Authority under the power granted under Environment (Protection) Act 1986	<i>Permission</i> from Central Ground Water Authority (CGWA) is required for extracting ground water for construction purposes, from declared as Semi-critical, Critical and Overexploited areas from ground water potential prospective. For NOC, An application in the prescribed Performa is to be submitted either to the Office of the Regional Director, (CGWB) of the concerned state, or to Member Secretary, CGWA, New Delhi

21. The PMGSY Scheme and Guidelines (2004) No. 12025/8/2001-RC, Ministry of Rural Development (MORD) also defines environmental safeguards particularly with respect to road selection and regulatory compliance which is also to be complied with.

G. Acknowledgement

22. The Technical Support consultants (TSC) gratefully acknowledge the support received from NRRDA and MPRRDA throughout the environmental assessment process. We also acknowledge the assistance received from respective PIUs and the PIC during field visits and other Govt. agencies for primary and secondary data collection as well during public consultation.

III. DESCRIPTION OF THE PROJECT

A. General

23. The PMGSY program has mandate to provide all-weather roads to all the rural habitations within the country. Second RCIP is planned to meet above objectives. 613.899 Km roads (46 nos.) are identified as sample roads for Madhya Pradesh under Tranche I of Second RCIP. The broad specification for road alignment selection, payment design, construction methodology, geometric design etc. are same and is as per the "Specification for Rural Roads" published by IRC on behalf of the Ministry of Rural Development, Govt. of India. The design details presented in this chapter are as per above specifications. Minor changes will apply depending on road specific issues and design consideration.

24. Since topography of most of the project districts in Madhya Pradesh state is largely flat, the design details applicable to flat terrain are presented in following section.

B. Sample Roads Selected in Madhya Pradesh State

25. The Madhya Pradesh state has selected 171 roads with a total length of 2066.75 Km spread over 29 districts as summarised at **Table 1** below and detailed at **Appendix 1**.

Table 1: Summary of District Wise Rural Roads

SI No	District	Block	Road Name	Length (Km)
1	Gwalior	Morar	Bilheti to Manpura	3.00
2	Gwalior	Morar	Morar Behat Road to Fusawali	5.00
3	Datia	Datia	Badora to Pichhore Road	20.00
4	Datia	Bhander	Bhander Chirgoan Road to Salon Bharroli	1.20
5	Datia	Bhander	Bhander to Sarsai	18.40
6	Sehore	Sehore	Ahamadpur Charnal, Chandbad, Parason	26.50
7	Jabalpur	Jabalpur	Pahadi Kheda- Silpur-Bligada	3.00
8	Jabalpur	Jabalpur	NH7- Tinsi-Tinsa	5.00
9	Jabalpur	Majholi	Majholi to Suhajni	6.64
10	Jabalpur	Patan	SH22A(Udana) to Sakra	13.60
11	Sehore	Ashta	Ashta Shujalपुरa Road to Khamkheda	9.60
12	Sehore	Ichhawar	Ichhawar To Kheri	9.00
13	Sehore	Nasrullaganj	Raheti to Gondi Guradiya, Chakaldi Amirganj	22.06
14	Sehore	Budhni	Jahajpura to Sattumadi, Ninor,Bibada to Budhni Rehti Rd	11.94
15	Rajgarh	Rajgarh	Guradiya to Patrikala (Chhatukheda)	5.80
16	Rajgarh	Rajgarh	Khujner Road (Chhatukheda Jod) to Padliyakhedhi	5.15
17	Rajgarh	Rajgarh	NH-3 (A.B. Road) to Dehri Baman	2.60
18	Rajgarh	Jeerapur	Machalpur to Kundaliya	11.60
19	Rajgarh	Jeerapur	Jeerapur to Paroliya	3.80
20	Bhopal	Phanda	T-010 Khajuri to T-008 Badjhiri via- Pipaliya Dhakad, Rasulia Ghat, Borkhedi, Khokariya, Jatkhedi, Teelakhedi, Narela, Moondla, Jhajariya Khurd	19.60
21	Badwani	Badwani	Badwani – Badgaon – Sajwani to Lonsara Rd	11.255
22	Mandsour	Mandsour	Ajikhedi-Jawasiya-Nandawata to Garoda	28.081
23	Neemuch	Jawad	T-01 Sarwaniya Maharaj to Lasoor	8.585
24	Damoh	Bhatiyagr	Bakayan-Futera-Magron Road	18.18

SI No	District	Block	Road Name	Length (Km)
25	Panna	Pawai	CDRL-08 Tigra-Mahodkala-Chandanpur-Khamariya	22.40
26	Sheopur	Sheopur	Sheopur to Dhodar (Canal Service Road) (ML-01)	36.00
27	Shivpuri	Narwar	Satanwada Bhitwar (MDR) Magroni To Hateda (Karera Bhitwar MDR Road) (Via Kankar, Phoolpur)	19.31
28	Satna	Majjhgawa	Gupt Goadavari to Sati Ansuyia	11.62
29	Rewa	Jawa	Ghooman to Rimari	11.00
30	Guna	Guna	Pagara-Ukawad to Barkheda Safa	19.20
31	Ashok Nagar	Ashok Nagar	Bamora Baskhedi to Pipalkheda	2.60
32	Dindori	Karanjiya	Bijouri to Chouradadar	9.95
33	Mandla	Niwas	Barela Niwas Rd to Pipraiya (MDR)	14.30
34	Chhindwara	Chhindwara	Chhindwara Nagpur NH-547 To Salaiya Via Sankh	24.00
35	Narsinghpur	Gotegaon	O.B. Road (Karkbel, Bamhni, Pipariya Mushram) To Themis Surwari To Malahpipariya Via (Basanpani Bouchar Karakuel themis)	13.886
36	Chattarpur	Bijawar	Malguwan Bijawar Road to Nayagaon	4.80
37	Tikamgarh	Tikamgarh	Darguwan To Dari	3.86
38	Umariya	Pali	Pali to Sudardadar	8.60
39	Shahdol	Budhar	Padkhuri to Tengha Via Keshwahi	36.725
40	Annuppur	Jaithari	AJV Road (Pondi) to Sulkhari	10.15
41	Sidhi	Sidhi	Gandhigram Saro Khurd Road	17.225
42	Sagar	Khurai	MRL -08 (NH-26a) Bhilone to Bhusa to Karaiya Gurjar to Katheli (SH-42)	16.28
43	Khargone	Segaon	Golwadi-Lehakoo to Keli	16.952
44	Sagar	Rehli	Ron Chulla to Baleh Road	25.60
45	Mandsour	Bhanpura	Garoth Bhanpura Road to Kuntalkhedi	7.75
46	Panna	Panna	MR Panna Pahadikheda to Siraswaha	12.10

C. Project Description

1. Rural Road Construction Proposals

26. The proposed rural road construction work will provide 3.75 to 7.5 m roadway width³ with 3.75 m carriageway in accordance with the IRC-SP 20: 2002 in plain terrain. The proposal considers a 3.75 m cement concrete pavement with lined storm water drains for stretches passing through built-up areas, waterlogged/water overtopping/ flood prone areas. The pavement design considers a base layer of variable thickness as per the design with granular sub base, 150 mm thick water bound macadam (WBM grade I & II) and finally topped with 20 mm thick bituminous pavement. Adequate cross drainage structures like pipe or slab culverts/bridge structures are considered for drainage channels across the roads. Few minor bridges are also proposed for construction. **Figure 2** shows the typical cross section of the rural roads.

27. The rural road construction works will be in conformance with the Rural Roads Manual and / or Technical Specifications (IRC: SP20: 2002) for Rural Roads published by the Indian Road Congress (IRC) on behalf of Ministry of Rural Development, Government of India. The broad design considerations are given at later part of this chapter.

³ The road width may be reduced to 6m in case of BT and 3.75 m in case of CC as per PMGSY recent guideline.

2. Present Condition

28. The project roads mainly pass through plain or riverine terrain and agricultural area. The project roads have several cross drainage structures, electric posts and telephone post along the existing alignment. There are some community physical structures like Temple, Mosque, primary or secondary schools beside the roads alignment, but largely will not be affected due to the road works.

3. Alignment and Profile

29. The existing road is generally an earthen track with some stretches of brickbat soling (description of the road surface). Thus, the project road is a new connectivity road. The construction works are to be confined to the existing alignment. The existing horizontal and vertical alignment / profile will be generally maintained except for minor smoothening or corrections to sustain consistent design speed without causing any land acquisition requirements and thereby the possible social and/or environmental concerns.

4. Design Considerations

30. **Geometrical Design and ROW Requirements:** The geometric design standards for this project will conform to PMGSY II guidelines. Recommended design standards vis-à-vis the standards followed for this road are described below. The requirement of ROW as per PMGSY II guidelines considered for the design is given at Table 2 below:

Table 2: ROW Requirement

Road classification	Plain and Rolling Terrain (ROW in m)			
	Open Area		Built-up Area	
	Width	Range	Width	Range
Rural roads (ODR and VR)	15	15-25	6.0	6.0

ODR: Other District Road; VR: Village Road

31. Since terrain is plain and the proposed Carriage way will be between 3.75 to 5.5m depending on the traffic flow, the design speed considered is as per recommended design speed of 60 Km/h. The radius of horizontal curve is considered as 90 m ruling minimum (60m absolute minimum). The vertical alignment is designed as per ruling gradient of 3.3% applicable for plain terrain.

32. **Pavement and Embankment Design:** Considering the sub-grade strength, projected traffic and the design life, the pavement design for low volume PMGSY roads are proposed to be carried out as per guidelines of IRC: SP: 72 – 2007 or IRC SP:77 “Design of Gravel Road” and IRC SP:62-2004 “Cement Concrete roads”. In built up area for hygienic and safety reasons, C.C pavement is proposed with a hard shoulder and appropriate line drain. A design life of 10 years is considered for the purpose of pavement design of flexible and granular pavements. The embankment height considered as 1m (average) from ground to crust except at the approaches of cross drainage structures. The embankment height will vary in flood prone area as per the HFL.

33. **Road side drain:** As the insufficient drainage of surface water leads to rapid damage of road, road side drain (**Figure 2**) are provided on the locations of habitation areas with concrete pavement. The rainwater will flow along the longitudinal slope and intermittent gaps in concrete curbs

34. **Carriageway:** The carriageway is proposed as 3.75 m as per IRC-SP20: 2002. It may be even restricted to 3.0 m, where traffic intensity is less than 100 motorised vehicles per day and where the traffic is not likely to increase due to situation, like dead end, low habitation and difficult terrain condition. The ROW requirement in built-up/constricted area may be even reduced to 4 m.

35. **Shoulder:** Earthen shoulder shall be constructed in layers and compacted to 100% of Proctor's Density. It is proposed to have 1.875 m wide shoulder (0.875 m hard shoulder and 1 m earthen shoulder) on either side of carriage way.

36. **Surfacing:** Slow setting bitumen emulsion will be applied as primer on water bound layer. Rapid setting bituminous emulsion shall be used for Tack coat. Premixed carpet 20 mm thick and mixed with equivalent viscosity grade bitumen shall be laid as surfacing course. 6 mm thick, Type B seal coat is considered for sealing of the premixed carpet.

37. **Structural Works:** Following grades of concrete are proposed for structural works as per specified MORD and IRC specifications:

- Concrete in superstructure of Slab Culvert – M-25 (RCC)
- Concrete in Abutment cap, Dirt wall of slab culverts – M-25 (PCC)
- Brickwork in Abutment, Return Wall, Headwall – Cement mortar (1:4)
- Concrete below Abutment, Return Wall, Headwall – M-10 (PCC)
- Concrete in pavement (on carriageway) – M-30 (PCC)
- Concrete in pavement (on shoulder and drain) – M-25 (PCC)

5. Construction Methods

38. Since the proposed rural roads are small in length, NRRDA has framed specific guidelines for cost effective construction of these rural roads. As per the guideline of NRRDA, construction by more of manual means is preferred. Motor grader & tractor-towed rotavator shall be used for handling of bulk materials like spreading of aggregates in sub-base & base courses by mix-in-place method. Ordinary smooth wheeled roller shall be used for compaction if the thickness of the compacted layer does not exceed 100 mm. It is also considered that, hot mix plant of medium type & capacity with separate dryer arrangement for aggregate shall be used for bituminous surfacing work that can be easily shifted. A self-propelled or towed bitumen pressure sprayer shall be used for spraying the materials in narrow strips with a pressure hand sprayer. For structural works, concrete shall be mixed in a mechanical mixer fitted with water measuring device. The excavation shall be done manually or mechanically using suitable medium size excavators.

6. Available Right of Way

39. As per the information available from transect walk, ROW is largely available for the rural roads. Additional land required for road improvement will be secured through voluntary donation from private landowners through the Community Participation Framework (CPF). The CPF establishes guidelines to ensure that donation is voluntary and negative social and economic impacts due to the project will be avoided or minimized. The community consultation processes for subproject preparation result in a set of documents that collectively serve as a plan for mitigating likely negative impacts of each subproject. This process follows the ADB social safeguard requirements mentioned below for projects involving voluntary donations:

- (i) full consultation with landowners and any non-titled people on site selection;

- (ii) voluntary donations do not severely affect the living standards of APs and are directly linked to benefits, with community sanctioned measures to replace any losses that are agreed through verbal and written record by affected people; and
- (iii) Voluntary donations are confirmed through verbal and written record and verified and adopted through constitutional process.
- (iv) Adequate grievance redress mechanisms are in place.

7. Traffic

40. The present traffic data on each of these rural roads typically varies between 10-15 vehicles per day on most of the rural stretches. The traffic largely comprises motor cycles/two wheelers, tractors, light commercial vehicles, animal drawn carts and bicycles.

8. Economic Assessment

41. The economic analysis carried out for the project has indicated that the rural road construction works will act as a catalyst for the rural economic growth and poverty alleviation of the community in the region.

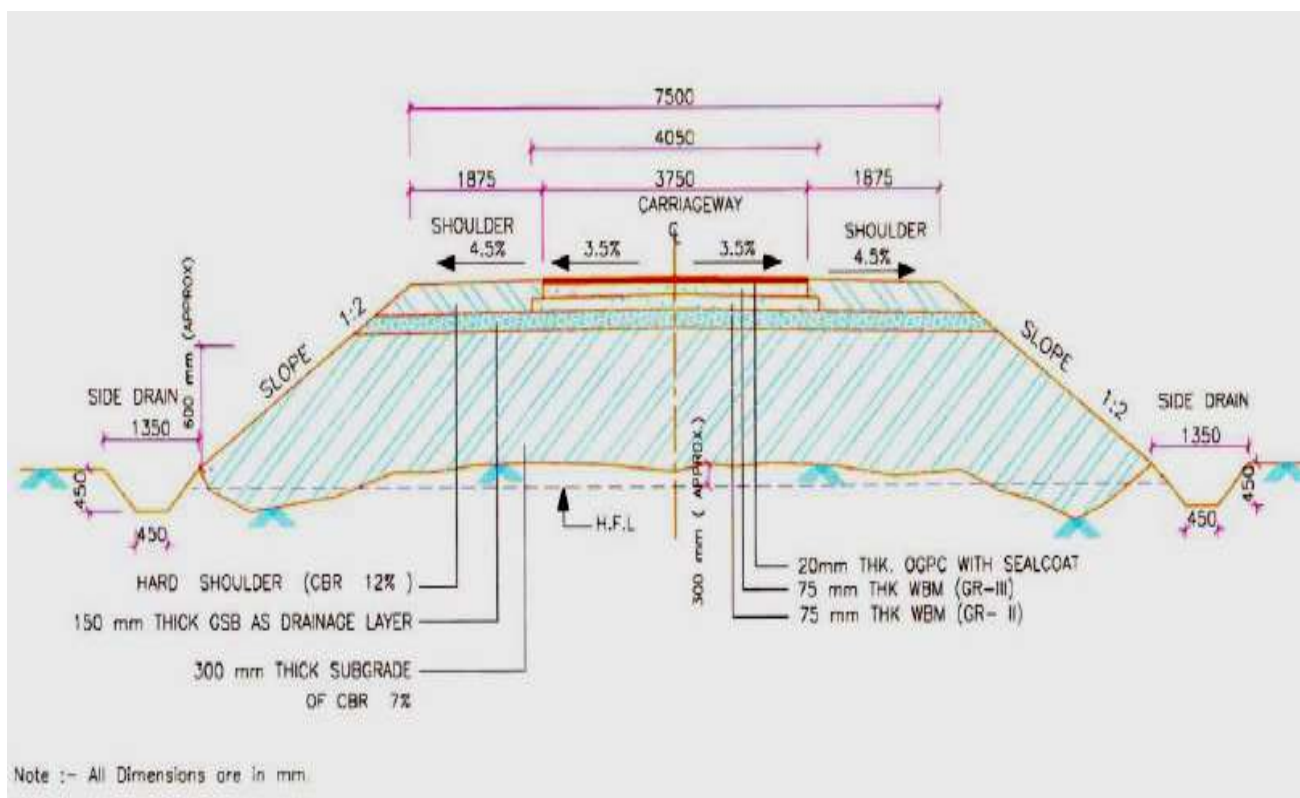


Figure 2: Cross-section of Rural Roads

IV. DESCRIPTION OF THE ENVIRONMENT

A. Background

42. Baseline environmental conditions about all facets of environment viz. physical, biological and socio-economic have been established using both primary and secondary sources, consultation with local people, and interaction with forests officials and other Government officials. Efforts have been made to collect the latest information both at regional as well as local level especially along the project roads alignment. This will help to predict likely changes in the environment due to the second RCIP road construction and will serve as performance indicators for various components.

43. The baseline information is presented below at state level and district level. Road specific environmental salient features has also been summarised in this chapter.

44. Madhya Pradesh is located between lat. 21°04' N and long. 74°02' and 82°49' E, The geographical area of the state is 308,144 km² (118,975 sq mi) which constitutes 9.38% of the land area of the country. The forest area of the state is 95,221 km² (36,765 sq mi) constituting 31% of the geographical area of the state and 12.44% of the forest area of the country. The state boundary touches six states of the country, namely Chhattisgarh, Maharashtra, Andhra Pradesh, Orissa, Jharkhand & Uttar Pradesh. The selected Sample roads fall in 29 out of the 50 districts in the state. Summary key environmental features of some of these districts from all spatial regions are given in **Table 3**.

B. Physical Environment

1. Meteorology and Climate

45. Madhya Pradesh has a topography that is crossed from north to south by plains separated by upland areas. The climate is extreme in the north of Madhya Pradesh. It is cool and breezy in the central parts and humid in the eastern and southern regions. Best time to visit is between Septembers to February. The state has three main seasons:

- **Winter:** November to February are the months of winter during which the average temperatures range from 10° to 27° C (50° to 81° F). Winters are usually pleasant and dry
- **Summer:** The March-to-May season is hot and dry. Summers are hot, with an average temperature of 29° C (85° F) and a high temperature that at times reaches 48° C (118° F).
- **Monsoon season:** The climate is monsoonal between June to September. During the monsoon season temperatures average 19° to 30° C (66° to 86° F). Madhya Pradesh receives an average annual rainfall of about 1200 mm (nearly 50 in), of which 90 percent falls during the monsoon season.

2. Ambient Air Quality

46. Most of the project area lies in vast open agricultural land and is largely free from air pollution sources other than traffic and few brick-kilns existing in the area. These were located in open area and operate only for few months. As such, the ambient air quality (for parameters SO₂, RSPM and NO_x) is expected to be within the limits in most of rural and semi urban areas. However, in absence of any existing data on ambient air quality levels of the project area, secondary sources were referred.

Table 3 : Summary Key Environmental Features of the Sample Roads Districts

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
Bhopal	<ul style="list-style-type: none"> ▪ Bhopal district has an area of 2772. 40 sq. km. ▪ Bhopal is divided into two sub-divisions-Berasia and Huzur ▪ Bhopal district has a total population of 2,368,145 as per 2011 census ▪ Bhopal is surrounded by Guna to the north, Vidisha in north-east, Raisen in East and South-East, Sehore in south and south-west and Rajgarh in the north-west zone 	<ul style="list-style-type: none"> ▪ The climate is dry to sub-humid and the average yearly rainfall is around 1130 mm. 	<ul style="list-style-type: none"> ▪ Van Vihar is a forest area around Bhopal 	<ul style="list-style-type: none"> ▪ The district is part of the Vindhya Plateau 		The soil is medium to shallow black		
Ashoknagar	<ul style="list-style-type: none"> ▪ Ashoknagar is divided into three sub-divisions, Ashoknagar, Mungaoli and Chandaoli, and into five tehsils, Ashoknagar, Mungaoli, Chanderi, Issagarh and Shadora ▪ It is surrounded by the districts of Guna, Vidisha, Sagar and Shivpuri districts 	The climate is semi-arid and rainfall is in the range of 650 to 700 mm				The soil is of medium black alluvial type		

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
Sagar	<ul style="list-style-type: none"> ▪ District is located in the north central region of Madhya Pradesh and lies between north latitude 23°10' to 24°27' and east longitude 78°4' to 79°21'. Covering a total area of 10,252 km² and a population of 2,021,783 as per census 2001 ▪ District is surrounded by Vidisha, Raisen, Lalitpur, Narsinghpur, Damoh and Chatarpur in west, westsouth, south, east, and northeast respectively. ▪ It is located at an elevation of 427 metres (1401 ft) 	<ul style="list-style-type: none"> ▪ The climate of the district is classified in four seasons: Summer (mid March to mid June), Winter (mid November to mid March) and Rainy Season (mid June to mid September) and Autumn (mid September to Mid November). The maximum and minimum temp ranges from 48 ° C (in May/June) to 6 ° C in January. The annual rainfall vary from 850 mm to is 1140 mm 	Nauradehi Sanctuary is present in the district but none of subprojects passes through this protected area	<ul style="list-style-type: none"> ▪ The district extends over two Physiographic divisions: <ul style="list-style-type: none"> ▪ <i>Bundelkhand massif in the north.</i> ▪ <i>Malwa Plateau in the south.</i> ▪ Major land use is agriculture 	The district is drained by the following four rivers: <i>Ganga Basin</i> , <i>Ken sub basin</i> , <i>Betwa sub basin</i> , <i>Narmada basin</i>	The major soils are Clay loam, Sandy clay loam and Sandy loam	The principal crops are Wheat, Rice, Jowar, Maize, Gram, Sugar cane	The district has no key environmental issue except that its surface water sources in major town are not safe for drinking due to increasing urbanisation. Ground water is suitable for drinking as per Central Ground Water Board. The district has substantial agriculture activities. District area lies in tropical climate zone and has medium range of flora and fauna.

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
Chhindwara	<ul style="list-style-type: none"> Chhindwara, located south-west of Satpura range 21.28 to 22.49 degree north longitude, and 78.40 to 79.24 degree east latitude The population of the district is 1,84,8882 as per 2001 census The total area of the district is 11,815 sq km It has 12 tehsils, namely, Chhindwara, Tamia, Parasia, Junnardeo, Amarwara, Chourai, Blchhua, Harrai, Mohkhed, Sausar and Pandhurna Chhindwara is surrounded by Betul in west, Hoshangabad in north-west, Narsimhapur in north and Seoni district in east, whereas its southern side borders Maharashtra 	<ul style="list-style-type: none"> The climate is dry sub-humid type and annual rainfall is in the range of 1200 to 1250 mm 		<p>Chhindwara district forms part of the Satpura plateau. It is divided into three main regions namely:</p> <ul style="list-style-type: none"> <i>The Plains near Nagpur region</i> The central region comprising the Satpura Range The Northern <i>Hilly Terrain</i> 	There are five major rivers which flow through the district namely Kanhan, Pench, Jam, Kulbehra, Shakkar and Doodh.	The soil is shallow to medium black type		

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
Guna	<ul style="list-style-type: none"> Guna district is located between 23.53 and 25.65 degree north longitude, and between 76.48 and 78.16 degree east latitude, and on the north-eastern part of Malwa Plateau Guna district has a population of 838926 living in an area of 6484.63 sq km It is divided into five tehsils, namely Guna, Aron, Raghogarh, Kumbhraj and Chanchoda, and five blocks, namely Bamori, Guna, Raghogarh, Chanchoda and Aron Guna is surrounded by Shivpuri in the north, Sagar in south-east and Vidisha, Bhopal, Rajgarh districts in the south. Its western portion borders the Rajasthan state. 	<ul style="list-style-type: none"> The climate is semi-arid and annual rainfall varies between 650 to 700 mm 	<ul style="list-style-type: none"> Guna has one forest village 		Parbati and Betwa are the two main rivers	Guna is richly endowed with black cotton soil. The soil type is of medium black alluvial		
Jabalpur	<ul style="list-style-type: none"> Jabalpur is divided into four tehsils, namely Sihora, Patan, Jabalpur and Kundam The total population of Jabalpur district is 2,15,1203 as per 2001 census 	<ul style="list-style-type: none"> The climate is dry sub-humid and the average annual rainfall ranges between 1050 to 1100 mm 		<ul style="list-style-type: none"> Jabalpur forms part of the Kaimur Plateau and Satpura hills 		The soil is of medium black type		

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
	<ul style="list-style-type: none"> Jabalpur is surrounded by Katni in the north & north-east, Damoh in the north and north-west, Narsimhapur in the south-west, Seoni in the south and Mandla in the south-east 							
Mandsaur	<ul style="list-style-type: none"> Total Geographical area of Mandsaur district is 5521 Sq. Km The total population of Mandsaur district as per 2001 census is 1183274 Mandsaur has four sub-divisions namely Mandsaur, Sitamau, Malhargarh and Garoth 	<ul style="list-style-type: none"> The climate is semi-arid and average annual rainfall ranges between 850 and 900 mm 		<ul style="list-style-type: none"> Mandsaur forms part of the Malwa and Nimar Plateau 		The soil is medium to deep black	Wheat, Jowar, Maize and pulses like Gram, Urad and Arhar are the main crops	
Neemuch	<ul style="list-style-type: none"> Neemuch lies between 24.15 and 24.35 degree north longitude, and between 74.45 & 75.37 degree east latitude The population of Neemuch as per 2011 census is 825958 	<ul style="list-style-type: none"> The climate is semi-arid and average annual rainfall ranges between 850 and 900 mm 		<ul style="list-style-type: none"> Neemuch forms part of the Malwa and Nimar Plateau 		The soil is medium to deep black	Wheat, Jowar, Maize and pulses like Gram, Urad and Arhar are the main crops	

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
Satna	<ul style="list-style-type: none"> Satna district is located between Longitude : 80°21' and 81°23' east Latitude : 23° 58' and 25°12' north Satna district has an area of 7502 sq kms The population of Satna is 2,228,619 as per 2011 census Raghuraj Nagar, Rampur Baghelan, Nagod, Amar Patan and Maihar are the five sub-divisions of Satna Satna has seven tehsils, namely Raghuraj Nagar, Rampur Baghelan, Nagod, Unchehra, Amarpatan, Ram Nagar and Maihar 	<ul style="list-style-type: none"> The climate is dry sub-humid and the average annual rainfall ranges between 1050 to 1100 mm 	<p>Mixed forests cover an area of 900 square miles in the district, extending over four ranges with headquarters at Satna, Majhgawan (both in Raghuraj Nagar tehsil) Nagod and Maihar.</p> <p>Teak (tectona grandis) occurs in about 10 square miles of Satna range, 8 square miles of Nagod range and 5 square miles of Maihar range. There is no Sal (Shorea robusia) in any one of the ranges. Bamboo is found in all the ranges. Other trees that occur in the district are saja (Terminalia tomentosa),</p>	<ul style="list-style-type: none"> The Kaimurs, the Panna hills, and the Vindhya system together with their spurs constitute the principal hills of the district. Satna district lies on Vindhyan Plateau, which has an average altitude of 1000' to 11000'. The southern portion of Nagod Tehsil below 24°30' north latitude is a hilly country consisting of a tangled mass of low hills, and enclosing considerable stretches of level ground. The Kaimur ridge, with its scarp side to the south, rises suddenly like a wall about eight miles to the north of Son river, going towards the east, with slight northerly inclination, almost parallel to the Son river. 	<p>Tons, Son, and Paisuni are the important rivers of the district draining it into the Bay of Bengal through the Ganga.</p> <p>Other major rivers of Satna are Satna river, Amran river, Tons river, Behar river and Barua river.</p>	The soil is of medium to deep black type		

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
			salai (Boswellia serrata), tendu (Diospyros tomentosa), Woodfordia floribunda, Khair (Acacia catechu), etc	<ul style="list-style-type: none"> The south western Maihar tehsil consists mainly of sandstones of Bhandar series, concealed in great part by alluvium. 				
Sehore	<ul style="list-style-type: none"> Sehore stretches between 22.31 degree to 23.40 degree north longitude, and from 76.22 degree east to 78.08 degree east latitude Sehore has a total population of 1,311,008 as per 2011 census Sehore is surrounded by seven districts, viz, Bhopal, Raisen, Hoshangabad, Dewas, Shajapur, Rajgarh and Harda 	<ul style="list-style-type: none"> The climate is dry to sub-humid and the average yearly rainfall is around 1100 to 1150 mm 		<ul style="list-style-type: none"> Sehore district's height is around 1500 ft to 2000 ft from the sea level 	Narmada, Parvati, Dudhi, Newaj, Kolar, Papnas, Kulans, Seewan, Lotia among others, are the main rivers of Sehore district	The soil is of medium black type		
Tikamgarh	<ul style="list-style-type: none"> Tikamgarh extends between the latitude 24 degree 26 minute and 25 degree 34 minute N and between 78 degree 26 minute and 79 degree 21 minute Longitudes Tikamgarh District is bounded by Chhatarpur district to east, Lalitpur 	<ul style="list-style-type: none"> The climate is dry sub-humid and average annual rainfall ranges between 700 to 750 mm 		<ul style="list-style-type: none"> Tikamgarh forms part of the Bundelkhand Plateau region 	Betwa, Dhasan, Jamni, Bagri and Barua are the main rivers of	The soil is of mixed red and black type	The main crops are Jowar, Wheat, Paddy, Urad and	

Districts	Location	Climate	Ecologically Sensitive Area (Wild Life Sanctuaries/National Park etc)	Geomorphology (Major Physiographic Units and land use)	Major Drainage	Major Soil Type	Principal Crops	Key Environmental Issues
	<p>district Uttar Pradesh to West, Jhansi to North and Sagar to South</p> <ul style="list-style-type: none"> ▪ The total area is 5048 sq km ▪ The total population is 1,202,998 as per 2001 census ▪ Tikamgarh has three sub-divisions namely Tikamgarh, Niwari and Jatar; and six tehsils namely, Niwari, Jatar, Tikamgarh, Prithvipur, Baldeogarh and Palera 				Tikamgarh		<p>Till, Soyabean amongst the oilseeds while Sugar cane also is grown to a certain extent. Important pulses grown in the district are Gram, Urad and Moong grown generally in Kharif.</p>	

Table 4: Maximum Observed Ambient Air Quality during 2008

Area Classification	SO ₂ (µg/m ³)	NO ₂ (µg/m ³)	RSPM (µg/m ³)
Industrial (maximum observed value)	30	27	265
Residential (maximum observed value)	8	20	105
National Ambient Air Quality Standards for Industrial and Residential Areas	80	80	100

Source: National Ambient Air Quality Status, 2008, CPCB, and Table 3.3

47. The above **Table 4** reveals that the concentration of all the pollutants is higher in industrial areas especially respirable suspended particulate matter. The levels of sulphur dioxide and nitrogen dioxide are however, well within the limits (NAAQS). The higher particulate matter levels are attributed to the vehicular movement on unpaved roads and the loose dust in the agricultural fields that lead to formation of dust clouds over short periods. The same can be concluded from **Table 5**, which provides a comparison of the air quality at different locations.

Table 5: Ambient Air Quality Status of Madhya Pradesh in Previous Years

City	Location	Type of Area	SO ₂	NO ₂	RSPM	SPM
			2008	2008	2008	2008
Bhopal	Govindpura	I	7	17	91	205
	Arera colony	R	BDL	34	129	356
	Hamidia road	R	9	20	124	308
Dewas	T.T. Nagar	R	5	11	62	120
	Eid Parry(I)Ltd	I	20	27	96	218
	Vikas Nagar	R	15	22	72	187
Gwalior	Dindyal Nagar	R	8	18	133	234
	Maharaj Bada	R	9	14	92	306
Indore	Polo ground	I	12	22	240	357
	Kothari market	R	12	22	217	325
	Scheme no. 78	R	6	12	131	203
Jabalpur	Vijay Nagar	R	BDL	25	136	297
Nagda	Chem. D Labour club	I	30	18	113	158
	Grasim guest house no 2	R	15	25	92	132
	Grasim Kalyan Kendra	R	22	32	97	141
Sagar	Pt. Deendayal Nagar	R	3	17	115	232
Satna	Sub divisional Off.	I	4	BDL	265	410
	Regional office	R	BDL	BDL	115	166
	District office	I	15	16	154	317
Singrauli	Regional office	R	7	9	70	151
	Mahakal temple	S	12	12	82	174
	Jayant township	R			78	386
	NTPC Vidyanagar	R			86	326
	Waidhan	R			49	227
National Ambient Air Quality Standards	Industrial Area (I) & Residential Area (R) (24 hourly average)	80	80	80	100	NP

Source: National Ambient Air Quality Monitoring Series, CPCB

R – Residential and other areas, I – Industrial area, L- Low, M- Moderate, H – High and C – Critical levels of pollution based on exceedance factor (calculated for n > 50 days), NP – Not Prescribed

3. Noise

48. Along the proposed road construction proposals, there is neither significant industrial activity nor significant vehicular traffic contributing to ambient noise levels. The occasional vehicular movement on the unpaved roads contributes to increased noise levels over short duration and limited to daytime. The existing roads do not appear to have vehicular traffic in the night time. Therefore, the ambient noise levels are expected to be within the National Ambient Noise Standards

4. Topography and Geomorphology

49. State of Madhya Pradesh is the second largest state of the country has covers an area of 30.82 million hectare, which constitutes 9.37% of the land area of the country. "Madhya Pradesh" by virtue of its geographical location can be termed as "Heart of India". The state is surrounded by Gujarat in the West, Rajasthan in the North-West, Uttar Pradesh in the North-east, Chhattisgarh in the East and Maharashtra in the South. Landlocked in the central part of the country, Madhya Pradesh has topography that is crossed from north to south by plains separated by upland areas. Geographically, Madhya Pradesh consists of a plateau with a mean elevation of 1600 ft above sea level, interspersed with the mountains of the Vindhya and the Satpura ranges with the Chhattisgarh plains to the east. The hills give rise to the main river systems - the Narmada and the Tapti, running from east to west, and the Chambal, Sone, Betwa, Mahanadi, and the Indravati west to east. Ground elevation varies from 270 m to 750 m above mean sea level.

50. The soils of state are rich and fertile. The state has a variety of soils ranging from rich clayey to gravelly. The major groups of soils found in the state can be divided in to following four categories i.e. alluvial, medium & deep black; shallow & medium black; and mixed red & black. Categorically state has two agro-climatic zones namely (i) Central Plateau & Hill Region and (ii) Western Plateau & Hill Region. These two zones have been further sub-grouped and the description regarding area and its soil & geological features.

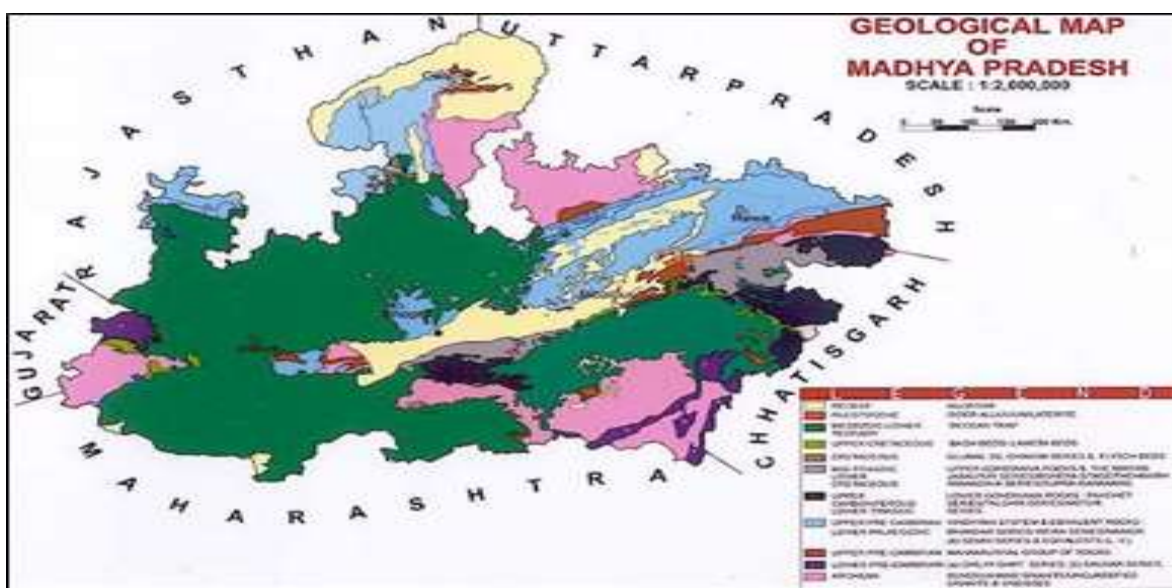


Figure 3:Geographical / Geological Map of Madhya Pradesh

5. Geology/Soil

51. The geology /soil of the state of Madhya Pradesh is given below:

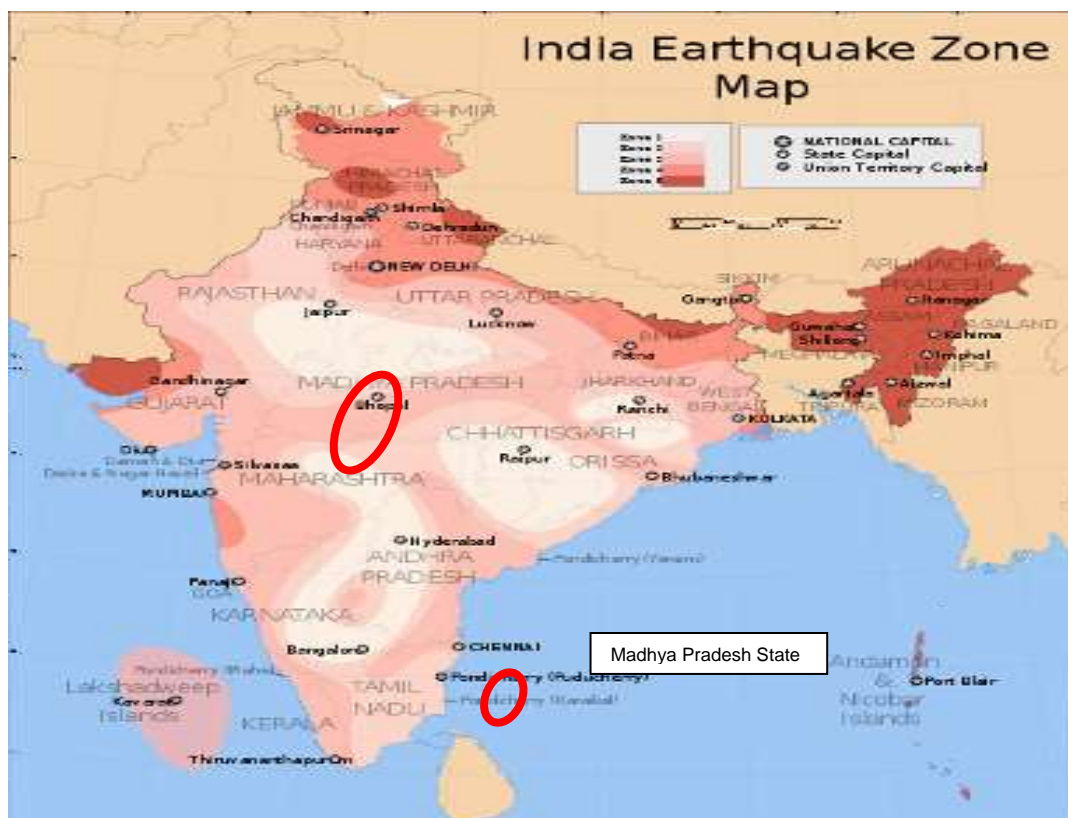
Zone	Sub-group (Region)	District covered	Rainfall (mm)	Climate	Type of Soil
Central Plateau and Hill Region	Bundelkhand	Chattarpur, Tikamgarh, Datia,	700	Dry sub-humid	Mixed red & Black
	Chhattisgarh Hills	Mandla, Dindori	1570	Moist sub-humid	Red & Yellow
	Kaimur Plateau & Satpura Hills	Jabalpur, Panna, Satna, Rewa, Sidhi, Seoni, Katni, Balaghat, Shahdol, Anoopur, Umariya	1100	Dry sub-humid	Medium Black
	Vindhya Plateau	Bhopal, Damoh, Raisen, Sagar, Sehore, Vidisha	1130	Dry sub-humid	Shallow to Medium Black
	Satpura Plateau	Betul, Chhindwara, Narsinghpur	1220	Dry sub-humid	Shallow to Medium Black
	Central Narmada Valley	Hosangabad, Harda	1300	Dry sub-humid	Deep Black
	Gird	Morena, Bhind, Gwalior, Guna, Shivpuri, Ashok, Sheo	670	Semi-arid	Medium Black alluvial
Western Plateau and Hill Region	Jhabua Hills	Jhabua	988	Semi-arid	Medium to black deep
	Malwa & Nimar Plateau	Indore, Dhar, Ujjain, Ratlam, Dewas, Mandsaur, Rajgarh, Shajapur, Khandwa, Khargone, Neemuch, Badwani, Burhanpur	874	Semi-arid	Medium to deep black

52. **Soil.** The major soil types within the project districts can be classified into three groups namely vertisol, ultisol and entisols. These soil types are further classified into red yellow loamy, black cotton soils. The entisols are sub-classified into younger alluvial, and laterite soils. The Ultisols are sub-classified into lateritic and alluvial soils. The vertisol is sub-classified into basic black cotton soil, older alluvial soils. Textures of soils are medium to heavy grained.

6. Earthquake & Seismicity

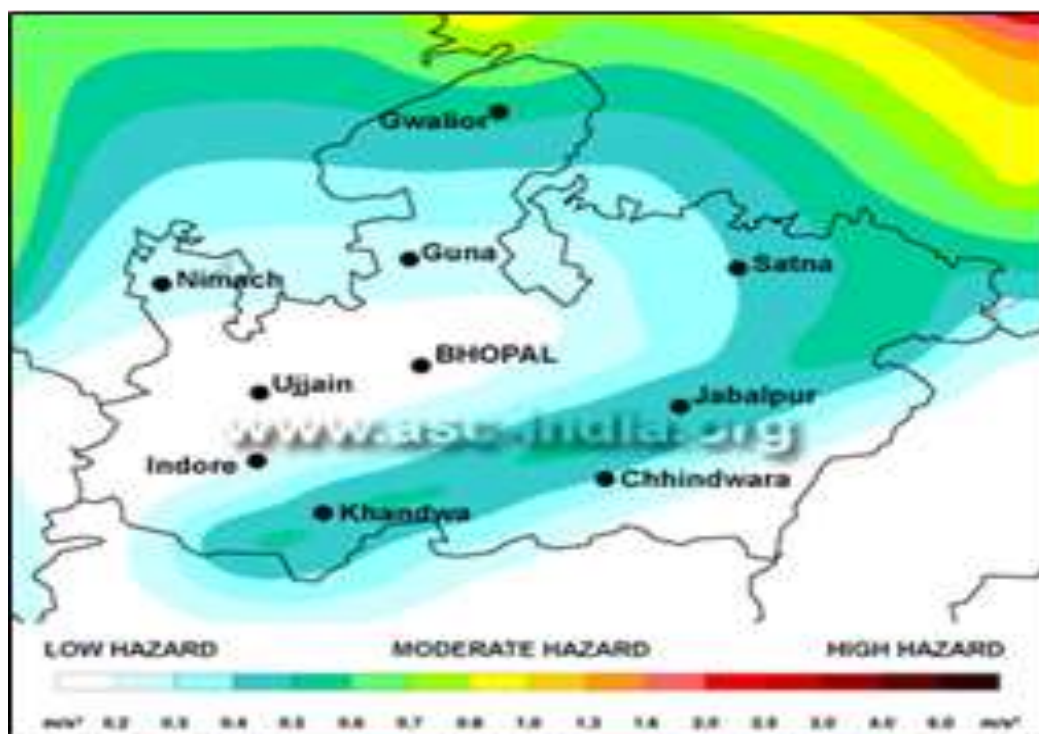
53. **Seismic Hazard.** The seismic hazard map of India was updated by Bureau of Indian Standards (BIS) in 2000⁴. The main change was merging of Zones I & II. As per this updation, Zone II and III (low to moderate Risk) stretches across the length of the M P State (**Figure 4**). According to GSHAP data, the state of Madhya Pradesh falls in a region of low to moderate seismic hazard.

⁴ IS 1893 (Part 1): 2002 Indian Standard Criteria for Earthquake Resistant Design of Structures Part 1 General Provisions and Buildings (Fifth Revision).



Source: Amateur Seismic Centre, Pune

Figure 4: Seismic Zone Map



Source: IS 1893 (Part 1) 2002

Figure 5: Hazard Zone Map

7. Land use

54. The most of the geographical area (307560 sq. km i.e. about 98 percent) of the state is available for utilization. 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 6**. Land use pattern along the project road is also mixed type dominated by agriculture, barren forest land and residential areas.

Table 6 :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	99.78
Forests	8683	28.17
Not Available for cultivation	3350	10.87
Permanent pastures and other grassing land	1360	4.41
Land under miscellaneous tree crops & groves	19	0.06
Culturable wasteland	1177	3.82
Fallow lands other current fallows	621	2.01
Current fallows	599	1.94
Net area sown (as per MP Annual Plan 2010-11)	14,790	47.98

Source: State of Forest Report, 2005, Forest Survey of India Dehradun

8. Hydrology and Water Quality

55. Madhya Pradesh is criss-crossed by India's four major rivers namely Narmada, Tapti, Sone and Mahanadi along-with their numerous tributaries. Availability of water in from these rivers to the sate is more than 81000 million cubic meters annually, out of which approximately 56857million cubic meters i.e. 69.74% could be utilized.

56. None of the rural road crosses any natural stream except two roads, which crosses Keth River and Chamla rivers. Sample road are mostly crossed by seasonal small channels. Ground water being extracted through hand pumps or tubewell is the main source of water supply to villagers.

57. **Surface Water Quality:** In Madhya Pradesh, pollution is increasing in most of surface water resources in major towns due to increasing urbanization trend. The estimated surface water available for use is around 306682 Million Cubic Meter (MCM). None of the water sources are safe for drinking or bathing without conventional water treatment. Rivers such as Narmada, Sone, Tapti Chambal, ken and Betwa etc. are found to be polluted at different stretches due to industrial, domestic and agricultural pollution. Among all the rivers, Narmada and Ken River is the most polluted.

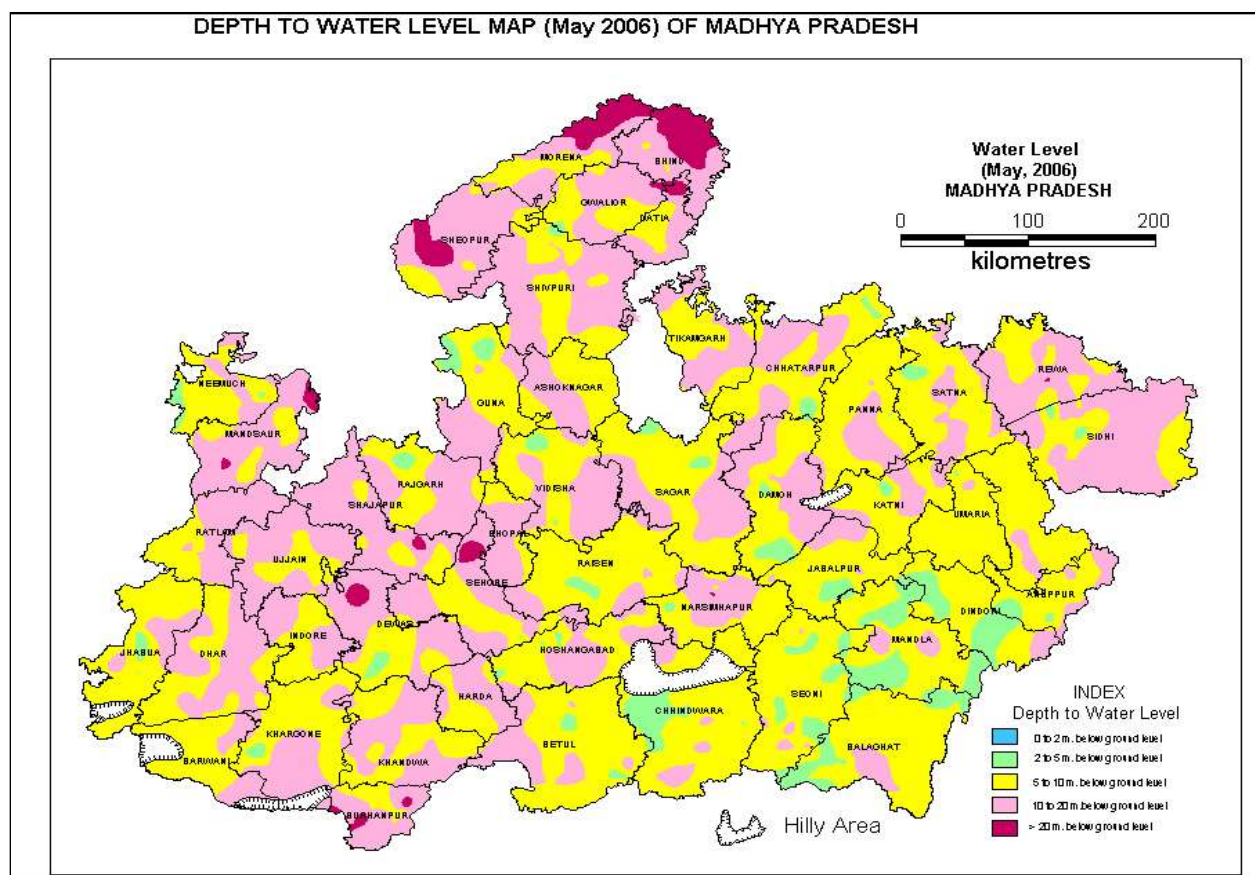
58. **Groundwater Quality and Availability:** The total Net Ground Water availability of Madhya Pradesh (1998) is 31093575.60 ha of which total current Ground Water Draft is 1437520.00 ha. The state is currently exploiting 46% of the available ground water. On 70% dependable yield, groundwater usage is around 66%. In hilly and undulating regions, springs, rivulets and wells provide drinking water. Most households in rural areas now rely on hand pumps for their supply of drinking water.

59. Among the 50 districts of the state, current ground water condition is safe in 40 districts. In 10 districts the ground water condition is in critical in 5 blocks and overexploited in 24 blocks.

In sample project districts, five blocks (Badnawar, Dhar, Manawar, Nalcha, and Tirla) in district Dar falls under overexploited category.

60. Fluoride, salinity and iron affect the quality of water in Madhya Pradesh. There are 4,018 villages with 7,746 sources in 22 districts that have been affected by fluoride; 562 villages with 1,269 sources in 13 districts that have been affected by salinity; and 856 villages with 1,449 sources in eight districts that have been affected by iron.

61. As per the central ground water board (CGWB) report, the groundwater quality of all the project districts Sagar, Sidhi, Dhar and Damoh, in both shallow and deeper aquifers is good and suitable for drinking, irrigation and industrial purposes. The Decadal (1995-2005) water table condition during Pre-monsoon is shown in **Figure 6**.



Source: Central Ground Water Board Northern Region Bhopal

Figure 6: Decadal Water Table Conditions in the Project Districts

62. **Hydrogeology:** The largest State of the country is underlain by formations in age ranging from Achaean to Recent. One fifth of the area is occupied by granite gneisses and meta-sedimentary rocks, whereas one tenth by Gondwanas comprising sand stones, lime stones & marbles. The Deccan Trap covers a larger part of the State whereas the Quaternary alluvium covers 6% of the State area. The alluvial deposits form prolific aquifers where tube wells can yield in the range of 50-80 m³/hr. The yield of tube wells in sand stones of Gondwanas ranges between 20-30 m³/hr; whereas in limestone of Gondwanas, it varies between 50-80 m³/hr. The yield of tube wells in select area ranges between 20-30 m³/hr.

C. Ecological Resources

63. Variability in climatic and edaphic conditions brings about significant difference in the forest types of the state. There are four important forest types viz. Tropical Moist, Tropical Dry, Tropical Thorn, Subtropical broad leaved hill forests. The forest area can also be classified based on the composition of forest and terrain of the area. Based on composition, there are three important forest formations namely Teak forest, Sal forest and miscellaneous forests. Bamboo bearing areas are widely distributed in the state. To obviate pressure on the natural forests, plantations have been undertaken in forest and nonforest areas to supplement the availability of fuel wood, small timber, fodder etc.

64. The forest cover has been classified in 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., which is 24.79% of the land area - dense forest constituting 13.57% and open forest 11.22%. In addition to these two categories of cover, the land having canopy cover of less than 10% is classified as scrub. The area under scrub is not included in the forest cover. Central, eastern and southern parts of the state are rich, whereas northern and western parts are deficient in forest. Figure 3.5 shows the forest map of the state. Project districts largely have open forests.



Figure 7 : Forest Map of Madhya Pradesh

65. The project state lies in tropical climate zone. It has a medium range of flora and fauna. Flora, fauna and vegetation types found in the areas have been described separately below. However, none of the roads consists of any rare, endangered or threatened floral species.

66. Of the 171 roads proposed under tranche 1, 3 roads pass through forest area. None of them pass through reserve forest or wildlife sanctuaries. All of them are existing roads/tracks and the road improvement within the forest stretches will be within the existing road width. Still some trees might require felling during clearing up operations for construction of rural roads. In most of cases, tree cutting has been minimized by suitably modifying the alignment. The list of commonly found flora in the sample road districts is given at **Table 7**.

67. The clearance of the vegetation and felling of trees for the road construction is an environmental concern. However, very small number of tree is falling within ROW and which can be saved with design considerations.

Table 7: List of Common Flora of Project Districts

S. No.	Local Name	Botanical Name	Family
Large Trees			
1.	Achar	<i>Buchanania lanzan (spreng)</i>	Anacardiaceae
2.	Arjun	<i>Terminalia arjuna (Bedd)</i>	Combretaceae
3.	Aam	<i>Mangifera indica (Linn)</i>	Anacardiaceae
4.	Awla	<i>Emblica officinalis</i>	Euphorbiaceae
5.	Imli	<i>Tamarindus indica (Linn)</i>	Caesalpiniaceae
6.	Kardhai	<i>Anogeissus pendula</i>	Combretaceae
7.	Kala siras	<i>Albizia lebbek</i>	Leguminosae (Mimoseae)
8.	Kevlor	<i>Bauhinia purpurea</i>	Caesalpinaceae
9.	Kumbhi	<i>Careya arborea</i>	Myrtaceae
10.	Kullu	<i>Sterculia urens</i>	Sterculiaceae
11.	Kem	<i>Mitragyna parvifolia</i>	Rubiaceae
12.	Khair	<i>Acacia catechu</i>	Leguminosae (Mimoseae)
13.	Gular	<i>Ficus glomerata</i>	Moraceae
14.	Gunja	<i>Gardenia pinnata</i>	Burseraceae
15.	Jamun	<i>Syzygium cuimini</i>	Myrtaceae
16.	Tendu	<i>Diospyros melanoxylon</i>	Ebenaceae
17.	Dhavda	<i>Anogeissus latifolia</i>	Combretaceae
18.	Dhobin	<i>Dalbergia paniculata</i>	Leguminosae (Papilionaceae)
19.	Nilgiri	<i>Eucalyptus spp</i>	Myrtaceae
20.	Neem	<i>Azadirachta indica</i>	Meliaceae
21.	Palas	<i>Butea monosperma</i>	Leguminosae (papilionaceae)
22.	Pangra	<i>Erythrina Suberosa</i>	Leguminosae (Papilionaceae)
23.	Pipal	<i>Ficus religiosa</i>	Moraceae
24.	Bad	<i>Ficus bengalensis</i>	Moraceae
25.	Bahera	<i>Terminalia belerica</i>	Combretaceae
26.	Babul	<i>Acacia nilotica</i>	Leguminosae (Mimoseae)
27.	Bel	<i>Aegle marmelos</i>	Rutaceae
28.	Bhirra	<i>Chloroxylon Swietenia</i>	Meliaceae
29.	Maharukh	<i>Ailanthus excelsa</i>	Simarubiaceae
30.	Mahua	<i>Madhuca indica</i>	Sapotaceae
31.	Shisham	<i>Delbergia latifolia, Roxb</i>	Leguminosae (Papilionaceae)
32.	Safed Siras	<i>Albizia procera, Benth</i>	Leguminosae (Mimoseae)
33.	Sagwan	<i>Tectona grandis</i>	Verbenaceae
34.	Saj	<i>Terminalia tomentosa</i>	Combretaceae
35.	Salai	<i>Boswellia serrata</i>	Burseraceae
36.	Seja	<i>Lagerstroemia parviflora</i>	Lythraceae
37.	Semal	<i>Bombax cieba</i>	Malvaceae
38.	Haldu	<i>Adina Cardifolia</i>	Rubiaceae
Small Tree			

S. No.	Local Name	Botanical Name	Family
39.	Amaltash	<i>Cassia fistula</i>	Leguminosae (Caesalpinaceae)
40.	Astara	<i>Bauhinia malabarica</i>	Leguminosae (Caesalpinaceae)
41.	Asta	<i>Bauhinia racemosa</i>	Leguminosae (Caesalpinaceae)
42.	Ghont	<i>Zizyphus xylopyra</i>	Rhamnaceae
43.	Ber	<i>Zizyphus jujube</i>	Rhamnaceae
44.	Lokhandi	<i>Ixora arborea</i>	Rubiaceae
45.	Sehra	<i>Bauhinia retusa</i>	Leguminosae (Caesalpinaceae)
Shrubs and Herbs			
46.	Adusa	<i>Adhatoda vasica</i>	Acanthaceae
47.	Arandi	<i>Ricinus Communis</i>	Euphorbiaceae
48.	Aak	<i>Calotropis gigantea</i>	Asclepiadaceae
49.	Gokhru	<i>Tribulus terrestris</i>	Zygophyllaceae
50.	Zhadneri	<i>Zizyphus nummularia</i>	Rhamnaceae
51.	Tulsi	<i>Ocimum Sanctum</i>	Labiatae
52.	Thuar	<i>Euphorbia nerifolia</i>	Euphorbiaceae
53.	Dhavai	<i>Woodfordia fruticosa</i>	Lythraceae
54.	Nirgudi	<i>Vitex negundo</i>	Verbenaceae
55.	Neel	<i>Indigofera pulchella</i>	Leguminosae
56.	Pawar	<i>Cassia tora</i>	Leguminosae (Caesalpinaceae)
57.	Beshram	<i>Ipomoea pescaparae</i>	Convolvulaceae
58.	Bhatkatiya	<i>Solanum nigrum</i>	Solanaceae
59.	Vidyasini	<i>Lantana camara</i>	Verbenaceae
60.	Shatavari	<i>Asparagus recemosus</i>	Liliaceae
61.	Sitafal	<i>Anona Squamosa</i>	Anonaceae
62.	Harsingar	<i>Nyctanthes arbortristis</i>	Oleaceae
63.	Ratanjot	<i>Jatropha curacas</i>	Euphorbiaceae
64.	Gunja	<i>Abrus precatorious</i>	Leguminosae
65.	Amrbel	<i>Cuscuta reflexa</i>	Convolvulaceae

1. Terrestrial/Avian fauna

68. The general faunal assessment was carried out in subproject area. The species generally found are given in **Table 8**.

Table 8: List of common fauna of Project Districts

S. No.	Local Name	Zoological Name	Family
Mammals			
1.	Common Langur	<i>Presbytia entellus</i>	Colobidae
2.	Rhesus macaque	<i>Macaca mulatta</i>	Cercopithecidae
3.	Common Mongoose	<i>Herpestes edwardsi</i>	Herpestidae
4.	Common five Stripped squirrel	<i>Funambulus pennanti</i>	Sciuridae
5.	Field rat	<i>Bandicota bengalensis</i>	Muridae
6.	Common house rat	<i>Rattus rattus-refescens</i>	Muridae
7.	Common Indian hare	<i>Lepus nigricollis</i>	Leporidae
Reptiles			
1.	<i>Python molurus</i>	Indian python	Pythonidae
2.	<i>Mabuya carinata</i>	Common skink	Scincidae
3.	<i>Ptyas mucosus</i>	Rat snake	Colubridae
4.	<i>Hemidactylus flaviviridis</i>	House Lizard	Gekkonidae
5.	<i>Calotes versicolor</i>	Garden Lizard	Agamidae
6.	<i>Naja naja</i>	Indian cobra	Elapidae
7.	<i>Varanus bengalensis</i>	Monitor Lizard	Varanidae

S. No.	Local Name	Zoological Name	Family
Avifauna			
1.	White Egret	<i>Egretta alba</i>	Ardeidae
2.	Little Egret	<i>Egretta garzetta</i>	Ardeidae
3.	Common or Grey Quail	<i>Coturnix coturnix</i>	Phasianidae
4.	Red wattled Lapwing	<i>Vanellus indicus</i>	Charadriidae
5.	Blue Rock Pigeon	<i>Columba livia</i>	Collumbidae
6.	Indian Ring Dove	<i>Streptopelia decaocto</i>	Collumbidae
7.	Spotted Dove	<i>Streptopelia chinensis</i>	Collumbidae
8.	Large Indian Parakeet	<i>Psittacula eupatria</i>	Psittacidae
9.	Rose Ringed Parakeet	<i>Psittacula krameri</i>	Psittacidae
10.	Blossom Headed Parakeet	<i>Psittacula cyanocephala</i>	Psittacidae
11.	Koel	<i>Eudynamys scolopacea</i>	Cuculidae
12.	Coucal	<i>Centropus sinensis</i>	Cuculidae
13.	Small Blue King Fisher or Common Kingfisher	<i>Alcedo atthis</i>	Alcedinidae
14.	White Breasted Kingfisher	<i>Halcyon smyrnensis</i>	Alcedinidae
15.	Green Bee Eater	<i>Merops orientalis</i>	Meropidae
16.	Indian Pitta	<i>Pitta brachyuran</i>	Pittiade
17.	King Crow; Black Drongo	<i>Dicrurus adsimilis</i>	Dicruidae
18.	Large Racket tailed Drongo	<i>Dicrurus paradiseus</i>	Dicruidae
19.	Common Mynah	<i>Aeridotheres tristis</i>	Sturnidae
20.	Jungle Mynah	<i>Aeridotheres</i>	Sturnidae
21.	House Crow	<i>Corvus splendens</i>	Corvidae
22.	Jungle Crow	<i>Corvus macrorhynchos</i>	Corvidae
23.	Red vented Bulbul	<i>Pyenonotus cafer</i>	Pycnontidae
24.	Jungle Babbler	<i>Turdoides striatus</i>	Muscicapidae Timalinae
25.	Pied Bush Chat	<i>Saxicola caprata</i>	Muscicapidae
26.	Magpie Robin	<i>Copsychus saularis</i>	Muscicapidae Turdinae
27.	Indian Robin	<i>Saxicola fulicatus</i>	Muscicapidae Turdinae
28.	Grey Wagtail	<i>Motacilla cinerea</i>	Motacillidae
29.	Purplesun Bird	<i>Nectarinia asiatica</i>	Nectarinidae
30.	House Sparrow	<i>Passer-domesticus</i>	passerinae
31.	Red Munia	<i>Estrilda amandava</i>	Estrildinae

2. Wild Life and Protected Areas

69. Madhya Pradesh is a pioneer state in the national movement for conservation of flora and fauna. Conservation oriented legal provisions were made in the erstwhile Acts regulating hunting of game-birds and wild animals. There are 9 National Parks and 25 Sanctuaries spread over an area of 10,862 sq. km constituting 11.40% of the total forest area and 3.52% of the geographical area of the state (**Figure 8**). Efforts are under way to increase the protected area network to 15% of the forest or 5% of the geographical area as suggested by State Wildlife Board. None of the project roads pass through Wildlife Sanctuaries/National Parks, Tiger Reserves etc.

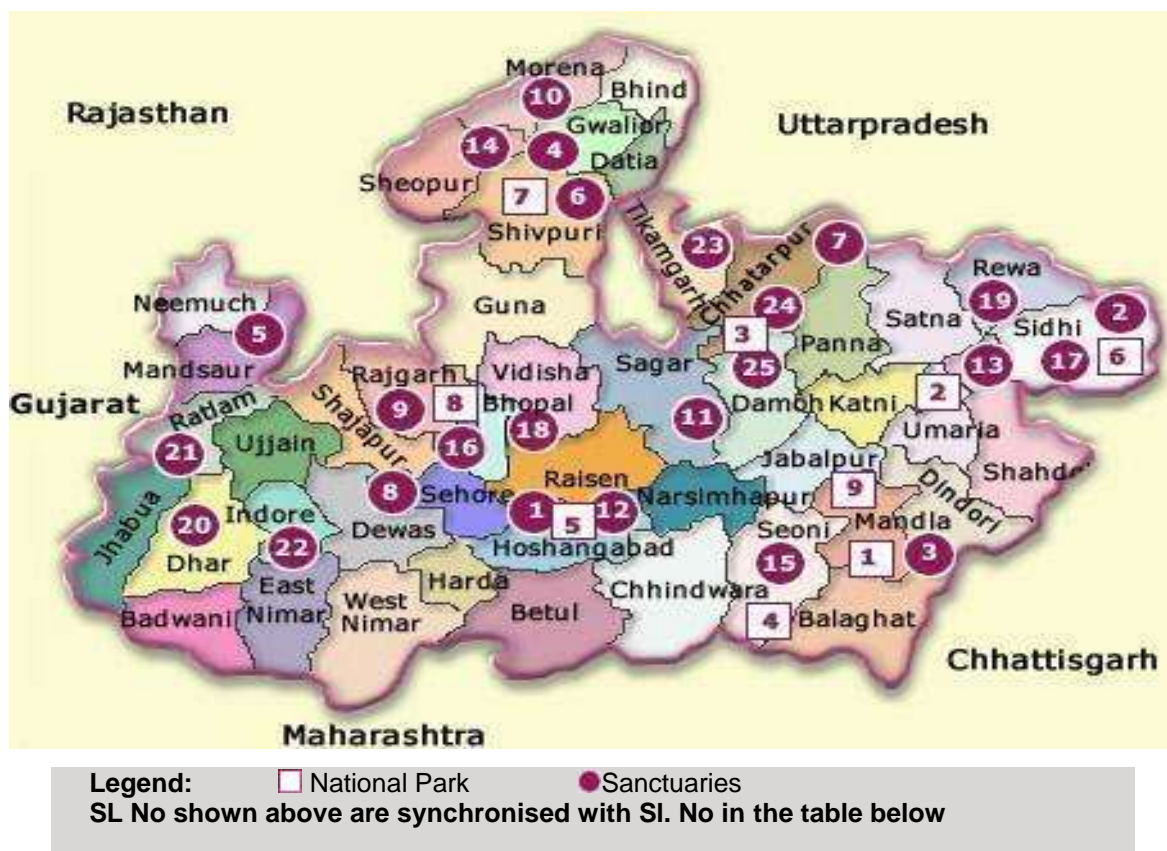


Figure 8: Protected Areas of Madhya Pradesh

70. **Table 9** provides details of National park and sanctuaries corresponding to serial number indicated at **Figure 8** above.

Table 9: List of Protected Areas in Madhya Pradesh

I. List of National Park in M. P. (SL. No. Below Corrospnd to Figure above)			
S. No.	Name and District of National Park	Area in km ²	Fauna
1.	Kanha National Park, District Mandla#	940	Tiger, Panther, Gaur, Chital, Sambar, Nilgai, Chinkara, Barking Deer, Swamp Deer, (Barasingha), Wild Boar & variety of upland birds.
2	Bandhavgarh National Park, District Umaria#	437	Tiger, Panther, Gaur, Chital, Sambar, Nilgai, Chinkara, Barking Deer, Wild Boar & variety of upland birds.
3	Panna National Park, District Panna, Chhatarpur#	543	Tiger, Chital, Chinkara, Sambar and the Sloth Bear
4	Pench Tiger Reserve, District Seoni, Chhindwara#	293	Tiger, Panther, Bison, Chital, Sambhar, Nilgai, Chinkara, Barking Deer, Chowsingha, Wild Boar & variety of upland birds.
5	Satpura National Park, Pachmarhi	524	Tiger, Leopard, Sambar, Chital, Bherki, Nilgai, Four-horned antelope, Chinkara, Bison (gour), Wild Boar, Wild Dog, Bear, Black Buck, Fox, Porcupine
6	Sanjay National Park, Sidhi	193.8	Tiger, Panther, Sambar, Chital, Gaur, etc.

I. List of National Park in M. P. (Sl. No. Below Corrospound to Figure above)			
S. No.	Name and District of National Park	Area in km²	Fauna
7	Madhav National Park, Shivpuri#	354	Panther, Chital, Sambar, Nilgai, Chinkara, Black Buck, Chausingha, Wild Boar, Crocodiles in lake, & variety of upland birds.
8	Van Vihar National Park, Bhopal#	4.45	Tiger, Panther, Lion, Bear, Hyena etc.
9	Mandla Plant Fossils National Park, Mandla#	0.27	Plant Fossils
II. List of Wild Life Sanctuaries in M.P.			
S.N	Sanctuary	S.No.	Sanctuary
1.	Bori	13.	Panpatha
2.	Bagdara	14.	Kuno
3.	Phen	15.	Pench
4.	Ghatigaon	16.	Ratapani
5.	Gandhisagar	17.	Sanjay Dubri
6.	Karera	18.	Singhori
7.	Ken Ghariyal	19.	Son Ghariyal
8.	Kheoni	20.	Sardarpur
9.	Narsinghgarh	21.	Sailana
10.	N. Chambal	22.	Ralamandal
11.	Nauradehi	23.	Orchha
12.	Pachmari	24.	Gangau
		25.	V. Durgawati

Project districts

3. Aquatic Biology

71. No wetland or large water body falls in and around the selected project roads area. Fisheries activities are also minimal in subproject areas.

D. Socio-Economic Environment

1. Demography

72. As per census 2011, Madhya Pradesh has a total population of 60 Mn persons. (Table 10). It has one of the largest tribal populations in the country. Out of the 50 districts in the State, 19 are predominantly tribal. Eighty-nine blocks (approx. 28%) of the total 313 development blocks are tribal blocks.

Table 10: Demographic Profile

Indicators	Status	Indicators	Status
Population (2011 Census)		Literacy	
Total	60,348,023	Total	70.6%
Male	31,443,652 (52.1%)	Male	80.5%
Female	28,904,371 (47.9%)	Female	60.0%
SC	9,155,177 (15.17%)	SC (2001)	58.57%
ST	12,233,474 (20.27%)	ST (2001)	41.16%
Urban	15,967,145 (26.46%)	Urban	92.91%
Rural	44,380,878 (73.54%)	Rural	65.32%
Sex ratio	919		

Source: Census of India, 2011

2. Literacy and Education

73. The State literacy rate presently is 70.6%, which is close to the national literacy rate of 74.04 %. While the female literacy has considerably improved over the last decade, a great disparity persists in the literacy rates of males and females. However, during the decade 2001-2011 some districts such as Alirajpur, Jhabua, Barwani have shown a huge improvement in the literacy rate.

3. Affluence

74. About 18.8 Mn People is considered living below poverty line in Madhya Pradesh, which constitutes about 43% of total population.

4. Agricultural

75. Agriculture is the main occupation in the state. About half of the land area is cultivable. The extent of availability of cultivable land varies depending on topography, rainfall, and soils. The larger cultivable land is found in the Chambal valley, Malwa Plateau, Rewa Plateau, and Chhattisgarh Plain.

76. The prime crop of the state is Cereals (about 41%), followed by pulses (about 20%), oilseed (about 30%) and Vegetables, fruits, fodder and other horticultural crops (about 9%).

5. Industries, Cottage and small industries:

77. The state has various industrially developed estates. The major industrial produce includes cement, pigiron, steel ingots, news print, and sugar. Industrialization is low in the subproject areas. However, there is high potentiality for the growth of cottage and small industries in subproject areas. Better communication and transport facilities may be contributory in this growth.

6. Public Facilities (Communication, health services, water supply, power):

78. State has well-developed postage and telephone system. Subprojects areas also has good access to these facilities. Educational facilities are available in the village areas as well. However, rural population has to depend on urban areas for undergraduate level education. The urban area has well organised water supply systems. However, rural areas including subproject areas still depends on hand pumps.

79. MP state has total power generation capacity of 6305 MW. However, state is still power deficient. About 97.43 % villages in the state are electrified.

E. Salient Environmental Features of Sample Roads

80. The salient environmental features of sample roads are summarized in **Table 11**.

Table 11: Salient Environmental Features of Sample Roads

District	Block	Road Name	Length Km	Features with 10m either side of existing road centre line							
				Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees		Utility Structures	
								No.	Likely to be affected	No.	Likely to be affected
Gwalior	Morar	Bilheti to Manpura	3.000	No	No	No	No	No	No	No	
Gwalior	Morar	Morar Behat Road to Fusawali	5.000	No	No	No	No	No	No	EP 3 HP 3	
Datia	Datia	Badora to Pichhore Road	20.000	No	2 Ponds	No	Yes	No	No	EP 9	
Datia	Bhander	Bhander Chirgoan Road to Salon Bharroli	1.200	No	No	No	No	No	No	EP 6	
Datia	Bhander	Bhander to Sarsai	18.400	No	No	No	No	No	No	EP 19 HP 2	
Sehore	Sehore	Ahamadpur Charnal, Chandbad, Parason	26.500	No	2 Rivers 1 Pond	No	No		2	EP 250 HP 2	
Jabalpur	Jabalpur	Pahadi Kheda- Silpur-Bligada	3.000	No	1 Pond	No	No	No	No	EP No	
Jabalpur	Jabalpur	NH7- Tinsi-Tinsa	5.000	No	1 Pond 1 well	No	Yes	No	No	No	
Jabalpur	Majholi	Majholi to Suhajni	6.640	No	1 Pond	No	Yes		1	No	
Jabalpur	Patan	SH22A(Udana) to Sakra	13.600	No	2 Ponds	No	No			No	
Sehore	Ashta	Ashta Shujalpur Road to Khamkheda	9.600	No	1 Pond	No	No		1	EP 14	
Sehore	Ichhawar	Ichhawar To Kheri	9.000	No	No	No	No		1	EP 17	
Sehore	Nasrullaganj	Raheti to Gondia Guradiya, Chakaldi Amirganj	22.060	No	No	No	No	60	4	EP 68 HP 1 TF 2	
Sehore	Budhni	Jahajpura to Sattumadi, Ninor, Bibada to Budhni Rehti Road	11.940	No	No	No	No		7	EP 3	EP 3
Rajgarh	Rajgarh	Guradiya to Patrikala (Chhatukheda)	5.800	No	No	No	No	Nil	10	EP 31	
Rajgarh	Rajgarh	Khujner Road (Chhatukheda Jod) to Padliyakhedhi	5.150	No	1 Pond	No	No	Nil	Nil	EP 5	
Rajgarh	Rajgarh	NH-3 (A.B. Road) to Dehri Baman	2.600	No	No	No	No		1	No	
Rajgarh	Jeerapur	Machalpur to Kundaliya	11.600	No	Kali sindh River 1 Pond	No	No	Nil	Nil	EP 18	EP 18
Rajgarh	Jeerapur	Jeerapur to Paroliya	3.800	No	1 pond	No	No	Nil	Nil	EP 11	EP 11

District	Block	Road Name	Length Km	Features with 10m either side of existing road centre line							
				Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees		Utility Structures	
								No.	Likely to be affected	No.	Likely to be affected
Bhopal	Phanda	T-010 Khajuri to T-008 Badjhiri via- Pipaliya Dhakad, Rasulia Ghat, Borkhedi, Khokariya, Jatkhedi, Teelakhedi, Narela, Moondla, Jhajariya Khurd	19.600	No	River crossing	No	No	Nil	Nil	20 EP HP 7	
Badwani	Badwani	Badwani – Badgaon – Sajwani to Lonsara Road	11.255	No	1 pond	No	No		5	EP 20 HP 2	
Mandsour	Mandsour	Ajikhedi-Jawasiya-Nandawata to Garoda	28.081 Km	No	No	No	No	170	6	EP 141 HP 11	
Neemuch	Jawad	T-01 Sarwaniya Maharaj to Lasoor	8.585 Km	No	No	No	No	25	2	EP 20 HP 8	
Damoh	Bhatiyagr	Bakayan-Futera-Magron Road	18.180	No	River(Judi)	No	No		6	EP 9	
Panna	Pawai	CDRL-08 Tigra-Mahodkala-Chandanpur-Khamariya	22.400	No		No	No	Nil	Nil	No	
Sheopur	Sheopur	Sheopur to Dhodar (Canal Service Road) (ML-01)	36.000	No	Canal	No	No	41	1	EP 33	
Shivpuri	Narwar	Satanwada Bhitwar (MDR) Magroni To Hateda (Karera Bhitwar MDR Road) (Via Kankar, Phoolpur)	19.310	No	3 streams	No	No	Nil	Nil	EP 9	
Satna	Majhgawa	Gupt goadavari to sati ansuyia	11.620	No	No	No	No	Nil	Nil	EP 6	
Rewa	Jawa	Ghooman to Rimari	11.000	No	No	No	No		2	EP 7 HP 2	
Guna	Guna	Pagara-Ukawad to Barkheda Safa	19.200	No	3 Nala	No	No		2	EP 36 HP 2	
Ashok Nagar	Ashok Nagar	Bamora Baskhedi to Pipalkheda	2.600	No	1 Nala	No	No		5	EP 9 HP 1	
Dindori	Karanjiya	Bijouri to Chouradadar	9.950	No	No	No	No	10	0	Nil	
Mandla	Niwas	Barela Niwas Rd to Pipraiya (MDR)	14.300	No	No	No	No	5	0	Nil	
Chhindwara	Chhindwara	CWA-NGP NH-547 To Salaiya Via Sankh	24.000	No	No	No	No	66	4	EP 13	
Narsinghpur	Gotegaon	O.B. Road (Karkbel, Bamhni, Pipariya Mushram) To Themi Surwari To Malahpipariya Via	13.886	No	No	No	No	39	1	EP 11	

District	Block	Road Name	Length Km	Features with 10m either side of existing road centre line							
				Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees		Utility Structures	
								No.	Likely to be affected	No.	Likely to be affected
		(Basanpani Bouchar Karakuel themi)									
Chattarpur	Bijawar	Malguwan Bijawar Road to Nayagaon	4.800	No	No	No	No	Nil	Nil	No	
Tikamgarh	Tikamgarh	Darguwan To Dari	3.860	No	No	No	No	Nil	Nil	No	
Umaria	Pali	Pali to Sudardadar	8.600	No	Birsingpur Reservoir	No	No	9	1	EP 5 HP 1	
Shahdol	Budhar	Padhkhuri to Tengha Via Keshwahi	36.725	No	River crossing 1 MI Tank	No	No	9	Nil	Nil HP 14	
Annuppur	Jaithari	AJV Road (Pondi) to Sulkhari	10.150	No	1 Nala 2 ponds	No	No	4	Nil	EP 7 HP 1	
Sidhi	Sidhi	Gandhigram Saro Khurd Road	17.225	No	1 pond	No	No	Nil	Nil	EP 2 HP 1	
Sagar	Khurai	MRL -08 (NH-26a) Bhilone to Bhusa to Karaiya Gurjar to Katheli (SH-42)	16.280	No	2 Nala	No	No	Nil	Nil	No	
Khargone	Segaon	Golwadi-Lehakoo to Keli	16.952 Km	No	No	No	No	151	4	EP 100 HP 5	
Sagar	Rehli	Ron Chulla to Baleh Road	25.600	No	Kopra River	No	No	14	Nil	EP 26	
Mandsour	Bhanpura	Garoth Bhanpura Road to Kuntalkhedi	7.75 Km	No	No	No	No	15	1	EP 25 HP 5	
Panna	Panna	MR Panna Pahadikheda to Siraswaha	12.100	No	No	No	Yes	45	2	No	

V. ANTICIPATED ENVIRONMENTAL IMPACTS AND ITS MITIGATION MEASURES

81. Road improvements work brings substantial economic and social benefits to rural communities and national economies. However, it may also cause adverse environmental impacts though of smaller magnitude, since rural road subprojects aligned along the existing road alignments and will be of 8-12 m width only (in special cases it will be between 5-6m). The impacts are expected largely during construction phase, which can be mitigated through engineering measures and adoption of best construction practices. This section outlines the identified impacts during design, construction and operation phases along with proposed mitigation measures for eliminating or minimizing the adverse impacts.

82. The associated environmental impacts are assessed considering present environmental setting of the project area, nature, and extent of the proposed activities. Impacts are analysed on both generic and specific nature and are classified as insignificant, minor, moderate and major.

Since the issues associated with most of the roads are similar, the impacts and mitigation measures given below are applicable to most of the subprojects. Any issue specific to a road, is separately mentioned.

A. Common Impacts during Design and Construction Phase

1. Climate change

83. **Impact:** The proposed roads are analysed considering climate change vulnerability screening checklist defined under EARF to second RCIP. The resource (like borrow earth, aggregate, cement, concrete) requirements for these rural roads as such are minimal. None of these resources is likely to be affected by climate changes (such as changes in temperature and precipitation). None of the project roads is located in natural hazard areas or passes through protected areas or flood prone areas. The habitations are less along these rural roads and as such, no exponential population growth is expected considering the generic trend of population migration from rural to urban areas. Most of the sample roads pass through agricultural fields and along the existing road alignments with low embankment height of 1m (average) from ground to crust except at the approaches to cross drainage structures. As such, the sub project roads are unlikely to be vulnerable or increase the vulnerability of surrounding areas (with respect to population growth, settlement patterns, increasing runoff or landslides

84. **Mitigation Measures:** Compensatory tree plantations⁵ (1:3) will be made to compensate the loss of trees cut for construction of sub project roads. Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of village Panchayat⁶. All non-sample rural roads to be included in second RCIP will also be screened for climate change vulnerability and necessary mitigation measures shall be adopted for minimisation of identified vulnerability if any.

2. Finalization of Alignment

⁵ SRRDA mostly undertake this activity through state forest department. The forest department plants tree either along the proposed roads if land is available otherwise on nearby degraded forest land.

⁶ Village Panchayats are planting trees along rural roads with funding under Mahatma Gandhi National Rural Employment Act scheme. The PIUs may facilitate with them for planting trees along the road. Some of the PIUs in different states are already helping Village Panchayats for the same.

85. Impact: The proposed rural road will be constructed to provide 8-12 m roadway in accordance with PMGSY II guidelines and technical specifications (IRC-SP 20: 2002) for plain terrains. Sample rural roads are aligned to existing road (earthen track with some stretches of brickbat soling). The existing road passes through plain terrain and primarily agriculture areas. None of the sample roads passes close to any protected monument or through protected areas. Impacts due to road alignment and design is expected to be minor and limited to shifting of some common utilities, community structures (temple, school) and cutting of trees falling within road way.

86. Mitigation Measures: The road alignment is finalised considering availability of right of way. The ROW is reduced in built up area or constricted areas to minimize additional land requirement. The road alignment has also been modified to avoid tree cutting, shifting of utilities or community structure to the extent feasible. Some of the measures taken include widening of the road on one end to maintain the tree on the road edge to avoid its cutting, using retaining wall to minimise the road width to 5m wherever required. The road is aligned to follow natural topography to avoid excessive cut and fill. All future roads to be included in second will follow above measures. In addition these subprojects will comply with the following criteria for alignment finalisation.

- The road will be part of district core network and will comply with PMGSY guidelines
- Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- Subproject will not pass through any designated wild life sanctuaries, national park, notified Eco sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area..
- Subproject to comply with local and National legislative requirements (such as forest clearance for diversion of forest land) and ADB's Safeguard Policy Statement 2009.

3. Land Acquisition

87. Impact: Minor impact, since no land acquisition is involved due to various measures considered for finalisation of road alignment. Villagers have volunteered to donate their land if at certain stages land is required for geometrical correction or alignment adjustment for avoiding tree cutting or shifting of community structure. There could be some impact on the encroachers; however, most of them have also volunteered to shift from the proposed alignment.

88. Mitigation Measures: All efforts shall be made to minimize the land acquisition while finalising the alignment. In an unavoidable situation, adopt suitable engineering measures to reduce the ROW requirement or donation of land from landowners. In the encroached areas, efforts shall be made to restricted road construction to the available space.

4. Protected Areas (National parks, wild life sanctuaries, Eco sensitive zones, protected /historical monuments) and Forest Areas.

89. Impact: Madhya Pradesh state has many wild life sanctuaries but none of the sample road is located within 10 km radius of the sample project roads. The nearest national parks and sanctuaries (Guru Ghasidas National Park in Koriya, Badalkhol in Jaspur and Gomarda in Raigarh district) are located at a distance of minimum 10km away from the project roads. Four out of the 12 sample

roads pass through forest area and the PIUs have already applied clearance from the Forest department for the purpose of the road construction. As the roads/tracks are already existing in case of all these roads, the project will have very little impact on forest cover of the state/Country. Madhya Pradesh is also known to have several archaeological monuments and historical monuments spread all over the state. However, none of them is located within 5 km of sample roads.

90. **Mitigation Measures:** As there are no Protected/Ecologically sensitive areas in the sub project areas, no such measures are proposed. In case of a diversion of forest land, prior forest clearance shall be obtained under Forest (Conservation) Act 1980 (amended 1988).

5. Land Clearing Operations

91. **Impact:** The site clearing operations may have impact on common utilities, community properties, land use and vegetation profile of the area if adequate considerations not given to road alignment finalisation, utility and community structure shifting plan, tree felling, and demolition waste disposal.

92. **Mitigation Measures:** The following steps shall be taken to minimise the associated impact with land clearing operations.

- The land clearing operation should be undertaken as per the defined road alignment and community structure, utility and road furniture shifting plan.
- The road land width shall be clearly demarcated on the ground.
- The utility and community structure shifting shall be as per plan and with consultations and concurrence of the community.
- Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a permission of Forest department. The vegetable cover shall be removed and disposed in consultation with community.
- All public utilities shall be shifted with a concurrence of respective agencies/authority and to the adjacent location approved by them.
- The top soils shall be collected and preserved for reuse as a base for turfing of embankment slopes or development of barren areas along roadside. The top soil shall be preserved at identified location with the provision of watering /grass development on the heap surface to prevent air pollution.

6. Cut and Fill and Embankment construction

93. **Impact:** Inadequate alignment planning may increase the cut and fill requirement as well as need for more borrow earth for embankment formation leading to some impact on land use. Inadequate provision for drainage and embankment slop protection may lead to soil erosion. Due consideration is given to above aspect for alignment finalisation of sample road. With the adoption of appropriate mitigation measures, the impact due to above activity on land use and other environmental component is expected to be minimal.

94. **Mitigation Measures:** The alignment design shall consider options to minimise excessive cuts and fills. The cut and fill quantities shall be used for embankment to minimise borrow earth requirement. The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage. Adequate provision shall be made for cross drainage structures for maintaining natural drainage pattern in the subproject area and preventing soil erosion. The top soil of the cut and fill area shall be used for embankment slope protection.

7. Establishment of Construction Camp, Temporary office and Storage Area

95. **Impact:** The congregation of labour population and technical staff in the subproject area during the construction phase is likely to put considerable stress on the limited resources of village areas. Some of the associated impacts are related to health, safety of the labourers at the construction camp sites, availability of safe drinking water, and sanitation.

96. The establishment of construction camp temporary office and storage area will reduce land productivity if these are established on agricultural land. Loading and unloading of construction material, transportation of material, handling of fuel and waste disposal from these areas may have direct and indirect impact on soil, water and air quality

97. **Mitigation Measures:** The following steps shall be taken to minimise/reduce these impacts:

- Construction camp sites shall be located away from any local human settlements (minimum 1 km away) and preferably located on lands, which are not productive barren/waste lands presently. Similarly, temporary office and storage areas shall be located away from human settlement areas (minimum 500 m).
- The construction camps, office and storage areas shall have adequate water supply, sanitation and all requisite infrastructure facilities. This would minimize dependence of construction personnel on outside resources, presently being used by local populace and minimize undesirable social friction thereof.
- The construction camps shall be located at a minimum 500m from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 500m from forest land/areas.
- The construction camps, office and storage areas shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.
- All construction camps shall have rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible.
- The construction camps, office and storage areas shall have health care facilities for adults, pregnant women and children.
- All construction personnel shall be subjected to routine vaccinations and other preventive/healthcare measures.
- Contractor shall arrange all personal protective equipment (PPEs) like helmet, boots, and earplugs for workers, first-aid and fire fighting equipment at construction sites. An emergency plan shall be prepared to fight with any emergency like fire.
- Garbage bins must be provided in the camp and regularly emptied and disposed off in a hygienic manner. Domestic solid waste shall be disposed of in a control manner. The recyclable waste shall be sold off and nonsaleable and biodegradable waste shall be disposed through secured land filling.
- All fuel oil/lubricant unloading and storage shall be made on the paved areas away from storm water drainage.
- After completion of construction work, the camp /temporary office/storage areas sites shall be restored to its original condition.

8. Traffic Movement

98. **Impact:** Construction work along the existing road could cause disturbances to traffic movements. It will also pose risk of accident to motorist at night if these blockages and disruption are not clearly demarcated.

99. **Mitigation Measures:** The contractor will prepare appropriate traffic diversion scheme, which shall be implemented in different stretches of the road as per the progress of the construction work. This plan shall be approved by PIU and implemented before start of any construction work to avoid any inconvenience to the present road users. The diversion plan should ensure smooth flow of traffic, minimise accidents to road users during construction works. Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and visible and retro reflective in nature for day and night visibility.

9. Associated Impacts due to Construction Activities

a. Loss of productive soil, erosion and land-use

100. **Impact:** No land use will change due to the project, since required ROW is available throughout the alignment. Land use though will change temporarily of construction camp, temporary office storage areas for the period of construction. This will also result in loss of soil productivity. Soil erosion may take place along steep and un-compacted embankment slope, and wherever vegetation is cleared. Soil erosion may have cumulative effect viz. siltation, embankment damage, drainage clogging etc. The siltation, due to soil erosion may occur only in the ponds located close to the roads. Ten out of the 12 sample roads reviewed have ponds located close to the existing road. Loss of soil due to run off from earth stockpiles may also lead to siltation. Land use may also change due to borrowing the earth.

101. **Mitigation Measures:** It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities, is restored back to its original land use before handing it over back to land owner. The top soil from the productive land (borrow areas, road widening areas etc.) 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. The topography of all the sample roads through out the stretch is plain except in case rolling/ undulating terrain for very small stretches in few of them especially located in Korla district. Therefore, cut and fill shall be planned as per IRC provisions and rural road manual. All steep cuts shall be flattened and benched. Shrubs shall be planted in loose soil area. 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 embankment areas. If soil erosion observed, suitable measures shall be taken to control it.

b. Borrow Areas and Quarries

102. **Impact:** Borrow areas if left un-rehabilitated may pose risk to people, particularly children and animals of accidentally falling into it. This may also become potential breeding ground for mosquitoes and vector born disease. Illegal quarrying may lead to unstable soil condition; destroy the landscape of the terrain, air and noise pollution.

103. **Mitigation Measures:** Borrowing earth from agricultural land shall be minimised to the extent possible. Further, no earth shall be borrowed from already low-lying areas. The borrow earth shall be sourced from identified locations and with prior permission of landowner and with clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and quantity that can be borrowed. The borrow area

shall be located/ rehabilitated as per the guidelines given at **Appendix 3**. Fly ash shall also be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. The stone aggregate shall be sourced from existing licensed quarries only. The quarry should have requisite consent to operate from State Pollution Control Board. No new quarry shall be opened for the proposed project.

c. Hydrology and Drainage

104. Impact: The activities involved with proposed road development may alter the hydrology and drainage pattern of the area in absence of adequate provision for cross drainage structure, construction wastes disposal and drainage in habitat areas.

105. None of the sample roads is crossing any natural stream/ river. Certain project roads are crossing local and seasonal drains. Village ponds are also located close to few roads.

106. Mitigation Measures: Adequate engineering measures like embankment height above high flood line, retaining wall, cross drainage structures are proposed for protection of sample roads from high river. Adequate provisions are also made for bank stabilisation (like toe wall, slope stabilisation), and prevention of silt runoff during construction and operational stages.

107. The provision of adequate cross drainage structures shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge capacity of the CD structure shall be designed accordingly. The construction work shall be planned in dry season so that water quality of the water channel is not affected due to siltation. 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. Provision of additional cross drainage structures shall be made in the areas where nearby land is sloping towards road alignment in both the both sides.

108. Provision of CC road construction in habitat area with drainage of both side of the road shall be made as per the design specifications and with adequate slope to prevent any water logging.

d. Compaction and Contamination of Soil

109. Impact: 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, equipments and construction camps/storage facilities. It may get 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.

110. Mitigation Measures: 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. 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/temporary office/storage areas. 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. Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. All efforts shall be made to minimise

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 labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.

e. Construction Debris and Wastes

111. Impact: Uncontrolled disposal of debris and waste may create unhygienic and unsafe condition around the disposal areas.

112. Mitigation Measures: All excavated materials from roadway, shoulders, verges, drains, cross drainage shall be used for embankments formation if feasible, 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. MORTH guidelines shall be followed for debris, wastes removal and disposal at unproductive/wastelands which shall be selected with the consent of villagers and Panchayat. The dumping site should be of adequate capacity and to be located away from residential areas (at least 1000m away). It should also be located away from water bodies to prevent any contamination of these bodies.

f. Air Quality

113. Impact: The potential sources of air emission during the construction phase of the project are given below which can cause localised air pollution.

- Dust from earth works (during site preparation).
- Emissions from the operation of construction equipment and machines.
- Fugitive emissions from vehicles plying on the road, during the transport of construction materials.
- Emissions other than dust particularly from the hot mix plants and laying of bitumen. Hot mix plant will generate carbon monoxide (CO), un-burnt hydrocarbon (HC), sulphur dioxide (SO₂), particulate matters (PM), and nitrogen oxides (NOx) emissions.
- Localised increased traffic congestion in construction areas. Most of the emissions will be in the form of coarse particulate matter, which will settle down in close vicinity of construction site. This may affect the air quality of nearby areas, especially, due to emission discharge from low height of the stack.

114. Mitigation Measures: All these impacts will be temporary and hence, no significant impact is envisaged. The following measures will be taken to minimise these:

- Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads⁷, earthworks, stockpiles and asphalt mixing plant areas.
- Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements.

⁷ Water suppression of fugitive dust can reduce emissions from 12% to 98%

- Material storage areas shall also be located downwind of the habitation area.
- Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by state pollution control board (SPCB) to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions.
- Diesel Generating (DG) sets shall also be fitted with stack of adequate height. Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained.
- The requisite PPE (helmet, mask, boot, hand gloves) shall be provided to the construction workers.

g. Noise Quality

115. Impact: Ambient noise level may increase temporarily in the close vicinity of various construction activities, maintenance workshops, vehicles movement and earthmoving equipment.

116. Mitigation Measures: The noise level will be intermittent and temporary and will attenuate fast with increase in distance from noise source. Further, vehicles and equipment should be fitted with silencers and maintained regularly. The workers shall be provided with personal protection devices such as earplugs and earmuffs. Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly.

h. Groundwater and Surface Water Quality and Availability

117. Impact: Water will be required for compaction of formation and domestic purposes in the workers camp. These requirements will be mainly sourced from groundwater. Any uncontrolled abstraction of ground water can deplete the ground water table fast. Contamination of groundwater is not envisaged since all construction camps will have septic tanks or mobile toilets depending on the number of workers in each camp. The drinking water supply to the habitat is primarily through hand pumps and bore wells. No significant impact is anticipated on surface water bodies except probability of siltation during construction. Due to non-perennial nature of surface water bodies, water requirements for drinking and construction purpose shall be met from ground water sources.

118. Mitigation Measures: Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority⁸ if applicable. The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. Water intensive activities shall not be undertaken during summer period to the extent feasible. Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting. Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. Measures are already purposed in earlier section for prevention of siltation in water bodies.

i. Biological Environment

119. Impact: Since the sample roads are not passing through any protected areas or forest area, there is no diversion of forest land. The major adverse impacts will be due to tree cutting,

⁸ As per Central Ground Water Authority (CGWA), there are 43 notified blocks in India where prior permission is required for extraction of ground water. Currently there are no notified areas in MP state. CGWA is continually updating the list of notified areas.

Siltation and contamination of water bodies may affect the aquatic life. Since there are only ponds and non-perennial water bodies (local nallas and few canals) the aquatic life is minimal and no significant impact is anticipated on aquatic life.

120. Mitigation Measures: All efforts shall be taken to avoid tree cutting wherever possible. Requisite permission from forest department shall be obtained for cutting of roadside trees. Compensatory Afforestation shall be made on 1:3. ratio basis. Additional trees shall be planted wherever feasible. All care shall be taken to avoid siltation/contamination of water bodies. Movement of herbivores like Cattle, Goats, Cows etc., have been observed in the surrounding agriculture fields. Disturbance to these animals will be avoided to the extent possible.

j. Impact on Common Property Resources

121. Impact: There are public utilities like Electric transformer, electric poles, and hand pumps all along the rural roads. The road construction may require shifting of these utilities. There are many community structures like school, playground village office and temples. One of the roads i.e Majholi to Suhajni in Jabalpur district has a small temple located adjacent to the road that will be affected due to the project.

122. Mitigation Measures: All efforts are made to minimize shifting of common utilities and community structures. ROW has been reduced in constricted areas with appropriate engineering measures to minimize land acquisition and shifting of community structures. The community structures/utilities which can not be saved will be shifted to adjacent area with the concurrence and in consultation with community.

B. Common Impacts during Post Construction and Operation Phase

1. Air Quality

123. Impact: Decrease in air quality due to increase in traffic, idling at congestions.

124. Mitigation Measures: The bad road condition is the main cause of poor air pollution at present. The improved road conditions will result in the improved ambient air quality. Also, the subproject road is largely traversing through vast open agriculture areas, which will provide adequate dispersion to gaseous pollutants, generated from vehicles and will offset the increased pollutants.

2. Noise

125. Impact: During the operational phase, 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 habitat areas, nearby schools and religious places.

126. Mitigation Measures: Awareness signboard shall be provided for safe driving near the habitat areas. Speed limitation and honking restrictions may be enforced near sensitive locations.

3. Land, Soil, Tree Plantation

127. Impact: The better access can lead to conversion of agriculture land for residential and commercial purposes close to roads, which may result in loss of productive land and agricultural produce. Since the rural road are aimed at connecting the villages, and with the general trend of

migration of rural population to urban areas, the phenomena of conversion of agriculture land to residential area is unlikely to change.

128. The land occupied for construction camp /temporary office/material storage area will remain unproductive if it is not restored after completion of construction activities.

129. It shall be essential to ensure the survivability of the compensatory tree planted

130. **Mitigation Measures** It shall be ensured that all construction camp/temporary office/material storage areas are restored to its original conditions. The borrow area rehabilitation will also be ensured as per the agreed plan with the landowner. Contractor and PIC will ensure the same and obtained clearance from PIU before handing over the site to SRRDA.

131. The PIC will undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for improving the survivability of the tree if required.

4. Groundwater

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

5. Hydrology and Drainage

133. **Impact:** Water accumulation incidence may occur due to inadequate availability of cross drainage structure or clogging of cross drainage structures.

134. **Mitigation Measures:** 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 shall be regularly conducted.

6. Socio-Economic Impact

135. Assessment of project impact on socio-economic conditions point to the conclusions that positive benefits are many fold compared to its adverse impact.

136. **Positive Impacts:** The better road access is likely to contribute the overall economic condition of village community. With the quick access to urban market areas, the farmers are likely to get better prices for their farm produce. Children will also be able to access the school and education facilities in the near by urban areas.

137. **Safety Measures** shall be adopted as per NRRDA guidelines. Some of them are highlighted below:

- Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves and bends where the curve design speed is less than 40 km per hour.
- Speed breakers shall also be provided at a threshold of habitation (as per NRRDA guidelines) at regular intervals (150-200 m) through habitation.
- The speed breakers are provided and directional sight boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required.

- Hazard markers to be installed at each end of all box culverts, river crossing causeways and similar CD structures
- Shoulder side slopes shall not be steeper than 2h:1V unless stone pitching of the slopes is provided.
- Cement concrete pavement and V-shaped drain is constructed to the full width of the available roadway within densely populated habitation.
- Directional sight board are installed on all sharp curves and bends
- At main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road.

C. Road Specific Impacts

138. The assessment of sample roads indicates that environmental issue associated with all the roads are similar. Hence mitigation measures applicable to all the road are also will be similar except variation in terms of magnitude which will depend on length of the road, the presence various environmental components. These components may be assessed in terms of no of pond, number of community structure (mostly temples, playground, school, gram Panchayat office) likely to be shifted, number and type of common utilities (hand pump, water tank, electric transformer, electrical poles).

139. Forest areas are located along four out of the 46 sample roads at different chainages, Appropriate measures relating to location of camp sites and working hours etc. should be maintained as provided in the environment management plan.

D. Climate Change Impacts and Risks

1. Climate Change Mitigation

140. The Transport Emissions Evaluation Model for Projects (TEEMP) is an excel based tool to assess CO₂ gross emissions without (business as usual or BAU) and with the project improvements (with project scenario or WPS). The tool, which was developed by Clean Air Asia and the Institute for Transportation and Development Policy, was funded by ADB. The main improvement from the project that was considered for the model are better surface roughness with less than 2.5m/km, and improved traffic speed and hence less fuel consumption. The model has also been used for CO₂ emission assessment during construction stage. 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. The model also computes for emission and emission intensity of PM and NO_x.

141. The following information were used to project CO₂ emissions for Tranche 1 of the Facility:

- a. RCIP 2 subprojects in Madhya Pradesh state will upgrade 171 rural roads with a total length of 2066.75 km;
- b. Road improvements will be confined to the existing one-lane 3.75-m road right-of-way, with lined storm water drains for stretches passing through built-up areas, waterlogged/water overtopping, and flood prone area; and
- c. Road roughness will improve from the current 8.0 m/km to 2.5 m/km.

142. Traffic forecasts were generated from the economic analysis for each road section, disaggregated into vehicle types and share to the annual average daily traffic (AADT). The cumulative AADT for the state is indicated in **Table 12**.

Table 12. AADT Composition

Vehicle Type	Percentage
Motorized	
Two-wheeler	48.24
Three-wheeler	2.20
Car/Jeep/Van	24.03
Multi-axle	4.90
Bus	3.91
Two-axle	16.73
Total (motorized)	100
Non-motorized	
Bicycle	97.7
Bullock cart	2.30
Total (non-motorized)	100.00

143. There are 171 rural roads with a total length of 2066.75 km proposed in Chhattisgarh, and with a carriageway width of 3.75m. Road capacity of 7,200 PCU/lane/day for rural roads was adopted for the project. The design life of the roads is 15 years.

144. Emission factors were taken from CBCP/ MOEF Draft Report on Emission Factor Development for Indian Vehicles (2007) and the Automotive Research Association of India.

Table 13. CO₂ Emission Factors

Vehicle Type	Gasoline (kg/liter)	Diesel (kg/liter)	LPG (kg)
2-wheeler	1.37		
3-wheeler	2.12	2.63	3.0
Car	2.24	2.59	
Multi-axle		3.21	
Bus		3.61	
2-axle		3.50	

145. To account for construction emission, the amount of emission per km was estimated. For rural roads, the emission factor for rural road in India (kg CO₂/km) was estimated at 48.4 tons/km⁹. These emissions were from construction materials used (aggregates/base materials, cement, bitumen and emulsion), and fuel used for transporting construction materials.

146. Total annual emissions without the project (business as usual) at the middle of the design life of 7.5 years is estimated at 20,707.92 tons/year and with project scenario is estimated at 20,119.55 tons/year, for all 171 roads proposed for Tranche 1 of RCIP 2. The with project scenario is still far below the 100,000 tons per year threshold set in the ADB SPS 2009 and therefore not required to implement options to reduce or offset CO₂ emissions.

⁹ <https://www.adb.org/sites/default/files/publication/28555/estimating-carbon-footprints-road-projects.pdf>

2. Climate Risks and Adaptation Needs

147. Climate risks in the State 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 various types of climate risks specific to the State of Madhya Pradesh. 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 climate risk maps, main risks identified for the project roads was flooding and landslides triggered by precipitation. The study reports that although the overall climate change risk level identified by the exercise was found to be low, the key risk identified was flooding due to increased precipitation intensity and increased storminess.

148. Key engineering measures taken to address the risk of flooding in the design of Madhya Pradesh district roads included: (a) Increase in road embankment height in flood prone areas/sections; (b) Improvement and provision of lined longitudinal and cross drains and new culverts; (c) Improvement and new construction of minor and major bridges; (d) Bridge heights to have a height of 0.6m above HFL for minor bridges and 0.9m above HFL for major bridges; and (e) Flood return period of 50 years for minor bridges and 100 years for major bridges to address overall climate change risks.

149. Provisions have also been made in the bidding documents for the contractor to prepare EMPs based on the final detailed design to address climate related risks and vulnerabilities.

VI. ENVIRONMENTAL MANAGEMENT PLAN, INSTITUTIONAL ARRANGEMENTS AND GRIEVANCE REDRESS MECHANISM

A. Environmental Management Plan

150. The Environmental Management Plan (EMP) is prepared to facilitate effective implementation of recommended mitigations measures with defined roles and responsibility for implementation and monitoring, regulatory compliance requirements, stages of implementation with location, period and costs. The mitigation measures are proposed to eliminate or minimise the identified impact associated with design, construction and operation stages of the project, to acceptable level by adopting the most feasible options.

151. The EMP is prepared as per Environmental Management Standard (ECOP) applicable to rural road defined be ADB at RRS I stage.

152. The identified impacts are insignificant and are related to clearing operations of RoW, traffic diversions, setting and operation of construction camps, quarry and borrowing operations, transportation of materials, construction of cross drainage structures, air & noise pollution due to construction activities and operation of construction equipment, tree cutting and shifting of utilities and physical community structure.

153. Appropriate mitigation measures are identified for all rural road construction and operation activities. The identified impacts associated with rural roads and mitigative measures are largely common to most of the roads. The EMP is detailed at **Appendix 4**. It provides action common to all roads at pre-construction, construction and operation stage. Since IEE is carried out, prior to preparation of DPR, the EMP will be updated specific to road as per DPR requirements by PIU and included with DPR, which shall be available to contractor at the time of bidding. The areas to be updated as per DPR provisions are highlighted under location column of EMP.

154. Since, these are rural road, the vehicular density and speed will be low. Movement of vehicles would be confined primarily for transfer of agricultural produce to market places. As such, no major emergency is anticipated. In any accidental eventuality, local administration can be reached quickly for help though Gram Panchayat (village administration) communication systems.

B. Environmental Monitoring Plan

155. The environmental monitoring program is prepared with aim to monitor the environmental performance of environmental management plan. The EMOP is planned with the focus on following objectives:

- To the assess the effectiveness of mitigation measures proposed
- To assess the change in environmental quality during construction and operation stage with respect to before the project scenario.
- To assess compliance to regulatory requirements
- To monitor the status of corrective action taken in case of deviation from the planned measures or regulatory requirements.

156. For rural roads, Environmental Monitoring plan will be more observation oriented and it provides observation areas with frequency of monitoring at pre-construction aspects¹⁰,

¹⁰ Aspects related to alignment selection for inclusion of new roads

construction stage and operation stage. A monitoring plan with monitoring indicator and frequency of monitoring is given at **Appendix 5**.

C. Institutional Arrangements and Responsibilities

1. Institutional Arrangement

157. NRRDA constituted by MORD is the nodal agency for the implementation of PMGSY in India. SRRDA is the state level agency responsible for implementation of PMGSY program in the state. NRRDA has developed various guidelines and defined institutional arrangements for effective and timely implementation of PMGSY program, which also covers measures for environmental and social safeguards. In line with the defined institutional requirements, each SRRDA has set up district level project implementation units (PIUs). NRRDA also appoints Technical Support Consultant (TSC) to provide technical support for capacity building in SRRDA/PIUs, facilitating them for environmental and social safeguard compliance monitoring and due diligence. SRRDA appoints PIC (project implementation consultant) for supervision of construction work. PIC also helps PIU in monitoring the EMP.

158. NRRDA is also responsible to coordinate with SRRDA and ensure compliance to ADB safeguard requirements.

159. The institutional arrangement at National Level and state level for implementation of PMGSY including second RCIP is shown at **Figure 9**.

D. Institutional Environmental Responsibilities

160. The institutional environmental responsibilities for different level and function is elaborated below

161. **MORD**¹¹ the executing agency has the responsibility for monitoring implementation of the EMP for all subprojects and undertaking necessary due diligence. MORD ensure this through its Nodal Agency NRRDA (National Rural Road Development Agency). MORD will also ensure that

- ADB is given access to undertake environmental due diligence for all subprojects, if and when needed as per EARF requirements.
- SRRDA meet all environmental assessment requirements in accordance with EARF
- It undertakes random monitoring of the implementation of the EMP
- Ensure compliance to legislative requirements such as forest clearance for diversion of forest land for non-forest purposes and Consent to Establish/Operate for hot mix plant, batching plant
- Appoint Technical Support Consultant (TSC) to assist SRRDA for various environmental aspect and safeguard compliances

¹¹ MoRD implements it through its nodal agency NRRDA which undertakes this with the help of Environmental Expert of Technical Support Consultant

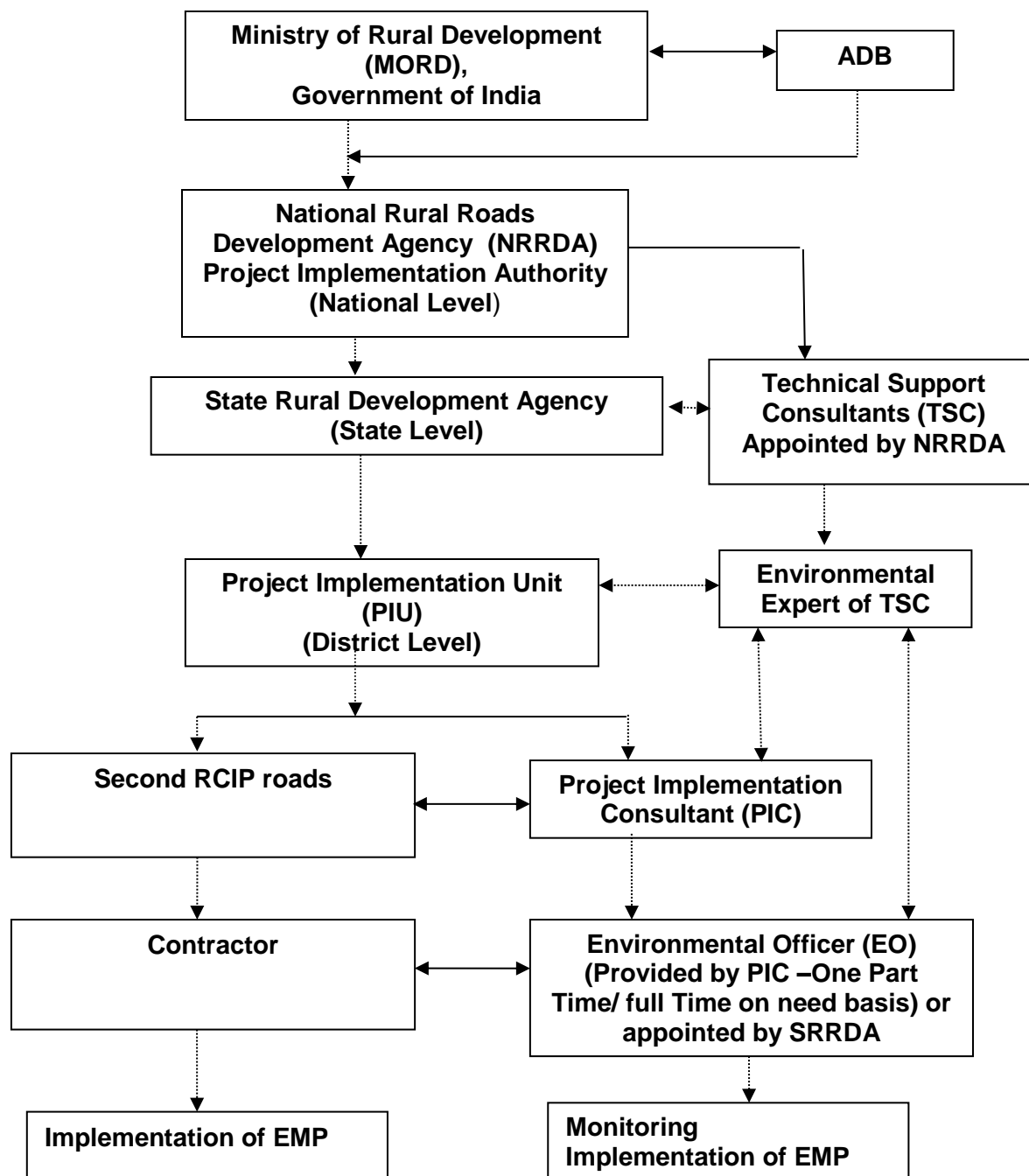


Figure 9: Institutional Arrangement for EMP Implementation

162. **SRRDA**¹² will ensure that:

- ECOP checklist is prepared for each road
- The completed ECOP checklist is included in the DPR with the help of PIC.
- Ensure that all required statutory environmental clearances are obtained and comply with clearance conditions;
- Ensure that the subproject specific EMPs and respective budget are included in the bidding documents;
- Ensure that the ECOP checklists and EMP (including general and site specific issues) are made available to the contractors;
- Undertake routine monitoring of the implementation of the EMP including spot checks on site and prepare monitoring reports at least once a year; and
- With the support of technical support consultants prepare satisfactory environmental due diligence reports of the earlier tranche/periodic financing request before implementing the next tranche.
- Appoint Project Implementation Consultant (PIC) for construction supervision and assist PIUs for EMP implementation and related safeguard compliances.

163. **PIU** will be responsible to:

- Complete the ECOP checklists and prepare subproject specific EMPs (including monitoring plan) for each subproject
- Obtain necessary statutory environmental clearance prior to commencement of civil works
- Update the respective ECOP checklists and EMPs if there are any changes in alignment of the subprojects
- To conduct monitoring of all subprojects and prepare pre-, during and post-construction monitoring checklists through the project implementation consultants,
- Prepare and submit to SRRDA annual monitoring report as per ADB defined format

164. **The Technical Support Consultants (TSC)** appointed by NRRDA. The Environmental Expert of TSC:

- Will provide technical assistance to SRRDA/PIU regarding environmental aspects, environmental permitting/clearances requirement,
- Periodically review EMP implementation status including spot site inspections.
- Conduct workshops/capacity building program at different level and functions.
- Prepare environmental Due Diligence report for each trench before implementing next trench
- Prepare state Level IEE reports and EMPs for non-sample roads based on the ECOP checklist completed by the PIC

165. **Project Implementation Consultant (PIC)** is appointed by SRRDA. PIC will provide one Environmental Officer (EO). The EO will be responsible to ensure adherence and implementation of EMP at all stages of works by the contractor. The EO, if found warranting may also conduct field tests, independent of the contractor to determine the effectiveness of EMP under approval of PIC/PIU. The broad duties / responsibilities of the Environmental Officer will include:

¹² With assistance from PIC (Project Implementation Unit)

- Review of project design and specifications to ensure their adequacy and suitability with respect to the implementation of EMP.
- Collection and dissemination of relevant environmental documents including amendments to environmental protection acts issued by the various agencies, namely, ADB, Government of India / State and local bodies;
- Interact with the counterpart of the Contractor(s), review work progress/plans and ensure implementation of the EMP;
- Co-ordination with the NGOs, community groups and Government departments on environmental issues, provide clarifications/ and obtain clearances during project implementation if any, as required from the regulatory authorities and/or submitting periodic compliance reports as required by the State Authorities;
- Monitoring sensitive environmental attributes during construction and operation stages¹³ to ensure that the suggested mitigation measures in the EMP are implemented. This will also serve as the basis for the annual environmental monitoring reports.
- Facilitate PIU for preparation of annual monitoring report as per ADB defined format
- Documentation of the environmental management/monitoring activities for the regular project implementation progress report; which will serve as the basis for the annual environmental monitoring reports.
- Conducting environmental training/awareness programs for the contractors, the project implementation personnel and the communities.

166. Contractor is appointed by SRRDA for construction of road and ensure implementation of EMP proposed. The broad duties of constructor are as follows:

- Make adequate costs provision for EMP requirements while bidding
- Ensure effective implementation of mitigative measures as per road specific EMP
- Comply with all applicable legislative requirements and obtain necessary consents for to Establish/Operate before start of hot mix plant and batching plants. Comply with al permit conditions
- Create awareness amongst workers for environment, occupational health and safety aspects. Participate in training and awareness programme along with its executives conducted by PIC.
- Provide PPE and adequate resources for Environment Occupational Health and Safety
- Follow all the guidelines for borrowing earth and restoration of borrow areas, setting up construction camps
- Sourcing of quarry material from approved quarries only
- Provide all required input to PIC for environmental monitoring as per EMP.

E. Environmental Assessment and Review Framework (EARF) for Second RCIP

¹³ Normally PIC is supposed to undertake five site visits and five monitoring reports as per contracts being issued by different SRRDA. It is proposed that PIC shall submit the following five monitoring reports: (1) First report at preconstruction stage, (2) Second report after three months of start of construction or on completion of 25% construction (3) Thrid report after seven months of start of construction or on completion of 75% of construction, (4) Fourth report after one month of completion of construction and first year of operation stage (5) Fifth report in second month of second year of operation stage.

167. ADB has prepared an Environmental Assessment and Review Framework (EARF) which identifies the broad scope of the MFF, outlines the policy, environmental screening and assessment, and institutional requirements for preparing the environmental assessments to be followed for subsequent batches and tranches. This EARF also specifies criteria for eligibility for selection rural roads under second RCIP. The sample roads are selected following these criteria. The EMP, monitoring requirement, institutional aspects, capacity building, grievance redress mechanism presented in this chapter are developed in line with above EARF. The eligibility criteria for selection of roads under second RCIP, environmental assessment requirement for each trench and legal framework are given below:

1. Selection Criteria and Environmental Assessment Requirement

168. The following criteria will be followed for selection of non-sample roads.

- (i) No Category A (as per ADB's SPS) subproject will be included in the MFF.
- (ii) Subprojects will be eligible for construction or upgrading in accordance with the PMGSY guidelines, and be included in the respective district core network.
- (iii) The subprojects shall not disturb any cultural heritage designated by the Government or by international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance.
- (iv) The subproject will not pass through any designated wildlife sanctuaries, national parks, other sanctuaries, notified ecological sensitive areas or area of international significance (e.g., protected wetland designated by the Wetland Convention).
- (v) The projects shall only involve activities that follow Government of India laws and regulations, ADB's Safeguard Policy Statement (2009)

169. The following environmental Assessment requirement will be followed for all roads included under second RCIP

- (i) ECOP checklists with annexes on trees, utility structures, community structures, strip plans and photographs will be completed for each and every road.
- (ii) Based on the requirements of the PMGSY guidelines separate ECOP checklists will be prepared for bridges that are longer than 15 m.
- (iii) Based on the completed ECOP checklists for roads and bridges, IEE reports will be prepared at a state level. These reports must contain a general EMP and a site specific EMP where there are site specific issues.
- (iv) ADB's REA checklist for roads and highways will be completed based on the state level IEE reports prepared and submitted to ADB to confirm categorization

170. The vulnerable to climate change will also be screened following screening checklists, which was integrated in the ADB REA Checklists and corresponding mitigation measures will be prepared.

- (i) Is the project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes

- (ii) Could changes in precipitation patterns or evaporation rates over the lifespan of the project affect its sustainability and cost (i.e., increased landslides increase maintenance costs)?
- (iii) Does the project use or depend on resources which could be affected by climate changes such as changes in temperature, precipitation, wind (increased soil moisture content in the sub-grade)?
- (iv) Are there any demographic or socioeconomic aspects of the subproject and project area (e.g., population growth, settlement patterns) that increase the vulnerability of the project and surrounding area?
- (v) Could the subproject potentially increase the vulnerability of the surrounding area (i.e., by increasing runoff, encouraging settlement in earthquake zones)

2. Legal Framework

171. As per Indian legislation, an environmental clearance is not required for rural roads. However, it may attract provisions of Forest Conservation Act, Wild Life (Protection) Act, and other legislation related with Air, Water and Noise pollution controls and prevention. The legislative applicability screening is presented in chapter 1 of this report and it will apply for non-sample road as well. Additionally, to ensure conformance to ADB's Safeguard Policy Statement, 2009 (SPS), the subprojects will be subject to the following requirements:

- (i) Submission of a completed Rapid Environment Assessment (REA) checklist for Roads and Highways and a categorization form for each state level IEE that is prepared.
- (ii) An Initial Environmental Examination¹⁴ (IEE) report including the preparation of an Environmental Management Plan (EMP) and a Monitoring Plan.
- (iii) Regular monitoring of implementation of the EMP and submission of monitoring reports and due diligence reports to ADB as necessary

F. Capacity Building

172. Existing capacity of the State Rural Roads Development Agencies (SRRDAs) and Project Implementation Units (PIUs) for implementing environmental safeguard issues need substantial strengthening. Capacity building activities will mainly comprise training workshops for SRRDA and PIU environmental officers on (i) completion of environmental code of practice (ECOP) checklists; (ii) preparation of environmental management plan (EMP) and monitoring plans; (iii) monitoring of EMP implementation and completion of pre-, during and post-construction monitoring checklists; and (iv) preparation of monitoring reports. These few workshops have already been conducted at participating states though ADB appointed Environmental specialist. Additional training will be carried out periodically, by In-house trained and experienced officials.

G. Consultation and Information Disclosure

173. During the preparation of ECOP and Detailed Project Report (DPR), the PIU has to ensure consultation, and addressal of concerns of the affected people.

174. All environmental assessment documents are subject to ADB's Public Communication Policy (2005) and will be made available to the public, upon request. The SRRDAs are responsible for ensuring that all environmental checklist documentation, including the environmental due

¹⁴ As per selection criteria, no Category A subproject will be included under RCIP.

diligence and monitoring reports, are properly and systematically kept as part of the Investment Program specific records. MORD must disclose state specific sample road IEE reports on its website.

H. Grievance Redress Mechanism

175. Subproject Level. Public disclosure and complaints contact person will be designated by the PIU for each subproject to help address all concerns and grievances of the local communities and affected parties. Contact details will form part of the subproject identification display board that will be placed at both ends of the rural road being constructed.

176. Village Level. If there are environmental issues concerning road subprojects, community consultation process that is transparent, gender responsive and accessible to all stakeholders, in accordance with PMGSY guidelines and SPS 2009 will be conducted. Grievances, if any, will be considered at the village level by the Grievance Redress Committee (GRC) consisting of members of Gram Panchayat, and Pradhan / Up-Pradhan of Gram Panchayat. The GRC will meet for addressing grievances as needed.

177. District Level. Grievances not resolved at the village level will be addressed through the district level GRC, with the following members:

- (i) Executive Engineer of the PIU;
- (ii) Member of Zilla Parishad;
- (iii) Member of the grievance committee of the concerned GP; and
- (iv) Representatives of APs will be active participants in the proceedings of grievance redressal.

178. Grievance procedures, which can be easily understood by stakeholders, and preferably in the local language, will be disseminated to affected communities. Issues need to be resolved prior to awarding of civil work contract.

179. National Level. NRRDA has made provision of registering complaint /suggestion through its website. NRRDA forwards these complains to concerned SRRDA for necessary actions. SRRDA directly or through concerned PIU initiate the appropriate action and update the complainant as well as NRRDA. It is proposed that NRRDA website will be cross-linked to each SRRDA website as well or SRRDA will also make provision of complain registry at its website.

180. The following indicative timeline to resolve grievances at different levels will be observed: Subproject level – 3 days; Village level – 1 week; District level – 1 week; and National level – 2 weeks. GRM related costs, which mostly include travel expenses and meeting related expenses such as refreshments, will be covered by PIU. The GRC meetings will only be convened only if and when necessary. Hence, GRC members will not be required to be present in all times during project implementation. Cost for other activities such as recording complaints, minutes of meetings, preparing reports, etc., will be carried out by the PIU / PIC. Complainant has the option to resort to legal redress at any stage.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. General

181. Public consultation was undertaken consistent with the ADB requirements. All the five principles of information dissemination, information solicitation, integration, co-ordination and engagement into dialogue were incorporated in the consultation process. A framework of different 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.

182. Stakeholder's consultations were held from March to June 2017. Some of these consultations, reflected below, were done in Charnaar to Chhatarpur, Ahamadpur to Charnaal, Chandbad to Maanpura, Durgaon to Gawaa, Gawaa to Khakadarpura (Patera), Kakandarpura (Patera) to Parason roads. Stakeholder's, including women were consulted to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design. Informal meetings, interviews were organized covering the entire project stretch. The informal consultation generally started with explaining the sub projects, followed by an explanation to potential impacts. Participant's views were gathered with regard to loss of agricultural land, shifting of utilities, shifting of common cultural properties, effect on air and noise quality of the area due to traffic, water availability, accident and risk.

183. 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 opinion was sought. Suggestions were also sought for mitigating any potential adverse impact.

B. Compliance with Relevant Regulatory Requirements

184. In India, public consultation is mandatory in case of Category A and B1 category projects¹⁵ in select conditions. Being a category B project as per ADB Safeguards Policy Statement 2009, consultation was carried out during the early stage of IEE report preparation. The requirement of public consultation during the implementation of the project has been proposed as part of the mitigation plan.

C. Beneficiaries' Comments

185. The project has immense acceptability among the local people. They perceived that in addition to providing all weather connectivity, the sub-project road would bring positive socio-economic changes in the area. Local people mainly discussed on issues related to drainage and commencement of the construction work.

186. Some of the general issues raised during the different consultation sessions are summarised below:

- **Construction Camp** - The participants did not apprehend any adverse impact due to the construction camp near to their villages. They responded positively towards providing support to these, if required, in terms of any food, water requirements.

¹⁵ As per schedule I of EIA notification number S.O. 1533, dated 14th September 2006. This notification also defines when a public consultation is mandatory. However, the project roads do not require environmental clearance under this notification.

- **Water Logging and Drainage** - Participants informed about few low-lying areas where water logging takes place during monsoon season. The villagers requested for provision of adequate cross drainage structures at these locations.
- **Loss of Livelihood and Income Restoration Options** - those who had encroached on the proposed alignment raised this issue. However, they offered the encroached space for the proposed project, if demanded.
- **Road Safety** - Safety issues were not of major concern among the inhabitants including women.
- **Land Acquisition** - People were in full support of the project and were ready to donate their land for the same, if required.
- **Losses of Idols/Shrines** - Participants supported the project and were willing to shift the idols, burial grounds and other religious structures observed at certain locations if required.
- **Loss of Trees Due to Road Construction** - Respondents were of the opinion that trees cutting should be avoided or else minimised. For trees to be cut compensatory plantation should be done. Some villagers expected additional plantation should be carried out. They recommended to plant only local tree species.
- **Impacts on Health** – Villagers do not perceive any impact due to this road project. However, issues pertaining to sexually transmitted diseases (STDs), HIV- AIDS may be an issue during construction stage however, this aspect is analysed by Social Impact Assessment team separately.
- **Ambient Air & Noise Quality** – The respondents viewed that these are the problems of urban areas and their villages are still untouched from this aspect. They even do not anticipate any of these problems after the completion of the project. However, they do not want increased in pollution during construction phase.
- **Inconvenience during Construction** - The participants viewed that they will manage it, as it will be temporary in nature.
- **Employment during Construction** - The locals expected that they should be given preference in employment during project implementation.
- **Perceptions and Expectations** - The public and the affected persons appreciated need and supported the project fully. Community at large appreciated overall benefits to them resulting from project development;

D. Addressal of Issues

187. The efforts made to address all the issues raised during consultations through design changes/adjustments and environmental best practices. Some of the provisions made under the project to address the issues and concerns of the community are given in **Table 14**. Consultations with stakeholders will continue throughout project implementation as necessary at different levels, to update and address the concerns of affected people on environment related issues.

Table 14: Addressal of Issues and Concerns under the Project

Issue/Concern	Addressal under the project
Water Logging and Drainage	Adequate cross drainage structures have been planned
Road Safety	Adequate safety signage is planned all along the rural road.
Land acquisition and Mode of compensation	The proposed RoW is 12m along the rural road. No land acquisition is planned in project road.

Issue/Concern	Addressal under the project
Loss of roadside idols/shrines	Idols and shrines will be relocated to the other nearby places with consultation and proper rituals
Loss of trees	Compensatory Afforestation would be done at the ratio of three trees for each tree to be cut. Additional tree plantation shall be made wherever feasible
Increased pollution levels	Ambient air quality, water quality largely meets the prescribed standard. All efforts shall be made to prevent pollution. No construction activity shall be taken at night in village area.
Utilities and basic infrastructure	All the effected utilities, electric poles, telephone lines, wells, tube wells etc. shall be relocated under the project cost. Primary water sources like hand pump and open well should be relocated first if affected.
Employment of locals during construction	Locals will be given preference for employment during the project implementation

VIII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

188. The findings of Environment Assessment of sample roads indicate that impacts are mostly similar and subprojects are unlikely to cause any significant 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, are temporary in nature, and can be mitigated with minor to negligible residual impacts.

189. The project received immense support from local people as they perceive that this project will improve the overall connectivity and bring various economic opportunities to the people of the area

190. All sample roads included under Second RCIP were selected based on ecological and climate change consideration defined under EARF and the through route linking the rural hubs. Accordingly, none of the sample roads passes through protected areas or encroaches precious ecology (sensitive or protected areas) or any historical or archeologically protected areas. As per selection guidelines, none of the selected sample road passes through reserved forests either. Few trees cutting though may be involved.

191. None of the rural road crosses any river, only local nallas are crossed where adequate engineering measures are proposed for the protection of road from the flood.

192. All the sample roads are aligned with existing village roads and unpaved movement paths. As such, land acquisition is nil or very minimal which is also acquired through donations from villagers.

193. Considering insignificant environmental sensitivity, the project is categorised as category B as per ADB Safeguard Policy Statement 2009.

194. No categorisation is made under environmental legislation of India, since these small roads do not require any environmental clearance in accordance to Indian Environmental (Protection) Act and Rules, 1986 amended till date. However, clearance from Forest Department will be required for cutting of trees.

195. The impacts identified are mostly related to alignment selection, land clearing, borrowing earth, cutting of trees, shifting of utilities and community structures, establishment of construction camp or material storage areas, transportation of material and operation of hot mix plant. All identified impacts are either eliminated or minimised through design consideration and suitable mitigative measures.

196. Environmental Management plan covering all stages of road construction (design, construction and operation) is prepared with defined responsibility for its implementation. Environmental Monitoring plan is also prepared to ensure effective implementation of EMPs.

197. NRRDA/SRRDA has defined institutional setup including with specified responsibility for environmental management. Existing capacity of the State Rural Roads Development Agencies (SRRDAs) and Project Implementation Units (PIUs) for implementing environmental safeguard issues need substantial strengthening. The capacity enhancement is proposed through focused workshops and training session. Few workshops have already been conducted at participating

states through ADB appointed Environmental specialist. Trained and experienced in-house officials should carry out more raining in future periodically.

The IEE also indicate that rural road construction works does not warrant further EIA study for subsequent rural road construction works in Madhya Pradesh.

B. Key Recommendations

198. Any major changes or any major additional work other than the proposed project activities will require updation of ECOPs and IEE. The updated ECOPs and IEE will have to be submitted to NRRDA, and ADB for concurrence before civil works commence.

199. The implementation of prescribed mitigation measures will minimize/avoid the adverse impacts. Moreover, the impacts shall be monitored continually by implementing and updating the Environmental Management plan and Environmental Monitoring Plan.

200. These IEE is prepared based on ECOPs and feasibility stage. Subproject specific EMP shall be improved as per the final provisions made under DPRs. The updated EMP if there is any change, shall also be sent to ADB for information.

201. Executing agency shall ensure that updated road specific EMP forms part of DPR and is available to contractor at the time of bidding. The contractor will specify the quantity and budget for various activities like rehabilitation of borrow earth pits, first aid and sanitation facilities at construction camp and temporary office/material storage place as per EMP requirements. The same shall be revised if there is any change in the project design. Any such change shall be reported to ADB as well

APPENDIX 1: DETAILS OF ROADS IN MADHYA PRADESH**Madhya Pradesh – District wise List of Roads Proposed under RCIP II Tranche I**

Sr. no.	District	Block	Name of Road	Length (in KM)
1	Balodabazar	Balodabazar	T04-Lawan to Siriyadih Lata	13.15
2	Balodabazar	Balodabazar	T14-Bhalukona to Singhari Parsapali Dongridih	6.00
3	Balodabazar	Bhatapara	ML11-Turma to Khairi	7.00
4	Balodabazar	Bhatapara	T07-Dhaneli to Borsi	20.60
5	Balodabazar	Bhatapara	ML10-Mopar to Arjuni	11.00
6	Balodabazar	Bhatapara	ML06-Gudaghat to Nipaniya	14.90
7	Balodabazar	Simga	T10-Hatband to Jangda	17.66
Total		7 Roads		90.31
1	Gariaband	Chhura	ML01-Madeli to Mudagaon via Ranipartewa	8.01
2	Gariaband	Deobhog	ML01-Jharabahal to Dhumamuda	13.22
3	Gariaband	Gariaband	T04-Joba to Kharta	16.00
4	Gariaband	Mainpur	ML11-Urmal To Kekarajor	9.57
5	Gariaband	Mainpur	ML01-Rajapadav to Gaurgaon	22.00
6	Gariaband	Rajim	T14-Fingeshwar to Sonasilly	16.30
Total		6 Roads		85.10
1	Dhamtari	Dhamtari	T10-NH 30 Limtara Biretara to Khamhariya Doma	10.25
2	Dhamtari	Kurud	T13-Bhalukona Gobra to Sakri Road	9.80
3	Dhamtari	Kurud	T11-Nari to Gadadih Road	12.50
4	Dhamtari	Kurud	T14-Kurud Kanharपुरi Bhusrenga to Bagdehi Road	10.25
5	Dhamtari	Kurud	T10-Bhusrenga Bagaud Bangoli Road	6.85
6	Dhamtari	Magarlod	T04-Badi Kareli Khatti Pasatthi Budeni	8.70
7	Dhamtari	Magarlod	T05-Singpur -Mohera-Maragaon-Jabrra-Bhobhalabahara Road	38.00
8	Dhamtari	Nagri	T10-Nagri Farsiya Nirrabeda Bhothli Bhaisasankara Hinchhapur	17.30
Total		8 Roads		113.65
1	Mahasamund	Bagbahara	T12-Bagbahara(NH353) to Jhalap	20.70
2	Mahasamund	Basna	T09-Lamber to Badesajapali	11.90
3	Mahasamund	Mahasamund	T13-Joba to Pidhi-Sirpur	18.22
4	Mahasamund	Pithora	T15-Pithora asnid Road-Kishanpur -Patandadar (T03)	13.30
Total		4 Roads		64.12
1	Raigarh	Baramkela	ML01-Sariya to Sankra	13.10
2	Raigarh	Baramkela	ML10-Baramkela Sohela road to Nawapara Bade	11.40
3	Raigarh	Gharghoda	ML03-Tenda Navapara to Dehrideeh to rabo dam	8.50
4	Raigarh	Gharghoda	ML01-Teram to Kurmibhona	8.70
5	Raigarh	Gharghoda	ML02-Kudumkela Jarkat to Badegumda	22.44
6	Raigarh	Lailunga	ML05-Mukdega Bhuiyapani To Kamarga	8.50
7	Raigarh	Pussore	ML01-Raigarh to Ektal Road	15.30
8	Raigarh	Pussore	ML03-Pussore Rengalpali Road to Lara chote hardi	11.23
9	Raigarh	Pussore	T01-Raigarh to Pussore	12.07
10	Raigarh	Raigarh	ML12-Boirdadar Chowk Raigarh to Urdana	12.97
11	Raigarh	Sarangarh	T03-Godam To Bandhapali	12.60
12	Raigarh	Sarangarh	ML01-Malda B Parsada Chhote To Gonda	12.04
13	Raigarh	Tamnar	T03-Tamnar To Keserchuna	22.20
14	Raigarh	Tamnar	T07-Gerwani to Saraipali	7.55
Total		14 roads		178.6
1	Janjgir-Champa	Akaltara	T04-Akaltara to Arasmeta	16.50

Sr. no.	District	Block	Name of Road	Length (in KM)
2	Janjgir-Champa	Akaltara	T02-Akaltara To Hardi Jarwey	18.50
3	Janjgir-Champa	Baloda	ML02-T01(Main road Pantora to Headaspur)	6.05
4	Janjgir-Champa	Bamhndih	T04-T04 Pondishankar to Kapisda	6.55
5	Janjgir-Champa	Dabhara	ML07-Main Road To Saradih-Kenabhata	10.22
6	Janjgir-Champa	Dabhara	ML04-Kotami to Salhe	5.45
7	Janjgir-Champa	Jaijaipur	ML08-Kutarabd Harethikala to Jamdi Malda	8.03
8	Janjgir-Champa	Malkharada	ML03-T05 to Mandragorhi	7.50
9	Janjgir-Champa	Nawagarh	ML04-T02 (Main Road To Kirit-Pendri)	6.80
10	Janjgir-Champa	Nawagarh	T05-T08 Awarid to Bhdesar to Dharashiv	12.55
11	Janjgir-Champa	Pamgarh	T03-T04 Main road to Kosala	6.00
12	Janjgir-Champa	Sakti	ML01-L028 Jetha to Dumarpar Main Road (MDR)	9.05
13	Janjgir-Champa	Sakti	ML04-NH 49 to Turridham	7.30
14	Janjgir-Champa	Sakti	ML03-L048 Main Road to Sakrelikala To Judga	7.52
Total		14 roads		128.02
1	Surajpur	Premnagar	ML17-Raghunathpur Karmipara Umeshwarpur Maniharidand to Durgapur	13.00
2	Surajpur	Ramanujnagar	ML08-Patrapali to Salhi Badkapara	10.96
3	Surajpur	Surajpur	ML05-Kunjnagar to Jamdai Patelpara	22.00
4	Surajpur	Surajpur	ML09-Bisrampur Datima Road to Sohagpur - Karangi Datima Mod	19.10
Total		4 roads		64.65
1	Surguja	Lakhanpur	T02-Hansdand Latori to Darripara	4.00
2	Surguja	Lakhanpur	T04-Keora Kataipara to Parri	7.20
3	Surguja	Lakhanpur	T03-Ambikapur Bilaspur Road to Gumgurakala	12.50
4	Surguja	Lundra	ML10-Bulga Udari Mode to Jamdi Kardoni Maghapara	15.35
5	Surguja	Lundra	T01-Raghunahtpur to Askala	8.50
6	Surguja	Mainpat	T09-NH 78 Rd 436.5 km to Pidiya Baigapara	22.00
Total		6 roads		91.95
1	Jashpur	Duldula	T08-Duldula To Gadakata via Chatakpur	18.90
2	Jashpur	Farsabahar	T05-Pamshala to Saraitoli	11.35
3	Jashpur	Farsabahar	T17-Pandripani to Menderbahar	10.70
4	Jashpur	Jashpur	T10-Girang to Boki	11.15
5	Jashpur	Pathalgaon	T02-Chandagarh to Pakargaon NH 78	14.06
6	Jashpur	Pathalgaon	T10-Pathalgaon to Kilkila	8.00
7	Jashpur	Pathalgaon	T08-Shivpur to Pathalgaon NH 78	9.20
8	Jashpur	Pathalgaon	T11-Kotba to Tr-06 Via Farsatoli	17.20
Total		8 roads		100.56
1	Korea	Baikunthpur	ML03-Sarbhoka to Chhindiya	7.40
2	Korea	Baikunthpur	ML04-Baikunthpur to Saraighana	10.30
3	Korea	Baikunthpur	MRL24-Patna to Chharchha via Murma, Besarjhariya	14.00
4	Korea	Khadgawan	T01-Shivpur to Udnapur	10.03
5	Korea	Khadgawan	ML01-Bachra to Badakalua	8.40
6	Korea	Khadgawan	T02-Dewadand to Koda	16.70
7	Korea	Manedragarh	T02-Manendgarh Ledri Paradol Road to Bundeli	7.00
8	Korea	Manedragarh	ML01-Chanwaridand to Bauridand	8.60
9	Korea	Manedragarh	T01-Purani Ledri to Narayanpur Bhauta	12.20
Total		9 roads		94.63
Grand Total		80 roads		1001.58

APPENDIX 2: RURAL ROADS: ENVIRONMENTAL CHECKLIST

Road Name: **Ahamadpur- Charnal to Parason Road**
 Block Name: **Sehore**
 District Name: **Sehore**
 Total Length of the Road: **26.0 km, (Surveyed length: 27.30 Km)**

A. Climatic Conditions

Temperature	High: 42.4 °C (May) Low: 7.9 °C (Dec)
Humidity	High: 93 % (Aug) Low: 76 %
Rainfall Rainy Season	1261 mm/year June to September

B. Location of the Road and Generic description of Environment

No.	Type of Ecosystem	Yes	No	Explanation
1.	Coastal area Mangrove (along roadside)		√	Distance from Coastline: km () more than 50% () less than 20%
2.	Type of Terrain—(Plain/Hilly/ Mountainous etc.) (Explain the topography of the area and how many km of the road are located in the hilly area)	√		Hilly area between Ch-15200m to Ch-15400 RHS and 18600m to Ch-19000m on LHS along the proposed alignment.
3.	Forest Area (Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?		√	Type of Vegetation: Legal Status of the Forest Area: Unclassified (Reserved, National Park, Sanctuaries, Unclassified, etc.) No part of the project road passes through any forest area.
4.	Wildlife (Explain whether there are any wildlife species in the project area)		√	Name of animals: NA Endangered species (if any): None
5.	Inhabited Area	√		Inhabited area lies between Ch-00m to Ch-800m Ahamadpur, Ch-13000m to Ch-13600m Chandbad, Ch-16000 to Ch-16200m Durgaon, Ch-16800m to Ch-17000m Durgaon, Ch-18400m to Ch-18800m Gavaa, Ch-20900m to Ch-21100m Khakandarpura, Ch-27200m to Ch-27300m both side with connecting village Parason.
6.	Agricultural Land	√		The agriculture land lies between Ch-1200m to Ch-6200m, Ch-6200m to Ch-10000m, Ch-10000m to Ch-11800m, Ch-13600m to Ch-15000m, Ch-15000m to Ch-16000m, Ch-16200m to Ch-16800, Ch-17000m to Ch-18400m, Ch-18800m to Ch-20200, Ch-20200m to Ch-20900m and Ch-21100m to Ch-27200m both side along the proposed alignment.
7.	Grazing grounds	√		Grazing ground was found between Ch-11600m to Ch-13000m on both side and 18400m to Ch-18800m on RHS along the proposed alignment.
8.	Barren Land		√	Barren land was not found along the project road.

C. Specific description of the Road Environment

(Note: Questions number 1, 4, 5, 7 and 8 must be answered after discussions with the local community people)

No.	Parameter/ Component	Yes	No	Explanation
1.	Are there any areas with landslide or erosion problems along the road? <i>(If yes, indicate the location (right or left side) and the chainage)</i>		√	No part of the project road is passing through hilly terrain prone to landslide or erosion. However, sufficient cross drainage structures will be constructed to avoid any erosion. () No Secondary Information is available and Local Community is not aware of this matter
2.	Are there any lakes/swamps beside the road? <i>(If yes, list them indicating the location (right or left side) and the chainage)</i>	√		There is a pond between Ch-19000 m to Ch-19200m on LHS which is 8m from center line of the alignment.
3.	Are there any nallas/streams/rivers etc. along/crossing the road? <i>(If yes, list them indicating the location (right, left or crossing) and the chainage)</i>	√		Few water bodies are crossing the proposed alignment and cross drainage structures are provided at these locations. Existing CD: Ch-400m to Ch-600m, Ch-800m to Ch-1000m (2 CD), 1200m to Ch-1400m, Ch-1600m to Ch-1800m, Ch-2400m to Ch-2600m, Ch-4800m to Ch-5000m (2 CD), Ch-5600m to Ch-5800m, Ch-5800m to Ch-6000m, Ch-6000m to Ch-6200m, Ch-6400m to Ch-6600m, Ch-7800m to Ch-8000, Ch-9200m to Ch-9400m, Ch-9600m to Ch-9800m, Ch-10000m to Ch-10200m, Ch-11600m to Ch-11800m, Ch-12200m to Ch-12400, Ch-12800m to Ch-13000m(2 CD), Ch-13400m to Ch-13600m, Ch-14400m to Ch-14600m, Ch-14600m to Ch-14800m (2 CD), Ch-16200m to Ch-16400m, Ch-16400m to Ch-16600m, Ch-16600m to Ch-16800m, Ch-17000m to Ch-17200m, Ch-17400m to Ch-17600m, Ch-18000m to Ch-18200m, Ch-19000m to Ch-19200m, Ch-19800m to Ch-20000m, Ch-20200m to Ch-20400 (2 CD), Ch-20600m to Ch-20800m, Ch-21200m to Ch-21400m, Ch-21600m to Ch-21800m, Ch-22200m to Ch-22400, Ch-23800m to Ch-24000m, Ch-24200m to Ch-24400 (2 CD), Ch-24800m to Ch-25000m, Ch-26000m to Ch-26200m, Ch-26400m to Ch-26600m Proposed FD: Ch-3000m to Ch-3200m, Ch-3400m to Ch-3600m, Ch-4400m to Ch-4600m, Ch-5200m to Ch-5400m, Ch-7000m to Ch-7200m, Ch-7400m to Ch-7600, Ch-8000m to Ch-8200m, Ch-8800m to Ch-9000m, Ch-9400m to Ch-9600, Ch-9800m to Ch-10000m, Ch-10400m to Ch-10600m, Ch-11000m to Ch-11200m, Ch-14800m to Ch-15000m, Ch-17200m to Ch-17400m, Ch-17600m to Ch-17800m, Ch-19400m to Ch-19600m, Ch-19600m to Ch-19800m, Ch-21400m to Ch-21600m, Ch-22600m to Ch-22800m and Ch-23600m to Ch-23800
4.	Are there problems of water stagnation and other drainage issues on or near the road? <i>(If yes, mention chainage)</i>	√		There are some points of water stagnation and other drainage issues near the road at between Ch-7000m to Ch-7200m on LHS, Ch-19600m to Ch-19800m and Ch-19800m to Ch-20000 on RHS.
5.	Is the area along the project road prone to flooding? <i>(If yes, mention flood level and frequency)</i>	√		No flood prone area is observed along the proposed alignment except as discussed in S.No.3. () No Secondary Information is available and local Community is not aware of this matter
6.	Are there any trees with a dbh of 30 cm or more within 10 m on either side from the center line of the road alignment? <i>(If yes attach list of trees indicating the location (right or left side) and the chainage)</i>	√		There are 200 trees of 30 cm dbh or more within 10m from C/L on both sides along the proposed alignment. Tree locations and distance from C/L is given in Attachment I . There will be 02 tree loss between Ch-1000m to Ch-1200m, Identified at the alignment.

No.	Parameter/ Component	Yes	No	Explanation
7.	Along the road and within 100m of the road shoulder, are there any faunal habitat areas, faunal breeding ground, bird migration area, or other similar areas? <i>(If yes, specify details of habitat with chainage)</i>		√	No Faunal Habitat Area, Faunal breeding ground and bird migration areas exist within 100 m of the road shoulder on both sides along the proposed alignment.
				() No Secondary Information is available and local Community is not aware of this matter
8.	Along the road and within 100m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	No evidence of rare, endangered or threatened species are noticed or informed within 100 m of the road shoulder on both sides along the proposed alignment.
				() No Secondary Information Available and Local Community is not aware of this matter
9.	Are there any utility structures ¹⁶ within 10 m on either side from the center line of the road alignment? <i>(If yes, attach list with chainage)</i>	√		There are few utility structures observed during the transect walk. The location and type of utility structure along with their approximate distance from C/L is given in Attachment II
10.	Are there any religious, cultural or community structures/buildings ¹⁷ within 10 m on either side from the center line of the road alignment? <i>(If yes attach list with chainage)</i>	√		Few religious cultural or community structures/buildings observed during the transect walk. The location and type of utility structure along with their approximate distance from C/L of proposed alignment is listed in Attachment III.

D. Public Consultation

S.No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. <i>(Attach list of people met and dates)</i>	√		Yes, consultation with the community was held on 03-03-2017 to 06-03-2017. Participants list is attached with CPF document.
2.	Any suggestion received in finalizing the alignment	√		Yes, in habitation area they required drainage.
3.	If suggestions received, were they incorporated into the design.	√		Community has suggested electricity poles shifting.

E. Please attach the following:

- 1) Sketch a map showing the bridge and the trees
- 2) List of trees indicating location (left or right side of the road) and chainage (as required under C. 6)
- 3) List of utility structures indicating location (left or right side of the road) and chainage (as required under C. 9)
- 4) List of community structures indicating location (left or right side of the road) and chainage (as required under C. 10)
- 5) Sketch of strip map of the road covering details of at least 10 m on either side from the center line of the road
- 6) Photographs of the project area showing at least 10 m on either side from center line of road alignment. Every 2 km or less of road must have at least 1 photograph.

Checked by

(Environment Expert)

¹⁶ Water tap, hand pump, electric pole, telephone pole, water pipe and other similar structures.

¹⁷ Mandir, Masjid, Church, religious/cultural/historical monuments, school, health center, public toilet and other similar structures.

Attachment I

List of Trees				
Chainage (m)			Left	Right
0	-	200	-	6
200	-	400	5	-
400	-	600	4	-
800	-	1000	1	-
1000	-	1200	1	3
3800	-	4000	1	-
4400	-	4600	-	2
4600	-	4800	1	-
4800	-	5000	-	4
5600	-	5800	1	-
5800	-	6000	2	-
6000	-	6200	2	-
6200	-	6400	-	1
6400	-	6600	-	1
6600	-	6800	3	6
6800	-	7000	-	1
7000	-	7200	-	3
8000	-	8200	2	-
8200	-	8400	3	1
8400	-	8600	-	4
9200	-	9400	2	-
9400	-	9600	5	-
9600	-	9800	-	1
9800	-	10000	1	1
10200	-	10400	4	3
10400	-	10600	6	5
10800	-	11000	1	-
11000	-	11200	1	-
11200	-	11400	2	7
11800	-	12000	-	1
12200		12400	2	2
12400		12600	1	2
12600	-	12800	1	4
13000	-	13200	1	1
13200	-	13400	-	2
13400	-	13600	-	1
13800	-	14000	1	1
14000	-	14200	6	5
14200	-	14400	-	1
14400	-	14600	-	6
14800	-	15000	1	1
15000	-	15200	2	-
15200	-	15400	-	1
15800	-	16000	-	1
16400	-	16600	-	1
16600	-	16800	1	1
16800	-	17000	1	1
17000	-	17200	6	-
17200	-	17400	3	-
17400	-	17600	-	7
17600	-	17800	1	1
18200	-	18400	-	1
19200	-	19400	2	-
20200	-	20400	2	-
20600	-	20800	-	2
20800	-	21000	1	-

List of Trees				
Chainage (m)			Left	Right
21000	-	21200	1	-
21600	-	21800	1	-
21800	-	22000	2	-
22000	-	22200	1	2
23600	-	23800	-	1
24600	-	24800	2	1
25000	-	25200	2	-
25200	-	25400	1	-
25400	-	25600	-	1
25600	-	25800	-	2
26400	-	26600	1	-
26600	-	26800	-	2
26800	-	27000	2	5
27000	-	27200	-	1
Total			93	107

Attachment II

List of Utilities				
Chainage (m)			Left	Right
0	-	200	8 EP	6 EP
200	-	400	4 EP	4 EP
400	-	600	3 EP	1 HP
1000	-	1200	5 EP	1 EP
1200	-	1400	-	1 EP
1400	-	1600	-	1 EP
1600	-	1800	3 EP	3 EP
1800	-	2000	3 EP	-
2000	-	2200	4 EP	-
2200	-	2400	4 EP	-
2400	-	2600	5 EP	-
2600	-	2800	5 EP	-
2800	-	3000	5 EP	-
3000	-	3200	6 EP	-
3200	-	3400	4 EP	-
3400	-	3600	5 EP	-
4000	-	4200	4 EP	-
4200	-	4400	1 TF	-
4400	-	4600	5 EP	-
4600	-	4800	4 EP	-
4800	-	5000	5 EP, 1 TF	-
5000	-	5200	5 EP	-
5200	-	5400	5 EP	-
5400	-	5600	2 EP	1 EP
6200	-	6400	1 EP	-
6800	-	7000	1 EP	1 EP
7000	-	7200	1 EP	-
7200	-	7400	7 EP	-
7400	-	7600	4 EP	-
7600	-	7800	3 EP	-
7800	-	8000	4 EP	-
8000	-	8200	4 EP	-
8200	-	8400	5 EP	-
8400	-	8600	7 EP	-
8600	-	8800	6 EP	7 EP
8800	-	9000	1 EP	5 EP
9000	-	9200	4 EP	9 EP
9200	-	9400	-	7 EP
9400	-	9600	-	5 EP

List of Utilities				
Chainage (m)			Left	Right
9600	-	9800	5 EP	5 EP
9800	-	10000	4 EP	-
10000	-	10200	4 EP	7 EP
10200	-	10400	3 EP	8 EP
10400	-	10600	4 EP	5 EP
10600	-	10800	4 EP	6 EP
10800	-	11000	5 EP	6 EP
11000	-	11200	3 EP	4 EP
11200	-	11400	4 EP	4 EP
11400	-	11600	4 EP	6 EP
11600	-	11800	2 EP	5 EP
11800	-	12000	2 EP	6 EP
12000	-	12200	5 EP	3 EP
12200	-	12400	1 EP	6 EP
12400	-	12600	5 EP	-
12600	-	12800	1	-
12800	-	13000	EP	-
13000	-	13200	5 EP	6 EP, 1 TF
13200	-	13400	2 EP	6 EP
13400	-	13600	1 EP, 1 TF, 1 HP	5 EP, 1 TF
13600	-	13800	3 EP	5 EP
14000	-	14200	5 EP	3 EP, 2 TF
14200	-	14400	4 EP	-
14400	-	14600	2 EP	-
14600	-	14800	2 EP	-
14800	-	15000	4 EP	-
15000	-	15200	2 EP	-
15200	-	15400	1 EP, HTL	6 EPHTL
15400	-	15600	HTL	5 EP, HTL
15600	-	15800	4 EP, HTL	4 EP, HTL
15800	-	16000	3 EP, 2 HTL	2 HTL
16000	-	16200	4 EP, 1 TF	-
16200	-	16400	4 EP	-
16400	-	16600	-	-
16600	-	16800	6 EP, 1 HP	-
16800	-	17000	4 EP, 1 HP	2 EP, HTL
17000	-	17200	HP	2 EP
17200	-	17400	-	3 EP
17400	-	17600	-	1 EP
17600	-	17800	4 EP	-
17800	-	18000	3 EP, HTL	1 EP, HTL
18200	-	18400	7 EP, HTL	5 EP
18600	-	18800	3 EP	-
19000	-	19200	4 EP	-
19200	-	19400	3 EP, HTL	2 HTL
19400	-	19600	3 EP	-
19600	-	19800	4 EP	HTL
20200	-	20400	-	2 EP
20600	-	20800	5 EP	4 EP
20800	-	21000	1 TF, 1 HP	1EP
21000	-	21200	3 EP	2 EP
21200	-	21400	2 EP	-
21400	-	21600	2 EP, HTL	HTL
21600	-	21800	2 EP, HTL	HTL
21800	-	22000	1 EP	-
22200	-	22400	3 EP	-
22400	-	22600	4 EP	-

List of Utilities				
Chainage (m)			Left	Right
22600	-	22800	ELC	ELC
23000	-	23200	4 EP, ELC	ELC
23200	-	23400	2 EP	-
23400	-	23600	-	OFC point
23600	-	23800	5 EP	-
23800	-	24000	2 EP, TF	-
24000	-	24200	2 EP, HTL	1 EP, HTL
24400	-	24600	2 EP, HTL	1 EP, HTL
25400	-	25600	ELC	1 EP
26400	-	26600	3 EP, TF	-
26800	-	27000	ELC	ELC, EP
27000	-	27200	HTL	HTL, EP

Attachment III

List of Community Structures				
Chainage (m)			Left	Right
400	-	600	-	Panchyat, School
800	-	1000	-	Cemetery
1000	-	1200	Religious place	Power house
4200	-	4400	Ware House	-
6000	-	6200	-	2 Wells
6800	-	7000	Well	-
7000	-	7200	Pit	-
8400	-	8600	-	School
8600	-	8800	-	Ware house
8800	-	9000	Temple, Water tank, Tube well	-
11000	-	11200	Well, HP	-
11800	-	12000	-	Religious place
12400	-	12600	-	Religious place
12600	-	12800	Animal Hospital, School	-
12800	-	13000	Govt. Shop	-
13000	-	13200	-	Govt. Shop
13200	-	13400	-	Temple boundary
13400	-	13600	-	Temple boundary
13600	-	13800	-	Cemetery
15200	-	15400	-	Water tank
16400	-	16600	2 Well	1 Well
16600	-	16800	-	Religious place
16800	-	17000	School	-
17000	-	17200	Religious place	-
17200	-	17400	-	Well
17400	-	17600	-	Well
17600	-	17800	-	1 Well
18400	-	18600	-	Religious place
18600	-	18800	-	-
19000	-	19200	School	-
19600	-	19800	Pond, Temple	-
19800	-	20000	-	Pit, Well
20200	-	20400	-	Pit, Well
21000	-	21200	Religious place	-
21400	-	21600	Religious place	School
21600	-	21800	Well	-
23600	-	23800	-	Well
24000	-	24200	2 Well	Religious place
24400	-	24600	Well	-
25000	-	25200	School	-

25200	-	25400	2 Wells	-
26800	-	27000	Daragaah	-
27000	-	27200	-	Religious place

Attachment-IV

Left					Chainage (m)			Right				
8 to 10m	6 to 8m	4 to 6m	2 to 4m	0 to 2m				0 to 2m	2 to 4m	4 to 6m	6 to 8m	8 to 10m
-	8 EP	-	-	-	0	-	200	-	-	6 Trees	6 EP	-
-	-	5 Trees	4 EP	-	200	-	400	-	-	4 EP	-	-
2 Trees	-	2 Trees	3 EP	-	400	-	600	-	-	-	HP	Panchyat Bhawan, School (40m)
-	-	1 Tree	-	-	800	-	1000	-	-	-	Cemetery	-
-	-	1 Tree	5 EP, Dargaha	-	1000	-	1200	-	1 Tree (2.5m)	2 Tree	1 EP	Power House
-	-	-	-	-	1200	-	1400	-	-	1 EP	-	-
-	-	-	-	-	1400	-	1600	-	-	1 EP	-	-
3 EP	-	-	-	-	1600	-	1800	-	-	-	-	3 EP
-	3 EP	-	-	-	1800	-	2000	-	-	-	-	-
-	4 EP	-	-	-	2000	-	2200	-	-	-	-	-
-	4 EP	-	-	-	2200	-	2400	-	-	-	-	-
-	5 EP	-	-	-	2400	-	2600	-	-	-	-	-
-	5 EP	-	-	-	2600	-	2800	-	-	-	-	-
-	5 EP	-	-	-	2800	-	3000	-	-	-	-	-
-	6 EP	-	-	-	3000	-	3200	-	-	-	-	-
-	4 EP	-	-	-	3200	-	3400	-	-	-	-	-
-	5 EP	-	-	-	3400	-	3600	-	-	-	-	-
-	-	1 Tree	-	-	3800	-	4000	-	-	-	-	-
4 EP	-	-	-	-	4000	-	4200	-	-	-	-	-
Ware house	-	TF	-	-	4200	-	4400	-	-	-	-	-
-	-	5 EP	-	-	4400	-	4600	-	-	2 Trees	-	-
-	4 EP	-	-	-	4600	-	4800	-	-	-	-	-
-	5 EP	TF	-	-	4800	-	5000	-	-	-	4 Trees	-
-	-	5 EP	-	-	5000	-	5200	-	-	-	-	-
-	-	1 EP	-	-	5200	-	5400	-	-	4 EP	-	-
-	-	2 EP	-	-	5400	-	5600	-	1 EP	-	-	-
-	-	1 Tree	-	-	5600	-	5800	-	-	-	-	-
-	-	2 Trees	-	-	5800	-	6000	-	-	-	-	-
-	2 Trees	-	-	-	6000	-	6200	-	-	-	-	2 Wells
-	-	-	1 EP	-	6200	-	6400	-	1 Tree	-	-	-
-	-	-	-	-	6400	-	6600	-	1 Tree	-	-	-
-	-	3 Trees	-	-	6600	-	6800	-	-	6 Trees	-	-
Well	-	1 EP	-	-	6800	-	7000	-	1 Tree	1 EP	-	-
-	Pit	1 EP	-	-	7000	-	7200	-	3 Trees	-	-	-
-	7 EP	-	-	-	7200	-	7400	-	-	-	-	-
-	4 EP	-	-	-	7400	-	7600	-	-	-	-	-
-	3 EP	-	-	-	7600	-	7800	-	-	-	-	-
-	4 EP	-	-	-	7800	-	8000	-	-	-	-	-
-	4 EP	2 Trees	-	-	8000	-	8200	-	-	-	-	-
-	-	3 Trees, 5 EP	-	-	8200	-	8400	-	-	1 Tree	-	-

Left					Chainage (m)			Right				
8 to 10m	6 to 8m	4 to 6m	2 to 4m	0 to 2m				0 to 2m	2 to 4m	4 to 6m	6 to 8m	8 to 10m
-	7 EP	-	-	-	8400	-	8600	-	-	4 Trees	-	School(50m)
-	6 EP	-	-	-	8600	-	8800	-	-	-	7 EP	Ware house (50m)
Tube well	-	Water tank	Temple, 1 EP	-	8800	-	9000	-	5 EP	-	-	-
-	-	4 EP	-	-	9000	-	9200	-	9 EP	-	-	-
-	-	-	2 Tree	-	9200	-	9400	-	-	7 EP	-	-
-	-	5 Trees	-	-	9400	-	9600	-	5 EP (2.5m)	-	-	-
-	-	-	5 EP	-	9600	-	9800	-	1 Tree, 5 EP	-	-	-
-	-	-	1 Tree, 4 EP	-	9800	-	10000	-	-	1 Tree	-	-
-	-	-	4 EP	-	10000	-	10200	-	7 EP	-	-	-
-	4 Trees	-	3 EP	-	10200	-	10400	-	-	3 Trees	8 EP	-
-	6 Trees	-	4 EP (2.5m)	-	10400	-	10600	-	-	5 EP	5 Trees	-
-	-	4 EP	-	-	10600	-	10800	-	6 EP	-	-	-
-	-	1 Tree, 5 EP	-	-	10800	-	11000	-	6 EP	-	-	-
HP	Well	1 Tree	3 EP	-	11000	-	11200	-	4 EP	-	-	-
-	4 EP	2 Trees	-	-	11200	-	11400	-	4 EP	7 Trees	-	-
-	-	4 EP	-	-	11400	-	11600	-	1 Tree	6 EP	-	-
-	-	2 EP	-	-	11600	-	11800	-	2 Trees, 6 EP	-	-	-
-	-	-	2 EP	-	11800	-	12000	-	2 Trees	6 EP	-	Religious place
-	-	5 EP	-	-	12000	-	12200	-	-	3 EP	-	-
-	1 EP	2 Trees	-	-	12200	-	12400	-	6 EP	4 Trees	-	-
-	-	1 Tree, 5 EP	-	-	12400	-	12600	-	-	1 Tree	Religious place	-
Animal Hospital (20m), School (40m)	-	1 Tree	1 EP	-	12600	-	12800	-	-	-	-	-
Govt shop (20m)	-	5 EP	-	-	12800	-	13000	-	-	-	-	-
-	-	-	1 Tree, 2 EP	-	13000	-	13200	-	6 EP, TF (2.5m)	Govt. Shop	-	-
-	HP	1 EP, TF	-	-	13200	-	13400	-	Platform, stairs, 3 EP (2.5m)	2 Trees, 3 EP	-	Temple (20m)
-	-	-	2 EP	-	13400	-	13600	-	1 tree (2.5), 5 EP, TF	Platform	Temple	-
-	-	-	3 EP	-	13600	-	13800	-	5 EP	-	-	Cemetery (50m)
-	-	1 Tree	-	-	13800	-	14000	-	-	1 Tree	-	-
-	-	6 Trees	5 EP	-	14000	-	14200	-	3 EP	5 Trees	-	2 TF
-	-	4 EP	-	-	14200	-	14400	-	-	1 Tree	-	-
-	-	2 EP	-	-	14400	-	14600	-	-	-	6 Trees	-
-	2 EP	-	-	-	14600	-	14800	-	-	-	-	-
-	2 EP	1 Tree	-	-	14800	-	15000	-	-	1 Tree	-	-
-	-	2 EP	2 Tree	-	15000	-	15200	-	-	-	-	-

Left					Chainage (m)			Right				
8 to 10m	6 to 8m	4 to 6m	2 to 4m	0 to 2m				0 to 2m	2 to 4m	4 to 6m	6 to 8m	8 to 10m
-	-	-	1 EP	-	15200	-	15400	-	-	1 Tree, 6 EP	Water Tank	-
-	-	-	-	-	15400	-	15600	-	5 EP	-	-	-
-	-	Ware house	4 EP	-	15600	-	15800	-	4 EP (2.5m)	-	-	-
-	-	3 EP	-	-	15800	-	16000	-	-	-	1 Tree	-
-	-	4 EP, TF	-	-	16000	-	16200	-	-	-	-	-
-	-	4 EP	-	-	16200	-	16400	-	-	-	-	-
2 Well (10m)	-	-	-	-	16400	-	16600	-	-	-	1 Tree	Well
HP	-	1 Tree	6 EP	-	16600	-	16800	-	-	-	1 Tree	-
-	-	School	1 Tree, 4 EP, HP	-	16800	-	17000	-	2 EP (2.5m)	1 Tree	-	-
HP(15m)	Temple	6 Trees	-	-	17000	-	17200	-	2 EP (2.5m)	-	-	-
-	-	3 Trees	-	-	17200	-	17400	-	3 EP	-	Well	-
-	-	-	-	-	17400	-	17600	-	-	7 Trees	1 EP	Well
-	-	1 Tree, 4 EP	-	-	17600	-	17800	-	-	1 Tree	-	Well (12m)
-	-	-	3 EP	-	17800	-	18000	-	1 EP	-	-	-
-	-	7 EP	-	-	18200	-	18400	-	4 EP	1 Tree	-	-
-	-	-	-	-	18400	-	18600	-	-	Temple	-	-
TF	School , HP	3 EP	-	-	18600	-	18800	-	-	-	-	-
-	Pond	Temple	4 EP	-	19000	-	19200	-	-	-	-	-
-	3 EP	2 Tree	-	-	19200	-	19400	-	-	-	-	-
-	-	3 EP	-	-	19400	-	19600	-	-	-	-	-
-	-	-	-	-	19600	-	19800	-	-	Well	-	Pit (20m)
Religious place (35m)	-	-	2 Trees	-	20200	-	20400	-	-	2 EP	-	-
-	-	5 EP	-	-	20600	-	20800	-	4 EP	2 Trees	-	-
-	-	HP	1 Tree, TF	-	20800	-	21000	-	1 EP	-	-	-
-	Religious place	1 Tree	3 EP (2.5m)	-	21000	-	21200	-	2 EP	-	-	School (15m)
-	-	-	2 EP	-	21200	-	21400	-	-	-	-	-
-	Well	2 EP	-	-	21400	-	21600	-	-	-	-	-
-	-	2 EP	1 Tree	-	21600	-	21800	-	Religious place	-	-	Well (20m)
-	-	1 EP	2 Trees	-	21800	-	22000	-	-	-	-	-
-	-	-	1 Tree	-	22000	-	22200	-	-	-	-	-
-	-	-	3 EP	-	22200	-	22400	-	-	-	-	-
-	4 EP	-	-	-	22400	-	22600	-	-	-	-	-
-	-	-	-	-	22600	-	22800	-	-	-	-	-
-	4 EP	-	-	-	23000	-	23200	-	-	-	-	-
-	-	2 EP	-	-	23200	-	23400	-	-	-	-	-
-	-	-	-	-	23400	-	23600	-	-	-	-	-
-	2 Wells	5 EP	-	-	23600	-	23800	-	1 tree, Religious place	-	-	-
TF	-	-	2 EP	-	23800	-	24000	-	-	-	-	-

Left					Chainage (m)			Right				
8 to 10m	6 to 8m	4 to 6m	2 to 4m	0 to 2m				0 to 2m	2 to 4m	4 to 6m	6 to 8m	8 to 10m
-	Well	-	2 EP	-	24000	-	24200	-	1 EP	-	-	-
School (20m)	-	-	-	-	24400	-	24600	-	-	-	-	-
-	-	-	2 Trees	-	24600	-	24800	-	1 tree	-	-	-
2 Wells	-	-	2 Trees	-	25000	-	25200	-	-	-	-	-
1 tree, Dargaha	-	-	-	-	25200	-	25400	-	-	-	-	-
-	-	-	-	-	25400	-	25600	-	1 EP	1 tree	-	-
-	-	-	-	-	25600	-	25800	-	-	2 trees	-	-
-	-	3 EP, TF	1 tree	-	26400	-	26600	-	-	-	-	-
-	-	-	-	-	26600	-	26800	-	1 tree	-	-	1 tree
-	-	2 Trees	-	-	26800	-	27000	-	5 Trees, 1 EP	Religious place	-	-
-	-	-	-	-	27000	-	27200	-	-	Religious place, 1 EP	1 Tree	-

E.P. Electric Pole, H.P. – Hand Pump, T.W.; Tube Well, P.H.C; Primary Health Center
A.L. – Agricultural Land; C.D. – Cross Drainage structure, W.T.—Water Tank

Photo Plates



Ch-00m Start point



Ch-5500m Junction LHS



Ch-7000m Pond-LHS



Ch-8400m to Ch-8600m School -RHS



Ch-11000m Well on LHS



Ch-12600m Tree on LHS



Ch-13400m Temple on RHS



Ch-14800m Curve on RHS



Ch-19400m 3 EP-LHS



19600m Pit on LHS



Ch-23600m Junction on RHS



Ch-27300m Curve on RHS, End point

Road safety photographs showing Road safety session on the alignment during transect walk



Ch- Ahamadpur to Charnaal (Tree on RHS and Dargah on LHS)



Charnaal to Chhatarpur (Junction-RHS)



Chandbad to Maanpura (Junction-LHS)



Durgaon to Gawaa



Gawaa to Khakandarpura (Patera)



Khakandarpura (Patera) to Parason

Photographs during the Community Consultation with villagers



Ahamadpur to Charnaal



Charnaal to Chhatarpur



Chandbad to Maanpura



Durgaon to Gawaa



Gawaa to Khakandarpura (Patera)



Khakandarpura (Patera) to Parason



APPENDIX 3: GUIDELINES FOR BORROW AREAS MANAGEMENT

I. 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 borrow 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.

2. The contractor in addition to the established practices, rules and regulation will also consider following criteria before finalizing the locations.

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

II. CONTRACTOR'S RESPONSIBILITY

3. The Contractor shall obtain representative samples from each of the identified borrow areas and have these tested at the site laboratory following a testing program 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;

- (1) 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.
- (2) 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.
- (3) Where the excavation reveals a combination of acceptable and un-acceptable 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.

III. BORROWING FROM DIFFERENT LAND-FORMS

A. Borrow Areas located in Agricultural Lands

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) 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).
- (iii) Borrowing of earth will be carried out up to a depth of 1.5m from the existing ground level.

- (iv) Borrowing of earth will not be done continuously through out the stretch.
- (v) Ridges of not less than 8m widths will be left at intervals not exceeding 300m.
- (vi) Small drains will be cut through the ridges, if necessary, to facilitate drainage.
- (vii) The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal).
- (viii) The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.

B. Borrow Areas located in Elevated Lands

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) 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).
- (iii) 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

C. Borrow Areas near River side

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) 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).
- (iii) 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.

D. Borrow Areas near Settlements

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) 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).
- (iii) 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.
- (iv) 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.

E. Borrow Pits along the Road

4. Borrow pits along the road shall be discouraged and if deemed necessary and permitted by the Engineer; following precautions are recommended.

- (i) The preservation of topsoil will be carried out in stockpile.
- (ii) 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).
- (iii) Ridges of not less than 8m widths should be left at intervals not exceeding 300m.
- (iv) Small drains shall be cut through the ridges of facilitate drainage.

- (v) 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 to 1.5m.
- (vi) 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.

IV. REHABILITATION OF BORROW AREAS

5. The objective of the rehabilitation program is to return the borrow pit sites to a safe and secure area, which the 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.

6. Re-development plan shall be prepared by the Contractor before the start of work inline with the owners will require and to the satisfaction of owner. The Borrow Areas shall be rehabilitated as per following;

- 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.
- 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.

7. 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 4: ENVIRONMENTAL MANAGEMENT PLAN

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
Measures common to all sample roads							
Design and Pre Construction Stage							
1.	Climate Change Consideration and Vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check point given under EARF and adoption of necessary mitigative measures as may be required Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of PRI (Panchyati Raj Institution) 	All through the alignment of each rural road	Pre Construction Phase	Part of Project Cost	Project Preparation design Consultant/ consultant	PIU/ MPRRDA
2.	Finalization of alignment	<ul style="list-style-type: none"> The road will be part of district core network and will comply with PMGSY guidelines Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance. Subproject will not pass through any designated wild life sanctuaries, national park, notified Eco sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area.. Subproject to comply with local and National legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009. Alignment finalization considering availability of right of way and in consultation with local people. ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines. Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. The road shall follow natural topography to avoid excessive cut and fill. 	All through the alignment of each rural road	Pre Construction Phase	Part of Project Cost	Project Preparation design Consultant/ consultant	PIU/ MPRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
3.	Land acquisition	<ul style="list-style-type: none"> ○ Avoid or minimize land acquisition. ○ Land acquisition, compensation packages, resettlement and rehabilitation, poverty alleviation programs for affected people and all other related issues are addressed through Social Impacts and Resettlement & Rehabilitation report. 	All through the alignment of each rural road	Pre Construction Phase	Land to be made available by the state Government	PIU, Govt. of Madhya Pradesh, and other	Environmental officer under the PIC will also coordinate and ensure implementation
4.	Biological environment - Tree planting	<ul style="list-style-type: none"> ○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from forest department shall be obtained for cutting of roadside trees. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. ○ Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation. 	Throughout the project section of the road. (<i>Highlight Tree cutting locations & proposed likely plantation location</i>)				
5.	Planning for land clearing	<ul style="list-style-type: none"> ○ The road land width shall be clearly demarcated on the ground. ○ The utility and community structure shifting shall be planned in consultations and concurrence of the community. ○ Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a prior permission of Forest department. ○ The vegetable cover shall be removed and disposed in consultation with community. ○ All public utilities shifting shall be planned with prior concurrence of respective agencies/authority and to the adjacent location approved by them 	All through the Rural roads excepting in stretches of habitations (<i>Attach or Refer to specific sections of DPR for the utilities to be shifted along with chainages for the location of such structures</i>)	Pre Construction Phase	Necessary cost provisions have been made. All other costs are included under project cost.	PIC, PIU, Forest Department NGOs (shifting of utilities shall be carried out by respective governmental bodies at cost to be reimbursed by project, implementing agency). To increase survival rate of new saplings, a core Tree Management Committee is to be created to ensure complete retrieval of vegetative cover and timely replacement of perished plantations. implementation Unit (PIU) of MPRRDA,	Environmental officer under the PIC will coordinate and ensure Officials of Forest Department, Contractor and local NGOs and coordinated by Environmental officer of Construction Supervision Consultant for specific package.
8.	Shifting on Common Properties Resources	<ul style="list-style-type: none"> ○ All efforts are made to minimize shifting of common utilities and community structures. 	As determined by contractor	Construction Phase	Borne by Contractor	Contractor is responsible for ensuring provision of facilities	Environmental officer and other team members of

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> The community structures/utilities which can not be saved will be shifted to adjacent area with the concurrence and in consultation with community. 	under approval of PIC /PIU <i>(Attach or Refer to specific sections of DPR for community structures to be shifted along with chainages for the location of such structures)</i>			under approval by PIC / PIU	<p>PIC will monitor and ensure appropriate implementation</p> <p>Environmental officer will regularly interact with the local people who are likely to be affected to ensure that their interests are protected and no social resentment sets in.</p>
6.	Cut and Fill and Embankment Construction design & planning	<ul style="list-style-type: none"> The alignment design shall consider options to minimize excessive cuts and fills. The cut and fill quantities shall be used for embankment to minimize borrow earth requirement. The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage. Adequate provision shall be made for cross drainage structure for maintaining natural drainage pattern in the subproject area and preventing soil erosion. Side drain for channelizing water to nearby natural drain in water stagnation /logging prone area. The top soil of the cut and fill area shall be used for embankment slope protection Embankment will be designed above High Flood Level (HFL) wherever, area is prone to flood. 	<p>All through the alignment of each rural road</p> <p><i>(Highlight the high flood level, chainage for action and linkages to DPR section)</i></p>	Pre Construction Phase	Part of Project Cost	Project Preparation design Consultant/ consultant	PIU/ MPRRDA
7.	Hydrology and Drainage	<ul style="list-style-type: none"> Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge 	Near all drainage crossing , nalas				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>capacity of the CD structure shall be designed accordingly.</p> <ul style="list-style-type: none"> Provision of adequate side drainage shall be made in water stagnant/logging areas. The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment to ensure minimum disturbance to natural drainage of surface and subsurface water of the area. Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. Provision of concrete road construction in habitat area with drainage of both side of the road shall be made as per the design provision and with adequate slope to prevent any water logging. Road level shall be fixed above HFL. Embankment slope stabilization measures shall be planned. Stabilization measures may include vegetative treatment, stone pitching, retaining wall where feasible, low cost options such as bamboo / eucalyptus tree pilling . 	<p>and river crossings etc.</p> <p><i>(indicate HFL Level and Highlight the chainage for action and linkages to DPR section)</i></p>				
8.	Establishment of Construction Camp, temporary office and storage area	<ul style="list-style-type: none"> Construction camp sites shall be located away from any local human settlements (minimum 0.5 km away) and preferably located on lands, which are not productive barren/waste lands presently. Similarly temporary office and storage areas shall be located away from human settlement areas (minimum 500 m). The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. The construction camps shall be located at a minimum 0.5 km from forest land/areas to 	<p>As determined by contractor under approval of PIC/PIU/ (ref- Labelled: WASTE OIL; and hazardous sign be displayed at oil handling areas and sold off to SPCB/ MoEF authorized re-refiners).</p>	Pre-construction and construction stage	To be included in contractor's cost	All facilities are to be planned and implemented by contractor under approval by PIU / PIC	PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 0.5 km from forest land/areas.</p> <ul style="list-style-type: none"> ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible. ○ The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipments (PPEs) like helmet, boots, earplugs for workers, first aid and fire fighting equipments shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. ○ Provision shall be made for domestic solid waste disposal in a control manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage. 	<i>(Contractor to specify the cost provision made for PPE and other environmental sanitation measures required per construction camp / temporary office/ storage area)</i>				
9.	Traffic Movement	<ul style="list-style-type: none"> ○ The contractor will identify the areas where temporary traffic diversion may be required. He would prepare appropriate traffic movement plan for ensuring continued flow of traffic during construction phase. This may include movement of the traffic from the site of the construction area. This kind of a temporary diversion shall be finalized with the concurrence of respective PIU. ○ Wherever, cross drainage structure work require longer construction time and road is to 	As proposed under DPR and determined by contractor and approved by PIC/PIU/ <i>(Highlight the chainages which may require traffic diversions)</i>	Pre-construction and construction stage	To be included in contractor's cost	All facilities are to be planned and implemented by contractor under approval by PIU / PIC	PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>be blocked for longer duration, the PIU / DPR Consultant shall define appropriate measures for traffic diversion before the start of the construction.</p> <ul style="list-style-type: none"> ○ The diversion plan should ensure smooth flow of traffic, minimize accidents to road users during construction works. ○ Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and retro reflective in nature for good visibility in day and night both. 					
10.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves design and bends where the curve design speed is less than 40 km per hour in plain and rolling terrain. ○ Speed breakers shall also be provided at a threshold of habitation (as per NRRDA guidelines) at regular intervals (150-200 m) through habitation. ○ The speed breakers shall be provided and directional sign boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required. ○ Provision shall be made for Hazard markers at each end of all box culverts, river crossing causeways and similar CD structures ○ Shoulder side slopes shall not be steeper than 2h:1V unless stone pitching of the slopes is provided. ○ Cement concrete pavement and V-shaped drain shall be constructed to the full width of the available roadway within densely populated habitation and as per feasibility. ○ Provision shall be made for Directional sight board shall be installed on all sharp curves and bends ○ At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	<p>Throughout the project section at the location determined by contractor and approved by PIU</p> <p><i>(Highlight the location with chainage for such requirements)</i></p>				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> It is proposed to approach railways for adequate safety at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both side of the railway crossing 					
	Construction Stage						
11.	Sourcing and transportation of construction material (aggregates , earth)	<p>Borrow Earth:</p> <ul style="list-style-type: none"> The borrow earth shall be obtained from identified locations and with prior permission for landowner and clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed. Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. 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). Borrowing of earth will not be done continuously through out the stretch. Ridges of not less than 8m widths will be left at intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage. The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside. Fly ash will also be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. The borrow area shall be rehabilitated as per the understanding arrived with the land- 	<p>As Borrow sites and quarries (if required) location.</p> <p><i>(List the probable locations for borrow areas. Highlight the identified quarries, if already identified. Contractors should also indicate the quarry they are likely to use if not already identified at DPR stag)</i></p>	During Design and construction Stage	Engineering cost	<p>The selection of quarries and material selection will be the responsibility of contractor under approval of PIC /PIU/TSC Environmental officer and other team members of PIC will ensure appropriate implementation of mitigation actions.</p>	<p>PIC /PIU/TSC Environmental officer and other team members of PIC will monitor</p>

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<p>owner. The re-habilitation plan may include the following:</p> <ul style="list-style-type: none"> ▪ 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 ground surface. ▪ Borrow areas might be used for aquaculture in case landowner wants such development. <p>Aggregate :</p> <ul style="list-style-type: none"> ○ The stone aggregate shall be sourced from existing licensed quarries ○ Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU. ○ Topsoil to be stockpiled and protected for use at the rehabilitation stage <p>Transportation of Construction Material</p> <ul style="list-style-type: none"> ○ Existing tracks / roads are to be used for hauling of materials to the extent possible. ○ Prior to construction of roads, topsoil shall be preserved or at least shall be used for any other useful purposes like using in turfing of embankment rather than allowing its loss by construction activities. ○ The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any. 					
	Loss of Productive Soil, erosion and land use change	<ul style="list-style-type: none"> ○ It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over back to land owner. 	Thought out the road section (The contractor shall include the cost for the	During the Construction stage	Included in project cost	Design Consultant and Contractor	PIU / MPRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
12.		<ul style="list-style-type: none"> The top soil from the productive land (borrow areas, road widening areas etc.) 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. Cut and fill shall be planned as per IRC provisions and rural road manual. All steep cuts shall be flattened and benched. Shrubs shall be planted in loose soil area. 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 embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion 	<i>measures as part of the construction cost)</i>				
13.	Compaction and Contamination of Soil	<ul style="list-style-type: none"> 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. 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/temporary office/storage areas. 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. Fuel and lubricants shall be stored at the predefined storage location. The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. 	<p>Throughout the project section of the road s</p> <p><i>(The contractor shall include the cost for the measures as part of the construction cost)</i></p>	<ul style="list-style-type: none"> Design and construction stage 	<ul style="list-style-type: none"> Project preparation cost and construction cost 	<ul style="list-style-type: none"> Design consultant and Contractor, 	PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> 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 labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners. 					
14.	Construction Debris and waste	<ul style="list-style-type: none"> All excavated materials from roadway, shoulders, verges, drains, cross drainage will 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 manner at designated landfill sites only in an environmentally accepted manner. For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. Unproductive/wastelands shall be selected with the consent of villagers and Panchayat for the same. The dumping site should be of adequate capacity. It should be located at least 500 m away from the residential areas. Dumping sites should be away from water bodies to prevent any contamination of these bodies. 	<ul style="list-style-type: none"> Throughout the project section of the road 	<ul style="list-style-type: none"> Design and construction stage 	<ul style="list-style-type: none"> Project preparation cost and construction cost 	<ul style="list-style-type: none"> Design consultant and Contractor, 	PIU
15.	Air and Noise Quality	<ul style="list-style-type: none"> Vehicles delivering loose and fine materials like sand and aggregates shall be covered. Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements. Material storage areas shall also be located downwind of the habitation area. 	<ul style="list-style-type: none"> Near all drainage crossing, nallas and river crossings etc. <p>(The contractor shall include the cost for the measures as part of the</p>	<ul style="list-style-type: none"> During Construction stage 	<ul style="list-style-type: none"> Included in engineering cost 	Contractor	PIU/ MPRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions. Diesel Generating (DG) sets shall also be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5 KVA and about 0.7 m for 10 KVA DG sets, above top of sound proofing enclosure of the Dg set). . Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained. The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers. Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. 	construction cost)				
16.	Biological environment - Tree planting	<ul style="list-style-type: none"> Compensatory Afforestation shall be made on 1:3.ratio basis as per the plannings. Additional trees shall be planted wherever feasible. 	Throughout the project section of the road (Highlight Tree cutting locations & proposed likely plantation location)	during the design and Construction stage	Part of engineering work cost included	MPRRDA	PIU MPRRDA and
17.	Ground Water and Surface Water Quality and Availability	<ul style="list-style-type: none"> Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority if applicable. The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. 	Throughout the project section of the road (The contractor shall include the cost for the measures as	construction stage	construction cost	Contractor,	PIC/PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		<ul style="list-style-type: none"> Water intensive activities shall not be undertaken during summer period to the extent feasible. Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. Preventive measures like slop stabilisation, etc shall be taken for prevention of siltation in water bodies. 	<i>part of the construction cost)</i>				
19.	Occupational Health and Safety	<ul style="list-style-type: none"> Verification of implementation of provision made at planning stage. Each worker is provided with requisite PPE Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 					
	Operation Stage						
19.	Air and Noise Quality	<ul style="list-style-type: none"> Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement.. Speed limitation and honking restrictions may be enforced near sensitive locations. 	Throughout the project section at the location determined by contractor and approved by PIU	Operation stage stage	construction cost	Contractor,	PIC/PIU
	Site restoration	<ul style="list-style-type: none"> All construction camp/temporary office/material storage areas are to be restored to its original conditions. The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. Obtained clearance from PIU before handling over the site to SRRDA. PIC to undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for 	<i>(The contractor shall include the cost for the measures as part of the construction cost)</i>				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		improving the survivability of the tree if required					
20.	Hydrology and Drainage	<ul style="list-style-type: none"> 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 shall be regularly conducted 	Throughout the project section at the location determined by contractor and approved by PIU	Operation stage stage	construction cost	Contractor,	PIC/PIU
21.	Occupational Health and Safety	<ul style="list-style-type: none"> Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	Throughout the project section at the location determined by contractor and approved by PIU	Operation stage stage	construction cost	Contractor,	PIC/PIU

Note :

- Road specific measures may vary depending on its location and environmental setting around. The exact extent of activities and related measures requires will depend on final alignment selection. Table 1 provides the list of common utilities, ponds, or community structures falling within 2-4 M of the road and may require shifting. Efforts shall be made to adopt the mitigative measures listed under respective section above including measures of aligning road on one end to save the the structures/trees as much as possible. The PIU will update this EMP before attaching it with the DPR and either list or refer to the section of DPR for highlighting the exact location with chainage of action areas (regarding shifting of common utilities, community structures, location of CD structures, embankment height in the flood prone areas, slope stabilization measures with locations near ponds or water bodies, tree cutting locations)
- The information to be updated in the standard EMP before attaching it with DPR is highlighted under location column of the standard EMP.

APPENDIX 5: ENVIRONMENTAL MONITORING PLAN**I. ENVIRONMENTAL MONITORING DURING DESIGN AND PRE-CONSTRUCTION STAGE**

Monitoring Responsibility: PIU with Support from PIC

Monitoring Frequency: Once prior to start of construction

Road Name with Block and District Name:.....

Road Length:

Report No.:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Climate Change Consideration and Vulnerability screening	<ul style="list-style-type: none"> Compliance to climate change vulnerability check point given under EARF and adoption of necessary mitigative measures as may be required Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of PRI (Panchyati Raj Institution) 	All through the alignment	No. of Additional Tree plantation Proposed		
2.	Finalization of alignment	<ul style="list-style-type: none"> The road will be part of district core network and will comply with PMGSY guidelines Subproject shall not disturb any cultural heritage designated by the government or by the international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance. Subproject will not pass through any designated wild life sanctuaries, national park, notified Eco sensitive areas or area of international significance such as protective wet land designated under Wetland Convention, and reserve forest area.. Subproject to comply with local and National legislative requirements such as forest clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009. Alignment finalization considering availability of right of way and in consultation with local people. ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines. Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. The road shall follow natural topography to avoid excessive cut and fill. 	All through the alignment of each rural road	Compliance to Conditions of Forest Clearance if applicable		
3.	Land acquisition	<ul style="list-style-type: none"> Avoid or minimize land acquisition. Land acquisition, compensation packages, resettlement and rehabilitation, poverty alleviation programs for affected people and all 	All through the alignment of each rural road			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		other related issues are addressed through Social Impacts and Resettlement & Rehabilitation report.				
4.	Biological environment - Tree planting	<ul style="list-style-type: none"> ○ All efforts shall be taken to avoid tree cutting wherever possible. ○ Requisite permission from forest department shall be obtained for cutting of roadside trees. ○ Provision of Compensatory Afforestation shall be made on 1:3.ratio basis. ○ Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation. 	Throughout the project section of the road			
5.	Planning for land clearing	<ul style="list-style-type: none"> ○ The road land width shall be clearly demarcated on the ground. ○ The utility and community structure shifting shall be planned in consultations and concurrence of the community. ○ Tree felling shall be limited to those, which could not be saved even by design measures. The tree shall be cut with a prior permission of Forest department. ○ The vegetable cover shall be removed and disposed in consultation with community. ○ All public utilities shifting shall be planned with prior concurrence of respective agencies/authority and to the adjacent location approved by them 	All through the Rural roads excepting in stretches of habitations	Tree cutting permission from Forests or Revenue department as applicable Permission of concerned utility Authorities No and proposed location of compensatory trees plantation, Concurrence from community for utility, community structure, and vegetation cover removal		
6.	Shifting on Common Properties Resources	<ul style="list-style-type: none"> ○ All efforts are made to minimize shifting of common utilities and community structures. ○ The community structures/utilities which can not be saved will be shifted to adjacent area with the concurrence and in consultation with community. 	As determined by contractor under approval of PIC /PIU			
7.	Cut and Fill and Embankment Construction design and planning	<ul style="list-style-type: none"> ○ The alignment design shall consider options to minimize excessive cuts and fills. ○ The cut and fill quantities shall be used for embankment to minimize barrow earth requirement. ○ The design shall be as per relevant IRC provisions for cut and fill, slope protection and drainage. ○ Adequate provision shall be made for cross drainage structure for maintaining natural drainage pattern in the subproject area and preventing soil erosion. ○ Side drain for channelizing water to nearby natural drain in water stagnation /logging prone area. 	All through the alignment of each rural road			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> The top soil of the cut and fill area shall be used for embankment slope protection Embankment will be designed above High Flood Level wherever, area is prone to flood. 				
8.	Hydrology and Drainage	<ul style="list-style-type: none"> Provision of adequate cross drainage structure shall be made to ensure smooth passage of water and maintaining natural drainage pattern of the area. The discharge capacity of the CD structure shall be designed accordingly. Provision of adequate side drainage shall be made in water stagnant/logging areas. The construction work near water body shall be planned preferably in dry season so that water quality of the water channel is not affected due to siltation and rain water runoff. Elaborate drainage system shall be provided to drain the storm water from the roadway and embankment to ensure minimum disturbance to natural drainage of surface and subsurface water of the area. Provision of additional cross drainage structure shall be made in the areas where nearby land is sloping towards road alignment on both the sides. Provision of concrete road construction in habitat area with drainage of both side of the road shall be made as per the design provision and with adequate slope to prevent any water logging. Road level shall be fixed above HFL. Embankment slope stabilization measures shall be planned. Stabilization measures may include vegetative treatment, stone pitching, retaining wall where feasible, low cost options such as bamboo / eucalyptus tree piling . 	Near all drainage crossing, nalas and river crossings etc.			
9.	Establishment of Construction Camp, temporary office and storage area	<ul style="list-style-type: none"> Construction camp sites shall be located away from any local human settlements (minimum 0.5 km away) and preferably located on lands, which are not productive barren/waste lands presently. Similarly temporary office and storage areas shall be located away from human settlement areas (minimum 500 m). The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. The construction camps shall be located at a minimum 0.5 km from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 0.5 km from forest land/areas. 	As determined by contractor under approval of PIC/PIU/ (ref- Labelled: WASTE OIL; and hazardous sign be displayed at oil handling areas and sold off to SPCB/ MoEF	Location of Construction camp with planning of requisite facilities and making provision of such facilities prior to start of construction. Availability of consent to establish from pollution control board for setting up the camp.		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> ○ The construction camps, office and storage areas shall have provision of septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use. ○ All construction camps shall have provision of rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible. ○ The construction camps, office and storage areas shall have provision of health care facilities for adults, pregnant women and children. ○ Personal Protective Equipments (PPEs) like helmet, boots, earplugs for workers, first aid and fire fighting equipments shall be available at construction sites before start of construction. An emergency plan shall be prepared to fight with any emergency like fire. ○ Provision shall be made for domestic solid waste disposal in a control manner. The recyclable waste shall be sold off and non-saleable and biodegradable waste shall be disposed through secured land filling. ○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage. 	authorized re-refiners).			
10.	Traffic Movement	<ul style="list-style-type: none"> ○ The contractor will prepare appropriate traffic diversion scheme approved by respective PIU. This shall be implemented prior to start of construction to avoid any inconvenience to the present road users. This shall be implemented in other stretches of the road as per the progress of the construction work. ○ The diversion plan should ensure smooth flow of traffic, minimize accidents to road users during construction works. ○ Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and retro reflective in nature for good visibility in day and night both. 	As proposed under DPR and determined by contractor and approved by PIC/PIU			
11.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves design and bends where the curve design speed is less than 40 km per hour in plain and rolling terrain. ○ Speed breakers shall also be provided at a threshold of habitation (as per NRRDA guidelines) at regular intervals (150-200 m) through habitation. ○ The speed breakers shall be provided and directional sign boards installed at sites where reverse horizontal curves are closely spaced and speed reduction is required. ○ Provision shall be made for Hazard markers at each end of all box culverts, river crossing causeways and similar CD structures 	Throughout the project section at the location determined by contractor and approved by PIU			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> Shoulder side slopes shall not be steeper than 2h:1V unless stone pitching of the slopes is provided. Cement concrete pavement and V-shaped drain shall be constructed to the full width of the available roadway within densely populated habitation and as per feasibility. Provision shall be made for Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. It is proposed to approach railways for adequate safety at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both side of the railway crossing 				
2.	Grievance Redress	<ul style="list-style-type: none"> Obtaining information from Village level Grievance redress committee, PIU as applicable 	Each Sample road once.			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

II. ENVIRONMENTAL MONITORING DURING CONSTRUCTION STAGE

Monitoring Responsibility : PIU with Support from PIC

Monitoring Frequency : (First Report after third month of start of construction or 25% construction . Second report after ninth month of construction or 75% construction).

Project Details:.....

Road Stretch Name :

Monitoring Report Quarter No.:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Sourcing and transportation of construction material (aggregates , earth)	Borrow Earth: <ul style="list-style-type: none"> The borrow earth shall be obtained from identified locations and with prior permission for landowner and clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed. Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. 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). Borrowing of earth will not be done continuously through out the stretch. Ridges of not less than 8m widths will be left at intervals not exceeding 300m. Small drains will be cut through the ridges, if necessary, to facilitate drainage. The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside. Fly ash will also be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. 	At Borrow sites and quarries (if required) location.	Compliance to IRC guidelines and stated criteria, Permission from land owners, Rehabilitation of borrow areas Availability of valid consent of quarries		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> The borrow area shall be rehabilitated as per the understanding arrived with the land-owner. The re-habilitation plan may include the following: <ul style="list-style-type: none"> 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 ground surface. Borrow areas might be used for aquaculture in case landowner wants such development. <p>Aggregate :</p> <ul style="list-style-type: none"> The stone aggregate shall be sourced from existing licensed quarries Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU. Topsoil to be stockpiled and protected for use at the rehabilitation stage <p>Transportation of Construction Material</p> <ul style="list-style-type: none"> Existing tracks / roads are to be used for hauling of materials to the extent possible. Prior to construction of roads, topsoil shall be preserved or at least shall be used for any other useful purposes like using in turfing of embankment rather than allowing its loss by construction activities. The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any. 				
2.	Loss of Productive Soil, erosion and land use change	<ul style="list-style-type: none"> It shall be ensured that the land taken on lease for access road, construction camp and temporary office of the storage facilities is restored back to its original land use before handing it over back to land owner. The top soil from the productive land (borrow areas, road widening areas etc.) 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. Cut and fill shall be planned as per IRC provisions and rural road manual. 	Throughout the road section			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> ○ All steep cuts shall be flattened and benched. ○ Shrubs shall be planted in loose soil area. ○ 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 embankment areas. In case soil erosion is found, suitable measures shall be taken to control the soil erosion 				
3	Compaction and Contamination of Soil	<ul style="list-style-type: none"> ○ 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. ○ 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/temporary office/storage areas. ○ 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. ○ Fuel and lubricants shall be stored at the predefined storage location. ○ The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. ○ All efforts shall be made to minimise 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 labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners. 	<ul style="list-style-type: none"> • Throughout the project section of the road s 			
4	Construction Debris and waste	<ul style="list-style-type: none"> ○ All excavated materials from roadway, shoulders, verges, drains, cross drainage will 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 manner at designated landfill sites only in an environmentally accepted manner. 	<ul style="list-style-type: none"> • Throughout the project section of the road 			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> For removal of debris, wastes and its disposal MOSRTH guidelines should be followed. Unproductive/wastelands shall be selected with the consent of villagers and Panchayat for the same. The dumping site should be of adequate capacity. It should be located at least 500 m away from the residential areas. Dumping sites should be away from water bodies to prevent any contamination of these bodies. 				
5.	Air and Noise Quality	<ul style="list-style-type: none"> Vehicles delivering loose and fine materials like sand and aggregates shall be covered. Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads, earthworks, stockpiles and asphalt mixing areas. Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction of the human settlements. Material storage areas shall also be located downwind of the habitation area. Hot mix plant shall be fitted with stack of adequate height (30 m) or as may be prescribed by SPCB to ensure enough dispersion of exit gases. Consent to establish and operate shall be obtained from State Pollution Control Board and comply with all consent conditions. Diesel Generating (DG) sets shall also be fitted with stack of adequate height (as per regulation height of the stack of open to air DG set shall be about 0.5 m for 5 KVA and about 0.7 m for 10 KVA DG sets, above top of sound proofing enclosure of the Dg set). . Low sulphur diesel shall be used in DG sets and other construction machineries. Construction vehicles and machineries shall be periodically maintained. The requisite PPE (helmet, mask, boot, hand gloves, earplugs) shall be provided to the construction workers. Workers' exposure to noise will be restricted to less than 8 hours a day. Workers duty shall be regulated accordingly. 	<ul style="list-style-type: none"> Near all drainage crossing , nalas and river crossings etc. 			
6.	Biological environment - Tree planting	<ul style="list-style-type: none"> Compensatory Afforestation shall be made on 1:3.ratio basis as per the plannings. Additional trees shall be planted wherever feasible. 	Throughout the project section of the road			
7.	Ground Water and Surface Water Quality and Availability	<ul style="list-style-type: none"> Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority if applicable. 	Throughout the project section of the road			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		<ul style="list-style-type: none"> ○ The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. ○ Water intensive activities shall not be undertaken during summer period to the extent feasible. ○ Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible ○ Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. ○ Preventive measures like slop stabilisation, etc shall be taken for prevention of siltation in water bodies. 				
8.	Occupational Health and Safety	<ul style="list-style-type: none"> ○ Verification of implementation of provision made at planning stage. ○ Each worker is provided with requisite PPE ○ Directional sight board shall be installed on all sharp curves and bends ○ At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	Throughout the project section at the location determined by contractor and approved by PIU			
9.	Grievance Redress	<ul style="list-style-type: none"> ○ Obtaining information from Village level Grievance redress committee, PIU as applicable 	Each Sample road once.			

NOTE: Each report must enclose Photograph to the maximum possible action points, even if work is in progress.

III. ENVIRONMENTAL MONITORING DURING OPERATION STAGE

Monitoring Responsibility: PIU with Support from PIC

Monitoring Frequency: On completion of construction and after one month of first and second year of maintenance period

Project Details :.....

Road Stretch Name:

Monitoring Report No.:

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
1.	Air and Noise Quality	<ul style="list-style-type: none"> Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement.. Speed limitation and honking restrictions may be enforced near sensitive locations. 	Throughout the project section at the location determined by contractor and approved by PIU			
2.	Site restoration	<ul style="list-style-type: none"> All construction camp/temporary office/material storage areas are to be restored to its original conditions. The borrow areas rehabilitation will be ensured as per the agreed plan with the landowner. Obtained clearance from PIU before handing over the site to SRRDA. PIC to undertake survivability assessment and report to PIU the status of compensatory tree plantation at a stage of completion of construction with recommendation for improving the survivability of the tree if required 	Throughout the road stretch	Survivability report, land owner concurrence of land reversal		
3	Hydrology and Drainage	<ul style="list-style-type: none"> 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 shall be regularly conducted 	Throughout the project section at the location determined by contractor and approved by PIU			
4.	Occupational Health and Safety	<ul style="list-style-type: none"> Directional sight board shall be installed on all sharp curves and bends At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. 	Throughout the project section at the location determined by contractor and approved by PIU			
5.	Grievance Redress	<ul style="list-style-type: none"> Obtaining information from Village level Grievance redress committee, PIU as applicable 	Each Sample road once.			

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