Initial Environmental Examination

August 2017

IND: Second Rural Connectivity Investment Program

Odisha

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)
INR1.00	=	$ 0.01545
$1.00	=	INR 64.73

ABBREVIATIONS

ADB	:	Asian Development Bank
BIS	:	Bureau of Indian Standards
CD	:	Cross Drainage
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	:	Multitranche 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
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
SRRDA	:	State Rural Road Development Agency
SBD	:	Standard Bidding Documents

SO_2	:	Sulphur di-Oxide
SPM	:	Suspended Particulate Matter
TSC	:	Technical Support Consultants
UG	:	Upgradation
WBM	:	Water Bound Macadam
ZP	:	Zilla Parisad

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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 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 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 Odisha is now planning to submit to ADB the first Periodic Finance Request (PFR) that includes the proposal for about 464 rural roads totalling to 2012.30 km in the state of Odisha. Odisha State Rural Road Agency (OSRRA) is the Implementing Agency (IA) for the ADB funded subprojects in the state. 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.

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. Standing on the coastal belt, the weather in Odisha is greatly influenced by the sea. The climate of the region is tropical resulting in very high temperature in the months of April and May. On the contrary, the Eastern Ghats of the state experience an extremely cold climate.

6. There are three major seasons - summer (March-June), rainy season (July-September) and the winter (October-February). It is warm almost throughout the year in the western districts of Sambalpur, Bolangir, Kalahandi, and Mayurbhanj (maximum temperature between 40-46°C). In the coastal districts, the climate is equable but highly humid and sticky. The summer maximum temperature ranges between 35-40°C and the low temperatures are usually between 12-14°C. Winter is not very severe except in some areas in Koraput and Phulbani where minimum temperature may drop to 3-4°C.

B. Biological Environment

7. The state of Odisha is known for abundance of natural beauty and wildlife. The major types of forests present in the state are tropical moist deciduous type and tropical dry deciduous

type. The hills, plateaus and isolated areas of the northeastern part of the state are covered by the tropical moist deciduous forests whereas the second types of the forests are located in the southwest region of the state. Some of the trees which grow in abundance in Odisha are bamboo (*Dendrocalamus sp.*), Teak (*Tectona grandis*), Mahula (*Madhuca indica*), sal (*Shorea robusta*), Jamun (*Syzygium cumini*), Dhoben (*Dalbergia paniculata*) Mundi (*Mitragyna parvifolia*) etc. There are 479 species of birds, 86 species of mammals, 19 species of amphibians and 110 species of reptiles present in Odisha. The state is also an important habitat for the endangered Olive Ridley turtles and Irrawaddy dolphins (found in coastal district of Odisha).

C. Socio-economic Environment

8. The state has an overall population of 41.95 million people as of 2011 of which 34.97 million live in rural areas representing 83.31% of the total. The corresponding rate of urbanization is 15%, compared to almost 30% to India as a whole. The state's average population density was 698 persons per km. In 2011 the gender ratio of the state is 978, which is more than the country as a whole (940). The literacy rate overall is 73.45 % which is slightly lower than the country average (74.04%). The male literacy rate is 82.4% whereas female literacy rate is 64.36%.

D. Anticipated Enviromental Impacts and Mitigating Measures

9. 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 enviromental management measures to address all the anticipated environmental impacts.

10. Total annual emissions without the project (business as usual) at the middle of the design life of 7.5 years is estimated at 50,994.84 tons/year and with project scenario is estimated at 48,888.70 tons/year, for all 464 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 CO_2 emissions.

11. 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.

12. **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.

13. **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 aspects[1], construction stage and operation stage.

14. **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 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.

15. **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.

E. Conclusion and Recommendations

16. **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

[1] Aspects related to alignment selection for inclusion of new roads

sample roads passes through protected areas or encroaches precious ecology (sensitive or protected areas) or any historical or archeologically protected areas.

17. 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.

18. **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.

19. 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.

I. 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 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 Odisha is now planning to submit to ADB the first Periodic Finance Request (PFR) that includes the proposal for about 464 rural roads totalling to 2012.30 km in the state of Odisha. Odisha State Rural Road Agency (OSRRA) is the Implementing Agency (IA) for the ADB funded subprojects in the state. 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 is that any road will be eligible for construction or up-gradation only if it is part of the Core Network[2] 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 shall not pass through any designated wildlife sanctuaries, national parks, notified ecological sensitive areas or area of internationally significance (e.g., protected wetland designated by the Wetland Convention);
iii. The sub projects shall only involve activities that follow Government of India laws and regulations and meets funding agency safeguard policies.

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

5. Summary of the proposed subprojects in Second RCIP Tranche I is presented in Table 1.

Table 1: Summary of proposed subprojects for Second RCIP-II Tr I

No. of Districts	:	27
No.of Roads in RCIP-II Tranche I	:	464
Total length of Roads in RCIP-II Tranche I (Km)	:	2012.30
Maximum Length (km)	:	25.22
Mnimum Length (km)	:	0.5
Average Road Length (km)	:	4.62

6. These districts are located all over the state covering 27 out pf the 30 districts. In this batch of subprojects, the longest road is 25.22 km (T04-Rairakhol Podabalanda to Badmal road in Rairakhol block of Sambalpur district), while T02-Sindhekela to Themera road (0.5 km) in Bangomunda block of Bolangir district is the shortest. The average length of roads works out to 4.62 km.

7. The list of 2012.30 km roads with their location and length is given in **Appendix 1**.

C. Rural Road Construction Proposal

8. The proposal for rural road construction works typically considers a 10-12m right of way (ROW), which includes side slopes for embankment, side drains on either side of the alignment. The roads consists both Black Top (B.T.) and Cement Concrete (C.C.) as per the ROW availability.

9. The construction proposals are confined to the existing alignment of the unpaved / partly paved tracks. Majority of these are pathways traditionally used by the villagers and transformed into the present form of unpaved tracks/roads through minor construction works taken up by the communities, local bodies and state Government over the decades.

D. ADB Safeguard Policies and Category of the Project

10. 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 classify a project into category A, B or C depending on potential adverse environmental impacts.

11. All environmentally sensitive components along each subproject roads is critically analysed to assess the magnitude and extent of likely impacts. These sample subproject roads stretch does not pass through any protected areas nor located near any archeologically important monument. As per selection guidelines, none of the selected subproject road passes through reserved forests either. Few trees cutting though may be involved. The road primarily passes through agricultural and residential areas. Most of the roads follow existing village roads and unpaved movement paths. As such, land acquisition is also low. Hence, the project will fall under category B as per ADB Safeguard Policy Statement 2009.

12. 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.

E. Objectives and Approach for Environmental Assessment

13. The prime objectives of the environmental assessment is to identify the likely environmental impacts during design, construction and operation stage of each sub project and suggest cost effective mitigation and monitoring measures with institutional mechanism applicable to all the subprojects as well as specific to a subproject.

14. Since there is large number of subproject roads involved under second RCIP and magnitude of each road is small, preparation of individual IEE's for each road will be difficult and time consuming. Subprojects specific Initial Environmental Assessment (IEE) is carried out following the IEE checklist in the EARF. Sample IEE checklists with annexures on tree, utility and community structures, strip maps and photographs for selected sample roads are enclosed as **Appendix 2.**

15. The findings of subproject specific assessment suggest that similar issues exist amongst the proposed project roads with very few subproject specific issues. Therefore, state specific IEE report has been prepared based on the IEE checklist of selected sample subproject. This IEE approach will be followed for conducting environmental assessment for remaining subprojects under second RCIP.

F. IEE Methodology and Content

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

17. **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.

18. **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.

19. **Data Analysis, Impact identification and Mitigation Measures**: Information collected was analyses and impact was identified using expert's assessment and following established practices. Mitigative measures are proposed common to larger roads and specific to the roads. EMP is prepared considering mitigative measures and institutional framework of SRRDA.

20. 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

G. Legal Framework and Legislative Requirements:

21. 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 signatory to various international conventions and protocols.

22. 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. Since above environmental assessment requirement is not applicable, the mainstream environmental concerns specific procedures that were formulated under Rural Connectivity Investment Program (RCIP) will in any case be implemented.

23. In addition to above, new road construction or road improvement work attract many legislation including for 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 second RCIP roads are listed below:

Sl. No.	Legislation	Applicability
1.	Environment (Protection) Act 1986-EIA Notification 2006 (Amended 2009)	Not applicable to these rural roads. It is applicable only to highways (NH and SH)**.**
2.	Forests (Conservation) Act 1980 (Amended 1988), and Forest (Conservation) Rules, 1981, (Amended 2003)	As per above Act/Rules *Forest Clearance* 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, since no sample road is selected if it passes through protected areas.
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 *No Objection Certificate (Consent to Establish and Consent to Operate)* from State Pollution Control Board prior to start of construction or setting up specific facility.
5.	The Air (Prevention and Control of Pollution) Act, 1981, (Amended 1987),	

Sl. No.	Legislation	Applicability
	and the Air (Prevention and Control of Pollution) Rules, 1982	*Authorisation* will also be required for disposal of Hazardous Waste like waste oil etc. from State Pollution Control Board
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	*Permission* 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

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

H. Acknowledgement

25. The Technical Support consultants (TSC) gratefully acknowledge the support received from NRRDA and OSRRA 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.

II. DESCRIPTION OF THE PROJECT

A. General

26. 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. 227.35 Km roads (47 nos.) are identified as sample roads for Odisha 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.

27. Since topography of Odisha state is largely flat, the design details applicable to flat terrain are presented in following section.

B. Sample Roads Selected in Odisha State

28. The Odisha state has selected 464 roads with a total length of 2012.30 Km spread over 27 districts as summarised at **Table 2** below and detailed at **Appendix 1.**

Table 2: Summary of District Wise Rural Roads

Sl No	District	Proposed no. of Roads	Road Length Km	Longest Road Km	Shortest Road Km	Avg. Length Km
1	Angul	5	25.08	6.69	3.00	5.02
2	Balasore	4	22.32	9.00	3.40	5.58
3	Bargarh	15	74.06	13.62	1.50	4.94
4	Bhadrak	1	5.00	5.00	5.00	5.00
5	Bolangir	4	25.10	12.60	1.85	6.28
6	Boudh	4	30.92	15.86	1.05	7.73
7	Cuttack	28	142.18	9.73	1.50	5.08
8	Dhenkanal	5	22.90	9.70	2.00	4.58
9	Ganjam	53	194.36	13.50	1.23	3.67
10	Jagatsinghpur	20	91.61	9.69	2.10	4.58
11	Jajpur	39	125.95	6.50	1.20	3.23
12	Jharsuguda	1	3.06	3.06	3.06	3.06
13	Kalahandi	6	23.40	5.10	1.90	3.90
14	Kendrapara	20	74.94	6.10	2.19	3.75
15	Keonjhar	22	80.99	8.16	1.16	3.68
16	Khurda	18	88.56	9.28	1.50	4.92
17	Koraput	6	35.06	8.80	3.30	5.84
18	Mayurbhanj	122	444.56	11.53	1.00	3.64
19	Nawarangpur	8	57.31	10.50	3.20	7.16
20	Nayagarh	7	31.88	7.50	2.21	4.55
21	Nuapara	8	22.87	8.00	1.05	2.86
22	Kandhmal	12	74.27	19.95	1.00	6.19
23	Puri	10	36.93	6.40	2.00	3.69
24	Rayagada	10	77.62	15.00	2.07	7.76
25	Sambalpur	14	105.21	25.22	1.37	7.52
26	Sonepur	7	29.02	11.28	1.40	4.15
27	Sundargarh	15	67.15	8.76	1.44	4.48
Total		**464**	**2012.30**	**25.22**	**1.00**	**4.34**

C. Project Description

1. Rural Road Construction Proposals

29. The proposed rural road construction work will provide 3.75 to 7.5 m roadway width[3] 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.

30. 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.

2. Present Condition

31. 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

32. 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

33. **Geometrical Design and ROW Requirements**: The geometric design standards for this project will conform to PMGSY (ADB) guidelines and the guidelines as stated in *IRC-SP 20:2002* and the final recommendations of NRRDA expert committee *(refer D.O. no. - 17305/1/2007-Tech/12 dated 30/09/2010)*. Recommended design standards vis-à-vis the standards followed for this road are described below. The requirement of ROW as per PMGSY guidelines considered for the design is given at Table 3 below:

[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.

Table 3: 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

34. Since terrain is plain, the design speed considered is as per recommended design speed of 50 Km/h for ruling (40 Km/h as minimum speed). 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.

35. **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.

36. **Road side drain**: As the insufficient drainage of surface water leads to rapid damage of road, road side drain (***Figure 2.1***) 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

37. **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.

38. **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.

39. **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.

40. **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

41. 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

42. As per the information available with SRRDA, ROW is largely available for the rural roads. However, in most of the roads, the required ROW is encroached and in some of the road, it is put to agricultural use by the adjacent landowners. The private landowners along the proposed right of way (ROW) however, are voluntarily parting the encroached land and in some cases parted even their own private land without any compensation, anticipating the developmental benefits from the road construction works.

7. Traffic

43. 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

44. 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.

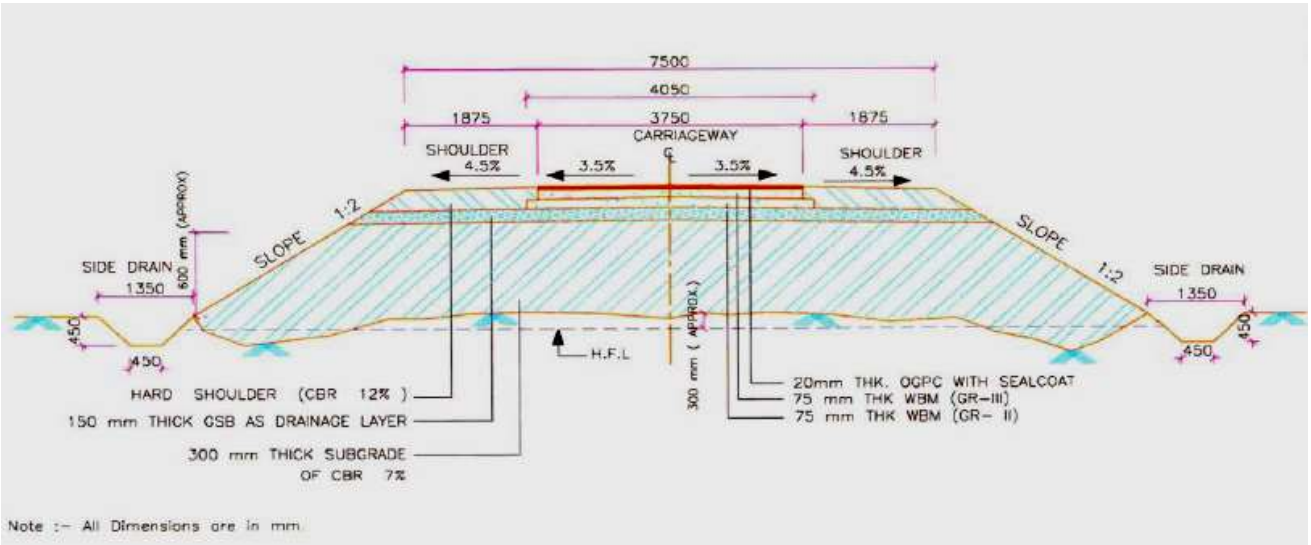

Figure 1: Cross-section of Rural Roads

III. DESCRIPTION OF THE ENVIRONMENT

A. Background

45. Baseline environmental conditions about all facets of environment viz. physical, biological and socio-economic have been established using both primary and secondary sources. Efforts have been made to collect the latest information both at regional as well as local level especially along the project corridor. This will help to predict likely changes in the environment due to the project and will serve as performance indicators for various components.

46. The project roads are spread all over the state covering 27 out of the 30 districts. The baseline information is presented below. Road specific environmental salient features has also been summarised in this chapter.

47. Odisha state is located between latitude 17°49' and 22°34' N and longitude 81°27' and 87°29' E. The geographical area of the state is 1,55,707 sq km. The state is bounded by the Bay in the east, West Bengal in the north-east, Bihar in the north, Chhattisgarh in the west, and Andhra Pradesh in the south. The RCIP-2 roads of the state fall in 27 out of the 30 districts of the state and the sample roads have been selected from each of these 25 districts. In total, 48 sample roads have been selected that comprise 10% of the roads proposed. List of the sample roads is provided below:

Table 4: List of Sample Roads for Initial Environmental Examination, RCIP-2, Odisha

Sl No	District	Block	Name of Road	Road Length Km
1	Angul	Pallahara	L026-Dalo Jokapani Road	5.52
2	Angul	Talcher	L053-Kalamchhuin Solanda Road	3.87
3	Balasore	Khaira	L109-Tudigadia to Jalada Road	7.78
4	Bargarh	Sohella	T02-SH3 near Sohela to Tambimunda	4.20
5	Bhadrak	Basudevpur	L022-PWD Road to Bachhada	5.00
6	Bolangir	Patnagarh	T11-Barpadar to Baghmund road	12.60
7	Boudh	Kantamal	L122-SH 41 to Badachapapali	1.05
8	Cuttack	Athagarh	L029-Kakhadi to Ramshyampur	7.05
9	Cuttack	Athagarh	L030-Kakhadi to Routraypur	6.00
10	Cuttack	Cuttack	T01-Gadama to Kishannagar	8.31
11	Dhenkanal	Odapada	L079-NH 42 to Tentuliapada	2.0
12	Ganjam	Belguntha	L039-PWD Road to Palakasandha	2.30
13	Ganjam	Belguntha	L045-PWD road to Madhabarida Via Benikpalli	5.00
14	Ganjam	Buguda	L043-Panigidi Manikapur	4.50
15	Ganjam	Jaganathprasad	L038-SH21 Panchubhuti Harijana Sahi	2.54
16	Ganjam	Seragada	L056-NH 217 to B Nuapalli road	1.30
17	Jagatsinghpur	Jagatsinghpur	L053-Urali to Patenigaon	3.75
18	Jagatsinghpur	Tirtol	L071-Balipatna to Pubapada	2.10
19	Jagatsinghpur	Nuagaon	L035-Alana II to panchapa	3.50
20	Jajpur	Binjharpur	L030-Kalyanapur Samalpur	3.92
21	Jharsuguda	Lakhanpur	L114-NH200 to Lakhanpur	5.00
22	Kalahandi	Junagarh	L128-NH 201 to Sanfurla	4.50
23	Kalahandi	Bhawanipatna	L037-PWD Road to Balajipita	3.10
24	Kandhamal	Khajuripada	T-05- Garakumpa Balasakumpa Road	5.35
25	Kendrapara	Rajnagar	L041-RB road to Balikana	3.40
26	Kendrapara	Rajnagar	L032-Tiarchak to Balarampur	2.48
27	Keonjhar	Jhumpura	L033-Arsala to Teliarsala road	5.81

Sl No	District	Block	Name of Road	Road Length Km
28	Keonjhar	Jhumpura	L032-NH215 to Bishnupur road	2.65
29	Khurda	Begunia	L060-R D road to Tandal	2.36
30	Khurda	Begunia	L030-R D road to Bengitangi	3.40
31	Koraput	Kotpad	L022-NH 43 to A Ghatarla	8.80
32	Koraput	Nandapur	L038-Thuba to Raising	3.00
33	Koraput	Kundra	Kundra to Bagderi	8.80
34	Mayurbhanj	Bisoi	L074-SH50 to Kasipentha Road	4.5
35	Mayurbhanj	Bisoi	L069-SH50 to Handifuta	3.89
36	Mayurbhanj	Betnati	L064-Betnoti to Sukhilahar Road	4.8
37	Nawarangpur	Nandahandi	T02-Dohana jn to Jagannathpur	3.2
38	Nayagarh	Ranpur	L042-MDR 76 to Barangadia	2.07
39	Nuapada	Nuapara	L032-RD Road to Beheradahi	8.00
40	Nuapada	Nuapara	L031- RD road to Palasabhadar	1.90
41	Puri	Puri	L051-E K Embkt to Uttarana	7.58
42	Rayagada	Gunupur	L052-PWD Road to Loba	7.50
43	Sambalpur	Jujumura	L061-NH42 to Ichhapal	10.9
44	Sambalpur	Jamankira	L051-NH 6 Chinimahul	7.70
45	Sonepur	Tarava	L025-Sibatala Lukapada RD road to Attasingha	1.44
46	Sonepur	Sonepur	L024-NH 224 to Janmura	4.20
47	Sundargarh	Bisra	MDR 32 to Tulsikani	2.70
48	Sundargarh	Balisankara	L029-Rouldega to Thiteitangar road	6.03

48. Summary key environmental features of the project districts are given in **Table 5**.

B. Physical Environment

1. Meteorology and Climate

49. Standing on the coastal belt, the weather in Odisha is greatly influenced by the sea. The climate of the region is tropical resulting in very high temperature in the months of April and May. On the contrary, the Eastern Ghats of the state experience an extremely cold climate.

50. There are three major seasons - summer (March-June), rainy season (July-September) and the winter (October-February). It is warm almost throughout the year in the western districts of Sambalpur, Bolangir, Kalahandi, and Mayurbhanj (maximum temperature between 40-46°C). In the coastal districts, the climate is equable but highly humid and sticky. The summer maximum temperature ranges between 35-40°C and the

Table 5: Summary Key Environmental Features of the Project Districts

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
Angul	Angul District came into existence as a separate District on April 1, 1993. The District is surrounded by Cuttack & Dhenkanal on the east, Sambalpur & Deogarh on the west, Sundargarh & Keonjhar on the north and Phulbani on the south. Covering an area of 6232 sq.km, Angul District is located at Latitude 20.50 North to 85.00 East Longitude.The altitude of this place is 564 to 1187 mts. Angul District is densely populated as per the 2001 census.. Total population comprises of 5, 87, 234 male population and 5, 52, 769 female population.	The climatic condition of Angul District is much varied. The average annual rainfall of the District is 1421 mm. However, there is a great variation of rainfall from year to year. The rainfall in the District during the last 10 years varied between 896 mm & 1744 mm. The best time to visit this District is during winter.	Forest coverage area is 2,716.82 km²				The total cultivable area of this District is 2, 16,403 hectares,. The major crops of the Kharif season are paddy, maize, ragi, oilseeds, pulses, small millets etc. Paddy, wheat, maize, field pea, sunflower, garlic, ginger, potato, onion, tobacco, sugarcane and coriander etc are the major Rabi crops	
Balasore	Balasore is situated between 20.48 - 21.59oN degree north latitude, and between 86.16 degree and 87.29 degree east longitude Balasore has a geographical area of 3,706 sq kms.	The climate is generally hot with high humidity and precipitation. May is the hottest and December is the coolest month. The highest maximum temperature recorded was 44 degree Celsius on June 8, 1998. The	Kuldhia Sanctuary	Balasore can be divided into three geographical regions, namely the coastal belt, the inner alluvial plain and the North- Western Hills that are part of the Eastern Ghats. The district has an	The major rivers are Subarnarekha, Budhabalanga, Jalaka, Kansabansa, and Sono	The major soils are clay loam, sandy clay loam and sandy loam. A small strip of saline soil is also witnessed in the coastal part of the district	Paddy, ground nut, mung, biri, maize, mango, citrus, papaya, pineapple8	Traffic noise in Balasore Town. Sea Turtle Nesting Protection.

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
		average annual rainfall is between 1,550 to 1,600 mm		average altitude of 19.08 metres, with the hills of Nilagiri having the highest peak at 1783 feet.				
Bargarh	Bargarh District formed on the 1st April 1993 divided from Sambalpur District. Bargarh District lies on the western most corner of Odisha between 20 degree 43' to 21 degree 41' north latitude and 82 degree 39' to 83 degree 58' east longitude. District is surrounded by Chhatisgarh state on the north, Sambalpur District on the east, Balangir and Subarnapur on the south and Nuapada District on the west. The District covers an area of 5837 sq km consisting total population of 1,478,833 as per 2011 census. Total male population of the District is 748,332 and female population is 730,501.	The Bargarh District experiences extreme type of climate with hot and dry summer followed by humid monsoon and chilling winter. The temperature varies from 10 degree Celsius to 46 degree Celsius. The winter season lasts between November to February. The hot season follows thereafter and continues till the second week of June. The south-west monsoon season is from mid June to the end of September. The average annual rainfall in the District is 1527 mm.					Paddy, wheat, Maize, Mung, Biri, Arhar, Fieldpea, Groundnut, Sesamum , Mustard, Sunflower etc	
Bhadrak	District is bounded by Balasore District on	The climate of this District is generally	The total forest area in 60.12	The average altitude of the	A number of deltaic rivers,	Bhadrak has saline, alluvial	Both Kharif and Rabi crop are	District has very good

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	the north, Jajpur District and river Baitarani on the south, Keonjhar District on the west and Bay of Bengal and Kendrapada District are on the east. It is located at 21.0667 Latitude and 86.5000 Longitude. The Bhadrak District covers an area of 1,721 Sq. Km.with geographical area of 2,46,529 ha.	hot and humid with May being the hottest month. December is the coldest month with monsoon generally arriving during the month of June. The rainfall during June to October constitutes at least 75 Percent of the actual rainfall of this District.	sq kms, i.e. 3.96 sq kms of demarcated protected forests, 32.98 sq kms of undemarcated forests besides other forests. However, there are no reserved forests area	district is 13 metres	viz: Salandi, Baitarani, Kansabansa, Gamol, Mantei, Genguti, Kochila, Reba and Kapali pass through and around the district	and sandy soil, with salt tracks found along the coast and arable tracts in the inner precincts of the district	grown here. However, Paddy is the principal crop, followed by pulses, vegetables and oilseeds	forest cover and potential risk of tree clearing for new road construction or expansion
Bolangir	The District is surrounded by Subarnapur district in east, Nuapada District in the west, Kalahandi District in the south and Bargarh District in the north. The District lies between 20o11'40 to 21o05'08 N latitude and 82o41'15 to 83o 40'22 E longitude. The District covers an area of 6575 sq.km.	Minimum temperature measured in the District is 16.6 o C and maximum is 48.7 o C. 1215.6 mm average rainfall is experienced in Balangir District. The district enjoys a temperate climate. Winters are cold, while summers are hot and humid. The District is prone to cyclonic rainfalls during the monsoons. The maximum temperature is 38 o C and minimum temperature is C. The average rainfall measured in the District is 1765.1mm	Numerous reserved forests	Red and yellow, Red and Black, Brown and Forest Laterite Soil. Stretch falling in Bolangir district is predominantly underlain by black cotton soil. In the block sections of Lakholi – Mahanadi-Khariar Road, Lateritic soil is present due to proximity to Mahanadi River and many other natural drains in this area.	The district forms a part of the Mahanadi River basin. Other important rivers of the district are the Maltijor, the Harrad, the Kulsara, the Bheden, and the Phuljharan.	The predominant soil groups found in the Balangir District are red, mixed red, black and alluvial soils	Paddy is the principal crop, accounting for 61 % of gross cropped area. Other important crops grown in the district are pulses, followed by oil seeds, fibre and other food crops like spices and condiment etc	Deforestation

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
Boudh	Boudh District is also known as Baudha District. The District is bounded by River Mahanadi & Angul District to the north, Kandhamal District to the south, Nayagarh District to the east and River Tel & Subarnapur District to the west. Covering a geographical area of 3444.8 sq km, the District lies 20 degree 22' to 20 degree 50' North Latitude and 83 degree 34' to 84 degree 49' East Longitude. *District has got total population of 441162 including total 221625 male population and 219537 female population. Total SC population of the District is 104934 and ST population is 55364 as per 2011 census*.	The climatic condition of the District is subtropical, being hot and dry in summer and cold and dry in winter. The rainy season is hot and humid. In summer temperature reaches 45 degree C and in winter temperature may come down to as low as 10 degree C.	Total Forest Area 1277.17sqm		The principal rivers are the Mahanadi and the Tel, which flow around the North Western side bordering Kantamal, Boudh and Harbhanga Blocks, an few small rivers such as Sunamodi, Salur, Khadog and Bagh are originated from thehilly regions of Kandhamal district and flow towards Boudh district and meet with Mahanadi and Tel river. Major portion of this district is flood prone as many rivers pass through this district.	Most part of the district has black alluvial soil. The soil of the district has high moisture retention capacity. The soil is quite rich for growing paddy, pulses, oil seeds and sugarcane.	Paddy, wheat, maize, ragi, mung, biri, kulthi, groundnut and mustard etc are some of the major crops grown here	
Cuttack	This city takes pride in the fact that it had been the capital of Odisha before shifting to Bhubaneswar, the new capital. Geographically, it is located at a latitude of 20 degree 03 to 20 degree 40 N and a	The District experiences tropical climate, with the summer being hot and the winter cold. The maximum temperature that this District experiences is well above 40 degree Celsius	Cuttack has Reserve Forests of 522.39 sq kms, Demarcated Protected Forests of 102.60 sq km, unclassified forests of 0.45	Fluvial from the Mahalik River	Cuttack city is flanked by Mahanadi riveron the north and Kathajodi river on the south and Brahmani. Kuakhai, Devi, Kushabhadr a	The soil is very fertile and is of medium blackalluvial type	Cuttack district has principalKharif season with secondary Rabi season. Rice, pulses, oil seeds, jute, sugarcane, coconut and turmeric are the	Poor air quality near fero alloy and power generating plants in Choudwar area.

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	longitude of 84 degree 58" to 86 degree 20 E. Cuttack city is flanked by Mahanadi river on the north and Kathajodi river on the south. Covering a geographical area of 3932 sq kms.	(during summer) and the minimum is as low as 10 deg C (during winter). Summer generally lasts from March to June and winter, from October to February. Rainfall is generally heavy during the monsoons, which occur during the months of July and August. The average rainfall received is around 1892.55 mm in the District. South West monsoon is primarily responsible for the rainfall.	sq km and other category of forests of 163.65 sq kms		and many small offshoots of Mahanadi.		major crops grown here.	
Dhenkanal								
Ganjam	Located on the boarder of Andhra Pradesh, Ganjam District came into existence on 1st April 1936. Ganjam District is on 19.4 to 20.17 degree north latitude and 84.7 to 85.12 degree east longitude. It covers an area of 8,070.60 sq km. The district is broadlydivided into two divisions, the coastal plain area in the east and hill and table lands in the west. The eastern ghats run along the	The climate of Ganjam is characterized by an equable temperature round the year, particularly in the coastal regions. The District's cold season from December to February is followed by hot season from March to May. The District experiences normal annual rainfall of 1,444 mms.	Chandaka-Damapara Sanctuary, Lakheri-Valley Wildlife Sanctuary, Chilka Lake	Charnockites, Granites	Rushikulya and Bahuda Rivers	The District is well known for its fertile soil and agricultural productivity.	A large variety of crops are grown here like Paddy, Ground nut, Sugar cane, Oil seeds, Ragi, Mung, Biri etc.	Managament of coastal area

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	western side of the District.							
Jagatsinghpur	Jagatsinghpur district is surrounded by Bay of Bengal in the East, Cuttack district in the West, Kendrapada district in the North and Puri district in the South. It is the smallest district of Odisha with ageographical area of 759 sq km,	East and South eastern Coastal plain with hot and humid climates having average annual normal rainfall of 1501.3 mm.	Pradip Sea Turtle Nesting	Deltaic alluvial and coastal saline.	Mahanadi, Paika, Devi Rivers	Mostly loam, sandy loam and clay loam	The Major food crop grown in Jagatsinghpur District is paddy. Sugarcane, turmeric and cotton are the major commercial crops	Sea Turtle Protection in Paradip
Jajpur	The Jajpur District came into being on 1st April 1993. Prior to that it was part of Cuttack District which divided into four Districts. The District is bounded by Keonjhar and Bhadrak Districts on its North, Cuttack on its South, Dhenkanal District on its East and Kendrapada District on its West. The Jajpur District located in between 20 degree 30' to 21 degree 10' North Latitude and 85 degree 40' to 86 degree 44' East Longitude. The District covering an area of 2,887.69 sq km	The climate of Jajpur District is normal as per Indian standards. All the seasons arrive in the District at their usual time. The District's average height from the sea level is 331 mts and its average rain fall is 1,014.5 mm. The average maximum and minimum temperatures are 38 degree C and 12 degree C respectively. Overall, the climate of the District is neither hotter nor cooler.	Dharma Mahakal Temple, Ratnagiri. Jagannath Temple, Jajpur Town. Trilochaneswar Temple, Jajpur Town. Varahanatha Temple, Jajpur Town. Buddhist site (excavated), Udaigiri. Ancient Buddhist Site, Langudi Hill, Mauza Panimuhani, Fazilpur & Salipur.		Baitarani and Brahmani Rivers	Deltaic Aluvial	District is having the third best conditions for sustainable development in agriculture followed by Bargarh and Jagatsinghpur Districts. Rice is traditionally grown in two well defined seasons, namely kharif and dalua. Of these two, kharif (rainy) is the most important rice season. The kharif rice is the main crop, covering over 85 percent of the total rice area, and depends entirely on the southwest monsoon. It is sown in June and	Archeological sites

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
							harvested in October–December, depending upon the duration of the cultivation and topography of the field. The dalua (summer) crop coincides with the dry season and depends entirely on irrigation. The source of irrigation water is tank. The dalua season stretches from December–January to April–May. Farmers grow only high–yielding varieties during this season.	
Jharsuguda	Mineral rich District, Jharsuguda is one of the most industrially developed District of Odisha. Jharsuguda District was established on 1st April, 1994. earlier it was a part of Sambalpur District. It was created by amalgamation of the erstwhile Jamindars of Rampur, Kolabira, Padampur and Kudabaga. The District is surrounded by Sundargarh	The District of Jharsuguda is characterized by a hot dry summer. The temperature in the month of May is 42 degree at the maximum. The average rainfall of the District is 1500 millimeter. From April to August the wind blows from south and southwest whereas from September onwards wind blows from North West.		Varied topographic setup comprising rugged terrain with isolated hills and undulating plains. Major land use is agriculture. However, certain coal mines are also located in the district.	District is drained by River Ib a tributaries of Mahanadi, which flows along western side of Jharsuguda.	Major portion of the land area covering hilly region has a radish stony soil. The plain region having brownish black soil is suitable for growing paddy and vegetables. The soil of the riverbanks and delta area is sandy loom suitable for	Paddy is the principle crop. The other crops grown in the district are oil seeds, pulses, vegetables and condiments.	The district has no key environmental issue. Ground water is suitable for drinking as per Central Ground Water Board. The district has substantial agriculture activities. District has medium range of flora and fauna

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	District in the North, Sambalpur District in the East, Bargarh District in the South and Chattisgarh state in the West. Jharsuguda District is situated at a distance of 515 km from Kolkata, 616 km from Nagpur, 48 km from Sambalpur and 372 km from state capital Bhubaneswar. Jharsuguda District is covering total area of 2, 081 sq kms. The District lies between 21.82 degree north latitude and 84.1 degree east longitude. Total population of the District is 514853 consisting of 352 villages. Urban Population is 185,885 and rural population is 3289668. Total male population of the District is 264549 and female population is 250304.					paddy, sugarcane and groundnut cultivation		
Kalahandi	Kalahandi District has derived its name from "Gudahandi Caves". Kalahandi District covering a geographical area of 7920 sq km lies in between 19.3 to 21.5	The climate of the Kalahandi District is of extreme type. It is dry except during monsoon. The maximum temperature of the District is 45 degree	Forest based products like Mahua, Kendu leaf, Wood, Timber and Bamboos also contribute to	Hilly in the southeastern and southern part (953 to 1929 above MSL) and (ii) Undulating plains Ampani-Koksara	Vanshadhara, Indravati, and Tel Rivers	Red and black soild	The District is rich with agriculture. Dharamgarh sub division was historical known for rice production in Odisha. Since 2000s the	Aluminum mining

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	N Latitude and 82.20 to 83.47 E Longitude. The District occupies the South Western portion of Odisha, bordered to the North by the Balangir District and Nuapada District, to the South by the Nabarangpur District, Koraput District and Rayagada District, and to the East by the Rayagada, Kandhamal District and Boudh District.	C, whereas the minimum temperature recorded is 11 degree C. The District experiences the average annual rainfall as 1378.20 mm. The monsoon starts late in June and generally lasts upto September.	local economy largely.	Junagarh and Bhawanipatnaa-Utkala- Kesinga tracts ranging in elevation from 350 to 186m above MSL.			Indravati Water Project, second biggest in the state has changed the landscape of southern Kalahandi, leading to two crops in a year. Because of this, blocks like Kalampur, Jaipatna, DharRayagada, Kandhamal District and Boudh District.	
Kendrapara	Kendrapara District is situated in Central Coastal plain zone of Odisha. The District is bounded by Bhadrak District at its North, Jagatsinghpur District at its South, Cuttack District at its West and Bay of Bengal at its East. Kendrapad District lies in 20 degree 20' N to 20 degree37' N Latitude and 86 degree 14' E to 87 degree 01' E Longitude. The Coastline of Kendrapara District covers 48 Km stretching from Dhamra Muhan to Batighar.	Kendrapara District has a moderate climate. The temperature in the region can go up to 34 degree C in Summer while in Winter the temperature can drop to 13 degree C. The normal rainfall measured in the District is 15101.3 mm	Bitarakhanika National Park		Bhramani River	Deltaic alluvial, coastal saline and alluvial soil	Rice, groundnut, green gram, black gram and jute are the main crops grown in the District. However, frequent occurrence of natural calamities viz cyclone, flood and drought has broken the backbone of the people. In order to survive under these conditions, people go for cultivation of their stapple food crop rice during rabi in the assured irrigated areas. Jute is the main cash crop of the District, grown	Flooding

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
							since long. Groundnut is an important oil seed crop of the District. Coconut is the important horticulture crop in Kendrapara District.	
Keonjhar	The Keonjhar District emerged as one of the District on 1st January, 1948. The District is bounded by Mayurbhanj District and Bhadrak District to the east, Jajpur District to the south, Dhenkanal District and Sundargarh District to the west and West Singhbhum district of Jharkhand State to the north. Covering a geographical area of 8240 sq kms, the Keonjhar District lies between 210 1' N to 220 10' N latitude and 850 11' E to 860 22' E longitude.	The climate of Keonjhar District is characterized by an oppressively hot summer with high humidity. Summer generally commences in the month of March. Temperature begins to rise rapidly attaining the maximum in the month of May. During the summer, maximum temperature touches around 380 C. The weather becomes more pleasant with the advent of the monsoon in June and remains as such up to the end of October. The temperature in the month of December is lowest i.e. it hovers at around 110 C. Sometimes it even drops down to as low as 70C. The average			Baitarani, Brahmani, Salani Rivers	Laterite and red soils	The major crops grown in the Keonjhar District are Paddy, Maize, Til, Niger, Arhar etc.	

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
		annual rainfall is around 1534.5 mms.						
Khurda	The District Khordha came in to existence on 1st April 1993, by dividing it off its earlier Puri district. Puri was divided into three districts Puri, Khordha and Nayagarh. The geographic location of khordha district stands at 19degree 55minutes to 20 degree 25minutes North Latitude and 84 degree 55minutes to 86 degree to 5 minutes East Longitude. Its bioclimatology is much influenced for the short radial distance from the Bay of Bengal and presences of a huge water body like the Chilika Lake	The district enjoys normal 1408mm with maximum and temperature 42.2 degree Celsius and 11.1 degree Celsius respectively. Similarly, the mean relative Humidity ranges from 46% to 89% .	Nalaban Sanctuary	Khordha into two district sub-regions one is Deltaic Alluvium sub-region which comprises of 3 blocks Balianta, Balipatna and Chilika Whereas Banpur, Begunia. Bhubaneswar, Bolagarh, Jatni, Khordha & Tangi belong to Lateritic sub-region.	Principal rivers are Kuakhai, Bhargabi, Budunai, Daya, Kushabhadr a, Malaguni, rana and Kusumi	Laterite, coastal saline and alluvial soil	Both Kharif and Rabi crop are grown here	
Koraput	The Koraput District lies at 17.4 degree to 20.7 degree North latitude and 81.24 degree to 84.2 degree east longitude. The District is bounded by Rayagada in the east, Bastar District of Chhatisgarh in the west and Nabarangpur District in the south. The	Koraput District experiences minimum 12.0 celsius and maximum 38.0 celsius temperature. The District experiences mainly three seasons i.e summer, winter and rainy. Summer occurs from April to June, Rainy season			Kolab River	Red soil	The suitability of soil and climatic condition for production of coffee, cashew, cotton, tobacco, vegetable and fruits and the production of these crops strengthen the economy of the Koraput District.	

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	Koraput District covers an area of 8379 sq km. The District has got 2 sub divisons namely Koraput and Jeypore. There are total 14 Tahsils, 14 Blocks, only one Municipality, 3 NACs, 23 Police stations, 2028 Villages and 226 Gram Panchayats functioning in the District of Koraput.	is from June to October and Winter is from November to March. Winter season in Koraput District is longer than other parts of Odisha. The average rainfall in the District is measured to be 1522mm(Average) rainfall.					The common annual food crops grown in the District are paddy, millet, maize and pulses.	
Mayurbhanj	Mayurbhanj is a land locked district with a total geographical area of 10418 Sq.km. and is situated in the Northern boundary of the state with district headquarters at Baripada. The district is bounded in the North-East by Midnapure district of West Bengal, Singhbhum district of Jharkhand in the North-west, Baleshwar district in the South-East and by Kendujhar in the South-West.	The district comes under “North Central Plateau agro-climatic region with an average rainfall of 1648.20 mm per annum. Being away from the coastal belt, the district experiences a sub-tropical climate with a hot summer, chilling winter with good precipitation.	Hadgarh Sanctuary	The district has a rich mineral base and is home to the Similipal Biosphere. Iron-ore (hematite), vanadiferous and titaniferous magnetic, chaina clay, galena (lead ore), Kyanite, asbestos, steatite (soap stone) and quartzite constitute the principal mineral resources of Mayurbhanj district, of these the iron-ore deposits of Gorumahisani, Badampahar and Suleipat, which have been exploited for a period of about	Subernarekha, Burhbabalanga, Jambira, Baitarani Rivers	Red-laterite category of soil dominates all over the district including Bamanghati and Panchpir plateau.		

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
				half a century, deserve special mention.				
Nawrangpur	Its boundary stretches in the north to Raipur and west to Bastar Districts of Chhatisgarh. The east side of Nabarangpur touches Kalahandi and Rayagada Districts and south to the Koraput Districts of Odisha. The river Indravati forms the border between Nabarangpur and Koraput Districts.Nabarangpur District covers an area of 5294 sq km. The District has a vast area of 1583.4 sq km covered by forests. It is situated at 20.3 to 17.5 Degree North latitude and 81.27 to 84.1 East longitudes.				Indravati River	Red soil		
Nayagarh	Nayagarh District was created in 1st April 1993 when the erstwhile Puri District was split into three distinct Districts. The District is bounded by Cuttack District on the North, Kandhamal District on the West, Ganjam District on the South and	The District experiences tropical climate, with the summers being hot and the winters cold. The maximum temperature that this district experiences is well above 40 deg C (during summers) and the minimum can be as low as 10	Forest area is 208000 sqm					

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	Khordha District on its East Nayagarh District lies between 19 degree 54' to 20 degree 32' North Latitude and 84 degree 29' to 85 degree 27' East Longitude. The District is situated on the hilly ranges in the West and its North Eastern parts have formed small well cultivated fertile valleys intersected by small streams. Nayagarh District Covering an geographical area of 3890 sq km consists total 864506 population as per 2001 census. The total male population of the District is 446177 and female population is 418339.	degree celsius (during winters). Summers generally last from March to June and winters, from October to February. Rainfall is generally heavy during the monsoons, which occur during the months of July and August. South West monsoon is primarily responsible for the rainfall in this District.						
Puri	Puri lies between 19.28 degree north to 26.35 degree north latitude, and from 84.29 degree east to 86.25 degreeeast longitude Puri has an area of 3051 sq kms Puri has only one subdivision	Climate is humid with temperature ranging between 14 degree to 37 degree Celsius throughout the year mm		The whole district is divided into two dissimilar topographical terrains, viz: the Littoral Tract, and the Level Alluvial Tract, along with sea coast bays and islands	The Principal rivers are Kushabhadra, Daya, Bhargabi, Kadua and Prachi.	Black, laterite, deltaic, coastal saline, and alluvial soils	Both Kharif and Rabi crop are grown here	
Rayagada	Rayagada district got the status of a separate district with		**Area under Forest is 2812.33** sq.km	The Rayagada district covers an area of				

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	effect from 2 October 1992 Population967911 Male471960 Female495951			7584.7 km^2. There are several hills including Baphlimali, Azimali, Tikrimali known for rare medicinal plants and wildlife.				
Sambalpur	Sambalpur district lies between 20° 40' N and 22° 11' N latitude, 82° 39' E and 85° 15' E longitude with a toal area of 6,702 Sq. Kms. The district is surrounded by Deogarh district in the east, Bargarh and Jharsuguda districts in the west, Sundergarh district in the north and Subarnpur and Angul districts in the South	Sambalpur district experiences extreme type of climate with 153 centimeters rainfall on an average per annum. Most of the rainfall is confined to the months from June to October Mercury rises upto 47° celcius during May with intolerable heat wave and falls as low as 11.8° celcius during December with extreme cold.	The district has a total forest area of 3986.27 Sq. Kms. which is 59.46% of the total area of the district.	The district has three distinctive physiographic units such as, Hilly Terrain of Bamra and Kuchinda in the north, plateau and ridges of Rairakhol in the south-east and valley and plains of Sambalpur Subdivision in the south east. Sambalpur district forms a part of North-West upland of Odisha, which is rolling and multiplying the ground slopes from a height of 776 ft. to a height of 460 ft.	Brahmani	The thick blanket of black cotton soil all over the district has been made somewhat sticky by the yellow earth developing in the undulation topography of the district.	Total land under cultivation in the district is 173540 hectares. Paddy is the principle crop	
Sonepur	Subarnapur district has figured on the political and cultural map of Odisha since the pre–historic period. It is bounded on the north by		Forest area is 328.75 sqm					

Districts	Location	Climate	Ecologically Sensitive Area 6	Geomorphology	Major Drainage	Major Soil Type7	Principal Crops	Key Environmental Issues
	Sambalpur district, on the south and the South–East by Boudh District, on the East by Rairakhol sub–division of Sambalpur District and on the West by Balangir district.							
Sundargarh	Sundargarh District was constituted on the 1st January, 1948, out of the two ex–States of Gangpur and Bonai, which merged with Odisha on that day. True to its name, this beautiful District of Sundargarh with about 43 percent of its total area under forest cover and numerous colourful tribes dotting its landscape and with abundant mining potential is bounded by Ranchi District of Jharkhand on the North, Raigarh District of Chhatisgarh on the west and North West, Jharsuguda, Sambalpur and Angul Districts of Odisha on the South and South East and Singhbhum	The climate of this District is characterized by extremely hot summers and cool winters. Climate is hot & moist sub humid. Normal rainfall of the District is approximately 1230 mm, but there is a deviation in receipt of rainfall pattern which is influencing crop production.			Brahmani, Sankh, Koel and IB are the major rivers flowing though this District.			

51. low temperatures are usually between 12-14°C. Winter is not very severe except in some areas in Koraput and Phulbani where minimum temperature may drop to 3-4°C.

52. The state receives most of its rainfall from the southwest monsoon between mid June to early October. A few pre-monsoon showers during April to mid-June and few during the winter months from the retreating northeast monsoon are not infrequent in the state. But most of the precipitation is confined to the four months from July to October. Consequently, many parts of Odisha are hit by severe drought. The maximum and minimum rainfall is in the neighbourhood of 1,800 mm and 1,000 mm respectively; the average is about 1,500 mm. Cyclonic storms, due to depression in Bay of Bengal, sometimes of devastating magnitude followed by heavy rains occur in the months of September, October and November. On the average there are about 60 to 70 rainy days in a year.

53. **Rainfall:** The rainfall in the project districts range between 1,082 mm to 1,527 mm, out of which more than 80% is received between June to September.

54. **Relative Humidity:** Normally, May to October months are humid and January to April are dry. The relative humidity in project districts range between 15 to 92%.

2. Air Quality

55. 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.

56. The State Pollution Control Board has been monitoring the ambient air quality at 32 selected locations in 13 towns & cities, i.e., Angul & Talcher, Balasore Berhampur, Bhubaneswar, Cuttack, Kalinganagar, Konark, Paradeep, Puri, Rayagada, Rourkela and Sambalpur under the NAMP and Keonjhar under SAMP.

57. The four air pollutants viz., Sulphur Dioxide (SO_2), Oxides of Nitrogen (NOx),Suspended Particulate Matter (SPM) and Respirable Suspended Particulate Matter RSPM (PM_{10}) has been identified for regular monitoring at all locations. The monitoring is carried out as per CPCB guideline i.e. 8 hour sampling for SPM and RSPM (PM_{10}), 4 hour sampling for SO_2 and NOx in 24 hours of a day with frequency of twice a week for 104 obsorvations in a year.

58. At all the monitored locations of the State for the year 2006 to 2014 the SO_2 concentration were Below Detectable limit (BDL) i.e.,<4.0 µg/m3 except in few areas like Angul, Talcher, Rourkela and Rasulpur of Balasore where SO_2 remains above BDL. However, the values were well below the prescribed limit i.e., 50 µg/m3. In these areas the source of SO_2 was from industrial emission. The maximum annual average of SO_2 was observed at MCL, Talcher as 14.3 µg/m3 in the year 2008. All places fell under Low category in the State on the basis of exceedence factor.

59. Oxides of Nitrogen (NO_X) of all monitored stations of Odisha during the year 2006-2014 remained in the Low Category except sometimes under Moderate Category at Angul, Talcher, Rayagada and Badambadi area of Cuttack. The Maximum annual average of NO_X value was 43µg/m3 as observed at Badambadi traffic tower in the year 2007. The NOX values of all stations remained well within the prescribed limit i.e., 40 µg/m3. High NOx at Badambadi area might be due to traffic junction near the monitoring station. From the trend of analysis (from the year 2006 to 2014) it was observed that the trend was increasing at all the monitoring stations except one

at Traffic tower, Badambadi which was in decreasing trend and remained unchanged at RO, Baniapat,Keonjhar.

60. PM10 Values in both industrial and residential area at all locations from the year 2006 to2013 indicates that the annual average values at all the locations were higher than the prescribed limit i.e., 60 ^g/m3 except at few locations like Paradeep, Sambalpur, Rayagada & Town Police Station, Puri where it remained below the limit. The High PM10 values in the major towns indicated that vehicular emission was the root cause which contributed very fine particles of size less than 10 µ to the ambient air. From the trend analysis it was observed that at all locations the trend were in increasing order except at Keonjhar, Sambalpur & Rourkela where the trend were in decreasing order. All monitoring locations fall under High and Critical categories except Moderate Category at Rayagada, Berhampur, Sambalpur and Paradeep areas. The fine dust in major towns came from vehicular emission due to steep increase in number of vehicles in the town area in addition to construction work and cutting of trees due to expansion of road and domestic emission contributed towards PM10.

61. These were located in open area and operate only for few months. As such, the ambient air quality for major pollutants like SO_2, SPM and NO_2 is expected to be within the limits. However, in absence of any existingdata on ambient air quality levels of the project area, secondary sources were referred to fulfillthis requirement:

Table 6: Ambient Air Quality

	SO2 (µg/m3)	NO2 (µg/m3)	RSPM (µg/m3)
Industrial	14	24	34
Residential	8	23	61
NAAQS	80	80	100

Source: National Ambient Air Quality Status, 2008, CPCB and Table III.3.

62. The above reveals that the concentration of all the pollutants well within the limits (NAAQS). A comparison of the pollutant concentration levels in different years is given in **Table 7**. The table gives higher suspended particulate matter levels, which 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.

63. However, several areas in the state have been earmarked for mining and power generation where ambient air qualities have deteriorated, these are: Rajgangpur Area (Iron & Steel, Sponge Iron, Cement, Secondary steel. Melting and rolling mill & refractories and chemicals), Ib valley area (Thermal power, Sponge iron, refractories, and coal mines), Hirakud area (Aluminum & rolling mills), Talcher-Angul area (Thermal power, Aluminum, Coal washeries, Ferro alloys, Coal mines), Choudwar area (Ferro alloys, Thermal power, pulp and paper, coke oven), Balasore area (pulp and paper, ferro alloys, rubber industries), Chandikhol (stone crusher, coke oven), Duburi (Integrated steel, ferro alloys, rubber industries), Paradeep area (fertilizer, sea food processing, petroleum coke), Khurda Tapang area (stone crusher), Joda Barbil area (iron, sponge iron, ferro alloys, iron ore crusher, mineral processing), and Rayagada area (pulp and paper, ferro alloys). From the Environmental Information System (ENVIS) Center of Odisha State of Environment, SPM, SO2, and NOx concentrations have been increasing in 4 monitoring stations, namely: Talcher Thermal Power Plant, Angul Township, Nayagada, and NALCO.

Table 7: Ambient Air Quality Status of Orissa in Previous Years

CITY	LOCATION	Type of Area	SO_2			NO_2			RSPM (PM10)			SPM		
			2004	2007	2008	2004	2007	2008	2004	2007	2008	2004	2007	2008
NAAQS			**80**			**80**			**100**			**-**		
Sambalpur	Roof of Filter Plant PHD Off.	R	-	BDL	3	-	11	14	-	74	0	-	163	130
Behrampur	Regional Office	R	-	BDL	BDL	-	15	13	-	89	6	-	201	154
Talcher	T.T.P.S. Colony	I	5	8	14	20	18	24	79	71	16	163	142	234
	Coal Field	I	5	10	10	8	15	19	95	95	4	203	192	189
Angul	Industrial Estate	I	BDL	6	6	17	17	22	61	107	34	113	186	282
	NALCO Nagar Township	R	4	5	8	8	19	18	101	54	24	188	102	172
Rourkela	IDL Police Outpost	R	5	6	6	9	10	10	82	57	61	165	105	215
	Regional Office	R	BDL	5	5	9	10	11	73	68	50	132	130	188
Rayagada	Jaykaypur	I	BDL	BDL	BDL	7	10	19	56	65	0	100	117	112
	Regional Office	R	BDL	BDL	BDL	11	13	20	59	81	1	107	156	121
Bhubaneshwar	SPCB Building	R	5	BDL	BDL	20	14	18	79	75	14	163	169	158
	IRC Village	R	5	BDL	BDL	8	13	21	95	88	40	203	324	166
	Capital Police Station	R	BDL	BDL	BDL	17	16	18	61	49	22	113	125	157
Cuttack	R.O. Cuttack Office	R	-	BDL	BDL	-	16	23	-	62	32	-	157	281
	Roof of Traffic Tower	R	-	BDL	BDL	-	43	16	-	62	28	-	138	167

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 exceedence factor (calculated for n > 50 days)
BDL = Below Detection Limit (Concentration less than 4 $\mu g/m^3$ for SO_2)
BDL = Below Detection Limit (Concentration less than 9 $\mu g/m^3$ for NO_2)

3. Noise

64. Along the proposed roads 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 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.

C. Topography and Geomorphology

65. Odisha is located between the parallels of 17.49'N and 22.34'N latitudes and meridians of 81$_{o}$.27'E and 87$_{o}$.29'E longitudes. It is bounded by the Bay of Bengal on the east, Chhattisgarh on the west and Andhra Pradesh on the south. It has a coastline of about 450 kms. It extends over an area of 155,707 sq km. according to the 1991 census. This region is the combination of several deltas of varied sizes and shapes formed by the major rivers of Odisha, such as the Subarnarekha, the Budhabalanga, the Baitarani, the Brahmani, the Mahanadi, and the Rushikulya. Therefore, the coastal plain of Odisha is called the"Hexadeltaic region" or the "Gift of Six Rivers". It stretches along the coast of the Bay of Bengal having the maximum width in the Middle Coastal Plain (the Mahanadi Delta), narrow in the Northern Coastal Plain (Balasore Plain) and narrowest in the Southern Coastal Plain (Ganjam Plain). The North Coastal Plain comprises the deltas of the Subarnarekha and the Budhabalanga rivers and bears evidences of marine transgressions. The Middle Coastal Plain comprises the compound deltas of the Baitarani, Brahmani and Mahanadi rivers and bears evidences of past 'back bays' and present lakes. The South Coastal Plain comprises the laccustrine Plain of Chilika Lakeand the smaller delta of the Rushikulya River. The plateaus are mostly eroded plateaus forming the western slopes of the Eastern Ghats with elevation varying from 305-610metres. There are two broad plateaus in Odisha: (i) the Panposh - Keonjhar –Pallahara plateau comprises the Upper Baitarani catchment basin, and (ii) the Nabrangpur -Jeypore plateau comprises the Sabari basin.

66. The project districts fall under the rolling upland category and include a number of erosional plains and river basin of Mahanadi presenting an upland plain.

67. The tract covers major parts of districts of Sambalpur, Deogarh, Jharsaguda, Bargarh, Bolangir, Sonepur, Dhenkanal, Angul, Boudh, Nayagarh, Khurda, and northern parts of Phulbani (Kandhamal) and western part of Puri districts. Ground elevation of the project districts vary from 150 to 300 m above mean sea level, but the topography of the project region is mostly flat.

1. Geology/Soil

68. Three distinct geological formations namely Consolidated, Semi-consolidated, and Unconsolidated are found in Odisha as detailed at **Table 8**. The project districts comprise of semi-consolidated formation of the Gondwana group and are covered with the rocks of Eastern Ghat mobile belt.

Table 8: Distribution of Major Geological Units in Odisha

Geological Age	Rock formation		Districts
Consolidated Formation			
Pre-Cambrian	Archaean complex	Granite gneisses Charnockites, Khondalites, Schist, Phyllite, slates, Granulite,Banded Haematite Quartzite etc.	Occur in all districts except Kendrapara, Jagatsinghpur, Bhadrak
	Cuddapah Vindhyan	Shale, Sand Stone, Quartzite, Limestone etc.	Koraput, Nowrangpur, Bargarh, Nawapara
Semi – Consolidated Formation			
Palaeozoic - Mesozoic	Gondwana Group	Boulder bed, Sandstone, Shale and coalseams	Angul, Sambalpur, Jharsuguda, Cuttack, Khurda, Bolangir, Phulbani, Sundergarh,
Tertiary	Baripada beds	Loosely cemented calcareous sandstone	Mayurbhanj
Unconsolidated Formation			
Pleistocene to Recent	Alluvium (clay, silt, gravel and sand in varying proportion)		Ganjam, Gajapati, Mayurbhanj, Khurda, Puri, Cuttack, Kendrapara, Jajpur, Bhadrak, Balasore, Keonjhar, Rayagada, Koraput, Nawarangpur

Source: Central Ground Water Board, South Eastern Region, Bhubaneshwar.

2. Soils

69. The state has different soil types ranging from fertile alluvial deltaic soils in coastal plains, mixed red and black soils in central table land, red and yellow soils with low fertility in northern plateau and red, black& brown forest soils in Eastern Ghat region. The soil types differ widely from high acidic with the degree of acidity varying widely. The majority of soils in Odisha are light textured red soils, which have low water holding capacity, low fertility and are highly erodible.

70. The major soil types within the project districts can be classified into five groups namely: inceptisols, ultisols, entisols, aridisols and alfisols. These soil types can be further classified into brown, red, yellow and lateritc soils. The entisols is sub-classified into younger alluvial, and laterite soils. The aridisols is sub-classified into saline and salinealkali soils. The alfisols is subclassified into deltaic alluvial soils, older alluvial soils, redgravel soils, red sandy soils, red sandy soils, red loamy and mixed red black soils.

3. Earthquake and Seismicity

71. A large portion of Odisha comes under earthquake Risk Zone-II or low damage risk zone. The Mahanadi and Brahmani graven, Mahanadi delta and parts of Balasore and Mayurbhanj district come under earthquake Risk Zone –III or moderate damage risk zone. The seismic hazard map of India was updated in 2000[9] by the Bureau of Indian Standards (BIS) as shown in **Figure 2**. It reveals that the project region falls in Zones II and III i.e., low to moderate risk zone. According to Global Seismic Hazard Assessment Program (GSHAP) data, the state of Odisha falls in a region of low to moderate seismic hazard. Historically, parts of this state have experienced seismic activity in the M4.0 range. The hazard zoning map is shown in **Figure 3.**

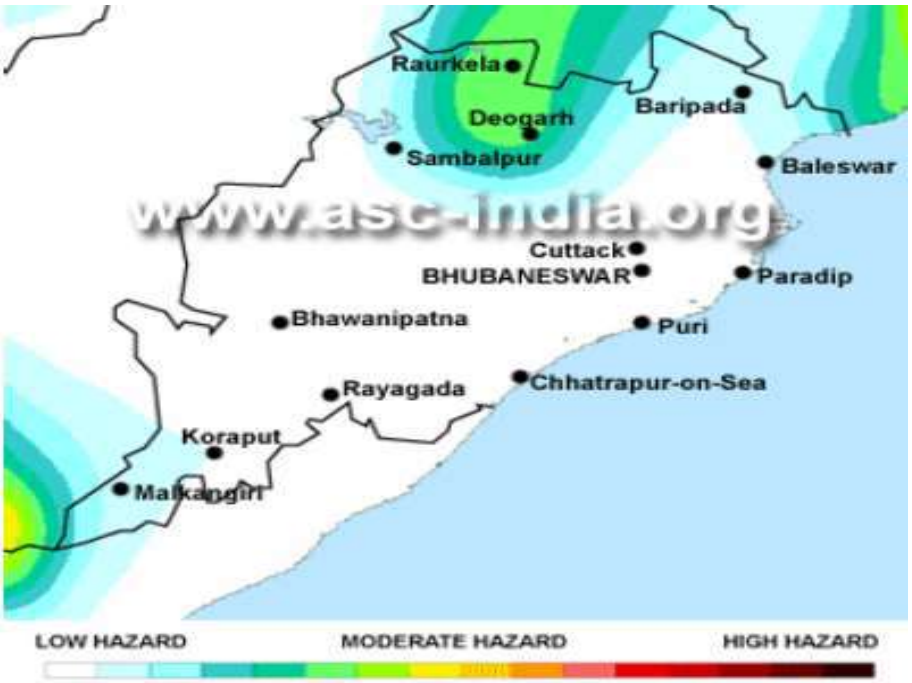

Figure 2: Hazard Zone Map

Source: Odisha State Disaster Management Authority

Figure 3: Seismic Zone Map

D. Land use

72. The state has broadly divided into 4 physiographic zones namely coastal plains, central tableland, northern plateau and Eastern Ghats. The area under various land uses in the state is presented in **Figure 4**. It shows that the state records a forest area of 37.3% of the total State

area. The cultivated area accounts for about 40% indicating the dominance of agriculture. As per the report of Odisha Remote Sensing Application Centre of 2002, water body covers an area of 230104.36 ha. The Wasteland Atlas of India -2000 reports shifting cultivation area in the state to be 10014.07 ha and mining industrial wasteland of 35.45 ha. This area is gradually increasing as per the other published reports. The land use pattern within the project districts can be broadly classified into arable irrigated, arable un-irrigated, forest areas, waste land/scrub, and rural / urban settlements areas.

E. Hydrology and Water Quality

73. Odisha is drained by the Mahanadi, Brahmani, Baitarani, Nagaballi, Subarnarekha, Rusikulya, and the Budhabalanga rivers along with their tributaries and distributaries. The tributaries of Mahanadi are Ib, Jhaun, Jira. The Sankh and the Tirka are important tributaries of Brahmani. Those of Baitarni are the Salandi and the Matai.

74. Hydro geologically, the area is underlain by diverse rock types ranging in age from Achaean to Recent. The State can be hydro-geologically sub-divided into consolidated, semiconsolidated, and unconsolidated formations. as shown in **Figure 5**.

75. **Surface Water Quality**: The rural road construction proposals normally cross small drainage channels like agricultural field channels, which eventually join major channels/rivulets. All of these channels generally remain dry for most part of the year and drain the storm water for few weeks only during or after the monsoon.

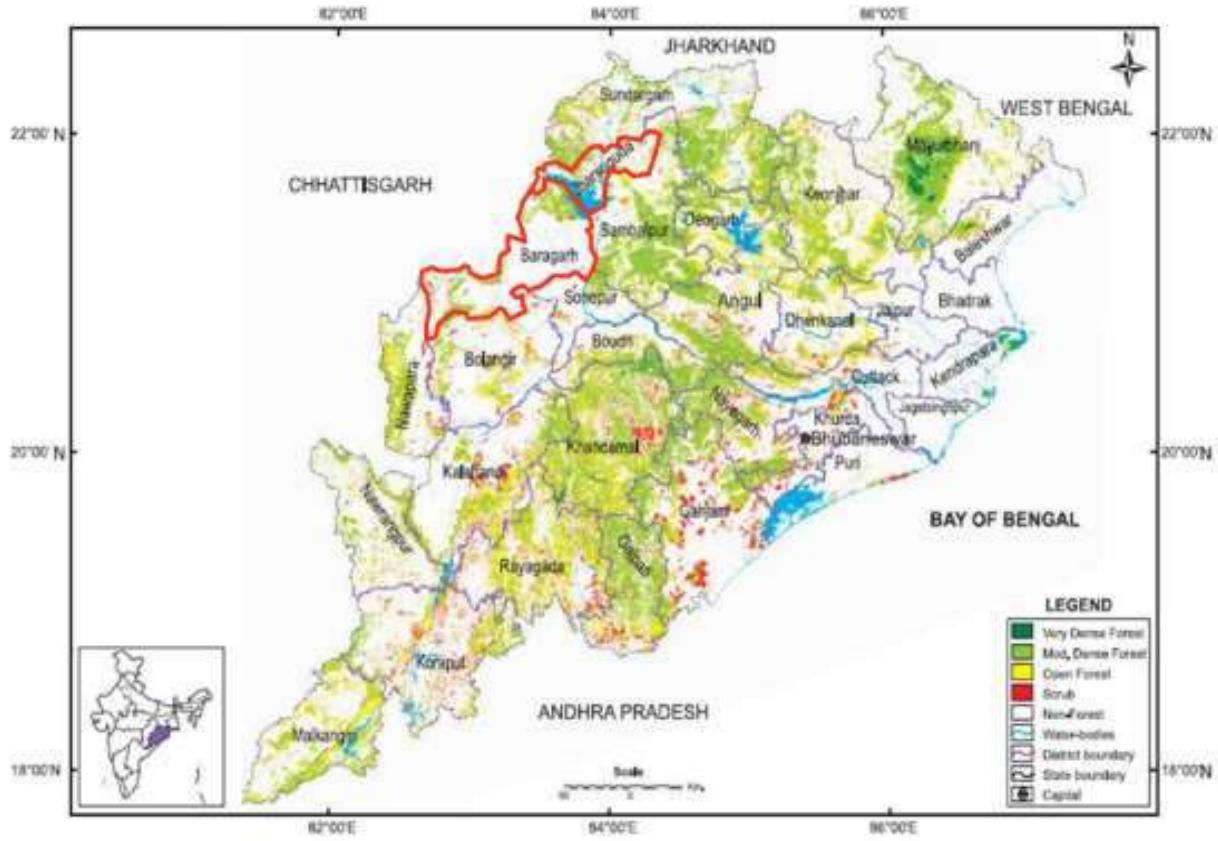

Figure 4: Land Use Pattern in the Project Districts

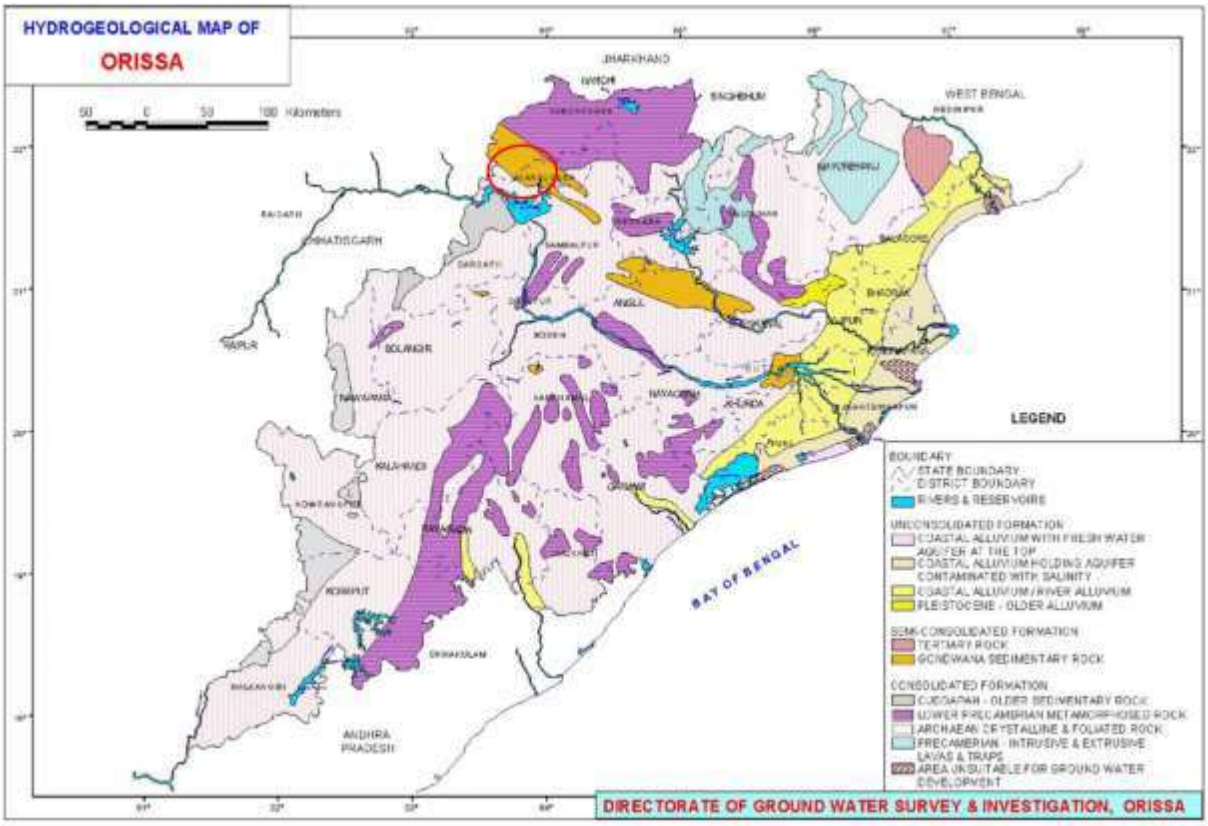

Figure 5: Hydrogeology of Odisha

76. **Groundwater Quality and Availability:** In the past, drinking water was obtained from wells, natural springs, streams, rivers, tanks, and lakes. In the plains, where drinking water has been generally insufficient, wells, tanks and small rivers have been the main sources. 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. Despite their increasing density, there are still places where hand pumps are not available or functioning. In these locations drinking water is sourced from tube wells or even rivers. Piped and tap water is still not common.

77. The groundwater potential in the project districts vary from than 1 liter/sec to 40 liter/sec. the hydro-geological formations in the coastal districts range between porous confined aquifers having primary intra-granular porosity with yields up to 40 liter/sec. to upland regions with generally limited ground water potential having less intra-granular porosity and fractures with yield less than 1 liter/sec. The occurrence of ground water table range from 1m above mean sea level to 500 m above mean sea level across the state.

78. An investigation was carried out by Mahananda et al. in 2010[10] to study the ground as well as surface water qualities, nutrient status, and physico-chemical characteristic of Bargarh district. The analysis was conducted for dug and bore well and three types of surface water (temple and community ponds). A comparative study of both types of ground water as well as pond water was carried out by taking certain important parameters like temperature, pH, total suspended solid, total dissolved solid, alkalinity, dissolved oxygen, chemical oxygen demand, nitrate, chloride, sodium, potassium, phosphate, fluoride and total coliform and faecal coliform (pond water). It was found that the maximum parameters were not at the level of pollution except few parameters like

nitrate for ground water. Ground water satisfy the requirement for the use in various purposes, but community pond water quality revealed highly polluted and unsafe for human use. Temple pond was comparatively less polluted than small and large community ponds, the study concluded.

F. Ecological Resources

79. The state of Odisha is known for abundance of natural beauty and wildlife. The major types of forests present in the state are tropical moist deciduous type and tropical dry deciduous type. The hills, plateaus and isolated areas of the northeastern part of the state are covered by the tropical moist deciduous forests whereas the second types of the forests are located in the southwest region of the state. Some of the trees which grow in abundance in Odisha are bamboo (*Dendrocalamus sp.*), Teak (*Tectona grandis*), Mahula (*Madhuca indica*), sal (*Shorea robusta*), Jamun (*Syzygium cumini*), Dhoben (*Dalbergia paniculata*) Mundi (*Mitragyna parvifolia*) etc. There are 479 species of birds, 86 species of mammals, 19 species of amphibians and 110 species of reptiles present in Odisha. The state is also an important habitat for the endangered Olive Ridley turtles and Irrawaddy dolphins (found in coastal district of Odisha). The forest map is given in **Figure 6**.

Figure 6: Forest Map of Odisha

1. Terrestrial flora

80. Important floral species observed in the project area are Amba (*Mangifera indica*), Aaola (*Emblica officinalis*), Arjun (*Terminalia arjuna*), Ashok (*Saraca asoca*), Bahada (*Terminalia belerica*), Bandhan (*Ougenia oojeinensis*), Bija (*Pterocarpu*s marsupium), Bheru (*Chloroxylon swietiana*), Char (*Buchanania lanzan*), Dhaman (*Grewia tiliofolia*), Dhaura(*Anogeissus latifolia*), Dhoben (*Dalbergia paniculata*), Genduli (*Sterculia urens*), Harida (*Terminalia chebula*), Jamun (*Syzygium cumini*), Kanchan (*Bauhinia spp*.), Karanj (*Pongamia glabra*), Kendu (*Diospyros melanoxylon*), Khair (*Acacia* catechu), Kochila (*Strychnos nuxvomica*), Kongra (*Xylia xylocarpa*),

Kurum (*Adina cordifolia*), Kusum (*Schleichera olesa*), Mahalimba (*Ailanthus excelsa*), Mahula (*Madhuca* indica), Tentra (*Albizia procera*), Mundi (*Mitragyna* parvifolia), Phasi (*Anogeissus acuminata*), Pitamai (*Garuga pinnata*), Rai (*Dillenia pentagyna*), Rajmohi (*Lannea coromandelica*), Rimili (*Bursera serrata*), Saguan (Tectona *grandis*), Sal (*Shorea robusta*), Salai (*Boswellia serrata*), Semal (*Bombax ceiba*), Sidha (*Lagerstromia parviflora*), Silveroak (*Grevillea robusta*), Siris (*Albizzia lebbeck*), Sisso (Bali) (*Dalbergia sisoo*), Sissoo (Pahari) (*Dalbergia latifolia*),Sunari (*Cassia fistula*), Tentuli (*Tamarindus indica*) etc.

81. The project area lies in tropical moist deciduous type and tropical dry deciduous type zone, it has a medium range of flora and fauna. However, none of the roads encroach to any habitat of rare, endangered, or threatened floral species and the habitat type in the area of the project roads are mainly modified habitat as per the definition of the ADB SPS.

2. Terrestrial/Avian fauna

82. The protected area (PA) network in the state comprises of 18 sanctuaries as given in **Table 9** and **Figure 7**. It constitutes 4.2% of the geographical area of the state and 11.4% of the forest area.

Table 9: List of Protected Areas in Odisha

S. No.	Name	District Located	Area (sq. km)
SANCTUARIES			
1.	Badrama	Sambalpur	304.03
2.	Baisipali	Nayagarh	168.35
3.	Balukhand-Konark	Puri	71.71
4.	Bhitarkanika	Kendrapara	672.00
5.	Debrigarh	Baragarh	346.91
6.	Gahirmatha	Kendrapara	1435.00
7.	Hadgad	Keonjhar	191.06
8.	Karlapat	Kalahandi	147.66
9.	Khalasuni	Sambalpur	116.0
10.	Kotgad	Phulbani	399.05
11.	Kuldhia Wildlife	Balasore	272.75
12.	Lakhari Valley	Gajapati	185.87
13.	Nalaban(Chilika)	Khurda, Puri & Ganjam	15.53
14.	Satkosia Gorge	Angul, Nayagarh, Phulbani	745.52
15.	Sunabeda	Nuapada	591.75
NATIONAL PARKS			
1.	Nandankanan	Khurda	14.16
2.	Similipal Tiger Reserve	Mayurbhanj	2200.00
3.	Chandaka Elephant Reserve	Khurda & Cuttack	75.79

83. Debrigarh Wildlife Sanctuary is about 5 km away from the proposed roads in Ambabhona and Bhatli blocks in Bargarh District.

84. Important faunal species found in the forest areas of Odisha are Sambar (*Cervus unicolar*), Chital (*Axis axis*), Barking deer (*Muntiacus muntjak*), Indian wild boar (*Sus scrofa*), Rhesus macaque (*Macaca mulatta*), Common langur (*Presbytis entellus*), Indian porcupine (*Hytrix indica*), and Indian pangolin (*Manis crassicaudata*). However, none other than Langur was observed near the subproject rods areas. The occurrence of wildlife species and or threatened or endangered species has not been reported within subproject road areas.

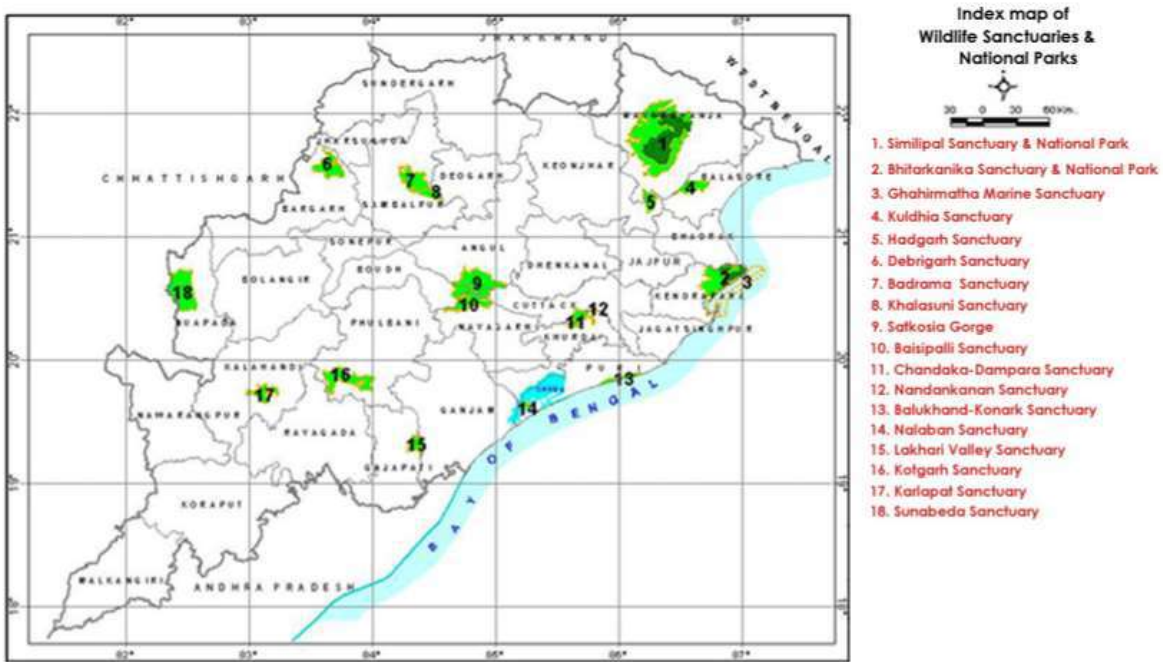

Figure 7: Protected Area Map of Odisha

3. Aquatic Biology

85. No wetland or big water bodies are located near the selected subproject road areas. Proposed construction works are not anticipated to affect aquatic biology of the area.

G. Socio-economic Environment

1. Demography

86. The state has an overall population of 41.95 million people as of 2011 of which 34.97 million live in rural areas representing 83.31% of the total. The corresponding rate of urbanization is 15%, compared to almost 30% to India as a whole. The state's average population density was 698 persons per km. In 2011 the gender ratio of the state is 978, which is more than the country as a whole (940). The literacy rate overall is 73.45 % which is slightly lower than the country average (74.04%). The male literacy rate is 82.4% whereas female literacy rate is 64.36%. The demographic profile of the state in comparison with the national average is shown in **Table 10**.

Table 10: Demographic Profile

S. No.	Item	Odisha	India
1	Total population (Census 2011) (in million)	41.95	1210.19
2	Decadal Growth (Census 2011) (%)	13.97	17.64
3	Crude Birth Rate (SRS 2008)	21.4	22.8
4	Crude Death Rate (SRS 2008)	9.0	7.4
5	Total Fertility Rate (SRS 2008)	2.4	2.6
6	Infant Mortality Rate (SRS 2008)	69	53
7	Maternal Mortality Ratio (SRS 2004 - 2006)	303	254
8	Sex Ratio (Census 2011)	978	940
9	Population below Poverty line (%)	47.15	26.10
10	Schedule Caste population (in million)	6.08	166.64

S. No.	Item	Odisha	India
11	Schedule Tribe population (in million)	8.15	84.33
12	Literacy Rate (Census 2011) (%)	73.45	74.04
13	Male Literacy Rate (Census 2011) (%)	82.4	82.14
14	Female Literacy Rate (Census 2011) (%)	64.36	65.46

Note: Figures in bracket indicate percentage. Source: Census, 2011.

2. Healthcare

87. As of 2001, there are 180 hospitals, 183 PHCs, 1,166 new PHC (new) and 14 mobile health units in the entire state. There are 13,786 hospital beds with 7,560 people per doctor and 2,663 people per hospital bed which is much higher that the All-India average of 1,361 in the state which is far from satisfactory. The state is well behind the aims of National Health Policy of providing universal health care and access to medical services. Life expectancy in the State has crawled to 57 years against national average of 61. The fact worrying the Government is the infant mortality rate (IMR) which is the highest in India at 96 per thousand. Poor of sanitation and contamintade waters are factor contributing to poor health. The habit of people to defecate in the open causes the spreading of water borne diseases. It is important to provide flush latrines in villages and motivate people to use them.

3. Literacy and Education

88. The literacy rate in the state is 73.45% which is slightly lower than the country average (74.04%). The male literacy rate is 82.4% whereas female literacy rate is 64.36%. Poor literacy areas are the less econiomically developed south and west districts. Only a third, or 11 out of 30 districts, have a literacy rate more than 70% most of which belong to the coastal area. Improvement in literacy rate changes the outlook of the people and makes them more useful assets of the community. The spread of literacy and education among women are more fruitful for the society. There are 35 engineering colleges, 3 medical colleges, 26 engineering schools, and 24 industrical training institutes (it is) to provide technical education.

4. Economy

89. The economy of Odisha has been lagging behind the national economy for several decades. Its per capita net state domestic product, a measure of average income, stood at Rs. 20,200 for 2006-07, which falls behind the national average by about 35%. Moreover, the gross domestic product of the state grew by a considerable lower rate than many other states for a long time despite its high growth potential.

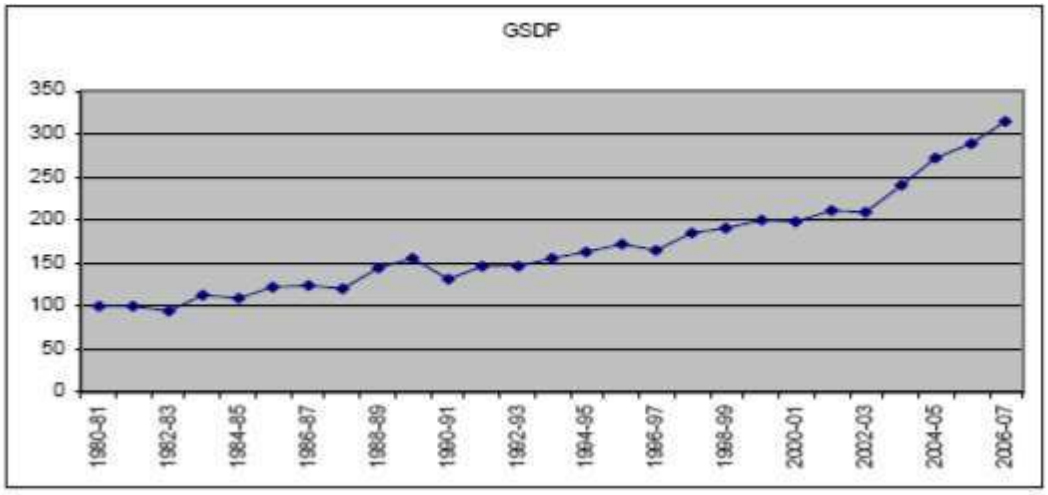

Figure 8: Index of Real GSDP in Odisha

90. Odisha's real GSDP has grown by an average annual rate of 4.8% on a long term basis during 1980-81 to 2006-07 compared to 6% for the same period for the nation as a whole. The index number of GSDP (with 1980-81 = 100.0) shown in Figure 3.9 nearly doubled over the 20year period 1980-2000 and has further increased by another 60% since then. In particular, the figure shows a sharp rise in the index after 2002-03. The average GSDP growth rate of 8.6% per annum during the period 2002-03 to 2006-07 compares very well with the national level. The per capita income of Odisha was about Rs. 7,700 at 1999-2000 prices in the year 1980-81. It nearly doubled to Rs.15,100 in 2006-07. Per capita income at the national level has grown by 160% from about Rs.8,600 to Rs.22,700 during the same period. Odisha thus continues to remain behind the national average considerably.

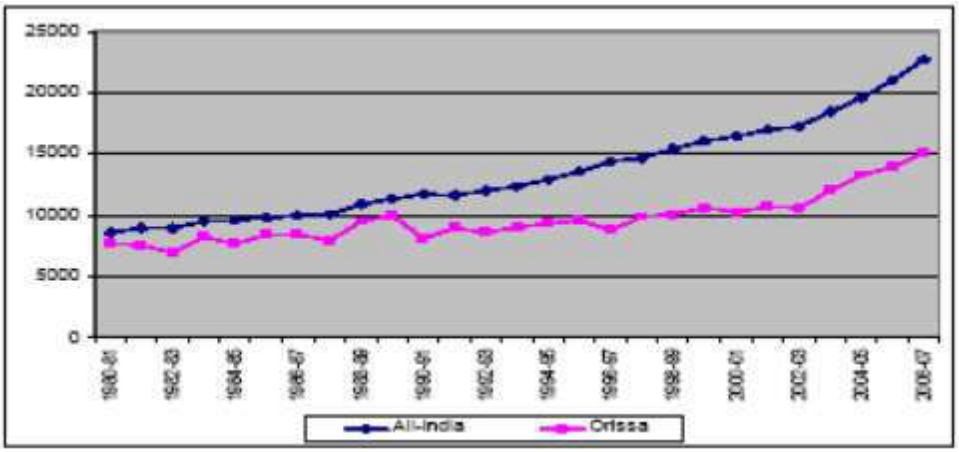

Figure 9: Per Capita Income (NDP) at 1999-2000 prices: Odisha and All India

5. Agriculture

91. The majority of the population in project districts is dependent on agriculture and subsistence forest. Podu cultivation (slash and burn) is practiced extensively by the tribals in the"dongar" (Upland). In the high hill slopes pulses, millets, mandya (ragi) and oilseeds like niger and mustard are grown. In the "Bilo" (low land) paddy is cultivated. Horticulture is also practiced particularly among the tribals. Vegetables are also cultivated crops being sweet potato, beans, chilly and yam. The agriculture is rain-fed. The agricultural implements used are still wooden

plough, wooden plod-breaker (coporpotta) and phouda sickle and hand axe especially in the backward districts of Koraput, Malkangir etc.

6. Industry and Mines

92. Although Jharsuguda and Sundergarh have major industrial areas, none of them fall with in the core or the buffer zone of the proposed road corridors. In general, none of the proposed road falls in mineral mining area whereas coal mining is the major mining activities of Jharsuguda districts. Sundargarh is known for the iron ore mining areas and Rourkela steel plant. None of these mining areas fall within subproject areas.

7. Flood Control facilities

93. Odisha is generally prone to various disasters like flood, cyclone, drought and fire. The last super cyclone in 1999 is an unforgettable event in the history of Odisha so also the high flood in 2001 and the drought in 2002. Bargarh roads are prone to flood during monsoon season. Various organizations working in Odisha in the field of disaster management as given below might be consulted for any further precaution in construction work apart from proper drainage provisions.

- Odisha State Disaster Mitigation Authority
- National Informatics Centre
- UNDP

8. Archaeological/Historical monuments

94. Although, Odisha is known to have several archaeological and historical/protected monuments spread all over the state, none of them are situated within 5 km on each side from the sample project roads.

9. Temples/Shrines/Idols/Statues

95. No historical religious structure falls close to proposed sample roads. Small tombs and roadside small temples do falls. Some of these which might be impacted or require relocation due to the construction works.

10. Power

96. During 2002-03, State's share in installed capacity in the State sector was 2,798.88 MW (hydro 1,918.88 MW and thermal 880.00 MW) against which power was available to the extent of about 869 MW. In addition to this, 440 MW of power was received from Central sector projects towards State share and 62 MW of power was purchased from captive power plants installed in the State by different industries. Thus, from all sources about 1371 MW of power was available against the estimated demand of 1367 MW. Out of 46,989 inhabitated villages in the State, 37,790 villages have been electrified by the end of 2002-03 with coverage of 84%.

H. Salient Environmental Features of Sample Roads

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

Table 11: Impacts on Biological Environment, Utility, Community and Religious Structures

District	Name of Road	Length Km	Features with 10m either side of existing road centre line					
			Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees#	Utlity Structures
Angul	L026-Dalo Jokapani Road	5.52	No	No	No	No	96	EP 8
Angul	L053-Kalamchhuin Solanda Road	3.87	No	1 Pond	No	No	73	No
Balasore	L109-Tudigadia to Jalada Road	7.78	No	1 pond	1 location	No	57	EP 4 HP 2
Bargarh	T02-SH3 near Sohela to Tambimunda	4.20	No	canal	No	No	87	No
Bhadrak	L022-PWD Road to Bachhada	5.00	No	No	No	No	72	EP 5
Bolangir	T11-Barpadar to Baghmund road	12.60	No	1 pond	No	No	38	No
Boudh	L122-SH 41 to Badachapapali	1.05	No	No	No	No	16	EP 3
Cuttack	L029-Kakhadi to Ramshyampur	7.05	No	No	No	No	131	EP 10, SP 2
Cuttack	L030-Kakhadi to Routraypur	6.00	No	Sapua Nala	No	No	157	EP 3
Cuttack	T01-Gadama to Kishannagar	8.31	No	Canal 2 pond	1 locations	No	139	EP 6
Dhenkanal	L079-NH 42 to Tentuliapada	2.0	No	1 pond	No	No	31	No
Ganjam	L039-PWD Road to Palakasandha	2.30	No	No	No	No	12	EP 13
Ganjam	L045-PWD road to Madhabarida Via Benikpalli	5.00	No	No	No	No	39	No
Ganjam	L043-Panigidi Manikapur	4.50	No	No	No	No	89	No
Ganjam	L038-SH21 Panchubhuti Harijana Sahi	2.54	No	No	No	No	56	No
Ganjam	L056-NH 217 to B Nuapalli road	1.30	No	No	No	No	31	No
Jagatsinghpur	L053-Urali to Patenigaon	3.75	No	No	No	No	63	No
Jagatsinghpur	L071-Balipatna to Pubapada	2.10	No	No	No	No	43	EP2
Jagatsinghpur	L035-Alana II to panchapa	3.50	No	Canal	No	No	39	No
Jajpur	L030-Kalyanapur Samalpur	3.92	No	No	No	No	43	EP2
Jharsuguda	L114-NH200 to Lakhanpur	5.00	No	No	No	No	38	No
Kalahandi	L128-NH 201 to Sanfula	4.50	No	No	No	No	77	No
Kalahandi	L037-PWD Road to Balajipita	3.10	No	No	No	No	71	No
Kandhamal	T-05- Garakumpa Balasakumpa Road	5.35	No	No	No	No	33	No
Kendrapara	L041-RB road to Balikana	3.40	No	No	1 locations	No	24	No
Kendrapara	L032-Tiarchak to Balarampur	2.48	No	Canal	No	No	25	EP4
Keonjhar	L033-Arsala to Teliarsala road	5.81	No	No	No	No	43	EP1
Keonjhar	L032-NH215 to Bishnupur road	2.65	No	No	No	No	9	EP5
Khurda	L060-R D road to Tandal	2.36	No	No	No	No	88	EP4
Khurda	L030-R D road to Bengitangi	3.40	No	No	No	No	46	No
Koraput	L022-NH 43 to A Ghatarla	8.80	No	No	No	No	34	No
Koraput	L038-Thuba to Raising	3.00	No	No	No	No	26	No
Koraput	Kundra to Bagderi	8.80	No	No	No	No	18	No

District	Name of Road	Length Km	Features with 10m either side of existing road centre line					
			Landslide prone	Water Body	Water Stagnation Area	Forest Area	Trees#	Utlity Structures
Mayurbhanj	L074-SH50 to Kasipentha Road	4.5	No	No	No	No	41	SP1
Mayurbhanj	L069-SH50 to Handifuta	3.89	No	1 pond	No	No	37	No
Mayurbhanj	L064-Betnoti to Sukhilahar Road	4.8	No	No	No	No	102	No
Nawarangpur	T02-Dohana jn to Jagannathpur	3.2	No	No	No	No	55	No
Nayagarh	L042-MDR 76 to Barangadia	2.07	No	No	No	No	61	HP 2
Nuapada	L032-RD Road to Beheradahi	8.00	No	No	No	No	17	EP8
Nuapada	L031- RD road to Palasabhadar	1.90	No	1 pond	No	No	33	No
Puri	L051-E K Embkt to Uttarana	7.58	No	Canal	No	No	24	No
Rayagada	L052-PWD Road to Loba	7.50	No	No	No	No	21	No
Sambalpur	L061-NH42 to Ichhapal	10.9	No	Canal	No	No	48	No
Sambalpur	L051-NH 6 Chinimahul	7.70	No	Canal 1 pond	No	No	71	No
Sonepur	L025-Sibatala Lukapada RD road to Attasingha	1.44	No	No	No	No	66	No
Sonepur	L024-NH 224 to Janmura	4.20	No	No	No	No	22	EP5
Sundargarh	MDR 32 to Tulsikani	2.70	No	No	No	No	41	EP2
Sundargarh	L029-Rouldega to Thiteitangar road	6.03	No	No	No	No	36	EP2

IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND ITS MITIGATION MEASURES

98. Road improvements work brings substantial economic and social benefits to rural communities and ultimately to the nation as a whole. Experience from past rural road upgrading projects however indicated risk for adverse impacts mostly related during the construction phase and the loss of avenue trees. Impacts are limited as the eligibility screening criteria defined in the environmental assessment and review framework avoids significant adverse impacts and proposed road improvements are confined along existing alignments. 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.

99. All project roads are subjected to environmental screening using the ECOP checklist. A sample size of 10% was selected by the ORRDA with support from the Project Implementation Consultant (PIC) from which this state level IEE was based. Separate environmental checklists were prepared for bridges with length greater than 50m. A standard EMP that forms part of the ECOP Checklist guided the preparation of the EMP provided in this report. As the MFF also calls for construction of training and research centers, separate assessments and EMPs will be prepared and may be integrated in the state-level IEEs as the designs and construction schedule are finalized.

100. 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 Projection

101. **Temperature**. By the 2050s, there is a general increase in temperature in Odisha with the average annual maximum and minimum temperatures expected to increase from 31.07$_{o}$C to 32.82 $_{o}$C and 20.18$_{o}$C to 22.41$_{o}$C, respectively from the 1960-1991 reference period. The future annual maximum and minimum temperatures are expected to increase from 42.65$_{o}$C – 44.72$_{o}$C and 7.59$_{o}$C-10.09$_{o}$C, respectively. The number or warm days is also expected to be more frequent with a 36.07% more chances of the daily maximum temperature exceeding the 90$_{th}$ percentile of reference maximum temperature and the 44.512% more chances of the daily minimum nighttime temperature exceeds the 90$_{th}$ percentile of the reference minimum temperature.

102. **Precipitation**. The GCM ensemble predicts a slight increase in annual rainfall from 1378mm to 1418 mm. The number of wet days or when precipitation is greater than >0.2mm will decrease from 120 to 117 days but the rainfall intensity (>1mm/day) will increase from 15 to 16 days.

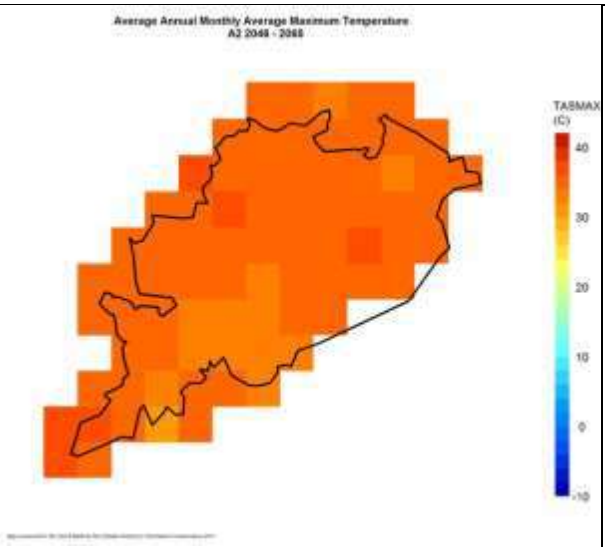

Figure 10: Predicted Future Average Annual Temperature, oC, A2 2046-2065

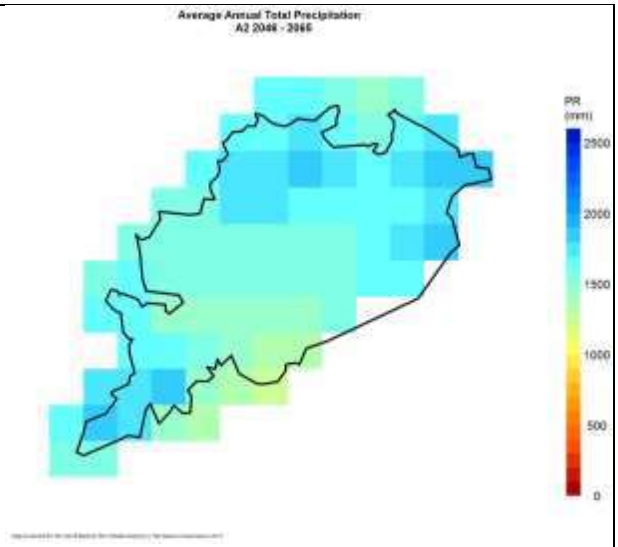

Figure 11: Predicted Change in Total Annual Precipitation, mm A2 2046-2065

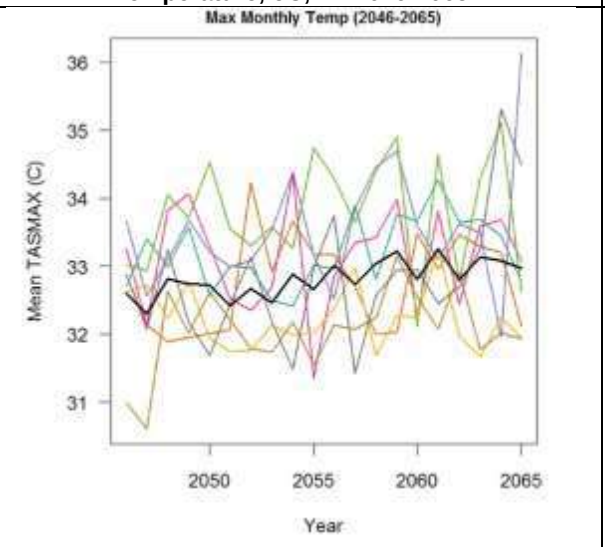

Figure 12: Future Trend of Maximum Monthly Temperature, A2, 2046-2065

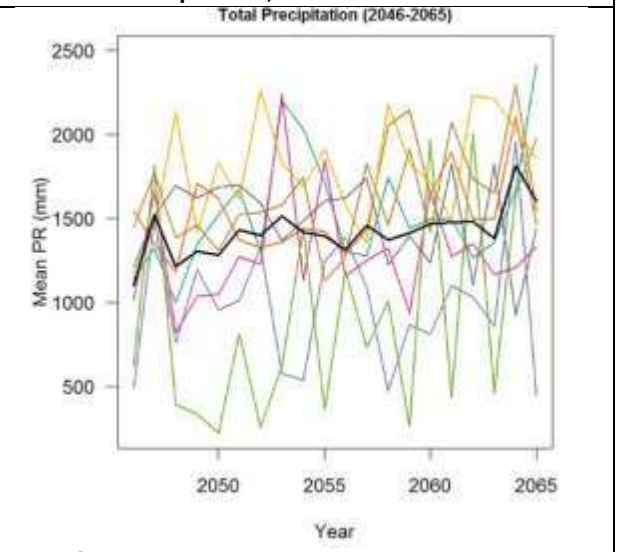

Figure 13: Future Trend in Total Precipitation, A2, 2046-2065

103. Figure indicates that geo-graphically, the highest temperatures will be experience in the interior districts of Dhenkanal and Debagarh. Marginally significant increase in rainfall is expected in Kendrapara, Baleswar, Sundargarh, and Gajapati districts.

2. Natural Hazards and Climate Risks

104. The natural hazards that will be compounded by the projected increase in rainfall and temperature are flooding, landslide, vegetation fire, and tsunami. The east southeastern region of the state that covers the districts of Kendrapara, Jagatsinghpur, Puri, Cuttack, Jajpur, Bhadrak, and Khurda are prone to flooding having 5-50 flooding events per 100 years. Along the Bay of Bengal on the same region The Port City of Paradwip, Kendrapara District has history of being hit by a tsunami while the entire coastline from Paradwip to Puri is at risk. The interior districts of Kandhamal, Boudh, and Angul have historical high hazard for vegetation fire.

Figure 14: Flood Risk, Odisha

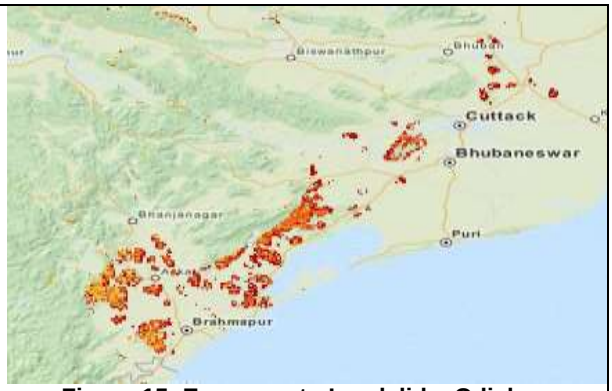

Figure 15: Exposure to Landslide, Odisha

Figure 16: Exposure to Tsunami, Odisha

Figure 17: Risk of Forest Fires, Odisha

105. **Mitigation Measures.** Civil works component including increasing embankment height, additional culverts, drains have been proposed that addresses identified climate change risks.

106. Compensatory tree plantations[11] (1:3) will be made to compensate the loss of trees for the construction of project roads. Additional efforts shall be made for tree plantation wherever feasible. All non-sample rural roads to be included in second RCIP, will also shall be screened for climate change vulnerability and necessary mitigation measures shall be adopted for minimisation of identified vulnerability if any.

3. Finalization of Alignment

107. **Impact**: The proposed rural roads will be constructed to provide 7.5 m roadway in accordance with PMGSY guidelines and technical specifications (IRC-SP 20: 2002) for plain terrain. Sample rural roads utilize existing road alignment usually of earthen track with some stretches of brickbat soling. The existing roads pass through plain terrain and primarily agriculture areas. None of the sample roads passes close to any protected monument or protected areas. Impacts due to road alignment and design is expected to be minor and limited to shifting of some common utilities, community structures (e.g. temple, school), and cutting of trees falling within road way.

108. **Mitigation Measures**: The road alignment is finalized considering availability of right-of way (RoW). The RoW is reduced in built up area or constricted areas to minimize land acquisition. The road alignment has also been modified to minimize tree cutting, shifting of utilities or community structure to the extent feasible. Some of the measures taken include widening of the

road on the opposite side of a tree that should be preserved or using retaining wall to minimize the road width to 5m wherever required. The road is aligned to follow natural topography to avoid unnecessary cut and fill. All future roads to be included in second RCIP will follow above measures. In addition these subprojects will comply with the following criteria for alignment finalization:

109. 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 wildlife 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.

4. Land Acquisition

110. **Impact**: No land acquisition is involved due to various measures considered for finalization 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. Due diligence on these aspects have been conducted separately and reported in the social compliance reports.

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

5. Protected Areas (National parks, Wildlife Sanctuaries, Eco-sensitive zones, protected /historical monuments) and Forest Areas

112. **Impact**: None of the sample road passes through any forest land and as such, project has no impact on forest cover of the state. Odisha 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.

113. **Mitigation Measures**: As there are no Protected/Ecologically sensitive areas in the subproject 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).

6. Land Clearing Operations

114. **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 finalization, utility and community structure shifting plan, tree felling, and demolition waste disposal.

115. **Mitigation Measures**: The following steps shall be taken to minimize 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.

7. Cut and Fill and Embankment construction

116. **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 finalization 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.

117. **Mitigation Measures:** 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 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.

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

118. **Impact**: The congregation of labor population and technical staff in the subproject area during the construction phase will put considerable stress on the limited resources of village areas. Some of the associated impacts are related to health, safety of the laborers at the construction campsites, availability of safe drinking water, and sanitation.

119. 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

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

- Construction campsites shall be located away from any local human settlements (minimum 500m 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 5 km from forest land/areas to deter the construction labor in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 1 km 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 non saleable 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.

9. Traffic Movement

121. **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.

122. **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 np later than 15 calendar days before the start of any construction work on a specific section to avoid any inconvenience to the present road users. 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 visible and retro reflective in nature for day and night visibility.

B. Associated Impacts due to Construction Activities

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

123. **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. 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.

124. **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 in all the sample is plain in nature. 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.

2. Borrow Areas and Quarries

125. **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.

126. **Mitigation Measures**: Borrowing earth from agricultural land shall be minimized 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 4**. 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.

3. Hydrology and Drainage

127. **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.

128. None of the sample roads is crossing any natural stream except L030-Kakhadi to Routraypur road in Cuttack district, which crosses Sapua Nallah. No flooding is reported from this river except stagnation of water along the road. Certain subproject roads are cross local and

seasonal drains. Village ponds are also located close to few roads. As such impact on hydrology and drainage pattern is expected to be minimal.

129. **Mitigation Measures**: 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.

130. 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.

4. Compaction and Contamination of Soil

131. **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.

132. **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 minimize the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. To avoid soil contamination at the wash-down and re-fuelling areas, “oil interceptors” shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.

5. Construction Debris and Wastes

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

134. **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 1,000 m away). It should also be located away from water bodies to prevent any contamination of these bodies.

6. Air Quality

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

136. 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 (SO_2), particulate matters (PM), and nitrogen oxides (NOx) emissions.
- Localized 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.

137. **Mitigation Measures**: All these impacts will be temporary and hence, no significant impact is envisaged. The following measures will be taken to minimize 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 roads, 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.
- 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.

7. Noise Quality

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

139. **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.

8. Groundwater and Surface Water Quality and Availability

140. **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. 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.

141. **Mitigation Measures**: Requisite permission shall be obtained for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority[13] 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.

9. Biological Environment

142. **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, Siltation and contamination of water bodies may affect the aquatic life. Since the aquatic life is minimal and no significant impact is anticipated on aquatic life.

143. **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, and cows have been observed in the surrounding agriculture fields. Disturbance to these animals will be avoided to the extent possible.

10. Impact on Common Property Resources

144. **Impact**: There are public utilities like electric transformers, electric poles, and hand pumps all along the project rural roads. The road construction may require shifting of these utilities. There are many community structures like school, playground village office temples.

145. **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.

11. Chance find artifacts

146. **Impact:** The project entails risk/damage to cultural properties and has likelihood of chance-finds.

147. **Mitigation Measures:** The Ancient Monuments and Archaeological Sites and Remains Act, 1958 requires the protection of all cultural and historical remains found in the project area. The contractor will ensure that none of the ancient monuments and archeological sites of importance are not affected due to the proposed project road and all construction related activities shall necessarily avoid such sites. All chance find artifacts shall be owned by the state and upon discovery all works around the area will cease and the Contractor will seek further guidance from the PIU and PIC. The Contractor will secure the discovery site.

C. Common Impacts during Operation Phase

1. Air Quality

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

149. **Mitigation Measures**: The bad road condition is the main cause of poor air pollution at present along the project roads. 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

150. **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.

151. 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

152. **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.

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

154. Since the habitat in the project area is already modified and the only vegetation that will be planted are the trees for purposes of compensatory plantation, it will be essential to ensure the survivability of the compensatory tree planted

155. **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 handling over the site to SRRDA.

156. 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

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

5. Hydrology and Drainage

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

159. **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. Socioeconomic Impact

160. Assessment of project impact on socioeconomic conditions point to the conclusions that positive benefits are many fold compared to its adverse impact.

161. **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.

162. **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 corves design and bends where the curve design speed is less than 40 km per hour in plain in 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 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.

7. Road Specific Impacts

163. 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).

D. Climate Change Impacts and Risks

1. Climate Change Mitigation

164. The Transport Emissions Evaluation Model for Projects (TEEMP) is an excel based tool to assess CO_2 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 NOx.

165. The following information were used to project CO_2 emissions for Tranche 1 of the Facility:

a. RCIP 2 subprojects in Odisha state will upgrade 464 rural roads with a total length of 2012.30 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.

166. 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	68.23
Three-wheeler	6.52
Car/Jeep/Van	13.26
Multi-axle	11.42
Bus	0.57
Two-axle	-
Total (motorized)	100
Non-motorized	

Vehicle Type	Percentage
Bicycle	93.22
Bullock cart	6.78
Total (non-motorized)	100.00

167. There are 464 rural roads with a total length of 2012.30 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.

168. 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: CO_2 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	

169. 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/km4. These emissions were from construction materials used (aggregates/base materials, cement, bitumen and emulsion), and fuel used for transporting construction materials.

170. Total annual emissions without the project (business as usual) at the middle of the design life of 7.5 years is estimated at 50,994.84 tons/year and with project scenario is estimated at 48,888.70 tons/year, for all 464 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 CO_2 emissions.

2. Climate Risks and Adaptation Needs

171. 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.

172. 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

[4] https://www.adb.org/sites/default/files/publication/28555/estimating-carbon-footprints-road-projects.pdf

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.

173. 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.

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

A. Environmental Management Plan

174. 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, timeframe and costs. The mitigation measures are proposed to eliminate or minimize the identified impact associated with design, construction and operation stages of the project, to acceptable level by adopting the most feasible options.

175. The EMP is prepared as per Environmental Management Standard (ECOP) applicable to rural road defined be ADB in the EARF for second RCIP.

176. The identified impacts are mostly 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 and noise pollution due to construction activities and operation of construction equipment, tree cutting and shifting of utilities and physical community structure.

177. 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 5. 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.

178. 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

179. The environmental monitoring program aims to assess the the environmental performance of environmental management plan. The EMOP will:

- assess the effectiveness of mitigation measures,
- assess the change in environmental quality during construction and operation stages,
- assess compliance to regulatory requirements, and
- monitor the status of corrective action taken in case of deviation from the planned measures or regulatory requirements.

180. For rural roads, EMoP will rely more on visual observation during pre construction aspects[14], construction stage and operation stage. A monitoring plan with monitoring indicator and frequency of monitoring is given in **Appendix 6**.

C. Institutional Arrangements and Responsibilities

1. Institutional Arrangement

181. 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.

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

183. The institutional arrangement at National Level and state level for implementation of PMGSY including second RCIP is shown at **Figure 18.**

D. Institutional Environmental Responsibilities

184. The institutional environmental responsibilities for different level and function are elaborated below.

- MORD[15] 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 alsoensure 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

185. SRRDA[16] 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;

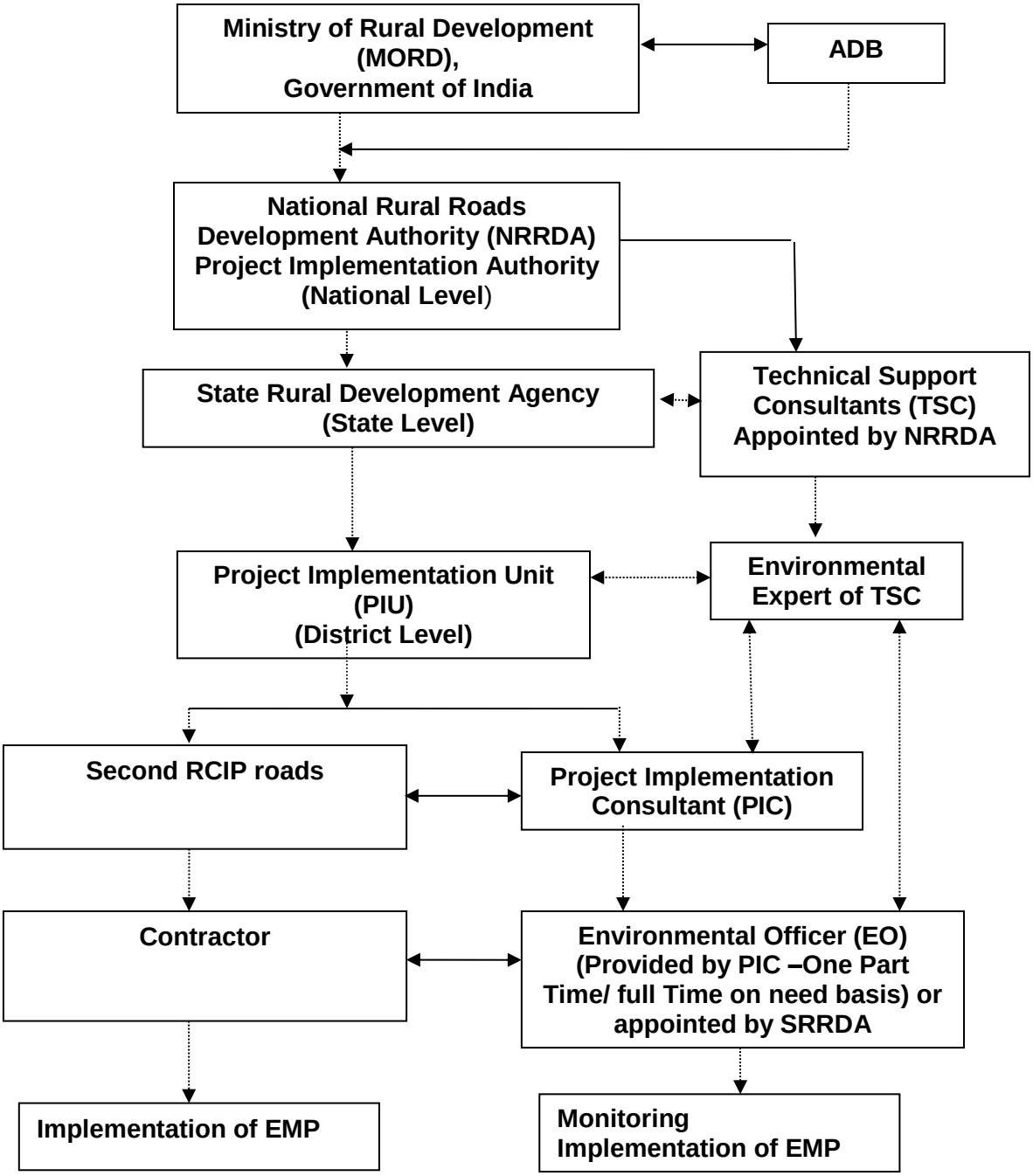

Figure 18: Institutional Arrangement for EMP Implementation

- 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;
- 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; and
- Appoint Project Implementation Consultant (PIC) for construction supervision and assist PIUs for EMP implementation and related safeguard compliances.

186. 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 postconstruction monitoring checklists through the project implementation consultants, and
- Prepare and submit to SRRDA annual monitoring report as per ADB defined format.

187. 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 tranche before implementing next tranche;
- Prepare state Level IEE reports and EMPs for non-sample roads based on the ECOP checklist completed by the PIC;

188. 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:

- 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;
- Coordination 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 stages12 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; and
- Conducting environmental training/awareness programs for the contractors, the project implementation personnel and the communities.

189. Contractor is appointed by SRRDA for construction of road and ensures implementation of EMP proposed. The broad duties of constrictor are as follows**:**

- Make adequate costs provision for EMP requirements while biding
- 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

190. 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 tranche and legal framework are given below:

1. Selection Criteria and Environmental Assessment Requirement

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

- No Category A (as per ADB’s SPS) subproject will be included in the MFF.

- Subprojects will be eligible for construction or upgrading in accordance with the PMGSY guidelines, and be included in the respective district core network.
- 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.
- The subproject will not pass through any designated wildlife sanctuaries, national parks, other sanctuaries, notified ecological sensitive areas or area of internationally significance (e.g., protected wetland designated by the Wetland Convention).
- The projects shall only involve activities that follow Government of India laws and regulations, ADB's Safeguard Policy Statement (2009)

192. The following environmental assessment requirement will be followed roads included under second RCIP:

- ECOP checklists with annexes on trees, utility structures, community structures, strip plans and photographs will be completed for each and every road.
- Based on the requirements of the PMGSY guidelines separate ECOP checklists will be prepared for bridges that are longer than 15 m.
- 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.
- 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.

193. 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.

- Is the project area subject to hazards such as earthquakes, floods, landslides, tropical cyclone winds, storm surges, tsunami or volcanic eruptions and climate changes?
- 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)?
- 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)?
- 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?
- Could the subproject potentially increase the vulnerability of the surrounding area (i.e., by increasing runoff, encouraging settlement in earthquake zones)?

2. Legal Framework

194. As per Indian legislation, an environmental clearance is not required for rural roads. However, it may attract provisions of Forest Conservation Act, Wildlife (Protection) Act, and other legislation related with Air, Water and Noise pollution controls and prevention. The legislative applicability screening is presented in chapter I of this report and it will apply for nonsample road

as well. Additionally, to ensure conformance to SPS 2009, the subprojects will be subject to the following requirements:

- 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.
- An Initial Environmental Examination13 (IEE) report including the preparation of an Environmental Management Plan (EMP) and a Monitoring Plan.
- Regular monitoring of implementation of the EMP and submission of monitoring reports and due diligence reports to ADB as necessary.

F. Capacity Building

195. 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 postconstruction monitoring checklists; and (iv) preparation of monitoring reports. These few workshops have already been conducted at participating states though ADB officials and TSC experts. Additional training will be carried out periodically, by in-house trained and experienced officials.

G. Consultation and Information Disclosure

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

197. All environmental assessment documents are subject to ADB's Public Communication Policy (2011) 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 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

198. **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.

199. **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.

200. **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.

201. 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.

202. **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.

203. 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 onlyif 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.

VI. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. General

204. Public consultation was undertaken consistent with the ADB requirements. All the five principles of information dissemination, information solicitation, integration, coordination 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.

205. Stakeholder's consultations were held from March to June 2017. 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. The informal consultation generally started with explaining the subprojects, 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.

206. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the subproject. 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

207. In India, public consultation is mandatory in case of Category A and B1 category Projects[17] 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. This will involve regular communications between the PIU, PIC and the grievance redressal committee's and community leaders. Consultations carried out and grievances addressed will be recorded in the annual environmental monitoring report which will be submitted for disclosure on the ADB website.

C. Beneficiaries' Comments

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

209. Some of the general issues raised during the different consultation sessions are summarized 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.
- **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 did not raised 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 minimized. 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 perceived 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 aspects are 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 PAPs appreciated need and supported the project fully. Community at large appreciated overall benefits to them resulting from project development;

D. Addressal of Issues

210. 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 safely 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.
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

Issue/Concern	Addressal under the project
Increased pollution levels	• Ambient air quality, water quality largely meets the prescribed standard. Al 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

VII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

211. 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.

212. 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.

213. All sample roads included under RCIP II 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. As per selection guidelines, none of the selected sample road passes through reserved forests either. Few trees cutting though may be involved.

214. Among the sample project roads there are 23 roads which are prone to flood due to river, proximity to rivers or due to accumulation of rainwater in and around project road area. Adequate engineering measures like cross drainage structures, slop stabilisation are proposed for the protection of road from the flood.

215. 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.

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

217. 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.

218. The impacts identified are mostly related to alignment selection, land clearing, borrowing earth, and 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.

219. 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.

220. NRRDA/SRRDA has defined institutional setup including 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 officials and TSC Experts. Trained and experienced in-house officials should carry out more raining in future periodically.

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

B. Key Recommendations:

222. Any major changes or any major additional work other than the proposed project activities will require preparation of another environmental assessment. This additional assessment will have to be submitted to NRRDA, Concerned Government authorities and ADB for concurrence before civil works commence.

223. 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.

224. 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.

225. Executing agency shall ensure that EMP and EMoP is included in Bill of Quantity (BOQ) and forms part of bid document and civil works contract. 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. The same shall be revised if necessary during project implementation or if there is any change in the project design. Any such change shall be reported to ADB as well.

APPENDIX 1: DETAILS OF PROPOSED BATCH 3 ROADS IN ODISHA

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
1	Angul	Chendipada	L039-PWD Road to Ambapal via Badamahitala Natada	3.00
2	Angul	Pallahara	L052-Batisuan Buabada Dhauragotha Road	6.69
3	Angul	Pallahara	L026-Dalo Jokapani Road	5.52
4	Angul	Talcher	L046-Karnapur Natedi Road	6.00
5	Angul	Talcher	L053-Kalamchhuin Solanda Road	3.87
6	Balasore	Basta	L035-Singla to Gadasahi Baliapal Road	3.40
7	Balasore	Khaira	T03-Barhapur to Charampa	4.50
8	Balasore	Khaira	L109-Tudigadia to Jalada Road	5.42
9	Balasore	Simulia	L044-Balikhanda to Andrei Road	9.00
10	Bargarh	Ambabhona	L036-RD Road to Dekhulia	8.86
11	Bargarh	Ambabhona	T02-Samardhara Chhak to Badamal	5.70
12	Bargarh	Bhatli	L043-R D Road to Hatisar	2.14
13	Bargarh	Bhatli	L058-Kanakbira Chhak to Jadamunda	3.23
14	Bargarh	Bijepur	T04-RD Road at 3rd Km to Pada Chhak	13.62
15	Bargarh	Bijepur	L039-RD Road to Bairakpali	1.50
16	Bargarh	Bijepur	L048-Saipali to Darlipali	3.15
17	Bargarh	Padampur	T06-PWD Road at Dahita to Budhamal Chhak	7.61
18	Bargarh	Paikmal	L045-SH3 at 69 Km to Borasambar	2.73
19	Bargarh	Paikmal	L029-MDR 36 at 52 Km to Sambalpuri	2.18
20	Bargarh	Sohella	T02-SH3 near Sohela to Tambimunda	4.20
21	Bargarh	Bijepur	L072-PWD Road to Satbandha	8.34
22	Bargarh	Padampur	L060-SH3 at 56 5 Km to Singhenpur	1.80
23	Bargarh	Sohella	L028-Haldipali Chhak to Jamchhapar	5.51
24	Bargarh	Paikmal	L084-SH3 at 87 Km to Mundhela	3.50
25	Bhadrak	Basudevpur	L022-PWD Road to Bachhada	5.00
26	Bolangir	Muribahal	L028-PWD road to Ichapara road	1.85
27	Bolangir	Patnagarh	T11-Barpadar to Baghmund road	12.60
28	Bolangir	Titilagarh	T04-Rigdol to Bhalegaon road	2.25
29	Bolangir	Titilagarh	T07-Sirekela to Goudatola road	8.40
30	Boudh	Boudh	T02-Baghiapada to Birigada road	4.82
31	Boudh	Harbhanga	T01-Dhalpur to SH23 Near Atalsara	15.86
32	Boudh	Kantamal	L122-SH 41 to Badachapapali	1.05
33	Boudh	Boudh	T10-Dahiya to Sagada rod	9.20
34	Cuttack	Athagarh	L029-Kakhadi to Ramshyampur	7.05
35	Cuttack	Athagarh	L044-PWD Road to Paikerapur	3.70
36	Cuttack	Athagarh	L030-Kakhadi to Routraypur	6.00
37	Cuttack	Baramba	L034-PWD Road to Diniary	5.00
38	Cuttack	Baramba	L048-R D Road to Kendupalli	6.30
39	Cuttack	Baramba	L025-Kajalbedha Barapalli	7.00
40	Cuttack	Cuttack	T01-Gadama to Kishannagar	8.31
41	Cuttack	Cuttack	T02-Damodarpur to Fullar	9.73
42	Cuttack	Kantapara	L033-Sanapatasundarpur to Waujanga	3.01
43	Cuttack	Mahanga	L049-Mahanga to Kalianti	8.80
44	Cuttack	Mahanga	L043-Khandal to Bhaunria	5.95
45	Cuttack	Narsinghpur	L064-Kamaladiha to Kaintira	4.00
46	Cuttack	Nischintakoili	L053-Jiginipur to Barado	2.63
47	Cuttack	Nischintakoili	L024-Dikhitpara Kentalo	3.50
48	Cuttack	Nischintakoili	L048-Damadarpur to Purunapari	1.50
49	Cuttack	Salipur	L042-C C Road Nandolagada to Tentola	3.05

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
50	Cuttack	Salipur	L043-Kendrapara canal embankment Tentola to Attoda	3.00
51	Cuttack	Salipur	L077-CC Road Naliamuhan to Sauri	4.00
52	Cuttack	Salipur	L044-C C Road Kharakhia to Jamalpur	2.55
53	Cuttack	Tangi Choudwar	L064-Rajbati Ramachandrapur to Ambilijhari	7.00
54	Cuttack	Tangi Choudwar	L056-Nakhara to Guali road	8.25
55	Cuttack	Cuttack	L022-Kandarpur to Athanga	4.00
56	Cuttack	Cuttack	L025-Kamarpada Dharina	2.91
57	Cuttack	Mahanga	L054-Nurtanga to Jankoti	6.55
58	Cuttack	Mahanga	L044-Palisahi to Badagotha	5.19
59	Cuttack	Tangi Choudwar	L023-PWD Road to Narayanpur	5.79
60	Cuttack	Tangi Choudwar	L026-Uchhapada to Kadei	3.10
61	Cuttack	Tangi Choudwar	L046-Tangi Haripur PWD Road to Karanji	4.31
62	Dhenkanal	Hindol	T05-T 1 to Gobardhanpur	9.70
63	Dhenkanal	Kankadahad	L043-Birasal to Tarajanga	6.00
64	Dhenkanal	Odapada	L079-NH 42 to Tentuliapada	2.00
65	Dhenkanal	Gondia	L064-L 63 to Santhasara	2.20
66	Dhenkanal	Parajang	L055-NH 200 to Naupalmundeilo	3.00
67	Ganjam	Aska	L036-RD Road to Karnoli	1.50
68	Ganjam	Aska	L043-RD road to Sahaspur	4.50
69	Ganjam	Aska	L050-SH 7 to Sapuapalli	1.52
70	Ganjam	Aska	L027-Babanpur Sahapur	2.18
71	Ganjam	Beguniapada	L048-SH 30 Khajapalli to Chakundajhola	4.12
72	Ganjam	Belguntha	L039-PWD Road to Palakasandha	2.30
73	Ganjam	Belguntha	L036-NunipadaSanadodanga	4.00
74	Ganjam	Belguntha	L045-PWD road to Madhabarida Via Benikpalli	5.00
75	Ganjam	Bhanjanagar	L041-PWD road to Veerda	1.50
76	Ganjam	Chikiti	L074-Sorala Rly station to Erendra	2.72
77	Ganjam	Chikiti	T05-SB Chaitanyapur to Digapahandi	7.06
78	Ganjam	Dharakote	L047-Jaggnathpur sasan Olomba Road	4.00
79	Ganjam	Dharakote	L025-NH 217 Laxmipur Via Sudnarapalli	5.00
80	Ganjam	Digapahandi	T03-Digapahandi to Kotabadapali chhak SH	3.00
81	Ganjam	Digapahandi	L089-PWD rod to Patanda	2.05
82	Ganjam	Digapahandi	L030-Approach road to Dhamanapadar road	2.57
83	Ganjam	Jaganathprasad	L063-SH 21 to Gochhabadi	2.06
84	Ganjam	Khallikote	L050-NH 5 to Khamar	5.05
85	Ganjam	Khallikote	L049-Khallikote to D H Palli	6.08
86	Ganjam	Kukudakhandi	L040-PWD road to Nalihada	1.60
87	Ganjam	Kukudakhandi	L053-Gurunthi to Bankiapalli	3.82
88	Ganjam	Polasara	L050-PWD road to Saradapur Road	1.50
89	Ganjam	Polasara	L041-Polasara Buguda PWD road to Nimina Canal	4.00
90	Ganjam	Polasara	L048-Mathura to Mardarajpur	3.00
91	Ganjam	Polasara	L023-Pandiripada Patalasingi Paniri	3.20
92	Ganjam	Polasara	L070-PWD road to Kanipalli	1.95
93	Ganjam	Polasara	L053-PWD road to Kartali	2.00
94	Ganjam	Polasara	L064-Jemadeipur to Dunguri road	3.50
95	Ganjam	Polasara	L071-Badua to Biripur	2.15
96	Ganjam	Purusottampur	L054-Bhutasarasingi Arakhapur Road	10.27
97	Ganjam	Purusottampur	L047-PWD road to Jaugada Tourist Place	4.58
98	Ganjam	Purusottampur	L049-PWD road to Chatamunduli Road	3.10
99	Ganjam	Purusottampur	L038-Bhabandha Sargunapalli Road	1.81
100	Ganjam	Purusottampur	L057-RD road to Nuagam	1.23

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
101	Ganjam	Purusottampur	L056-Purusottampur Kandarapalli Via Ranigam Road	5.06
102	Ganjam	Rengailunda	L040-Pathara to Ganju road	3.03
103	Ganjam	Seragada	L037-Barasing to Bhetasingi road	2.45
104	Ganjam	Sorada	L022-RD road to Siarimala	1.30
105	Ganjam	Belguntha	L054-PWD road to Bankilidi Via Sanaborisingi	3.75
106	Ganjam	Bhanjanagar	L062-PWD road to Khariguda	3.80
107	Ganjam	Buguda	L043-Panigidi Manikapur	4.50
108	Ganjam	Chhatrapur	L031-NH 5 to Paikapada road	7.17
109	Ganjam	Digapahandi	L063-PWD road to Gundriguda	4.75
110	Ganjam	Jaganathprasad	L038-SH21 Panchubhuti Harijana Sahi	2.53
111	Ganjam	Jaganathprasad	L039-SH 21 to Chadheipalli Road	2.48
112	Ganjam	Jaganathprasad	L048-RD Road Rauti	3.00
113	Ganjam	Jaganathprasad	L051-Jagnathprasad Block Agyanprasad Chhak	3.86
114	Ganjam	Kabisuryanagar	L047-Sunapall to Asinapur	4.13
115	Ganjam	Khallikote	L039-PWD road Pustapur to A Nuapalli	4.67
116	Ganjam	Khallikote	L055-NH 5 Langaleswasr to BGhodapada	13.50
117	Ganjam	Patrapur	L055-PWD road Sirrampur	6.72
118	Ganjam	Rengailunda	L035-PWD road Gunupur to Belakudi road	1.50
119	Ganjam	Seragada	L056-NH 217 to B Nuapalli road	2.25
120	Jagatsinghpur	Balikuda	T01-Kandarpur to Machhagaon	4.51
121	Jagatsinghpur	Balikuda	L086-Sangrampur to Achutipur	5.51
122	Jagatsinghpur	Biridi	L026-Maindipur to Bagalpur	4.30
123	Jagatsinghpur	Jagatsinghpur	L055-MSPur to tartanga	6.00
124	Jagatsinghpur	Jagatsinghpur	L053-Urali to Patenigaon	4.70
125	Jagatsinghpur	Kujanga	L059-Rahama to Gorada	3.21
126	Jagatsinghpur	Kujanga	L032-Santara to mangarajpur	4.20
127	Jagatsinghpur	Nuagaon	T01-Alanahat MDR to Sikharghat	5.00
128	Jagatsinghpur	Nuagaon	L035-Alana II to panchapa	3.75
129	Jagatsinghpur	Raghunathpur	L062-T 06 PWD Road to Korakora	3.50
130	Jagatsinghpur	Raghunathpur	L041-T 05 Bartira to Ichhapur	3.50
131	Jagatsinghpur	Tirtol	L071-Balipatna to Pubapada	2.10
132	Jagatsinghpur	Tirtol	L058-Katara to Baranga	4.89
133	Jagatsinghpur	Tirtol	L023-Nagapura to Porgadei	3.00
134	Jagatsinghpur	Balikuda	L064-Nuagaon via Anatapur to Khadikandanda	9.69
135	Jagatsinghpur	Biridi	L035-Kamasasana to Nuagaon	4.50
136	Jagatsinghpur	Jagatsinghpur	L031-Jagatsinghpur to Balarampur	7.10
137	Jagatsinghpur	Jagatsinghpur	L057-Ninigaon to nachhipur	3.75
138	Jagatsinghpur	Jagatsinghpur	L047-Alipingal to Benukhanda	3.00
139	Jagatsinghpur	Tirtol	L029-PWD road 2nd Km to Batilo	5.40
140	Jajpur	Badachana	T01-Krushnadaspur to Ratnagiri	5.00
141	Jajpur	Badachana	L032-Raipur Chhak to Bengapur	4.50
142	Jajpur	Badachana	L026-Saudia Chhak to Barapada	3.00
143	Jajpur	Badachana	T08-Darpani to Samia RD Road	6.00
144	Jajpur	Binjharpur	L030-Kalyanapur Samalpur	2.94
145	Jajpur	Binjharpur	L046-Mainda Kapila RD Road to Ramachandrapur	3.92
146	Jajpur	Binjharpur	L044-Mainda Kapila RD Road to Lenkasahi	1.41
147	Jajpur	Binjharpur	L041-Sansanda to Baruna	3.00
148	Jajpur	Danagadi	T10-Expressway to Kolathapada	4.00
149	Jajpur	Danagadi	T02-TTS Chhaka RD Road to Mulasara	6.43
150	Jajpur	Dasrathpur	L070-Mangalpur to Bajrapata	1.73
151	Jajpur	Dasrathpur	L041-Mirjapur to Senanda	3.00
152	Jajpur	Dharmasala	L072-Jenapur to Brundadeipur	3.60

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
153	Jajpur	Jajpur	L024-SH 56 Kamagarh to Bidyadharpur	5.40
154	Jajpur	Korei	T03-Barundei to Bandal	6.50
155	Jajpur	Korei	L024-Kadamia Chhak to Osala	5.59
156	Jajpur	Rasulpur	L048-Krushnanagar to Pahanga	4.18
157	Jajpur	Rasulpur	L023-R and B Road to Bahadalpur	2.30
158	Jajpur	Jajpur	L033-Khandra kamalpur RD Road to Govindpur	5.22
159	Jajpur	Jajpur	L064-RD Road to Beruda	2.40
160	Jajpur	Korei	L042-NH 215 to Pimpala	2.98
161	Jajpur	Sukinda	L063-RD Road to Pimpudia	3.73
162	Jajpur	Danagadi	L067-Express Highway to Dankarisahi	2.24
163	Jajpur	Danagadi	L073-RD Road to Sabara	1.49
164	Jajpur	Danagadi	L049-NH 200 to Golagaon	1.20
165	Jajpur	Danagadi	L060-Expressway to Benapatia	3.61
166	Jajpur	Danagadi	L062-RD Road to Dhabahali	3.20
167	Jajpur	Danagadi	L065-Expressway to Tungeisuni	2.60
168	Jajpur	Danagadi	L068-Expressway to Mahalisahi	2.20
169	Jajpur	Rasulpur	L047-Vikipur to Tarapur	2.24
170	Jajpur	Sukinda	L071-R and B Road Kalarangiatta	1.49
171	Jajpur	Sukinda	L028-NH200 to Sarangapur	2.50
172	Jajpur	Sukinda	L054-Bandhagaon to Mantiri	2.20
173	Jajpur	Sukinda	L068-R and B Road to Bhalukipatla	1.49
174	Jajpur	Sukinda	L046-NH200 to Bhalukhanthia	4.32
175	Jajpur	Sukinda	L047-NH 200 to Olia	3.20
176	Jajpur	Sukinda	L073-R and B Road to Balipada	1.49
177	Jajpur	Sukinda	L077-Aradapal to Podaro	2.25
178	Jajpur	Sukinda	L072-R and B Road to Sukarangi	1.40
179	Jharsuguda	Lakhanpur	L114-NH200 to Lakhanpur	3.06
180	Kalahandi	Bhawanipatna	L027-PWD Road to Kusumsila	5.00
181	Kalahandi	Bhawanipatna	L037-PWD Road to Balajipita	3.80
182	Kalahandi	Bhawanipatna	L041-Tarinimandir to Gabhapada	5.10
183	Kalahandi	Junagarh	L101-Ghulijuba to Maliguda	3.10
184	Kalahandi	Junagarh	L128-NH 201 to Sanfurla	1.90
185	Kalahandi	Koksara	L042-Bangamunda to Dengaguda	4.50
186	Kendrapara	Derabis	L053-Balia to Tilanga	6.10
187	Kendrapara	Derabis	L034-Anuapada Bus stop to Sorisia via Gahaga Narsinghpur	4.52
188	Kendrapara	Derabis	L055-Golarhat to Nilakanthapur II	3.30
189	Kendrapara	Derabis	L050-Pallei to Kanipada Sabalanga	2.19
190	Kendrapara	Derabis	L039-Tarata to Bindhasahi via Teheda sahi	4.01
191	Kendrapara	Derabis	L058-Derabish College Chhaka to Badaphogal via Bisok	4.01
192	Kendrapara	Derabis	L068-Belarpur to Kansaripatana	2.36
193	Kendrapara	Garadpur	L033-Andhalo to Patsura	3.95
194	Kendrapara	Garadpur	L022-Nadiabarei to Karilopatana	4.50
195	Kendrapara	Garadpur	L030-Gardapur to Sitalpatana	2.85
196	Kendrapara	Kendrapara	L077-SH 9A to Badamantia	4.10
197	Kendrapara	Kendrapara	L054-CC Road balia to Tarapur	5.89
198	Kendrapara	Kendrapara	L070-PWD road to Dhumatsasan	4.03
199	Kendrapara	Mahakalapara	L047-Olia nilakanthapur to Gayaspur	4.00
200	Kendrapara	Marshaghai	L048-Jamboo Canal Embkt to Hatia	2.20
201	Kendrapara	Marshaghai	L039-Karilopatna to Dalanta	3.80
202	Kendrapara	Marshaghai	L049-NH 5A to Darbachha	2.20

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
203	Kendrapara	Rajnagar	L041-RB road to Balikana	3.13
204	Kendrapara	Rajnagar	L032-Tiarchak to Balarampur	3.40
205	Kendrapara	Rajnagar	L029-Hatina to Kathuaganga	4.40
206	Keonjhar	Jhumpura	L032-NH215 to Bishnupur road	2.35
207	Keonjhar	Jhumpura	L033-Arsala to Teliarsala road	2.65
208	Keonjhar	Keonjhar	T03-NH 215 to Barakhanda	6.30
209	Keonjhar	Patna	L035-Malliposi to Chinamaliposi road	4.86
210	Keonjhar	Telkoi	T02-Khuntapada to Kaliahata road	8.16
211	Keonjhar	Telkoi	T03-Telkoi to Akul	6.20
212	Keonjhar	Saharpada	L074-Nishintapur to Baikala road	2.69
213	Keonjhar	Saharpada	L027-BHalidiha to Jerkanibeda	7.49
214	Keonjhar	Champua	L022-SH 10 to Jayantinapur Road	2.48
215	Keonjhar	Champua	L067-Remuli to Ramchandrapur road	2.99
216	Keonjhar	Ghatgaon	L034-NH215 to Mukundpurpatna road	1.98
217	Keonjhar	Ghatgaon	L028-Ghatgaon to Uperdiha road	1.48
218	Keonjhar	Ghatgaon	L030-NH215 to Melana road	2.88
219	Keonjhar	Ghatgaon	L025-NH215 to Kundapitha road	1.16
220	Keonjhar	Ghatgaon	L038-RDRoad to Bhanjatipra road	1.50
221	Keonjhar	Jhumpura	L035-NH215 to Nahabeda road	5.81
222	Keonjhar	Jhumpura	L044-PWD Road to Ghuntposi road	2.04
223	Keonjhar	Joda	L059-PWD Road toKankhendra road	2.01
224	Keonjhar	Joda	L053-T03 to Kashia Ka road	3.00
225	Keonjhar	Joda	L052-T02 to Nasarda road	6.51
226	Keonjhar	Joda	L028-Dampur to Kanhupur	3.46
227	Keonjhar	Keonjhar	L064-NH215 to Bhaliadihi road	2.99
228	Khurda	Balianta	L042-Tankapani Bentapur	5.65
229	Khurda	Balipatna	T03-KBC right embankment at Niali to Meladanada	2.20
230	Khurda	Banapur	L058-PWD road Karadapali	4.28
231	Khurda	Begunia	L050-Dingar to Gadamanitri	7.25
232	Khurda	Begunia	L030-R D road to Bengitangi	1.50
233	Khurda	Begunia	L025-Sarua to Keranga	3.40
234	Khurda	Begunia	L060-R D road to Tandal	4.50
235	Khurda	Bhubaneswar	L024-P W D road to Ostapada	2.62
236	Khurda	Bhubaneswar	L059-Chandaka Chhak PWD road to Mundasahi	2.36
237	Khurda	Chilika	L039-N H 5 to Gheekhala	3.83
238	Khurda	Chilika	L038-N H 5 Kimbhiripada to Lambodarpur	1.52
239	Khurda	Jatni	L052-Chhatabar to Mahula road	2.88
240	Khurda	Khurda	T05-N H 5 R D road to Mandarbasta	9.28
241	Khurda	Tangi	T03-N H 5 to Bhusandapur	7.20
242	Khurda	Bolagarh	L047-Dibyasinghapur to Gobardhanpur road	7.29
243	Khurda	Banapur	L037-Canal road to Kusarada	9.00
244	Khurda	Bolagarh	L051-Khanguria to Rammandir road	8.01
245	Khurda	Bolagarh	L022-Gediaplli to Shyamamohaptrapatna	5.80
246	Koraput	Kotpad	L022-NH 43 to A Ghatarla	4.76
247	Koraput	Kundra	L066-Kundra to Bagderi	8.80
248	Koraput	Kundra	L061-Kundra to Pakhnaguda	7.00
249	Koraput	Kundra	L029-Jeeraguda to Dangarpaunsi	5.00
250	Koraput	Nandapur	L038-Thuba to Raising	6.20
251	Koraput	Nandapur	T07-Nandapur to Banamaliput Lamtaput	3.30
252	Mayurbhanj	Badasahi	L044-RDRoad to Chenguamagalpur Road	2.50
253	Mayurbhanj	Badasahi	T02-Baghmara to Makadakenda	3.00
254	Mayurbhanj	Badasahi	L080-SH19 to Talanda Road	3.00

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
255	Mayurbhanj	Bangiriposi	L025-NH5 to Kumbharmundhakata Road	5.13
256	Mayurbhanj	Bangiriposi	L027-Budhamara to Pathuri Road	2.25
257	Mayurbhanj	Bangiriposi	L049-Shymsundarpur to Budhikhamari Road	4.00
258	Mayurbhanj	Baripada	L043-NH5 to Jhadjamda Road	2.00
259	Mayurbhanj	Betnati	L064-Betnoti to Sukhilahar Road	4.80
260	Mayurbhanj	Betnati	L048-MDR70 Nakhara to Khandadeulia Road	5.20
261	Mayurbhanj	Betnati	T06-NH5 at Betnoti to Merda Road	2.60
262	Mayurbhanj	Betnati	L070-NH 5 Dhanpur to Navadoy School	3.50
263	Mayurbhanj	Betnati	L049-Nadpur to Patalipura Road	4.10
264	Mayurbhanj	Betnati	L057-NH 5 to Janakideipur Road	3.66
265	Mayurbhanj	Betnati	L041-Balk to Kantipur	5.70
266	Mayurbhanj	Bijatola	L029-PWD Road to Begdega road	4.50
267	Mayurbhanj	Bisoi	L036-Asna to Kasipani	5.70
268	Mayurbhanj	Bisoi	L058-NH6 to Rangamatia Road	6.77
269	Mayurbhanj	Bisoi	L069-SH50 to Handifuta	1.75
270	Mayurbhanj	Bisoi	L074-SH50 to Kasipentha Road	5.00
271	Mayurbhanj	Jashipur	L051-NH6 to Begunia	3.89
272	Mayurbhanj	Jashipur	L043-Dhudku to Goili	6.65
273	Mayurbhanj	Jashipur	L047-NH6 to Bakartala	4.50
274	Mayurbhanj	Kaptipada	L059-RD Road to Salchua Road	3.50
275	Mayurbhanj	Kaptipada	T03-Mahisasuri to Sarat Road	1.30
276	Mayurbhanj	Kaptipada	L046-Goudgan to Baulakhaladi Road	5.00
277	Mayurbhanj	Karanjia	L048-Karanjia to Saradha	3.25
278	Mayurbhanj	Khunta	L027-PWD Road to Athapada Road	3.70
279	Mayurbhanj	Kuliana	T02-Chalunia to Kalajhinei Road	3.96
280	Mayurbhanj	Kuliana	T06-NH5 to at Kuchei to Chandua Road	7.24
281	Mayurbhanj	Kuliana	L062-RD Road to Sundria Road	1.50
282	Mayurbhanj	Kuliana	L052-RD Road at Kulina to Madanasahi Road	5.54
283	Mayurbhanj	Rairanghpur	T01-Garumahisani to Suriyagoda road	1.76
284	Mayurbhanj	Rairanghpur	L048-Sanpokhana to Godigaon	4.52
285	Mayurbhanj	Raruan	L025-PWD Road to Godapalsa	4.27
286	Mayurbhanj	Raruan	L051-RD Road to Righa	2.20
287	Mayurbhanj	Raruan	L028-ODR to Badmenta	3.77
288	Mayurbhanj	Rasgovindpur	T01-ODR Chitrada Rajghat Road	3.90
289	Mayurbhanj	Rasgovindpur	L040-Anla to Paikasahi Road	2.80
290	Mayurbhanj	Rasgovindpur	L029-Sarumula to Darakhuli Road	4.70
291	Mayurbhanj	Samakhunta	L022-Dhanpur to Sindurgoura Road	4.10
292	Mayurbhanj	Samakhunta	L031-Karanjia to Baunsbilla Road	2.25
293	Mayurbhanj	Samakhunta	L044-Samakhunta to Sankuchiamara Road	3.50
294	Mayurbhanj	Saraskana	L031-San Kachimbilla to Pandra Road	4.40
295	Mayurbhanj	Saraskana	L038-NH6 to Nuhamalia Sahar Road	4.20
296	Mayurbhanj	Saraskana	L048-NH6 to Rautara Road	2.70
297	Mayurbhanj	Saraskana	L051-NH6 to Ghantibuda	4.40
298	Mayurbhanj	Sukruli	L034-NH 6 to Kasia	1.63
299	Mayurbhanj	Sukruli	L035-PWD Road to Haldia	1.78
300	Mayurbhanj	Sukruli	T01-Tangabilla to Sukruli Road	9.62
301	Mayurbhanj	Sukruli	L048-Kesna to Adipur	1.12
302	Mayurbhanj	Suliapada	L035-Paktia to KamarjantaRoad	7.00
303	Mayurbhanj	Suliapada	L039-PWD Road to Lankadiha Road	3.00
304	Mayurbhanj	Suliapada	L061-PWD Road at Deuli chhak to nuagaon Road	3.71
305	Mayurbhanj	Suliapada	L037-Paktia to Ukasole Road	3.50
306	Mayurbhanj	Udala	L040-Udala to Balabhadrapur Road	3.70

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
307	Mayurbhanj	Udala	L027-Radho to Mauda Road	4.30
308	Mayurbhanj	Baripada	L058-T03 to raikarjharan Road	9.20
309	Mayurbhanj	Rasgovindpur	L065-Jhirani to Mahulia Road	11.53
310	Mayurbhanj	Saraskana	L022-RD Road to Badratila Road	5.91
311	Mayurbhnaj	GB Nagar	PWD Road to Tangena Road	2.40
312	Mayurbhnaj	Badasahi	RD Road to Jamuna Road	3.00
313	Mayurbhnaj	Badasahi	RDRoad to Dhadabani Road	2.20
314	Mayurbhnaj	Khunta	PWD Road to Sankadadiha	4.00
315	Mayurbhnaj	Khunta	PWD Road to Badjamuna Road	2.00
316	Mayurbhnaj	Khunta	SH19 to Dharampur Road	2.50
317	Mayurbhnaj	Khunta	RD Road to Raghunathpur Road	3.50
318	Mayurbhnaj	Khunta	RD Road to Baragadia Road	2.20
319	Mayurbhnaj	Khunta	Beldangiri to Taragadi Road	2.00
320	Mayurbhnaj	Khunta	SH19 to Nuagaon Road	6.00
321	Mayurbhnaj	Khunta	RD Road to Belpal Road	4.10
322	Mayurbhnaj	Khunta	Badkaranjia to Dhabanisole Road	3.20
323	Mayurbhnaj	Baripada	NH5 to Karanjia Road	2.25
324	Mayurbhnaj	Baripada	T5 to Betna Road	6.00
325	Mayurbhnaj	Samakhunta	Jyotipur to Itamundia Road	2.50
326	Mayurbhnaj	Samakhunta	RD Road to DR Nagar	2.25
327	Mayurbhnaj	Samakhunta	RD Road at Harisole to Chandanpur Road	2.30
328	Mayurbhnaj	Saraskana	RD Road to Kasipal Road	1.50
329	Mayurbhnaj	Saraskana	RD Road to Dakhinbadi Road	2.30
330	Mayurbhnaj	Saraskana	RD Road to Bhandhiari Road	2.10
331	Mayurbhnaj	Saraskana	NH6 to Badbudamara Road	4.50
332	Mayurbhnaj	Saraskana	NH6 to Jambani Road	2.30
333	Mayurbhnaj	Saraskana	NH6 to Talak Road	1.50
334	Mayurbhnaj	Saraskana	NH6 to Kurundihi Road	1.50
335	Mayurbhnaj	Saraskana	NH6 to Kendua Road	3.00
336	Mayurbhnaj	Suliapada	PWD Road to Kaltia Road	3.00
337	Mayurbhnaj	Suliapada	RD Road to Bad Tungadhua Road	2.00
338	Mayurbhnaj	Suliapada	RD Road toKusumi Road	1.20
339	Mayurbhnaj	Suliapada	Bhuskunda to Patharnesa Road	2.25
340	Mayurbhnaj	Suliapada	Bilash to Pandusole Road	1.60
341	Mayurbhnaj	Suliapada	Kujidihi chhak to Pathara Road	7.00
342	Mayurbhnaj	Suliapada	RD Road to Rasunia Road	1.20
343	Mayurbhnaj	Suliapada	Kujidihi Chitakhal Road	2.20
344	Mayurbhnaj	Suliapada	Sanjogiband to Sarasposi Road	1.70
345	Mayurbhnaj	Suliapada	Bedhi to Kadopatia Road	3.00
346	Mayurbhnaj	Suliapada	RD Road to Handbhanga Road	2.00
347	Mayurbhnaj	Suliapada	PWD Road to Kundiasole Road	3.00
348	Mayurbhnaj	Suliapada	PWD Road to Chakchakia Road	1.40
349	Mayurbhnaj	Suliapada	RD Road at Bhola chhak to Kathsirsi Road	1.80
350	Mayurbhnaj	Udala	MDR70 to Dutikadeipur	6.95
351	Mayurbhnaj	Badasahi	PWD Road to Barapada Road	2.00
352	Mayurbhnaj	Khunta	PS Road to Nuagaon Road	5.00
353	Mayurbhnaj	Suliapada	Dhadangri to Nedua Road	4.50
354	Mayurbhnaj	Saraskana	Bedhakudar to Amdiha Road	4.80
355	Mayurbhnaj	Saraskana	Kasiabeda Chhak to Ghuma Road	2.50
356	Mayurbhnaj	Saraskana	Paktia to Pokpoka Road	3.44
357	Mayurbhnaj	Saraskana	RD Road to Silphodi Road	4.10
358	Mayurbhnaj	Saraskana	RD Road to Bankisole Road	4.92

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
359	Mayurbhnaj	Saraskana	RD Road to Gopinathpur Road	2.44
360	Mayurbhnaj	Saraskana	RD Road to Jodajam Road	2.05
361	Mayurbhnaj	Saraskana	RD Road to Kundiapani Road	3.30
362	Mayurbhnaj	Saraskana	RD Road Mundhabani Road	3.50
363	Mayurbhnaj	Kuliana	NH 5 to Aniapal	2.50
364	Mayurbhnaj	Kuliana	RD Road to Kamarpal Road	6.00
365	Mayurbhnaj	Kuliana	RD Road to Kesrpur Road	2.00
366	Mayurbhnaj	Kuliana	RD Road to Srichandanpur Road	1.00
367	Mayurbhnaj	Kuliana	RD Road to Tiringidihi Road	5.20
368	Mayurbhnaj	Kuliana	NH 5 to Palasbani Road	5.25
369	Mayurbhnaj	Kuliana	RD Road to Baitpur Road	6.90
370	Mayurbhnaj	Morada	Kisantandi Chhak to Gadia	3.60
371	Mayurbhnaj	Morada	Moroda to Bhatchatrapur Road	7.80
372	Mayurbhnaj	Morada	PWD Road to Dhansole Road	1.20
373	Mayurbhnaj	Samakhunta	SH 19 to Pandura Road	4.50
374	Nawarangpur	Kosagumuda	L038-RD jn to Kantasariguda	9.10
375	Nawarangpur	Kosagumuda	L059-Kasagumuda to Khutiguda	8.01
376	Nawarangpur	Nandahandi	T04-Chiliguda to Ekamba	8.00
377	Nawarangpur	Nandahandi	T02-Dohana jn to Jagannathpur	3.90
378	Nawarangpur	Nowrangpur	T08-Chikili to Phatakote road	8.60
379	Nawarangpur	Papadahandi	T08-Jatabal to Manigam	10.50
380	Nawarangpur	Raighar	L065-Mohanda to Nisantikira	6.00
381	Nawarangpur	Raighar	L057-Dongripara jn to Dongripara	3.20
382	Nayagarh	Khandapara	L042-MDR 68 to Ranipada Extn	2.21
383	Nayagarh	Ranpur	L044-Jankia to Krushnachandrapur	7.50
384	Nayagarh	Ranpur	L051-NH5 to Benta	4.51
385	Nayagarh	Ranpur	L042-MDR 76 to Barangadia	5.02
386	Nayagarh	Ranpur	L096-RD Road to Thanapallipatna	5.25
387	Nayagarh	Ranpur	L061-MDR 76 to Krushnapur	4.69
388	Nayagarh	Nayagarh	L109-RD Road to Saluni	2.70
389	Nuapara	Komna	L040-Tikrapara to Jetupali	2.25
390	Nuapara	Komna	L060-PWD Road to Malikmunda	4.00
391	Nuapara	Komna	L100-Tengnabasa road to Khajurbahal	2.07
392	Nuapara	Nuapara	L031-RD Road to Palsabhadar	1.90
393	Nuapara	Nuapara	L032-RD Road to Beheradahi	1.05
394	Nuapara	Nuapara	L036-RD road to Bkakharamal	1.50
395	Nuapara	Nuapara	L027-RD Road to Jamli	2.10
396	Nuapara	Sinpalli	L024-Hatibandha to Bharuamunda	8.00
397	Phulbani(Kandhamal)	Balliguda	T05-Barakhama to Daka Road	1.70
398	Phulbani(Kandhamal)	Daringbadi	T05-Gadapur to Dusharigan road	4.10
399	Phulbani(Kandhamal)	Daringbadi	L067-Saniketa to Suganketa road	3.20
400	Phulbani(Kandhamal)	G.Udayagiri	L038-PWD Road to Raipalli	8.17
401	Phulbani(Kandhamal)	K.Nuagaon	L048-NH 217 to Balamarpadar road	3.10
402	Phulbani(Kandhamal)	K.Nuagaon	L058-Sarangada to Bandudi road	7.10
403	Phulbani(Kandhamal)	Khajuripada	T05-Garakumpa Balaskumpa road	5.35
404	Phulbani(Kandhamal)	Phiringia	T02-Budakamba Balandapada road	19.95
405	Phulbani(Kandhamal)	Phiringia	T05-Gochhapada Jn to Nedipadar	6.26
406	Phulbani(Kandhamal)	Raikia	T05-Sugudabadi to Mandasuru road	7.85
407	Phulbani(Kandhamal)	Tumudibandh	L035-Guchuka to Pukuru road	6.50
408	Phulbani(Kandhamal)	Tumudibandh	L024-NH 217 to Padikia road	1.00
409	Puri	Brahmagiri	T03-Baliharchandi to Gaudiaghai	3.32
410	Puri	Delanga	L058-T7 to Barakera	2.50

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
411	Puri	Nimapada	T05-Nimapara to Dhamantira	6.40
412	Puri	Nimapada	T03-Nimapara to Balanga	5.21
413	Puri	Pipili	L046-T5 Satasankha Balanga road to Rupadeipur	2.00
414	Puri	Pipili	L075-T7 to Danagohiri	3.00
415	Puri	Pipili	L060-NH203 to Birapurusottampur	5.00
416	Puri	Pipili	L080-T9 to Gunthal	2.00
417	Puri	Puri	L051-E K Embkt to Uttarana	3.00
418	Puri	Puri	L041-NH 203 to Khandiabandha	4.50
419	Rayagada	Gudari	T03-RD Road to Karlaghat	10.50
420	Rayagada	Gunupur	L052-PWD Road to Loba	4.00
421	Rayagada	Kalyansinghpur	T02-Kumariguda to Papikona	7.58
422	Rayagada	Kalyansinghpur	T01-K usabheti to Badadwarasahi	3.00
423	Rayagada	Kashipur	L049-Kucheipadar to Dumbaguda	7.50
424	Rayagada	Kolnara	L080-PWD road to Badakhilapadar	12.00
425	Rayagada	Padmapur	L038-PWD Road to Biripadar	3.97
426	Rayagada	Padmapur	T05-Padmapur to MKRai	12.00
427	Rayagada	Rayagada	T05-Kumbikota to Badacheka	2.07
428	Rayagada	Kashipur	T01-Kasipur to Sikarpai	15.00
429	Sambalpur	Bamra	L057-SH 24 to Bandhakani	6.60
430	Sambalpur	Bamra	L050-Chhatiposh to Charbhaya	5.49
431	Sambalpur	Jamankira	L051-NH 6 Chinimahul	1.37
432	Sambalpur	Jamankira	L031-NH 200 Nuagaon	3.58
433	Sambalpur	Jamankira	L038-NH 6 to Badibahal M	1.60
434	Sambalpur	Jamankira	L033-NH 200 to Balimal	6.11
435	Sambalpur	Jujumura	L061-NH42 to Ichhapal	7.70
436	Sambalpur	Kuchinda	L036-Tainsar to Badmundaloi	9.45
437	Sambalpur	Kuchinda	L060-Charbhati to Tihadipali	5.40
438	Sambalpur	Maneswar	L057-PWD Road to Jaduloisingh	10.90
439	Sambalpur	Naktideul	T01-Batagaon to Salebhata road	10.54
440	Sambalpur	Rairakhole	T04-Rairakhol Podabalanda to Badmal road	25.22
441	Sambalpur	Bamra	L072-Gurla to Bounsalaga	3.75
442	Sambalpur	Jujumura	L036-Gadgadbahal to Adhapada	7.50
443	Sonepur	Sonepur	T05-MDR 39 Nandanmal to Dabpali	2.73
444	Sonepur	Sonepur	T04-Khari Kutasingha	11.28
445	Sonepur	Sonepur	L041-NH 224 to Buromunda	2.10
446	Sonepur	Sonepur	L044-B A R D road to Mayurudan	5.26
447	Sonepur	Sonepur	L024-NH 224 to Janmura	4.20
448	Sonepur	Sonepur	L035-Nh 224 to Badbahali	1.40
449	Sonepur	Tarava	L025-Sibatala Lukapada RD road to Attasingha	2.05
450	Sundargarh	Balisankara	L029-Rouldega to Thiteitangar road	6.03
451	Sundargarh	Bargaon	L055-RD road to Manaharpur	1.56
452	Sundargarh	Bargaon	L059-Singarmunda to Aludega	1.44
453	Sundargarh	Bisra	L039-MDR 32 to Tulsikani	2.70
454	Sundargarh	Bonaigarh	L040-NH 23 to Tendra	8.20
455	Sundargarh	Bonaigarh	L026-NH 23 to Jamirposh	7.00
456	Sundargarh	Hemgiri	L045-Kanika to Kusumel	8.76
457	Sundargarh	Kuanramunda	T04-NH 23 to Jhurmur road	3.20
458	Sundargarh	Kutra	L031-PS road to Beldihi road	1.45
459	Sundargarh	Lahunipara	L037-Kurda to Fuljhar road	4.59
460	Sundargarh	Lahunipara	L054-RD road to Angul road	4.20
461	Sundargarh	Subdega	L044-MDR SH 31 to Tilijora	3.43
462	Sundargarh	Subdega	L035-ODRroad At Kurunkel to Majhapara Deogaon	3.20

Sl. No.	District	Name of the Block	Name of the Road	Length in Km.
463	Sundargarh	Tangarpali	L037-PWD road to Belsara Via Budabahal	3.10
464	Sundargarh	Balisankara	L063-Bhatipada to PWD road via Rampur Gaikanpali Bhimkuta Kurei Jamudhar	8.29
			Total	**2012.30**

APPENDIX 2: SAMPLE RURAL ROADS: ENVIRONMENTAL CHECKLIST

RURAL ROADS: ENVIRONMENTAL CHECKLIST

District	**Jagatsinghpur**
Block	Nuagaon
Name of the Sub Project Road	Alana II to Panchapa
Road No	L-35
Length	3.77 Km

A. Climatic Conditions

Temperature	High: 39 Low: 1
Humidity	High: 85 Low: 39
Rainfall Rainy Season	1210 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: 419 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)*	√		The road passes through plain terrain all along the alignment.
4.	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: **NA** Legal Status of the Forest Area: NA *(Reserved, National Park, Sanctuaries, Unclassified, etc.)*
5.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals: **NA** Endangered species (if any): No
6.	Inhabited Area	√		The inhabited area located at Ch-0/000 to 0/200, 0/720 to 0/940, 2/750 to 4/350 Km.
7.	Agricultural Land	√		The agricultural land located in patches along road alignment at Ch.1/000 to 2/300 & 4/300 to 5/000 km.
8.	Grazing grounds	√		Patches of Grazing ground exists along the Agricultural land on road alignment.
9.	Barren Land	√		Barren land is located in patches at Ch. 1/700 to 1/800 & 2/400 to 2/600, 3/300 to 3/700, 4/300 to 4/500 Km.

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?		√	There are no areas with landslide or erosion problems along the road

	(*If yes, indicate the location (right or left side) and the chainage)*			( ) No Secondary Information is available and Local Community is not aware of this matter.
2.	Are there any lakes/swamps beside the road? **(*If yes, list them indicating the location (right or left side)and the chainage*)**		√	There are no lakes and swamps located on the road alignment.
3.	Are there any nallas/streams/rivers etc. along/crossing the road? **(*If yes, list them indicating the location (right, left or crossing) and the chainage***		√	No nallas/streams/rivers etc. along/crossing the road.
4.	Are there problems of water stagnation and other drainage issues on or near the road?(***If yes, mention chainage)***	√		There are problem of water stagnation and other drainage issues near the road. So community suggested for 5 new CD (HPC) works at Ch. 1/350, 1/740, 1/900, 2/250 & 4/900 Km. No RCC Slab Culvert is required. (√) No Secondary Information is available and Local Community is not aware of this matter.
5.	Is the area along the project road prone to flooding? ***(If yes, mention flood level and frequency)***		√	No, No part of the road is prone to flooding (√) 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 centre line of the road alignment? **(*If yes attach list of trees indicating the location (right or left side)and the chainage*)**	√		There are trees existing on road alignment. But tree felling is not required since sufficient ROW is available.
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? ***(If yes, specify details of habitat with chainage)***		√	No such area
				(√) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100 m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	No such area (√) No Secondary Information Available and Local Community is not aware of this matter
9.	Are there any utility structures[5] within 10 m on either side from the centre line of the road alignment? ***(If yes, attach list with chainage)***	√		List Attached
10.	Are there any religious, cultural or community structures/buildings[6] within 10 m on either side from the centre line of the road alignment? ***(If yes attach list with chainage)***		√	List Attached

D. Public Consultation

[5] Water tap, hand pump, electric pole, telephone pole, water pipe and other similar strucutures.

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

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment.	√		Consultation with local community has been conducted
2.	Any suggestion received in finalizing the alignment	√		Suggestion received and incorporated in the CPF and ECoP
3.	If suggestions received, were they incorporated into the design?	√		Suggestion received and incorporated in the CPF and ECoP document.

1) List of trees indicating location (left or right side of the road) and chainage (as required under C. 6)

Chainage	Number		Whether Cutting required	Chainage	Number		Whether Cutting required
	LHS	RHS			LHS	RHS	
000-200	3	1	No Cutting	1800-2000	3	4	No Cutting
200-400	4	7	No Cutting	2000-2200	4	4	No Cutting
400-600	5	6	No Cutting	2200-2400	15	8	No Cutting
600-800	2	7	No Cutting	2400-2600	3	0	No Cutting
800-1000	5	7	No Cutting	2600-2800	0	2	No Cutting
1000-1200	4	3	No Cutting	2800-3000	0	0	No Cutting
1200-1400	4	5	No Cutting	3000-3200	3	4	No Cutting
1400-1600	6	4	No Cutting	3200-3400	2	4	No Cutting
1600-1800	6	4	No Cutting	3400-3770	3	4	No Cutting

2) List of utility structures indicating location (left or right side of the road) and chainage (as required under C. 9)

Chainage	LHS	REMARK	RHS	REMARK
200-300			EP-2	No Shifting
300-400	EP-2	No Shifting		
400-500	EP-2	No Shifting		
500-600			EP-1	No Shifting
600-700	EP-2	No Shifting	EP-2	No Shifting
1000-1100	EP-2	No Shifting		
1100-1200			EP-1	No Shifting
1300-1400			EP-2	No Shifting
1400-1500	EP-1	No Shifting	EP-1	No Shifting
1500-1600	EP-2	No Shifting		
1600-1700	EP-1	No Shifting		
1800-1900	EP-3	No Shifting		
1900-2000	EP-1	No Shifting	EP-1	No Shifting
2000-2100			EP-1	No Shifting
2100-2200			EP-3	No Shifting
2300-2400	EP-1	No Shifting		
2600-2900	EP-3	No Shifting		
2900-3000			EP-1	No Shifting
3200-3300			EP-2	No Shifting
3300-3400			EP-1	No Shifting

3) List of community structures indicating location (left or right side of the road) and chainage (as required under C. 10)

Chainage	LHS	RHS	Remark
100-200	TM-2	-	No Shifting
400-500	TM-2	-	No Shifting
600-700	TW-1	-	No Shifting
1000-1100	TW-1	-	No Shifting

4) Sketch of strip map of the road covering details of at least 10 m on either side from the centre line of the road.

AREA	LHS	CH	RHS	AREA
Village area		3/700 to 3/770	Tree-5	Village area
Open area		3/600 to 3/700	Tree-3	Open area
Open Area	Tree-2	3/500 to 3/600	Tree-1	Open Area
Open Area		3/400 to 3/500	Trr-1	Open Area
Open area	Tree-4	3/300 to 3/400	Tree-5	Village area
Open area	Tree-9	3/200 to 3/300	Electric pole-1 Private House-2	Open area
Open area	Tree-4	3/100 to 3/200	Pond-1	Open area
Village Area	Tree-3	3/000 to 3/100	Temple-2	Village Area
Village Area	Private House-2	2/900 to 3/000	Electric Pole-1	Village Area
Village Area	Private House-2 Electric Pole-1	2/800 to 2/900	Electric Pole-1	Village Area
Village area	Private House-2	2/700 to 2/800	Electric Pole-2	Open Area
Village area	Electric Pole-2	2/600 to 2/700		Open Area
Village	Private House-2	2/500 to	Private House-2	Open

AREA	LHS		CH	RHS		AREA
Open Area	Electric Pole-2		2/400 to 2/500			Open Area
	Private House-2				Electric Pole-2	
Open area	Electric Pole-2		2/300 to 2/400			Open area
	Private House-2					
Open Area	Tube well-2		2/200 to 2/300			Open Area
	Private House-2				Private House-1	
	Electric Pole-2					
Open Area	Tree-4		2/100 to 2/200		Electric Pole-3	Open Area
	Pond-1				Private House-1	
Open Area	Electric pole-2		2/000 to 2/100			Open Area
	Private House-2					
Open area			1/900 to 2/000			Open area
	Electric pole-1				Electric pole-1	
Open area	Electric pole-3		1/800 to 1/900			Open area
	Private House-2					
Open Area			1/700 to 1/800			Open Area
	Pond-1				Private House-1	
Open area			1/600 to 1/700			Open area
	Private House-1					
Open area			1/500 to 1/600			Open area
	Tree-3				Tree-6	
Open area			1/400 to 1/500			Open area
	Tree-5				Private House-1	
Open Area			1/300 to 1/400			Open Area
	Electric pole-2				Private House-1	
Open Area	Private House-1		1/200 to 1/300			Open Area
Open Area			1/100 to 1/200			Open Area
	Private House-1				Private House-1	
Open Area	Electric Pole-1		1/000 to 1/100		Private House-1	Open Area
	Tube well-1					
Village	Tree-1		0/900		Tree-7	Village

AREA	LHS		CH	RHS		AREA
	Private House-1				Private House-1	
Open area			0/800 to 0/9000			Open area
	Private House-1					
	Tree-1					
Village area			0/700 to 0/8000			Village area
					Private House-4	
Open Area	Electric Pole-1		0/600 to 0/700		Electric Pole-1	Open Area
	Private House-1				Private House-1	
Village area	Sub Station-1		0/500 to 0/600		Electric pole-1	Open area
	Tree-7					
Village area	Electric pole-2		0/400 to 0/500		School-1	Village area
	Private House-1				Private House-1	
Village area	Electric pole-2		0/300 to 0/400			Village area
	Private House-1				Private House-1	
Open Area			0/200 to 0/300		Electric pole-2	Villag e area
	Private House-2				Private House-1	
Village area	Temple-1		0/100 to 0/200			Village area
	Private House-1				Tree-6	
Open Area	Tree-7		0/000 to 0/100		Private House-1	Village area
	Private House-1				Tree-6	

5) Photographs of the project area showing at least 10 m on either side from centre line of road alignment. Every 2 Km. or less of road must

	Ch.0/000 km, CC Road proposed

	Ch.0/000 to 0/100 km, CC Road proposed
	Ch.0/100 to 0/200 km, CC Road proposed
	Ch.0/200 to 0/300 Km, CC Road proposed
	Ch.0/300 to 0/400 Km, CC Road proposed
	Ch.0/400 to 0/500 Km, CC Road proposed
	Ch.0/500 to 0/600 Km, CC Road proposed

	Ch.0/600 to 0/700 Km, CC Road proposed
	Ch.0/700 to 0/727 Km, CC Road proposed
	Ch.0/727 to 0/979 Km, BT Road proposed
	Ch.0/979 to 1/077 Km, CC Road proposed
	Ch.1/077 to 1/150 Km

	Ch.1/150 to 1/250 km
	Ch.1/250 to 1/325Km
	Ch.1/325 to 1/400 Km, CC Road proposed
	Ch.1/400 to 1/450 Km, CC Road proposed
	Ch.1/450 to 1/500 Km, CC Road proposed

	Ch.1/500 to 1/600 Km, CC Road proposed
	Ch.1/600 to 1/700 Km, CC Road proposed
	Ch.1/700 to 1/781Km, CC Road proposed
	Ch.1/781 to 1/900 Km
	Ch.1/900 to 1/990 Km

	Ch.1/990 to 2/050 Km, CC Road proposed
	Ch.2/050 to 2/100 km, CC Road proposed
	Ch.2/100 to 2/125 km, CC Road proposed
	Ch.2/125 to 2/400 km
	Ch.2/400 to 2/500 km

	Ch.2/500 to 2/600 km
	Ch.2/600 to 2/650 km
	Ch.2/650 to 2/856 km
	Ch.2/856to 3/200 km
	Ch.3/200 to 3/300 km

	Ch.3/300 to 3/500 km
	Ch.3/500 to 3/700 km
	Ch.3/700 to 3/765 km
	Pallisabha in Progress

RURAL ROADS: ENVIRONMENTAL CHECKLIST

District	**Khurda**
Block	Begunia
Name of the Sub Project Road	R D road to Tandal
Road No	L-60
Length	2.30 Km

A. Climatic Conditions

Temperature	High: 46 Low: 13
Humidity	High: 84 Low: 34
Rainfall Rainy Season	1010 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: 312 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)*	√		The road passes through plain terrain all along the alignment.
4.	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: **NA** Legal Status of the Forest Area: NA *(Reserved, National Park, Sanctuaries, Unclassified, etc.)*
5.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals: **NA** Endangered species (if any): No
6.	Inhabited Area	√		The inhabited area located at Ch. 1/300 to 1/400, 1/500 to 1/700, 1/800 to 2/300 Km.
7.	Agricultural Land	√		The agricultural land located in patches along road alignment at Ch. 0/100 to 0/300, 1/100 to 1/200, 2/000 to 2/500 Km
8.	Grazing grounds	√		Patches of Grazing ground exists along the Agricultural land on road alignment.
9.	Barren Land	√		Barren land is located in patches at Ch. 0/200 to 0/600, 1/800 to 2/600, 2/800 to 3/500 Km.

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?		√	There are no areas with landslide or erosion problems along the road

	(*If yes, indicate the location (right or left side) and the chainage)*			( ) No Secondary Information is available and Local Community is not aware of this matter.
2.	Are there any lakes/swamps beside the road? **(*If yes, list them indicating the location (right or left side)and the chainage*)**		√	There are no lakes and swamps located on the road alignment.
3.	Are there any nallas/streams/rivers etc. along/crossing the road? **(*If yes, list them indicating the location (right, left or crossing) and the chainage***		√	No nallas/streams/rivers etc. along/crossing the road.
4.	Are there problems of water stagnation and other drainage issues on or near the road?(***If yes, mention chainage)***	√		There are problem of water stagnation and other drainage issues near the road. So community suggested for 5 CD works at Ch. 0/560, 1/140, 0/720, 1/620, 2/030 km. (√) No Secondary Information is available and Local Community is not aware of this matter.
5.	Is the area along the project road prone to flooding? ***(If yes, mention flood level and frequency)***		√	No, No part of the road is prone to flooding (√) 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 centre line of the road alignment? **(*If yes attach list of trees indicating the location (right or left side)and the chainage***)	√		There are trees existing on road alignment. But tree felling is not required since sufficient ROW is available.
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? ***(If yes, specify details of habitat with chainage)***		√	No such area
				(√) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100 m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	No such area (√) No Secondary Information Available and Local Community is not aware of this matter
9.	Are there any utility structures[7] within 10 m on either side from the centre line of the road alignment? ***(If yes, attach list with chainage)***	√		List Attached
10.	Are there any religious, cultural or community structures/buildings[8] within 10 m on either side from the centre line of the road alignment? ***(If yes attach list with chainage)***	√		List Attached

D. Public Consultation

[7] Water tap, hand pump, electric pole, telephone pole, water pipe and other similar strucutures.
[8] Mandir, Masjid, Church, religious/cultural/historical monuments, school, health center, public toilet and other similar structures.

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment.	√		Consultation with local community has been conducted
2.	Any suggestion received in finalizing the alignment	√		Suggestion received and incorporated in the CPF and ECoP
3.	If suggestions received, were they incorporated into the design?	√		Suggestions recommended for inclusion in design

E. Please attach the following:

1) List of trees indicating location (left or right side of the road) and chainage (as required under C. 6)

Chainage	Number		Whether Cutting required	Chainage	Number		Whether Cutting required
	LHS	RHS			LHS	RHS	
000-100	2	0	No Cutting	1000-1100	5	2	No Cutting
100-200	1	1	1 at LHS needs cutting	1100-1200	4	2	No Cutting
200-300	1	2	No Cutting	1200-1300	1	3	No Cutting
300-400	3	1	No Cutting	1300-1400	1	1	No Cutting
400-500	2	4	No Cutting	1600-1700	4	1	No Cutting
500-600	3	5	No Cutting	1800-1900	3	1	No Cutting
600-700	2	3	No Cutting	1900-2000	1	3	No Cutting
700-800	1	5	No Cutting	2000-2100	5	2	No Cutting
800-900	5	3	No Cutting	2100-2200	0	4	No Cutting
900-1000	1	0	No Cutting	2200-2300	3	1	No Cutting

2) List of utility structures indicating location (left or right side of the road) and chainage (as required under C. 9)

Chainage	LHS	REMARK	RHS	REMARK
1700-1800		-	EP-1	No Shifting
1800-1900	EP-2	No Shifting		
2000-2100			EP-1	No Shifting
2100-2200			EP-1	No Shifting
2200-2300			EP-2	No Shifting

3) List of community structures indicating location (left or right side of the road) and chainage (as required under C. 10)

Chainage	LHS	RHS	Remark
000-100	Pond, Temple		No Shifting required
1400-1500	school		No Shifting required
2100-2200	school	-	No Shifting required
2200-2300	Pond, Temple		No Shifting required

4) Sketch of strip map of the road covering details of at least 10 m on either side from the centre line of the road.

AREA	LHS		CH	RHS		AREA
Open Area	Pond-1		2/200 to 2/300		Private House-1	Open Area
	Temple-1				Electric Pole-2	

AREA	LHS		CH	RHS		AREA
	Tree-3					
Open Area	School		2/100 to 2/200		Electric Pole-1	Open Area
	Curve				Private House-1	
Open Area	Private House-1		2/000 to 2/100		Electric Pole-1	Open Area
					Private House-1	
Open area			1/900 to 2/000		Private House-1	Open area
	Private House-2					
	Tree-1					
Open area	Electric Pole-2		1/800 to 1/900		Private House-2	Open area
					Tree-1	
Open Area			1/700 to 1/800			Open Area
					Electric Pole -1	
Open area			1/600 to 1/700		Tree-1	Open area
	Private House-1				Private House-1	
Open area			1/500 to 1/600		Private House-1	Open area
	Private House-2					
Open area			1/400 to 1/500			Open area
	School					
Open Area			1/300 to 1/400		Tree-1	Open Area
	Tree-1				Private House-1	
Open Area			1/200 to 1/300			Open Area
	Tree-1					

AREA	LHS		CH	RHS		AREA
Open Area			1/100 to 1/200		Tree-2	Open Area
	Curve					
Open Area			1/000 to 1/100			Open Area
	Private House-1					
Open area			0/900 to 0/10000			Open area
	Tree-1					
Open area			0/700 to 0/900			Open area
	Private House-1					
Open area			0/500 to 0/600			Open area
Open Area			0/400 to 0/600			Open Area
Open Area			0/300 to 0/400			Open Area
Open Area			0/200 to 0/300			Open Area
	Tree-1					
Open Area			0/100 to 0/200			Open Area
	Tree-1					
Open Area	Pond-1		0/000 to 0/100		T-junction	Open Area
	Tree-2				Private House-1	
	Temple-1					

5) Photographs of the project area showing at least 10 m on either side from centre line of road alignment. Every 2 Km. or less of road must

	Ch.0/000 Km
	Ch.0/070 km LHS-Temple Curve LHS
	Ch.0/000 to 0/100 km LHS-Pond
	Ch.0/100 to 0/200 Km Tree Cutting
	Ch.0/150 km Tree Cutting

	Ch.0/200 to 0/300 km
	Ch.0/300 to 0/400 Km
	Ch.0/400 to 0/500 Km
	Ch.0/500 to 0/600 Km
	Ch. 0/500 to 0/600 km

	Ch.0/600 to 0/700 Km
	Ch.0/700 to 0/800 Km
	Ch.0/800 to 0/900 Km
	Ch.0/900 to 1/000 Km
	Ch.1/000 to 1/100 Km

	Ch.1/100 to 1/200 km
	Ch.1/200 to 1/300 Km
	Ch.1/300 to 1/400 Km Kachara Habitation
	Ch.1/400 to 1/500 Km LHS School
	Ch. 1/500 to 1/600 km

	Ch.1/600 to 1/700 Km
	Ch.1/700 to 1/800 Km
	Ch.1/800 to 1/900 Km
	Ch.1/900 to 2/000 Km
	Ch. 2/000 to 2/100 Km

	Ch.2/100 to 2/200 Km Tawala Ugme School LHS
	Ch.2/250 Km LHS-Pond & Temple
	Ch.2/300 km End Point of The Road
	Pallisabha In progress

RURAL ROADS: ENVIRONMENTAL CHECKLIST

District	**Bargarh**
Block	Sohella
Name of the Sub Project Road	Bahalbahal
Road No	T-02
Length	4.20

A. Climatic Conditions

Temperature	High: 41 Low: 23
Humidity	High: 89 Low: 34
Rainfall Rainy Season	942 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: 435 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)*	√		The road passes through plain terrain all along the alignment.
4.	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: **NA** Legal Status of the Forest Area: *(Reserved, National Park, Sanctuaries, Unclassified, etc.)*
5.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals: **NA** Endangered species (if any): No
6.	Inhabited Area	√		The inhabited area located at Ch. 4/100 to 4/200 Km.
7.	Agricultural Land	√		The agricultural land located in some patches along road alignment 0/200 to 0/400, 0/600 to 1/400
8.	Grazing grounds	√		Patches of Grazing ground exists along the Agricultural land and from 1/400 to 4/100
9.	Barren Land	√		Barren land is located in patches at Ch. 1/500 to 4.000 km.

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? ***(If yes, indicate the location (right or left side) and the chainage)***		√	There are no areas with landslide or erosion problems along the road ( ) No Secondary Information is available and Local Community is not aware of this matter.
2.	Are there any lakes/swamps beside the road? ***(If yes, list them indicating the location (right or left side) and the chainage)***		√	There are no lakes and swamps located on the road alignment.

No.	Parameter/ Component	Yes	No	Explanation
3.	Are there any nallas/streams/rivers etc. along/crossing the road? **(*If yes, list them indicating the location (right, left or crossing) and the chainage***		√	No nallas/streams/rivers etc. along/crossing the road.
4.	Are there problems of water stagnation and other drainage issues on or near the road?(***If yes, mention chainage)***		√	There are no problem of water stagnation. But community suggested for 2 new CD works -1/620 Km (600 MM SR) and 2/850 Km ((900 MM SR) (√) No Secondary Information is available and Local Community is not aware of this matter.
5.	Is the area along the project road prone to flooding? ***(If yes, mention flood level and frequency)***		√	No, No part of the road is prone to flooding (√) 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 centre line of the road alignment? **(*If yes attach list of trees indicating the location (right or left side)and the chainage***)	√		There are trees existing on road alignment. But tree felling is not required since sufficient ROW is available.
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? ***(If yes, specify details of habitat with chainage)***		√	No such area (√) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100 m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	No such area (√) No Secondary Information Available and Local Community is not aware of this matter
9.	Are there any utility structures[9] within 10 m on either side from the centre line of the road alignment? ***(If yes, attach list with chainage)***	√		List Attached-No shifting required
10.	Are there any religious, cultural or community structures/buildings[10] within 10 m from the centre line of the road alignment? ***(If yes attach list with chainage)***	√		List Attached

D. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment.	√		Consultation with local community has been conducted on 31.03. 2017 before finalizing the alignment.
2.	Any suggestion received in finalizing the alignment	√		Suggestion for drainage, road safety and social & environmental safeguards received and incorporated in the CPF and ECoP

[9] Water tap, hand pump, electric pole, telephone pole, water pipe and other similar strucutures.
[10] Mandir, Masjid, Church, religious/cultural/historical monuments, school, health center, public toilet and other similar structures.

No.	Consultation Activities	Yes	No	Remarks
3.	If suggestions received, were they incorporated into the design?	√		The CPF and ECoP documents have been shared with PIUs and OSRRA for action

E. Please attach the following:

1) List of trees indicating location (left or right side of the road) and chainage (as required under C. 6)

Chainage	Number		Whether Cutting required	Chainage	Number		Whether Cutting required
	LHS	RHS			LHS	RHS	
000-200	2	-	No Cutting	2200-2400	3	6	No Cutting
200-400	3	-	No Cutting	2400-2600	4	2	No Cutting
400-600	1	-	No Cutting	2600-2800	-	4	No Cutting
600-800	4	3	No Cutting	2800-3000	3	2	No Cutting
800-1000	-	-	No Cutting	3000-3200	-	4	No Cutting
1000-1200	2	-	No Cutting	3200-3400	1	1	No Cutting
1200-1400	3	3	No Cutting	3400-3600	4	5	No Cutting
1400-1600	1	1	No Cutting	3600-3800	2	2	No Cutting
1600-1800	-	5	No Cutting	3800-4000	2	1	No Cutting
1800-2000	-	1	No Cutting	4000-4200	2	-	No Cutting
2000-2200	-	3	No Cutting				

2) List of utility structures indicating location (left or right side of the road) and chainage (as required under C. 9)

Chainage	LHS	REMARK	RHS	REMARK
1500-1600	EP-1	No Shifting	EP-1	No Shifting -
1600-1700	EP-1	No Shifting	-	-
3300-3400	-	-	EP-1	No Shifting

3) List of community structures indicating location (left or right side of the road) and chainage (as required under C. 10)

Chainage	LHS	RHS	Remark
1500-1600	-	TM-1	Not affected

4) Sketch of strip map of the road covering details of at least 10 m on either side from the centre line of the road.

AREA	LHS	CH	RHS	AREA
Village area		4/100 to 4/200		Village area
	Tree-2			
		4000 to 4/100		
Open area		3/900 to 4/000		Open area
	Tree-2		Tree-1	

Open area			3/800 to 3/900			Open area
Open area	Tree-1		3/700 to 3/800		Tree-1	Open area
Open area	Tree-1		3/600 to 3/700		Tree-1	Open area
Open area	Tree-2		3/500 to 3600		Tree-2	Open area
Open area	Tree-2		3/400 to 3/500		Tree-3	Open area
Open area			3/300 to 3/400		Electric Pole-1	Open area
Open area	Tree-1		3/200 to 3/300		Tree-1	Open area
Open area			3/100 to 3/200		Tree-3	Open area
Open area			3/000 to 3/100		Tree-1	Open area
Open area	Tree-1		2/900 to 3/000		Tree-1	Open area
Open area	Tree-2		2/800 to 2/900		Tree-1	Open area
Open Area			2/700 to 2/800		Tree-2	Open Area
Open Area			2/600 to 2/700		Tree-2	Open Area
Open area	Tree-1		2/500 to 2/600		Tree-1	Open area
Open Area	Tree-3		2/400 to 2/500		Tree-1	Open Area

Open area			2/300 to 2/400			Open area
	Tree-1				Tree-3	
Open Area			2/200 to 2/300			Open Area
	Tree-2				Tree-3	
Open Area			2/100 to 2/200			Open Area
					Tree-2	
Open Area			2/000 to 2/100			Open Area
					Tree-1	
Open area			1/900 to 2/000			Open area
					Tree-1	
Open area			1/800 to 1/900			Open area
Open Area			1/700 to 1/800			Open Area
					Tree-2	
Open area			1/600 to 1/700		Tree-3	Open area
	Electric pole-1				Private House-1	
Open area			1/500 to 1/600		Temple-1	Open area
	Electric pole-1				Electric pole-1	
Ope n area			1/40 0 to 1/50 0			Ope n area
	Tree-1				Tree-1	
Open area			1/300 to 1/400			Open area
	Tree-1				Tree-2	
Open area			1/200 to 1/300			Open area
	Tree-2				Tree-1	
Open area			1/100 to 1/200			Open area
	Tree-1					
Open area			1/000 to 1/100			Open Area
	Tree-1					
Open area			0/900 to 1/000			Open area

Open area			0/800 to 0/9000			Village Area
Open area	Tree-1		0/700 to 0/8000		Tree-1	Open area
Open Area	Tree-3		0/600 to 0/700		Tree-2	Open Area
Open area			0/500 to 0/600		Tree-2	Open area
Open area	Tree-1		0/400 to 0/500			Open Area
Open area	Tree-2		0/300 to 0/400			Open area
Open area	Tree-1		0/200 to 0/300			Open area
Open area			0/100 to 0/200			Open area
Open area	Tree-2		0/000 to 0/100			Open area

5) Photographs of the project area showing at least 10 m on either side from centre line of road alignment. Every 2 Km. or less of road must

1		Ch. 0/00 Kanapali Chhak & T junction.

2		Ch. 0/000 to 0/100 Km Curve
4		Ch. 0/100 to 0/200 Km
5		Ch. 0/200 Km to 0/300
6		Ch. 0/300 to 400 Km and Curve at 0/400 Km

7		Ch. 0/400 to 0/468 Km Y junction with Curve
8		Ch. 0/468 to 0/500 Km Curve
9		Ch. 0/500 to 0/600 Km
11		Ch. 0/600 to 0/700 Km 600 mm SR at Ch. 0/700 Km

13		Ch. 0/700 km to 0/800 curve at 0/770 Km
15		Ch. 0/800 Km to 0/900 Km curve at 0/885 Km
16		Ch. 0/900 to 1/000 Km. At 0/930 Km 600 mm S/R
17		Ch. 1/000 to 1/100 Km at Curve 1/190 Km

18		Ch. 1/100 to 1/200 Km at 1/145 Km 600mm SR.
19		Ch. 1/200 to 1/300 Km at 1/276 Km Curve
20		Ch. 1/300 to 1/400 Km
21		CH-1/400 Km to 1/500 Km CD at Ch. 1/465 Km 600 mm SR with Curve

22		Ch. 1/500 to 1/600 Km at 1/522 Curve with T-junction and Temple
23		Ch. 1/600 to 1/700 Km
24		Ch. 1/700 to 1/800 Km
25		Ch-1/800 to 2/000 Km curve at Ch. 1/822 Km

26		Ch-2/000 Km to 2/100 Km
27		Ch-2/100 to 2/200 Km
28		Ch- 2/200 to 2/300 Km
29		Ch-2/300 to 2/400 CD at ch. 2/324 Km

30		Ch-2/400 to 2/500 Km
31		Ch-2/500 to 2/600 Km
32		Ch-2/600 km to 2/700 Km
33		Ch-2/700 to 2/800 Km Curve at 2/758 Km

34		Ch-2/800 to 2/900 Km
35		Ch-2/900 to 3/000 Km
36		Ch-3/00 to 3/100 Km
37		Ch-3/100 Km to 3/200 Km curve AT Ch. 3/183 Km

38		Ch-3/200 to 3/300 Km Curve at 3/240 Km
39		Ch-3/300 to 3/400 Km
40		Ch-3/400 to 3/500 Km
41		Ch-3/500 to 3/600 Km

42		Ch-3/600 to 3/700 Km curve at 3/672
43		Ch-3/700 to 3/800 Km
44		Ch. 3/800 to 3/900 Km
45		Ch. 3/900 to 4/000 Km T – Junction at Ch. 3/937 Km

46		Ch. 4/000 To 4/100 Km
47		At Ch. 4/100 to 4/200 Km
48		End of the Road Barmunda Junction
49		Pallisabha at Bahal bahal Village.

APPENDIX 3: GUIDELINES FOR BORROW AREAS MANAGEMENT

A. SELECTION OF BORROW AREAS

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

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.

B. 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.

C. BORROWING FROM DIFFERENT LAND-FORMS

1. 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.

2. 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

3. 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.

4. 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.

5. 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.

D. 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	○ 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 Consultant/ design consultant	PIU/ ASRRDA
2.	Finalization of alignment	○ 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	○ All through the alignment of each rural road	Pre Construction Phase	Part of Project Cost	Project Preparation Consultant/ design consultant	PIU/ ASRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		clearance for diversion of forestland and ADB's Safeguard Policy Statement 2009. o Alignment finalization considering availability of right of way and in consultation with local people. o ROW may be reduced in built up area or constricted areas to minimize land acquisition as per PMGSY Guidelines. o Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. o The road shall follow natural topography to avoid excessive cut and fill.					
3.	Land acquisition	o Avoid or minimize land acquisition. o 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.	o 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	o All efforts shall be taken to avoid tree cutting wherever possible. o Requisite permission from forest department shall be obtained for cutting of roadside trees. o Provision of Compensatory Afforestation shall be made on 1:3.ratio basis.	Throughout the project section of the road. ***(Highlight Tree cutting locations & proposed likely***				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		○ Permission shall be taken for diversion of any forest land if involved. Provision shall be made for additional compensatory tree plantation.	***plantation location)***				
5.	Planning for land clearing	○ 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 ***(Attach or Refer to specific sections of DPR for the utilities to be shifted along with chainages for the location of such structures)***	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 ASRRDA,	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	○ 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 ***(Attach or Refer to specific sections of***	Construction Phase	Borne by Contractor	Contractor is responsible for ensuring provision of facilities under approval by PIC / PIU	Environmental officer and other team members of PIC will monitor and ensure appropriate implementation

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
			DPR for community structures to be shifted along with chainages for the location of such structures)				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.
6.	Cut and Fill and Embankment Construction design & planning	○ 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. ○ The top soil of the cut and fill area shall be used for embankment slope protection	All through the alignment of each rural road ***(Highlight the high flood level, chainage for action and linkages to DPR section)***	Pre Construction Phase	Part of Project Cost	Project Preparation Consultant/ design consultant	PIU/ ASRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		○ Embankment will be designed above High Flood Level (HFL) wherever, area is prone to flood.					
7.	Hydrology and Drainage	○ 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	Near all drainage crossing , nalas and river crossings etc. ***(indicate HFL Level and Highlight the chainage for action and linkages to DPR section)***				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		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 .					
8.	Establishment of Construction Camp, temporary office and storage area	○ 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	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). ***(Contractor to specify the cost provision made for PPE and other environmental sanitation***	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
		minimum 0.5 km from forest land/areas. ○ 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.	***measures required per construction camp / temporary office / storage area)***				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		○ Provision of paved area for unloading and storage of fuel oil, lubricant oil, away from storm water drainage.					
9.	Traffic Movement	○ The contractor will identify the areas were 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 be blocked for longer duration, the PIU / DPR Consultant shall define appropriate measures for traffic diversion before the start of the construction. ○ 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/ ***(Highlight the chainages which may require traffic diversions)***	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
10.	Occupational Health and Safety	○ Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp corves 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 and near schools or religious places. ○ 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	Throughout the project section at the location determined by contractor and approved by PIU ***(Highlight the location with chainage for such requirements)***				

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		installed on all sharp curves and bends o At a main road, intersection or crossing "STOP" sign and 'T-intersection' warning sign shall be installed on the village road. o 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)	**Borrow Earth:** o 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. o Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. o 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	As Borrow sites and quarries (if required) location. ***(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)***	During Design and construction Stage	Engineering cost	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.	PIC /PIU/TSC Environmental officer and other team members of PIC will monitor

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		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-owner. The re-habilitation plan may include the 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					

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		that it looks more or less like the original ground surface. ▪ Borrow areas might be used for aquaculture in case landowner wants such development. **Aggregate :** o The stone aggregate shall be sourced from existing licensed quarries o Copies of consent/ approval / rehabilitation plan for use of existing source will be submitted to PIU. o Topsoil to be stockpiled and protected for use at the rehabilitation stage **Transportation of Construction Material** o Existing tracks / roads are to be used for hauling of materials to the extent possible. o 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. o The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation.					

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any.					
12.	Loss of Productive Soil, erosion and land use change	○ 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. ○ 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	Thought out the road section ***(The contractor shall include the cost for the measures as part of the construction cost)***	During the Construction stage	Included in project cost	Design Consultant and Contractor	PIU / ASRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		measures shall be taken to control the soil erosion					
13.	Compaction and Contamination of Soil	○ 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.	Throughout the project section of the road s ***(The contractor shall include the cost for the measures as part of the construction cost)***	• Design and construction stage	• Project preparation cost and construction cost •	• Design consultant and Contractor,	PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		○ 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	○ 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.	• Throughout the project section of the road	• Design and construction stage	• Project preparation cost and construction cost	• Design consultant and Contractor,	PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		Dumping sites should be away from water bodies to prevent any contamination of these bodies.					
15.	Air and Noise Quality	○ 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	• Near all drainage crossing , nalas and river crossings etc. ***(The contractor shall include the cost for the measures as part of the construction cost)***	• During Construction stage	• Included in engineering cost	Contractor	PIU/ ASRRDA

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		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.					
16.	Biological environment - Tree planting	○ Compensatory Afforestation shall be made on 1:3.ratio basis as per the planning. ○ 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	ASRRDA	PIU and ASRRDA
17.	Ground Water and Surface Water Quality and Availability	○ 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	Throughout the project section of the road ***(The contractor shall include the cost for the measures as part of the***	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
		to nearby communities remains unaffected. o Water intensive activities shall not be undertaken during summer period to the extent feasible. o Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting if feasible o Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. o Preventive measures like slop stabilisation, etc shall be taken for prevention of siltation in water bodies.	***construction cost)***				
19.	Occupational Health and Safety	o Verification of implementation of provision made at planning stage. o Each worker is provided with requisite PPE o Directional sight board shall be installed on all sharp curves and bends o 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	o Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due vehicle movement.. Speed limitation	Throughout the project section at the location determined by	Operation stage stage	construction cost	Contractor,	PIC/PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
		and honking restrictions may be enforced near sensitive locations.	contractor and approved by PIU				
	Site restoration	○ 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 improving the survivability of the tree if required	***(The contractor shall include the cost for the measures as part of the construction cost)***				
20.	Hydrology and Drainage	○ 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	○ 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	Operation stage stage	construction cost	Contractor,	PIC/PIU

SL. NO.	Project Action/Environmental Attributes	Mitigation Measures	Location	Time Frame	Cost	Responsible for Implementing	Responsible for Monitoring
			approved by PIU				

Note :

1. 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)

2. 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	○ 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	○ 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.	All through the alignment of each rural road	Compliance to Conditions of Forest Clearance if applicable		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		○ 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.				
3.	Land acquisition	○ 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			
4.	Biological environment - Tree planting	○ 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	○ 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		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
				community for utility, community structure, and vegetation cover removal		
6.	Shifting on Common Properties Resources	○ 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	○ 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. ○ 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.	All through the alignment of each rural road			
8.	Hydrology and Drainage	○ 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.	Near all drainage crossing , nalas and river crossings etc.			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		○ 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 .				
9.	Establishment of Construction Camp, temporary office and storage area	○ 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. ○ 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.	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).	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
		○ 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.				
10.	Traffic Movement	○ 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	○ Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp corves design and bends where the curve design speed is less than 40 km per hour in plain and rolling terrain.	Throughout the project section at the location determined by			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		○ 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. ○ 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	contractor and approved by PIU			
	Grievance Redress	○ 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:** o 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. o Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. o 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). o Borrowing of earth will not be done continuously through out the stretch. o Ridges of not less than 8m widths will be left at intervals not exceeding 300m. o Small drains will be cut through the ridges, if necessary, to facilitate drainage. o The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). o The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.	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
		○ 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-owner. The re-habilitation plan may include the 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 ground surface. ▪ Borrow areas might be used for aquaculture in case landowner wants such development. **Aggregate :** ○ 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 **Transportation of Construction Material** ○ 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.				

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
2.	Loss of Productive Soil, erosion and land use change	○ 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. ○ 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	Thought out the road section			
3.	Compaction and Contamination of Soil	○ 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.	• Through out the project section of the road s			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		○ 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.				
4.	Construction Debris and waste	○ 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.	• Through out the project section of the road			
5.	Air and Noise Quality	○ 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.	• Near all drainage crossing, nalas and river crossing s etc.			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		○ 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.				
6.	Biological environment - Tree planting	○ Compensatory Afforestation shall be made on 1:3.ratio basis as per the planning. ○ Additional trees shall be planted wherever feasible.	Throughout the project section of the road			
7.	Ground Water and Surface Water Quality and Availability	○ 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			

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Additional Monitoring Indicator if applicable	Compliance status	Corrective action proposed in case of delay
		○ 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	○ 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			
.	Grievance Redress	○ 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) construction

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	○ 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	○ 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 improving the survivability of the tree if required	Throughout the road stretch	Survivability report, land owner concurrence of land reversal		
3	Hydrology and Drainage	○ 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	○ 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	○ 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.