Initial Environmental Examination

May 2015

IND: Rural Connectivity Investment Program – Project 3

Batch 3 Roads, West Bengal

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

CURRENCY EQUIVALENT

as of May 2015

Currency unit	—	Indian rupee (Rs)
Rs 1.00	=	$ .01572
$1.00	=	Rs 63.5981

ABBREVIATIONS

ADB	Asian Development Bank
MORD	Ministry of Rural Development
MORD	Ministry of Rural Development
APO	Accident Prevention Officer
B.T.	Black Top
BGL	Below Ground Level
BIS	Bureau of Indian Standards
BOQ	Bill of Quantity
C.C.	Cement Concrete
CD	Cross Drainage
CGWA	Central Ground Water Authority
CGWB	Central Ground Water Board
Ch.	Chainage
COI	Corridor Of Impact
CPCB	Central Pollution Control Board
CTE	Consent to Establish
CTO	Consent to Operate
DG	Diesel Generating
DPR	Detailed Project Report
EARF	Environmental Assessment Review Framework
ECOP	Environmental Code of Practices
EIA	Environmental Impact Assessment
EMOP	Environmental Monitoring Plan
EMP	Environmental Management Plan
EO	Environmental Officer
FEO	Field Environmental Officer
GDP	Gross Domestic Product
GOI	Government of India
GSHAP	Global Seismic Hazard Assessment Program
HC	Hydrocarbon
HH	House Hold
IEE	Initial Environmental Assessment
IRC	Indian Road Congress
LHS	Left Hand Side
MCM	Million Cubic Meter
MFF	Multi-Tranche Financing Facility
MoEF	Ministry of Environment and Forests
MoRD	Ministry of Rural Development
MOSRTH	Ministry of Road Transport & Highways
NAAQS	National Ambient Air Quality Standards
NGO	Non-government organization
NOx	Nitrogen Oxides

NRRDA	National Rural Road Development Agency
NSDP	Net State Domestic Product
PIC	Project Implementation Consultant
PIU	Project Implementation Unit
PLF	Plant Load Factor
PM	Particulate Matters
PMGSY	Pradhan Mantri Gram Sadak Yojna
PPE	Personal Protective Equipment's
PPTA	Project Preparation Technical Assistance
RCIP	Rural Connectivity Investment Program
RHS	Right Hand Side
ROW	Right of way
RRS I	Loan 2018-IND: Rural Roads Sector I Project
RRS II	Loan 2248-IND: Rural Roads Sector II
RSES	ADB's Environmental Safeguard Division
SBD	Standard Bidding Documents
SDP	State Domestic Product
SO_2	Sulphur Dioxide
SPCB	State Pollution Control Board
SPS	ADB's Safeguard Policy Statement,2009
SRRDA	State Rural Road Development Agency
STDs	Sexually transmitted diseases
TDS	Total Dissolved Solids
TSC	Technical Support Consultants
UNESCO	United Nations Educational, Scientific and
WBM	Water Bound Macadam
WBSRRDA	West Bengal State Rural Road Development

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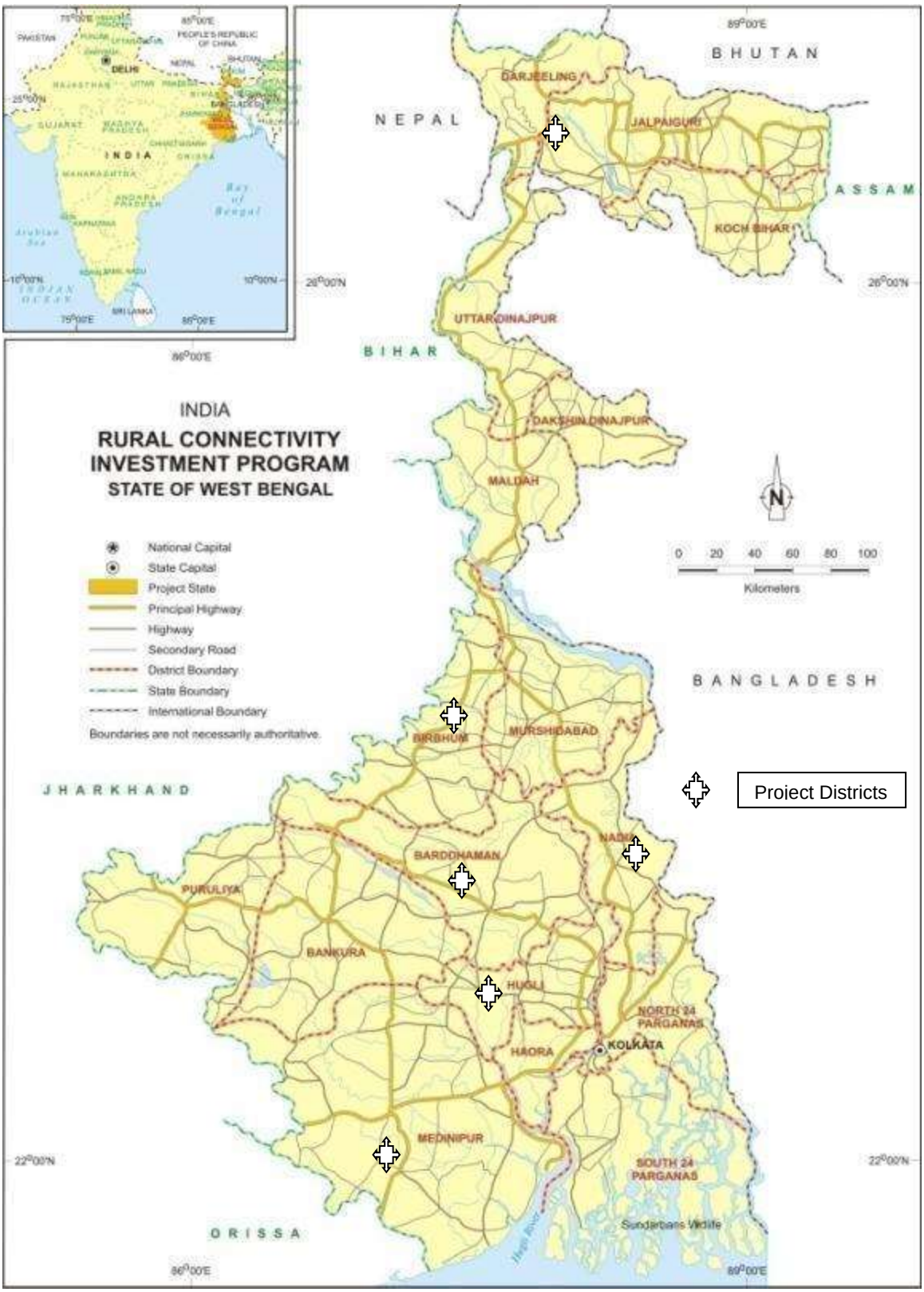


Figure 1: State and Project Districts Map of West Bengal

EXECUTIVE SUMMARY

A. Background

1. The Government of India (GOI) launched PMGSY in year 2000 with the objective of providing all-weather road connectivity to all rural habitations with a population of more than 500 persons in plains and 250 persons in hill states. This program is being implemented through National Rural Road Development Authority (NRRDA) under Ministry of Rural Development (MORD) at central level and through State Rural Road Development Authority/Agencies (SRRDA) at state level. The Rural Connectivity Investment Program (RCIP) is continuation of Rural Road Sector II Program (RRS IIP) and is a multi-tranche financing facility (MFF) that aims to construct or upgrade to the all-weather standard about 9,000 km of rural roads connecting around 4,800 habitations in the states of Assam, Chhattisgarh, Odisha, Madhya Pradesh and West Bengal. Under RCIP Project 1 (Loan 2881-IND) sub-projects cover about 3,530 km in total (426.43 km in Assam, 1,009 km in Chhattisgarh, 1,187 km in Madhya Pradesh, 757 km in Odisha, and 151 km in West Bengal) while the RCIP Project 2 (Loan 3065-IND) covers about 3,693 km in total (499 km in Assam, 429 km in Chhattisgarh, 654 km in Madhya Pradesh, 1,184 km in Odisha, and 930 km in West Bengal). The amount funded for the states under ADB RCIP Project 1 is approximately $381.44 million while funding under Project 2 is about $275 million. The subprojects are at various stages of implementation.

2. The Government is now planning to submit to ADB the Third Periodic Finance Request (PFR) that includes the proposal for about 76 rural roads totalling to 637.574 km in the state of West Bengal spread over in 6 districts. The West Bengal Rural Road Development Agency (WBRRDA) is the implementing agency (IA) for the ADB funded subprojects in the state. Tranche III as per classification of ADB has been categorised as ‘Category B’ project and therefore requires an Initial Environmental Examination (IEE).

3. These roads has been selected following PMGSY guidelines for the selection of roads under this programme and satisfy the following environmental safeguards: i) the selected road shall not disturb any cultural heritage designated by the Government or by international agencies, such as UNESCO, and shall avoid any monuments of cultural or historical importance; ii) the selected road shall not pass through any designated wildlife sanctuaries, national parks, notified ecological sensitive areas or area of internationally significance (e.g., protected wetland designated by the Wetland Convention); and iii) the sub projects shall only involve activities that follow Government of India laws and regulations and meets funding agency safeguard policies

B. Description of Project

4. The proposal for rural road construction works typically considers a 10-12 m 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. The construction proposals are confined to the existing alignment of the unpaved tracks. The broad specifications for road alignment selection, pavement design, construction methodology, and geometric design are in accordance with the “Specification for Rural Roads” published by IRC on behalf of the Ministry of Rural Development, Government of India (GoI). The design details presented in this chapter highlights the PMGSY specifications. Minor changes will apply depending on road specific issues and design consideration. Since topography of Assam state is largely flat, the design details applicable to flat terrain.

5. The proposed rural road construction work will provide 7.5 m roadway width (this may be reduced to 6 m as per latest guidelines) 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 to be constructed.

6. 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 IRC guidelines 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. The design speed considered is as per recommended design speed of 50 Km/h.

C. Description of Environment

7. West Bengal is located between lat. 20°31'N and 27°12'N and long. 85°50' and 89°52' E. The geographical area of the state is 88,752 km^2 (34267 sq mi). The state boundary touches five states of the country, namely Assam, Sikkim, Orissa, Jharkhand and Bihar. It also share boundary with three countries namely Nepal, Bhutan, and Bangladesh. The state forms the ethno-linguistic region of Bengal.

8. The climate of the West Bengal state, except the Himalayan and sub-Himalayan region in the northern part of the state has a tropical climate. The minimum annual temperature in the northern districts (Himalayan foot hill region) varies from freezing point to 17°C and over 18°C in other parts of the state. The annual mean maximum temperature ranges from 28°C in the Himalayan region to 33°C in the plains. Normally, May to October months are humid and January to April are dry. The relative humidity (expressed in percentage) is more in northern and southern part of State as compared to western and eastern parts of the state. The maximum relative humidity ranges from 75 to 95% in morning hours and 50 to 65% in the evening hours. As per seismic hazard map of India updated by Bureau of Indian Standards The project region falls in Zones III & V i.e moderate to high risk zone.

9. 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. As such, the ambient air quality (for parameters SO2, RSPM and NOX) is expected to be iv within the limits in most of rural and semi urban areas. The ambient noise levels are also expected to be within the National Ambient Noise Standards due to absence of any high noise sources in proposed road vicinity.

10. The land use within state broadly comprises of cultivable land, uncultivable land, forest land, waste land, urban area and industrial area. Land use pattern along the project road is mixed type dominated by agriculture, barren land, forest land and residential areas. The district Jalpaiguri, has substantial area covered under forests.

11. West Bengal State has three major river basins, namely Ganga, Brahmaputra and Subarnarekha. Among these, Ganga is the largest and covers almost 80% of the state, whereas the Brahmaputra basin covers about 15% of the area and Subarnarekha basin covers about 5% of the geographical area of the State. The rural road construction proposals are normally cross small drainage channels, which eventually join the 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.\

12. The west Bengal state owing to the varying altitude from the Himalayas to the coastal plains, the flora and fauna of the state is diverse. Forests make up 14% of the geographical area of West Bengal, which is lower than the national average of 23%. Protected forests cover 4% of the state area. Part of the world's largest mangrove forest Sundarbans is located in southern West Bengal. None of the road stretches passes through any forest land/area. The tree density within ROW of sample road project alignment is about 5-10 trees per Km. West Bengal has 5 National Parks and 15 Wild life sanctuaries spread over an area of 2754.39 Sq. Km. There is no wildlife Sanctuaries/National Parks, Tiger Reserves etc. along the project area. No wetland or large water body falls except large water stagnant area in one or two roads. Fisheries activities are quite common in subproject areas. None of the roads consists of any rare, endangered or threatened floral or faunal species. Small number of tree is falling within ROW.

13. West Bengal has a total population of about 90 million is largely rural (73%). Tribal constitute about 5.8% of the population, and scheduled castes form about 28.6%. The healthcare system in the state is well establish and is undergoing for further upgradation through public private partnership. West Bengal’s network of healthcare facilities comprises 433 Governmental & non-Governmental hospitals.The state has made considerable progress in the literacy level of the state increasing from 68.64% in 2001 to 77.08 in 2011. The percentage of population below the poverty is high at 32%.

14. Agriculture is the leading occupation in West Bengal. Rice is the state's principal food crop. Other food crops are pulses, oil seeds, wheat, tobacco, sugarcane and potatoes. Manufacturing industries playing an important economic role are engineering products, electronics, electrical equipment, cables, steel, leather, textiles, jewellery, frigates, automobiles, railway coaches, and wagons. West Bengal is nearly three percent of the nation's cultivable land. It produces more than eight per cent of the food of the country. West v Bengal has well-developed road and rail network.

D. Anticipated Environmental Impacts and Mitigation Measures

15. Road improvements work brings substantial economic and social benefits to rural communities and national economies. However, it may also cause adverse environmental impacts though of smaller magnitude, since rural road subprojects are planned to follow the existing alignments and will be of 6 to 7.5 m width only. The impacts are largely expected to be during construction phase, which can be mitigated through engineering measures and adoption of best construction practices.

16. All project roads are subjected to environmental screening using the ECOP checklist. A sample size of 10% was selected by the WBRRDA with support from the Project Implementation Consultant (PIC) from which this state level IEE was based. Separate environmental checklist were prepared for bridges with length greater than 50m. All sample roads included under RCIP 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. No forestland diversion is involved either.

17. By the 2050s, downscaled global climate models predicts a general warming in the West Bengal. The annual average maximum temperature is expected to increase by 0.89oC-3.05oC and the maximum temperature is expected to increase by 0.5oC to 2.86oC. However, there was no agreement of the GCM ensemble on the projected change in rainfall. Nonetheless, in areas where a significant probability (>95%) in predicted future rainfall exists, annual rainfall will increase in Hoogli and Barddhaman. The cost of addressing flooding and erosion for the RCIP Tranche 3 in the State is Rs 116.042 million of which RS9.544M is for constructing cross and side drains, Rs1.076M is for bridges and culverts, Rs103.263M is for increasing road embankment height, and Rs2.158M is for slope stabilization.

18. No land acquisition is involved due to various measures considered for finalisation of road alignment. Villagers have volunteered to donate their land if at certain stages land is required for geometrical correction or alignment adjustment for avoiding tree cutting or shifting of community structure. None of the sample road passes through any forest land, however about 83 avenue trees will be cleared from 16 sample roads There are 43 ponds are located very near to ROW of 16 roads in Wes Bengal, where protection work is needed to avoid damage an \d encroachment to private properties.

19. Site clearing operations may have impact on common utilities, community properties, and land use. These will be avoided by limiting most of the construction activities along the alignment and strictly implementing the utility and road furniture shifting plan; ground staking of RoW; prior informed consent on vegetation clearing, tree felling with permission from Forest Department, and utility shifting; and preservation and re-use of all topsoil.

20. Impacts related to health, safety of the labourers at the construction campsites, availability of safe drinking water, sanitation, and collection, storage, and disposal of oily wastes addressed in the EMP mostly through good housekeeping and linking with local health protection programs. All construction camps and hotmix plant will be set up at least 500 m away from habitat or forest areas. 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 to avoid or minimize disturbance to existing traffic. 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. To minimize deterioration of air quality during construction the following will be implemented as part of the civil works: i) use of covered haul trucks, ii) regular sprinkling of water on active construction fronts and materials storage areas; iii) hot mix plants and diesel generating sets comply with stack height requirements and secure clearance from the State Pollution Control Board, and iv) mandatory use of PPEs to all construction workers.

21. Borrowing earth from agricultural land shall be minimised to the extent possible. Further, no earth shall be borrowed from already low-lying areas. The borrow earth shall be sourced from identified locations and with prior permission of landowner and with clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and quantity that can be borrowed. Balance cut and fill will be followed to the extent possible to minimize borrowing. Adequate provision shall be made for cross

drainage structures for maintaining natural drainage pattern in the subproject area and preventing soil erosion.

22. 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. Road levels shall be designed considering HFL. Low costs measures like use of bamboo or eucalyptus tree will be adopted for embankment protection and control of soil erosion. Other slope stabilisation measure like vegetative protection will be installed when necessary as deemed by the PIC. None of the sample roads is crossing any natural stream except NH-55 to Siridihi (A) road in Dhenkanal district, which crosses Sarapa Nallah.

E. Environmental Management Plan and Institutional Arrangements

23. 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 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.

24. 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 construction stage and operation stage.

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

26. Grievance Redress Mechanism is also defined for receiving public concerns at state, PIU, and central level.

F. Public Consultation and Information Disclosure

27. The project has immense acceptability among the local people. They perceived that in addition to providing all weather connectivity, the sub-project road would bring positive socioeconomic changes in the area. The project has tried its best to address all the issues raised during consultations under the constraints of suitability from engineering point of view.

G. Conclusion

28. 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. 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. 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.

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

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 Authority (NRRDA) under Ministry of Rural Development (MORD) at central level and through State Rural Road Development Authority/Agencies (SRRDA) at state level.

2. The Rural Connectivity Investment Program (RCIP) is continuation of Rural Road Sector II Program (RRS IIP) and is a multi-tranche financing facility (MFF) that will construct or upgrade to the all-weather standard about 9,000 km of rural roads connecting around 4,800 habitations in the states of Assam, Chhattisgarh, Orissa, Madhya Pradesh and West Bengal (RCIP states). The RCIP will also focus on improvement of institutional arrangements, business processes and associated capacity building. This will especially be done in relation with design, operation, safeguard, financial, road safety, and asset management matters. 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. RCIP Tranche 1 was to finance part of the cost of (i) construction of 3,461 km of rural roads in the five project states (ii) the related consultancy services to provide support for subprojects under Tranche 1 and (iii) capacity building of implementing agencies by establishing rural connectivity training and research centers (RCTRCs) and rural roads network management units (RRNMUs). The Loan for Tranche 1 (Ln 2881-IND) totalling $252 million was signed in April 2013 and became effective on 5 June 2013. RCIP Tranche 2 (Ln 3065-IND) totaling $275 million was approved on 25 November 2013. Under RCIP Tranche I till May 2014; 515 out of 532 (or about 97%) contracts have been awarded while for RCIP Tranche II; 498 out of 716 (or about 70%) contracts have been awarded.

4. The Government is now planning to submit to ADB the Third Periodic Finance Request (PFR) that includes the proposal for about 76. rural roads totalling to 637.574 km in the state of West Bengal. WBSRRDA is the implementing agency (IA) for the ADB funded subprojects in the state. The preparatory works for the proposed roads under the third 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. The report has been prepared by M/s Operations Research Group (P) Ltd., the Technical Support Consultants (TSC) appointed by National Rural Road Development Agency (NRRDA) under the ADB loan assistance.

B. Project Road Identification and Location

5. 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[1] and satisfy the following environmental safeguards:

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

6. The WBSRRDA has selected about 637.574 km of rural roads to be taken up under RCIP Tranche III subproject roads in West Bengal. The 637.574 km of roads comprises 76 different stretches spread over in 6 districts of the State. Within each district, the roads are further scattered in several blocks and sub divisions. The minimum and maximum length of the roads ranges between 2.26 km and 20.543 km respectively. The list of 637.574 km roads with location and length is given in Appendix 1 and the location map of the districts is shown in Figure 1.

7. Table 1 shows the summary of roads district wise qualified for Project 3 funding.

Table 1: RCIP: Tranche III Roads in West Bengal

Sl no	District	No of Roads	Total Road Length (Km)
1	Siliguri M.P.	10	10
2	Birbhum	7	7
3	Burdwan	16	16
4	Hooghly	12	12
5	Nadia	20	20
6	Purba Medinipur	11	11
Total		**76**	**637.6**

C. Rural Road Construction Proposal

8. The proposal for rural road construction works typically considers a 10-12 m 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.

[1]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

D. ADB's Safeguard Policies and Category of the Project

10. The Asian Development Bank has defined its Safeguard requirements under its 'Safeguard Policy Statement 2009' (SPS 2009). The SPS 2009 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 2009 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 stretches do 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, additional land requirement is also low. Hence, the project falls 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 Environnemental 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 sub projects as well as specific to a subproject.

14. Since there is large number of subproject roads involved under RCIP and magnitude of each road is small, preparation of individual IEE's for each road will be difficult and time consuming. ADB had finalised Environmental Code of Practices (ECOP) checklist under RRS II, which is modified for RCIP. Subprojects specific Initial Environmental Assessment (IEE) is carried out as per this ECOP checklist for sample roads. These completed ECOP checklist with annexure on tree, utility and community structures, strip plans and selected photographs for 16 sample roads are enclosed as Appendix 2 and Appendix 3 respectively.

15. The findings of 16 sample subproject specific assessment suggest that similar issues exist amongst the other 60 roads with very few subproject specific issues. Therefore, IEE report has been prepared based on ECOP checklist of selected sample subproject roads (16 roads of 116.237 km) covering 21% of total roads in the state. Impact is assessed for all the 76 roads under Tranche III. This IEE approach will be followed for conducting environmental assessment for other Tranches under RCIP.

F. IEE Methodology and Content

16. Initial Environmental Examination has been largely structured as per SPS, 2009 and ADB's Environmental Assessment Guidelines (2003). The IEE report includes EMPs, monitoring

plans; cover the most environmentally sensitive components in state as well as specific to sample 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 roads alignment Based on the proposed cross-section.

18. **Field visits, Primary and Secondary Data Collection**: Few of the selected sample roads was visited along with concerned PIU officials and PIC 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. Finally IEE is prepared after site observation and review of all collected relevant documents.

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

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 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 Roads Sector I (RRS I) and Rural Roads Sector II Investment Program (RRS II) 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/spot mix plants, and use of vehicles for construction. The legislation applicable for RCIP roads are listed below:

Table 2: Applicable Rules and Regulations for RCIP Roads

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 National and State highways**.**
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 roads 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/ spot 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. *Authorisation* will also be required for disposal of Hazardous Waste like waste oil etc. from State Pollution Control Board
5.	The Air (Prevention and Control of Pollution) Act, 1981, (Amended 1987), and the Air (Prevention and Control of Pollution) Rules, 1982	
6.	The Noise Pollution (Regulation and Control) Rules, 2000 (Amended 2002)	
7.	The Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008 (Amended 2009), and the Batteries (Management and Handling) Rule, 2001	
8.	Guidelines for Ground Water Extraction Prescribed by Central Ground Water Authority under the power granted under Environment (Protection) Act 1986	*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 critical or semi critical from ground water potential prospective. For NOC, An application in the prescribed Performa is to be submitted to either to the Office of the Regional Director, Central Ground Water Board (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 TSC gratefully acknowledge the support received from NRRDA and WBSRRDA throughout the environmental assessment process. We also acknowledge the assistance received from respective PIUs and PIC 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. RCIP is planned to meet above objective. 116.237 Km roads (16 nos.) are identified as sample roads for West Bengal under Tranche III of 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 project districts of West Bengal state is largely flat and few patches are undulated, the design details applicable to flat terrain are presented in following section.

B. Sample Roads Selected in West Bengal State

28. The West Bengal state has selected 76 roads with a total length of **637.6** Km spread over 5 districts and 1 mahakuma parishad for Tranche III funding. Details shown in Appendix 1. District wise Summary is given in Table 3.

Table 3: Summary of District Wise Rural Roads – Tranche III

Sl no	District	No. of Packages	No of Roads	Total Road Length (Km)	Maximum Road Length (Km)	Minimum Road Length (Km)
1	Siliguri M.P.	10	10	43.578	7.2	2.5
2	Birbhum	7	7	50.550	18.5	2.26
3	Burdwan	16	16	137.200	13.75	4.6
4	Hooghly	12	12	87.930	14.72	3.16
5	Nadia	20	20	218.100	20.543	5.145
6	Purba Medinipur	11	11	100.300	15.6	5.2
Total		**76**	**76**	**637.6**	**20.543**	**2.26**

29. For preparation of IEE, 16 sample roads (116.237 km) covering more than 20% of the total roads in the state have been considered. All 6 districts have been covered for selection of sample roads. Details are given in Table below

Table 4: Details of Sample Roads

Sl. No.	District Name	Road Name	Length (Km)
1	Birbhum	Dakshingram to Saithia Rampurhat road at Battala via Ratma Sibgram	4.821
2	Birbhum	Barutia to Chottorigram Road via Radhanagar	2.381
3	Burdwan	Radhakantapur More to Sahajadpur	5.250
4	Burdwan	Bhota to Karanji	13.650
5	Hooghly	Kumarganj To Balitakundu Part Of Pundahit Rathtala To Balitakundu Po Salikana To Shripur Jn	4.084
6	Hooghly	Mukundapur busstop to Blacktop road part of singhtimore Ichanagar Rangupur RD	3.600
7	Hooghly	Keshab Chak Bank toTarakeswar Padmapukur More	5.880

Sl. No.	District Name	Road Name	Length (Km)
8	Nadia	Nimtala Bazar To Rustam Nagar	6.564
9	Nadia	Hanskhali To Nidhirpota	5.302
10	Nadia	Kalinagar To Sahapur	19.925
11	Nadia	Kharer Math To Gobindapur	6.275
12	Purba Medinipur	Jasar To Brindabanchak	11.000
13	Purba Medinipur	Gorsafat To Asnan (Arang Kyarana)	9.750
14	Purba Medinipur	Dakshin Kalamdan To Tikashi	9.100
15	Siliguri M.P.	Goyaltuli more to Bidhannagar via Tufandangi	6.134
16	Siliguri M.P.	Balaijhora (NH31C) to Bhogvita	2.521
Total 16 roads in 6 districts			**116.237**

C. Project Description

1. Rural Road Construction Proposals

30. The proposed rural road construction work will provide 7.5 m roadway width[2] 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. **0** shows the typical cross section of the rural roads.

31. 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

32. The project roads mainly pass through plain terrain and agricultural area. The project roads have several cross drainage structure, electric post 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 will not be affected due to the widening of roads. There are some utilities besides the roads. Some of these may need to be shifted.

3. Alignment and Profile

33. The existing road is generally a murram/brick/partly bituminous track with some stretches of brickbat soling (description of the road surface). Thus, the project road is an upgraded 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 voluntary land acquisition requirements and thereby the possible social and/or environmental concerns.

[2] The road width may be reduced 6m as per PMGSY recent decision.

4. Design Considerations

34. **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 5 below:

Table 5: 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

35. Since terrain is plain mostly, 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.

36. **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.

37. **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 rain water will flow along the longitudinal slope and intermittent gaps in concrete curbs

38. **Carriageway:** The carriageway is proposed as 3.75 m as per IRC-SP20: 2002. It may be even restricted to 3.0m, 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 5 m.

39. **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.

40. **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.

41. **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

42. Since these are smaller roads, 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. Compaction of all items shall be done by ordinary smooth wheeled roller if the thickness of the compacted layer does not exceed 100 mm. It is also considered that, hot mix/ spot 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

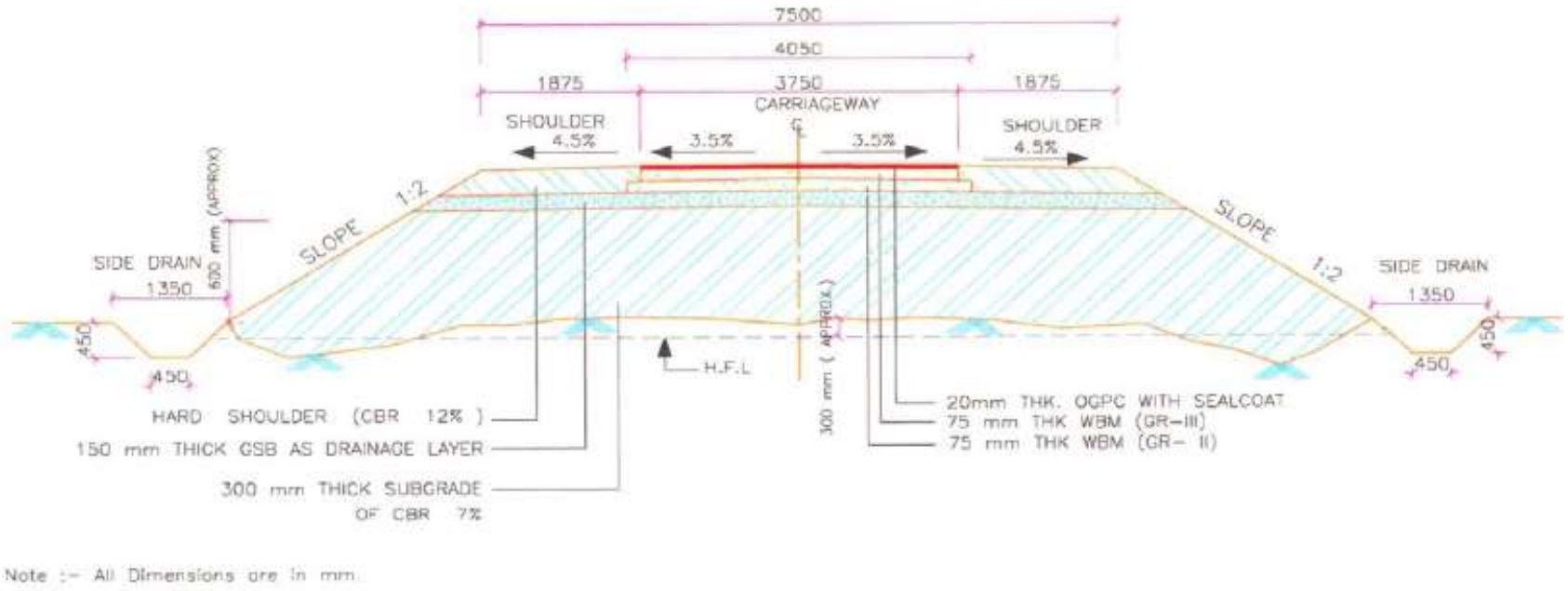
43. As per the information available with West Bengal State Rural Road Development Agency (WBSRRDA), ROW is largely available for all the sample roads. In some of the road, it is put to agricultural use by the adjacent landowners. The private landowners along the proposed right of way (ROW) however, 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

44. The present traffic data on each of these rural roads typically vary 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

45. The economic analysis carried out under 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.



Note :- All Dimensions are in mm.

Figure 2: Cross-section of Rural Roads

III. DESCRIPTION OF THE ENVIRONMENT

A. General

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

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

48. West Bengal is located between lat. 20°31'N and 27°12'N and long. 85°50' and 89°52' E. The geographical area of the state is 88,752 km^2 (34267 sq mi). The state boundary touches five states of the country, namely Assam, Sikkim, Orissa, Jharkhand and Bihar. It also share boundary with three countries namely Nepal, Bhutan, and Bangladesh. The state forms the ethno-linguistic region of Bengal. The capital of the state is Kolkata, the third-largest urban agglomeration and the third-largest city in India. The selected Sample roads fall in Birbhum, Burdwan, Hooghly, Nadia, Putba Medinipur and Siliguri MP. Summary key environmental features of these districts are given in Table 6.

Table 6: Summary Key Environmental Features of the Sample Roads Districts

S. No.	Parameters	Siliguri MP	Birbhum	Hooghly	Purba Medinipore	Burdwan	Nadia
1.	**Location**	• Siliguri Mahakuma Parishad (MP) has been formed in 1989 for the plains of Darjeeling district i.e Siliguri subdivision. It has a geographical area of 837.45 sq km and lies between the latitude 26027' N.and 26057'N.and the longitude 88007' E. and 88031' E. • It is bounded on the north by the Sub-Himalayan ranges of Darjeeling district and on the south by Bangladesh, Uttar Dinajpur & Bihar. On the east, lies Jalpaiguri district and Kalimpong Sub-division of Darjeeling district, and is bounded on the west by Nepal.	• Birbhum is the northernmost District of the Burdwan Division. It lies between 23° 32' 30" and 24° 35' 0" north latitude and 88° 1' 40" and 87° 5' 25" east longitude. and cover an area of 4545 sq.km • The district is surrounded by Murshidabad in east, Burdwan in south and state of Jharkhand in west	• Hooghly district is located between latitudes 23° 01‘ 20” and 22° 39‘ 32” N. The eastern most proximity of the district is marked by 88° 30‘ 15” east longitude and its western most proximity by 87° 30‘ 20”east longitude. It is situated on the western bank of river Bhagirathi or Hooghly bordering Barddhaman and Nadia district in the north, Howrah and Purba Medinipur in the South, North 24 Parganas and Nadia in the east and Bankura and Paschim Medinipur district in the west. • The district is a completely flat land with no place having more than an elevation of 200 meters. The River Hooghly borders it to the east. Another major river is 'Damodar'. The district is bordered by Howrah District to the south, Bardhaman District to the north, and to the east by the River Hooghly. Bankura District lies to the north-west, with Medinipur District to the south-west.	• Purba Medinipore lies between 22°57’10” and 21°36’35”” N and 88°12’40” and 86°33’50” E. This District spread over 4295 Sq. km • Purba Medinipur is located in the southern part of West Bengal. It is bounded to the north by Paschim Medinipur and Howrah Districts, east by Howrah and South 24 Parganas Districts and Bay of Bengal, South by Bay of Bengal and West by Paschim Medinipur District and State of Orissa. The south west corner of this District shares a common border with the State of Orissa.	• Burdwan district extends from 22^{o}56' to 23^{o}53' North latitude and from 86^{o}48' to 88^{o}25' East longitudes. District has an area of 7,024 km². • Lying within Burdwan Division, the district is bounded on the north by Dumka (of Jharkhand), Birbhum and Murshidabad, on the east by Nadia, on the south by Hooghly, Bankura and Purulia and on the west by Dhanbad (of Jharkhand) districts.	• The district located between north latitude 24^{0}11’ and 22^{0}53’, and east longitude 89^{0}22’ and 88^{0}9’. • The district is bounded on the North and North-west by the district of Murshidabad. On the North-east it is bounded by the Republic of Bangladesh, in the south and south east, by the district of North 24 Parganas.
2.	**Climate**	• Siliguri has three distinct seasons: summer, winter and monsoon. In summer the temperature	• The climate of the district is generally dry, mild and healthy. • The climate on the western side is dry and extreme, but	• Hooghly has a tropical savanna climate. The annual mean temperature is 26.8_C, although monthly mean temperatures range from 16_C to 33_C and	• The district has tropical climate with temperature-Mean Maximum temperature 32.05o Celsius. Mean Minimum temperature	• Average temperature in hot season is 30oC while at the cold season is 20oC. And average rainfall is 1500 mm	• The Climate of Nadia is characterized by an oppressively hot summer, high humidity all the

S. No.	Parameters	Siliguri MP	Birbhum	Hooghly	Purba Medinipore	Burdwan	Nadia
		reaches 35 degree Celsius. Winters are generally chilled and cool when temperature goes down to 2 to 3 degree Celsius • Mean annual maximum temperature: 34.8^{o} C, Mean annual minimum temperature: 12.8o C. Whereas Annual mean humidity: 81%. Average annual rainfall : 3620 mm & Average no. of rainy days 113	is relatively milder on the eastern side. During summer, the temperature can shoot well above 40 °C (104 °F) and in winters it can drop to around 10 °C (50 °F). It has been observed that rainfall is higher in the western areas as compared to the eastern areas. • The annual average rainfall varies from 1,405 to 1,212 mm, mostly in the monsoon months (June to October).	maximum temperatures in Hooghly often exceed 380 C. The main seasonal influence upon the climate is the monsoon. Maximum rainfall occurs during the monsoon in August and the average annual total is above 1,500mm. Moderate northwesterly to northeasterly winds prevails for most of the year with a high frequency of calms. Summer is dominated by strong southwesterly monsoon winds. Winters are comfortable with temperatures lying between11 to 170C.	20.83o Celsius. • Average Total Rainfall 1703 mm		year round and well-distributed rainfall during the monsoon. The winter sets in the middle of November and continues till the end of February. The rainfall during the monsoon months from June to September constitutes about 71 percent of the annual rainfall. Maximum rain occurs in the months of July-August. Temperature ranges from 27o C to 42o C (minimum to maximum) with a maximum humidity of 96 percent.
3.	**Wild Life Sanctuaries/ National Park etc**	• No Wildlife sanctuary within Siliguri MP.	• Ballavpur Wild Life Sanctuary located near Santinekaton at Bolpur sub division • However, none of subproject roads passes through this sanctuary.	None	None	• Ramnabagan Wild Life Sanctuary located in the district • However, none of subproject roads passes through this sanctuary.	• Bethuadahari Wild Life Sanctuary located in the district • However, none of subproject roads passes through this sanctuary.
4	**Geomorphology** -. *Major Physiographic Units and land use*	• Except for the lesser Himalayan zone of Siwalik deposits of Tertiary Age in the northern part, the main geologic formation	• This region of the district with its varied tectonic elements and riverine features is a transitional zone between the Jharkhand plateau	• The physiography of the region is that of a typical alluvial plain with gentle ups and downs. The terrain is essentially composed of soft river borne sediments deposited under fluviatile	• The physiography of the region is that of a typical alluvial plain with gentle ups and downs. The terrain is essentially composed of soft river borne	• District with its varied tectonic elements and riverine features, is a transitional zone between the Jharkhand plateau	• The physiography of the region is that of a typical alluvial plain with gentle ups and downs. The terrain is

S. No.	Parameters	Siliguri MP	Birbhum	Hooghly	Purba Medinipore	Burdwan	Nadia
		encountered in the area includes the sub-areal formations and alluvial deposit of recent age (Jana and Haque, 1999). Most of the formation materials have been deposited cyclothermically. The study area is a monoclinal structure, more or less parallel to the foothill of the lesser Himalaya in the north. The general slope of the area is North-East to South-West direction ranging from 0° 54' to 22° 58'.	which constitutes a portion of peninsular shield in the west and Ganga-Brahamaputra alluvial plain in the north and east. In general the Jharkhand plateau consists of the meta-sedimentary rocks of precambrian age, Gondwana sedimentary rocks, Rajmahal basalts and upper tertiary sediments. Laterite has developed on these older rocks as well as on early Quaternary sediments. • Major land use is agriculture	environment. The general slope is from north west to south east. As the area is situated very near to the out fall, the dominant slope of the land is towards south with average elevation varying from 3.5 m to 2.5 m above MSL.	sediments deposited under fluviatile environment. The general slope is from north west to south east. • Major land use is agriculture	which constitutes a portion of peninsular shield in the west and Ganga-Brahamaputra alluvial plain in the north and east. In general the Jharkhand plateau consists of the meta-sedimentary rocks of precambrian age, Gondwana sedimentary rocks, Rajmahal basalts and upper tertiary sediments. Laterite has developed on these older rocks as well as on early Quaternary sediments. Towards south, the alluvial plain merges with Damodar-kasain-Subarnarekha deltaic plains. • Major land use is agriculture	essentially composed of soft river borne sediments deposited under fluviatile environment. The general slope is from north west to south east. As the area is situated very near to the out fall, the dominant slope of the land is towards south with average elevation varying from 3.5 m to 2.5 m above MSL.
	Geomorphology *Major Drainage*	• Teesta and Mahananda are the two primary rivers of Siliguri. People of this region share emotional bond with these two rivers. These rivers have found a place in several compositions which prove that man and nature cannot live without each	• The district is drained by the several rivers flow across the district. Some of these are Ajay, Mayurakshi (Mor), Kopai, Bakreshwar, Brahmani, Dwarka, Hinglo, Chapala, Bansloi, Pagla etc.	• The district is broadly divided into two main natural divisions, the plains and the uplands, the river Dwarakeswar forming the dividing line between the two. The flat alluvial plains may again be sub-divided into three regions, namely (i) the Dwarkeswar-Damodar interriverine plain, (ii) the Damodar- Bhagirathi interriverine plain and (iii) the Char lands	• The Drainage of the district is mainly controlled by by River (1) Rupnarayan (2) Kangsabati (3) Haldi (4) Keleghai (5) Chandia (6) Rosulpur. • Bay of Bengal is located at the southern part of the District.	• The river system in Burdwan includes the Bhagirathi-Hooghly in the east, the Ajoy and its tributaries in the north and the Dwarakeswar, the Damodar and its branches in the south-west. Besides, there are innumerable Khals and old river beds all over the area..	• The important rivers of the district are Bhagirathi, Churni, Mathabhanga, Ichamati and jalangi.

S. No.	Parameters	Siliguri MP	Birbhum	Hooghly	Purba Medinipore	Burdwan	Nadia
		other.These rivers are the lifelines of the people of this region. There are other tiny river systems such as the Panchanadi and Balasun.		• Major drainage river of the district - Bhagirathi (western bank), Damodaar, Mundeswari, Darakeswar			
5	**Major Soil Type**	• All the soils are definitely acidic in nature with the tendency to increase slightly in depth in most cases indicating the lacking of bases from surface and accumulation in the lower horizons. The weathering of lateritic type is the substantial mechanism in the transformation of the substratum.	• The predominant soil types are old alluvial and red lateritic with low to medium in organic carbon & phosphate content and medium to high in potash. The soil is acidic in nature with pH range of 5.0 to 6.5	• As this district lies in Gangetic alluvial plains the predominant group of soil is sandy loam to loamy soils covering area of 32.0% and 48.0% cultivated of total area respectively. Clay soil persists in 8% area and clay loam in 12.0% area of the total cultivated areas.	• Red soil, Alluvial soil and Lateritic soil	• In the west coarse gritty soil blended with rock fragments is formed from the weathering of pegmatites, quartz veins and conglomeratic sandstones, where as sandy soil characteristic of granitic rocks and sandstones. This soil is of reddish colour, medium to coarse in texture, acidic in reaction, low in nitrogen, calcium, phosphate and other plant nutrients. Water holding capacity of this soil increases with depth as well as with the increase of clay portions. • Towards the east alluvial soil attains an enormous thickness in the low level plains to the east. This alluvial soil is formed of alluvium brought down by the Ajay, Damodar, Bhagirathi	• Alluvium of sub-recent to recent origin consists of alternate beds of compacted clay; silt and sand and are mostly confined to the bandhs and beds of present day river channels. Texture of the materials and occurrence of mica ferruginous and calcium carbonate concretions developed from different types of alluvium. Illite is the dominant clay mineral and Kaolinite and illite as mixed clay minerals are also found in the soil of this area. The soil is fine loamy mixed gray mottled, slightly acidic sandy loam.

S. No.	Parameters	Siliguri MP	Birbhum	Hooghly	Purba Medinipore	Burdwan	Nadia
						and numerous other rivers. These soils are sandy, well drained and slightly acidic in nature.	
6	**Principal Crops**	• Rice, Tea etc.	• Rice is the major crop of this district and occupies about 70% of the grossed cropped area. The other important crops are wheat, potato, mustard, vegetables, sugarcane and pulses.	• Rice is the major crop of this district and occupies about 70% of the grossed cropped area. The other important crops are wheat, potato, mustard, vegetables, sugarcane and pulses.	• Main Agricultural products: - Rice, Wheat, Mustard, Ground Nut and Paan.	• Main Agricultural products:- Rice, vegetables, mustard	• Main Agricultural products: - Rice, Wheat, oil seed, potato & vegetables
7	**Hydrogeology**	• District areas with moderate yield (yield between 50 - 150m3hr)	• Based on the geological and geomorphologic set up Birbhum district falls within hydro geological unit namely fissured formations. Groundwater restricted to weathered residum fracture zone having secondary porosity. Groundwater Potential: 3.6 - 18 cum/hour (1 - 5 Ips)	• District areas with moderate yield (yield between 50 - 150m3hr)	• Geological set up of the district found that, these stone-formations belong to 'recent' (Holocene), Pleistocene, Pliocene, Miocene, etc. Almost in 2/3 part of this region, 'recent aluvium' can be found. And then 'laterite'. Other rocks are conglomerate, epidiorite and niche	• Ground water occurs in this formation both under water table and confined condition. • Most of the areas with moderate yield (yield between 50 - 150m3hr)	• Ground water occurs in this formation both under water table and confined condition. In Nadia district down to 150m there is absence of any significant clay beds making the entire aquifer upto 150m depth to occur under water table condition
8	**Existing Environmental Issues**	• The district has no key environmental issue • As Siliguri is not a planned city, it has been experiencing problems in meeting present demand with its social and physical infrastructure. The streets of Siliguri is almost choked by	• The district has no key environmental issue except that its ground water is contaminated with Fluoride. The district economy is primarily agriculture with only small scale industries. Big industries like thermal power plant are also located in Birbhum. Its forest	• Almost in every year the district is affected by flood in major areas of Khanakul - II, Khanakul - I, Arambagh Sub-division & Tarakeswar & Balagarh Blocks under Chandernagore & Sadar Sub-division. Specially Khanakul - I & Khanakul – II remain water logged for a long days due to heavy rainfall as well as due to discharge of DVC water	• The district has no key environmental issues. Other than industrial emission impact natural hazards from drought and flood is common. Since sea coast exist in this district erosion is always an environment issue. Its forest covers is limited to 83 sq km against total area of the	• The district has no key environmental issues. The environmental issue are localised and may be associated with development of Industries. The western part of the district, chiefly Asansol, is rich in coal and other mineral resources.	• One of the major environmental issue of the district is presence of Arsenic in ground water

S. No.	Parameters	Siliguri MP	Birbhum	Hooghly	Purba Medinipore	Burdwan	Nadia
		mixed traffic, usually paratransits and personalized two/four wheelers, slow moving vans, dense urban corridors and existence of busy commercial set ups along major roads. The rapid motorization and increasing level of economic status of the city dwellers has put immense pressure on transportation system of the town resulting in high level of congestion and fatalities. • Only 13% of the area covered under forest	covers is limited to 159 sq km against total area of the district as 4545 sq. km i.e. only 3.5 %	through Damodar, Mundeswari, Darakeswar rivers only for their low topography. This miserable flood situation in this district causes ample miseries to the local people increasing the death toll of both human being as well as animal population every year.	district as 4295 sq. km. (i.e only 1.93%)	This part is highly industrialised and contains various factories based on iron and steel proc essing, as well as many cement factorie s. Durgapur, Burnpur, and Kulti are in the western part of the district. It also contains power plants at Durgapur and Dishergarh. • It is reported that Purbasthali I & II Blocks of Burdwan District contains Arsenic above the permissible limit. Its forest covers is limited to 277 sq km against total area of the district as 7024 sq. km. (i.e only 3.94 %)	

Source: District Handbook, District Human Development Report, Central Ground Water Authority Report and other District/Govt., India Meteorological Department website, West Bengal: a study in urban geography, Z.T. Khan, Northern Book Centre, Delhi, 1994, pp. 221, District website of all districts, Wikipedia, State Forest Report, Govt. of West Bengal (2014)

B. Physical Environment

1. Meteorology and Climate

49. The climate of the West Bengal state, except the Himalayan and sub-Himalayan region in the northern part of the state has a tropical climate. The tropic of cancer passes through the middle Burdwan districts and northern parts of Bankura district

50. **Temperature:** The minimum annual temperature in the northern districts (Himalayan foot hill region) varies from freezing point to 17°C and over 18°C in other parts of the state. The annual mean maximum temperature ranges from 28°C in the Himalayan region to 33°C in the plains. In certain parts of the state, occasionally the mean maximum temperature can rise up to 43°C.

51. **Rainfall:** The average rainfall in the State is 1750 mm. In the Himalayan Region i.e in northern part the average rainfall ranges from 2500 - 6000 mm. In the southern part average rainfall ranges from 1125 - 1900 mm.

52. **Relative Humidity:** Normally, May to October months are humid and January to April are dry. The relative humidity (expressed in percentage) is more in northern and southern part of State as compared to western and eastern parts of the state. The maximum relative humidity ranges from 75 to 95% in morning hours and 50 to 65% in the evening hours.

2. Ambient Air Quality

53. 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 & small scale industries existing in the area. These were located in open rural area and operate only for few months. As such, the ambient air quality for major pollutants like SO_2, RSPM and NO_X is expected to be within the limits. However, in absence of any existing data on ambient air quality levels of the project area, secondary sources were referred.

Table 7: Ambient Air Quality during 2012

Area Classification	SO_2 ($\mu g/m^3$)	NO_2 ($\mu g/m^3$)	RSPM ($\mu g/m^3$)
Industrial (maximum observed value)	22	80	207
Residential (maximum observed value)	12	73	117
National Ambient Air Quality Standards for Industrial and Residential Areas	80	80	100

Source: National Ambient Air Quality Monitoring Series- Status and Trends in India, 2012, CPCB, MoEF

54. The above Table reveals that the concentration of all the pollutants is higher in industrial areas especially respirable suspended particulate matter. The levels of sulphur dioxide and nitrogen dioxide are largely within the limits (NAAQS) except few reading of NOx. The higher particulate matter levels are attributed to the vehicular movement on unpaved roads and the loose dust in the agricultural fields that lead to formation of dust clouds over short periods. The same can be concluded from Table 8 which provides a comparison of the air quality at different locations. All the locations are within the urban environment with industrial contribution at few of them.

Table 8: Ambient Air Quality Status of West Bengal in 2010-11

City	Location	Type of Area	SO_2 ($\mu g/m^3$)	NOx ($\mu g/m^3$)	RSPM ($\mu g/m^3$)
			2010	2010	2010
Asansol (Burdwan Dist.)	Asansol MC	I	8	68	132
Durgpur (Burdwan dist.)	Dew India	I	9	73	207
	Kwality Hotel	I	8	69	136
	PCBL club	R	7	60	90
Haldia (Purba Medinipore dist.)	Super Market	I	13	50	47
	WBIIDC	I	15	53	60
Howrah	Bandhaghat	I	15	85	127
	Howrah MC	I	12	80	127
	Bator	R	9	63	102
	Naskarpara	R	12	73	117
Kolkata	Behala chowrasta	I	9	72	98
	Cossipore police station	I	22	65	142
	Dunlop bridge	I	8	67	100
	Balshanbghata	R	6	52	77
National Ambient Air Quality Standards	Industrial Area (I) & Residential Area (R) (24 hourly average)		80	80	100

Source: National Ambient Air Quality Monitoring Series- Status and Trends in India, 2011, CPCB, MoEF
R – Residential and other areas,
I – Industrial area,

3. Noise

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

4. Physiography and Geology

56. The West Bengal state can be divided into four distinct physiographic divisions (Figure 3) as under:

- Hilly Districts like Darjeeling, Jalpaiguri and Coochbehar in Himalayan region
- Central part of the state like, Murshidabad is mainly being alluvial plains.
- Districts like Bardhaman, Birbhum and Bankura districts forming a fringe of western plateau.
- Lower Gangetic plain of North 24 Parganas, Hooghly, Nadia districts forming the part of deltaic zone

57. Detail of physiographic characteristics in three distinct regions which cover 16 sample roads of 6 districts is elaborated in Table 9**.**

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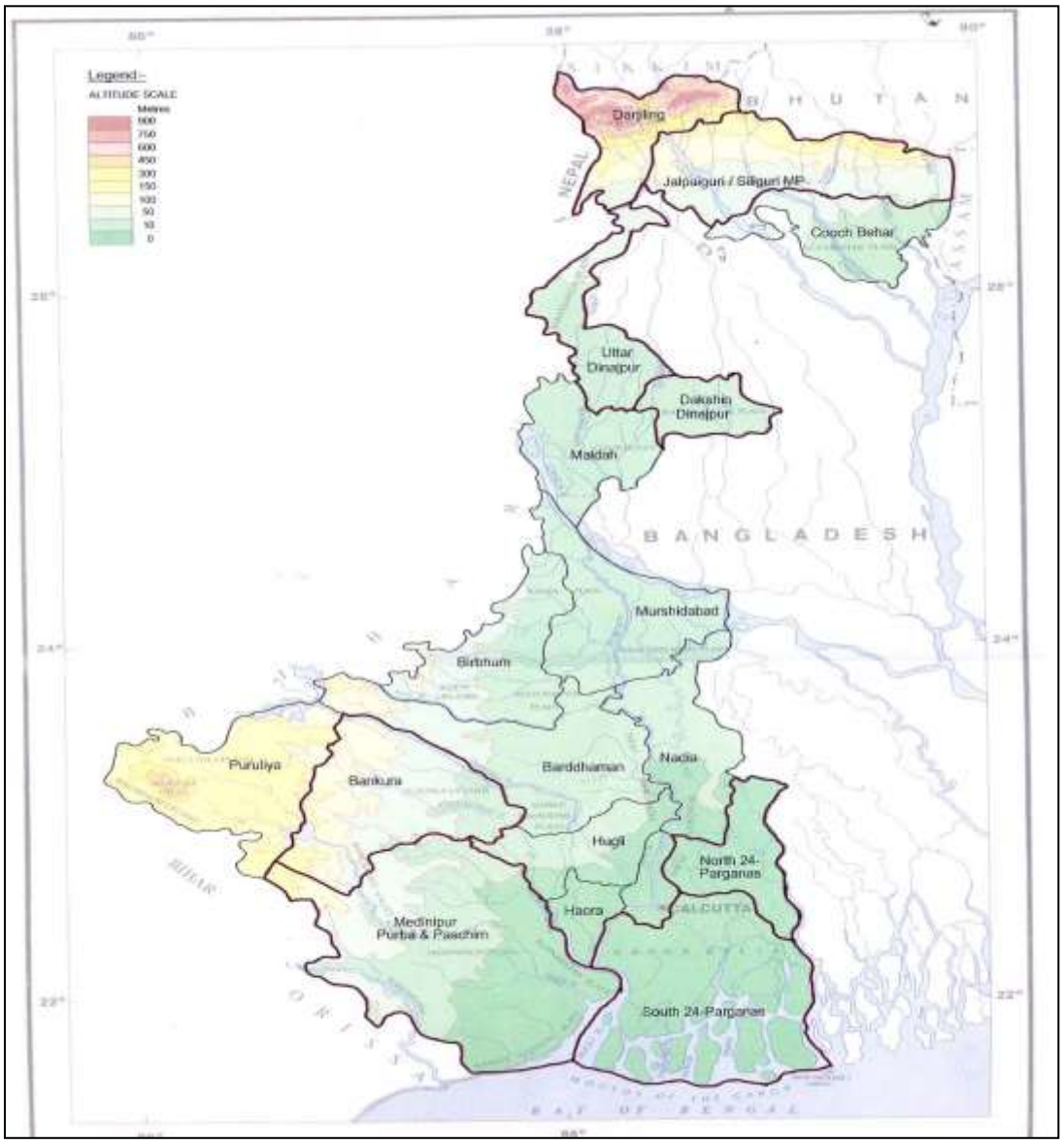


Figure 3: Physiography Map of Project Districts –West Bengal

Table 9: Physiographic Characteristics of different districts

Districts	Physiographic Characteristics
Drjeeling including **Siliguri MP**, Jalpaiguri, Coochbehar, Uttar Dinajpur	In Darjeeling and Jalpaiguri Districts, Pre-Cambrian is represented by the Darjeeling Gneiss, Lingtse Gneiss and Daling group of rocks. Apart from the Precambrian formations, there exist some sedimentary rocks of the Gondwana period and also of Siwalik formations of the late Tertiary period. A belt of alluvial detritus of Tertiary age occurs in the Terai region of the northern part of Jalpaiguri, Coochbehar and Darjeeling districts. This area consists of alluvium terrain underlain by lithified soft Quaternary Formation comprising sand, silt and clay with fine texture. Flood plain deposits are noticed in and around the meander belt of different rivers.
Burdwan, Bankura, **Birbhum,** Purulia and West Medinipur	This region with its varied tectonic elements and riverine features is a transitional zone between the Jharkhand plateau which constitutes a portion of peninsular shield in the west and Ganga-Brahamaputra alluvial plain in the north and east. In general the Jharkhand plateau consists of the meta-sedimentary rocks of precambrian age, Gondwana sedimentary rocks, Rajmahal basalts and upper tertiary sediments. Laterite has developed on these older rocks as well as on early Quaternary sediments. Towards south, the alluvial plain merges with Damodar-Kasain-Subarnarekha deltaic plains. The western half of the district resembles a promontory jutting out from the hill ranges of Chotonagpur plateau and consists of barren, rocky and rolling country with a laterite soil rising into rocky hillocks, the highest being 227 m. These diversify the otherwise monotonous landscape and lend a special charm to the skyline around Asansol subdivision. In Purulia district due to undulated topography nearly 50% of the rainfall flows away as runoff. The district is covered by mostly residual soil formed by weathering of bed rocks.
South 24 Parganas, North 24 Parganas, Howrah, **Hooghl**y, **Purba Medinipur, Nadia** and Sundarban	The physiography of the region is that of a typical alluvial plain with gentle ups and downs. The terrain is essentially composed of soft river borne sediments deposited under fluviatile environment. The general slope is from north west to south east. As the area is situated very near to the out fall, the dominant slope of the land is towards south with average elevation varying from 3.5 m to 2.5 m above MSL. The region is criss-crossed by a network of small streams and rivulets without falls either at river Hooghly or Haldi. Since these rivers are connected to the sea, the channels suffer daily fluctuations in water level due to tidal influence. Hence, estuarine conditions prevail here with problems of salinity and coastal hazards especially along the banks and river fronts.

58. The Gondwana rocks show extensive development in the Burdwan district and extend into adjoining parts of Bankura and Puruliya districts and also occur as small basins in Birbhum district. The Gondwanas rest unconformably over the Precambrians. Subsequently the rocks have suffered a series of block faulting. The coalfield has a faulted contact with the Precambrians. A boulder bed, at the base of the sequence is considered to be of glacial origin. A thick series of shale and sandstones with inter-calatines of a number of coal seams overlie the boulder bed. Coal seams are mainly confined to Barakar and Raniganj formations. The Gondwana rocks are intruded by dykes and sills of dolomite, mica-peridotite and amprodite.

59. North 24 Parganas, Nadia, Hooghly district is underlain by Quaternary sediments consisting of clay, silt and various grades of sand gravel and pebble. No hard rock geological formation is found here. Lithological log indicates the presence of a clay bed at the top of the geological succession with thickness varying from 10-40 m. Alternate clay and sand bed exists further in the downward direction. A group of granular aquifer is found between 250-650 m below ground level. The geological map of West Bengal is shown at Figure 4.

Figure 4: Geological Map of West Bengal

5. Soils

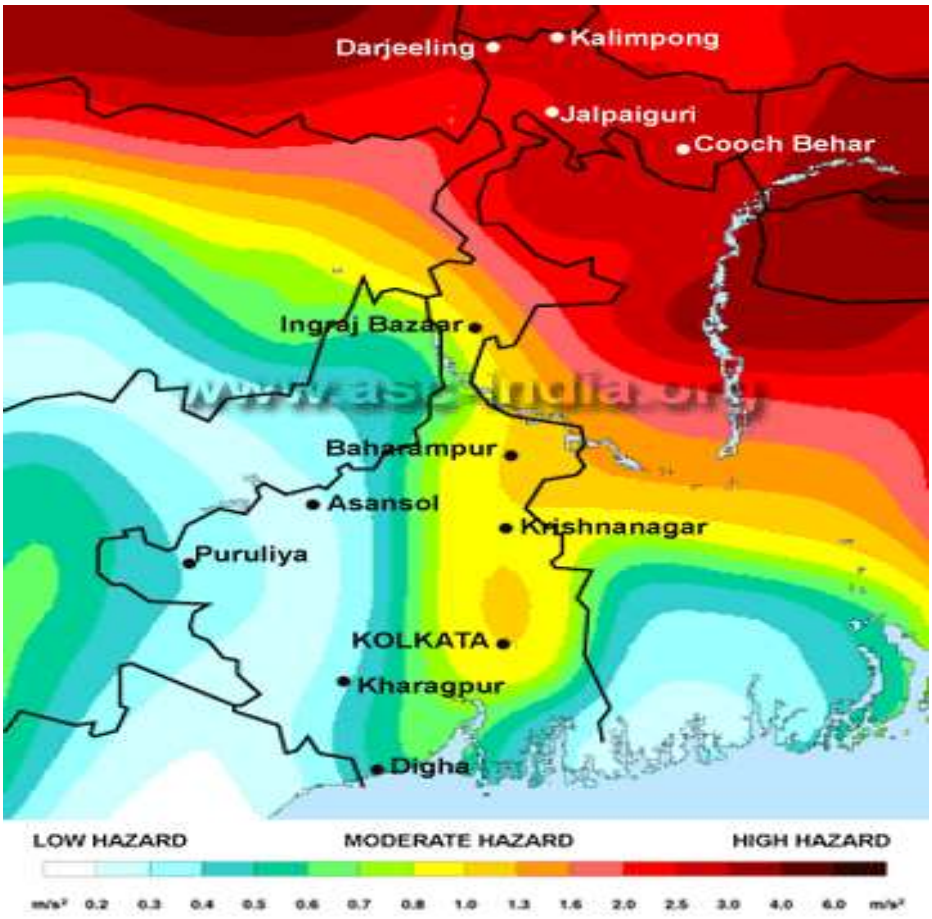
60. The major soil types within West Bengal can be classified into five groups namely ultisols, entisols, aridisols, mollisols and alfisols. These soil types can be further classified into several sub groups. The ultisols is sub-classified into brown, red, yellow and laterite soils. The entisols is sub-classified into younger alluvial, coastal alluvial and bhabar soils. The aridisols is sub-classified into saline and saline alkali soils. The mollisols is sub-classified into Tarai soils and mountain meadow soils. The alfisols is sub-classified into deltaic alluvial soils, older alluvial soils, red gravel soils, red sandy soils, and red loamy and mixed red black soils.

Table 10: The soil pattern in the state

Agro climatic Zone (District wise)	Soil type
Entire North Bengal (Darjeeling, Jalpaigur, **Siliguri** & Cooch Behar)	Acidic
Gangetic alluvium (N&S Dinajpur, Murshidabad, Malda, **Nadia, Hugli**, Haora, **Birbhum** , N & S 24 Parganas)	Alluvial
Vindhyan family soil (**Barddhaman**, Murshidabad, Medinipur (W), Haora, Birbhum & West Dinajpur)	Alluvial
Lateritic Red Soil (**Birbhum, Burdwan**, **Medinipur**, Bankura, Puruliya, Malda, North & South Dinajpur)	Alluvial
Coastal Soil (South 24 Parganas, North 24 Parganas and **East Medinipur**)	Coastal Saline

6. Seismicity

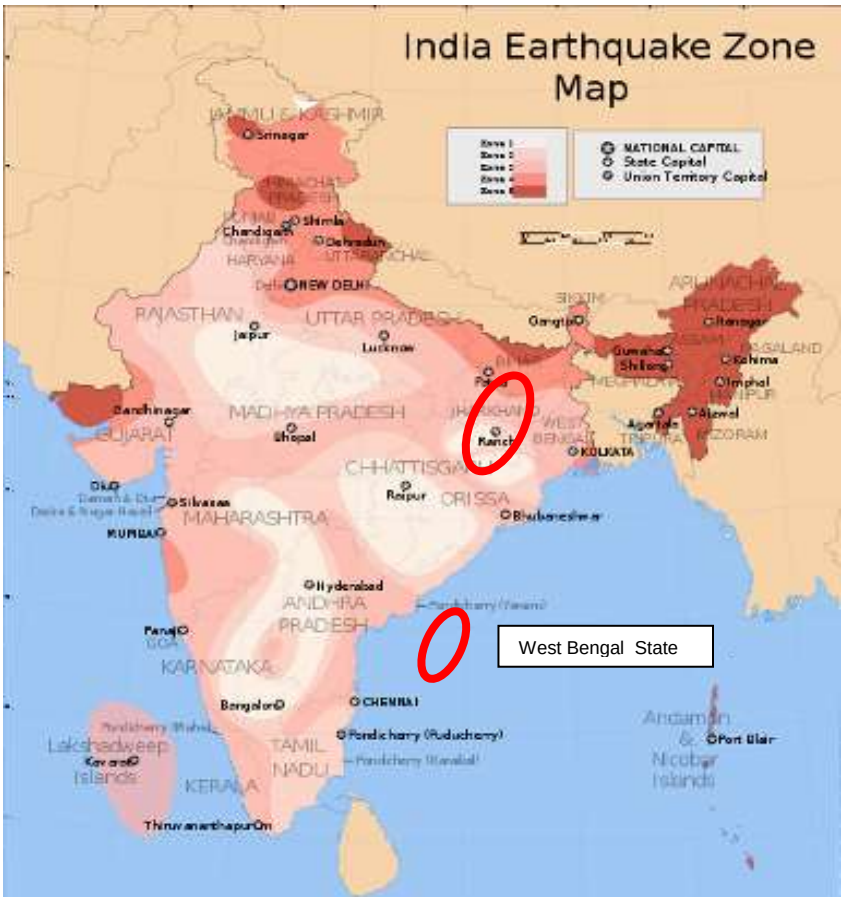
61. The seismic hazard map of India was updated by Bureau of Indian Standards (BIS) in 2000[3] . The main change was merging of Zones I & II. As per this map, western sections of the northern districts of Jalpaiguri, Siliguri and Coochbehar lie in Zone V (high seismicity). The remaining parts of these two districts and other districts (Darjeeling, Uttar Dinajpur**,** Dakshin Dinajpur, Maldah**,** and South 24 Parganas) lie in Zone IV. The rest of the state including the city of Kolkata lies in Zone III. The Hazard and Seismic Zoning map is shown in Figure 5 and Figure 6 respectively.



Source: Amateur Seismic Centre, Pune

Figure 5: Hazard Zone Map

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



Source: IS 1893 (Part 1) 2002

Figure 6: Seismic Zone Map

7. Land use

62. The distribution of land utilization within the entire state broadly comprises of cultivable land, uncultivable land, forest land, waste land, urban area and industrial area. Land use pattern along the project road is mixed type dominated by agriculture, barren land, forest land and barren areas. Table 11 indicates the land use pattern of project districts.

Table 11: Utilization of Land in project Districts of West Bengal (In ha, 2010-11) (area in ha)

Sr. No.	District	Area according to village papers	Area under forest	Area under non Agricultural use	Barren & unculturable land	Land under Misc. Tree groves not include in net area sown	Cultu rable waste land	Fallow land other than current fallow	Current fallows	Net area sown
1	Birbhum	451118	15853	101191	281	824	2815	2696	7331	319956
2	Burdwan	698762	21165	211566	858	1986	4876	1237	4352	452462
3	Hooghly	313379	530	96526	89	1588	1518	119	594	212407
4	Nadia	390655	1216	90220	54	3729	631	113	4181	290447
5	Purba Medinipur	396594	899	102236	689	2149	296	237	1856	288052

Sr. No.	District	Area according to village papers	Area under forest	Area under non Agricultural use	Barren & unculturable land	Land under Misc. Tree groves not include in net area sown	Culturable waste land	Fallow land other than current fallow	Current fallows	Net area sown
6	Darjeeling (Siliguri MP within Darjeeling)	325469	124575	40527	2465	2350	1487	3216	16437	133582

Source: Economic Review, Govt. of West Bengal: 2013

8. Hydro-geology and Hydrology

63. **Hydro-geology**: Based on the geological and geomorphological set up, characteristics of the aquifers and chemical character of ground water the State can be divided into two broad units.

- **Fissured Formations:** Ground water occurs in these formations in the upper weathered mantle (thickness 5-10m) and at deeper levels (60-100m depth) in the fractures, fissures and joints where limited quantities of ground water (less than 20m^3/hr) may be available from bore wells and large dia dug wells.
- **Porous Formations:** Ground water occurs in this formation both under water table and confined condition. In Nadia, Murshidabad (except Kandi Sub-division) districts down to 150m there is absence of any significant clay beds making the entire aquifer upto 150m depth to occur under water table condition. In the Bhabar Zone (foothills of Himalayan trench) aquifers are having very deep water table and are characterised by high seasonal variation of water table to the tune of 10-12m. In this lateritic part occurring in parts of Birbhum, Burdwan, Bankura & Medinipur districts, individual aquifers being of limited thickness and discontinuous nature. The potentiality of this aquifer is very poor. By and large yield of the tube well (down to 100-400mbgl) varies from80-100m^3/hr.

64. Based on the yield prospects the State can be divided into three parts namely:

- Areas of prolific ground water resources (yield is more than 150m^3//hr) : Jalpaiguri, Coochbihar, **Medinipur**,N&S 24- Parganas districts
- Areas with moderate yield(yield between 50 - 150m^3hr) : Comprising part of Malda, Uttar & Dakshin Dinajpur, western part of Murshidabad, marginal tract of **Birbhum, Burdwan**, Bankura, **Nadia, Hooghly** and **Medinipur** districts.
- Areas with limited yield prospect (yield less than 50m^3hr) : Extreme marginal tracts of **Medinipur**, Bankura, Purulia

65. The sand zones occurring within the depth range of 127 to 290 m bgl are more pronounced and attain fairly good thickness (often 25 or more) and laterally extensive as well. These grayish micaceous sand beds which are fine to coarse grained in texture are very important from the point of ground water storage. The sand beds are separated generally by fairly persistent clayey layers. Below the depth of 290 m, the unconsolidated sediments are generally argillaceous and do not hold much scope for ground water development.

66. The ground water development in West Bengal is generally occurring through shallow tube wells (yield up to 30 cum per hour), medium tube wells (yield up to 100cum per hour) and

deep heavy tube wells (yield up to 200 cum per hour). The entire region has a very good potential for ground water development with estimated present ground water utilization at less than 50% of the available resources. The entire West Bengal falls under safe category as per Central Ground Water Board (CGWB) guidelines.

67. In the coastal tract of East Medinipur, S 24- Parganas, southern part of N 24- Parganas, Bidhannagar and some parts of Haora lying in the active delta of the Ganga --- the Bhagirathi river system ground water occurs under a characteristic hydrochemical situation in which fresh water group of aquifers occurs within span of 120-300m sandwitched between saline to brackish aquifers. Yield of the tube well varies from 100-150m^3//hr. Some of the hot springs (35-41^{0}C) from deep seated fractured zones of older rocks occurs around Bakreswar, Birbhum districts.

68. **Hydrology**: West Bengal State has three major river basins, namely Ganga, Brahmaputra and Subarnarekha. Among these, Ganga is the largest and covers almost 80% of the state, whereas the Brahmaputra basin covers about 15% of the area and Subarnarekha basin covers about 5% of the geographical area of the State.

69. The rural road construction proposals are normally cross small drainage channels, which eventually join the 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.

70. Several hand operated tube wells are seen along side of the existing tracks in many of the proposed road construction proposals. These tube wells are the main source of drinking water for rural communities in the region.

71. ***Flood Affected and Drought Prone areas***: The West Bengal has both chronically draught prone and flood affected areas within the state. The chronically drought prone area is, part of Bankura, Purulia district. Chronically flood affected areas are parts of North 24 parganas, Purba & Pashim Medinipore, Burdwan, Hooghly and Malda districts.

72. **Water Quality**: SPCB carries out the water quality monitoring in West Bengal. pH of groundwater is observed in the range of 7.1-8.37 and meets the water quality criteria. Conductivity varies from 589-1983 µmhos/cm and meeting the criteria for beneficial uses. BOD is observed in the range of 0.2-1.8mg/l. Arsenic contamination is also seen in certain part of state. Total Coliform varies from 2-1,600 MPN/100 ml and meeting the desired criteria at all the locations. The quality of surface water is generally good and can be used for drinking water with physio-chemical treatment.

C. Biological Environment

73. The west Bengal state owing to the varying altitude from the Himalayas to the coastal plains, the flora and fauna of the state is diverse. As on 2011 forests make up more than 27% of the geographical area of West Bengal, which is higher than the national average of 23%. Total recorded forest land in the state is 11,879 sq.km, of which 7,054 sq.km is Reserved Forest, 3,772 sq.km. is Protected Forest and 1,053 sq.km is Unclassified State Forest, thus constituting 13.38% of the geographical area of the state. Part of the world's largest mangrove forest Sundarbans is located in southern West Bengal.

1. Terrestrial flora

74. During the field investigations, the most dominant terrestrial flora within the project districts was recorded. The dominant flora comprised generally the trees planted along side of the rural road proposals, particularly the stretches along agricultural lands. Many of these are planted by the adjacent landowners and often perceived, as a fence to their respective lands. Hence the habitat type is mainly modified habitat in accordance with the ADB SPS. The common trees observed alongside of the road projects are presented in Table 12.

Table 12: List of common plant species available in the study area

S.No.	Botanical Name	Local Name
1.	*Acacia auriculiformis*	Akashmani
2.	*Acacia catechu*	Khair
3.	*Acacia mangium*	Akashpradip
4.	*Ailanthus grandis*	Gokul
5.	*Anthocephalus kadamba*	Kadam
6.	*Artocarpus chaplasha*	Lator
7.	*Bischofia javanica*	Kainjal
8.	*Bombax ceiba*	Simul
9.	*Casaurina equisetifolia*	Jhau
10.	*Casaurina intertropica*	Jhau
11.	*Chukrasia tabularis*	Chikrassi
12.	*Cordia alleodora*	Bohori
13.	*Dalbergia sissoo*	Sissoo
14.	*Dipterocarpus macrocarpus*	Garjan
15.	*Duabanga sonneritiodes*	Lampate
16.	*Eucalyptus camaldulensis*	Eucalyptus
17.	*Eucalyptus citriodora*	Eucalyptus
18.	*Eucalyptus hybrida*	Eucalyptus
19.	*Eucalyptus tereticornis*	Eucalyptus
20.	*Gmelina arborea*	Gamar
21.	*Lagerostroemia microcarpa*	Benteak
22.	*Lagerostroemia parviflora*	Sidha
23.	*Lagerostroemia speciosa*	Jarul
24.	*Leucaena leucocephala*	Subabool
25.	*Madhuca latifolia*	Mahua
26.	*Michelia champaca*	Champ
27.	*Schima wallichii*	Chilouni
28.	*Shorea robusta*	Sal
29.	*Tectona grandis*	Teak
30.	*Terminalia arjuna*	Arjun
31.	*Terminalia myriocarpa*	Panisaj
32.	*Terminalia tomentosa*	Pacasaj
33.	*Xylia dolabriformis*	Lohakat
34.	*Ziziphus mauritiana*	Narkeli

75. None of the road stretches passes through any reserved and protected forest land/area. No sample road passes through the designated forest area. The tree density within ROW of sample road project alignment is about 2-3 trees per Km.

2. Wild Life and Protected Areas

76. West Bengal has 5 National Parks and 15 Wild life sanctuaries spread over an area of 2754.39 Sq. Km (Figure 7). There is no wildlife Sanctuaries/National Parks, Tiger Reserves etc. along the sample project road area.

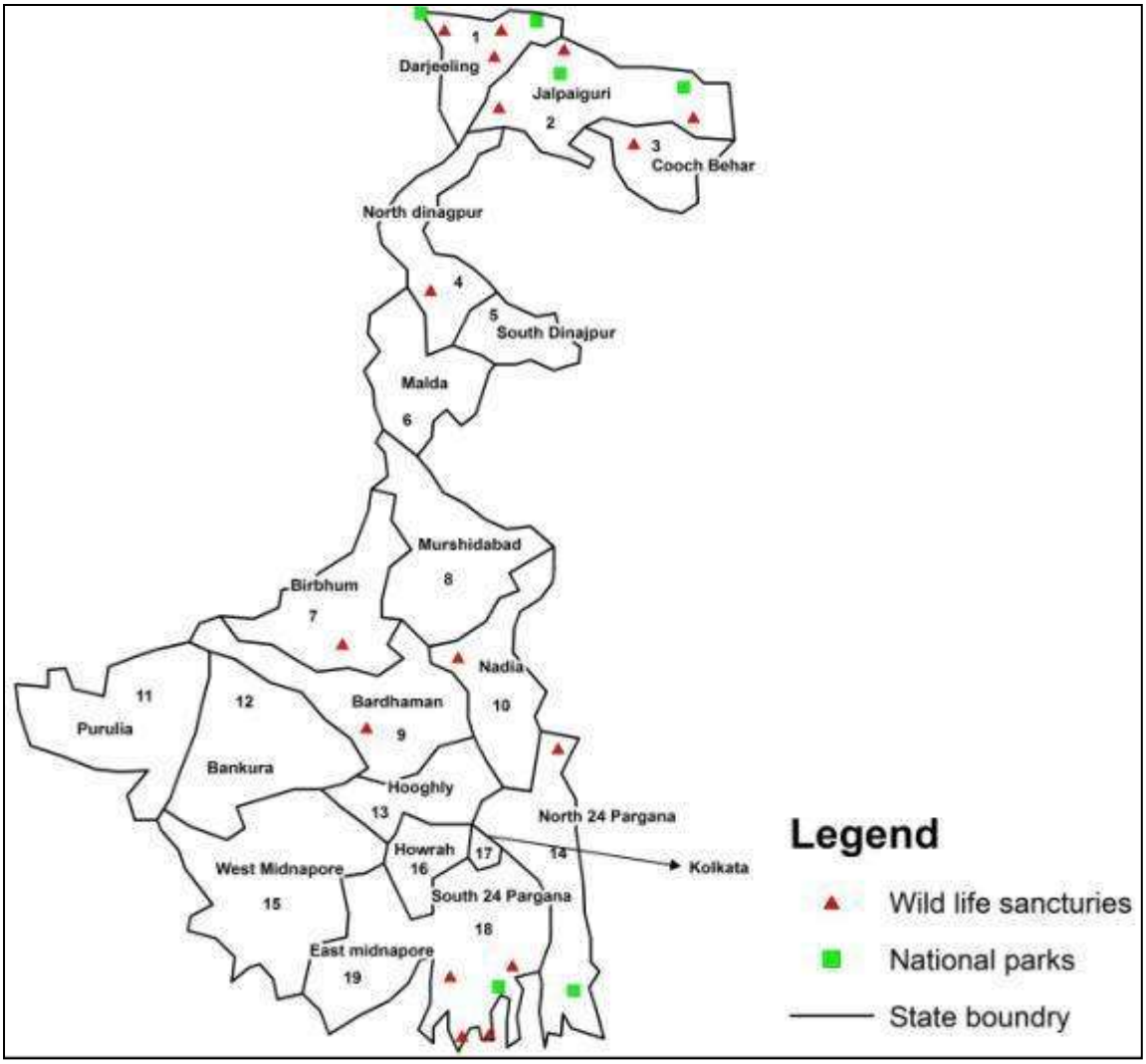


Figure 7: Protected Areas of West Bengal

77. Table 13 provides details of National park and Sanctuaries corresponding to serial Number indicated at Figure 7 above.

Table 13: List of Protected Areas in West Bengal

No. Corresponding to legend given in Fig 3.5	Name	Area (km^2)	District	Fauna
National Parks				
2	Buxa NP	117.1	Jalpaiguri	Asian Elephant, Tiger, Gaur, Wild boar, Sambar
2	Gorumara NP	79.45	Jalpaiguri	Tiger, Gaur, Wild boar, Sambar
1	Neora Valley NP	88	**Siliguri** (Darjeeling)	clouded leopard, red panda, musk deer, black bear, sloth bear, golden cat, wild boar, leopard cat, goral, serow, barking deer, sambar, Himalayan flying squirrel, Rufous-throated Partridge, Satyr Tragopan, Crimson-

No. Corresponding to legend given in Fig 3.5	Name	Area (km^2)	District	Fauna
				breasted Woodpecker, Darjeeling Woodpecker, Bay Woodpecker, Golden-throated Barbet, Hodgson's Hawk Cuckoo,
1	Singhalila NP	78.6	**Siliguri** (Darjeeling)	Red Panda, Leopard Cat, Barking Deer, Yellow-throated Marten, Wild Boar, Pangolin, Himalayan Black Bear, Leopard, Clouded Leopard, Serow and Takin. Tigers, Scarlet Minivet, Kalij Pheasant, Blood Pheasant, Satyr Tragopan
14,18	**Sunderbans NP**	1330.1	North & South 24-Paraganas	Royal Bengal Tiger; Fishing Cats, Macaques, Wild Boar, Common Grey Mongoose, Fox, Jungle Cat, Flying Fox, Pangolin, Chital
Wildlife Sanctuaries				
7	Ballavpur WLS	2	**Birbhum**	Blackbuck and Spotted deer, jackals, foxes and a variety of water birds
10	Bethuadahari WLS	0.67	**Nadia**	Spotted deer, Jackal, Bengal fox, Porcupine, Common Langur, Parakeets, Indian Cuckoo, Barbets Barbets and other smaller birds and pythons
14	Bibhutibhusan WLS	0.64	North 24-Paraganas	spotted deer and the sanctuary is also rich in common birds
2	Buxa WLS	251.89	Jalpaiguri	Asian Elephant, Tiger, Gaur, Wild boar, Sambar
2	Chapramari WLS	9.49	Jalpaiguri	Royal Bengal Tiger, elephant, varieties of deer, reptiles and other animals
18	Haliday Island WLS	5.95	South 24-Paraganas	wild boar, barking and spotted deer, and rhesus monkeys
2,3	Jaldapara WLS	216.51	Jalpaiguri & Cooch Behar	Royal Bengal Tigers, elephants, deers, sambhar, barking deer, spotted deer and hog deer, wild pig, bisons
1	Jorepokhri WLS	0.04	**Darjeeling**	Himalayan Salamander (Tylototriton verrucosus), locally known as 'Gora'
18	Lothian Island WLS	38	South 24-Paraganas	smaller birds, specially Paradise Flycatcher,
1	Mahananda WLS	127.22	**Darjeeling**	Royal Bengal Tiger, Indian elephants, Indian bison, chital (spotted deer), barking deer, sambar, Rhesus monkey
18	Narendrapur WLS	0.1	South 24-Paraganas	smaller birds, specially Paradise Flycatcher, Oriole
4	Raiganj WLS	1.3	North	Asian openbill, open-bill storks,

No. Corresponding to legend given in Fig 3.5	Name	Area (km^2)	District	Fauna
			Dinajpur	egrets, night herons and cormorants, kites, flycatchers, owls, kingfishers, woodpeckers, drongoes
9	Ramnabagan WLS	0.14	**Burdwan**	Spotted deer and Common Langur. Black Buck
18	Sajnekhali WLS	362.4	South 24-Paraganas	spotted deer, Rhesus Macaques, wild boar, tigers, Water Monitor Lizards, Fishing Cats, otters, crocodiles, Batagur Terrapins, and migratory birds
1	Senchal WLS	38.88	**Darjeeling**	barking deer, wild pig, himalayan black bear, leopard, jungle cat, common rhesus monkey, Assam macaque, Himalayan flying squirrel, etc.

78. Fauna of the districts comprise leopard, wolf, hyaena, jackal and other smaller species, but hyaenas and leopards are not common. Wolves are scarce, and are mostly found in the jungles north of Kanksa. Wild pigs and monkeys are numerous throughout the districts. In the hilly areas, poisonous snakes (several kinds of cobra, the karait and the deadly Russell's viper) and species of harmless grass snakes are very common. Python is also found but very occasionally.

79. The common avifauna of the districts are pea-fowl, jungle-fowl, jungle crow, house crow, treepie, common babbler, common jora, gold-fronted chloropsis, red-vented babul, red-whiskered bulbul, red spotted bluethroat, brown-backed robin, Shama, Tickell's blue flycatcher, paradise flycatcher, wood shrike, black drongo, tailor bird, streaked fantail warbler, golden oriole, common mayna, pied mayna, white-backed munia, white-throated munia, spitted munia, red munia, yellow-throated sparrow, house sparrow, woodpecker, India cuckoo, pied crested cuckoo, koel, parakeet, nilkantha, bee-eater, kingfisher, hornbill, hoopoe, horned owl, spotted owlet, jungle owlet, griffon vulture, long-billed vulture, scavenger vulture, lagger falcon, small spotted eagle, brahminy kite, pariah kite, sparrow hawk, various types of pigeon and dove, goose, duck, teal, lapwing, white necked stork and several varieties of egret and heron. The low-lying swampy areas of Burdwan being in line of migration provide a very good sheltering place for the migratory birds in winter.

3. Aquatic Biology

80. No wetland or large water body falls within the sample roads. Fisheries activities are quite common in subproject areas.

D. Socio-Economic Environment

1. Demography

81. It is a state with several unique features, such as abundant natural resources, rich biodiversity, and rich cultural diversity. The population of about 90 million is largely rural (73%). Tribal constitute about 5.8% of the population, and scheduled castes form about 28.6%. The welfare and development of tribal is an important focus area for the state government. The

gender ratio of the state is higher than the national average. Table 14 shows the demographic profile of the project districts.

Table 14: Demographic Profile of the Project Districts

Sl. No.	District	Area Sq.Km.	Population 2011			Population Density/ Sq. Km.	
			P	M	F	2001	2011
West Bengal		**88,752**	**91347736**	**46927389**	**44420347**	**903**	**1029**
1	Bibhum	4,545	3502387	1791017	1711370	663	771
2	Hooghly	3,149	5520389	2819100	2701289	1601	1753
3	Nadia	3,927	5168488	2655056	2513432	1173	1316
4	Purba Medinipore	4,736	5094238	2631094	2463144	933	1076
5	Burdwan	7,024	7723663	3975356	3748307	982	1100
6	Darjeeling (Siliguri)	3,149	1842034	934796	907238	511	585

P- Total, M- Male, F- Female, *Source: Census, 2011*

2. Healthcare

82. The healthcare system in the state is well establish and is undergoing for further upgradation through public private partnership. West Bengal's network of healthcare facilities comprises 433 Governmental & non-Governmental hospitals. West Bengal has established some of the most modern & extremely well equipped healthcare facilities such as Apollo Gleneagles Hospital, AMRI –Apollo & BM Birla Heart Research Centre.

3. Literacy and Education

83. The state has made considerable progress in the literacy level of the state. The literacy rate of the state is almost the same as national average. Table 15 shows human development indicators of West Bengal. The gross enrolment ratios for boys and girls are higher than the all-India average. The number of primary schools per 100 thousand population is above the average all-India level. Table 16 shows the literacy rate of project districts of West Bengal

Table 15: Human Development Indicators of West Bengal

Indicators		Year	Unit	West Bengal	All India
Infant Mortality Rate		2002	Per'000 live birth	40	63
Life Expectancy at Birth	Male	2003	Years	65	63.87
	Female	2003	Years	69	66.91
Death Rate		2002	Per '000 pop.	6.6	8.1
Gross Enrolment Ratio (Classes I-IV)	Boys	2002-03	Per cent	98.60	97.53
	Girls	2002-03	Per cent	85.60	93.07
	Total	2002-03	Per cent	92.20	95.39
Primary School		2002-03	Per Lakh Pop.	50.25	63.42

Source: Census of India

Table 16: Literacy Rate of project districts

District	Literates 2011	Literates 2001	Literacy Rate (%) Excluding 0-6 age group) 2011	Literacy Rate (%) (Excluding 0-6 age group) 2001
West Bengal	**62614556**	**47196401**	**77.08**	**68.64**
Bibhum	2175923	1553852	70.90	61.48
Hooghly	4140487	3333988	82.55	75.11

District	Literates 2011	Literates 2001	Literacy Rate (%) Excluding 0-6 age group) 2011	Literacy Rate (%) (Excluding 0-6 age group) 2001
Nadia	3524073	2644461	75.58	66.14
Purba Medinipore	3969750	3037106	87.66	80.16
Burdwan	5350197	4205146	77.15	70.18
Darjeeling	1328218	1008288	79.92	71.79

Source: Census, 2011

4. Affluence

84. The percentage of population below the poverty is high at 32%. On an average, the level of affluence of a household in West Bengal is lower than that of a household in the rest of the country (Table 17). In both rural and urban areas of West Bengal, the proportion of households having access to safe drinking water is also less compared to the all-India scenario.

Table 17: Indicators of Affluence

Indicators		Year	Unit	West Bengal	All India
HH in houses with concrete roof		2001	Per cent	2.1	19.8
HH with drinking water in premises		2001	Per cent	32.1	39.0
HH with open drainage for waste water		2001	Per cent	23.4	33.9
HH having access to safe	Rural	2001	Per cent	36.2	73.2
Drinking water	Urban	2001	Per cent	58.8	90.0
	Total	2001	Per cent	47	77.9

Source: Census data 2001

5. Economy

85. Agriculture is the leading occupation in West Bengal. Rice is the state's principal food crop. Other food crops are pulses, oil seeds, wheat, tobacco, sugarcane and potatoes. Jute is the main cash crop of the region. Tea is also produced commercially; the region is well known for Darjeeling and other high quality teas. However, the service sector is the largest contributor to the gross domestic product of the state, contributing 51% of the state domestic product compared to 27% from agriculture and 22% from industry.

86. Manufacturing industries playing an important economic role are engineering products, electronics, electrical equipment, cables, steel, leather, textiles, jewellery, frigates, automobiles, railway coaches, and wagons. The Durgapur centre has established a number of industries in the areas of tea, sugar, chemicals and fertilizers. Natural resources like tea and jute in and nearby parts has made West Bengal a major centre for the jute and tea industries.

6. Agriculture

87. West Bengal is nearly three percent of the nation's cultivable land. It produces more than eight per cent of the food of the country. The agricultural sector is characterized by the predominance of small and marginal farmers. The average size of holding here is also less than one hectare.

7. Mineral Resources

88. West Bengal stands third in the country in terms of mineral production. The state contributes about one-fifth to the total production of minerals in the country. Coal constitutes 99% of the minerals extracted in West Bengal; fireclay, china clay, limestone, copper, iron, wolfram, manganese and dolomite are mined in small quantities. There are good possibilities of obtaining mineral oil and natural gas in the areas near the Bay of Bengal, in Purba Medinipur, Sundarbans, South 24 Parganas and North Bengal plains. Research is undergoing for finding natural gas in various places.

89. West Bengal is the third largest state for coal production, accounting for about half of India's total. Coal is extracted from about 228 mines in the Raniganj and Asansol region of Burdwan district. High garde bituminous coal is mined at Raniganj, Dishergarh, Santaldih, Kulti, Barakar, Ghushik, Kajora. Coalfields stretch over an area of about 1,550 km^2 (598 sq mi). The coalfields of Raniganj support the Asansol-Durgapur industrial belt by providing fuel to the industries as well as generation of thermal power. Lignite mined in Darjeeling is used to make briquettes. Coal deposits are also found along the Ajoy river in Birbhum district.

90. West Bengal ranks next to Bihar and Madhya Pradesh in production of fireclay. Most of this mineral is extracted in the Raniganj region along with few amount is also extracted from Birbhum and Purulia. China clay used in the pottery, paper, textile, rubber and paint industries are unearthed a tMohammad Bazar in Birbhum and Mejia in Bankura. Rest of the production comes from Purulia, Burdwan, Darjeeling and Jalpaiguri.

91. Limestone which is used in cement industry is mined in Bankura, Purulia, Darjeeling and Jalpaiguri There are copper mines in Jalpaiguri and Darjeeling. Small quantities of low quality iron-ore are mined in Bardhaman, Purulia, Birbhum and Darjeeling There are manganese in the Jhargram region of Paschim Medinipur, Purulia and Burdwan. Wolfram is mined at Jhilimili in Bankura. The state's production of dolomite comes from the Dooars region of Jalpaiguri.

92. No sample roads are located near mines.

8. Physical Infrastructure

93. West Bengal has well-developed road and rail network. As of 2012, the total length of surface road in West Bengal is over 92,023 km (57,180 mi); national highways comprise 2,578 km (1,602 mi) and state highways 2,393 km (1,487 mi). As of 2006, the road density of the state is 103.69 km per 100 km² (166.92 mi per 100 sq mi), higher than the national average of 74.7 km per 100 km² (120 mi per 100 sq mi). Average speed on state highways varies between 40–50 km/h (25–31 mi/h); in villages and towns, speeds are as low as 20–25 km/h (12–16 mi/h) due to the substandard quality of road constructions and low maintenance. As of 2012, the total railway route length is around 4,481 km (2,784 mi). Table 18 shows physical infrastructure of the state.

Table 18: Physical Infrastructure

Indicators	Year	Unit	West Bengal	All India
Road Density	2006	Per '00 sq.km.	103.69	74.7
Railway route length	2001	Per'000 sq. km.	3.68	19.17
Village electrification	2004	Per cent	83.6	83.8
HH with electricity for lighting	2001	Per cent	24.34	55.8
No. of post offices	2002	Per Lakh Pop.	204	15.08
Tele density	2003	Per '00 Pop.	6.96	6.6

94. ***Power:*** The percentage of villages electrified is about 87% in the entire state. However, the percentage of households with electricity is only 27%. West Bengal has been a pioneer in power development over the years. NASSCOM-Gartner ranks West Bengal's power infrastructure as the best in the country. There has been an installed capacity of 9629.9 MW in the State in 2011.

9. Religious and Cultural festivals

95. The festivals of West Bengal embody the robust and composite cultural heritage of India. Various communities of the Indian subcontinent celebrate as many as forty festivals with complete communal concordance. The most important festivals of West Bengal are Durga Puja, Sarasvati Puja, Kali Puja and Dol Purnima.

96. There are few temples, mosque located along the project roads. Some of these may need to be shifted.

E. Salient Environmental Features of Sample Roads

97. The salient environmental features of sample roads are summarized in Table 19 below:

Table 19: Salient Environmental Features of Sample Roads

District	Block	Road Name (length)	Salient Environmental Features
Birbhum	Mayuresweri – I	Dakshingram to Saithia Rampurhat road at Battala via Ratma Sibgram (4.821 km)	• Topography is plain • Inhabited areas of the small villages namely, Dakshingram, Ratma, Sibgram, exists near Ch (0m – 745m), (1176m – 2037m), (3480m – 3984m) in scattered manner respectively beside the alignment. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed road alignment • There are 33 Nos. of trees are located within 10m on either side of the alignment. 4 nos. need to be cut • Few utility structures (102 nos.) within 10m on either side of the alignment, few (6 nos.) of them needs shifting • There are 21 nos. of community structures (School, Religious place, Health Centre, etc.) within 10m on either side of the alignment. Few of them need to be shifted or alignment to be adjusted • Project road passes mainly through agricultural land
Birbhum	Mayuresweri – II	Barutia to Chottorigram Road via Radhanagar	• Topography is plain • Small villages namely, Barutia Radhanagar Chottori (413m – 477m),

District	Block	Road Name (length)	Salient Environmental Features
		(2.381 km)	(1280m – 1380m), (1782m - 2196m), (2196m – 2381m) respectively beside the alignment • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed road alignment • There are 26 Nos. of trees are located within 10m on either side of the alignment. 1 no. need to be cut • Few utility structures (52 nos.) within 10m on either side of the alignment, few (3 nos.) of them needs shifting • There are a total of 7 community / religious, cultural structures within 10m on either side from the center line of the road alignment Club at Ch Burial Ground at Ch 1837m, Samabay Smite at Ch 1913m, P. School at Ch 2370m, (LHS) on the other hand High School at Ch 1562m, SSK at Ch 1569m, Health Canter at Ch 2076m, Mosque at Ch 2293m, (RHS). No impact is expected. • Project road passes mainly through agricultural land
Burdwan	Memari –II	Radhakantapur More to Sahajadpur (5.25 km)	• Topography is plain • Small villages exist such as Bohar (0-475m),Golampara, (675-1030m) Sidhuria (1375-1685m), Bishnupur (3500-4170) and sahajadpur (4175-5250m) in scattered manner. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are some nallas crossed by the road • No water stagnation wirhin the proposed road alignment • There are 8 Nos. of trees are located within 10m on either side of the alignment. No trees need to be cut • Few utility structures (35 nos.) within 10m on either side of the alignment, few (7 nos.) of them needs shifting • There are a total of 7 community / religious, cultural structures within 10m on either side from the center line of the road alignment. No impact on community structure is expected. • Project road passes mainly through

District	Block	Road Name (length)	Salient Environmental Features
			agricultural land
Burdwan	Ausgram -I	Bhota to Karanji (13.65 km)	• Topography is plain • There are few villages namely Takipur (442m-970m), Chowari (1005m-1430m) Asinda (2552m-3150m) Brojopur adibasipara (3470m-3820m) Brojopur (4100m-4750m) Bhada (10745m-11180m) Karanji (12227m-13250m) • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed road alignment • There are 138 Nos. of trees are located within 10m on either side of the alignment. No trees need to be cut • Few utility structures (150 nos.) within 10m on either side of the alignment. No utility needs to be shifted • There are 39 nos. of community structures (School, club, Temple Grave yard, etc.) within 10m on either side of the alignment. No impact on community structure is expected • Some part of the project road passes through agriculture land at following ch. 000m-260m, 1675m-2552m, 4150m-7000m, 8065m-9900m, 11180m-12227m.
Hooghly	Goghat-II	Kumarganj To Balitakundu Part of Pundahit Rathtala To Balitakundu Po Salikana To Shripur Jn (4.048 km)	• Topography is plain • Inhabited areas of the small villages namely, Pundahit, Masidbera, Paschim Chakla exists near starting, Ch 64m – 307m, 2439m – 2870m, 3183m – 3547m, in scattered manner respectively beside the alignment. • There is no forest area beside or away from the alignment. Plantation area exists beside the alignment near Ch. 2695m – 2735m, 3010m – 3105m, (LHS) & 270m - 300m, 2655m – 2697m, 2865m – 2875m, 2950m – 3005m, 3122m – 3190m, 3220m – 3392m, 3407m – 3428m, 3655m – 3900m. Plantation area wil be not affected • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed

District	Block	Road Name (length)	Salient Environmental Features
			road alignment • There are 37 Nos. of trees are located within 10m on either side of the alignment. 6 nos. need to be cut • Few utility structures (37 nos.) within 10m on either side of the alignment, few (8 nos.) of them needs shifting • There are a total of 8 community / religious, cultural structures within 10m on either side from the canter line of the road alignment Temple at Ch 248m, 2765m, Play Ground at 2630m, ICDS at 2692m, (LHS) on the other hand Temple at 2439m, GP Office at 2604m, Primary School at 2610m, Burial Ground at 2870m (RHS). No impact on community structure is expected • There are few patches where there are agricultural land beside the alignment between Ch 0m – 35m, 420m – 2502m, 3547m – 4081m (LHS). & 0m – 37m, 323m – 2439m, 3547m – 4081m (RHS).
Hooghly	Jangipara	Mukundapur busstop to Blacktop road part of singhtimore Ichanagar Rangupur RD (3.6 km)	• Topography is plain • Inhabited areas of the small villages namely, Mukundapur, Moral, exists near Ch 345m – 588m, 650m – 983m, 1055m – 1203m, in scattered manner respectively beside the alignment. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed road alignment • There are 28 Nos. of trees are located within 10m on either side of the alignment. 10 nos. need to be cut • Few utility structures (28 nos.) within 10m on either side of the alignment. No shifting is required • There are a total of 11 community / religious, cultural structures within 10m on either side from the centre line of the road alignment Idgha at Ch 359m, Burial Ground at 379m, Health Canter at 413m, Club at 503m, 1203m, ICDS at 760m, Mosque at 775m, Temple at 882m, 1100m, (LHS) on the other hand Burning Hut at Ch 1424m, Temple at 1737m, (RHS). No impact on community structure is expected • There are few patches where there are

District	Block	Road Name (length)	Salient Environmental Features
			agricultural land beside the alignment between Ch 0m – 345m, 890m – 1055m, 1215m – 3570m **(**LHS). & 0m – 506m, 1127m – 1215m, 2072m – 3600m, (RHS). • Grazing ground exists beside the alignment near Ch 1375m (RHS)
Hooghly	Tarakeshwar	Keshab Chak Bank toTarakeswar Padmapukur More (5.880 km)	• Topography is plain • There are few villages namely Keshab Chak(000m-230m)Talpur(736-935m) Ketra (2848m-3650m) Noyapara (4318m-4770m) Vata (5237m-5721m) • There is swampy area at ch.1613m-1960m (RHS). Besides this there are some ponds and water bodies are exist • The DVC canel crossed by the road at ch. 994m. Other than this few cross drainage structures are located • No water stagnation wirhin the proposed road alignment • There are 25 Nos. of trees are located within 10m on either side of the alignment. 3 nos. need to be cut • Few utility structures (89 nos.) within 10m on either side of the alignment. 5 nos. of utility structure need to be shifted • There are 6 nos of religious, cultural or community structures within 10m on either side of the alignment. No impact is expected on community structure • Some part of the project road passes through agriculture land
Nadia	Haringhata	Nimtala Bazar To Rustam Nagar (6.564 km)	• Topography is plain • Small villages namely, Nimtalabazar, Majhdia, Ghoshpara, Kaharpara, Bagpara, Singhpara, Kanapukur, Rustamnagar 0m – 210m, 210m – 1102m, 1102m – 1577m, 1577m – 1720m, 1720m – 2490m, 2490m – 2870m, 2870m – 3890m, 3890m – 6576m, respectively beside the alignment. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed road alignment • There are 49 Nos. of trees are located within 10m on either side of the alignment. 3 nos. need to be cut • Few utility structures (130 nos.) within

District	Block	Road Name (length)	Salient Environmental Features
			10m on either side of the alignment. 3 nos. of utility structure need to be shifted • There are a total of 7 community / religious, cultural structures within 10m on either side from the center line of the road alignment Club at Ch Burial Ground at Ch 1837m, Samabay Smite at Ch 1913m, P. School at Ch 2370m, (LHS) on the other hand High School at Ch 1562m, SSK at Ch 1569m, Health Canter at Ch 2076m, Mosque at Ch 2293m,(RHS). • Some part of the project road passes through agriculture land
Nadia	Hanskhali	Hanskhali To Nidhirpota (5.302 km)	• Topography is plain • Inhabited areas of the small villages namely Kalipara, Batikamari exists near Ch 0m – 1500m and 3825-5259m in scattered manner respectively beside the alignment. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • Small stream crosses the road near CH 5290 m where water flows towards the river Churni. • No water stagnation wirhin the proposed road alignment • There are 38 Nos. of trees are located within 10m on either side of the alignment. 1 no. need to be cut • Few utility structures (62 nos.) within 10m on either side of the alignment. 12 nos. of utility structure need to be shifted • There are 3 numbers of community / religious structures within 10m on either side from the centre line of the road alignment. Temple exists at Ch 276m (RHS), 3802m (RHS). Batikamari primary school exists at ch. 4427m (RHS). No impact on community structure • There are few patches where there are agricultural land beside the alignment between Ch 1170m – 1192m (LHS), 1360m – 3810m (LHS), 1560m – 3780m (RHS).
Nadia	Hanskhali	Kalinagar To Sahapur (19.925 km)	• Topography is plain • Inhabited areas of the small villages are concentrated beside the alignment near Ch. 0584m.– 0797m.(Kalinagar),Ch.0799m.-2306m (Madhyanatungram) 2306m - 3374m(Natungram) , Ch.3435m.-4700m.

District	Block	Road Name (length)	Salient Environmental Features
			(Benali), 5387m.-5520m,5680-5710m,5830-5890m,5997-6070m,6280-6395 m, 6962-7236m (Bilpara), 7730-8100m,8160-8294m.(Berhaskhali) and so on. • Swampy area was observed beside the alignment from ch 4640 to 5884 m(LHS) which are the remnants of one ancient river . Some small & big ponds exist beside the project road • Small canal crosses the road at CH 562M, 17076m.Other than these cross drainage structures and irrigation conduits exist • Water stagnation problem was observed beside the alignment near ch 770m,8612m • There are 235 Nos. of trees are located within 10m on either side of the alignment. 39 no. need to be cut • Few utility structures (293 nos.) within 10m on either side of the alignment. 83 nos. of utility structure need to be shifted • There are 26 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either from the center line of the road alignment. 1 temple likely to be affected • Some part of the project road passes through agriculture land • Grazing ground exists beside the alignment near Ch. 4114m (LHS), 10530m (LHS).
Nadia	Hanskhali	Kharer Math To Gobindapur (6.275 km)	• Topography is plain • Inhabited areas of the small villages namely**,** Surendranathpur, Avaynagar, Kharermath, Bareagobindapur, exists near Ch 000m – 1575m, 1575m – 3515m, 3515m – 5590m, 5590m-6268m, in scattered manner respectively beside the alignment**.** • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There are no road side nallas / streams / rivers noticed along the road alignment. • No water stagnation wirhin the proposed road alignment • There are 26 Nos. of trees are located within 10m on either side of the alignment. No tree needs to be cut • Few utility structures (118 nos.) within 10m on either side of the alignment. No

District	Block	Road Name (length)	Salient Environmental Features
			utility shifting is required • There are a total of 16 community / religious, cultural structures within 10m on either side from the centre line of the road alignment ICDDS at Ch 612m, 2505m, 3022m, Mosque at 711m, 3000m, Primary School at 915m, Samity at 5882m, (LHS) on the other hand Samity at Ch 10m, ICDS at 315m, 6242m, Primary School at 2716m, Flood Canter at 2731m, High School at 5860m, Club at 5865m, Temple at 6202m, (RHS). No community structure will be affected • Some part of the project road passes through agriculture land
Purba Medinipore	Panskura -II	Jasar To Brindabanchak (11.0 km)	• Topography is plain • There are small villages namely Kulhunda (o-1600m), Kashigoria (1600-2200m), Kellagachia (2200-3700m), Durbachati (3700-4400m) Padimachak (4400-6500m), Kismatkhayra (6500-7700m), Nij khoyra (7700-8700m), Roychak (8700-9500m), Bakshitala (9500-9820m), Keshetrahut (9820-10200m), Kajichak (10200-11000m) • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • The river Kansabati flows along the road on RHS from ch 1600m to 2300m. Other than this there are some irrigational lockgate at Ch 327m, 2493m, 3734m, 5058m, 6885m, 9267m, & 10269m. • No water stagnation wirhin the proposed road alignment • There are 35 Nos. of trees are located within 10m on either side of the alignment. No tree needs to be cut • Few utility structures (207 nos.) within 10m on either side of the alignment. 13 nos. utility shifting is required • There are 11 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either side from the center line of the road alignment. No impact is expected on community structure. • Agricultural land exists beside the alignment near Ch. 200-1600m,2200-2750m, RHS & 800-1200m, 4400-5058m, LHS etc.
Purba	Moyna	Gorsafat To Asnan	• Topography is plain

District	Block	Road Name (length)	Salient Environmental Features
Medinipore		(Arang Kyarana) (9.75 km)	• There are small villages namely P.D.Patna (0-2100)m, DakshinMoyna (2100-3500)m, Mosam Chak 3500-3700)m,Kishore Chack (3700-4500)m, LaluaGeria ((4500-5000)m Deoly (5000-6200), Shyampur (6200-7700)m, Ghoraberia (7800-8200)m, Narkitda Uttarpara (8200-8800)m, Asanan (88oo-9400)m,Narikitda Uttarpara (9400-9750)m, exist beside the road. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There is a Canal along the road at ch (110m- 3902) RHS,and(3924-5024)mLHS and another canal crossed by the road at ch.3431m. • No water stagnation wirhin the proposed road alignment • There are 69 Nos. of trees are located within 10m on either side of the alignment. 10 nos. tree needs to be cut • Few utility structures (164 nos.) within 10m on either side of the alignment. 11 nos. utility shifting is required • There are 16 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either side from the center line of the road alignment. One temple may be affected. • Some portion of agricultural land exists beside the alignment near Ch.(400-900)m,(2400-2600).RHS,(2900-3100) Bothside,(5900-7080)m etc.
Purba Medinipore	Contai –III	Dakshin Kalamdan To Tikashi (15 km)	• Topography is plain • There are small villages namely Dakshin kalamdan (om-3100m), Tikashi Dakshin (3100m-5700m), Purba kalamdan (5700m-6300m), Uttar Tikashi (6300m-9100m) exist beside the road. • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • There is a Canal crossed by the road at Ch 2944m • No water stagnation wirhin the proposed road alignment • There are 27 Nos. of trees are located within 10m on either side of the alignment. 1 no. tree needs to be cut • Few utility structures (108 nos.) within 10m on either side of the alignment. 5 nos. utility shifting is required

District	Block	Road Name (length)	Salient Environmental Features
			• There are 10 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either side from the center line of the road alignment. No impact is expected on religious structure. • Some portion of agricultural land exists beside the alignment near Ch(.(0m-1612m) LHS, (1200m-2100m)RHS, (3200m-4200m) Bothside (7000-7800)m etc.
Siliguri MP	Phassidewa	Goyaltuli more to Bidhannagar via Tufandangi (6.134 km)	• Topography is plain • There are few villages namely Goyaltuli (000m-293m), Kuchiamora (421m-935m) Matigara (1935m-2352m) Jor pakhri (3960m-4690m) • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • Tista river crosses the project road at ch. 225m-268m • No water stagnation wirhin the proposed road alignment • There are 39 Nos. of trees are located within 10m on either side of the alignment. 3 nos. tree needs to be cut • Few utility structures (62 nos.) within 10m on either side of the alignment. 1 no. utility shifting is required • There are 7 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either side from the center line of the road alignment. No impact is expected on religious structure. • Some portion of agricultural land exists beside the alignment
Siliguri MP	Kharibari	Balaijhora (NH31C) to Bhogvita (2.521 km)	• Topography is plain • There are few villages namely Durga mandir (000m-411m), Sukarujote (574m-985m) Bhogvita (1198m-1634m) Deburamjote (1738m-2521m) • There is no lake or swampy area beside the alignment but many small & big ponds / Water body were found • One Canal which is connected with Tista river crosses the alignment at ch 1067m-1099m. • No water stagnation wirhin the proposed road alignment • There are 46 Nos. of trees are located within 10m on either side of the alignment. No tree needs to be cut

District	Block	Road Name (length)	Salient Environmental Features
			• Few utility structures (53 nos.) within 10m on either side of the alignment. No utility shifting is required • There are 10 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either side from the center line of the road alignment. No impact is expected on religious structure. • Some part of the project road passes through agriculture land at following ch. 505mm-574m. 875m-1045m. 2201m-2326m

IV. ANTICIPATED ENVIRONMENTAL IMPACTS AND ITS MITIGATION MEASURES

98. Road improvements work brings substantial economic and social benefits to rural communities and national economies. However, it may also cause adverse environmental impacts though of smaller magnitude, since rural road subprojects aligned along the existing road alignments and will be of 7.5 m width only. 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. 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.

100. Since the issues associated with most of the roads are similar, the impacts and mitigation measures given below are applicable to rest 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 warming in the West Bengal. The annual average maximum temperature is expected to increase by 0.89^{o}C-3.05^{o}C and the maximum temperature is expected to increase by 0.5^{o}C to 2.86^{o}C. The increase in temperature rom historical records is more pronounce during the months of August and September when the chances of future monthly maximum temperatures will exceed the top 10% recorded temperature by 15%-80%, and 21%-66% of the time, respectively. Warmer temperatures will be felt in the northern districts of Maldah, Dakshin Dinajpur, Uttar Dinajpur, Darjeeling, Jalpaiguri, and Koch Bihar with an increase if at least 2^{o}C.

102. **Precipitation**. There was no agreement of the GCM ensemble on the projected change in rainfall ranging from a decrease of 471.7 mm/year to an increase of 600.29 mm/year. Nonetheless, in areas where a significant probability (>95%) in predicted future rainfall exists, annual rainfall will increase in Hoogli and Barddhaman. Finally, with a marginally significant probability (>90% but <95%confidence) the northernmost tip of the State particularly Darjeeling, Jalpaiguri, and Koch Bihar will experience increase in rainfall by as much as 400mm/year with an increase in rainfall intensity index to 2.6.

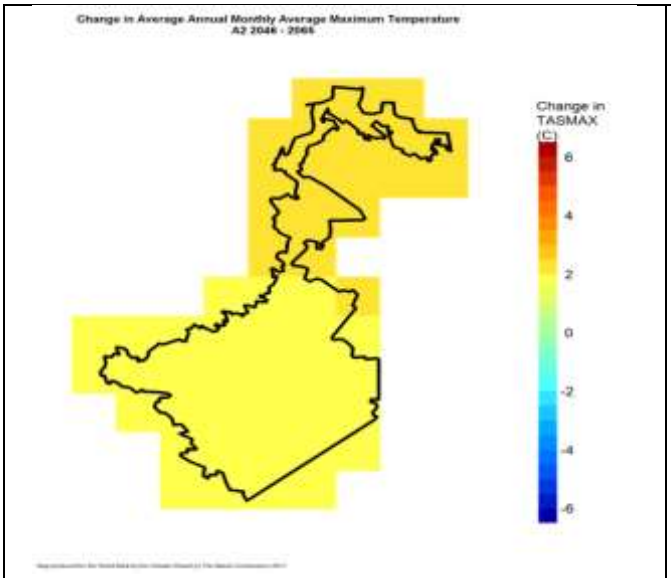


Figure 8: Predicted Change in Annual Average Maximum Temperature, A2, 2046-2065

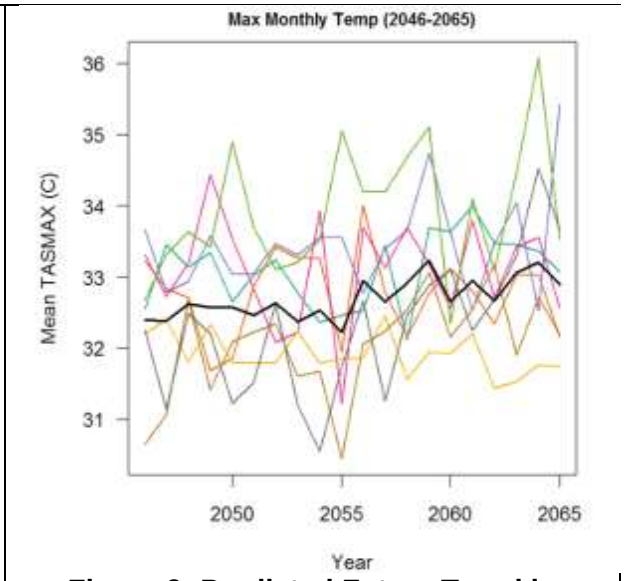


Figure 9: Predicted Future Trend in Annual Maximum Temperature , A2, 2046-2065

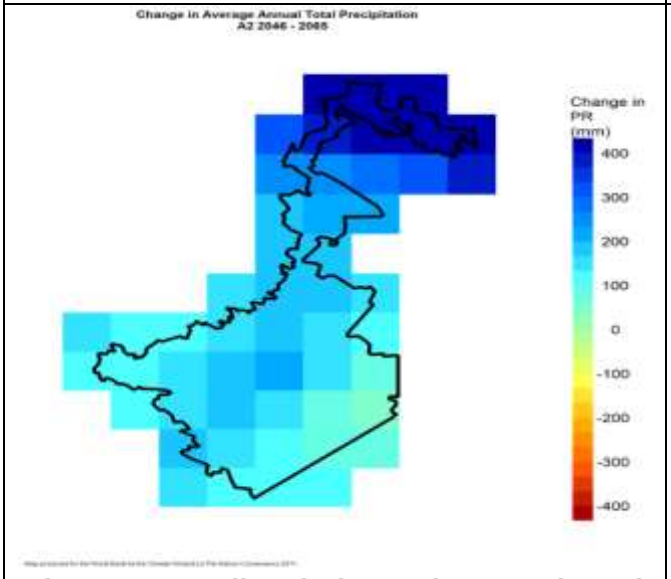


Figure 10: Predicted Change in Annual Total Precipitation, A2, 2046-2065

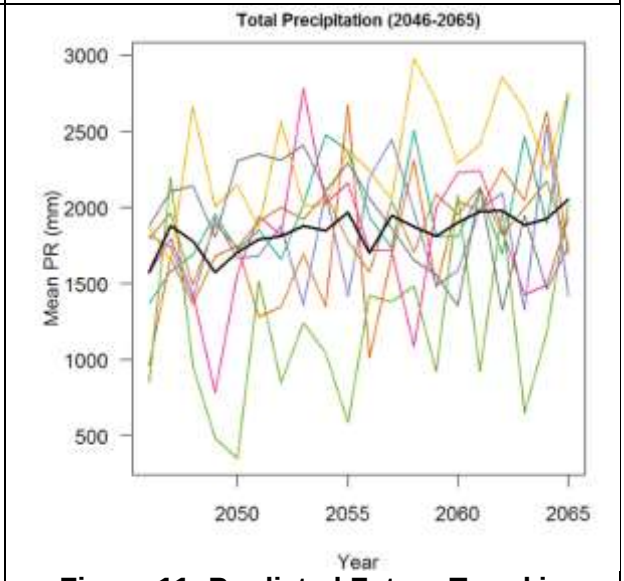


Figure 11: Predicted Future Trend in Annual Total Precipitation, A2, 2046-2065

2. Natural Hazards and Climate Risks

103. The implications of the projected increases in temperature and rainfall coupled with the existing natural hazards of the State pose risks to the project roads and bridges sustainability and viability. The most dominant risk of climate change is flooding in in Murshidabad, Barddhaman, Hoogli, North 24 Paraganas, South 24 Paraganas, and West Medinipur which has suffered from historical flooding. This is followed by increase in rainfall in earthquake and landslide prone areas that can jeopardize road embankment stability. Risk of occurrence of earthquake measuring 7-8 MMI at 10% in 50 years in Uttar Dinajpur, Darjeeling, Jalpaiguri, and Koch Bihar. Finally sea level rise can exacerbate damage from tsunami risk areas of North

Paraganas, South 24 Paraganas and to a limited extent in West Medinipur. Barddhaman, Hoogli, North 24 Paraganas, South 24 Paraganas, and West Medinipur.

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

105. **Mitigation Measures.** The succeeding Table presents the civil works component that address identified climate change risks. Although no attempt was made to segregate additional cost implications due to climate change from standard engineering design practices as stipulated in the IRC, the cost of addressing flooding and erosion for the RCIP Tranche 3 in the State is Rs 116.042 million of which RS9.544M is for constructing cross and side drains, Rs1.076M is for bridges and culverts, Rs103.263M is for increasing road embankment height, and Rs2.158M is for slope stabilization.

106. Compensatory tree plantations[4] (1:3) will be made to compensate the loss of trees cut for construction of subproject roads. Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of village Panchayat.[5] All non-sample rural roads to be included in RCIP will also be screened for climate change vulnerability and necessary mitigation measures shall be adopted for minimization of identified vulnerability if any.

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

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

S.L. No.	Road Name	District	Project Cost in the DPR (Lakhs)	Length (m) Located in Flood Prone Area	Length (m) Located in Landslide Prone Area	Length (m) Located in Tsunami Prone Area	Cost of Design Measures to Address the Risks (Rs.)			
							Cost of Cross and Side Drains	Cost of Bridges/ culverts	Increasing Embankment height	Slope Stabilization (Pitching, turfing etc.)
1	Radhakantapur More to Sahajadpur (From Bohar Gadaitala to sahajadpur) (WB - 05 - ADB - 20)	Burdwan	274.58	2600	-	-	1043450	-	2694000	157374
2	Bamungoria to Haripur (WB - 05 - ADB - 26)		275.34	2880	-	-	-	1076268	2984202	63130
3	Chatnai (at STKK Rd.) to Kashipur (WB - 05 - ADB - 35)		546.11	2069	-	-	844144	-	2143921	123160
4	Mohanpur Betari More to Jagothpur part of Vikdas Saora Road (WB 08 ADB 21)	Hooghly	202.281	2300	-	-	422098	-	1718610	-
5	Kumarganj to Balitakundu part of Pundahit Rathtala to Balitakundu PO Salikana to Shripur JN (WB 08 ADB 22)		208.631	2650	-	-	424690	-	1942810	-
6	Chatrashal to Chabbispur (WB 08 ADB 34)		653.461	7000	-	-	1081785	-	5230215	-
7	Gorsafat to Asnan (Arang Kyarana) (WB-19-ADB-20)	Purba Medinipur	567.78	9750	-	-	831237	-	12040186	284975
8	Jasar to Brindaban Chak (WB-19-ADB-21)		631.25	11000	-	-	869947	-	17848322	323101
9	Khalsiberia to Paschim Sarpai (WB-19-ADB-22)	Purba Medinipur	907.87	15600	-	-	871483	-	16862470	308297
10	Bararamkua to Gaurangabar (WB-19-ADB-26)		446.21	6900	-	-	867411	-	8486623	202379
11	Diglabarh to Bankura Chak (WB-19-ADB-27)		628.34	10400	-	-	815822	-	15549146	305213
12	Chandipur to Bar Baharpota (WB-19-ADB-28)		458.54	8100	-	-	813803	-	9643112	237861
13	Kaur Maishali (from Chakrasul) to Pania via Chakrasul (WB-19-ADB-32)		329.18	5200	-	-	658068.002	-	6119835	152562

107. Compensatory tree plantations[6] (1:3) will be made to compensate the loss of trees if any for the construction of subproject roads and maintaining the tree cover. Efforts shall be made to plant additional trees for increasing the carbon sink. The tree may be planted with help of village Panchayat[7]. All non-sample rural roads to be included in RCIP, will also be screened for climate change vulnerability and necessary mitigation measures shall be adopted for minimisation of identified vulnerability if any.

3. Finalization of Alignment

108. **Impact**: The proposed rural road will be constructed to provide 7.5 m roadway in accordance with PMGSY guidelines and technical specifications (IRC-SP 20: 2002) for plain terrains. Sample rural road are aligned to existing road (murram, some stretches of brickbat soling or broken bituminous track). Basically present roads are considered for upgradation. The existing road passes through plain terrain and primarily agriculture areas. None of the sample roads passes close to any protected monument or through protected areas. Impacts due to road alignment and design is expected to be minor and limited to shifting of some common utilities, community structures (religious structure, school) and cutting of trees falling within road way.

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

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

4. Land Acquisition

110. **Impact**: No land acquisition is involved due to various measures considered for finalisation of road alignment. Villagers have volunteered to donate their land if at certain stages land is required for geometrical correction or alignment adjustment for avoiding tree cutting or

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

[7] Village Panchayats are planting trees at along rural roads with funding under Mahatma Gandhi National Rural Employment Guarantee Act (NREGA) scheme. The PIUs may facilitate with them for planting trees along the road. Some of the PIUs in different states are already helping Village Panchayats for the same.

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

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

112. **Impact**: West Bengal state has many wild life sanctuaries but none of them is located within 10 km radius of the sample project roads. None of the sample road passes through any forest land and as such, project has no impact on forest cover of the state/Country. Village social forestry is located near few roads but outside the impact zone. West Bengal 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 sub project areas, no such measures are proposed. In case of a diversion of forest land, prior forest clearance shall be obtained under Forest (Conservation) Act 1980 (amended 1988).

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 finalisation, utility and community structure shifting plan, tree felling, and demolition waste disposal.

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

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

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 slope protection may lead to soil erosion. Due consideration is given to above aspect for alignment finalisation of sample road. With the adoption of appropriate mitigation measures, the impact due to above activity on land use and other environmental component is expected to be minimal.

117. **Mitigation Measures:** The alignment design shall consider options to minimise excessive cuts and fills. The cut and fill quantities shall be used for embankment to minimise 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 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 labour population and technical staff in the subproject area during the construction phase is likely to put considerable stress on the limited resources of village areas. Some of the associated impacts are related to health, safety of the labourers at the construction camp sites, availability of safe drinking water, and sanitation.

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 minimise/reduce these impacts:

- Construction camp sites shall be located away from any local human settlements (minimum 1 km away) and preferably located on lands, which are not productive barren/waste lands presently. Similarly temporary office and storage areas shall be located away from human settlement areas (minimum 500 m).
- The construction camps, office and storage areas shall have adequate water supply, sanitation and all requisite infrastructure facilities. This would minimize dependence of construction personnel on outside resources, presently being used by local populace and minimize undesirable social friction thereof.
- The construction camps shall be located at a minimum 500m from forest land/areas to deter the construction labour in trespassing. Similarly, temporary office and storage areas shall be located at a minimum 500m from forest land/areas.
- The construction camps, office and storage areas shall have septic tank/soak pit of adequate capacity so that it can function properly for the entire duration of its use.
- All construction camps shall have rationing facilities particularly for kerosene/LPG so that dependence on firewood for cooking is avoided completely to the extent possible.
- The construction camps, office and storage areas shall have health care facilities for adults, pregnant women and children.
- All construction personnel shall be subjected to routine vaccinations and other preventive/healthcare measures.

- Contractor shall arrange all personal protective equipment (PPEs) like helmet, gloves, 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 before start of any construction work to avoid any inconvenience to the present road users. The diversion plan should ensure smooth flow of traffic, minimise accidents to road users during construction works. Adequate signboards shall be placed much ahead of diversion site to caution the road users. The road signs should be bold and visible and retro reflective in nature for day and night visibility.

10. Associated Impacts due to Construction Activities

a. 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. There are 43 ponds are located very near to ROW of 16 roads in Wes Bengal, where protection work is needed

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. All steep cuts shall be flattened and benched. Shrubs shall be planted in loose soil area.IRC: 56 -1974 recommended practice for treatment of embankment slopes for erosion control shall be taken into consideration. Soil erosion shall be visually checked on slopes and embankment areas. If soil erosion observed, suitable measures shall be taken to control it.

b. Borrow Areas and Quarries

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 minimised to the extent possible. Further, no earth shall be borrowed from already low-lying areas. The borrow earth shall be sourced from identified locations and with prior permission of landowner and with clear understanding for its rehabilitation. The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and quantity that can be borrowed. The borrow area shall be located/ rehabilitated as per the guidelines given at Appendix 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.

c. 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. Few of the sample roads is crossing or running close to (outside impact zone) any natural stream or river (Ref. Table 6). In some cases project roads are crossing local and seasonal drains. Village ponds are also located close to few roads. There as impact on Hydrology and Drainage Pattern is expected to be minimal. Flooding of road due to water stagnation and road overtopping or flooding may occur near water stagnation areas.

129. **Mitigation Measures**: Adequate provisions are proposed for bank stabilisation and prevention of silt runoff during construction and operational stage. 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. It will be ensured that natural flow of water along the road to nearby Provision of additional cross drainage structures shall be made in the areas where nearby land is sloping towards road alignment in both sides. Bank stabilisation measures like bamboo or eucalyptus tree piling based support may be used where long road stretch get are involved and CC wall are not feasible.

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.

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

e. Construction Debris and Wastes

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. MOSRTH 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 1000 m away). It should also be located away from water bodies to prevent any contamination of these bodies.

f. 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.

- 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.
- Localised increased traffic congestion in construction areas. Most of the emissions will be in the form of coarse particulate matter, which will settle down in close vicinity of construction site. This may affect the air quality of nearby areas, especially, due to emission discharge from low height of the stack.

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

- Vehicles delivering loose and fine materials like sand and aggregates shall be covered.
- Dust suppression measures like water sprinkling, shall be applied in all dust prone locations such as unpaved haulage roads8, earthworks, stockpiles and asphalt mixing plant areas.
- Mixing plants and asphalt (hot/spot 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.
- 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.
- **Permits**: Contractor must obtain "Consent to Establish" before setting up Hot Mix plant, batching plants. The consent can be obtained by applying to State Pollution Control Board in prescribed format and with requisite fee. The consent to establish must be converted to 'Consent to Operate" once condition of consent to establish is complied with.

g. Noise Quality

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

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

h. Groundwater and Surface Water Quality and Availability

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

[8]Water suppression of fugitive dust can reduce emissions from 12% to 98%

140. **Mitigation Measures**: Requisite permission shall be obtained if applicable for abstraction of groundwater from State Ground Water Board/Central Ground Water Authority[9] if applicable. The contractor shall arrange for water required during construction in such a way that the water availability and supply to nearby communities remains unaffected. Water intensive activities shall not be undertaken during summer period to the extent feasible. Provision shall be made to link side drains with the nearby ponds for facilitating water harvesting. Where ponds are not available, the water harvesting pits shall be constructed as per the requirement and rainfall intensity. Measures are already purposed in earlier section for prevention of siltation in water bodies.

i. Biological Environment

141. **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 there are only ponds and non-perennial water the aquatic life is minimal and no significant impact is anticipated on aquatic life. As per estimation there will be 83 nos. tree felling will be required for construction of 16 sample roads (Ref Table 20).

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

j. Impact on Common Property Resources

143. **Impact**: There are public utilities like electric transformer, electric poles, telephone poles and hand pumps all along the rural roads. The road construction may require shifting of these utilities. There are many community structures like school, playground village office temples. Possible impact to common property for 16 sample roads is shown in Table 20**.**

144. **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 possession and shifting of community structures. The community structures/utilities which cannot be saved will be shifted to adjacent area with the concurrence and in consultation with community. .

B. Common Impacts during Post Construction and Operation Phase

1. Air Quality

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

146. **Mitigation Measures:** The bad road conditions the main cause of poor air pollution at present. The improved road conditions will result in the improved ambient air quality. Also, the

[9]As per Central Ground Water Authority (CGWA), there are 43 notified blocks in India where prior permission is required fro extraction of ground water. Currently there are no notified areas in West Bengal. CGWA is continually updating the list of notified areas.

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

147. **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.

148. **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

149. **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.

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

151. 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.

152. **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 WBSRRDA.

153. 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

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

5. Hydrology and Drainage

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

156. **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.

C. Socio-Economic Impact

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

158. **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 nearby urban areas.

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

- Speed breakers (Rumble strips) as per IRC: 99-1988 shall be provided at sharp curves 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.

D. Road Specific Impacts

160. The Many adverse impacts of road projects can be avoided or minimized by applying environmentally sound design, construction and operation and maintenance practises. The review of the environmental salient features specific to sample roads given in chapter III identify that mitigation measures applicable to all the road are similar in nature except variation in terms of magnitude of the measures which depends on length of the road, presence of pond, number of community structure (mostly temples, school) likely to be shifted, number and type of common utility (hand pump, electric transformer, electrical poles).

161. Water stagnation and water logging problem is not identified along the sample road areas. If problems arise for rest of the roads adequate design measures for drainage, road levels shall be taken for prevention of water logging.

162. Table 20 provides the list of common utilities, ponds, religious structures, trees falling within 2.75 M of the either side of centreline of the sample roads (16 nos.) which may be

affected and needs shifting. Boundary wall of few schools is also located near the alignment. Effort shall be made to adopt the mitigation measures listed under respective section above including measures of aligning road on one end to save the structures/trees as much as possible.

Table 20: Impacts on biological environment, utility, community and religious structures

Sr. No.	District	Block	Road Name	Length	Forest clearance required	Within the Impact zone			
						Affected community Structure*	No. of trees likely to be affected	Type and no. of utility structures likely to be shifted	Water-body-protection work needed
1	Siliguri M.P.	Kharibari	Balaijhora (NH31C) to Bhogvita, Ch. 0.00km-2.521km	2.521	Nil	Nil	NIL	NIL	NIL
2	Siliguri M.P.	Phassidewa	Goyaltuli more to Bidhannagar via Tufandangi (ch. 3.98 at Tufandangi to ch. 10.114km at Jorepakuri)	6.134	Nil	Nil	3 Trees	EP-1	NIL
3	Birbhum	Mayuresweri – I	Dakshingram to Saithia Rampurhat road at Battala via Ratma Sibgram	4.821	Nil	Temple-4,Club-1	4 Trees	EP-6	Pond-6
4	Birbhum	Mayuresweri – II	Barutia to Chottorigram Road via Radhanagar	2.381	Nil	Nil	1 Tree	EP-2,HP-1	Pond-2
5	Burdwan	Memari –II	Radhakantapur More to Sahajadpur	5.250	Nil	Nil	Nil	EP-4, TP-3	NIL
6	Burdwan	Ausgram -I	Bhota to Karanji	13.650	Nil	Nil	Nil	Nil	NIL
7	Hooghly	Jangipara	Mukundapur busstop to Blacktop road part of singhtimore Ichanagar Rangupur RD	3.600	Nil	Nil	10 Trees	NIL	Pond-2
8	Hooghly	Goghat-II	Kumarganj To Balitakundu Part of Pundahit Rathtala To Balitakundu Po Salikana To Shripur Jn	4.084	Nil	Nil	6 Trees	EP-6, HP-2	NIL
9	Hooghly	Tarakeshwar	Keshab Chak Bank To Tarakeswar Padmapukur More	5.880	Nil	Nil	3 Trees	EP-4, TP-1	NIL
10	Nadia	Hanskhali	Hanskhali To Nidhirpota	5.302	Nil	Nil	1 Tree	EP-8, TP-4,	Pond-6
11	Nadia	Hanskhali	Kalinagar To Sahapur	13.58	Nil	1 Temple	39 Trees	72 EP,8 TP, 3 TRF	Pond -27
12	Nadia	Tehatta – II	Kharer Math To Gobindapur	6.275	Nil	NIL	NIL	NIL	NIL
13	Nadia	Haringhata	Nimtala Bazar To Rustam Nagar	6.564	Nil	Nil	3 Trees	EP-3	NIL
14	Purba Medinipur	Panskura – II	Jasar To Brindabanchak	11.000	Nil	Nil	Nil	EP-8,TP-5	NIL
15	Purba Medinipur	Moyna	Gorsafat - Asnan (Arang Kyarana)	9.750	Nil	1 Temple	10 Trees	2 EP, 1 TAP, 8 TP	NIL
16	Purba Medinipur	Khejuri	Dakshin Kalamdan - Tikashi	9.100	Nil	NIL	3 Trees	2 EP	NIL

V. CLIMATE RISK SCREENING AND ADAPTATION MEASURES

A. Climate Change Projection

163. **Temperature**. By the 2050s, there is a general warming in the West Bengal. The annual average maximum temperature is expected to increase by 0.89oC-3.05oC and the maximum temperature is expected to increase by 0.5oC to 2.86oC. The increase in temperature rom historical records is more pronounce during the months of August and September when the chances of future monthly maximum temperatures will exceed the top 10% recorded temperature by 15%-80%, and 21%-66% of the time, respectively. Warmer temperatures will be felt in the northern districts of Maldah, Dakshin Dinajpur, Uttar Dinajpur, Darjeeling, Jalpaiguri, and Koch Bihar with an increase if at least 2oC.

164. **Precipitation**. There was no agreement of the GCM ensemble on the projected change in rainfall ranging from a decrease of 471.7 mm/year to an increase of 600.29 mm/year. Nonetheless, in areas where a significant probability (>95%) in predicted future rainfall exists, annual rainfall will increase in Hoogli and Barddhaman. Finally, with a marginally significant probability (>90% but <95%confidence) the northernmost tip of the State particularly Darjeeling, Jalpaiguri, and Koch Bihar will experience increase in rainfall by as much as 400mm/year with an increase in rainfall intensity index to 2.6.

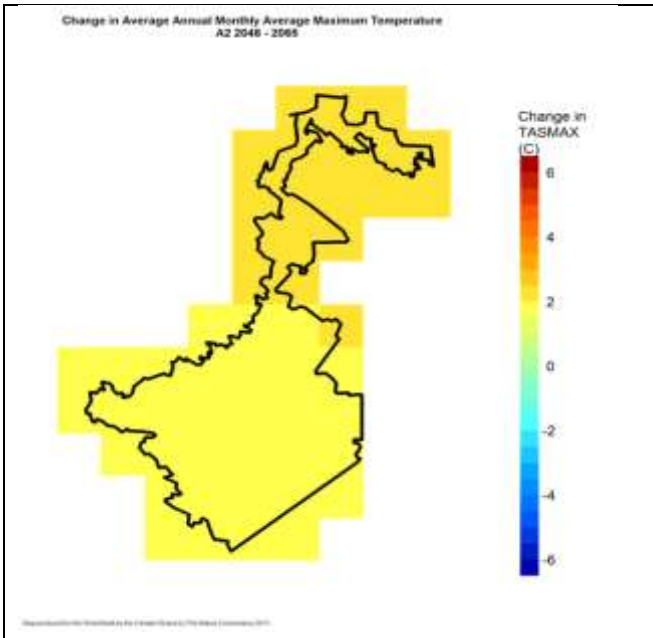


Figure 12: Predicted Change in Annual Average Maximum Temperature, A2, 2046-2065

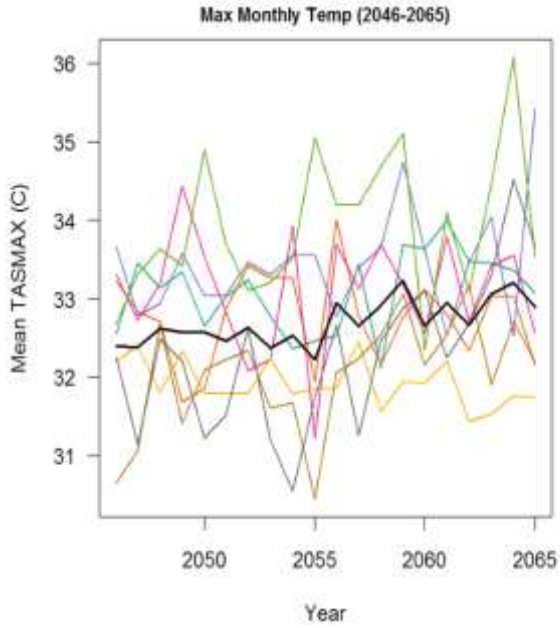


Figure 13: Predicted Future Trend in Annual Maximum Temperature , A2, 2046-2065

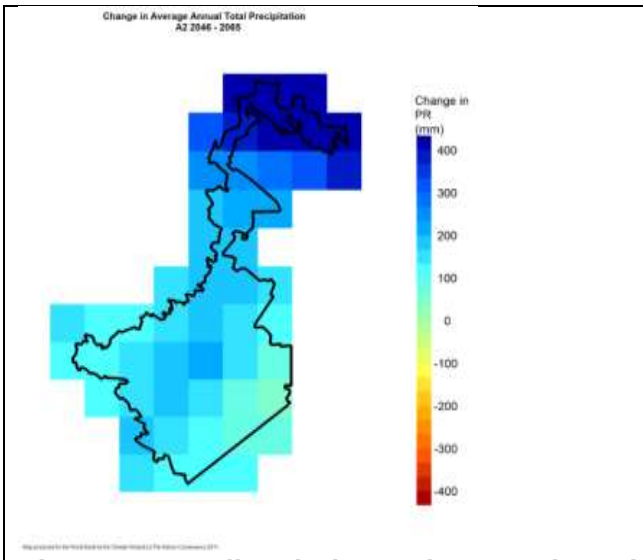


Figure 14: Predicted Change in Annual Total Precipitation, A2, 2046-2065

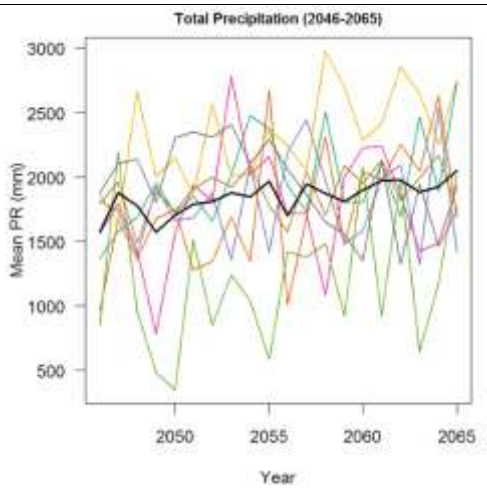


Figure 15: Predicted Future Trend in Annual Total Precipitation, A2, 2046-2065

B. Natural Hazards and Climate Risks

165. The state has several natural hazards that can be exacerbated by the predicted changes in temperature and rainfall. North Paraganas, South 24 Paraganas, and to a limited extent West Medinipur are prone to tsunami. Flood risks exists in Murshidabad, Barddhaman, Hoogli, North 24 Paraganas, South 24 Paraganas, and West Medinipur. The districts of Uttar Dinajpur, Darjeeling, Jalpaiguri, and Koch Bihar are prone to earthquake with 10% probability of having 7-8 MMI in 50 years.

166. The implications of the projected increases in temperature and rainfall coupled with the existing natural hazards of the State pose risks to the project roads and bridges sustainability and viability. The most dominant risk of climate change is flooding along the Brahamaputra River. All areas adjacent to the Brahamaputra River are prone to flood risks with historical records of greater than 50 events per 100 year and major tributaries at 5-50 occurrences. Flooding in Guwahati, Barpeta, Nalbari, Dhuburi, Kokrajhar, Darang, Golaghat, Dibrugarh, and Dhemaji exposes more than 1,000 persons per year resulting to extreme mortality risk. The projected increase in total rainfall and intensity both upstream and downstream of the Brahmaputra within the State of Assam may result to more severe flooding. This is followed by increase in rainfall in earthquake and landslide prone areas that can jeopardize road embankment stability. Almost the entire State has experienced events between 5.0-6.0 intensities with Dimapur experiencing the most severe earthquakes between 7.1-8.0. Silchar has experienced the most serious ground shaking and most frequent earthquake occurrences at 8-9 Modified Mercali Intensity (MMI) and 0.2-0.4 events/year, respectively. Very high landslide risk areas are found along the Manipur and Nagaland border particularly in Dhuburi and Goalpara districts. The predicted 200-300 mm/year increase in rainfall, also increase the risk of rainfall triggered landslide in this area that can weaken road embankments. Finally, the predicted increase in maximum temperature also increases the risk of vegetation fire which is highest in Dibrugarh with a recorded 300-1,000 events per pixel (see Map) followed by Kamrup with 100-300 events, and low risk of less than 30 events in the Cachar, North Cachar, Anglong, Karbi Anglong, and Golaghat. Bitumen heating and camp site location should ensure that wildfire is avoided particularly near the Marat Longri Wildlife Reserve in Karbi Anglong Autonomous District Council, Borail Sanctuary in Cachar, and all reserved forests.

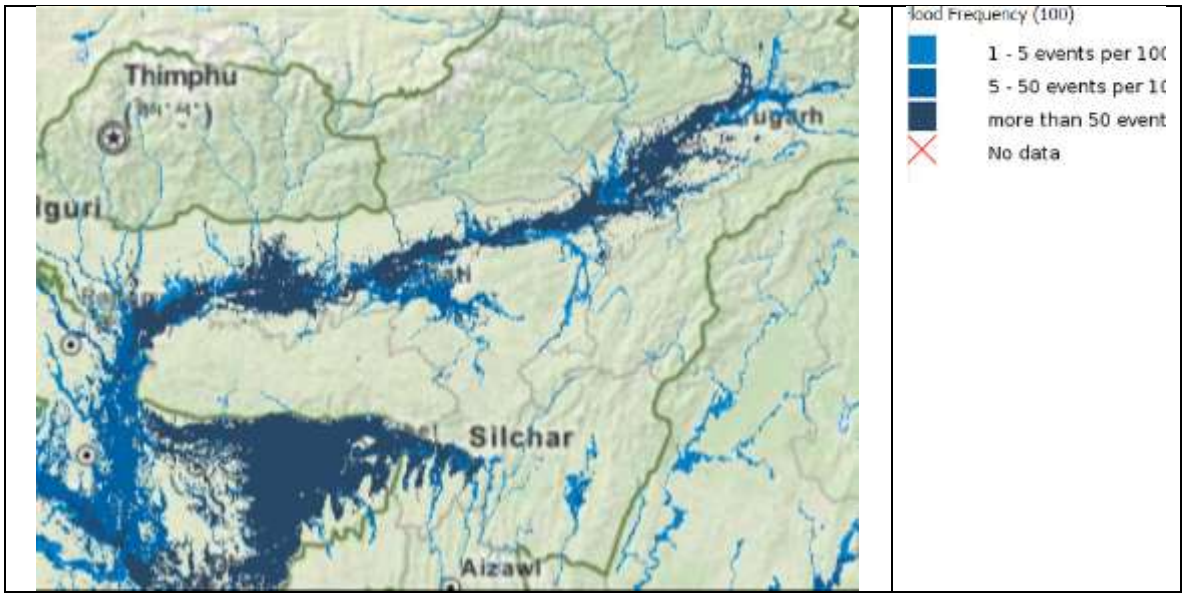


Figure 16: Flood Frequency Map, Assam

Figure 17:Landslide Prone Map, Assam

C. Climate Change Adaptation Measures

a) Enumerate the roads and mention the total number and length located in flood prone areas.

b) Enumerate the roads and mention the total number and length located in landslide prone areas.

c) Discuss the design measures to address these two risks (Road Design Standards) and summarize the costs involved broken down as follows:

   a. Cost of Cross and Side Drains
   b. Cost of Bridges
   c. Cost of increasing embankment height

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

A. Environmental Management Plan

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

168. The EMP is prepared as per Environmental Management Standard (ECOP) applicable to rural road defined be ADB at RRS I and RRS II stages.

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

170. Appropriate mitigation measures are identified for all rural road construction and operation activities. The identified impacts associated with rural roads and mitigation 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. Before bidding road specific EMP will be prepared by PIC and which will be attached in final DPR.

171. 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

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

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

173. For rural roads, Environmental Monitoring plan will be more observation oriented and it provides observation areas with frequency of monitoring at pre construction aspects[10], construction stage and operation stage. A monitoring plan with monitoring indicator and frequency of monitoring is given at Appendix 6.

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

C. Institutional Arrangements and Responsibilities

174. 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.

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

176. The institutional arrangement at National Level and state level for implementation of PMGSY including RCIP is shown at Figure 8.

D. Institutional Environmental Responsibilities

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

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

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

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

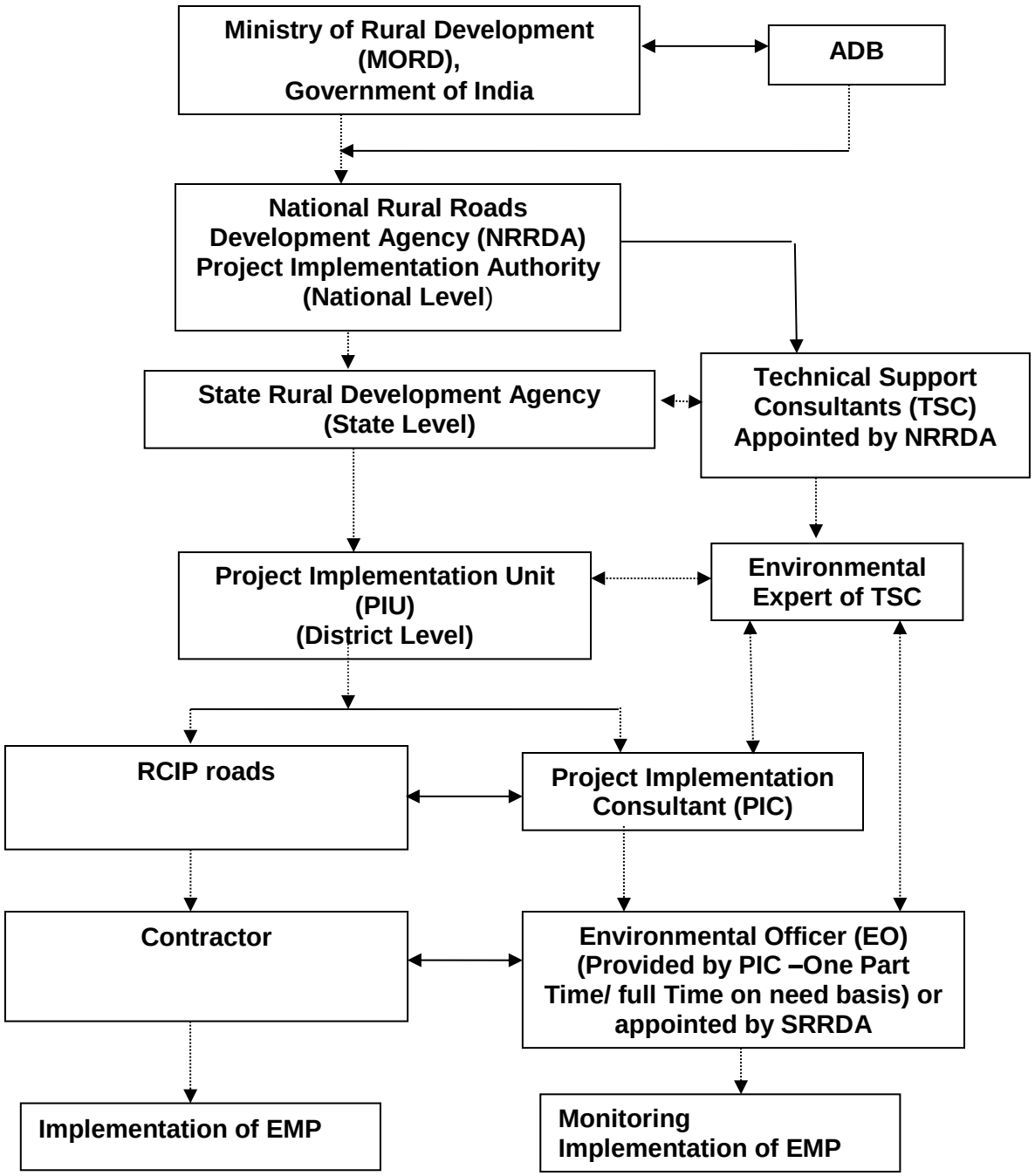


Figure 18: Institutional Arrangement for EMP Implementation

179. **SRRDA**[12]will ensure that :

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

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

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

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

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

182. **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.

[12] With assistance from PIC (Project Implementation Unit)

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

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

- Make adequate costs provision for EMP requirements while biding
- Ensure effective implementation of mitigation 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 RCIP

184. 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 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 RCIP, environmental assessment requirement for each trench and legal framework are given below:

1. Selection Criteria and Environmental Assessment Requirement

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

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

186. The following environmental Assessment requirement will be followed roads included under RCIP

(i) ECOP checklists with annexes on trees, utility structures, community structures, strip plans and photographs will be completed for each and every road.
(ii) Based on the requirements of the PMGSY guidelines separate ECOP checklists will be prepared for bridges that are longer than 50 m.
(iii) Based on the completed ECOP checklists for roads and bridges, IEE reports will be prepared at a state level. These reports must contain a general EMP and a site specific EMP where there are site specific issues.
(iv) ADB's REA checklist for roads and highways will be completed based on the state level IEE reports prepared and submitted to ADB to confirm categorization

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

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

2. Legal Framework

188. As per Indian legislation, an environmental clearance is not required for rural roads. However, it may attract provisions of Forest Conservation Act, Wild Life (Protection) Act, and other legislation related with Air, Water and Noise pollution controls and prevention. The legislative applicability screening is presented in chapter 1 of this report and it will apply for non-

sample road as well. Additionally, to ensure conformance to ADB's Safeguard Policy Statement, 2009 (SPS), the subprojects will be subject to the following requirements:

(i) An Initial Environmental Examination[13] (IEE) report including the preparation of an Environmental Management Plan (EMP) and a Monitoring Plan.
(ii) Regular monitoring of implementation of the EMP and submission of monitoring reports and due diligence reports to ADB as necessary

F. Capacity Building

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

G. Consultation and Information Disclosure

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

191. All environmental assessment documents are subject to ADB's Public Communication Policy (2005) and will be made available to the public, upon request. The WBSRRDA 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 sample road IEE report on its website.

H. Grievance Redress Mechanism

192. PRI administered village level committee is the first contact point for any aggrieved person. This committee will try to settle the concern by them self or in consultation with contractor or PIU. The unresolved concerned are forwarded to PIU for further action. PIU resolves these concerns in consultation with PIC, WBSRRDA, and contractor as the situation demands. This is an established practice and is seen effective enough in RRS II. PIC will also collect concerns received by this committee in the intervening period and report the effectiveness of action taken.

193. Experience in earlier tranches of the programIn shows that village level grievance redress committees comprising the sarpanch, panchayat secretary and other prominent citizens of the village were in place. However, as the site selection and project design process involved participation and full consultation with the community, there was hardly any grievance by the APs and no complaint was received by any of the village committees.

[13] As per selection criteria, no Category A subproject will be included under RCIP.

194. At national level NRRDA has made provision of registering complain /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 WBSRRDA website as well or WBSRRDA will also make provision of complain registry at its website.

VII. PUBLIC CONSULTATION AND INFORMATION DISCLOSURE

A. General

195. Public consultation was undertaken consistent with the ADB's requirements. All the five principles of information dissemination, information solicitation, integration, co-ordination and engagement into dialogue were incorporated in the consultation process. A framework of different environmental impacts likely from the project was strengthened and modified based on opinions of all those consulted, especially in the micro level by setting up dialogues with the village people from whom information on site facts and prevailing conditions were collected.

196. Stakeholder's consultations were held with the intent to understand their concerns, apprehensions, overall opinion and solicit recommendations to improve project design. Informal meetings, interviews were organized covering the entire project stretch. The informal consultation generally started with explaining the sub projects, followed by an explanation to potential impacts. Participant's views were gathered with regard to loss of agricultural land, effect on air and noise quality of the area due to traffic, water availability, accident and risk.

197. The discussions were designed to receive maximum inputs from the participants regarding their acceptability and environmental concerns arising out of the sub-project. They were given the brief outline of the project to which their opinion was sought. Suggestions were also sought for mitigating any potential adverse impact.

B. Compliance with Relevant Regulatory Requirements

198. In India, public consultation is mandatory in case of Category A and B1 category projects[14] in select conditions. Being a category B project as per SPS 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

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

200. Some of the general issues raised during the different consultation sessions can be summed up as follows.

- **Construction Camp** - Impacts from the establishment and operation of the construction camps like generation and disposal of solid wastes, sewage, potable water requirements, health/hygiene, and safety is part of the contractor's responsibility highlighting the need for compliance with applicable laws. Waste

[14] As per schedule I of EIA notification number S.O. 1533, dated 14th September 2006. This notification also defines when a public consultation is mandatory.

and material use minimization will be promoted to decrease the volume of wastes that will be generated.

- 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** - This issue was raised by those who had encroached on the proposed alignment. 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 through voluntary donation** - 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. During construction of road contractor will try their best to save religious structure.
- **Loss of Trees Due to Road Construction** - Respondents were of the opinion that trees cutting should be avoided or else minimised. For trees to be cut compensatory plantation should be done. Some villagers expected additional plantation should be done. Recommended tree species for plantation were other local varieties.
- **Impacts on Health** - Separate consultation sessions were organised by social team to identify issues pertaining to health specifically for sexually transmitted diseases (STDs). Settlements along the rural roads were reported to be getting exposed to such diseases, as there are no long distance users on the project roads.
- **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.
- **Inconvenience during Construction** - The participants viewed that they will manage it as it will be temporary.
- **Employment during Construction** - The locals expected that they should be given preference in employment during project implementation.
- **Perceptions and Expectations** - Perceptions and expectations of the community recorded during the consultation sessions can be broadly listed as:
  - The public and the affected persons appreciated and supported the project with their open hearts.
  - Community at large appreciated overall benefits to them resulting from project development;
  - They were aware of the increased access, lesser commuting time after project implementation;
- **Addressal of Issues** - The project has tried its best to address all the issues raised during consultations under the constraints of suitability from engineering point of view. Some of the provisions made under the project to address the issues and concerns of the community are given in Table 21**.**

Table 21: 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 10-12m 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.
Excavation and back filling	Monitor adherence to contract specifications
Erosion	Monitor proper management of excavated soil/silt including timely removal of material from project site
Storage and transportation of construction materials, excavated soil and silt	Monitor adequacy of measures undertaken to prevent fugitive dust
Increased pollution levels	Pollution levels are not crossing the prescribed limits of CPCB and planned plantation will screen the emission.
Noise and emissions from construction vehicle	Monitor 'Pollution under Control' certificate are current for construction vehicles
Utilities and basic infrastructure	All the utilities, electric poles, telephone lines, wells, tube wells etc. to be impacted will be relocated under the project cost.
Employment of locals during construction	Locals will be given preference for employment during the project implementation
Health check up of workers	Monitor adequacy of health check up service provided including attendance of the physician retained and the extent to which the workforce is availing this service
Health and safety requirement	Monitor adherence to all occupational and safety requirements

VIII. CONCLUSIONS AND RECOMMENDATIONS

A. Conclusions

201. 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.

202. 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.

203. All sample roads included under Tranche III 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.

204. Few of the rural roads cross natural streams and rivers. However, none of these roads is prone to flood.

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

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

207. 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. For felling of trees permission needs to be taken up from gram panchyat.

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

209. 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.

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

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

211. The IEE also indicate that rural road construction works does not warrant further EIA study for subsequent rural road construction works in West Bengal.

B. Key Recommendations

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

213. 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.

214. These IEE is prepared based on ECOPs. 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.

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

Appendix 1: Details of Roads in West Bengal RCIP Batch III (Tranche III)

PIU/Dist	Package	Name of Road	Length (km)	Approx Cost (Rs. In lakh)
Siliguri M.P.	WB 17 ADB 15	Howdavita(NH31) to Tetulguri ((ch. 0.00km - 3.904km)	3.904	207.159
Siliguri M.P.	WB 17 ADB 17	Balaijhora (NH31C) to Bhogvita, Ch. 0.00km-2.521km	2.521	155.951
Siliguri M.P.	WB 17 ADB 19	NH31C (near Bapujipath) to Dangarvita via Manjoyjote, ch. 0.00km-2.767km	2.767	170.885
Siliguri M.P.	WB 17 ADB 20	NH31 (near Bagdogra Airport) to Church More via Tarbanda (ch. 2.355km at Digravita - 8.071km at Saldangi)	5.716	304.46
Siliguri M.P.	WB 17 ADB 23	NH31(near Ayappa Temple) to Alokjhari via Putimari (ch. 0.00km-2.507km)	2.507	142.737
Siliguri M.P.	WB 17 ADB 25	NH31C Chowpukuria to Bhariadangar Chhat (ch. 0.00km -6.534km)	6.534	344.339
Siliguri M.P.	WB 17 ADB 28	NH 31C Rupsingh to Dhemal (ch. 0.00km-6.534km)	7.2	436.899
Siliguri M.P.	WB 17 ADB 29	Goyaltuli more to Bidhannagar via Tufandangi (ch. 3.98 at Tufandangi to ch. 10.114km at Jorepakuri)	6.134	353.8
Siliguri M.P.	WB 17 ADB 35	NH31C(near Sathbhaiya) to Naxalbari Tea Estate (ch. 0.00km-3.795km)	3.795	203.417
Siliguri M.P.	WB 17 ADB 37	Mangalsingh(NH31C) to Sebdella (ch. 0.00km-2.50km)	2.5	157.051
Grand Total of 10 roads of Siliguri M.P District			**43.578**	**2476.698**
Birbhum	WB 04 ADB 24	Pahareswar More To Kharui More	18.5	1050.74
Birbhum	WB 04 ADB 23	Gerupahari To Babuijore	8.515	516.4
Birbhum	WB 04 ADB 25	Layekbazar to Karpatikuri Busstand via Donaipur Padmabatipur bye pass	6.99	402.41
Birbhum	WB 04 ADB 26	Maldiha to Chatrisapara	2.26	120.45
Birbhum	WB 04 ADB 27	Ayas Dharmatala G.P. Office to Chamtibagan ADB Road via Nachhia Debogram Lambodarpur	7.078	349.44
Birbhum	WB 04 ADB 28	Dakshingram to Saithia Rampurhat road at Battala via Ratma Sibgram	4.821	281.76
Birbhum	WB 04 ADB 29	Barutia to Chottorigram Road via Radhanagar	2.381	138.34
Grand Total of 7 roads of Birbhum District			**50.545**	**2859.54**
Burdwan	WB 05 ADB 27	Mougram to Naihati	9.225	479.47
Burdwan	WB 05 ADB 20	Radhakantapur More to Sahajadpur	5.250	299.33
Burdwan	WB 05 ADB 35	Chatni (At STKK Rd.) to Kashipur	12.225	614.96
Burdwan	WB 05 ADB 24	Chelod to Chanda	7.445	336.48
Burdwan	WB 05 ADB 21	Ura to Dadpur	8.650	480.82
Burdwan	WB 05 ADB 22	Galsi to Dakshinvasapur	7.900	441.32
Burdwan	WB 05 ADB 26	Bamungoria to Haripur	5.925	311.25
Burdwan	WB 05 ADB 23	Chhora to Bishnupur	5.550	272.21
Burdwan	WB 05 ADB 29	Dignagar to Shibda	6.900	358.3
Burdwan	WB 05 ADB 28	Bhota to Karanji	13.650	692.23
Burdwan	WB 05 ADB 30	Gopalmath to Sonai	6.150	327.71
Burdwan	WB 05 ADB 31	Deslopa to Sankarpur	13.750	618.02
Burdwan	WB 05 ADB 25	Harishpur J.K. Ropeways to Sidhuli	10.000	444.17
Burdwan	WB 05 ADB 32	Debipur (NH2) at Panagarah to NH2 at Rajbandh to Manikara	12.200	626.66
Burdwan	WB 05 ADB 33	Gutulia to Madhaiganj	7.750	361.11
Burdwan	WB 05 ADB 34	Raniganj (O.D.R.) to Baktar Nagar Vill.(Upto N.H)	4.600	242.72
Grand Total of 16 roads of Burdwan District			**137.170**	**6906.76**
Hooghly	WB 08 ADB 25	Haripal station to Shipaigachi - part of mosai More to Illipur	14.720	1049.21
Hooghly	WB 08 ADB 23	Mukundapur busstop to Blacktop road part of singhtimore Ichanagar Rangupur RD	3.600	261.28
Hooghly	WB 08 ADB 30	Baradigrui Bus stand to majpur jarapar part of Pursurah Baradigrui	3.160	227.08

PIU/Dist	Package	Name of Road	Length (km)	Approx Cost (Rs. In lakh)
Hooghly	WB 08 ADB 22	Kumarganj To Balitakundu Part Of Pundahit Rathtala To Balitakundu Po Salikana To Shripur Jn	4.084	265.23
Hooghly	WB 08 ADB 21	Mohanpur Betari More To Jagothpur Part Of Vikdas Saora Road	3.780	254.39
Hooghly	WB 08 ADB 24	Singti To Binogram Damodhar Bhand Road	11.930	796.36
Hooghly	WB 08 ADB 34	Chatrashal To Chabbispur	11.220	820.13
Hooghly	WB 08 ADB 20	Keshab Chak Bank To Tarakeswar Padmapukur More	5.880	412.52
Hooghly	WB 08 ADB 33	Purushattambati To Jarura Part Of Korala Via Sugandha To Towards Bhardeswer Ps	10.530	758.97
Hooghly	WB 08 ADB 27	Apurbapur To Bora Via Paltagarh And Ramnagore	6.900	484.01
Hooghly	WB 08 ADB 29	Milki Part Of Majiman To 23 No Route Via Mouro	8.440	122.77
Hooghly	WB 08 ADB 35	Chowanpara Bridge To Kindkarbetai Kadamtala	3.690	268.224
Grand Total of 12 roads of Hooghly District			**87.934**	**6188.104**
Nadia	WB 14 ADB 17	Hazrapur To Duttapulia More	13.58	818.4
Nadia	WB 14 ADB 20	Nokari To Kulgachhi	5.145	307.26
Nadia	WB 14 ADB 21	Betaibazar To Chhitkadaspara	10.471	659.82
Nadia	WB 14 ADB 19	Hanskhali To Nidhirpota	5.302	323.56
Nadia	WB 14 ADB 23	Kalinagar To Sahapur	19.925	1171.02
Nadia	WB 14 ADB 14	Ghurni To Patuli Ghat	16.937	1042.17
Nadia	WB 14 ADB 16	Goaldanga Dhal(Pwd Road) To Bangaljhi Dakshin	10.111	587.45
Nadia	WB 14 ADB 27	Baor To Bdo Office Para	7.925	506.61
Nadia	WB 14 ADB 26	Sadhipur To Lalnagar	16.945	1097.38
Nadia	WB 14 ADB 22	Kharer Math To Gobindapur	6.275	406.87
Nadia	WB 14 ADB 24	Nimtala Bazar To Rustam Nagar	6.564	438.95
Nadia	WB 14 ADB 29	Isrnali To Gopinath	6.637	427.97
Nadia	WB 14 ADB 28	Hijuli Ghospara To Baglachra	6.380	404.9
Nadia	WB 14 ADB 15	Shitalpur To Debgram Krishi Firm	18.034	1154.06
Nadia	WB 14 ADB 13	Janal To Nidaya Sluicegate (Mayapur) Via Post Office More	6.29	383.79
Nadia	WB 14 ADB 18	Methiadanga Jamtala More To Baganchara Via Barodanga Para	9.604	569.32
Nadia	WB 14 ADB 12	Ruipukur To Chak Chapra	20.543	1237.61
Nadia	WB 14 ADB 30	Nh 34 Bholdang To Birpur Ghat	10.507	640.3
Nadia	WB 14 ADB 11	Ghatigachha To Ruppur	8.175	517.49
Nadia	WB 14 ADB 25	Natna To Chak Madhubona	12.753	756.2
Grand Total of 20 roads of Nadia District			**218.097**	**13451.13**
Purba Medinipur	WB 19 ADB 21	Jasar To Brindabanchak	11.000	741.79
Purba Medinipur	WB 19 ADB 27	Diglabarh - Bankura Chak	10.400	734.68
Purba Medinipur	WB 19 ADB 28	Chandipur - Bar Baharpota	8.100	535.56
Purba Medinipur	WB 19 ADB 29	Katlauri - Fatepur	7.400	572.07
Purba Medinipur	WB 19 ADB 31	Nimdasbar - Biramput	5.800	406.68
Purba Medinipur	WB 19 ADB 20	Gorsafat - Asnan (Arang Kyarana)	9.750	661.66
Purba Medinipur	WB 19 ADB 22	Khalsiberia To Paschim Sarpai	15.600	1066.55
Purba Medinipur	WB 19 ADB 23	Dakshin Kalamdan - Tikashi	9.100	667.54
Purba Medinipur	WB 19 ADB 24	Durgapur - Jhaugeria	11.000	820.41
Purba Medinipur	WB 19 ADB 26	Bararamkua - Gaurangabar	6.900	521.00
Purba Medinipur	WB 19 ADB 32	Kaur Maishali (From Chakrasul) - Pania Via Chakrasul	5.200	384.34
Grand Total of 11 roads of Purba Medinipur District			**100.250**	**7112.28**
Grand Total of 76 Roads			**637.574**	**38994.512**

Appendix 2: ECOPs of Sample Roads in West Bengal

RURAL ROADS: ENVIRONMENTAL CHECKLIST

Road Name: **DAKSHINGRAM TO SAITHIA RAMPURHAT ROAD AT BATTALA VIA RATMA SIBGRAM**
Block Name: **MAYURESWER - I**
District Name: **BIRBHUM**
Total Length of the Road: **4.821 km**

A. Climatic Conditions

Temperature	High: 36°C Low: 11°C
Humidity	High: 91% in July Low: 51% in March
Rainfall Rainy Season	2015 m/year June to mid-September

B. Location of the Road and Generic description of Environment

No.	Type of Ecosystem	Yes	No	Explanation
1.	Coastal area Mangrove (along roadside)		√	The area is far away from CRZ (Coastal Regulation Zone). ( ) 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)*	√		Altitude: 12.3 m **The topography of the area is flat in nature.**
3.	Forest Area *(Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?*		√	Type of Vegetation: N.A Legal Status of the Forest Area: *(Reserved, National Park, Sanctuaries, Unclassified, etc.)* **There is no forest area beside or away from the alignment.**
4.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals: **NA** Endangered species (if any): **None**
5.	Inhabited Area	√		Inhabited areas of the small villages namely**,** Dakshingram, Ratma, Sibgram, exists near Ch (0m – 745m), (1176m – 2037m), (3480m – 3984m) in scattered manner respectively beside the alignment**.**
6.	Agricultural Land	√		There are few patches where there are agricultural land beside the alignment between Ch 745m – 1038m, 2262m – 3419m, 4038m – 4721m **(LHS)**. & 830m – 1176m, 2205m – 3320m, 3984m – 4721m, **(RHS)**.
7.	Grazing grounds	√		Grazing ground exists beside the alignment near **Ch 2144m (RHS)**
8.	Barren Land		√	There is no barren land beside the alignment.

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 is no such area with landslide or erosion problem. ( ) 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 is no lake or swampy area beside the alignment but many small & big ponds / Water body were found at **Ch.** 775m, 1040m, 1277m, 1415m, 1457m, 4038m, & so on **(LHS)** on the other hand 27m, 421m, 651m, 775m, 1293m, 1415m, 2037m, & so on **(RHS).**Existing beside the 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***		√	There are no road side nallas / streams / rivers noticed along the road alignment. However, few CD structures were noticed at **Ch. 3m, 124m, 1126m, 1783m, 1917m, 2205m, 2652m, & so on.**
4.	Are there problems of water stagnation and other drainage issues on or near the road? (***If yes, mention chainage)***		√	There is no problem of any water stagnation and other drainage issues observed. ( ) 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)***		√	The area is not flood prone. ( ) 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 canter line of the road alignment? **(*If yes attach list of trees indicating the location (right or left side)and the chainage*)**	√		There are **33 nos**. of trees with a dbh of 30cm or more within 10m on either side of the road alignment**. (List Placed at Attachment I)**
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)***		√	There are no such areas within 100m from the road shoulder.
			√	( ) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	There is no endangered species of flora or fauna within 100m from the road shoulder. ( ) No Secondary Information Available and Local Community is not aware of this matter

No.	Parameter/ Component	Yes	No	Explanation
9.	Are there any utility structures within 10 m on either side from the canter line of the road alignment? ***(If yes, attach list with chainage)***	√		There are 102 nos. utility structures (EP, TP, HP) within 10m on either side of the alignment.(List Placed at Attachment II)
10.	Are there any religious, cultural or community structures/buildings within 10 m on either side from the canter line of the road alignment? ***(If yes attach list with chainage)***	√		There are a total of 21 community / religious, cultural structures within 10m on either side from the centre line of the road alignment Temple at Ch 93m, 352m, 378m, 504m, 677m, 1762m, 1769m, 1773m, Library at 595m, Club at 604m, 1917m, H. School at 629m, P. School at 651m, Health centre at 1176m,**(LHS)** on the other hand Club at Ch 165m, Temple at 261m, 378m, 504m, 1695m, 2034m, P. School at 3679m**(RHS).**

D. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. *(Attach list of people met and dates)*	√		Consultation with local community was conducted on 03.12.2013. List of people attached.
2.	Any suggestion received in finalizing the alignment	√		Villagers suggested to provide speed breaker, protection wall etc. wherever required.
3.	If suggestions received, were they incorporated into the design?		√	Suggestion will be incorporated after discussion with PIU.

Attachment I

BLOCK: MAYURESWER - I
DISTRICT : BIRBHUM
ROAD CODE : T-04

List of trees

Chainage(M)	Left (No.of Trees)	Right (No. of Trees)
90	TREE	TREE
130		TREE
439		TREE
715	TREE	
827		TREE
1197		TREE
1214		TREE
1245		TREE
1252		TREE
1370	TREE	
1616	TREE	
1765	TREE	
1980		TREE
2050	TREE	
2095	TREE	
2134	TREE	
2137	TREE	
2212	TREE	
2405		TREE

2414	TREE	TREE
3352	TREE	
3387	TREE	TREE
3408		TREE
3419		TREE
3489		TREE
3626	TREE	
3820		TREE
3829		2 TREE
3860		TREE

Attachment II

BLOCK: MAYURESWER - I
DISTRICT : BIRBHUM
ROAD CODE : T-04

List of Utilities

Chainage (M)	Left	Right
0		TF
56	EP	
99	EP + TP	
139		EP
173		EP + TP
205		HP
210	EP	
236	EP	
258		EP
260	EP	
280	EP + TP	
304	EP + TP	
310		EP
326	EP	
341	EP	
370	TP	
384	TP	EP
430	EP	
444		HP
460	TP	
471		EP
488		EP
497		TP
524		EP
580	EP	
626	EP	
651		EP
677		EP
715	EP	
745	EP	
1126	EP	
1142	EP	
1187	EP	
1266	EP	
1283		EP
1332	EP	

1348	EP	
1370		EP
1389		HP
1436		EP
1476		EP + TP
1492		EP
1526		TP
1548	EP	
1586		EP
1596		TF
1633		TP
1644	EP	
1677		EP + TP
1712	EP	
1758		EP
1783	EP	
1785	HP	
1800	EP	
1826		TP
1855		EP + TP
1896		EP
1935		EP + TP
1980	EP	
2036	EP	
2210	HP	
3509		EP
3548		EP
3554	EP	
3560	HP	
3603	EP	
3626		EP
3679		EP
3693	TP	
3699		EP + TP
3710	TP	
3721	EP	
3750	EP + TP	
3786		EP + HP
3820	EP	
3829	EP	
3847		EP
3855		EP
3881		HP + TF
3898		EP
3929		EP
3957	EP	
3970	HP	
3984	EP	
4038	EP	
4066	2 EP	
4149	EP	EP

Attachment III

BLOCK:
MAYURESWER - I

DISTRICT : BIRBHUM

ROAD CODE : T-04

List of Community Structures

Chainage(M)	Left	Right
93	TEMPLE	
165		CLUB
261		TEMPLE
352	TEMPLE	
378	TEMPLE	TEMPLE
504	TEMPLE	TEMPLE
595	LIBRARY	
604	CLUB	
629	HIGH SCHOOL	
651	PRIMARY SCHOOL	
677	TEMPLE	
1176	HELTHCENTER	
1762	TEMPLE	
1769	TEMPLE	
1773	TEMPLE	
1917	CLUB	
2034		TEMPLE

Attachment IV

BLOCK: MAYURESWER - I

DISTRICT : BIRBHUM
ROAD CODE : T-04

8m to 10m	6m to 8m	4m to 6m	2.75m to 4m	0m to 2.75m	Chainage(M)	0m to 2.75m	2.75m to 4m	4m to 6m	6m to 8m	8m to 10m	CD
					0		TF				
					3						CD
					27	POND					
			EP		56						
			TREE		90		TREE				
			TEMPLE		93						
			EP + TP		99						
					124						CD
					130		TREE				
					139		EP				
					165		CLUB				
					173		EP + TP				
					205		HP				
			EP		210						
			EP		236						
					258		EP				
			EP		260						
					261		TEMPLE				
			EP + TP		280						
			EP + TP		304						
					310		EP				
			EP		326						
			EP		341						
			TEMPLE		352						
			TP		370						
			TEMPLE		378		TEMPLE				
			TP		384		EP				
					421		POND				
			EP		430						

					439		TREE				
					444		HP				
			TP		460						
					471	EP					
					488		EP				
					497		TP				
				TEMPLE	504	TEMPLE					
					524		EP				
					545						CD
			EP		580						
		LIBRARY			595						
				CLUB	604						
			EP		626						
			HIGH SCHOOL		629						
			PRIMARY		651		EP +				
			TEMPLE		677		EP +				
			TREE + EP		715						
			EP		745						
					760						CD
			POND		775		POND				
					827		TREE				
			POND		1040						
			EP		1126						CD
			EP		1142						
			HELTHCENTER		1176						
			EP		1187						
					1197		TREE				
					1214	TREE					
					1245		TREE				
					1252		TREE				
			EP		1266						
				POND	1277						
					1283	EP					
					1293	POND					
				EP	1332						
			EP		1348						
					1362						CD
			TREE		1370		EP				

					1389		HP				
			POND		1415		POND				
					1436		EP				
			POND		1457						
					1476		EP + TP				
					1492	EP					
					1526		TP				
			EP		1548						
					1586		EP				
					1596		POND + TF				
				TREE	1616	POND					
					1633		TP				
				EP	1644						
					1677		EP + TP				
					1695						
			EP		1712						
					1758		EP				
				TEMPLE	1762						
			TREE		1765						
			TEMPLE		1769						
				TEMPLE	1773						
			EP		1783						CD
			HP		1785						
			EP		1800						
					1826		TP				
					1855		EP + TP				
					1896		EP				
					1905						CD
			CLUB		1917						
			POND		1935		EP + TP				
			POND		1960						CD
			EP		1980		TREE				
					2034		TEMPLE				
			EP		2036						
					2037		POND				
			TREE		2050						
				POND	2083						

				TREE	2095	POND					
					2128						CD
			TREE		2134						
			TREE		2137						
					2205						CD
			HP		2210						
			TREE		2212						
			POND		2262						CD
					2405		TREE				
			TREE		2414		TREE				
					2503						CD
					2652						CD
					2802						CD
					2983						CD
					3268						CD
			POND		3335						
			TREE		3352						
			TREE		3387		TREE				
					3408		TREE		POND		
					3419		TREE				
					3489		TREE				
					3509		EP				
					3548		EP				
			EP		3554		POND				
			HP		3560		POND				
			EP		3603						
				TREE	3626	EP					
					3679		EP				
			TP		3693						
					3699		EP + TP				
			TP		3710						
			EP		3721						
			EP + TP		3750						
					3786		EP + HP				
					3805						CD
			EP		3820		TREE				
			EP		3829		2 TREE				
					3847		EP				

					3855		EP				
					3860		TREE				
					3881		HP + TF				
					3885						CD
					3898		EP + POND				
					3929		EP				
			EP		3957						
			HP		3970						
			EP		3984						
			EP + POND		4038						
			2 EP		4066		POND				
			EP		4149		EP				
			POND		4212						
					4404		POND				
End of the road					4821	**End of the road**					

Road Name: **BARUTIA TO CHOTTORIGRAM ROAD VIA RADHANAGAR**
Block Name: **MAYURESWER - II**
District Name: **BIRBHUM**
Total Length of the Road: **2.381km**

A. Climatic Conditions

Temperature	High: 36°C Low: 11°C
Humidity	High: 91% in July Low: 51% in March
Rainfall Rainy Season	2015 m/year June to mid-September

N.S. – Not Specified

B. Location of the Road and Generic description of Environment

No.	Type of Ecosystem	Yes	No	Explanation
1.	Coastal area Mangrove (along roadside)		√	The area is far away from CRZ (Coastal Regulation Zone).
				( ) 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)*	√		Altitude: 54.5m. The topography of the area is flat in nature.
3.	Forest Area *(Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?*		√	Type of Vegetation: N.A Legal Status of the Forest Area: *(Reserved, National Park, Sanctuaries, Unclassified, etc.)*
				There is no forest area beside or away from the alignment.
4.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals: **NA** Endangered species (if any):**None**
5.	Inhabited Area	√		Small villages namely**,** Barutia Radhanagar Chottori (413m – 477m), (1280m – 1380m), (1782m - 2196m), (2196m – 2381m) respectively beside the alignment**.**
6.	Agricultural Land	√		There are few patches where there are agricultural land beside the alignment between Ch 70m – 413m, 477m – 1280m, 1380m – 1782m **(LHS),** & 55m – 437m, 477m – 1280m, 1284m – 1658m, 2034m – 2143m **(RHS)**
7.	Grazing grounds	√		Grazing ground exists beside the alignment near Ch 22m **(LHS)**
8.	Barren Land		√	There is no barren land beside the alignment.

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 is no such area with landslide or erosion problem. ( ) 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 is no lake or swampy area beside the alignment but many small & big ponds / Water body were found at Ch. 1258m, 1782m, 1960m, (LHS) on the other hand 22m, 140m, 203m, 2180m, & so on (RHS). Existing beside the 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***		√	There are no road side nallas / streams / rivers noticed along the road alignment. However, few CD structures were noticed at Ch. 7m, 269m, 964m, 1213m, 1443m, & so on.
4.	Are there problems of water stagnation and other drainage issues on or near the road? (***If yes, mention chainage)***		√	There is no problem of any water stagnation and other drainage issues observed. ( ) 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)***		√	The area is not flood prone. ( ) 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 canter line of the road alignment? **(*If yes attach list of trees indicating the location (right or left side)and the chainage*)**	√		There are 26 nos. of trees with a dbh of 30cm or more within 10m on either side of the road alignment.(List Placed at Attachment I)
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)***		√ √	There are no such areas within 100m from the road shoulder. ( ) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	There is no endangered species of flora or fauna within 100m from the road shoulder. ( ) No Secondary Information Available and Local Community is not aware of this matter
9.	Are there any utility structures within 10 m on either side from the canter line of the road alignment? ***(If yes, attach list with chainage)***	√		There are 52 nos. utility structures (EP, TP, HP) within 10m on either side of the alignment.(List Placed at Attachment II)

No.	Parameter/ Component	Yes	No	Explanation
10.	Are there any religious, cultural or community structures/buildings within 10 m on either side from the canter line of the road alignment? ***(If yes attach list with chainage)***	√		There are a total of 7 community / religious, cultural structures within 10m on either side from the center line of the road alignment Club at Ch Burial Ground at Ch 1837m, Samabay Smite at Ch 1913m, P. School at Ch 2370m, (LHS) on the other hand High School at Ch 1562m, SSK at Ch 1569m, Health Canter at Ch 2076m, Mosque at Ch 2293m,(RHS).

D. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. ***(Attach list of people met and dates)***	√		Consultation with local community was conducted on 10.12.2013. List of people attached.
2.	Any suggestion received in finalizing the alignment	√		Villagers suggested to provide speed breaker, protection wall etc. wherever required.
3.	If suggestions received, were they incorporated into the design?		√	Suggestion will be incorporated after discussion with PIU.

Attachment I

BLOCK: MAYURESWER - II

DISTRICT : BIRBHUM

ROAD CODE : T-05

List of trees

Chainage(M)	Left (No.of Trees)	Right (No. of Trees)
22		TREE
73	2 TREE	
105	TREE	
120	TREE	
400 - 413	5 TREE	
480	TREE	
485	TREE	
542		TREE
559		TREE
1284	TREE	
1744		TREE PLANTATION
1932	5 TREE	
2034		TREE
2040	TREE	
2180		4TREE
TOTAL	**18**	**8**

Attachment II

BLOCK: MAYURESWER - II

DISTRICT : BIRBHUM

ROAD CODE : T-05

List of Utilities

Chainage(M)	Left	Right
0	EP	
51		EP
105	EP	
140		EP
187		EP
238		EP
287	EP	
341	EP	
377		EP
413		EP
437		EP
440		HP
463	EP	
475		EP
1258	EP	
1280	HP	
1284		EP
1329	EP	
1377		EP
1418	EP	
1436	EP	
1446	EP	EP
1492	EP	
1539		EP
1585	EP	
1615	EP	
1654	EP	
1698		EP
1714	EP	
1744	EP	
1782	EP	
1809	EP	HP
1865	EP	
1921	EP	
1926	HP	
1970		EP
1980	EP	
2040		EP
2089	EP	
2096		EP
2143		EP
2180		EP
2196		HP
2200		EP
2240	EP	
2260		EP

2293		EP
2330	EP	
2340		EP
2381		EP
TOTAL	**26**	**26**

Attachment III

BLOCK: MAYURESWER - II

DISTRICT : BIRBHUM

ROAD CODE : T-05

List of Community Structures

Chainage(M)	Left	Right
1562		HIGH SCHOOL
1569		S.S.K
1837	BURIAL GROUND	
1913	SAMABAI SAMITI	
2076		HEALTH CENTER
2293		MOSQUE
2370	P.SCHOOL	

Attachment IV

BLOCK: MAYURESWER - II
DISTRICT :
BIRBHUM
ROAD CODE : T-05

8m to 10m	6m to 8m	4m to 6m	2.75m to 4m	0m to 2.75m	Chainage (M)	0m to 2.75m	2.75m to 4m	4m to 6m	6m to 8m	8m to 10m	CD
			EP		0						
					7						CD
			Grazing grounds		22	POND, TREE					
					51	EP					
			2 TREE		73						
			EP + TREE		105						
			TREE		120						
					140		POND + EP				
					187		EP				
					203	POND					
					238		EP				
					269						CD
			EP		287						
			EP		341						
					377		EP				
			5 TREE		400 - 413						
					413		EP				
					437		EP				
					440		HP				
			EP		463						
					475		EP				
			TREE		480						
			TREE		485						
					538						CD
					542		TREE				
					559		TREE				
					581						CD
					964						CD
					1213						CD
			POND + EP		1258						

			HP		1280						
			TREE		1284		EP				
			EP		1329						
					1377		EP				
			EP		1418						
			EP		1436						
					1443						CD
			EP		1446		EP				
			EP		1492						
					1539		EP				
					1562		HIGH SCHOOL				
					1569		S.S.K				
			EP		1585						
			EP		1615						
			EP		1654						
					1698		EP				
			EP		1714						
			EP		1744		TREE PLANTATION				
			POND + EP		1782						
				EP	1809	HP					
			BURIAL GROUND		1837						
			EP		1865						
			SAMABAI SAMITI		1913						
			EP		1921						
			HP		1926						
			POND + 5 TREE		1932						
					1963						CD
					1970		EP				
			EP		1980						
					2034		TREE				CD
			TREE		2040		EP				
					2076		HELTH CENTER				
			EP		2089						
					2096		EP				
					2143		EP				

					2180		EP+4TREE+POND				
					2196		HP				
					2200		EP				
			EP		2240						
					2260		EP				
					2293		EP		MOSQUE		
			EP		2330		POND				
					2340		EP				
			P.SCHOOL		2370						
Endof the road					2381		EP	**Endof the road**			

Road Name:**Radhakantapur more to Sahajadpur**
Block Name:**Memari-II**
District Name:**Burdwan**
Total Length of the Road:**5.250 km**

A. Climatic Conditions

Temperature	High: 36°C (May) Low: 14°C(Dec)
Humidity	High: 92% in July Low: 65% in March
Rainfall Rainy Season	1550mm/year June to mid-September

N.S. – Not Specified

B. Location of the Road and Generic description of Environment

No.	Type of Ecosystem	Yes	No	Explanation
1.	Coastal area Mangrove (along roadside)		√	Distance from Coastline: km. There is away from CRZ (Coastal Regulation Zone).
				( ) 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)*	√		Altitude: 39.7m The topography of the area is flat in nature.
3.	Forest Area *(Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?*		√	Type of Vegetation: There is no forest beside the project road. Legal Status of the Forest Area: *(Reserved, National Park, Sanctuaries, Unclassified, etc.)*
				No part of the project road passes through any forest area.
4.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals: N.A. Endangered species (if any): None, as there is no forest area.
5.	Inhabited Area	√		Small villages exist such as Bohar (0-475m),Golampara, (675-1030m) Sidhuria (1375-1685m), Bishnupur (3500-4170) and sahajadpur (4175-5250m) in scattered manner.
6.	Agricultural Land	√		Agricultural land exists beside the alignment near Ch 470-675),(1030-1375),(1920-3470),(4225-5040)
7.	Grazing grounds		√	There is no Grazing ground beside the alignment.
8.	Barren Land		√	There is no barren land beside the alignment.

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 is no landslide problem along the road since no part of the project corridor lies within hilly terrain. Erosion problem was not noted 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 is no lake or swampy area beside the alignment but many small and big ponds exist beside the alignment at Ch.330m, 705m, 965m, 1070m, 2360m, 2910m, 2950m, 3344m, 4150m,(LHS) 640m, 845m, 909m, 965m, 1442m, 1705m, 3470m, 3612m, 3740m, 3815m, 4010m, 4100m, RHS
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***	√		There are some nallas crossed by the road at ch 228m, 552m, 656m, 860m, 1070m, 1121m, 1470m, 1685m, 2301m, 2740m, 2923m, 2953m, 3776m, 3880m, 4325m, 4665m, 5040m, .
4.	Are there problems of water stagnation and other drainage issues on or near the road? (***If yes, mention chainage)***		√	Water stagnation problem has not been found during transect walk. ( ) 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)***		√	The area is not prone to flooding problem. ( ) No Secondary Information is available and Local Community is not aware of this matter
6.	Are there any trees with a dbh of 30 cm or more within 10 m on either side from the center line of the road alignment? **(*If yes attach list of trees indicating the location (right or left side)and the chainage*)**	√		There are 8 Nos. of trees with a dbh of 30m or more within 10m on either side from the center line of the road alignment. List attached in attachment-I)
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)***		√	There is no such area within 100m from the road shoulder. ( ) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	There is no evidence of endangered species of flora or fauna within 100m from the road shoulder. ( ) No Secondary Information Available and Local Community is not aware of this matter

No.	Parameter/ Component	Yes	No	Explanation
9.	Are there any utility structures within 10 m on either side from the center line of the road alignment? ***(If yes, attach list with chainage)***	√		There are 35 nos. of utility structures (EP, TP, HP, Tap, TF etc.)Within 10m on either side from the center line of the road alignment. (Attachment-II)
10.	Are there any religious, cultural or community structures/ buildings within 10 m on either side from the center line of the road alignment? ***(If yes attach list with chainage)***	√		There are 7 nos. of religious / cultural / community structures (School, Temple Health Centre, etc.) within 10m on either from the center line of the road alignment. (Attachment-III)

D. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. ***(Attach list of people met and dates)***	√		Consultation with local community was conducted on 03/12/2013 (List of people attached)
2.	Any suggestion received in finalizing the alignment	√		Community suggested to provide sufficient protective works beside the pond and water bodies.
3.	If suggestions received, were they incorporated into the design?		√	Final decision will be taken after discussion with respective PIU.

BLOCK: Memari-II **Attachment I**
DISTRICT : Burdwan
ROAD CODE : T-02

List of Trees

Chainage(M)	Left (No.of Trees)	Right (No. of Trees)
3521-3600	2 TREE	2 TREE
3605	TREE	
3996		TREE
4005		TREE
5112	TREE	

BLOCK: Memari-II **Attachment II**
DISTRICT : Burdwan
ROAD CODE :T-04

List of Utilities

Chainage(M)	Left	Right
35	EP	
50	EP	
81		TP
111	EP	
236	EP	
285	EP	
305	EP	
327	HP	
342	EP	
379	EP	
558		TP

578		EP
609	EP	EP
915		TP
935		EP
1070		EP
1485		HP
1558	EP	
1580		EP
1595	EP	
1620	EP	EP
1670		EP
2464	EP	
3498	EP	
3521-3600	TP	
3615	EP/TP	
3776	EP	
3892	EP	
3915		EP
3992		EP
4100		EP
4117	TP	

Attachment III

BLOCK: Memari-II

DISTRICT : Burdwan

ROAD CODE : T-04

List of Community Structures

Chainage(M)	Left	Right
155		HOSPITAL
295	TEMPLE	
886	TEMPLE	
1730	GRAVEYARD	
1780		P.SCHOOL
2301		
3890		P.SCHOOL
4175		GRAVEYARD

BLOCK: Memari-II **Attachment IV**
DISTRICT : Burdwan
ROAD CODE : T-02

8m to 10m	6m to 8m	4m to 6m	2.75m to 4m	0m to 2.75m	Chainage(M)	0m to 2.75m	2.75m to 4m	4m to 6m	6m to 8m	8m to 10m	CD
			EP		35						
			EP		50						
					81	TP					
			EP		111						
					155		HOSPITAL				
					228						CD
			EP		236						
			EP		285						
			TEMPLE		295						
			EP		305						
			HP		327						
			POND		330						
				EP	342						
			EP		379						
					552						CD
					558		TP				
					578		EP				
				EP	609		EP				
					640		POND				
					656						CD
			POND		705						
					845		POND				
					860						CD
			TEMPLE		886						
					909		POND				
					915	TP					
					935		EP				
			POND		965		POND				
					1070		EP				CD

					1121						CD
					1442		POND				
					1470						CD
					1485		HP/POND				
			EP		1558						
					1580		EP				
			EP		1595						
			EP		1620		EP				
					1670		EP				
					1685						CD
					1705		POND				
					1715			PLAY GROUND			
			GRAVEYARD		1730						
					1780		P.SCHOOL				
					2301						CD
			POND		2360						
			EP		2464						
					2740						CD
			POND		2910						
					2923						CD
			POND		2950						
					2953						CD
			POND		3344						
					3470		POND				
				EP	3498						
			TP/2 TREE		3521-3600		2 TREE				
			TREE		3605						
					3612		POND				
			EP/TP		3615						
					3695			POND			
					3740		POND				
				EP	3776						
					3815		POND				
					3818						CD
					3880						CD
					3890		P.SCHOOL				
			EP		3892						
					3915		EP				

					3992		EP				
					3996		TREE				
					4005		TREE				
					4010		POND				
					4075		POND				
					4100		EP				
				TP	4117						
			POND		4150						
					4175		GRAVEYARD				
					4325						CD
					4665						CD
					5040						CD
			TREE		5112						
		END POINT			5250			END POINT			

Road Name: **Bhota to Karanji**
Block Name: **Ausgram I**
District Name: **Burdwan**
Total Length of the Road: **13.650 km**

A. Climatic Conditions

Temperature	High: 36°C (May) Low: 14°C(Dec)
Humidity	High: 92% in July Low: 65% in March
Rainfall Rainy Season	1550mm/year June to mid-September

B. Location of the Road and Generic description of Environment

No.	Type of Ecosystem	Yes	No	Explanation
1.	Coastal area Mangrove (along roadside)		√	Distance from Coastline: km. The area is far away from CRZ (Coastal Regulation Zone).
				( ) 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)*	√		Altitude: 33.6m The topography of the area is flat in nature.
3.	Forest Area *(Explain whether the road passes through forest areas or located along the forest areas and distance from shoulder to the forest area)?*		√	Type of Vegetation: There is no forest area beside the alignment. Legal Status of the Forest Area: *(Reserved, National Park, Sanctuaries, Unclassified, etc.)*
				No part of the project road passes through any forest area.
4.	Wildlife (*Explain whether there are any wildlife species in the project area*)		√	Name of animals :N.A. Endangered species (if any):None
5.	Inhabited Area	√		There are few villages namely Takipur (442m-970m), Chowari (1005m-1430m) Asinda (2552m-3150m) Brojopur adibasipara (3470m-3820m) Brojopur (4100m-4750m) Bhada (10745m-11180m) Karanji (12227m-13250m)
6.	Agricultural Land	√		Some part of the project road passes through agriculture land at following ch. 000m-260m, 1675m-2552m, 4150m-7000m, 8065m-9900m, 11180m-12227m.
7.	Grazing grounds		√	As per the discussions with the villagers no part of the study area consisted of grazing land.
8.	BarrenLand		√	There is no barren land beside the alignment.

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 is no landslide or erosion problem 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 is no lakes/swamps beside the road, but there are ponds at Ch. 475m-505m, 527m-565m, 1350m-1360m 1415m-1428m, 1675m, 2500m-2530m, 2870m, 3665m-3820m, 4315m & so on.
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*		√	There are no nallahs/streams/rivers etc. crossing by the road but there are some cross drainage structures at Ch. 8065m, 8500m, 8880m, 10665m, 11150m, 11182m, 11580m, 11660m, 12400m, 12632m, 12940m.
4.	Are there problems of water stagnation and other drainage issues on or near the road? (*If yes, mention chainage)*		√	There is no water stagnation problem in the project road. ( ) 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)*		√	The area is not 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 center line of the road alignment? (*If yes attach list of trees indicating the location (right or left side)and the chainage*)	√		There are 138 Nos. of trees with a dbh of 30m or more within 10m on either side of the alignment. (List placed at Attachment I)
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 faunal habitat, breeding ground etc. Has been found within 100 m of the road shoulder. ( ) No Secondary Information is available and Local Community is not aware of this matter
8.	Along the road and within 100m of the road shoulder is there any evidence of floral and faunal species that are classified as endangered species?		√	There is no evidence of endangered species of flora & fauna within 100m from road shoulder. ( ) No Secondary Information Available and Local Community is not aware of this matter

No.	Parameter/ Component	Yes	No	Explanation
9.	Are there any utility structures within 10 m on either side from the center line of the road alignment? *(If yes, attach list with chainage)*	√		There are 150 Nos. of utility structures (EP, TP, HP, etc.) within 10m on either side of the centre line of road alignment. (List placed at Attachment II).
10.	Are there any religious, cultural or community structures/buildings within 10 m on either side from the center line of the road alignment? *(If yes attach list with chainage)*	√		There are 39 nos. of community structures (School, club, Temple Grave yard, etc.) within 10m on either side of the alignment. (List placed at Attachment III)

D. Public Consultation

No.	Consultation Activities	Yes	No	Remarks
1.	Consultation with local community was conducted before finalizing the alignment. ***(Attach list of people met and dates)***	√		Consultation with local community was conducted on 09.12.2013.(list of people attached).
2.	Any suggestion received in finalizing the alignment	√		Community suggested to construct culverts, speed breakers, filling work for restoration of borrow pits wherever required.
3.	If suggestions received, were they incorporated into the design?		√	Suggestions will be incorporated after discussion with respective PIU.

Attachment I

BLOCK: Ausgram I

DISTRICT : Burdwan

ROAD CODE : T07

Chainage(M)	Left (No.of Trees)	Right (No. of Trees)
0		TREE
10	TREE	
1176		TREE
1178		TREE
1370	TREE	
1380	2TREE	
1390	TREE	
1392	TREE	
1396	TREE	
1420		TREE
1422		TREE
1430		TREE
1780	TREE	TREE
1790	TREE	TREE
1820	TREE	
1850		TREE

1910	TREE	TREE
1950	TREE	TREE
1970	TREE	TREE
2015	TREE	TREE
2250-2310	TREE	TREE
2270		TREE
2300	TREE	TREE
2305		TREE
2310		TREE
2315	TREE	
2320		TREE
2350	TREE	
2352	TREE	TREE
2356	TREE	TREE
2360	TREE	TREE
2370	TREE	TREE
2450	TREE	TREE
2500-2530		
2540		TREE
2550	TREE	TREE
2552	TREE	
2590	TREE	
2595	TREE	
2650	TREE	
2940	TREE	TREE
2990		
3004	TREE	TREE
3006		TREE
3007		TREE
3008		TREE
3009	TREE	
3010		TREE
3030	TREE	
3035	TREE	TREE
3048	TREE	
3050	TREE	
3070	TREE	
3142	TREE	
3200	TREE	
3830	TREE	TREE
3840	TREE	
3850	TREE	TREE
3860	TREE	TREE
3925	TREE	TREE
4000	TREE	TREE
4025	TREE	TREE
4290		TREE
4295	TREE	TREE
4300	2TREE	
4310	TREE	
7300	TREE	TREE
7340	TREE	TREE
7400	TREE	TREE
7500	TREE	TREE
7640		TREE
7650		TREE

7655		TREE
7660		TREE
7670		TREE
7715		TREE
7810		TREE
7883-7930		TREE
7920	TREE	
7970	TREE	
8000		TREE
8015		TREE
9290		TREE
9350		TREE
10350		TREE
10750	TREE	
10775		TREE
10777	TREE	
10900		TREE
10910		TREE
10920	TREE	
11130	TREE	
11136	TREE	
11140	TREE	
11179		TREE
11180		TREE
11200	TREE	TREE
11210	TREE	
11270	TREE	
11300	TREE	TREE
11350	TREE	TREE
11400		TREE
12300	TREE	TREE
12310	TREE	
12370	TREE	
12430		TREE

Attachment II

BLOCK: Ausgram I

DISTRICT : Burdwan

ROAD CODE : T07

List of Utilities

Chainage(M)	Left	Right
20	HP	
158		EP
240		TRF
442		EP
505	EP	TP/EP
515	TP	
522		EP
570		EP/TP
590	EP	EP
625	TP	
740	TP	
800	EP	
830		EP

920		EP
930	EP	TP
970		EP
1110		EP
1340	T.P	
1570	EP	
2540	EP	
2552		EP
2560	TP	
2562	EP	HP
2565	EP	
2570		TP
2690	EP	
2750	TP	
2870	HP	EP
2990		EP
3010	TP/EP	
3080		EP
3090	EP	
3125-3150	EP	
3470	EP	
3630		HP/EP
3760	HP/EP	
4170		EP
4200		EP
4270		EP
4300		EP
4305	HP	TP
4312		HP
4320	EP	EP/TP
4350		EP
4370		EP
4450	EP	
4530	EP/TP	
4542		TP
4560	EP	
4562		EP
4580		TP
4590-4600	HP/TP	
4615		TP
4620		EP
6370	EP	
7050	TP	EP
7150	EP	TP
7510		EP/TP
7530	EP/TP	
7580	TP	
7600	TP	
7620	EP	TP
7630		EP
7640	TRF	
7650	EP/TP	
7655	EP	
7750		EP
7880	EP	
7905		EP

7950		EP
7957		EP
7990	HP	
8000	EP	
8015	TRF	
8120		EP
8220	EP	EP
9050	EP	
9120	EP	
9200	TRF	
9250	EP	
9260		EP
9290	EP	
9340	EP	
9400	EP	
9720	EP	
9725		EP
9730	EP	
9750	EP	
9760		EP
9800	EP	EP
9820	EP	EP
9900	EP	EP
10000	EP	
10125	TRF	
10710	EP	
10750		EP
10777		EP
10800		EP/HP
10905		EP
10922		EP
10925	EP/TP	
10930		EP
10940	EP/TP	
11010	HP	EP
11145	EP	
11177	EP	EP
11300	EP	
11400	EP	
11420		EP
11450		EP
11470	EP	
12140	EP	EP
12410	EP	
12420		EP
12430	EP	
13000	EP	
13500		EP
13520		TRF
13550		EP

Attachment III

BLOCK: Ausgram I
DISTRICT : Burdwan
ROAD CODE : T07

List of Community Structures

Chainage(M)	Left	Right
0	Bishramgar	
520		TEMPLE
550		TEMPLE
715	TEMPLE	
770	SOMABYSOMETY	
1300	F.P.SCHOOL	

2250-2310		Play ground
2650		TEMPLE
3004		TEMPLE
3015	ICDS	
3125-3150		F.P.SCHOOL
3570	ICDS	CLUB
3670	TEMPLE	S.S.K.
4100		F.P.SCHOOL
4135-4210		PLAYGROUND
4270	CLUB	
4510	TEMPLE	
4550	TEMPLE	
4620	ICDS	
4745-4750		ASHRAM
7715	CLUB	
8810		ASHRAM
8950-9020		PLAYGROUND
9715	ICDS	
10300		ICDS
10690		F.P.School
10775	TEMPLE	
10800	ICDS	
11000	TEMPLE	
11136		TEMPLE
11500		TEMPLE
12200		HelthCentre
12227	F.P.School	
13400	F.P.School	
13456		Mosque
13510	GRAVEYARD	
13575	Bishramagar	

Attachment IV

BLOCK: Ausgram I
DISTRICT : Burdwan
ROAD CODE : T07

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
			Bishramgar		0		Tree				
			Tree		10						
			HP		20						
					158		EP				
					240			TRF			
					260						CD
					300						
					442		EP				
					475-505		POND				
			EP		505		TP/EP				
			TP		515						
					520		TEMPLE				
					522		EP				
					527-565		POND				
					550		TEMPLE				
					570		EP/TP				
			EP		590		EP				
			TP		625						
			TEMPLE		715						
			TP		740						
			EP		800						
			SOMABYS		770						
					800						
					830		EP				
					880						CD
					920		EP				
			EP		930		TP				
					970		EP				
					1105						CD
					1110		EP				
					1150						CD
					1176		TREE				

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
					1177						
					1178		TREE				
					1179						
					1180						
					1190						
					1200						CD
					1285						
			F.P.SCHOO		1300						
			T.P		1340						
			POND		1350-1360						
			TREE		1370						
			2TREE		1380						
			POND		1390-1395						
			TREE		1390						
			TREE		1392						
			TREE		1396						
			POND		1415-1428						
					1420		TREE				
					1422		TREE				
					1430		TREE				
					1555						
			EP		1570						
			POND		1675						CD
					1780						
					1790						
					1792-1795						
			TREE		1780		TREE				
			TREE		1790		TREE				
			TREE		1820						
					1850		TREE				
			TREE		1910		TREE				
			TREE		1950		TREE				
			TREE		1970		TREE				
			TREE		2015		TREE				
			TREE		2250-2310		TREE	PLAYGRO UND			
					2270		TREE				
			TREE		2300		TREE				
					2305		TREE				

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
					2310		TREE				
			TREE		2315						
					2320		TREE				
			TREE		2350						
			TREE		2352		TREE				
			TREE		2356		TREE				
			TREE		2360		TREE				
			TREE		2370		TREE				
			TREE		**2450**		TREE				
			POND		2500-2530						
			EP		2540		TREE				
			TREE		2550		TREE				
			TREE		2552		EP				
			TP		2560						
			EP		2562		HP				
			EP		2565						
					2570		TP				CD
					2575						
			TREE		2590						
			TREE		2595						
			TREE		2650		TEMPLE				
			EP		2690						
			TP		2750						
			HP		2870		EP	POND			
			TREE		2940		TREE				
					2990		EP				
			TREE		3004		TREE	TEMPLE			
					3006		TREE				
					3007		TREE				
					3008		TREE				
			TREE		3009						
			TP/EP		3010		TREE				
			ICDS		3015						
			TREE		3030						
			TREE		3035		TREE				
			TREE		3048						
			TREE		3050						
			TREE		**3070**						
					3080		EP				

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
			EP		**3090**						
			EP		**3125-3150**		F.P.SCHO				
			TREE		**3142**						
					3150						CD
			TREE		**3200**						
					3430						CD
			EP		**3470**						
			ICDS		**3570**			CLUB			
					3615						CD
					3630		HP/EP				
			TEMPLE		**3670**		S.S.K.				
					3750						CD
			HP/EP		**3760**						
			POND		**3765-3820**						
			TREE		**3830**		TREE				
			TREE		**3840**						
			TREE		3850		TREE				
			TREE		3860		TREE				
					3900						CD
			TREE		3925		TREE				
		PUMPHOUSE	TREE		4000		TREE				
			TREE		4025		TREE				
					4050						CD
					4100		F.P.SCHOOL				
			POND		4135-4210		PLAYGROUND				
					4170		EP				
					4200		EP				
					4250						CD
			CLUB		4270		EP				
			PUMPHOU		4290		TREE				
			TREE		4295		TREE				
			2TREE		4300		EP				
			HP		4305		TP				
			TREE		4310						
					4312		HP				
			POND		4315						
			EP		4320		EP/TP				
					4340						CD

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
					4350		EP				
					4370		EP				
			EP		4450						
					4500						CD
			TEMPLE		4510						
			EP/TP		4530						
					4542		TP				
			TEMPLE		4550						
			EP		4560						
					4562		EP				
					4580		TP				
			POND/HP/T		4590-4600						
					4615		TP				
		ICDS			4620		EP				
					4745-4750		ASHRAM				
					4770						
					4810						CD
					4918						CD
					5560-5575		POND				
					6320						CD
			EP		6370						
			TP		7050		EP				
			EP		7150		TP				
			TREE		7300		TREE				
			TREE		7340		TREE				
			TREE		7400		TREE				
			TREE		7500		TREE				
					7510		EP/TP				
			EP/TP		7530						
			TP		7580						
			TP		7600						
			EP		7620		TP				
					7630		EP				
			TRF		7640		TREE				
			EP/TP		7650		TREE				
			EP		7655		TREE				
					7660		TREE				
					7670		TREE				
			CLUB		7715		TREE				

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
			POND		7750		EP				
					7810		TREE				
			EP		7880						
			POND		7883-7930		TREE				
			TREE		7920						
					7905		EP				
					7935						
					7950		EP				
					7955						
					7957		EP				
			TREE		7970						
			HP		7990						
			EP		8000		TREE				
			TRF		8015		TREE				
					8065						CD
					8120		EP				
			EP		8220		EP				
					8500						CD
					8810		ASHRAM				
					8880						CD
					8950-9020		PLAYGROUND				
			EP		9050						
			EP		9120						
			TRF		9200						
			EP		9250						
					9260		EP				
			EP		9290		TREE				
			EP		9340						
					9350		TREE				
			EP		9400						
		ICDS			9715						
			EP		9720						
					9725		EP				
			EP		9730						
			EP		9750						
					9760		EP				
			EP		9800		EP				
			EP		9820		EP				

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
			EP		9900		EP				
			EP		10000						
			TRF		10125						
					10300			ICDS			
					10350		TREE				
					10665						CD
					10690			F.P.School			
			EP		10710						
			TREE		10750		EP				
			TEMPLE		10775		TREE				
			TREE		10777		EP				
		ICDS			10800		EP/HP				
					10900		TREE				
					10905		EP				
					10910		TREE				
			TREE		10920						
					10922		EP				
			EP/TP		10925						
					10930		EP				
			EP/TP		10940						
			TEMPLE		11000						
			HP		11010		EP				
			TREE		11130						
			TREE		11136		TEMPLE				
			TREE		11140						
			EP		11145						
					11150						CD
					11175						
			EP		11177		EP				
					11178						
					11179		TREE				
					11180		TREE				
					11182						CD
			TREE		11200		TREE				
			TREE		11210						
			TREE		11270						
			EP/TREE		11300		TREE				
			TREE		11350		TREE				
			EP		11400		TREE				

8m to 10m	6m to 8m	4m to 6m	2.75m to	0m to	Chainage	0m to	2.75m to	4m to 6m	6m to 8m	8m to	CD
					11420		EP				
					11450		EP				
			EP		11470						
					11500		TEMPLE				
					11580						CD
					11660						CD
			EP		12140		EP				
					12200		HelthCentr				
			F.P.School		12227						
			TREE		12300		TREE				
			TREE		12310						
			TREE		12370						
					12400						CD
			EP		12410						
					12420		EP				
			EP		12430		TREE				
					12470			Poulty farm			
					12632						CD
					12940						CD
			EP		13000						
			F.P.School		13400						
					13456		Mosque				
					13500		EP				
			GRAVEYA		13510						
					13520			TRF			
					13550		EP				
			Bishramaga		13575						

Appendix 3: Photo Illustration of Sample Roads in West Bengal

Barutia to Chottorigram Road via Radhanagar – sample road at Burdwan district

Public consultation for the sample road at Burdwan district

Starting point of Dakshingram to Saithia Rampurhat road at Birbhum

Public consultation for the sample road at Birbhum district

Small temple besides the road {Gorsafat To Asnan (Arang Kyarana)} at Purba Medinipur

Minor bridge over canal - {Gorsafat To Asnan (Arang Kyarana)} road at Purba Medinipur

Jasar To Brindabanchak road at Purba Medinipore

Public consultation at Jasar To Brindabanchak road at Purba Medinipore

Pond beside the road Kumarganj To Balitakundu at Hooghly

Tube well beside Kumarganj To Balitakundu road at Hooghly

Tree beside Kumarganj To Balitakundu road at Hooghly

Public consultation - villager, ADB team, PIC, PIU and TSC - Kumarganj To Balitakundu road at Hooghly

Appendix 4: 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.

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

B. CONTRACTOR'S RESPONSIBILTY

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 programme approved by the Engineer. It shall be ensured that the sub-grade material when compacted to the density requirements shall yield the design CBR value of the sub-grade. Contractor shall begin operations keeping in mind following;

a) Haulage of material to embankments or other areas of fill shall proceed only when sufficient spreading and compaction plants is operating at the place of deposition.
b) No excavated acceptable material other than surplus to requirements of the Contract shall be removed from the site. Contractor should be permitted to remove acceptable material from the site to suit his operational procedure, then shall make consequent deficit of material arising there from.
c) Where the excavation reveals a combination of acceptable and 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.
d) The Contractor shall ensure that he does not adversely affect the stability of excavation or fills by the methods of stockpiling materials, use of plants are siting of temporary buildings or structures.

C. BORROWING FROM DIFFERENT LAND-FORMS

1. Borrow Areas located in Agricultural Lands

(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/PPCB 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 programme is to return the borrow pit sites to a safe and secure area, which the general public should be able to safely enter and enjoy. Securing borrow pits in a stable condition is fundamental requirement of the rehabilitation process. This could be achieved by filling the borrow pit floor to approximately the access road level.

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 5: Environmental Management Plan

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
I	**Design and Preconstruction 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 (Panchayati Raj Institution)	All through the alignment of each rural road	Design costs.	PIU, Design consultants	PIU, WBSRRDA
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. • Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. • The road shall follow natural topography to avoid excessive cut and fill.	All through the alignment of each rural road	Design costs	PIU, Design consultants	PIU, WBSRRDA
3.	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	Land to be made available and necessary costs if any to be borne by the state	PIU	PIU, WBSRRDA, PIC, TSC
4.	Clearing of vegetation and	• All efforts shall be taken to avoid tree cutting wherever possible.	All through the alignment of each	Costs for Forestry clearance for	Forestry clearance and	PIU, PIC, TSC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
	removing trees	• 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. • The vegetative cover shall be removed and disposed in consultation with community.	rural road (Enter chainages where tree cutting and diversion of forest land is required & proposed plantation location if details are available)	diversion of forest land, obtaining tree cutting permit to be borne by state. Costs for compensatory forestation to be borne by state or by PRI – NREGA scheme.	permit to be obtained by the PIU. Compensatory plantation to be carried out in coordination with PRI under schemes such as NREGA or local Forestry Department	
5.	Shifting of utilities and common property resources	• The road land width shall be clearly demarcated on the ground. • All efforts will be made to minimize shifting of utilities and common property resources • Utility and community structure shifting shall be planned in consultations and concurrence of the community • Required permissions and necessary actions will be taken on a timely basis for removing and shifting utility structures and common property resources before road construction activities begin.	(Enter chainages where shifting of utility structures and common property resources are required. Enter total numbers of each structure required for shifting/removal)	Costs to cover shifting and reconstruction of common property resources must be included under project costs.	PIU, contractor, utility agencies (Internal procedures to be discussed and agreed between the above parties)	PIU, PIC, TSC
6.	Design and planning of embankment construction	• The alignment design shall consider options to minimize excessive cuts and fills. • The cut off material shall be planned to 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. • The top soil of the cut and fill area shall be used for embankment slope protection • Embankment will be designed above High Flood Level (HFL) in flood prone areas where feasible.	All through the alignment of each rural road *(Enter the chainages that are prone to floods)*	Part of Project Cost	PIU, Design Consultants	PIU, WBSRRDA
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 drainage structures shall be made in water stagnant/logging areas.	Near all drainage crossings, nalas, rivers, streams and ponds. *(Enter chainages where*	Included in project costs.	PIU, Design consultants	PIU, WBSRRDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		• 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. • 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.	*earthern/structural cross drains, longitudinal drains, streams, ponds and rivers exist)*			
8.	Establishment of Construction Camp, temporary office and storage area	• Construction camp sites shall be located away from any local human settlements and forested areas (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 and forested areas (minimum 0.5 km). • The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. • 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 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 controlled manner. The recyclable waste shall be sold off and non-saleable and biodegradable	For all roads	To be included in contractor's cost	Contractor	PIU, PIC, TSC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		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.				
9.	Traffic Management and Road Safety	• Identify the areas where temporary traffic diversion may be required. • Prepare appropriate traffic movement plan approved by respective PIU for ensuring continued safe flow of traffic, pedestrians and all road users during construction. • 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. • 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 both during the day and night. • It is proposed for the respective PIU to discuss with the railways division/department for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing All measures for traffic control and safety in accordance with IRC codes:99-1988 will be followed	As proposed under DPR and determined by contractor and approved by PIC/PIU/ (Enter the chainages which may require traffic diversions where possible)	To be included in contractor's cost	Contractor	PIU, PIC, TSC
II.	**Construction Stage**					
10.	Sourcing and transportation of construction material	**Borrow Earth:** • The borrow earth shall be obtained from identified locations and with prior permission of landowner and clear understanding for its rehabilitation. • 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. • The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and	(Enter chainage or probable locations of borrow areas. Enter name and location of identified quarries.)	To be included under contractors costs	Contractor	PIC, PIU, TSC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		amount that can be borrowed. • Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. • A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal). • Borrowing of earth will not be done continuously through out the stretch. • Ridges of not less than 8m widths will be left at intervals not exceeding 300m. • Small drains will be cut through the ridges, if necessary, to facilitate drainage. • The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). • The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside. • Fly ash will be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. **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 and shall be used for other useful purposes like using in turfing of embankment. • 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.				
11.	Loss of Productive Soil, erosion and	• The top soil from the productive land (borrow areas, road widening areas etc.) shall be preserved and	All though the alignment of each	To be included under contractors	Contractor	PIU / WBSRRDA

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
	land use change	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. • 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.	project road	costs		
12.	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. • Fuel and lubricants shall be stored at the predefined storage location. • The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. • All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. • To avoid soil contamination at the wash-down and re-fuelling areas, “oil interceptors” shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.	All though the alignment of each project road	To be included under contractors costs	Contractor,	PIU, PIC, TSC
13.	Construction Debris and waste	• 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	All though the alignment of each project road	To be included under contractors costs	Contractor	PIU, PIC, TSC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		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.				
14.	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/spot 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 where available. Construction vehicles and machineries shall be periodically maintained.	Throughout the project road section	To be included under contractors costs	Contractor	PIU, WBSRRDA
15.	Tree plantation	• Compensatory Afforestation shall be made on 1:3.ratio basis • Additional trees shall be planted wherever feasible. • Follow up maintenance of planted saplings will be	(Enter the number of trees requird for planting and location of plantation site if	Costs to be covered by state or PRI under schemes such as	PIU to coordinate compensatory forestation with	PIU, PIC, TSC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		carried out for a minimum of 3 years	available)	NREGA	PRI under schemes such as NREGA or local Forestry Department	
16.	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. • 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 slope stabilisation, etc shall be taken for prevention of siltation in water bodies.	Throughout the project road	To be included under contractors costs	Contractor	PIU, PIC, TSC
17	Occupational Health and Safety	• 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. • 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.	In all project roads	Costs to be borne by Contractor	Contractor	PIC, PIU, TSC
III	**Post Construction and Operation Stage**					
18.	Air and Noise Quality	• Awareness signboard to be provided for slow driving near the habitat areas to minimize dust generation due to vehicle movement. Speed limitation and honking restrictions may be enforced near sensitive locations.	At the location determined by contractor and approved by PIU	construction cost	Contractor,	PIC, PIU, TSC
19.	Site restoration	• All construction camp/temporary office/material	All locations of	To be borne by	Contractor	PIU, PIC, TSC

SL. NO.	Project Action/ Environmental Attributes	Mitigation Measures	Location/numbers	Costs	Responsible for Implementing	Responsible for Monitoring
		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. • Obtain clearance from PIU before handling over the site to WBSRRDA. • PIC to undertake survivability assessment and report status to PIU of compensatory tree plantation (at completion of construction) with recommendation for improving the survivability of the tree if required	construction camps/temporary office/ material storage, and borrow areas	the contractor		
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	At project road locations with drainage structures	To be covered under road maintenance costs.	PIU	PIU, WBSRRDA
21	Community 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	construction cost	Maintenance Contractor, PIU	PIC/PIU

Appendix 6: 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	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
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 (Panchayati Raj Institution)	All through the alignment of each rural road		
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. • Adjust alignment to the extent feasible to avoid tree cutting, shifting of utilities or community structure. • The road shall follow natural topography to avoid excessive cut and fill.	All through the alignment of each rural road		
3.	Land acquisition	• Land acquisition, compensation packages, resettlement and rehabilitation, poverty alleviation programs for affected	All through the alignment of each rural road		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		people and all other related issues are addressed through Social Impacts and Resettlement & Rehabilitation report.			
4.	Clearing of vegetation and removing trees	• 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. • The vegetative cover shall be removed and disposed in consultation with community.	All through the alignment of each rural road *(Enter chainages where tree cutting and diversion of forest land is required & proposed plantation location if details are available)*		
5.	Shifting of utilities and common property resources	• The road land width shall be clearly demarcated on the ground. • All efforts will be made to minimize shifting of utilities and common property resources • Utility and community structure shifting shall be planned in consultations and concurrence of the community • Required permissions and necessary actions will be taken on a timely basis for removing and shifting utility structures and common property resources before road construction activities begin**.**	*(Enter chainages where shifting of utility structures and common property resources are required. Enter total numbers of each structure required for shifting/removal)*		
6.	Design and planning of embankment construction	• The alignment design shall consider options to minimize excessive cuts and fills. • The cut off material shall be planned to 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. • The top soil of the cut and fill area shall be used for embankment slope protection Embankment will be designed above High Flood Level (HFL) in flood prone areas where feasible.	All through the alignment of each rural road ***(Enter the chainages that are prone to floods)***		
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 drainage structures shall be made in water stagnant/logging areas.	Near all drainage crossings, nalas, rivers, streams and ponds. *(Enter chainages where earthern/structural cross drains, longitudinal drains, streams, ponds and rivers*		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		• 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. • 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.	*exist)*		
8.	Establishment of Construction Camp, temporary office and storage area	• Construction camp sites shall be located away from any local human settlements and forested areas (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 and forested areas (minimum 0.5 km). • The construction camps, office and storage areas shall have provision of adequate water supply, sanitation and all requisite infrastructure facilities. • 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 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 controlled 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.	For all roads		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
9.	Traffic Management and Road Safety	• Identify the areas where temporary traffic diversion may be required. • Prepare appropriate traffic movement plan approved by respective PIU for ensuring continued safe flow of traffic, pedestrians and all road users during construction. • 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. • 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 both during the day and night. • It is proposed for the respective PIU to discuss with the railways division/department for providing adequate safety measures at unmanned railway crossing where applicable. Adequate clearly visible sign shall be provided on both sides of the railway crossing All measures for traffic control and safety in accordance with IRC codes:99-1988 will be followed	As proposed under DPR and determined by contractor and approved by PIC/PIU/ *(Enter the chainages which may require traffic diversions where possible)*		
10.	Grievance Redress	• Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

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 : Once during construction after completion of about 50% of construction
Project Details:…….
Road Stretch Name : …….
Monitoring Report Quarter No.: ……..

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.	Sourcing and transportation of construction material	Borrow Earth: • The borrow earth shall be obtained from identified locations and with prior permission of landowner and clear understanding for its rehabilitation. • 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. • The Indian Road Congress (IRC):10-1961 guideline should be used for selection of borrow pits and amount that can be borrowed. • Borrowing earth from agricultural land shall be minimized to the extent possible. Further, no earth shall be borrowed from already low-lying areas. • A 15 cm topsoil will be stripped off from the borrow pit and this will be stored in stockpiles in a designated area for height not exceeding 2m and side slopes not steeper than 1:2 (Vertical: Horizontal). • Borrowing of earth will not be done continuously through out the stretch. • Ridges of not less than 8m widths will be left at intervals not exceeding 300m. • Small drains will be cut through the ridges, if necessary, to facilitate drainage. • The slope of the edges will be maintained not steeper than 1:4 (vertical: Horizontal). • The depth of borrow pits will not be more than 30 cm after stripping the 15 cm topsoil aside.	*(Enter chainage or probable locations of borrow areas.* *Enter name and location of identified quarries.)*		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		• Fly ash will be used in road embankment as per IRC guidelines wherever thermal power plant is located within 100 km of the road alignment. 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 and shall be used for other useful purposes like using in turfing of embankment. • The vehicles deployed for material transportation shall be spillage proof to avoid or minimize the spillage of the material during transportation. In any case, the transportation links are to be inspected at least twice daily to clear accidental spillage, if any.			
2.	Loss of Productive Soil, erosion and land use change	• 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. • 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.	All though the alignment of each project road		
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.	All though the alignment of each project road		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		• The productive land shall be reclaimed after construction activity. • Fuel and lubricants shall be stored at the predefined storage location. • The storage area shall be paved with gentle slope to a corner and connected with a chamber to collect any spills of the oils. • All efforts shall be made to minimise the waste generation. Unavoidable waste shall be stored at the designated place prior to disposal. • To avoid soil contamination at the wash-down and re-fuelling areas, “oil interceptors” shall be provided. Oil and grease spill and oil soaked materials are to be collected and stored in labelled containers (Labelled: WASTE OIL; and hazardous sign be displayed) and sold off to SPCB/ MoEF authorized re-refiners.			
4.	Construction Debris and waste	• 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.	All though the alignment of each project 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. • Mixing plants and asphalt (hot mix) plants shall be located at least 0.5 km away and in downwind direction	Throughout the project road section		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		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 where available. Construction vehicles and machineries shall be periodically maintained.			
6.	Tree plantation	• Compensatory Afforestation shall be made on 1:3.ratio basis. • Additional trees shall be planted wherever feasible. • Follow up maintenance of planted saplings will be carried out for a minimum of 3 years	*(Enter the number of trees requird for planting and location of plantation site if available)*		
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. • 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 slope stabilisation, etc shall be taken for prevention of siltation in water bodies.	Throughout the project road		
8.	Occupational Health and Safety	• 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	In all project roads		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
		than 8 hours a day. Workers duty shall be regulated accordingly. • 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.			
9.	Grievance Redress	• Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

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: Once, one month after completion of construction
Project Details :…….
Road Stretch Name: …….
Monitoring Report No.: ……..

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
1.	Air and Noise Quality	• Awareness sign board shall be provided for slow driving near the habitat areas to minimize dust generation due to 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. • Obtain clearance from PIU before handling over the site to WBSRRDA. • 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	All locations of construction camps/temporary office/ material storage, and borrow areas		
3.	Tree plantation	• Follow up maintenance of planted saplings will be carried out for a minimum of 3 years • Data on plantation survivability to be collected	*(Enter the number of trees requird for planting and location of plantation sites)*		
4.	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	At project road locations with drainage structures		
5	Community 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		

SL. NO.	Environmental Attributes	Mitigation Measures	Location	Compliance status (Complied, partly complied, not complied)	Corrective action proposed if any
6	Grievance Redress	• Maintaining records of all environment related grievances raised, if any, and the actions taken to address them through the village level grievance redress committee (GRC) and PIU as applicable	All project roads.		

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

Appendix 7: List of Person for Public Consultation

District	Name of the persons present	Designation
Kolkata	Mr. Gaur Chattopadhyay	Advisor,WBSRDA
	Mr. A N Chattopadhyay	Consultant,WBSRDA
Hoogly	Mr.Nashir Hussain	Member,Kumar Ganj G.P
	Mr.Dilip Mondal	Community Leader
	Mr.Mohan Mondal	Community Leader
	Mr.Dipta Kumar Mondal	Villager,Kumar Ganj
	Mr.Manik Manna	Villager
	Mr.Piru Majhi	Villager
	Mr.Sekh Nausad Ali	Villager
	Mr.Debbroto Ghosh	Villager
	Mr.Shri Kanto Porel	Villager
Burdwan	Mr.Seikh Sirajul Islam	Community Leader Village Bohar
	Mr.Mohim Seikh	Member Bohar G.P 1
	Mr.Seikh Moinuddin	Villager
	Mr.Hasnul Molla	Pradhan Bohar GP1
	Mr. Partha Singha Roy	Member Bohar GP1
	Mr.Biswajit Singha Roy	Member Bohar GP1
	Mr.Seikh Samsul	Member,Bohar GP1
Birbhum	Ms.Chobi Bagdi	Pradhan Dakshingram GP
	Mr.Soumitro Mondal	Member Dakshingram GP
	Mr.Pathik Das	Member Dakshingram GP
	Mr. Pathik Das	Member Dakshingram GP
	Mr.Ashok Mondal	Member Dakshingram GP
	Mr.Mihir Kumar Mondal	School teacher
	Mr.Amiya Das	Villager
	Mr.Sadhan Kumar Singh	Villager
	Mr.Ramkrishna Bagdi	Villager
	Mr.Mritunjoy Majumder	Villager
	Mr.Jayanto Dalal	Villager
	Mr.Dibendu Mondal	Villager
	Mr.Gouri Shankar Bagdi	Villager
	Mr.Jullar Rehaman	President Panchayat Samiti
	Mr.Mohamad Hasmat	Villager
	Mr.Ersad Seikh	Villager
	Mr.Samsuddin Seikh	Villager
	Mr.Monirul Seikh	Villager
	Mr.Robin Mallick	Villager
	Mr.Ismail Seikh	Villager
	Mr.Abdul Hasan	Villager
	Mr.Herul Molla	Member,Mayureswar,Panchyat Samiti
	Mr.Jasmuddin Seikh	Villager
	Mr.Aslam Seikh	Member GP
Purbo Medinipur	Ms.Namita Dalui	Pradhan Moyna II GP
	Mr.Sachindranath Majhi	Upa Pradhan Moyna II GP
	Mr.Naryan Bhuia	Villager/AP
	Mr.pranab Maiti	Villager/AP

District	Name of the persons present	Designation
	Mr.Tapan Kumar Sinha	Villager/AP
	Mr.Kalipada Jena	Villager/AP
	Mr.Sachin Mahar	Villager/ AP
	Mr.Bulu Mahar	Villager/ AP
	Ms.Niyati Bizre	Pradhan Naichanpur GP
	Mr.Shaktipada Das	Member Naichanpur GP
	Mr.Subroto bal	Member Naichanpur GP
	Ms.Sabita Singh	Karmadhaksya/Panchyat Samiti Moyna
	Mr.kalipada parink	Nirman Sahayok/ Naichanpur GP
	Mr.Sampada patro	Member panchyats Samiti
	Mr.Shantu Satra	Villager
	Mr.Jayanto Jana	Villager
	Mr.Gaurhari Mondal	Villager
	Mr.naryan Chandra maiti	Villager
	Mr.Indrajit Adhikari	Villager
	Ms.Jayanti Hait	Pradhan Baishnab Chak GP
	Mr.Haladhar Maiti	UPA-Pradhan Baishnab Chak GP
	Mr.Radhanath Ghoroi	Pradhan Khonari GP
	Mr.Sudip Kumar maiti	Ex-Pradhan Baishnab Chak GP
	Ms.Krishna patra	Member Kolaghat panchyat Samiti
	Mr.jagannath patra	Villager
Nadia	Ms.Mitali Sikdar	Pradhan,Nimtala GP
	Mr.Abani Biswas	Member,Nimtala GP
	Piyush Kanti Sikdar	Ex-Pradhan,Nimtala GP
	Mohadeb Sarkar	Villager
	Shankar Moitra	Villager
	Manab Ghosh	Villager
	Laloo Dey	Villager
	Tinku Mondal	Villager
	Gopal Das	Villager
	Swapan Mondal	Villager
	Subroto Biswas	Villager
	Nemai Dey	Villager
	Rana Saha	Villager
	Santosh Das	Villager
	Iswar Chandra Das	Villager
	Bijoy Saha	Villager
	Dora Raha	Villager
	Ashok Bairagi	Villager
	Indrajit Mondal	Villager
	Indrajit Dey	Villager
	Goutam Dutta	Villager
	Nishikanta Sarkar	Villager
	Saheb Dey	Villager
	Surya Pal	Villager
	Ranjit Dewasi	VAP
PIC	Mr. Hasanul Islam	Team Leader, PIC

District	Name of the persons present	Designation
	Mr Jyanta Banerjee	Supervisor PIC (Environment)
	Mr. Himangshu Bhowmik	Supervisor PIC (Environment)
	Mr. Tilak Banerjee	Supervisor PIC (Social)
	Mr. Buddha paul	Supervisor PIC (Social)
	Mr. Prasenjit Thakur	DPR consultant