

# Environmental Management Plan And Biodiversity Action Plan

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Sikkim Major District Roads Upgradation Project - E1  
Rorathang - Rongli Corridor

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## Abbreviations

AP	: Affected individuals
APs	: Affected Persons
AAQM	: Ambient Air Quality Monitoring
APHA	: American Public Health Association
AADT	: Annual Average Daily Traffic
ADB	: Asian Development Bank
AE	: Authority Engineer
BPL	: Below Poverty Line
CO	: Carbon Monoxide
CPCB	: Central Pollution Control Board
CTE	: Consent to establish
CTO	: Consent to operate
C&D	: Construction and Demolition
DPR	: Detailed Project Report
D	: Dispensary
DO	: Dissolved Oxygen
ESO	: Environment and Social Officer
EC	: Environmental Clearance
EIA	: Environmental Impact Assessment
EMP	: Environmental Management Plan
EE	: Executive Engineer
FPS	: Fair Price Shop
FWC	: Family Welfare Centres
Fi	: Financial Intermediary
FGDs	: Focus Group Discussions
GoS	: Government of Sikkim
GRC	: Grievance Redressal Committee
HSE	: Health, Safety & Environment
INRM	: India Resident Mission
IMD	: Indian Meteorological Department
INTACH	: Indian National Trust for Art and Culture Heritage
IRC	: Indian Road Congress
IEE	: Initial Environmental Examination
IFC	: International Finance Corporation
MBT	: Main Boundary Thrust
MCTO	: Main Central Thrust
MDR	: Major District Road
MCW	: Maternity and Child Welfare Centre
MoEF&CC	: Ministry of Environment, Forests and Climate Change
NAAQM	: National Ambient Air Quality Standards
NP	: National Park
NWMP	: National Water Quality Monitoring Programme
NPV	: Net Present Value
NO <sub>2</sub>	: Nitrogen di-oxide
NoC	: No Objection Certificate
NDIR	: Non-Dispersive Infra-Red
O&G	: Oil & Grease
PM	: Particulate Matter
PPE	: Personal Protective Equipment

PUC	:	Pollution Under Control
PaH	:	Polynuclear Aromatic Hydrocarbon
PHC	:	Primary Health Centre
PHS	:	Primary Health Sub Centre
PIU	:	Project Implementation Unit
PRF	:	Project Readiness Financing
PST	:	Project Site Team
PWD	:	Public Works Department
QAC	:	Quality Assurance Consultants
REA	:	Rapid Environment Assessment
RFCTLARR	:	Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act
Row	:	Right-of-Way
R&BD	:	Roads & Bridges Department
SPS	:	Safeguard Policy Statement
SHGs	:	Self Help Groups
SH	:	State Highways
TBC	:	T.B. Clinic
TA	:	Technical Assistance
TDS	:	Total Dissolved Solids
TSS	:	Total Suspended Solids
VEC	:	Valued Environmental Components
VOC	:	Vehicle Operating Cost
VH	:	Veterinary Hospital
VAC	:	Village Administrative Centre
WBM	:	Water Bounded Macadam
WLS	:	Wild Life Sanctuary

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## **1. Environmental Management Plan**

1. Environmental Management Plan (EMP) has been prepared which is mainly centered on the understanding the interactions between the environmental settings, project activities and the assessment of the anticipated impacts.
2. The EMP would help the contractors/Project implementing Authorities to implement the project in an environmentally sustainable manner and where contractors understand the potential environmental impacts arising from the project road and take appropriate actions/mitigation measures to properly mitigate/manage such environmental impacts.
3. The Environmental Management Plan (EMP) will guide the environmentally-sound construction of the project road and ensure efficient lines of communication/co-ordination between the Project Implementation Unit, Contractor and the Roads & Bridges (R&B) Department, Government of Sikkim (GoS). The EMP has been prepared into three stages based on project road construction activities i.e., (i) Pre-construction Stage; (ii) Construction Stage; and (iii) Demobilization Stage. EMP for the phase-1 roads and bridges have been prepared and presented in Table No 2. Various guidelines, checklists and reporting formats for implementation of EMP are given as Annexures.
4. Budgetary provisions for implementation of EMP shall be integrated with the bid/construction contract in the form of technical specifications and environmental performance requirements. The costs to be incurred on implementation of EMP shall be incidental to the civil works and therefore, no separate environment budget/cost will be provided to the contractor for implementation of EMP.
5. The contractor will ensure effective implementation of EMP during pre-construction, construction and demobilization stages. EMP for operation stage will be implemented by Project Implementation Unit.
6. The Contractor is deemed not to have complied with the EMP if, i), within the boundaries of the project site/ancillary sites, site extensions and haul/access roads, (ii) there is evidence of contravention of clauses, (iii) if environmental damage ensues due to negligence, (iv) the contractor fails to comply with corrective action measures or other instructions issued by the Project Implementation Unit within a specified timeframe and (v) the Contractor fails to respond adequately to complaints from the public.

## **2. Institutional Arrangements for Environmental Management**

7. The environmental management requirements/guidelines/plans need to be applied and implemented at all stages of the project. This requires an institutional mechanism to deal with various processes and requirements at each stage. Within the institutional framework proposed for the project, preparation, implementation, supervision and monitoring of environment functions, particularly the Environment Management Plans, a dedicated unit, viz., Environmental and Social Management Unit (ESMU), shall be formulated.

**Table 1 :Implementation Agencies and Key Responsibilities**

Agency	Role and Responsibility
<div>Project Implementation Unit (R&amp;BD)</div> <div>Detailed Project Report (DPR) Consultants</div> <div>RP Implementing NGO</div> <div>Construction Supervision Consultants (CSC)</div> <div>Contractor</div> <div>District level officials</div> <div>Community Based Organizations</div>	<div>Field Level</div> <ul style="list-style-type: none"> <li>• Disclosure of project information in public spaces and through relevant media.</li> <li>• Disseminate project information to the community in coordination with DPR Consultants</li> <li>• Facilitate the socioeconomic survey and census</li> <li>• Facilitate consultation by the civil works contractor with community throughout implementation</li> <li>• Oversee land acquisition and coordinate with Deputy Commissioner</li> <li>• Supervise the mitigation measures during implementation and its progress</li> <li>• Conduct internal monitoring and prepare reports.</li> </ul> <div>District Level</div> <ul style="list-style-type: none"> <li>• Disseminate project information to the project affected community with assistance from DPR Consultants</li> <li>• Ensure establishment of Grievance Redress Committee at the district level for grievance redress with assistance from DPR Consultants</li> </ul> <div>PIU Level</div> <ul style="list-style-type: none"> <li>• Make final decision on roads to be included under the project</li> <li>• Overall responsibility for project design, feasibility, construction and operation and guide PIUs</li> <li>• Ensure that sufficient funds are available to properly implement all agreed social safeguards measures</li> <li>• Ensure that all subprojects comply with the provisions of ADB's SPS 2009 and Gol's policies and regulations</li> <li>• Submit semi-annual safeguards monitoring reports to ADB</li> </ul> <ul style="list-style-type: none"> <li>• Undertake consultations involving community and DPs</li> <li>• Prepare due diligence report if no land acquisition</li> <li>• Encourage community/ DPs to voluntarily participate during the implementation</li> </ul> <ul style="list-style-type: none"> <li>• Assist in the implementation of the RP if involuntary resettlement is identified.</li> <li>• Provide technical support and advise to the IAs in the implementation of the RP specifically for addressing complaints and grievances and participate in resolving issues as a member of the GRC</li> <li>• Monitor and assist the NGO by providing Technical Support and advice during implementation of RP.</li> <li>• Provide technical advice and on the job training to the contractors as necessary</li> <li>• Preparation of semi-annual monitoring reports based on the monitoring checklists and submission to PIU for further submission to ADB</li> <li>• Act as External Monitor for project with significant impact</li> <li>• Consult community and PIU regarding location of construction camps</li> <li>• Sign agreement with title holder for temporary use of land and restore the land to equal or better condition upon completion</li> <li>• Commence construction only when alignment is free of encumbrance</li> <li>• Respond in a timely fashion to recommendations from GRCs</li> <li>• Provide any existing socioeconomic information, maps and other related information to DPR Consultant prior to the field data/information collection activities.</li> <li>• Act as the local focal point of information dissemination</li> <li>• Execute land acquisition process</li> <li>• Ensure the community participation at various stages of the project</li> <li>• Coordination with stakeholder organizations</li> <li>• Assist in Monitoring of the project</li> <li>• Providing indigenous knowledge as required</li> </ul>

### **3. External Monitor**

8. The PWD/ESMU will engage an External Monitor with approval of Asian Development Bank for half yearly environmental monitoring of the projects during construction stage and annually during operation stage. The primary purpose of an External Monitor is to provide an objective assessment of R&BD's compliance with ADB's SPS 2009 and the effectiveness of their Environmental Management Plans (EMP) and Biodiversity Action Plan. This includes verifying the accuracy of monitoring information submitted by the borrower. The independent audit helps identify any gaps or deficiencies in safeguard implementation, allowing for timely corrective actions and preventing or minimizing negative environmental and social consequences.

### **4. Environment Management Plan For E1 Rorathang - Rongli Corridor**

9. The environmental management plan for E1 Rorathang - Rongli Corridor has been provided in Table No 2.





Table 2 : Environmental Management Plan

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
A	Pre construction stage					
Pre construction stage activities by Project Implementing Unit						
A 1	Tree Cutting	Approximately 524 trees are likely to be felled for up gradation of the project. Prior permission shall be obtained for cutting trees from forest department	Trees growing within the proposed toe line (bottom of formation) will need to be removed for up gradation of the project road.	Indian Forest Act 1927; Forest (Conservation) Act 1980; Forest (Conservation) Rule 1981, 2003, 2022, 2023; Van (Sanrakshan Evam Samvardhan) Rules 2023; Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006	Contractor and PIU	PMU/ PIU R&BD, Sikkim
A2		All efforts shall be made to preserve trees including evaluation of minor design adjustments/alternatives as applicable to save trees. In the event of design changes, additional assessments including the possibility to save tree shall be made. Stacking, Transport and storage of wood shall be done as per relevant norms. Systematic corridor level documentation of trees cut and those saved will be maintained by the implementing agency. Tree cutting should be carried out during non-nesting period. Additionally Compensatory Afforestation of 1:10 shall be taken under the project. Heritage trees (list along with location- Annexure 8) should be preserved, no cutting, disturbance to such area shall be done by the contractor. Although no impact on heritage tree is envisaged				

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
	Loss of fauna-considering the Mountainous scrub/moderate forest habitat reptile species such as lizards, snakes will be affected	A thorough pre-inspection should be conducted. This should involve collaboration with professional snake handlers and herpetofauna experts. Their role will be to identify, safely capture, and relocate any snakes or other reptiles present at the site to a nearby suitable and secure environment. This proactive measure will minimize the risk to both the reptile population and human personnel, ensuring a balanced approach to site development while maintaining ecological integrity. Record of surveyed, rescued animals shall be maintained by dedicated Biodiversity expert of the Contractor, and should be informed to forest wildlife department.	Corridor of Impact area	Wild Life Protection Act 1972	PIU, Contractor	PMU, PIU
A 4	Loss of land and Properties	Land acquisition is expected in the road. Minor acquisitions are proposed at various sections to accommodate design and protection measures. Total envisaged land acquisition = 0.18 ha (0.046 ha private land). It is imperative that all regulations stipulated in the Resettlement Action Plan (RAP) be strictly adhered to. These include timely relocation and fair compensation for affected individuals, addressing grievances efficiently, and regular monitoring.	Respective land acquisition as per RAP at various sections to accommodate corridor design on project corridor.	Respective RAP	PIU, Contractor	PMU/ PIU R&BD, Sikkim
A 4.1	Replacement of Common	All common property resources such as community sources of water will be relocated.	Along ROW on all the stretch.	Respective RAP	Contractor in consultation with the local people	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
	Property Resources	Contractor shall initiate relocation in consultation with the community. He shall Construct new structure at identified location and the destroy affected structure.	Site of any new CPR identified during pre-construction field monitoring.			
A 5	Utility Shifting	Electric lines and transformers, water pipe lines, OFC lines and telephone lines were observed along the project road. All utilities impacted due to the project will be relocated with prior approval of the concerned agencies before construction starts.	Those located within RoW there needs to be shifted.	Utility Relocation Plan of DPR	Concerned Department, Contractor and PIU	PMU/ PIU R&BD, Sikkim
A 6	Orientation of implementation agencies	PIU shall organize orientation sessions to the contractor. This shall include on-site training sessions. Training shall include project staff, Contractors, consultants.	Training sessions at PIU and Contractors convenience location.	EMP, RAP	Contractor and PIU	PMU/ PIU R&BD, Sikkim
Pre construction Activities by the Contractor & Construction Supervision Consultant						
A7	Joint Field Verification	The Construction Supervision Consultant (CSC) and the Contractor will carry out joint field verification of the EMP. The efficacy of the mitigation/enhancement measures suggested in the EMP will be checked.	All locations along the project corridor where mitigation/enhancement/ monitoring measures are proposed	EMP and Contract Document	Contractor	CSC and PIU R&BD
A8	Modification of the Contract Documents	If required, CSC will propose modification/inclusion of the EMP and Contract documents (particularly the BOQs). It will be subject to approval of PIU, MPWD.	All locations along the project corridor where changes in mitigation/enhancement/ monitoring measures are felt necessary	Contract Document	Contractor	CSC and PIU, R&BD

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
A 11	Common Property Resources (CPRs) and structures	<p>All common property resources shall be relocated/restored before the commencement of road improvement works.</p> <p>Before commencement of works, joint field monitoring shall be conducted by contractor and PIU to map the alignments, to check any CPR is being impacted during construction works, while relocating these common property resources all concerned agencies including PIU shall take necessary precautions and shall provide barricades/delineation of the such sites to prevent accidental fall of pedestrian or other road users into pits, drains or both during demolition and construction of certain facilities.</p> <p>The CPRs falling within Impacted zone of 100 m from the road, necessary safety measures such as safety barricading, safe access to the CPRs shall be provided by the contractor.</p> <p>Access of CPRs should not be interrupted, alternate access will be provided by the contractor.</p>	At chainage 3+600 in RHS PHSC Sudunglakha and at 5+400 in RHS Govt. Primary School are identified. These will not be affected by the proposed road works.	EMP & Contract Document,	Contractor and PIU	PMU/ PIU R&BD, Sikkim
A 12	Procurement of Machinery, Crushers, Batching Plants etc.	Specifications of crushers, hot mix plants and batching plants will comply with the requirements of the relevant current emission control legislations.	Suitable locations for plants, as identified and proposed by the contractor.	Water (Prevention and Control of Pollution) Act, 1974 + Air (Prevention and Control of Pollution) Act, 1981	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
				Contract, MoRTH: 111.1, 121.2; Air & Noise Standards		
A 13	Construction Camp Locations - Selection, Design & Layout	<p>The contractor has to establish labour camp with basic facilities for providing free accommodation to the migrant labors engage for the different construction activities.</p> <p>If contractor decides to establish labour camp, siting of the camp shall be as per the guidelines given in Annexure-9 and layout of camp shall be approved by PIU.</p> <p>Construction camps should not be proposed:</p> <p>Within 1km radius of Reserve Forest /Ecologically sensitive areas.</p> <p>Within 500 m from the nearest habitation to avoid conflicts and stress over the infrastructure facilities, with the local community.</p> <p>Locations for stockyards for construction materials will be identified at least 500 m from watercourses.</p> <p>The waste disposal and sewage system for the camp will be designed, built and operated such that no odour is generated.</p> <p>Unless otherwise arranged by the local sanitary authority, arrangements for disposal of excreta suitably approved by the local medical health or municipal authorities or as directed by CSC will be provided by the Contractor.</p>	Locations Selection, Design & Layout shall be finalized by the contractor and submit to the PIU.	Contract, Environment Protection Act, 1986 & MoRTH Clause 121.2, 111.8.4, Factory Act 1948	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		A comprehensive Camp Management Plan must be prepared by the contractor and submitted for approval to the Construction Supervision Consultant (CSC) prior to the commencement of construction. The Camp Management Plan shall include provisions to prevent uncontrolled discharge of wastewater or effluents, ensure proper storage of food and supplies to mitigate pest problems, maintain sanitation and cleanliness throughout the camp, provide adequate drinking water for all camp dwellers, ensure appropriate separate sanitation facilities for men and women, and prominently display the workers' code of conduct in visible locations throughout the camps. Constructor shall install and maintain fire extinguisher at all required locations such as plants, stores, workshops, canteens, residential accommodations, offices etc.				
A 13	Arrangements for Temporary Land for Camp site and Plant site	The Contractor shall obtain consent from land owners in writing for temporary use of land for setting up of labour camp and Plant site, stock yard etc. The Contractor will submit land lease agreement to the PIU along with the layout plan of such site.	Locations Selection, Design & Layout of temporary camp site and plant site shall be finalized by the contractor and submit to the PIU.	Contract, Environment Protection Act, 1986 & MoRTH: 111.1	Contractor	PMU/ PIU R&BD, Sikkim
A 14	Construction Vehicles, Equipment and	All vehicles and equipment to be procured for the proposed up gradation works of project road shall conform to the relevant Bureau of Indian	The contractor shall maintain records of Pollution Under	Air (Prevention and Control of Pollution) Act, 1981	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
	Machinery.	Standard (BIS) norms. The discharge standards promulgated under the Environment Protection Act, 1986 and Motor Vehicles Act, 2019 shall be strictly adhered to. The silent/quiet equipment like DG set as per regulations shall be used at the construction site or labour camp. The contractor shall maintain records of Pollution under Control (PUC) certificates for all vehicles used during the contract period, which shall be produced to PIU for monitoring whenever required.	Control (PUC) certificates for all vehicles used during the contract period, which shall be Produced to PIU for monitoring whenever required	Contract, MoRTH: 111.1, 121.2; Air & Noise Standards		
A 15	Arrangement for Construction water	To avoid disruption/disturbance to other water users, the contractor shall extract water from fixed locations. The contractor shall consult the local people before finalization of the locations. Contractor can extract ground water only in case surface water sources are not available and that too only after proper permission from Central Ground Water Authority. (Note - Stage of Ground Water Development in East Sikkim comes under “safe” category as per “Dynamic Ground Water Resources Assessment of Sikkim (As on 31st March, 2022)” report by CGWB).	The contractor shall source construction water preferentially from Surface water bodies in the project area. Boring of any tube wells shall be drilled only after obtaining necessary permission from Central Ground Water Authority.	Guidelines to regulate and control ground water extraction in India (24-Sep-2020 & amendment)	Contractor	PMU/ PIU R&BD, Sikkim
A 16	Sand (all river beds used directly or	If the supplier of sand is another (third) party, then the authentic copy of lease agreement that has been executed between the village head and the supplier has to be submitted to	If the contractor is intended to open his own quarry then Environmental	Vendor should have prior approval for sand mining under Amended EIA	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
	indirectly for the project)	PIU/PMU of the project, before any procurement is made from such a site. The procurement of the material shall be ensured from approved quarries.	clearance for stone quarry and borrow area shall be obtained from DEIAA/SEIAA	notification dated 15th January, 2016. S.O 141 (E)		
A17	Labor requirement	The contractor preferably shall use unskilled/semiskilled labour from local areas to give the maximum benefit to the local community to avoid any additional stress on the existing facilities. On an average 150 labours/ day will be required during construction stage depending upon extent of construction work. All applicable labour regulation shall be complied by the contractor. Necessary facilities shall be provided to workers as per The Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996. The main contractor has to develop the system for engaging the labor for sub-contractors and fully responsible for maintenance of labor standards as well as safety of those labors.	Project site	The Building and other Construction Workers' (Regulation of Employment and Conditions of Service) Act, 1996., Factory Act 1948	Contractor	PMU/ PIU R&BD, Sikkim
A18	Traffic Management Plan- Planning for Traffic Diversions and Detours	Detailed traffic control plan shall be prepared by the contractor and same shall be submitted to the PIU for approval five days prior of the commencement of the work. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements including night time safety measures, details of traffic	All along the Project Corridor.	MORT&H" Clause 112.4 Refer Guidelines-: Generic guidelines for environment friendly	Contractor	PMU/ PIU R&BD, Sikkim



S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>arrangement after cessation of work each day, safety measures undertaken for transport of hazardous materials and arrangement of flagmen etc. to regulate traffic congestion.</p> <p>The contractor shall provide specific measures for safety of pedestrians and workers as part of traffic control plans. The contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>The Contractor shall also inform local community about diversion in traffic routes and pedestrian access arrangements with assistance from PIU.</p>		Construction methodology, Section – 5 & 6.		
A 19	Stockyard/ Storage of Construction Material and Establishing Equipment Laydown Area	<p>Contractor in consultation with PIU shall identify the site for temporary use of land storage of construction materials including pipes etc. These sites shall not cause an inconvenience to local population / traffic movement. These locations shall be approved by the PIU.</p> <p>Selection of location for materials storage and equipment lay-down areas must take into account of prevailing winds, distances to adjacent land uses, general on – site topography and water erosion potential of the soil. Impervious surfaces must be provided wherever necessary.</p>	Stockyard location	MoRTH: 111.1	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>Protect material stockpiles from storm water (e.g. by excavating a cutoff ditch around stockpiles to keep away storm water).</p> <p>Enclosed storage for fuel with non- permeable flooring.</p> <p>Contractor shall cover material stockpiles with tarpaulin or other materials. Avoid stockpiling material near natural streams.</p> <p>Proper cover and stacking of loose construction material will be ensured during construction of outfall structures at construction site to prevent surface runoff and contamination of receiving water body.</p> <p>Staff dealing with these materials / substances must be aware of their potential impacts and follow the appropriate safety measures. The contractor must ensure that its staff is made aware of the health risks associated with any hazardous substances like bitumen, diesel, used oil and has been provided with the appropriate protective clothing/equipment in case of spillages or accidents and have received the necessary training. Necessary training and awareness program shall be carried out to make sure that the contractor and its staff is well aware about hazardous nature of substances.</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		Locations for stockyards for construction materials will be identified at least 500 m from watercourses.				
A 20	Information Dissemination and Communication Activities	<p>Project information Board showing the name of work, project cost, duration, date of commencement, date of completion, executing agency and contact details (including telephone numbers) shall be displayed on both sides of the roads in English and in vernacular languages.</p> <p>Information boards shall also be setup at the sites of construction camps, labour camps, plants and stockyard site.</p> <p>Details of nodal officer with telephone numbers shall be displayed for registering compliant/grievances by stakeholder/general public.</p> <p>The contractor will prepare emergency action plan for dealing with accidents and other issue by displaying the phone numbers</p>	All along the project road	Contract, EMP document, General EHS guideline, WB	Contractor	PMU/ PIU R&BD, Sikkim
A 21	Fly ash	Fly ash from thermal power plants must be utilized if such plants are located within a 300 km radius of the project site. Several plants have been identified, and the use of fly ash is recommended wherever feasible.	Identified Power Plants include - Farakka Super Thermal Power Station (West Bengal), Nabinagar Super Critical Thermal Power Project (Bihar), Meja	The MoEF&CC's Notification of 25th January, 2016.	-	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
			Thermal Power Station (West Bengal), Kahalgaon Super Thermal Power Station (Bihar), Barh Super Thermal Power Station (Bihar), and Bhartiya Rail Bijilee Company Limited (BRBCL) (Bihar).			
Natural Hazards and Climate Change risks						
A 22	Damage to pavement integrity like Rutting, embrittlement, softening and migration of liquid asphalt. Thermal expansion in bridge expansion joints and paved surfaces	Asphalt binder specifications based on viscosity-grade specifications as per IS 73-2013 guidelines and IS 15462 2004 for rubber modified binder and polymer modified binders. 25mm Thick Stone Mastic Asphalt (SAM) has been proposed in perennial subsidence zone and intermittent built up area along the project corridor to prevent waterlogging on pavement surface and seepage through pavement surface.	All along the project road	IRC:37-2018,	Contractor	PMU/ PIU R&BD, Sikkim
A 23	Earthquake	Relevant IS codes shall be adopted in designing the structures to sustain the magnitude of earthquake corresponding to Seismic zone of the project area the Project area is located in	All along the project road	The road and bridge design shall follow (IS: 1893-Part 1, 2016 and IS: 1893-	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		high damage risk zone w.r.t seismicity (Zone IV).		Part 3, 2014). The other codes for reference are (a) IRC 6: 2000, (b) IRC 112: 2011 and (c) IRC 78: 2014, that will also be followed		
A 24	Land slides	Several landslide zones are observed in the corridor. Brest walls and Gabions, 3D Reinforced Geosynthetic erosion control mat, Rock Fall Netting, Soil Nailing/Rock Bolting with Shotcrete facia has been proposed as engineering control methods of slope protection Slope of the hill side cut shall as per guideline in those suggested for bioengineering, turfing and engineering protection measures.	Landslide zones have been initially identified at chainages 2+968 and 4+180.	Design Report, DPR	Contractor	PMU/ PIU R&BD, Sikkim
B	CONSTRUCTION STAGE					
B 1	Site Clearance (Clearing and grubbing)	If required vegetation shall be removed from the construction zone only. All works shall be carried out in such a way that the damage or disruption to flora other than those identified is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works shall be removed with prior approval of PIU. The Contractor, under any circumstances shall not cut or damage trees.	Within Proposed ROW	Design Report MoRTH 201 111.15.1, Sub clause 111.15.4 Indian Forest Act 1927; Forest (Conservation) Act 1980; Forest (Conservation) Rule	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		Trees identified under the project shall be cut only after receiving necessary permissions. Vegetation with girth size of over 30 cm will be considered as trees and shall be compensated		1981, 2003, 2022, 2023; Van (Sanrakshan Evam Samvardhan) Rule 2023.		
B 1.2	Dismantling of Culverts/bridge work	All necessary measures shall be taken especially while working close to cross drainage channels to prevent earthwork, stonework, materials and appendage as well as the method of operation from impeding cross-drainage at streams, water canals, existing irrigation and drainage systems. Demolition waste shall be collected and disposed as per the provision of Construction & Demolition Rule 2016.	At locations where bridge works and culverts are proposed.	MoRTH 202.2, C&D Rule 2016 and its further amendment thereafter	Contractor	PMU/ PIU R&BD, Sikkim
B 1.3	Generation and Disposal of debris, spoil from hill cut section	Debris generated due to the dismantling of the existing road shall be suitably reused in the proposed construction. Scarified asphalts and the other construction wastes shall be appropriately re-used in road construction with the permission of PIU. The dismantled road and scarified bitumen waste shall be utilized for the paving of cross roads, access roads and paving works in construction sites and campus, temporary traffic diversions, haulage routes, parking areas along the roads or in any other manner approved by the PIU. The Contractor shall suitably dispose of unutilized debris and waste materials either	Project site, tentative sites for dumping yard identified 1+180, 3+700, 5+300, 5+980	MoRTH 202.5, Solid Waste Management Rule 2016, HW Management Rule 2016 Hazardous And Other Wastes (Management and Transboundary Movement) Rules & In the Hon'ble National Green Tribunal Eastern Zone Bench,	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>through filling up of borrows areas located in wasteland or at pre-designated disposal locations, subject to the approval of the Environmental Expert of PIU.</p> <p>At locations identified for disposal of residual bituminous wastes, the disposal shall be carried out over a 60 mm thick layer of rammed clay so as to eliminate the possibility of leaching of wastes into the ground water. The Contractor shall ensure that the surface area of such disposal pits is covered with a layer of soil.</p> <p>All arrangements for transportation during construction including dismantling and clearing debris shall be considered incidental to the work and shall be planned and implemented by the Contractor as approved and directed by the Environmental Expert of PIU.</p> <p>The pre-designed disposal locations are shall be a part of Solid Waste Management Plan which shall be prepared by the Contractor in consultation and with approval of Environmental Expert of PIU.</p> <p>Debris generated from pile driving or other construction activities shall be disposed in such a way that it does not flow into the surface water bodies or form mud puddles in the area.</p>		Kolkata O.A. No. 26/2023/EZ		
B.1.4	Stripping and Stocking and	The topsoil from areas to be permanently covered shall be stripped to a specified depth of 150 mm and stored in stockpiles. A portion of	Throughout Project Corridor, where	MoRTH: 301.3.2 & MoRTH: 305.3.3 MoRTH: 301.7 &	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
	preservation of top soil	<p>the temporarily acquired area and/or right of use shall be earmarked for storing topsoil. The locations for stock piling shall be pre-identified in consultation and with approval of Environmental Specialist of PIU. The following precautionary measures shall be taken to preserve them till they are used:</p> <p>(a) Stockpile shall be designed such that the slope does not exceed 1:2 (vertical to horizontal), and height of the pile is restricted to 2 m. To retain soil and to allow percolation of water, silt fencing shall protect the edges of the pile.</p> <p>(b) Stockpiles shall not be surcharged or otherwise loaded and multiple handling shall be kept to a minimum to ensure that no compaction will occur. The stockpiles shall be covered with gunny bags or vegetation.</p> <p>(c) It shall be ensured by the Contractor that the topsoil will not be unnecessarily trafficked either before stripping or when in stockpiles. Such stockpiled topsoil will be utilized for:</p> <p>Covering all disturbed areas including borrow areas is necessary, only in a case where there is rehabilitation</p> <p>Dressing of slopes of road embankment</p> <p>Agricultural fields of farmers acquired temporarily land.</p>	clearing and grubbing shall be carried out.	MoRTH: 305.3.9 Guidelines-5		



S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
B 1.5	Accessibility	The Contractor shall provide safe and convenient passage for vehicles, pedestrians and livestock from roadsides and property accesses connection to the project road by providing temporary connecting road. The Contractor shall also ensure that the existing accesses will not be undertaken without providing adequate provisions. The Contractor shall take care that the cross roads are constructed in such a sequence that construction work on the adjacent cross roads are taken up one after one so that traffic movement in any given area not get affected much.	All along the Project Corridor.	MoRTH: 112.1 MoRTH: 112.4 MoRTH:112.2 MoRTH: 112.5	Contractor	PMU/ PIU R&BD, Sikkim
B 1.6	Planning for Traffic Diversions and Detours	Temporary diversions shall be constructed with the approval of the Environmental Specialist of PIU. Detailed Traffic Control Plans shall be prepared by the Contractor and approved by Environmental Specialist seven days prior to commencement of works on any section of road. The traffic control plans shall contain details of temporary diversions, traffic safety arrangements for construction under traffic, details of traffic arrangement after cessation of work each day, safety measures for night time traffic and precaution for transportation of hazardous materials and arrangement of flagmen.	Project Site	MoRTH: 112.1 MoRTH: 112.4 MoRTH:112.2 MoRTH: 112.5	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>The Contractor shall ensure that the diversion/detour is always maintained in running condition, particularly during the monsoon to avoid disruption to traffic flow.</p> <p>The Contractor shall also inform local community of changes to traffic routes, conditions and pedestrian access arrangements. The temporary traffic detours shall be kept free of dust by sprinkling of water three times a day and as required under specific conditions (depending on weather conditions, construction in the settlement areas and volume of traffic).</p>				
B.2	Procurement of Construction Materials and construction activities					
B 2.1	Procurement for Aggregate and other construction materials	<p>No borrow area shall be opened without permission of the Environmental Specialist and without obtaining necessary regulatory permission. The location, shape and size of the designated borrow areas shall be as approved by the Environmental Specialist and in accordance to the IRC recommended practice for borrow pits for road embankments (IRC 36: 2010).</p> <p>The borrowing operations shall be carried out as specified in the guidelines for siting and operation of borrow areas.</p> <p>The unpaved surfaces used for the haulage of borrow materials, if passing through the settlement areas or habitations; will be</p>	<p>Project site (identified Borrow Pits at 0+050, 2+000, 4+000, 6+000)</p> <p>Only Approved borrow pits will be used</p>	<p>MoRTH Clause 111.2, IRC 36: 2010 Sub Clause 111.15.2</p> <p>MoRTH Clause 305.2.2.2</p>	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>maintained dust free by the Contractor. Sprinkling of water shall be carried out twice a day to control dust along such roads during their Period of use.</p> <p>During dry seasons (winter and summer) frequency of water sprinkling shall be increased in the settlement areas and Environmental Specialist of PIU will decide the sprinkling time depending on the local requirements.</p> <p>Contractor shall rehabilitate the borrow areas as soon as borrowing of soil is over from a particular borrow area in accordance with the approved borrow area Redevelopment Plan.</p>				
B 2.2	Quarry Operations & Crushers	<p>The Contractor shall obtain materials for approved quarries. The crushers will be operated after obtaining consent to establish and consent to operate from Sikkim Pollution Control Board.</p> <p>Contractor shall obtain permission Department of Geology and Mineral Resources, environmental clearances from SEIAA as applicable.</p> <p>Contractor shall submit application for approval of the quarry along with the copy of permission obtained from regulatory authorities. In addition to that Contractor shall prepare redevelopment /rehabilitation plan and submit it to CSC.</p> <p>Approved quarries shall be used only.</p>	<p>Quarry site (Makha/Tanak, Majhitar (Jorthang), Baghey Khola)</p> <p>No fresh quarry without approval from Mining department and State Forest department is envisaged.</p>	MoRTH: 111.3	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
B.2.3	Transporting Construction Materials	<p>Contractor shall maintain all roads, which are used for transporting construction materials, equipment and machineries.</p> <p>All vehicles delivering fine materials like aggregate, cement, earth, sand, etc., to the site will be covered by Tarpaulin to avoid spillage of materials and wind-blown dust from the top of vehicles.</p> <p>Existing road used by vehicles of the contractor or any of his subcontractor or suppliers of materials shall be kept clear of all dust/mud or other extraneous materials dropped by such vehicles.</p> <p>The contractor shall make effort to transport materials to the site in nonpeak hours.</p>	Project site	MoRTH: 111.9	Contractor	PMU/ PIU R&BD, Sikkim
B 2.4	Blasting	<p>Blasting will be carried out only with permission of the CSC. Blasting will be carried out during fixed hours (preferably during mid-day) and timing should be made known to all the people within 1000m (200m for pre-splitting) from the blasting site in all directions. MoRTH clause 302.4 shall be adhered by Contractor.</p> <p>Red danger flags (200 m from the blasting site) shall be displayed prominently in all directions during the blasting operations.</p> <p>The blasting operation shall remain in the charge of competent and experienced supervisor and workmen who are thoroughly</p>	All blasting and Pre-splitting Sites.	MoRTH Clause : 302	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		acquainted with the details of handling explosives and blasting operations.				
B 3	Labour Camp Site	<p>Project information board shall be displayed at the labour camp site.</p> <p>Electrical cables and wires shall be properly arranged with proper electrical safety. Loose electrical connections shall not be allowed at the labour camp.</p> <p>Red danger sign with bone &amp; skull shall be displayed as per The Electrical Rules at three phase motors, electrical panels and electrical machines, DG sets, etc.</p> <p>Housekeeping at labour camp shall be maintained properly. Daily sweeping and cleaning shall be done at the labour camp.</p> <p>HIV Aid awareness posters shall be displayed at the camp site.</p> <p>Solid waste generated at the camp site shall be collected in covered waste bins. Then, it shall be segregated as biodegradable (food waste, paper, etc.) and non-biodegradable (plastic, polyethylene bag, etc.) wastes.</p> <p>Polyethylene/plastic wastes will be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc.) solid waste shall be disposed in compost pit. Non-biodegradable inert wastes shall be sent to nearest land fill site. Proper drinking water, well ventilated</p>	Project site	Factory Act 1948, ILO- Safety and health in construction	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		accommodation, sanitation, canteen facilities shall be provided to workers at the labour camp. Suitable signages shall be displayed at labour camps.				
B 3.1	Health and Hygiene at work place and camp	<p>All sanitary facilities shall be cleaned four times daily and at least twice during working hours. Receptacles shall be tarred inside and outside at least once a year.</p> <p>All temporary accommodation must be maintained in such a fashion that uncontaminated water is available for drinking, cooking and washing. Garbage bins must be regularly emptied and garbage should be disposed off in a hygienic manner. Adequate health care is to be provided for the work force. Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta shall be made by putting a layer of night soils at the bottom of a permanent tank prepared for the purpose and covering it with 15 cm layer of waste or refuse and then covering it with a layer of earth for a fortnight (by then it will turn into manure).</p> <p>On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta or other disposal pits or trenches filled in and effectively sealed off and the outline site left clean and tidy, at the Contractor's</p>	All applicable locations	Factory Act 1948, ILO- Safety and health in construction	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		expense, to the entire satisfaction of the Engineer.				
B 3.2	Potable Water	A sufficient supply of cold potable water, compliant with IS standards, shall be provided and maintained at every workplace in suitable and easily accessible locations. In cases where the drinking water is sourced from an intermittent public water supply, storage tanks shall be provided.	Construction camp, working sites, quarry, crusher etc. locations	IS 10,500 (2012)	Contractor	PMU/ PIU R&BD, Sikkim
B 3.3	First Aid	At every workplace, a readily available first aid unit including an adequate supply of sterilized dressing material and appliances will be provided as per the Factory Act 1948. Workplaces, remote and far away from regular hospitals will have indoor health units with one bed for every 250 workers. Suitable transport will be provided to facilitate take injured or ill person(s) to the nearest applicable hospital. At every workplace and construction camp, equipment and nursing staff shall be provided. "Guidelines on First-aid in the Workplace" by International Labour Organization shall be followed.	Construction camp, working sites, quarry, crusher plant, HMP etc.	"Guidelines on First-aid in the Workplace" by ILO ISBN: 983-2014-43-3  EHS Guideline, WB	Contractor	PMU/ PIU R&BD, Sikkim
B 3.4	Occupational health and safety of workers	The Contractor will comply with the requirements of the Environmental, Health, and Safety (EHS) Guidelines of and Environment, Health and Safety Guidelines for Toll Roads the	Labour camp and construction site	ILO, Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>World Bank Group, April, 2007<sup>1</sup>, and the statutory norms of safety during construction. The Contractor will develop their OHS Plan covering job-hazard assessment of the worksites, hiring of qualified workers for hazardous work.</p> <p>The contractor will carry out regular training to workers including sub-contractor staff and labor etc. on OHS aspects, including daily toolbox talks, regular safety audits, etc.</p> <p>The contractor will maintain record of training safety audits and safety committee meetings as well as incidents register and report to the authority engineer and PIU. All the corrective measures required and taken must.</p> <p>All the workers including labour will undergo for medical check-up prior to deployment at site.</p> <p>The Contractor will provide adequate good quality Personal Protective Equipment (PPE) to all the workers including those of sub-contractors working at construction zones and Plant sites and will ensure that these PPEs are used by workers at all time during works.</p> <p>Adequate drainage, sanitation and waste disposal will be provided at workplaces.</p>		<p>Conditions of Service) Act, 1996;</p> <p>MoRTH 105 Sub Clause 111.11 Refer Occupational Health and Safety (OHSA) complying with IS:14489:1998; Reaffirmed 2002 Refer Occupational safety, health and working condition code 2020 Gazette of India dated 28th September 2020</p>		

<sup>1</sup><http://www.ifc.org/wps/wcm/connect/554e8d80488658e4b76af76a6515bb18/Final%2B-%2BGeneral%2BEHS%2BGuidelines.pdf?MOD=AJPERES> and <http://www.ifc.org/wps/wcm/connect/7e4c7f80488554d5b45cf66a6515bb18/Final%2B-%2BToll%2BRoads.pdf?MOD=AJPERES&id=1323162564158>



S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>Proper drainage will be maintained around sites to avoid water logging leading to various diseases</p> <p>Adequate sanitation and waste disposal facilities will be provided at construction camps by means of septic tanks, soakage pits etc. A health care system will be maintained at construction camp for routine checkup of workers and avoidance of spread of any communicable disease</p> <p>Readily available First Aid kit bearing all necessary first aid items will be proved at all the work sites and should be regularly maintained.</p> <p>The Contractor will organize awareness program on occupational health and safety aspects as well as on HIV/AIDS and sexually transmitted diseases (STDs) for workers on periodic basis (once in 3 months). Making available condoms etc. at vending machines at convenient locations Community based meetings, consultations in camp, distribution of leaf let, IEC communication, posters, banners</p> <p>The Contractor will strictly follow the Standard Operational Procedures (SOPs) issues by the Government of India and State Government from time to time for prevention of spread of COVID-19 epidemic.</p> <p>Contractor shall arrange periodic testing of his workforce against COVID 19 virus and create</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>awareness among workers on minimizing chances of infection due to this virus.</p> <p>Contractor shall also coordinate with the concerned officials of the district healthcare services responsible for COVID 19 Control</p> <p>Contractor shall arrange periodic testing of his workforce against COVID 19 virus and create awareness among workers on minimizing chances of infection due to this virus.</p> <p>The contractor will notify safe assembly point at Camp site and construction site in case of emergency</p>				
B4	Construction Specific Issues					
B 4.0	Drainage and Flood control	<p>Major bridges, minor bridges, pipe culverts and box culverts are proposed to be constructed in the proposed project</p> <p>The Contractor shall ensure that no construction materials/debris shall block the water flow or create water lodging at the work site. The Contractor shall take remedies to remove accumulated water (if any) from the construction sites, camp sites, storage yard, excavated areas etc.</p> <p>Construction works shall be planned well in advance prior to on-set of monsoons to avoid water- pool besides providing temporary cross drainage systems. The contractor shall take all adequate precautions to ensure that construction materials and excavated materials</p>	Project site	MoRTH Clause CLAUSE 111 201.4, 202.5; In the Hon'ble National Green Tribunal Eastern Zone Bench, Kolkata O.A. No. 26/2023/EZ	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		are enclosed in such a manner that erosion or run off of sediments is controlled. Silt fencing shall be installed prior to the onset of the monsoon at all the required locations, as directed by PIU/PMU. Prior to monsoon, the contractor shall provide either permanent or temporary drains to prevent water accumulation in surrounding residential, commercial and agricultural areas.				
B 4.1	Slope Protection and Control of Soil Erosion	For construction of realignments earth filling shall be required for embankment for new road construction, which shall require slope protection and control of soil erosion. The Contractor shall construct slope protection works as per design, or as directed by PIU to control soil erosion and sedimentation through use of Breast walls, Retaining Walls, gabion wall, dykes, sedimentation chambers, basins, fibber mats, mulches, grasses, slope, drains and other devices. All temporary sedimentation, pollution control works and maintenance thereof will be deemed as incidental to the earth work or other items of work and as such no separate payment shall be made for them. Contractor shall ensure the following aspects After construction of road embankment, the side slopes shall be covered with grass and shrubs as per design specifications.	All exposed slope	MoRTH Clause 306	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>Turfing works will be taken up as soon as possible provided the season is favourable for the establishment of grass sods. Other measures of slope stabilization shall include mulching netting and seeding of batters and drains immediately on completion of earthworks.</p> <p>Shrubs and grass will be planted on road embankment slopes, slopes of all cut, fill etc. On sections with high filling and deep cutting the side slopes will be graded and covered with bushes and grass, etc., adopting suitable Good density of herbs likes Eupatorium odoratum, Eupatorium adenophorum, Cynodon dactylon provide result in conservation strategies for soil erosion. Other Populus sp, bamboo species and plant like Anthrocephalus cadamba, Erythrina indica, Bischofia javanica, Terminalia myriocarpa, Agave americana are effective species to check the soil erosion from degraded land, exposed surface. bioengineering techniques. The suitability to be decided by the Engineer at site</p> <p>In borrow pits, the depth shall be so regulated that the sides of the excavation shall have a slope not steeper than 1 vertical to 2 horizontals, from the edge of the final section of the bank.</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		Along sections abutting water bodies, pitching shall be done as per design specifications to protect slopes.				
B 4.2	Handling of cement bags	Cement bags shall be stored and emptied in covered area to control fugitive dust emissions. While handling and emptying cement bags, workers shall wear masks, hand gloves and protective goggles. Manual transferring of cement bags from one place to another place shall not be allowed. For this purpose, trolley shall be used.	Construction sites	Occupational safety, health and working condition code 2020 Gazette of India dated 28th September 2020; Solid Waste management Rules 2016, Plastic Waste Management Rules 2016	Contractor	PMU/ PIU R&BD, Sikkim
B 4.5	Work-zone safety Management	The Contractor shall prepare the construction safety plan as per provisions under the IRC 67-2001, SP-55 for safe work zone and the same shall be approved by the environmental specialist of PIU/PMU prior to start of road works. Temporary barricades shall be provided to delineate construction zone as well as material stacking areas. The construction site and the labour facility (if any) shall be appropriately barricaded to prevent entry and accidental trespassing of workers, staff and others into the construction site. The contractor has to comply with all regulations regarding safe scaffolding, ladders,	Labour camp and construction site	ILO, Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996, MoRTH 105 Sub clause 111.11	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</p> <p>All operational areas shall be access controlled. Watch and ward facilities at all times shall be provided by the contractor.</p> <p>Proper retro reflective warning signage shall be installed on the access road next to the construction site about movement of construction machinery and vehicles.</p> <p>In excavations for longitudinal surface road drains, culverts etc., a high visibility warning and retro reflective signage shall be displayed in vernacular language and English. Entry of unauthorized persons shall be restricted.</p> <p>Excavation of 1.5 metres deep or greater shall be adequately barricaded.</p> <p>There shall be adequate lighting arrangement at night to prevent mishaps after construction activity ceases for the day. All the retro reflective Safety signage as per IRC 55 shall be erected at construction site for generating awareness among local Community and road user during the construction.</p> <p>All relevant provisions of the Factories Act, 1948 and the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996 will be adhered to.</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
B 4.5	Excavation works for longitudinal drains along road corridor.	<p>As per DPR, Earthen drains shall be provided through-out the project road to ensure efficient drainage from carriageway to drain. All drains shall be connected to cross drainage structure. Median drains shall be provided with rain water harvesting structure.</p> <p>At the excavation site, warning sign boards shall be displayed in vernacular language and English.</p> <p>Entry of general public/unauthorized person shall be restricted.</p> <p>During excavation for laying of concrete (RCC) cover drains necessary safety measures shall be taken by the contractor.</p> <p>Excavation of 1.5 meters deep or greater requires sides protection (Close Timbering and step cutting) unless the excavation is made entirely in stable rock.</p> <p>Contractor shall follow strict protocol during construction/ excavation for longitudinal drainage especially along the sensitive receptors like schools, mosque, community centers, religious places, shrines, grave yard etc. Excavated earth will be collected and disposed in pre-identified site with the approval of PIU. Excavated earth shall not be dump on the carriageway or shoulders.</p> <p>Casted drain block and drain cover shall not be stacked on the road.</p>	All along the project road.	MORTH Clause 300, 201.4, 202.5 In the Honorable National Green Tribunal Eastern Zone Bench Kolkata O.A. 26/2023/EZ	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		To ensure elimination of excavation hazards, excavation shall be carried out in the presence of competent person. Suitable barricading shall be provided around the excavation site. Suitable personal protective equipment shall be provided to the workers				
B 4.6	Sensitive Receptors Impact Management	The construction operations at each sensitive receptor i.e., schools, religious places, shrines, community centers, grave yards etc. and general residential houses shall be limited to a time period of 7:30 am to 6:00 pm. Periodic maintenance and calibration of construction equipment's/ vehicles shall meet applicable CPCB emission standards. Contractor shall ensure regular dust suppression measures by way of standard and efficient water sprinkling through water tankers at designated sensitive receptors. Noise barriers shall be installed during the construction phase to protect the school from the noise of construction activities. Adequate barricading and safety measures shall be provided and ensured to protect from dust pollution and noise impacts on sensitive receptors like schools and religious places etc., due to vehicle movement prior to the start of work and their effectiveness shall be checked during construction.	Locations of sensitive receptors, Chainage 3+600 km (PHC), Ch.5+400km (School), Temples at 1+960, 4+815, 5+230, 7+290	The Noise Pollution (Regulation and Control) Rules, 2000; WHO guideline for Noise rules 2002; MoST 111.13 MoST 111.1 MoST 111.6	Contractor	PMU/ PIU R&BD, Sikkim



S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
B 4.7	Pedestrian and Vehicular Traffic Movement Management	<p>Detailed traffic control plans shall be prepared and submitted to the PIU for approval one week prior to commencement of works.</p> <p>The traffic control plans shall contain details of temporary diversion, details of arrangements for construction (road stretches, timing and phases).</p> <p>Construction itinerary shall be provided in advance so that the road users can use alternative routes.</p> <p>Warning and safety signs of ongoing works shall be erected.</p> <p>Suitable retro reflective warning signs shall be placed near construction locations and they shall be visible at night.</p> <p>Alternative access ways shall be communicated to the community by way of announcement appropriately for the public information.</p> <p>The contractor shall take all necessary measures for the safety of traffic during construction and shall provide, erect and maintain such barricades, including signs, markings, flagmen as proposed and approved by PIU. The contractor shall ensure that all signs, barricades, pavement markings are provided as per applicable IRC code and guidelines.</p> <p>Install signage, barricading, fencing as required and include safety measures for transport of</p>	All along the project road.	MoRTH sub clause 112,	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		materials/ equipment's, which shall be limited to certain times, and arrangements for flagmen at intersection.				
B 5	Construction work Impacts on Forest, Flora and Fauna					
B 5.1	Loss of damage to vegetation	<p>Vegetation will be removed from the construction zone before commencement of construction. All works will be carried out such that the damage or disruption to flora other than those identified for cutting is minimum. Only ground cover/shrubs that impinge directly on the permanent works or necessary temporary works will be removed with prior approval from the Environmental Expert. The Contractor, under any circumstances will not cut or damage trees.</p> <p>Trees identified under the project will be cut only after receiving clearance from the Forest Department and after the receipt of written permission from PIU.</p> <p>Vegetation only with girth of over 30 cm measured at a height of 1.0 m above the ground will be considered as trees and shall be compensated.</p> <p>The clearing and grubbing will be restricted to only propose ROW.</p> <p>No debris/ waste materials will be disposed off within the forest area.</p>	Project site	<p>Indian Forest Act 1927; Forest (Conservation) Act 1980; Forest (Conservation) Rule 1981, 2003, 2022, 2023; Van (Sanrakshan Evam Samvardhan) Rule 2023; Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006 Compensatory Afforestation Fund Act, 2016.</p>	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		No tree cutting within the forest stretch will be allowed beyond the diverted forest land as per forest clearance.				
B 5.2	Impacts on Forest, Flora and Fauna	<p>The Contractor will submit site specific Environmental Management Action Plan along with their work plan for working in the forest stretch and will strictly follow all the precautionary measures as approved and directed by the PMC/PIU-R&amp;B, Government of Sikkim.</p> <p>During continuance of the contract, the contractor and his sub-contractors, if any, shall abide at all times by all existing enactments on environmental protection and rules made there under, regulations, notifications and bye-laws of the State or Central Government, or local authorities and any other law, bye-law, regulations that may be passed or notification that may be issued in this respect in future by the State or Central Government or the local authority</p> <p>The Contractor will strictly comply with the conditions stipulated by the Forest department during works and also ensure that the sub-contractor also follows the same.</p> <p>The Contractor will obtain requisite permission from Forest &amp; Wildlife Department for movement of manpower and machineries in the reserved Forest area and submit the copy of the</p>	Project site	<p>Indian Forest Act 1927;</p> <p>Forest (Conservation) Act 1980;</p> <p>Forest (Conservation) Rule 1981, 2003, 2022, 2023;</p> <p>Van (Sanrakshan Evam Samvardhan) Rule 2023;</p> <p>Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006</p> <p>Compensatory Afforestation Fund Act, 2016.</p>	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>same to PIU and authority engineer. The contractor will submit specific work plan with regard to temporary land width for diversion or any activity in accordance with the conditions of the respective Forest Department while working in RF sections.</p> <p>The contractor will not extract earth materials from forest area. The clearing and grubbing will be restricted to only proposed ROW. The Contractor will not take away the excavated materials generated due to excavation and road bed preparation within the forest stretch without proper permission from the forest department.</p> <p>The excavated materials within the forest stretch will be stacked at the pre-identified site in consultation with the forest department.</p> <p>The Construction camp, work force camp, construction plants, stock yards, vehicular/equipment servicing area and other allied sites shall not be established in the vicinity/nearby forest areas. At least 1 Km distance shall be kept from boundary of Reserved Forest areas.</p> <p>The Contractor will not operate any borrow area within the forest area.</p> <p>No debris/ waste materials will be disposed off within the forest area.</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>Tree cutting within the forest stretch will be restricted to only area the diverted as per forest clearance.</p> <p>Movement of vehicles and equipments in the forest stretch will strictly be ensured within the pegged area only.</p> <p>The Work force shall be strictly prohibited from entering into forest areas beyond the work zone or private lands under any circumstances. The Contractor will provide mobile toilet units for the workforce at site</p> <p>In the forest section the construction work shall be restricted to day hours only and work shall not be carried out in the late evening hours/night hours /early mornings.</p> <p>The contractor will prepare bitumen mix for black topping/ pavement outside forest area to avoid any risk of forest fire and damage to the forest area and wild animals</p> <p>The Contractor will sensitize the workforce about the risk of forest fire and no smoking shall be allowed within the forest section.</p> <p>No cooking will be allowed in the forest area.</p> <p>The Contractor will maintain firefighting equipments at the site during construction activities to act immediately in case of forest fire.</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		The Contractor will develop emergency action plan in consultation with Forest Department to deal with forest fire No fire wood use in cooking is allowed				
B 5.3	Damage to forest	Upon sighting a wild animal at the site, the DFO shall be notified immediately. Any attempts to capture animals spotted in the vicinity of construction areas are strictly prohibited. Work force shall be strictly instructed not to harm / kill wild animals under any circumstance. All the construction vehicles will follow the speed limit Use of Horns should be minimum at site in the forest reach. The construction work shall be restricted to day hours only and work shall not be carried out in the late evening hours/night hours /early mornings. Heritage trees should be preserved, no cutting, disturbance to such area shall be done by the contractor. No impact on heritage tree is envisaged as per the design.	Project site	Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006	Contractor	PMU/ PIU R&BD, Sikkim
B 5.4	Loss, damage or disruption to Wild animals	There is no known wildlife habitat or movement route across the proposed alignment. As a pre-cautionary measure, all works are to be carried out in such a fashion that the damage and disruption to fauna is minimum. Construction workers shall be sensitized by Contractor's EO to protect natural resources	Project site	Wild Life Protection Act 1972, & Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>and fauna, including wild animals and aquatic life. (if found) hunting and unauthorized fishing shall be prohibited.</p> <p>The Contractor shall ensure that there is no disruption or damage to the wild animals due to his activities or by his persons.</p> <p>The Wildlife (Protection) Act, 1972, The State rules for wild life protection will strictly be adhered to. State rules for hunting (wild life protection) and rules for Bird catching (wild life protection) will strictly be adhered to.</p> <p>It will be responsibility of the Contractor to ensure that there is no illegal poaching of wild animals around the area of activities by his staff, labour or sub-contractors' personnel.</p> <p>Construction vehicles will run along specified access to avoid accidents to cattle or wild animal</p> <p>The work force shall be oriented not to feed monkeys in order to avoid accident with the monkeys</p> <p>All work force shall be oriented to keep calm and walk away from the scene, in case, wild animals are sighted either during work hours.</p> <p>The site worker will strictly be advised.</p> <p>Work force shall be strictly instructed not to harm / kill wild animals under any circumstance.</p> <p>All the construction vehicles will follow the speed limit</p>				

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		Use of Horns should be minimum at site in the forest reach. The construction work shall be restricted to day hours only and work shall not be carried out in the late evening hours/night hours /early mornings.				
B 6 .1	Water Pollution					
B.6.1.1	Water Pollution from Construction Wastes	The contractor shall take all precautionary measures to prevent entering of wastewater into streams, water bodies or the irrigation system during construction. Contractor will avoid construction works close to the Streams or water bodies during monsoon. Contractor shall not wash his vehicles in river water and enter riverbed for that purpose. Any type of construction wastes shall not be disposed in rivers or water bodies.	Project Road and near locations. Nearest river is Rangpo which is closest from the road on LHS at Ch- 1+050 km, 2+965	Contract Document, EMP; In the Honorable National Green Tribunal Eastern Zone Bench Kolkata O.A. 26/2023/EZ	Contractor	PMU/ PIU R&BD, Sikkim
B 6. 2.2	Waste water lubricants	Waste water generated from the sanitary facilities at labour camp shall be treated in septic tank followed by soak pit. No untreated raw sewage/waste water shall be discharged into any river and water body. Workers shall not be allowed for open defecation. Proper toilets fitted with septic tank and soak pit shall be provided for workers at camp site. At the bridge construction site portable toilets shall be provided for workers and sewage from portable toilets shall be passed through septic tank followed by soak pit.	Project Road	Contract Document, EMP, Water Act 1974	Contractor	PMU/ PIU R&BD, Sikkim



S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
B 6.3.1	Siltation of Water Bodies and Degradation of Water Quality	<p>The project road crossing natural streams at design chainage which remain dry in non-rainy days.</p> <p>The Contractor shall not excavate beds of any stream/canals/ any other water body for borrowing earth for embankment construction.</p> <p>The Contractor shall construct silt fencing at the base of the embankment construction for the entire perimeter of any water body (including wells) adjacent to the project road and around the stockpiles at the construction sites including ancillary sites close to water bodies. The fencing shall be provided prior to commencement of earthwork and continue till the stabilization of the embankment slopes, on the particular sub-section of the road.</p> <p>Contractor shall ensure that construction materials containing fine particles are stored in an enclosure such that sediment-laden water does not drain into nearby watercourse.</p> <p>On completion of construction of culverts and bridges, drainage channels shall be cleared by collecting debris and disposed suitably.</p> <p>Detours/diversions constructed for construction of culverts and bridges shall be cleared before onset of monsoon.</p> <p>All discharge standards promulgated under Environmental Protection Act, 1986, shall be adhered to.</p>	Project site	EPA 1986 In the Honorable National Green Tribunal Eastern Zone Bench Kolkata O.A. 26/2023/EZ	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
B 6.2	Air Pollution					
B 6.2.1	Dust Pollution	Road construction works specially earth work and movement of construction vehicles plying during construction phase shall may add to dust and gaseous air pollution along the project road. Frequent dust suppression shall be ensured for this stretch of the road by use of water tankers. The contractor shall procure the construction machineries, which conforms to the pollution control norms specified by the MoEF&CC/CPCB/Sikkim Pollution Control Board. The excavated earth /construction materials shall be stored properly so that it does not generate fugitive emissions. Regular maintenance of vehicles to be used for materials transportation and equipment shall be carried and vehicular pollution check should be made mandatory. Mask and other PPE should be provided as a mandatory effort to the construction workers in dust prone areas. Stone Crusher plant should have 6 FT GI Sheet Barricading around the plant.	Project Road	MoRTH Clause 111, Air (Prevention and Control of Pollution) Act, 1981	Contractor	PMU/ PIU R&BD, Sikkim
B 6.2.2	Emission from Construction Vehicles, Equipment and Machineries	The contractor shall ensure that all vehicles, equipment and machinery used for construction works are regularly maintained and conform that pollution emission levels comply with the requirements of CPCB and/Motor Vehicles Rules. The contractor shall submit Pollution	Project Road	Air (Prevention and Control of Pollution) Act, 1981,	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>under Control (PUC) certificates for all vehicles used in the project.</p> <p>DG set shall be provided with chimney of adequate height as per CPCB guidelines (Height of stack in meter = Height of the building + 0.2 <math>\sqrt{\text{KVA}}</math>).</p> <p>The environmental monitoring shall be conducted as per the monitoring Plan.</p>				
B 4.3	Noise Pollution					
B 6.3.1	Noise Levels from Construction Vehicles and Equipment's	<p>The contractor shall confirm the following:</p> <p>All construction equipment used in excavation, concreting, etc., shall strictly conform to the MoEF&amp;CC/CPCB/Sikkim Pollution Control Board noise standards.</p> <p>All vehicles and equipment used in construction works shall be fitted with exhaust silencers/mufflers.</p> <p>Maintenance and servicing of all construction vehicles and machineries shall be done regularly.</p> <p>Only acoustic enclosures fitted DG sets shall be allowed at the construction site and labour camp.</p> <p>At the construction sites within 150 m of the nearest habitation, noisy construction work and use of high noise generation equipment will be stopped during the night time between 10.00 pm to 6.00 am. Working hours of the construction activities shall be restricted around</p>	Project site	<p>The Noise Pollution (Regulation and Control) Rules, 2000</p> <p>WHO guideline for Noise rules 2002;</p> <p>MoST 111.13</p> <p>MoST 111.1</p> <p>MoST 111.6</p>	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		educational institutes/health centers (silence zones) up to a distance of 100 m from the sensitive receptors. Noise monitoring shall be carried out in construction areas through the approved monitoring agency				
B 7	Archaeological Resources and Cultural properties					
B 7.1	Chance in Finding of Archaeological Property	All fossils, coins, articles of value of antiquity, structures and other remains or things of geological or archaeological interest discovered on the site shall be the property of the Government and shall be dealt with as per provisions of the relevant legislation. The contractor shall take reasonable precautions to prevent his workmen or any other persons from removing and damaging any such article or thing. He shall immediately (upon discovery thereof and before removal) acquaint the Environmental Expert of the PIU of such discovery and carry out the PIU's instructions for dealing with the same, waiting which all work shall be stopped. The PIU seek direction from the Archaeological Survey of India (ASI) before instructing the Contractor to recommence the work in the site.	Project site, no ASI Monument in the indirect influence area at 5 km radius	--	Contractor	PMU/ PIU R&BD, Sikkim
B 7.2	Impacts on Cultural Properties	All necessary and adequate care shall be taken to minimize impact on cultural properties which includes cultural sites and remains, places of worship including mosques, temples, shrines,	Project site	--	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		etc., graveyards, monuments and any other important structures as identified during design stage. Relocation and enhancement measures shall be taken up as per design and in consultation with local community. Access to such Properties from the road shall be maintained clear and clean.				
B 8	Personal Safety					
B 8.1	Personal Safety Measures for Labour and Staff	<p>The contractor shall take necessary measures for personal safety of workers:</p> <p>Protective safety shoes, gum boots, hand gloves, protective goggles, etc. (as required) will be provided to the workers employed in excavation, steel rebaring and bending, concrete works, erection of pump station, etc.</p> <p>Welder's protective eye-shields shall be provided to workers who are engaged in welding works.</p> <p>Earplugs shall be provided to the workers exposed to high noise levels.</p> <p>Safety vests shall be worn by workers when they work on construction site.</p> <p>The Contractor shall comply with all regulations regarding safe scaffolding, ladders, working platforms, gangway, stairwells, excavations, trenches and safe means of entry and egress.</p> <p>The contractor shall comply with all the precautions as required for ensuring the safety</p>	Labour camp and Project site	<p>ILO- Safety and health in construction, Factory Act 1948, BOCWA 2006 MoRTH 105 Sub Clause 111.11 Refer Occupational Health and Safety (OHSA) complying with IS:14489:1998; Reaffirmed 2002 Refer Occupational safety, health and working condition code 2020 Gazette of India dated 28th September 2020</p>	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		of the workmen as far as those are applicable to this contract. The contractor shall make sure that during the construction work all relevant provisions of Building and other Construction Workers (regulation of Employment and Conditions of Services) Act, 1996 are adhered to. The Contractor shall not employ any person below the age of 14 years for any work.				
B 8.2	Traffic and Safety	The Contractor shall take all necessary measures for the safety of traffic during construction and provide, erect and maintain such barricades, including signs, markings, flags, lights and flagmen as proposed in the traffic control plan/drawings and as required by the Environmental Expert for the information and protection of traffic approaching or passing through the section of any existing cross roads. The Contractor shall ensure that all signs, barricades, pavement markings are provided. Before taking up of construction, a Traffic Control Plan shall be devised and implemented to the satisfaction of the Environmental Expert of PIU	Labour camp and Project site	--	Contractor	PMU/ PIU R&BD, Sikkim
B 8.3	Emergency Management	Emergency numbers shall be displayed at the construction sites and camp site. First aid boxes shall be made available at construction site and camp site,	Labour camp and Project site	ILO- Safety and health in construction, Factory Act 1948, BOCW 2006		

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		Fire extinguishers for petroleum oil fire and electrical fire shall be made available at camp site, fuel storage site, construction site etc. Designated vehicles, which can be used as ambulance shall be available at construction site at all the time.				
B 8.4	Risk force measure	The contractor shall make required arrangements for prompt first aid treatment to minimize the mishap, if any during the operation of machinery/construction vehicles, dismantling, excavation, concrete pouring, hot asphalt handling and erection of pumps. Construction Safety Plan for the all the road stretches, embankment development, protection works, longitudinal drains, ancillary sites shall be prepared by the contractor and to identify necessary actions in the event of an emergency	Labour camp and Project site	ILO- Safety and health in construction, Factory Act 1948, BOCW 2006	Contractor	PMU/ PIU R&BD, Sikkim
B 8.6	Informatory signs and hoardings	The Contractor shall provide, erect and maintain informatory/safety signs, hoardings written in English and local language, wherever required or as suggested by the Environmental Specialist of PIU	All along the Project site	--	Contractor	Authority Engineer
B 9	Labour camp and Project site management					
B 9.1	Labor Influx	The contractor will preferably engage local labour force. The Contractor will provide all the required resources to the migrant labourers to avoid pressure on social infrastructure, such as water supply, sanitation arrangements, etc.	Labour Camp	ILO- Safety and health in construction, Factory Act 1948, BOCW 2006	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>Project will incorporate social and environmental mitigation measures into the civil works contract. The responsibilities for managing these adverse impacts will be clearly reflected as a contractual obligation, with a mechanism for addressing non-compliance. Educate Labour supplier contractor in all labour laws, behavioral change communication in labour management through IEC process as part of Labour Management Plan.</p> <p>The contractor has to provide all the basic facilities such as drinking water, power supply, drainage facilities, toilets and bathroom facilities separately for male and female workers, etc. for their all their labour camps including temporary shelters at construction sites. Mobile toilets and first Aid Kits are required to be provided by the contractor at all the construction zone.</p> <p>Community consultation shall be done regularly. The construction site should be demarcated and cautious Information “board such as “go slow”, “construction in progress”, “speed limit”, etc. shall be placed.</p> <p>PPE shall be provided to all construction labour and staff and same shall be monitored by PIU and Authority Engineer.</p>				
B 9.2	Accommodation for Laborers	Contractor shall follow all relevant provisions of the Building and the other Construction Workers (Regulation of Employment and Conditions of	Labour Camp	ILO- Safety and health in construction,	Contractor	PMU/ PIU R&BD, Sikkim



S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		<p>Service) Act, 1996 for construction and maintenance of labour camp.</p> <p>The location, layout and basic facility provision of each labour camp shall be submitted to Environmental Expert of PIU prior to their construction.</p> <p>The construction of labor camp shall commence only upon the written approval of the Environmental Expert of PIU.</p> <p>The contractor shall maintain necessary well ventilated living accommodation, toilets, bath rooms and ancillary facilities in functional and hygienic manner.</p> <p>Proper ventilation along with standard exhaust fans shall be provided in labour accommodation rooms.</p> <p>Regular cleaning and sweeping shall be ensured at the labour camp site.</p> <p>Systematic waste collection management at labour camp shall be managed as per SWM Rules 2016. Standard First Aid Kits/units including an adequate sterilized dressing Materials shall be maintained.</p>		Factory Act 1948, BOCW 2006		
B 9.3	HIV/AIDS Prevention Measures	Necessary HIV/AIDS prevention measures shall be taken at labour camp. HIV/AIDS awareness program shall be organized by the contractor's Environment & Safety Officer.	Labour Camp and construction site	ILO- Safety and health in construction, Factory Act 1948, BOCW 2006	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
B 9.4	Potable Water for Workers	<p>The contractor shall construct and maintain labour accommodation in such a fashion that uncontaminated clean water is available for drinking, cooking, bathing and washing. The contractor shall also provide potable water facilities within the precincts of workplace/pump stations in an accessible place, as per standards set by the Building and other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996.</p> <p>The contractor shall also provide the following:</p> <p>a) Supply of sufficient quantity of potable water (as per IS) at construction site/labour camp (site at suitable and easily accessible places and regular maintenance of such facilities).</p> <p>b) If any water storage tank is provided then it shall be kept such that the bottom of the tank at is least 1 meter above the surrounding ground level.</p> <p>c) If water is drawn from any existing well/ hand pump, which is within 30 meters proximity of any toilet, drain or other source of pollution, then the well shall be disinfected before water is used for the drinking. Environmental Expert of PIU shall be required to inspect the labour camp once in a week to ensure the compliance of the EMP.</p>	Labour Camp and construction site	ILO- Safety and health in construction, Factory Act 1948, BOCW 2006	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
B 9.5	Sanitation and Sewage System at Labour Camp	<p>The contractor shall ensure that: The sewage system for the camp shall be designed, built and operated in such a fashion that no health hazard occurs and no pollution to the air, ground water or adjacent water courses take place, Separate toilets/bathrooms, as required, shall be provided for men and women, marked in vernacular language, Toilets shall be provided with septic tank followed by soak pit. Adequate water supply shall be provided in all toilets and urinals, Night soil shall be disposed of with the help of municipality or disposed of by putting layer of it at the bottom of a permanent pit prepared for such purpose and covered with 15 cm layer of waste or refuse and then covered with a layer of earth for a fortnight</p>	Labour Camp	<p>ILO- Safety and health in construction, Factory Act 1948, BOCW 2006 Refer Occupational safety, health and working condition code 2020 Gazette of India dated 28th September 2020</p>	Contractor	PMU/ PIU R&BD, Sikkim
B 9.6	Waste disposal	<p>The contractor shall provide garbage bins in the camp &amp; construction site and ensure that these are regularly emptied and disposed off in a hygienic manner according to Solid Waste Management Plan as per Solid Waste Management Rule 2016. Burning of wastes at construction site &amp; labour camp and road side shall not be allowed. Solid waste generated at the construction site &amp; labour camp, shall be collected in covered waste bins and segregated as biodegradable</p>	Labour Camp	<p>ILO- Safety and health in construction, BOCW 2006 Solid Waste Management Rules 2016</p>	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
		(food waste, paper, etc.) and non-biodegradable (plastic, polyethylene bag, etc.) wastes. Polyethylene/plastic wastes shall be stored in empty cement bags and to be sent for recycling through scrap dealer. Biodegradable (food waste, paper, etc.) solid waste shall be disposed in the compost pit.				
B 10	Environmental Monitoring					
B 10.1	Environmental Monitoring Construction Stage	Environmental monitoring for ambient air quality, noise levels and water quality shall be carried out as per environmental monitoring plan and in accordance to instruction of Environmental Specialist of PIU.	Project sites near sensitive receptors, Construction Camp, Crusher plant etc..	Air & Water Act	Contractor	Authorized Engineer /PIU
B 10.2	Compensatory Plantation	Loss of trees shall be compensated by planting trees 1:10 ratio (i.e. for loss of 1 tree 10 trees shall planted) or greater and the possibility of translocation of may be explored in consultation with the forest department. Same trees may be envisaged wherever applicable. Regular monitoring shall be carried out for plantation along the project road for cutting of trees Silver Oak, Ashoka tree, Dhupi, Delonix regia, Cassia fistula, Panisaj, Gokul, Local Dhobo grass, Champ, Lagrrstroemia, Paulanea etc. plant as per prevailing species of the area should be used under compensatory afforestation.	Project site	FCA 1980 & Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006 Indian Forest Act 1927; Forest (Conservation) Act 1980; Forest (Conservation) Rule 1981, 2003, 2022, 2023; Van (Sanrakshan Evam Samvardhan)	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
				Rule 2023; State Compensatory Afforestation fund act 2016.		
C	Contractor's Demobilization					
C.1	Clean-up Operations, Restoration and Rehabilitation	<p>The contractor shall prepare project and labour camp site restoration plan, which shall be approved by the PIU / Environmental Expert. The clean-up and site restoration operations are to be implemented by the contractor prior to demobilization from construction site and labour camp. The contractor shall clear all temporary structures, debris, construction wastes, garbage, night soils, etc in environmental sound manner.</p> <p>All disposal pits or trenches shall be filled in and effectively sealed off.</p> <p>Construction places including camp and any other area used/affected due to the project operations shall be left clean and tidy at the contractor's expense to the entire satisfaction to the PIU.</p>	Project site, All construction camp, sites	--	Contractor	PMU/ PIU R&BD, Sikkim
C 2	Land Rehabilitation	<p>All surfaces hardened due to construction activities shall be ripped &amp; imported materials thereon removed.</p> <p>All rubbles shall be removed from the site to an approved disposal site. Burying of rubble on site is prohibited.</p>	Project site	MoRTH: 111.2	Contractor	PMU/ PIU R&BD, Sikkim

S. No	Environmental Issues	Environmental Mitigation Measures	Location	Responsibilities		
				Reference	Planning & Execution	Supervision/ Monitoring
		Surfaces shall be checked for waste products from activities such as concreting or asphaltting and cleared in a manner approved by the Engineer. All embankments shall be trimmed, shaped and replanted to the satisfaction of the PIU. Borrow pits shall be closed and rehabilitated in accordance with the pre-approved management plan for each borrow pit. The Contractor shall liaise with the PIU regarding these requirements. All surfaces hardened due to construction activities shall be ripped & imported materials thereon removed.				
D	Post Construction stage					
D 1	Environment Monitoring Post Construction stage	Environmental monitoring for ambient air quality, noise levels and water quality as per environmental monitoring plan and in accordance to instruction of Environmental Specialist of PMU.	Near Sensitive receptors	EMP	PIU	PMU
D 2	Monitoring of Afforested and Landscape areas	Continuous watch and monitoring of plantation and landscape areas shall be done for its performance and survival rate. The plantation shall be properly guarded by watch and ward personnel. Provision shall be made for manure application and watering on schedule.	Along the Road landscape, exposed surface near the bridge, culverts, and area allocated under CA by Forest Department under the project	FCA 1980 & Sikkim Private and Other Non-Forest Lands Tree Felling Rules, 2006 State comepensatory afforestation act 2016.	PIU, Forest department, Contractor	PMU

S. No	Environmental Issues	Environmental Mitigation Measures	Location		Responsibilities	
				Reference	Planning & Execution	Supervision/ Monitoring
				Indian Forest Act 1927; Forest (Conservation) Act 1980; Forest (Conservation) Rule 1981, 2003, 2022, 2023; Van (Sanrakshan Evam Samvardhan) Rule 2023;		
D 3	Soil erosion and monitoring of Borrow areas	Visual monitoring and inspection of soil erosion at borrow areas, quarries (if closed and rehabilitated), embankments and other places expected to be affected, shall be carried out once in every three months.	-	MoRTH: 111.2	PIU	PMU

## 5. Environmental Monitoring Plan

10. The monitoring programme consists of performance indicators, reporting formats and necessary budgetary provisions. The contractors monitoring plan should be in accordance with the baseline environmental monitoring, locations provided in the Environmental impact assessment report.
11. The monitoring plan has the following objectives:
  - To ensure effective implementation of EMP
  - To evaluate the performance of mitigation measures proposed in the EMP
  - To comply with all applicable environmental, safety, labour and local legislation
  - To ensure that public opinions and obligations are considered and respected to the required satisfaction level
  - To modify the mitigation measures or implementing additional measures, if required.
12. The monitoring requirement for the different environmental components have been prepared is presented in **Error! Reference source not found.** below.

### 1.1 Performance Monitoring Indicators

13. Environmental components identified of significance in affecting the environment at critical locations have been suggested as Performance Indicators. For example, near the construction site, a thick layer of dust over the nearby vegetation/leaf is an indication that the dust control measures are not effective. The performance indicators will be evaluated under three heads as mentioned below:
  - Environmental condition indicators to determine efficacy of environmental mitigation measures for controlling air, noise and water pollution.
  - Environmental management indicators to determine compliance with the suggested environmental management measures.
  - Operational performance indicators have also been devised to determine efficacy and usefulness of the proposed mitigation measures for the project road.
14. The performance indicators and monitoring plan prepared for the project road are presented in Table 3 . Details of the performance indicators parameters for each of the component have to be identified and reported during all stages of the implementation. The contractor must ensure that the mitigation measures comply with the requirements of organizations like the IFC and WHO for pollution prevention and occupational health and safety management at the project site. The prepared monitoring plan aligns with the standards set by the MOEF, CPCB, IFC, and WHO.

Table 3: Brief Description of Measures

Sl. No.	Description of Item	Indicator	Stage	Responsibility
1	Verification and identification of earth borrow areas and stone quarries	Compliance of site selection Criteria	Pre-construction	Contractor
2	Identification of locations for construction camp and construction plant sites	Compliance of site selection Criteria	Pre-construction phase	Contractor
3	Progress on Tree removal	Tree cutting	Pre-construction phase	Project Implementation Unit



Sl. No.	Description of Item	Indicator	Stage	Responsibility
4	Disposal of soil from hill cutting	Disposal at the preidentified and approved disposal site. No disposal on the valley side.	Construction	Contractor
5	Location of the temporary storage areas for excavated materials to be reused in road construction, embankment and sub grade	Storage of excavated materials	Pre-construction phase	Contractor
6	Implementation of mitigation measures specified in the EMP	Prevention/ Control of Pollution	Construction phase	Contractor
7	Environmental monitoring as per the conditions stipulated in the consents/ as described in environmental monitoring plan	Environmental Conditions at Construction Sites/Plants/ Camps	Construction phase	Contractor
8	Environmental monitoring in accordance with the frequency and duration of monitoring as well as the locations as per the Monitoring plan. Before the onset of monsoon all the debris/ excavated materials will be cleaned from the work sites and disposed of temporarily stock piled debris for final disposal properly away from the water bodies	Ambient Air Quality, Ambient Noise Level, Ground and Surface Water Quality, Silting of Water Bodies.	Construction phase	Contractor through external agency and will be supervised by the Environment Specialist of Authority Engineer/ Project Implementation Unit
9	Monitoring work zone safety	Use of PPE and signages	Construction phase	Contractor and will be supervised by the Environmental Specialist of Authority Engineer / PMC
10	Implementation of the enhancement measures suggested for the pond redevelopment areas, cultural/community properties and oxbow land development	Enhancements/ Shiftings	Construction phase	Contractor
11	Reporting of accidents at worksites/road construction sites	Accidents Reporting	Construction phase	Contractor
12	Plantation of shrubs and grass in high embankment/ enhancement sites and incidental spaces	Land scaping	Construction and Defect Liability Period	Contractor
13	Compensatory tree plantation and Reporting of the Survival Rate. The survival rate should be monitored and reported on quarterly basis	Tree Plantation and survival rate	Construction and Operation Stage	Forest Department and Project Implementation Unit
14	Verification of the borrow area redevelopment as specified in the redevelopment plan and Satisfaction of the owners/IRC guidelines	Status borrow area	Construction and operation stage	Contractor and Project Implementation Unit

Sl. No.	Description of Item	Indicator	Stage	Responsibility
15	De-mobilization of Camps and Plant on completion of works	Clean-up and restoration of the site	De-Mobilization	Contractor and will be supervised by the Environmental Specialist of Authority Engineer/ Project Implementation Unit

#### 1.1 Monitoring Plans for Environment Conditions

15. For each of the environmental components, the environmental monitoring plan specifies the parameters to be monitored; location of the monitoring sites and duration of monitoring. The monitoring plan also specifies the applicable standards, implementation and supervising responsibilities. The monitoring plan for the various environmental condition indicators of the project in construction stages is presented in . Monitoring plan does not include the requirement of arising out of regulation provision such as obtaining Consents for plant site operation.

Table 4: Brief Description of Measures

Sl. No	Locations of worksite	Site safety measures
1	Construction site	Caution boards, Safety Cones, Delineators
2	Deep cutting	The construction zone shall be barricaded with G.I. Sheet or arrangement to be made as per plan approved by the Project Implementation Unit [Provide Safety Sign Boards and Safety Barriers marked with reflective tapes]
3	Temporary diversion (If any)	Diversion Board, Barricading [Provide 'Diversion Ahead' boards at 50m, 100m and 150m ahead of diversions with reflective tape for illumination at night at all diverted locations]
4	Safety of the workers	Helmets, Safety-Shoes, Goggles, Dusk mask. Etc.

Furthermore, periodical site monitoring shall be carried out by the Environmental Expert of PIU for surveillance & monitoring of road safety during the road construction. The brief description of measures has been given in Table 5.

Table 5: Environmental Monitoring Plan

Attribute	Timing	Parameter	Standards	Frequency	Duration	Location	Implementation
	Pre - construction			Two samples for one week (on non-consecutive days)		As Indicated in table no 6 and 7 & places designated for Construction labour camps, plants sites and settlements along the work zones in downwind direction as decided by Environmental Expert of Authority Engineer/PMC	Contractor
Ambient Air	Construction	PM2.5, PM10, SO2, NO2 & CO	National Ambient Air Quality Standards (NAAQM) 2009	Two samples for one week (on non-consecutive days) for in winter and summer seasons (six monthly)	24 Hours Sampling, 2 Samples in on Week	Construction labour camps, plants sites and settlements along the work zones in downwind direction (Locations will be decided by Environmental Expert of Authority Engineer/PMC)	Contractor
	Operation			Once every season except monsoon season for 5 years after completion of construction		As Indicated in table no 6 & 7	Contractor
Ground water	Pre - construction	Organoleptic and Physical, Chemical & Bacteriological Parameters	Potable Water Standards (IS 10500: 2012)	Once before commencement of construction	Grab Sampling Once	Places designated for Construction labour camps, plants sites and settlements along the work zones in downwind direction as decided by Environmental Expert of Authority Engineer/PMC	
	Construction			Winter and Summer Seasons	Grab Sampling Once	Construction labour camp, plants sites, settlements along the work zones (locations will be decided by Environmental Expert of Authority Engineer /PMC)	Contractor
Surface water	Pre - construction		Indian Standards	Once before commencement of construction	Grab Sampling Once	Places designated for Construction labour camps, plants sites and settlements along the work zones in downwind direction as decided	

Attribute	Timing	Parameter	Standards	Frequency	Duration	Location	Implementation
		<sup>2</sup> (i) pH, BOD, COD, TDS, TSS, Pb, DO Oil & Grease for Surface	(IS:2296-1982) for inland surface waters			by Environmental Expert of Authority Engineer/PMC	
	Construction	Water (ii) pH, TDS, Total Hardness, Sulphate, Chloride, Fe, Pb, As, for Ground Water		Winter and Summer Seasons	Grab Sampling Once	Construction labour camp, plants sites, River and Ponds (locations will be decided by Environmental Expert of Authority Engineer/PMC)	Contractor
Noise	Pre - construction	Level Equivalent L Day and L Night based on hourly Noise Measurements	Ambient Noise Standards, MoEF Noise Rules, 2000	Once before commencement of construction	Hourly noise measurements for one day	As Indicated in table 6 & 7 & places designated for Construction labour camps, plants sites and settlements along the work zones in downwind direction as decided by Environmental Expert of Authority Engineer/PMC	
	Construction				Hourly noise measurements for one day in winter and summer seasons	Construction labour camp, plants sites, settlements along the work zones (locations will be decided by Environmental Expert of Authority Engineer/PMC)	Contractor
	Operation	Equivalent noise levels using an integrated noise level meter kept at a distance of 15 from edge of pavement		Winter and Summer Seasons	Hourly noise measurements for one day in winter and summer seasons for 5 years after construction completion.	At potential abutting traffic detours and traffic diversions and major intersection near habitations.	Contractor

<sup>2</sup> These parameters along with parameters suggested in EIA Guidance Manual for Highways should be included. However, deletion or addition of any other parameters during construction phase shall be decided by Environmental Officer of Construction Supervision Consultant (CSC).

Attribute	Timing	Parameter	Standards	Frequency	Duration	Location	Implementation
Soil	Pre - construction	As suggested in section 4.2 of EIA Guidance Manual for Highways.	Threshold for each contaminant set by IRIS database of USEPA until national standards are promulgated	During the Pre monsoon & Post monsoon season each year for the entire construction period	Grab Sampling	At productive agricultural lands abutting traffic detours and traffic diversions and major intersection.	Contractor
	Construction				Grab Sampling	At productive agricultural lands abutting traffic detours and traffic diversions and major intersection.	Contractor

16. The number of samplings will be determined by the number provided in the Table No 6

Table 6: Number of samples

Monitoring -	E 1 - No. of Monitoring Stations
Air	2
Noise Monitoring	2
Water Quality Monitoring (GW)	2
Surface water quality Monitoring	2
Soil Quality Monitoring	2

17. The selection of sampling location will be determined based on the criteria provided in the Table no. 7

Table 7: Selection of Monitoring Stations

Attributions	Stage	Location
Air	Construction	Receptor location:  Settlement (Near Swiss Garnier), CH 0 + 560; BDO Office, CH 7 + 930  Plant and Equipment site: Aggregate Crusher site Aggregate Batching Plant location Asphalt Hot Mix plant
	Operation	Receptor location: West Lungdar Lengte Hreichuck
Noise	Construction	Receptor location:  Settlement (Near Swiss Garnier), CH 0 + 560; BDO Office, CH 7 + 930  Plant and Equipment site: Aggregate Crusher site Aggregate Batching Plant location Asphalt Hot Mix plant Operation of construction equipment
	Operation	Receptor location: West Lungdar Lengte Hreichuck
Water	Construction	At all corridors, rivers within 5 km upstream and downstream along with streams along project corridors

Attributions	Stage	Location
		Construction Camp Sites for drinking water as frequently EO as feels required. Immediately when change in source concerned.
Soil	Construction	at productive agricultural lands close to intersections or along sensitive land uses (3 locations) any accident or spill locations involving bulk transport carrying hazardous materials
It is noted that locations are indicative. It will finally be decided by Environmental Officer of CSC during construction phase and by PIU, R&BD during operation phase.		

## 6. Environmental Reporting System

18. The environmental reporting system for the suggested monitoring programme will function at two levels:
19. Reporting for environmental condition indicators and environmental management indicators
20. Reporting for operational performance indicators at the Project level. Environmental monitoring involves of the works. It provides the necessary feedback for the project management to keep the programme on schedule for achieving the expected outcomes.
21. Reporting of overall environmental and social monitoring right from project to apex level shall be done in the following order as per ADB's SPS –



22. The Contractor, Authority Engineer shall operate the reporting system for environmental conditions and environmental management indicators. The reporting system is presented in **Error! Reference source not found..** The reporting schedule for contractors and construction supervision consultant have been prepared, which are on the basis of the implementation of EMP by the Contractor and monitoring by the Independent Engineer. The reporting system will start with the Contractor who is the main executor of the implementation EMP activities.
23. The Contractor will report to the Independent Engineer, who in turn will report to the Project Implementation Unit. The reporting system will comprise the following:
24. The contractor shall submit monthly environmental compliance reports along with formal monthly project progress report to the Authority Engineer/PMC/ construction supervision consultant.
25. The Authority Engineer shall submit separate quarterly environmental monitoring reports to Project Implementation Unit in addition to submission of the summary of the activities of the month in the formal monthly report including any deviations and corrective actions
26. Project Implementation Unit shall be responsible for the preparation of the targets for identified non compliances for the EMP compliance
27. Solutions for further effective implementation may also emerge as a result of the compliance monitoring reports.

28. The photographic records shall be kept to provide useful environmental monitoring tools. All material sources points, disposal locations, plant's locations, camp locations, crusher locations etc. shall be photographed and kept as a record. A full record of construction activities and EMP implementation shall be kept as part of normal contract monitoring system. The Reporting and Monitoring Systems for various stages of construction and related activities have been proposed in Table No 8.

Table 8: Environmental Reporting System

Item	Contractor	Construction Supervision Consultant (Independent Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Independent Engineer /PMC	Reporting	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to ADB
Pre-Construction Stage					
Sites of camps and Plants	Weekly	Weekly	Monthly	Monthly	Quarterly
Location of borrow area	Weekly	Weekly	Monthly	Monthly	Quarterly
Location of stone quarry	Weekly	Weekly	Monthly	Monthly	Quarterly
Shifting of Community/ Cultural Structures (If Any)	Weekly	Weekly	Monthly	Monthly	Quarterly
Tree cutting and Clearing of Vegetation	Weekly	Weekly	Monthly	Monthly	Monthly
Construction Stage					
Monitoring of construction site and construction Camp	Regular	Regular	Monthly	Monthly	Quarterly
Establishment of BP/HMP	Monthly	Monthly	Quarterly	Half Yearly	Quarterly
Pollution Monitoring	Six Monthly	As required	In Monthly report	In quarterly report	In quarterly report
Monitoring of Enhancement	Weekly	Weekly	Monthly	Monthly	Quarterly
Top soil Preservations	Weekly	Weekly	Monthly	Monthly	Quarterly



Item	Contractor	Construction Supervision Consultant (Independent Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Independent Engineer /PMC	Reporting	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to ADB
Borrow area/ quarry area/ debris disposal area	Weekly	Weekly	Monthly	Monthly	Quarterly
Tree Plantation	Monthly	Monthly	Monthly	Monthly	Quarterly
Accident Report	As and when take place	Monthly	Quarterly	Quarterly	Quarterly
Demobilization of Plants					
Clean-up of plants & camps sites and Restoration of Sites	Monthly	Monthly	Monthly	Monthly	Quarterly
<p>Capacity Building and its needs</p> <p>Need for training</p> <p>To enable the R&amp;BD in integrating the social and environmental issues in its day-to-day operation and in internalizing the environmental and social issues in the existing and future road development projects training is conceived. To achieve this goal, the R&amp;BD, needs training on road development and environment management and the effective implementation of the environmental issues.</p> <p>Targets of proposed training</p> <p>The training programme will equip the environmental personnel of R&amp;BD, Sikkim to implement and supervise the EMP and expose senior members of the R&amp;BD to environmental and social issues associated with the highway projects. Such a group of senior staff can then be given the responsibility of active dissemination of the culture of environmental/social consciousness and ethics within the rest of the organisation. Further this will also include the CSC deputed under the project.</p> <p>Once the environmental staff of R&amp;BD &amp; CSC have received training and have gained experience through the implementation of the EMP, they should be ready to resume leadership role within the organization in providing training and in implementing future projects. In order to disseminate environmental experience gained by the R&amp;BD &amp; CSC, each staff would be required to maintain good records and prepare dissemination notes on specific issues and problems encountered and resolved, and how the experience gained could be integrated in future road projects.</p> <p>Proposed training components</p> <p>The environmental training aspects of the environmental personnel of R&amp;BD should encompass the following:</p> <p>Understanding of the relevant environmental regulations and their application to the project.</p> <p>Environmental management practices in hill roads upgradation and maintenance</p> <p>Main impacts of the project on the environment.</p>					

Item	Contractor	Construction Supervision Consultant (Independent Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Independent Engineer /PMC	Reporting	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to ADB
<p>Mitigation measures as given in the EMP and their implementation through incorporation in the design, construction supervision and monitoring.</p> <p>Duties and responsibilities of the Contractors, Supervisor Engineers, Supervision Consultants and the R&amp;BD</p> <p>Public/community consultation and its role during the implementation of the project.</p> <p>Liaison with other departments and relevant agencies (such as Forestry).</p> <p>Supervision of the implementation of the EMP and social issues during construction and operation.</p> <p>Resolution of environmental and social issues and their reporting.</p> <p>Monitoring during construction and operation.</p> <p>Weekly, monthly and quarterly report preparations and submission.</p> <p>Preparation of dissemination notes, holding of workshops, and training of other staff in R&amp;BD.</p> <p>The training modules to be worked out for the project need to be of relevance to the specific context of the roads in Sikkim focussing on the following issues:</p> <p>Conservation of biodiversity</p> <p>Slope stability and vulnerability to landslides</p> <p>Siting criteria for identification of dumping sites</p> <p>Harnessing water resources, including rain water harvesting</p> <p>Concepts of bio-engineering and application of bio-engineering techniques for slope protection</p> <p>Social management , gender inclusiveness</p> <p>Labour Management</p> <p>Session on SEA/SH risks mitigation</p> <p>Stakeholder engagement</p> <p>Grievance Redress Mechanism</p> <p>Anyother as per projet's requirement pertaining to E&amp;S monitoring</p> <p>Training of Contractor's Personnel</p> <p>The Contractor shall provide appropriate training to relevant Contractor's Personnel on Environmental Social (ES) aspects of the Contract, including appropriate sensitization on prohibition of Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH), and health and safety training.</p>					

Item	Contractor	Construction Supervision Consultant (Independent Engineer /PMC)		PMU/PIU	
	Implementation and Reporting to Independent Engineer /PMC	Reporting	Reporting to PMU/PIU	Oversee Compliance Monitoring	Report to ADB
<p>As stated in the Specification or as instructed by the Engineer, the Contractor shall also allow appropriate opportunities for the relevant Contractor's Personnel to be trained on ES aspects of the Contract by the Employer's Personnel.</p> <p>The Contractor shall provide training on SEA and SH, including its prevention, to any of its personnel who has a role to supervise other Contractor's Personnel.</p>					

**Table 9: EMP Items Considered Under Different Heads/source**

Sl. No.	Description	Source
1	Environmental Monitoring for air, water, noise and soil during construction and operation phase as per EMOP	Included as EMP Implementation Cost (Contractor's Quote)
2	Avoiding dust suppression in haul roads and material storage location (₹2,000 per tanker; 4 tankers a day for 240 days)	Included in Civil Items
3	Providing solid waste management facility in construction camp (dustbins, transportation, compost pit, inoculum etc.)	Included in Civil cost
4	Providing Training to officials and workers of Contractors	Authority Engineer Cost
5	Tree Plantation in the ratio 1:10 with respect to trees cut with 5yrs maintenance	Included under Road Arboriculture cost (Contractor's Quote)
6	Tree cutting	Included in Civil cost
7	Additional Roadside Plantation (Arboriculture)	Included in civil cost
8	Rainwater Harvesting structures	Included in civil cost
9	Informatory Signages for safety near sensitive locations, built up sections and forest sections	Included in civil cost
10	Noise barriers for sensitive locations	Contingencies as per Requirement
11	Forest diversion for acquisition of Forest Land	Sikkim Roads and Bridges Department
12	Cost for Climate resilience and protection work	Included in civil cost

29. The environmental budget for the various environmental management measures proposed for construction and operation of the project road is detailed in Table 10-11. There are several other environmental issues that have been addressed as part of good engineering practices, the costs for which have been accounted for in the engineering cost.
30. In the given the road wise number of samples during the construction and operation phase.

## 7. Environmental Management Budget

31. The environmental budget for construction and operation stage has been provided in table no 10 and 11

Table 10 : Environmental Budget

Particulars	Unit Cost	Frequency	No of Stations	Environmental Monitoring in Construction Phase* (excluding monsoon season)	E1
					8.90 km
Air quality Monitoring	9500	3	2	3	171,000
Noise Monitoring	1000	3	2	3	18,000
Surface Water Quality Monitoring	7500	3	2	3	135,000
Ground Water Quality Monitoring	7500	3	2	3	135,000
Soil Quality Monitoring	6000	3	2	3	108,000
Travel and Transportation of Monitoring team (Lump sum Amount)	100000	-	-	-	100,000
Noise barrier	40000	-	-	-	160,020
Silt fencing total	600 rm	-	-	-	180,000
Sanitation at construction camp	100000	-	-	-	200,000
<b>Sub Total</b>					<b>1,207,020</b>
<b>Afforestation Cost</b>					
Compensatory Plantation @1500 INR/per tree (10 times of the number of affected trees) for trees existing on Revenue Land (including PWD Land)	540 nos of impacted trees	-	10 times -5400	-	81,00,000
Net Present Value for affected forest land Ha. , (eco class VI as per	897000**	-	0.13 ha	-	116,610

Particulars	Unit Cost	Frequency	No of Stations	Environmental Monitoring in Construction Phase* (excluding monsoon season)	E1
					8.90 km
Hon'ble Supreme Court Order dated 28.03.2008					
<b>Total Cost (Forest &amp; tree approval)</b>					<b>8,360,130</b>
<b>Cost for operation phase</b>					
Air quality Monitoring	9500	2	2	3	114,000
Noise Monitoring	1000	2	2	3	12,000
Surface Water Quality Monitoring	7500	2	2	3	90,000
Ground Water Quality Monitoring	7500	2	2	3	90,000
Soil Quality Monitoring	6000	2	2	3	72,000
Training & orientation	50000	-	-	-	50,000
Travel and Transportation of Monitoring team (Lump sum Amount)	50000	-	-	-	50,000
dust suppression in haul roads and material storage location	Lumsum				150,000
<b>Cost for operation phase</b>					<b>628,000</b>
<b>Total Cost</b>					<b>10,051,630</b>
<b>Contingency 5%</b>					<b>502,581.5</b>
<b>Sub Total Cost</b>					<b>10,554,212</b>

\*Construction period has been assumed as 3 years for corridor length 5-10 km & O&M period of 2 years

\*\* NPV shall be finally decided by respective DFOs and addition NPV, afforestation cost