

PREPARE THE DETAILED ENVIRONMENT IMPACT ASSESSMENT REPORT FOR SELECTED CORRIDORS OF STATE HIGHWAYS IN UTTARAKHAND UNDER UTTARAKHAND STATE HIGHWAY IMPROVEMENT PROJECT –KATHGODAM – RANIBAGH – BHEEMTAL – KHUTANI – PADAMPUR – DHANACHAULI – PAHADPANI – SAHAR PHATAK – MORNOLA – DEVIDHURA – LOHAGHAT – PANCHESWAR MOTOR ROAD (SH 10).

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ABSTRACT OF DISSERTATION

PREPARE THE DETAILED ENVIRONMENT IMPACT ASSESSMENT REPORT FOR SELECTED CORRIDORS OF STATE HIGHWAYS IN UTTARAKHAND UNDER UTTARAKHAND STATE HIGHWAY IMPROVEMENT PROJECT –KATHGODAM – RANIBAGH – BHEEMTAL – KHUTANI – PADAMPUR – DHANACHAULI – PAHADPANI – SAHAR PHATAK – MORNOLA – DEVIDHURA – LOHAGHAT – PANCHESWAR MOTOR ROAD (SH 10).

The project road section of SH-10 from Kathgodam to Pancheswar lies in districts of Nainital, Almora, and Champawat in the State of Uttarakhand. Length of the existing project road is 184.672 km, Proposed Length is 177.118 km. Existing Project Road is of single lane configuration for 69.7 km and of intermediate lane configuration for 115 km as per road inventory done during June 2018. Existing pavement is of flexible type, though there are some concrete pavement in some built-up locations. In general, the condition of the existing pavement varying from poor to fair.

The proposed project road is located within 5 km of International (Indo-Nepal) Border, hence it comes under category-A under the schedule, due to applicability of General Condition, of EIA Notification, although it is a State Highway expansion project in hilly terrain above 1000-meter MSL.

The project proponent has applied for scoping / approval of ToR for EIA study vide letter no. 262/2019 dated 17th July 2019. MoEF&CC vide EDS dated 8th August 2019 replied, "As per EIA Notification, 2006 as amended from time to time, the all highway expansion projects in border states do not require scoping. Further such projects are exempted from public hearing. Hence, apply directly for grant of Environmental Clearance as per provisions contained in the said Notification."

The baseline data collection of different environmental components viz. air quality, noise, water quality, land use, ecology and socioeconomics was carried out for one season through a well-designed field studies covering data collection from primary as well as secondary sources. The primary baseline data has been collected within the right of way as well as area falling within

500 m on either side of existing right of way and secondary data has been collected within 15 km aerial distance from project road as per guidelines of MoEF Environmental Impact Assessment Guidance Manual for Highways.

The assessment of potential environmental impact consists of comparing the expected changes in the environment with or without the project. The analysis predicts the nature and significance of the expected impacts.

The objectives of environmental monitoring are: ensure effective implementation of EMP; comply with all applicable environmental, safety, labour and local legislation; ensure that public opinions and obligations are taken in to account and respected to the required satisfaction level; and modify the mitigation measures or Implementing additional measures if required. Detailed environmental monitoring plan for construction as well as operation phase has been prepared and presented in Volume – IV: Environment Assessment Report.

Development of road infrastructure is the first step towards wholesome development of State, cities, towns and people. The project is justified in terms of improvement of carriageway and road quality reduction of increased traffic congestion, improvement in road safety, improvement of environmental quality due to reduction of traffic congestion, improvement in existing transportation facilities, economic development and infrastructure development potential.

Environment Impact Assessment Study for the Selected Corridor

Chapter-1

(a) PROJECT BACKGROUND

The Uttarakhand Public Works Department (UK PWD), has been assigned the responsibility of Preparation of Feasibility Study and Detailed Project Report for selected corridors of State Highways under Uttarakhand State Highway Improvement Project (USHIP). The Detailed Project Report is being prepared for procurement of a loan from Asian Development Bank for the development of these selected State Highways.

In pursuance of the above, Private Company have been appointed as Consultants to carry out the Consultancy Services for preparation of Detailed Project Report for the Improvement & upgradation of Kathgodam - Ranibagh - Bheemtal - Khutani - Padampur - Dhanachauli - Pahadpani - Shahar Phatak - Mornola - Devidhura - Lohaghat – Pancheswar road section of SH- 10 in Nainital, Almora, and Champawat districts in the State of Uttarakhand. The main objective of the consultancy service is to establish the technical, economical, and financial viability of the project and prepare detailed project reports for rehabilitation/upgrading/construction of the existing/missing road to SH configuration. In line with Terms of references (TOR) of DPR study.

b) PROJECT DESCRIPTION

Uttarakhand PWD is developing roadway infrastructure by various state level and national level programs.

- i. Uttarakhand State Roads Investment Program (USRIP) is an ambitious road improvement program taken up by the state with the support of the Asian Development Bank. The Program has been planned and developed after a detailed study of the road network in Uttarakhand. The Program was planned to improve and develop a total of 10800 km of road network under various projects using the Multi Trench Financing Facility extended by the Asian Development Bank.
- ii. The Ministry of Road Transport and Highways allocates funds to the States/ Union Territories (UTs) for development of State Roads (non-Rural Roads) and Roads of Economic Importance and Inter State Connectivity (EI&ISC) as per the provisions of the Central Road Fund Act, 2000 amended by the Finance Act from time to time. Improvement of 13 roads are being carried out under CRF funding in 2018-2019.
- iii. **Uttarakhand State Highway Improvement Programme (USHIP)** is another ambitious road improvement program taken up by the state with the support of the Asian

Development Bank. The Uttarakhand Public Works Department (UK PWD), Government of Uttarakhand is negotiating a loan from Asian Development Bank (ADB) for development of 1005.115Km of State Highway (SH) network.

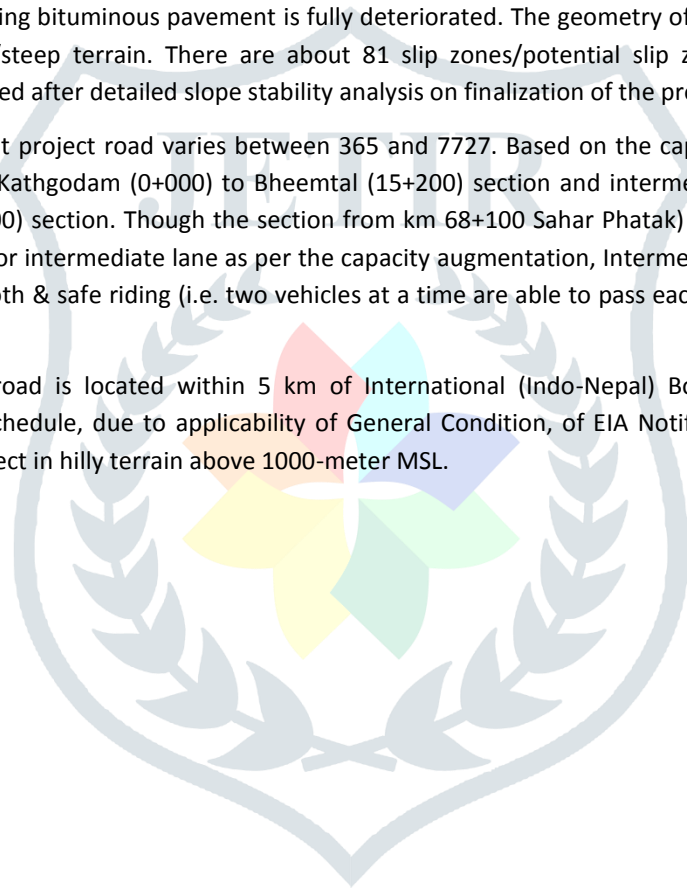
The project road section of SH-10 from Kathgodam - Ranibagh - Bheemtal - Khutani - Padampur - Dhanachauli - Pahadpani - Sahar Phatak - Mornola - Devidhura - Lohaghat – Pancheswar is proposed for improvement and upgradation to intermediate lane / two lane with paved shoulders under **Uttarakhand State Highway Improvement Programmed (USHIP)**.

The project road is implemented by UK PWD (ADB) Circle, Pithoragargh and monitored by Project Director/Chief Engineer, Project Management Unit, Asian Development Bank (Transport), Public Works Department, Dehradun, Uttarakhand.

The project road section of SH-10 from Kathgodam to Pancheswar lies in districts of Nainital, Almora, and Champawat in the State of Uttarakhand. Length of the existing project road is 184.672 km, Proposed Length is 177.118 km. Existing Project Road is of single lane configuration for 69.7 km and of intermediate lane configuration for 115 km as per road inventory done during June 2018. Existing pavement is of flexible type, though there are some concrete pavement in some built-up locations. In general, the condition of the existing pavement varying from poor to fair. In some locations the existing bituminous pavement is fully deteriorated. The geometry of the existing road is very poor owing to mountainous/steep terrain. There are about 81 slip zones/potential slip zones. Site-specific protective measures will be proposed after detailed slope stability analysis on finalization of the proposed alignment.

Base Year AADT (PCU) at project road varies between 365 and 7727. Based on the capacity augmentation, 2 laning has been proposed for Kathgodam (0+000) to Bheemtal (15+200) section and intermediate lane from Bheemtal to Sahar Phatak (km 68+100) section. Though the section from km 68+100 Sahar Phatak) to km 177+118 (Pancheswar) road does not warrant for intermediate lane as per the capacity augmentation, Intermediate lane has been proposed for this section for smooth & safe riding (i.e. two vehicles at a time are able to pass each other on the road safely) as per ToR of DPR study.

The proposed project road is located within 5 km of International (Indo-Nepal) Border, hence it comes under category-A under the schedule, due to applicability of General Condition, of EIA Notification, although it is a State Highway expansion project in hilly terrain above 1000-meter MSL.



The Project Road originates from Km 91+815 of NH-87 at Ranibagh near Kathgodam and ends at Km 208 of SH-10 at Pancheswar near Nepal Border. The location map of the project corridor has been presented in Figure 6.1.

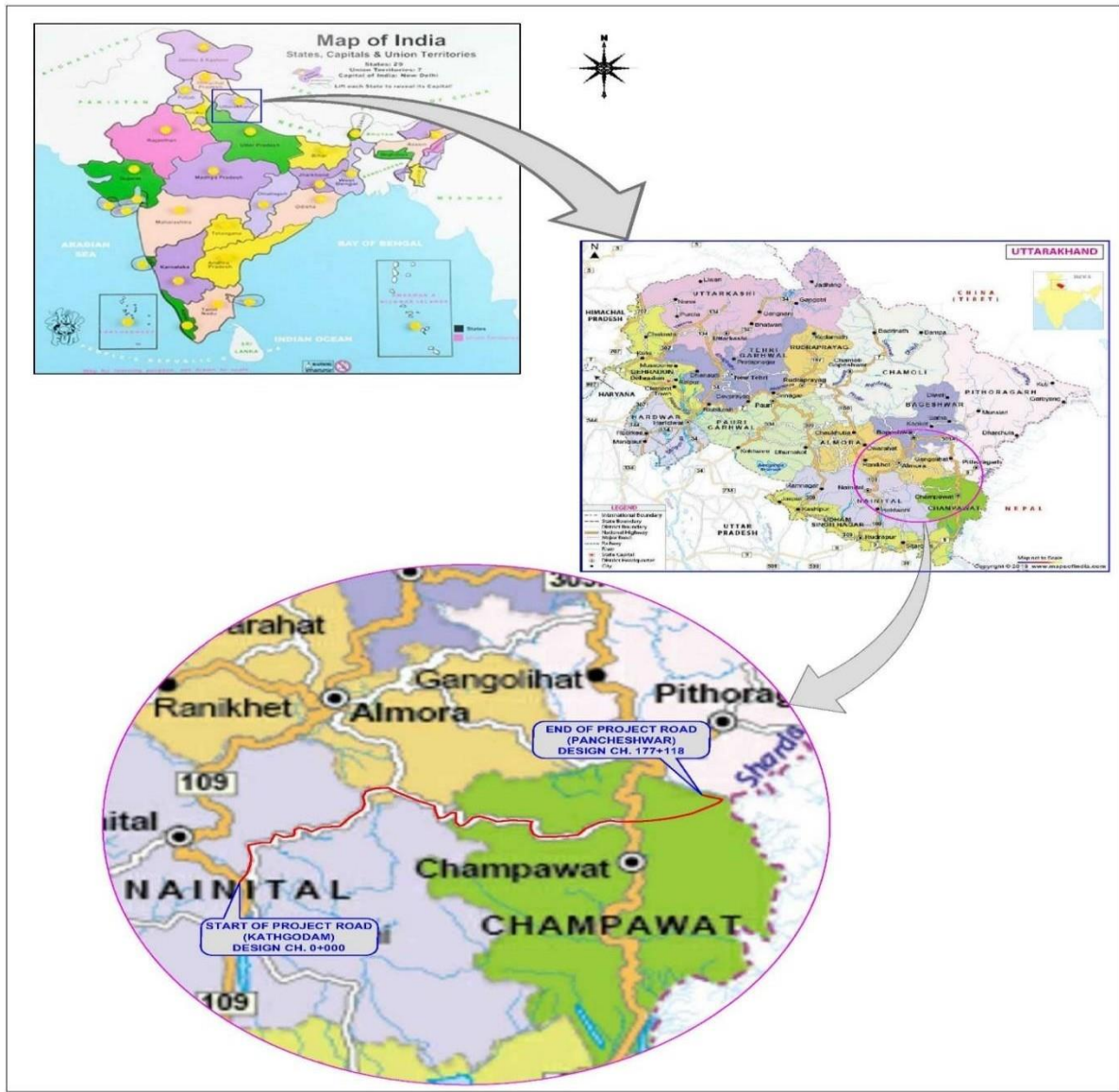


Figure 1. 1: Location Map

C) SALIENT FEATURES OF THE PROJECT

- The project road start at Ranibagh near Kathgodam in Nainital district and travers through Bheemtal - Khutani - Padampur - Dhanachauli - Pahadpani - Sahar Phatak - Mornola - Devidhura - Lohaghat and ends at Pancheswar in Champawat District. The project road lies in the districts of Almora, Pauri Garhwal and Chamoli districts in the State of Uttarakhand.
- The proposed project road is located within 5 km of International (Indo-Nepal) Border, hence it comes under category-A under the schedule, due to applicability of General Condition, of EIA Notification, although it is a State Highway expansion project in hilly terrain above 1000-meter MSL.
- The project neither pass through any National park/ Wildlife Sanctuary/ Conservation reserve etc., nor falls within 10 km boundary of any Protected Area under Wildlife Protection Act 1972.
- The proposed land acquisition for the proposed alignment is approx. **158.584 ha** including diversion of **126.67 ha** forest land (Reserved Forest, Van Panchayat and Civil & Soyam land).
- The **proposed RoW is 12m** except at few locations, where it may be increase due to geographic conditions. **In built-up area proposed ROW will be 8.5m.**
- Length of the **existing project road is 184.672 km, Proposed Length is 177.118 km.**
- The project road lies in the districts of Nainital, Almora&Champawat in the State of Uttarakhand.
- Existing Project Road is of **single lane configuration** for **69.7km** and of **intermediate lane configuration** for **115 km** as per road inventory done during June 2018.
- Existing pavement is of **flexible type**, though there are some concrete pavement in some built-up locations. In general, the condition of the existing pavement varying from **poor to fair**. In some locations the existing bituminous pavement is fully deteriorated.
- The geometry of the existing road is **very poor** owing to **mountainous/steep terrain**.
- There are **1 Major Bridge, 7 Minor Bridges and 1278 cross drainage structures** in the project corridor. All the existing bridges with intermediate lane configuration, capable of carrying one lane of Class B loading only, have been proposed for realignment/reconstruction.
- Based on the capacity augmentation, 2 laning has been proposed for Kathgodam (0+000) to Bheemtal (15+200) section and intermediate lane from Bheemtal to Sahar Phatak (km 68+100) section. Though the section from km 68+100 Sahar Phatak) to km 177+118 (Pancheswar) road does not warrant for intermediate lane as per the capacity augmentation, Intermediate lane has been proposed for this section for smooth & safe riding (i.e. two vehicles at a time are able to pass each other on the road safely) as per ToR of DPR study.
- Material requirements are Soil - 1,347,616.16 Cum; Coarse Sand- 403,023.70 MT; Aggregates- 979,958.22 MT; Cement- 206,495.26 MT; GSB- 287,109.80 MT; Bitumen- 8,537.63; Emulsion- 1386.81 MT; and Steel- 45,937.63 MT.
- About 1100 KLD water will be required during construction, which will be extracted from surface water sources after obtaining necessary permissions.

❖ Chapter-2

➤ Literature Review

Review of literature has a vital importance in the research work. Researchers take advantages of knowledge, which has accumulated in the past as a result of constant human endeavour. It helps the researcher in carrying his work systematically. In case of EIA study lots of legal policies, acts and frameworks and the already completed project for development may be consider that may help in investigation of researcher for preparation of dissertation. Same as, we have also considered EIA act, guidelines manuals and sanctioned projects from the concerned authorities of Environment ministry for the investigation of the said project that are given below-

Environment Protection Act (19 Novmember1986): In the wake of the Bhopal Tragedy, the Government of India enacted the Environment Protection Act of 1986 under Article 253 of the Constitution. Passed in March 1986, it came into force on 19 November 1986. It has 26 sections and 4 chapters. The purpose of the Act is to implement the decisions of the United Nations Conference on the Human Environment. They relate to the protection and improvement of the human environment and the prevention of hazards to human beings, other living creatures, plants and property. The Act is an “umbrella” legislation designed to provide a framework for central government coordination of the activities of various central and state authorities established under previous laws.

EIA Notification (27th January 1994): f the 'Environment (Protection) Rules, 1986 inviting objections from the public within sixty days are from the date of publication home said notification, against the intention of the Central .Government to impose restrictions , and prohibitions on the expansion and modernization of any activity or new projects being undertaken in any part of India unless environmental clearance has been accorded by the Central Government or the State Government in accordance with the procedure specified in that notification. Any person who desires to undertake any new project or the expansion or modernisation of any existing industry or project listed in Schedule I shall submit an application to the Secretary. Ministry of Environment and Forests, New Delhi.

EIA Notification (2006): The Ministry of Environment and Forests (MoEF) uses Environmental Impact Assessment Notification 2006 as a major tool for minimizing the adverse impact of rapid industrialization on environment and for reversing those trends which may lead to climate change in long run. EIA 2006 was issued on 14th September 2006, in supersession of EIA 1994, except in respect of things done or omitted to be done before such supersession. The Notification is issued under relevant provisions of the Environment (Protection) Act, 1986. EIA notification2006 is reform notification of 1994 notification.

Highway Manual (February 2010): Environmental Impact Notification S.O.1533 (E), of 14th September 2006 as amended in 2009 has made it mandatory to obtain environmental clearance for scheduled development projects. The EIA guidance manual will help the project proponent and consultant in the preparation of EIA report. It also helps the regulatory authority while reviewing the report and the public as well to be aware of the related environmental issues.

Summary of EIA shall be a summary of the full EIA report condensed to ten A-4 size pages at the maximum. It should necessarily cover in brief the following chapters of the full EIA report. Introduction Project description of the environment Anticipated environmental impact & mitigation measures Additional studies Project benefits Important Aspects of the Environmental Management Plan and Important Aspects of the Environmental Monitoring Programme Disclosure of consultants engaged.

In the scenario of the development project, the project is very necessary for a developing country, but the environment sustainability must be required because the completion of project, several problems comes in front of the habitation and the local community of that place. Several problems such as physical impacts on environment and biological impacts has comes after developing the project. In the physical impact, Air, water soil and Noise pollutions take place and puts harmful effect on environment.

Same as the biological impact include the flora & fauna and the forestry vegetation due the additional cutting of trees and due to fly ash plants.

❖ Chapter-3

➤ Methodology-**SCOPE OF THE EIA/EMP STUDY**

The Ministry of Environment, Forest and Climate Change (MoEF&CC), Government of India, vide Notification S.O. 1533 dated September 14, 2006 and its subsequent amendments have made it mandatory to obtain Environmental Clearance (EC) for the projects listed in the schedule-1 of the said notification. State Highway expansion project located in hilly terrain (above 1000 AMSL) are listed in the schedule-1 of the EIA notification and require prior environmental clearance. The proposed project road is located within 5 km of International (Indo-Nepal) Border, hence it comes under category-A due to applicability of General Condition of EIA Notification.

As a requirement for seeking Environmental Clearance (EC), the consultants are required to prepare the detailed Environmental Impact Assessment (EIA) report and the Environmental Management Plan (EMP) for obtaining environmental clearances from the Ministry of Environment, Forest and Climate Change (MoEF&CC). The main aim of the Environmental Impact Assessment (EIA) is to ensure that the project proposals are environmentally sound and sustainable on a long-term basis. The adverse effects of the proposal need to be identified in advance and duly considered in preparation of project's engineering designs.

The project proponent has applied for scoping / approval of ToR for EIA study vide letter no. 262/2019 dated 17th July 2019. MoEF&CC vide EDS dated 8th August 2019 replied, "As per EIA Notification, 2006 as amended from time to time, the all highway expansion projects in border states do not require scoping. Further such projects are exempted from public hearing. Hence, apply directly for grant of Environmental Clearance as per provisions contained in the said Notification."

The Standard Terms of Reference has been prepared by MoEF&CC for guiding the Project Proponents on preparation of EIA / EMP Report and expediting the process of Environmental Clearance without compromising environmental norms and the rigor of environment impact assessment. For the present EIA study, the standard TOR issued by MoEF&CC, for conducting environment impact assessment study for highways, have been considered.

POLICIES, LEGAL AND ADMINISTRATIVE FRAMEWORK

Statutory permissions and clearances required during construction and operation of the project are summarized in **Table 1.1.**

Table 1. 1: Summary of Relevant Environmental Acts and Guidelines

Sl. No	Act/Rules	Year	Objective	Applicable Yes/No	Reason for applicability	Authority
1.	Environmental (Protection) Act	1986	To protect and improve overall environment	Yes	As all environmental notifications, rules and schedules are issued under this act	MoEF&CC Gol, Forests & Env. Dept., GoUK, CPCB, UEPPCB,
2.	Environmental Impact Assessment (EIA) Notification	2006	To provide environmental clearance to new development activities following environmental impact assessment	Yes	The project attracts the conditions of EIA Notification 2006 and further amendments	MoEF&CC

3.	Forest (Conservation) Act	1980	To check deforestation by restricting conversion of forested areas into non-forested areas	Yes	RF and PF Forest area is identified along the alignment. At The crossings point of roads / railway / canal), the proposed project will also falls in notified protected forest areas declared for management purposes (Avenue plantations).	Forest Department GoUK
4.	Water (Prevention and Control of Pollution) Act and Cess Act of 1977 as amended in 1988	1974	To control water pollution by controlling emission & Water pollutants as per the prescribed standards	Yes	This act will be applicable during construction, for establishments of hot mix plant, stone crusher, construction camp, workers' camp, etc.	UEPPCB
5.	Air (Prevention and Control of Pollution) Act as amended in 1987	1981	To control air pollution by controlling emission and air pollutants according to prescribed standards	Yes	This act will be applicable during construction; for obtaining NOC for establishment of hot mix plant, workers'	UEPPCB
Sl. No	Act/Rules	Year	Objective	Applicable Yes/No	Reason for applicability	Authority
					camp, stone crusher, construction camp, etc.	
6.	Noise Pollution (Regulation and Control) rules	2000	Noise pollution regulation and controls	Yes	This act will be applicable as vehicular noise on project routes required to assess for future years and necessary protection measure need to be considered in design.	UEPPCB
7.	Ancient Monuments and Archaeological. Sites and Remains (Amendment and Validation) Act, 2010	2010	Conservation of Cultural and Historical remains found in India	No	The project route is not close to any Ancient Monument, declared protected under the act.	Archaeological Dept. Gol, Dept. of Archaeology, GoUK,

8.	Notification for use of fly ash	2016	Promoting the utilization of fly ash in the manufacture of building materials and in construction activity within a specified radius of 300 kilometers from coal or lignite based thermal power plants	Yes	Fly ash is available at Kashipur Thermal Power Plant, which is close to the proposed project and is located within 100 km	MoEF&CC
9.	The Explosives Act (& Rules)	1884	An Act to regulate the manufacture, possession, use, sale, transport, import and export of Explosives	Yes	For transporting and storing diesel, bitumen etc.	UEPPCB
10.	Public Liability Insurance Act	1991	Insurance for the purpose of providing immediate relief to the persons affected by accident occurring while handling any	Yes	Contractor need to stock hazardous material like diesel, Bitumen, Emulsions etc. safely	UEPPCB
Sl. No	Act/Rules	Year	Objective	Applicable Yes/No	Reason for applicability	Authority
			hazardous substance and for matters connected therewith or incidental thereto			
11.	Coastal Regulation Zone	2011	To regulate activities in the coastal zone to protect ecologically sensitive areas	No	The proposed expressway does not pass along CRZ	MoEF&CC
12.	Hazardous and Other Wastes (Management and Transboundary Movement) Rules	2016	Storage, handling, transportation and disposal of hazardous waste	Yes	Storage and handling of hazardous waste during construction	UEPPCB
13.	Solid Waste Management Rules	2016	Management and handling of solid waste	Yes	For disposal of solid waste generated during construction	UEPPCB
14.	Construction and Demolition Waste Management Rules	2016	Management of construction and demolition waste	Yes	For disposal of solid waste generated due to construction and demolition	UEPPCB
15.	Batteries (Management & Handling) Amendment Rules	2010	Management and handling of used lead batteries	Yes	Safe disposal of used lead batteries	UEPPCB

16.	E-Waste (Management) Rules	2016	Effective mechanism to regulate generation, collection, storage, transport, import, export, recycling, treatment and disposal of e-wastes	Yes	Handling of e-waste	UEPPCB
17.	Central Motor Vehicles Act	1988	To control vehicular air and noise pollution.	Yes	This rule will be applicable to road users and construction machinery	Motor Vehicle Department
18.	Minor Mineral	1960	For opening new	Yes	Regulate use of minor	District
Sl. No	Act/Rules	Year	Objective	Applicable Yes/No	Reason for applicability	Authority
	and concession Rules		quarry		minerals like stone, soil, river, sand etc.	Collector
19.	The Mining Act	1952	The mining act has been notified for safe and sound mining activity	Yes	The construction of proposed expressway will require aggregates. These will be procured through mining from quarries	Department of mining, GoUK,
20.						
21.	The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act	2013	Set out rules for fair compensation and acquisition of land	Yes	This act will be applicable as there will be acquisition of land for widening, geometric improvements and bypasses	Revenue Department State Government

❖ Chapter-4

➤ Site Study & calculation

BASELINE ENVIRONMENTAL STATUS OF THE STUDY AREA

The baseline data collection of different environmental components viz. air quality, noise, water quality, land use, ecology and socioeconomics was carried out for one season through a well- designed field studies covering data collection from primary as well as secondary sources. The primary baseline data has been collected within the right of way as well as area falling within 500 m on either side of existing right of way and secondary data has been collected within 15 km aerial distance from project road as per guidelines of MoEF Environmental Impact Assessment Guidance Manual for Highways.

Land Use and Soil Quality

The land use along the project road is mainly forest land followed by agricultural land except few built up areas.

Soil samples were collected at five locations along the proposed highway and were analyzed for the physical & chemical properties. They were assessed for agricultural and afforestation potential. The soil of the study area is categorized as Clay loam & Sandy Clay Loam based on different soil separates (sand, silt and clay). The pH of the soil samples ranged from 7.2 to 8.57, indicating that soils are neutral to slightly alkaline in nature. The soil EC also varied from 132 to

217. These parameters indicate that soils are neutral in reaction and having average EC. Macro nutrients like Nitrogen (N), Phosphorus (P) and Potassium (K) are considered as primary nutrients and Sulphur (S) as secondary nutrient. These nutrients help in proper growth. The availability of nutrients in study area is good. Based on soil analysis data it is concluded that soil of the study area is neutral in reaction. The availability of Nutrients for the plant growth in the study area is good.

Ambient Air Quality

Baseline data for the parameters - Particulate Matter size less than 10 μ m or PM₁₀ μ g/m³, Particulate Matter size less than 2.5 μ m or PM_{2.5} μ g/m³, Sulphur Dioxide (μ g/m³), Nitrogen Dioxide (μ g/m³) and Carbon Monoxide (μ g/m³) in the study area has been generated for one season (March to May 2019) at 9 locations as per NAAQS, 2009.

The minimum and maximum concentrations for PM 2.5 were recorded as 22.9 μ g/m³ and 35.1 μ g/m³ respectively. The minimum and maximum concentrations for PM 10 were recorded as 47.1 μ g/m³ and 70.6 μ g/m³ respectively. The minimum concentration was recorded at Pati Town (AQ-7) and the maximum concentration was recorded at Pajena (AQ-5). There was not much variation in SO₂ and NO_x as no pollution emitting industry is located along the project road. The Results show that all the parameters are well below the National Ambient Air Quality Standard, 2009, that shows that the area is free from the air pollution.

Noise Quality

An assessment of baseline noise quality was undertaken to (a) establish the status of exposure of the major sensitive receptors, and (b) to identify the noise pollution levels in and around the site. The noise monitoring was done at nine locations, following CPCB protocol of Noise Monitoring. An analysis of the different Leq data obtained during the study period (March to May 2019) has been made. Variation was noted during the daytime as well as night-time, noise monitoring was conducted at 9 locations along the proposed project.

The daytime noise levels at all the locations ranged from 45.1 dB(A) to 55.8 dB(A). The minimum recorded at Pajena (NQ-5) and the maximum at Lohaghat (NQ-8). The nighttime noise levels at all the locations ranged from 36.1 dB(A) to 41.1 dB(A). The minimum recorded at Pajena (NQ-5) and the maximum at Pati Town (NQ-7).

Water Resources and Water Quality

The study area is rich in water sources. Such water resources include the rivers, streams, lake, etc. Rivers flowing through the project area are Gaula, Ram Ganga, Kali/Sharda, Lohawati river and their tributaries, rivulets, etc.

Five ground water and four surface water samples have been collected from the study area. Samples of ground water were collected from hand pumps & surface water from rivers/streams in the pre-monsoon season in 2019. A perusal of the physico-chemical analysis results of groundwater/spring water samples indicates that the groundwater in the study area is fresh and all the constituents lie within the permissible limits of IS 10500:2012 (Drinking Water quality Standards).

Ecology

Plant and animal communities are indicators of the environment. They respond not only to one environmental factor but also to an interacting group of factors. These communities integrate influences and react sensitively to change in the balance of environmental stresses. Depletion of biodiversity is mainly due to intense anthropogenic pressure owing to "Population Explosion" mainly for expansion of agriculture, over exploitation of forests for day to day needs, over grazing and illicit felling, shifting cultivation, development activities like, irrigation, construction of hydro-electric dams, road construction including mining activities- all leading to dysgenic selection.

Taxonomic Diversity (Flora): A general survey of the vegetation was made to observe different floral species. The common tree species found in the study area were Pine, Oak, Deodar, Akhrot, Aam, Buransh, Neem, Aadu, Aalu Bukhara, Papdi, Kafal, Kimmo, Shisam, Sal, etc.

Taxonomic Diversity (Fauna): A general faunal study was carried out for the project site and surrounding area. No endangered species of fauna was observed during field survey within and surrounding area of project.

Common mammalian fauna observed/reported in the study area were Leopard, Langoor, Geedad (Jackal), Lomadi (Indian fox), Himalayan Black Bear, Barking Deer, Spotted Deer, Sambar, Newala (Common mongoose), Squirrel,

Porcupine, Indian Wild Boar etc.

In Reptile family, Girgit (Indian Garden Lizard), Goh (Common Indian Monitor), Ajar (Indian Python), Indian Krait, Common Wolf Snake, Rat Snake, Naag (Spectacled Cobra), Naagraj (King Cobra) and Himalayan pit viper are common species found in the area.

Common avian species observed/reported in the study area were Parakeet, Quail, Whistling thrush, Chakor, monal pheasant cheer pheasant, koklas pheasant, Red Junglefowl, Pigeon, Jungle Owlet, Koyal, Papiha, Indian Roller, House Sparrows, etc.

Aquatic Ecology

Aquatic plants are plants that have adapted to living in aquatic environments (saltwater or freshwater). They are also referred to as hydrophytes or macrophytes. A macrophyte is an aquatic plant that grows in or near water and is either emergent, submergent, or floating. In lakes and rivers macrophytes provide cover for fish and substrate for aquatic invertebrates, produce oxygen, and act as food for some fish and wildlife. Main water bodies present along the project highway are River Gaula, Bhimtal lake, Kali River & Ramganga River.

Bhimtal lake ecosystem consists of various biotic and abiotic components such as algae, phytoplanktons, zooplanktons and various aquatic plants along with various fish species, which are namely Common carp (Cyprinus carpio), Mahsheer (Tor tor) and Rohu (Labiatorohita).

In River ecosystem, Phytoplankton contributed bulk of the total plankton. A total of 47 genera of phytoplankton was encountered during the course of these investigations wherein Bacillariophyceae was represented by 27 genera, Chlorophyceae by 13 genera and Cyanophyceae by 7 genera. Among diatoms, six genera namely Navicula, Cymbella, Amphora, Synedra, Fragillaria and Amphipleura together contributed in bulk and dominated. Other taxa like Frustulia, Cocconeis, Diatoma, Neidium, Caloneis, Gomphoneis and Bacillaria also contributed to the diatom population. Among green algae, genera like Zygnema, Spirogyra, Ulothrix, Tribonema and Cladophora together dominated. Among blue green algae, Oscillatoria was the chief contributor followed by Anabaena, Nostoc and Rivularia.

Project highway ends near Pancheshwar, which is popular as one of the best angling locations in India. Here, the Saryu and Mahakali River confluence. The place offers the rich pickings of the Mahseer fishes. Here, an International Angling Event, based on 'catch and release technique' is jointly organized by Uttarakhand Tourism and Kumaon Mandal Vikas Nigam Ltd.

Forest & Wildlife Protected Area

Most of the part of Project Highway traverse through Sub-tropical forest and Sub-temperate forest area. **Sub-Tropical Forest:** This kind of forest zone lies between the altitude of 300 m and 1500 m. **Sub-Temperate Forest:** The forest communities of this zone are generally found 1800 m to 2800 m altitude.

The project require diversion of 126.67 ha forest land (Reserved Forest, Van Panchayat and Civil & Soyam land).

The project road is not passing through or located within 15 km aerial distance of any Protected Area notified under Wildlife Protection Act.

SOCIO-ECONOMIC AND HEALTH ENVIRONMENT

The project road section of SH-10 from Kathgodam to Pancheswar is proposed for improvement and upgradation to intermediate lane / two lane with paved shoulders under Uttarakhand State Highway Improvement Programme (USHIP). The project road is traverse through Kathgodam - Ranibagh - Bheemtal - Khutani - Padampur - Dhanachauli - Pahadpani - Shahar Phatak - Mornola - Devidhura - Lohaghat and Pancheswar in districts of Nainital, Almora, and Champawat in the State of Uttarakhand.

The proposed project road falls in Nainital, Almora and Champawat districts of Uttarakhand State and it is expected that about 1,836,759 of the State population will benefit. Population density of the project influenced district varies considerably as per the census data of 2011, which clearly indicate that the density of population in Nainital district (225 persons/ sq.km.), has increased during 2001-2011. Any significant increase in population density brings in two demographic factors that determines it i.e. natural increase in population and migration. Further, natural increase

depends on the fertility and mortality rates. Sex ratio of the influenced districts presents the same scenario as that of State. Sex-ratio of Uttarakhand is 963 female per thousand males. In the project affected districts, the highest sex ratio is in Almora (1139).

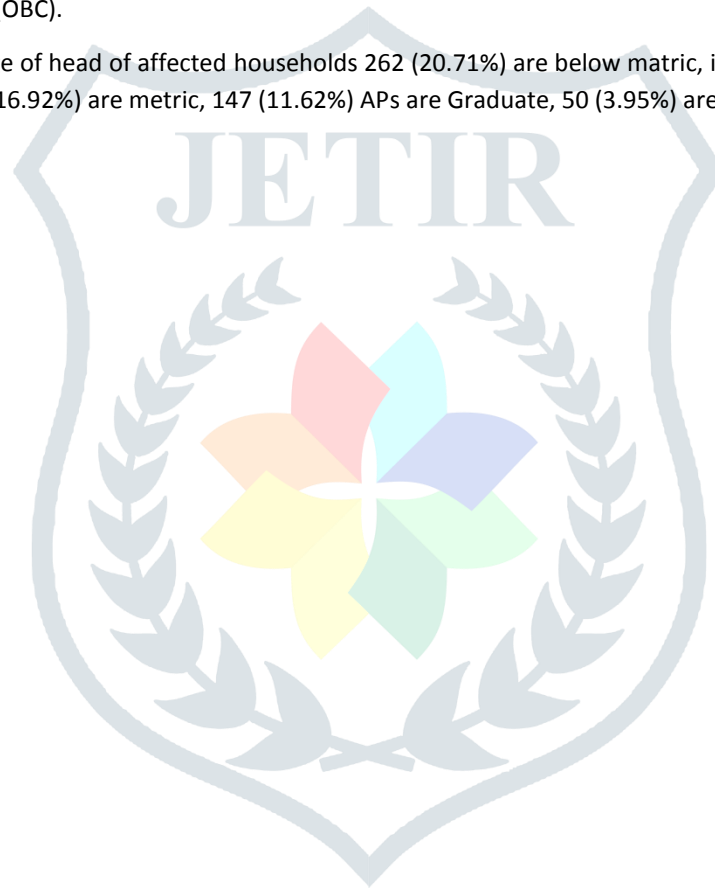
Socioeconomic Profile of PAPs

There are a total of 6574 APs affected by the project road, among whom 2950 are in Nainital District, 668 are in Almora District & 2956 are in Champawat District.

Social customs and traditions play a major role in determining the socio-economic development as well as occupational pattern in the influence area. Keeping this in mind an initial analysis was conducted to understand the religious profile of the PAPs within the corridor of impact. The majority of the PAPs belong to the Hindu religion followed by Muslims and Sikhism. Trend shows that Hindu communities dominate the project road.

As per the census survey of all of the 1265 affected households, the social stratification of the project area shows that 961 households are from general category, 138 households are from Scheduled Caste (SC) and 58 household are from Other Backward Class (OBC).

A significant percentage of head of affected households 262 (20.71%) are below matric, illiterate, 245 (19.34%) are up to middle school, 214 (16.92%) are metric, 147 (11.62%) APs are Graduate, 50 (3.95%) are above graduate level.



❖ Chapter-5-

➤ Environmental Impact /Result

SIGNIFICANT ENVIRONMENTAL IMPACTS & RECOMMENDED MITIGATION MEASURES

The assessment of potential environmental impact consists of comparing the expected changes in the environment with or without the project. The analysis predicts the nature and significance of the expected impacts.

Impact on Land Environment:

Loss of productive soil due to site clearance and excavation as the proposed project will require _____ ha of land including 126.67 ha forest land (reserved forest, Van Panchayat & Civil & Soyam land).

Compaction of Soil: Soils of productive agricultural area adjoining subproject road, haul roads, construction camp area, labour camp area and at other construction establishment may be compacted due to the movement of heavy equipment, transport vehicles, and storage of materials. Mitigation measure includes control of movement of construction vehicles; new haulage roads will be limited on the barren lands; and rehabilitation of construction camps, labour camps, material storage areas near to its original condition after the completion of work;

Contamination of Soil Land is also impacted from oil residues, lead and other hazardous materials produced from vehicles and construction machineries. In the present project, contractor will use diesel, Bitumen, Emulsions etc. during construction of highway. However, at material storage site, interceptor / HDPE sheets shall be provided to avoid any soil contamination. Hence, the contamination of the soil is negligible.

Soil Erosion: The construction activities require cutting of hill slope, filling, the cutting of trees and stone quarrying, which will lead to soil erosion. Although this impact is unavoidable, it becomes significant as the roads are located on hilly terrain as the land is unstable. Excavation of borrows pits and quarrying is another important activity, which have impact on land environment. Extraction of fill materials from riverbed can cause significant environmental impacts due to erosion.

Mitigation measures to minimize impacts are:

- Minimize removal of vegetation and all trees removed will be compensated as per Forest Conservation Act for forest trees and as per Tree Protection Act for non-forest trees;
- Source rock and sand from existing license quarries;
- Balance cut and fill;
- Prohibit blasting;
- Prohibit disposal of spoils on the valley side; and
- Proper construction of drainage facilities to prevent soil from being saturated and increase susceptibility to erosion and maintain the original flow of water.

Impact on Water Resources

114 hand pumps are coming within proposed Right of Way (RoW) of the project highway and Rivers / Water streams flowing across the highway at 7 location and flowing along the highway (within 100 m) at six locations. These water resources will be impacted due to improvement & upgradation of the existing highway. Road construction decreases available water to the host community in terms of its substantial requirement for processing, dust suppression, and domestic use of camps, and to a certain extent decrease the water availability by reducing groundwater recharge due to pavement of road surface. The risk of contaminating both surface and groundwater from untreated camp sewage also impacts availability of water to its most beneficial users. Although the construction requirement is temporary,

mitigation measures must ensure the additional water demand will not burden existing water supply and sanitation systems. No local water supply will be used for construction purposes. Water will be taken from nearby surface water sources such as rivers/springs/streams are available all along the highway. Underground water will be taken after permission of concerned authority at construction sites if required.

Mitigation Measures

To avoid contamination of water, no wastewater will be disposed without treatment. This will include the treatment of sewage through septic tank and interception of all oil-contaminated wastewater for oil recovery prior to disposal. All petroleum-based storage and handling areas will be paved to prevent groundwater contamination and facilitate easy clean-up and recover of spills. Prohibit the cleaning of tools and equipment on or near rivers, canals, and other water bodies. To conserve water and promote recycling, no drinking quality water will be used for dust suppression. The potential impacts, their mitigation and the phase of implementation regarding water sources were assessed with regard to surface water bodies and underground water tables with reference to hand pumps.

Impact on Air Quality

Air quality along the project corridor will be impacted both during the construction and operation stages of the project.

- Construction stage impacts will be of short term and have adverse impacts on the construction workers as well as the settlements adjacent to the road, especially those in the down wind direction.
- Operation stage impacts will not be as severe as the construction stage impacts and will be confined generally to a band of upto 100m from the edge of the lane on either side of the corridor.

The ambient air quality along the project road is good and within the National ambient air quality standards, 2009, some important observations on the project roads are:-

- Since no industry is located along the project corridor, most of the pollution is vehicular & burning of domestic fuel.
- The emissions of individual vehicles, their monitoring and regular checks are important. The fuel composition, maintenance of engines, and engine temperature must be properly regulated for improved scenario.
- As there is no structure of archaeological importance going to be affected due to proposed alignment, the impact does not need an assessment from this point of view.
- The parameters of air quality measurements, namely, PM_{2.5}, PM₁₀, NO_x, SO₂ and Carbon Monoxide (CO) at all selected sites were recorded to be within the prescribed limits.
- The mitigative measures suggested include the policies, regulation and enforcement programs covering vehicle standards and maintenance requirement, fuel quality and technology, management of traffic efficiency and removing the high-pollution vehicles.
- Sensitive areas will be taken care of especially in this regard.

Impacts During Construction Phase: Increase in local air pollution due to rock crushing, and filling works, and chemicals from asphalt processing. Most of the dust during construction arises from excavation and filling during site preparation works, loading, unloading and transportation of construction material, drilling, blasting; use of heavy equipment and machinery in the earthworks and pavement works. Gaseous emissions like, oxides of sulphur (SO₂), oxides of nitrogen (NO_x), carbon monoxide (CO), and hydrocarbon (HC) are emitted from mobile sources, hot mix plant, batching plants and diesel generator sets. Elevated concentration of these parameters cause pollution, albeit short term.

Mitigations measures: To minimize impacts on community areas, the location of all construction establishments such as hot mix plants, WMM plants, crusher plants, construction camps, and offices will be located at least 1000 m away. To control gaseous emission during construction, Consent to Establish (CTE) and Consent to Operation (CTO) will be obtained for construction establishments such as hot mix plants, batching plants and stone crushers from the UEPPCB. Pollution control devices such as cyclone separators /scrubbers will be installed to control emissions from hot mix plants, crushing units and concrete batching plants. Height of the stacks will comply with statutory

requirements. All vehicles and construction equipment operating for the contractor and the consultant will obtain and maintain "Pollution under Control" (PUC) Certificates. Periodic air quality monitoring to ensure emissions comply with standards will be conducted.

Impacts on Noise Quality

The impacts of noise due to the project will be of temporary significance locally in the construction phase and slight increase may occur during the operation stages. Sources of noise pollution include construction activity, traffic, and heavy equipment operation.

Mitigation measures to reduce Noise levels

The following are the mitigation measures to reduce noise pollution:

- Noise standards will be strictly enforced for all vehicles, plants, equipment, and construction machinery. All construction equipment used for an 8-hour shift will conform to a standard of less than 90dB(A). If required, high noise producing generators such as concrete mixers, generators, graders, etc. must be provided with noise shields.
- Machinery and vehicles will be maintained regularly, with particular attention to silencers and mufflers, to keep construction noise levels to minimum.
- Workers in the vicinity of high noise levels will be provided earplugs, helmets and will be engaged in diversified activities to prevent prolonged exposure to noise levels of more than 90dB(A) per 8-hour shift.
- During construction vibratory compactors will be used sparingly within the urban areas. In case of complaints from roadside residents, the engineer will ask the site engineer to take suitable steps of restricting the work hours even further or use an alternative roller.
- The sensitive receptors such as school and temple have been identified and those that are close to the project roads will be provided noise barrier to accommodate the long-term impact of the improved road.

Impact on Biological Environment

Some important positive and negative impacts on flora, fauna and ecosystem of the present road-widening project are: -

- It can be seen from baseline data that many wild animals are present in the study, the impact will be of greater extent, and proper management is required.
- Since the road is passing through the heavily forested area hence there may be a chance of conflict between the wildlife and fast running vehicles.
- Due to increased traffic the noise level of the area will be increased which will have negative impact over the peaceful atmosphere of the forest area.
- The proposed road project may impact over the free movement of wild animals.
- Hunting of wild animals during the construction phase as well as during the operation of road may lead negative impact on the fauna of the area.
- There will be no loss of biodiversity, since no rare/endangered/threatened (RET) plant or animal species is going to be eliminated due to the proposed project.
- There will be no loss of habitat by the road itself, borrow pit areas and quarry sites.
- The proposed road project will not affect migratory path of animal breeding zone, wetlands or important ecosystems.
- The aquatic habitat will not be damaged.
- The loss of herbal cover, at least during the construction phase, is likely to produce some negative impacts.
- Impact due to burning of fuel: During the construction working labours may utilize the forest wood for cooking as fuel etc., which may lead to biotic pressure on the forests.

Removal of Trees

The impacts of tree cutting on the environmental quality will be as follows.

- The loss of trees will lead to higher degree of soil erosion. This has to be compensated by re-plantation of trees in the first priority, at the pre-construction stage.

- The loss of trees will reduce the ambient air quality since trees act as adsorbent of air pollutants thereby improving the air quality.
- The reduction in number of trees, especially in or near congested marketplaces will enhance the raising of noise level.
- The other benefits of such trees such as fruits, stability of hill slopes will be worst affected till the new trees grow up and compensate.

However, a careful and proper planning of re-plantation of trees right at the commencement of construction and the phase wise removal of existing trees will mitigate the negative impacts.

Impact on Aquatic Ecology

There are few rivers, lakes and rivulets located along the project road. Construction activities near these water bodies may adversely affect the biological environment of these water bodies. Proper mitigation measures will be required during construction activities near these water bodies to avoid siltation, contamination from construction material disposal or leaching of oil, grease or chemicals. Mitigation measure may include but not limited to the following:

- Silt fencing around water bodies during construction to avoid silt laden runoff entering water body
- Turfing or pitching of embankments of water bodies affected will be done where possible to prevent erosion that causes siltation.
- No solid waste will be dumped in or near the water bodies or rivers.

Encroachment on Historical and Cultural Areas

No historical or cultural areas will be shifted as a result of the road upgrading. However, several religious structures are near the road which will be affected in terms noise, dust, and temporary partial/full blockade of access causing inconvenience. The same mitigation measures addressing noise, and dust discussed earlier will be implemented on these sensitive areas.

Impacts on Occupational Health and Safety

Employers are required to implement precautions to protect the health and safety of workers. Road construction exposes workers to various physical hazards that may result to minor, disabling, catastrophic, or fatal injuries. Work close to rotating and moving equipment like hot mix plant operation, materials handling, motor pool repairs/machining and the like create trap hazards putting extremities at risk. Exposure to loud noise can cause temporary or permanent hearing impairment. Hand-arm vibration, electrical, welding/works, and working close to moving vehicles also expose workers to injuries.

Impacts on Community Health and Safety

These impacts pertain to those that take place outside the project boundaries, in this case the ROW and camp site, but are related to road construction and operation. Other impact on community health and safety related to road construction pertains to road crashes, structural safety, transport of hazardous materials, communicable and vector borne diseases, and emergency preparedness in case or road failures such as slides rendering villages inaccessible.

Impact on Cultural Heritage

It has been observed that no archaeological site or monument and cultural heritage site exists close to highway. Therefore, there would not be any kind of significant impact on the cultural heritage sites.

ENVIRONMENTAL MONITORING PROGRAMME

The objectives of environmental monitoring are: ensure effective implementation of EMP; comply with all applicable environmental, safety, labour and local legislation; ensure that public opinions and obligations are taken in to account and respected to the required satisfaction level; and modify the mitigation measures or Implementing additional

measures if required. Detailed environmental monitoring plan for construction as well as operation phase has been prepared and presented in Volume – IV: Environment Assessment Report. The tentative environmental monitoring budget has been prepared based on environmental monitoring provisions and cost incurred for the similar work. The budget includes environmental monitoring during construction and operation phase. The approximate estimated cost of environmental monitoring is Rs. 15.04 Lakhs for construction phase and Rs. 3.94 Lakhs / year for operation phase.

PUBLIC CONSULTATION & DISCLOSURE

The public participation process included identifying interested and affected parties (stakeholders); informing and providing the stakeholders with sufficient background and technical information regarding the proposed development; creating opportunities and mechanisms whereby they can participate and raise their viewpoints (issues, comments and concerns) with regard to the proposed development; giving the stakeholders feedback on process findings and recommendations; and ensuring compliance to process requirements with regards to the environmental and related legislation.

Stakeholder consultation and participation with various stakeholders is an integral part of the environmental and social impact assessment and also part of regulatory requirement of EIA Notification, 2006 and ADB SPS 2009 requirements. The stakeholders of the project include project affected communities (on either side of the project road) and institutional stakeholders such as PCB, local bodies, Forest & Environment Department, etc. Consultations at micro-level (along the road) and macro-level (e.g. District/State level institutional consultations) helped planners to integrate the short term and long terms requirements of the local, regional, state and national goals into the planning process. The regional, state and national goals are generally set by the legislations and policies by controlling or limiting the activities in order to reduce and nullify the adverse impact generated by infrastructure projects like roads and highways.

One to one meeting was generally held with a few members of local communities. These consultations sometimes focused on one or more specific issues in a given section of the project corridor. Focused group consultations were conducted with a sample section of the community with a good representation from the affected communities. Such meetings usually provide substantial information about the community concerns. Public Consultation records, photographs and details of consultations are provided in following sections.

Consultations with various stakeholders were carried out at various levels in the project area during preparation. Key stakeholders consulted included affected people as well as other community members living along the project road, community-based organizations and business communities in the area. Moreover, revenue officials, village heads, head of Gram Panchayat, and village administrative officers were also consulted. The consultation methods included general public consultation meetings, and focus group discussions (FGDs) with women groups, with a total of 262 members.

Public Disclosure: The EIA report will be disclosed in the English language at PMU & PIU office of PWD and will also be available in the website executing / funding agency. The full reports will also be available to interested parties upon request from PMU/PIU.

PROJECT BENEFITS

Development of road infrastructure is the first step towards wholesome development of State, cities, towns and people. The project is justified in terms of improvement of carriageway and road quality reduction of increased traffic congestion, improvement in road safety, improvement of environmental quality due to reduction of traffic congestion, improvement in existing transportation facilities, economic development and infrastructure development potential.

Direct and indirect benefits of proposed State Highway Improvement project are as below:

Direct Benefits:

- Fast and safe connectivity
- Decongestion of traffic on the road

- savings in fuel, travel time and total transportation cost of road users
- Reduction in road accident
- reduction in pollution due to constant flow and segregation of traffic from other roads

Macro Level Benefits

- Employment opportunity to people
- Development of tourism
- development of local industry
- Quick Transportation of agriculture produce and perishable goods
- Improved quality of life for people

Environmental Benefits of the Project

- Reduction in soil erosion leading improved water quality in nearby water bodies by providing line drains and improving cross drainage system.
- Reduced Air Pollution, Vehicle maintenance, Fuel Savings due to better quality of roads.
- Noise pollution reduction due to reduced traffic congestion and better riding quality.
- Improved drainage condition will reduce water pollution.
- Roadside drainage as well as cross drainage will reduce water logging along the road and also reduced water borne disease.
- Provision of footpaths, bus bays and drainage facility will also help to improve the aesthetics along the road.

ENVIRONMENT MANAGEMENT PLAN

An environmental management plan (EMP) translates recommended mitigation and monitoring measures into specific actions that will be carried out by the contractor and proponent. Environmental Management Plan deals with the management measures and implementation procedure of the guidelines along with enhancement measures recommended to avoid, minimize and mitigate foreseen environmental impacts of the project.

The EMP will guide the environmentally -sound construction of the project road and ensure efficient lines of communication between the contractors and PIU/PMU. The EMP identifies the three phases of development as: (i) Site Establishment and Preliminary Activities; (ii) Construction Phase; and (iii) Post Construction/Operational Phase.

The purpose of the EMP is to ensure that the activities are undertaken in a responsible non detrimental manner with the objectives of:

- (i) provide a pro-active, feasible and practical working tool to enable the measurement and monitoring of environmental performance on site;
- (ii) guide and control the implementation of findings and recommendations of the environmental assessment conducted for the subproject;
- (iii) detail specific actions deemed necessary to assist in mitigating the environmental impact of the subproject; and
- (iv) ensure that safety recommendations are complied with.

A copy of the EMP must always be kept on site during the construction period. The EMP will be made binding on all contractors operating on the site and will be included within the Contractual Clauses. Non -compliance with, or any deviation from, the conditions set out in this document constitutes a failure in compliance.

The Contractor is deemed not to have complied with the EMP if:

- Within the boundaries of the site, site extensions and haul/ access roads there is evidence of contravention

of clauses.

- If environmental damage arises due to negligence.

ENVIRONMENTAL BUDGET

Based upon the environmental issues identified & predicted impact on the environment, EMP cost is estimated to implement the key environmental measures and environmental management & monitoring plan. The Environmental budget for Pre-Construction phase has been is estimated Rs. 16.16 Crores, the cost for implementation of Environmental Management Plan during Construction Phase has been estimated Rs. 3.9 Crores and Rs. 3.88 Lacs per year for implementation of Environmental Monitoring Plan during operation phase.

