

1. PROJECT DESCRIPTION

A) Introduction

The Govt. of India (GoI) through Ministry of Roads & Highways (MORT&H) is contemplating to enhance the traffic capacity and safety for efficient transshipment of goods as well as passenger traffic on few of the selected heavily trafficked stretches/ corridors of National Highways. The National Highways Authority of India (NHAI) has been entrusted for the development, maintenance and management of National Highways, under NHDP Phase-IV programme.

The project under consideration aims at converting existing 2-lane NH-69 from Obedullaganj to Betul into 4-lane divided carriageway to be executed by private entrepreneurs as BOT projects. The NHAI has assigned LEA Associates South Asia Private Limited (LASA) to prepare Detailed Project Report (DPR).

Location

The project corridor starts km 2.800 of NH-69 at Umaria village (Goharganj taluka) and traverses through Goharganj taluka of Raisen district, Budni taluka of Sehore district, further runs across Narmada river and enters into Hoshangabad & Itarsi taluka of Hoshangabad district and further runs through Shahpur, Ghoradongari and Betul taluka of Betul districts and ends at km 137.000 of NH-69. Major settlements along the corridor are Barkheda, Budni, Hoshangabad, Itarsi, Pathrota, Kesla, Sukhtawa, Bhonra, Shahpur, Padarbuzzurg, and Bhart Bharti. Total length of the corridor is approximately 134 km. The location map of the project is given in Figure 1.

Existing RoW

In general available land width is about 30 m between existing km 2.800 to 27.500 and about 24 m between existing km 62.800 to km 137.000.

B) Project Influence Area

i) *Direct Area of Influence*

The direct influence area of the project is restricted to proposed Right of Way (RoW) only, since the project involves widening of existing highway and all construction and operation stage activities will be contained within it. The proposed RoW is 60 m except locations of Toll Plazas and Rest Places. However, RoW has been restricted to 45 m at sanctuary and forest areas.

ii) *Indirect Area of Influence*

As per MoEF guidelines for conducting EIA (EIA notification, S O 1533 dated 14th Sept, 2006); the geographical scope of the EIA study has been considered as 15 km radius for highway projects for major environmental features like National Park, Wildlife Sanctuary, Critically Polluted Area, Notified Eco-Sensitive Zone, Inter-state Boundaries and International Boundaries (10 km), Coastal Zones, Areas protected under international conventions, defence installations etc. Physical features like physiography, hydrology were also studied/ recorded within 15 km radius of the project road.

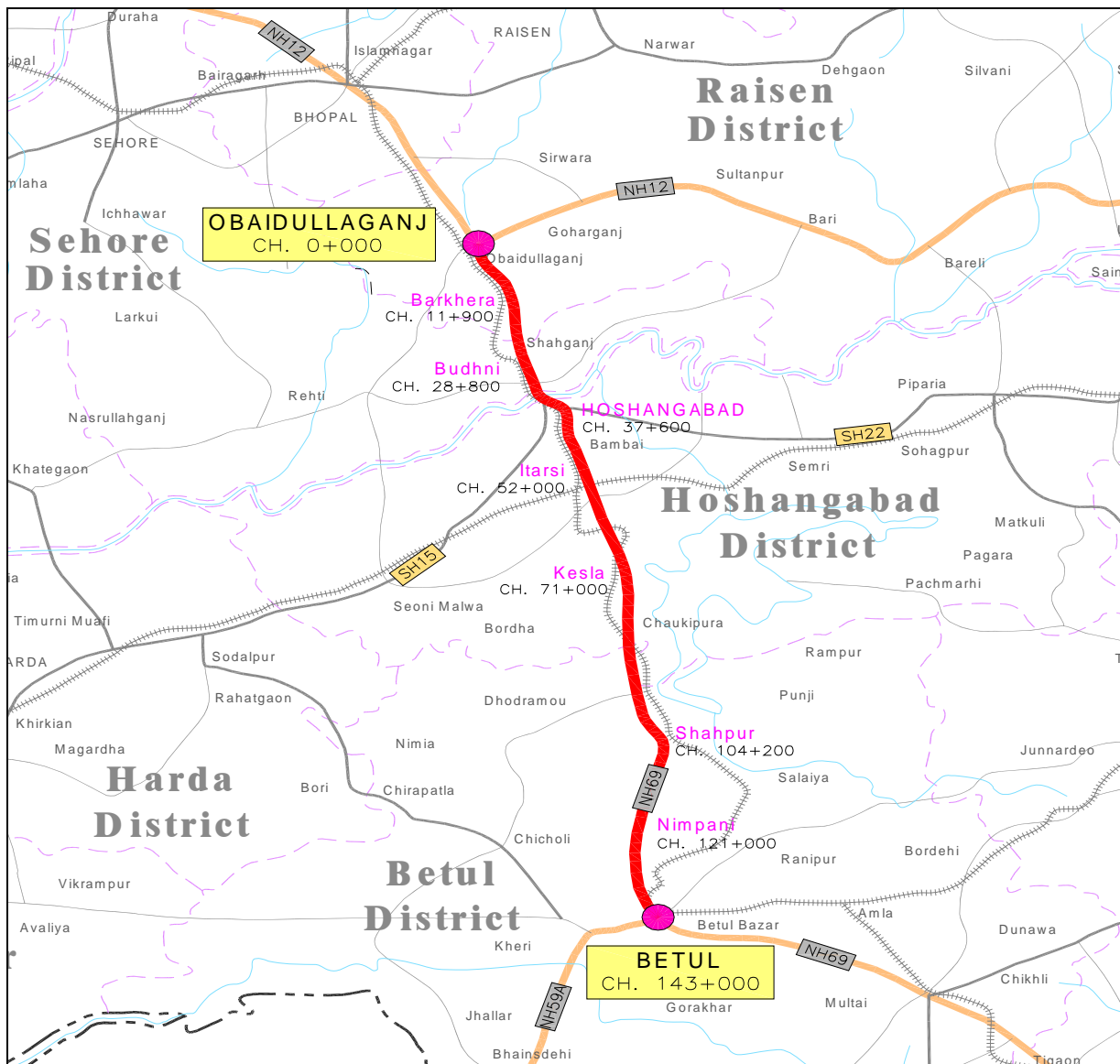


Figure 1: Location Map of the Project Road

C) Statutory Clearance Requirement

Table 1: Statutory Clearance Requirements

Sl No	Clearance Required for	Statute under which clearance is required	Statutory Authority
1.	Environmental Clearance	EIA Notification, 2006 issued under EP Act, 1986	Ministry of Environment and Forest, GOI, New Delhi
2.	Wildlife Clearance	Wildlife Protection Act 1972	State Wildlife Board, Dept of Forest, Govt. of MP & Central Empowered Committee, MoEF
3.	Forest Clearance	Forest Conservation Act 1980	Dept of Forests, Govt. of MP and MoEF
4.	Permission for felling of Roadside trees	-	Revenue Department
5.	Consent to Establish (CTE)	Water (P&CP) Act, 1974 & Air (P&CP) Act, 1981	Madhya Pradesh Pollution Control Board.

D) Project Interventions

The existing 2-lane NH-69 shall be widened to 4-lane divided carriageway. The large settlements viz Budni, Hoshangabad, Itarsi, Shahpur and Padhar have been proposed for bypass. Details of bypasses are given in Table 2.

Table 2: Details of Bypass

Sl. No	Proposed Chainage (Km)			Side	Name
	From	To	Length (km)		
1	28.000	61.500	33.5	Left	Budni-Hoshangabad-Itarsi
2	102.100	106.100	4.0	Right	Shahpur Bypass
3	119.700	124.100	4.4	Right	Padhar Bypass

Proposed features include 6 major bridges, 3 fly over, 3 RoB, 58 minor bridges, 197 culvers, 3 Toll Plazas, 20 major intersections, Truck lay bye at 5 locations, bus bays at 70 locations, 22 Pedestrian/Cattle Underpasses and 12 Vehicular Underpasses. The proposed median width is 4.5 m throughout.

Covered lined drainage will be provided in semi urban areas below the footpath for 1.5 m width, open unlined trapezoidal drains in rural areas with 0.6 m width and chute drain at high embankments (embankment height more than 3 m).

2. DESCRIPTION OF THE ENVIRONMENT

A) Physical Environment

(i) Meteorology

Climate: Study area has three distinct seasons - summer (March to May), winter (November to February), and the intervening rainy months of the southwest monsoon (June to September).

Temperature: The mean maximum temperature in the region reaches 42.1°C and 39.4°C in the month of May at Hoshangabad and Betul respectively. During the winter season, in mean minimum temperature dips to 11.7°C and 10.2°C in the month of January and December at Hoshangabad and Betul respectively wherein mean maximum temperature remains around 27°C.

Humidity: The maximum humidity is observed to be 97 % (Hoshangabad) and 92% (Betul) during the month of August in morning hours. The minimum humidity is recorded as 19% and 17% during the month of March at Hoshangabad and Betul respectively.

Rainfall: Maximum rainfall occurs under the influence of the South West monsoons (June-September). Total annual rainfall recorded at Hoshangabad and Betul stations are 1221.2 mm and 1177.8 mm respectively. Maximum precipitation recorded as 392.1 mm and 379.3 mm during the month of August at Hoshangabad and Betul station respectively.

Wind Speed: Mean wind speed in Hoshangabad station varies between 2.9 kmph to 7.7 kmph and the same varies in Betul station between 3.4 kmph to 7.7 kmph. Average maximum wind speed recorded in June at both stations and average minimum wind speed recorded as at Hoshangabad and Betul during the month of November and December respectively.

ii) Physiography and Terrain

The project region majorly falls in the Satpura plateau. The project corridor passes through mainly plain areas. Rolling terrain exists between km 16+000 to 26+000 and hilly area exists between km 64+100 to 66+500 & km 121+600 to km 116+600. However, the slopes of the hills are moderate.

The average elevation of the project road varies between 400 m to 650 m from MSL. As we move from North to South the altitude increases.

(iii) Land Use

Land use along the existing project corridor are mainly Agricultural (50.4 km) followed by Forests and private plantation (44.6 km), Built up (41.8 km) and Barren (6.2km). However, The proposed project land use changes as 74.4 km agricultural, followed by 44.6 km forest and plantation, 8.8 km built up and 6.2 km barren.

(iv) Water Resources

Surface Water: Narmada (Ch 34+000) and Machna (km 106+000) are two perennial water rivers across the project road. Other seasonal rivers across the project road are Sukhi river, Tawa river etc.

Ground Water: Ground water and canals are the major source of irrigation in the project districts within the project influence area. Irrigation takes place mainly by dug wells, tube wells/bore wells, and canals. Pre-monsoon (May 2006) water level varies between 5 m to 10 m in parts of Raisen, Sehore and Betul districts. The same varies between 10-20 m in major part of the Hoshangabad district. (Source: *Central Ground Water Board, Bhopal*) All the ground water blocks through which project road passes are safe category.

(v) Water Quality

The surface water samples were collected from 4 rivers viz. Narmada, Sukhtawa, Machna and Tawa for monitoring the surface water quality. Bore wells are the major source of water for drinking and other domestic purposes in villages and towns. Ground water (bore wells) samples were collected from 2 locations viz. Padhar and Bharat Bharti.

Surface Water Quality Results: The pH value ranged between 7.46-7.95. TDS content ranged between 77-146 mg/l while Chloride values ranged from 6 to 13 mg/l respectively, well below the tolerance limits. Iron content is found to be varying between 0.42 to 0.98 mg/l. There is no significant presence of trace metals in the surface waters. There is no faecal contamination where as the total coliform bacteria recorded as <2.0 mg/l. Turbidity (NTU) values varies between 8 to -92 indicate soil erosion in the study area. Oil and grease is found to be <1.0 mg/l.

While comparing with the CPCB norms for surface waters, all parameters are found to be within the standard limits.

Ground Water Quality Results: The ground water sources has agreeable colour, taste and odour. The pH value ranged between 7.31-7.67, generally above the neutral mark and within the permissible limits for drinking water. TDS value ranged between 331-441 mg/l, and is within the permissible limit for drinking water (500 mg/l). Chloride values ranged from 33mg/l to 37 mg/l, iron content varies between 0.05-0.66 mg/l, thus within permissible limits. BOD is <2 mg/l. There is no significant bacteriological contamination of these sources. Total Hardness ranged between 231-268 mg/l. Heavy metals like arsenic, mercury are BDL.

(vi) Air Quality

The air polluting sources in the project region primarily consist of industries and the vehicles plying on the roads. A total of ten (6) ambient air monitoring stations were identified based on the different existing land use pattern along the project road.

Ambient air quality was monitored as per GSR 826(E) dated 16th November 2009. All the stations fall in residential and rural zone., The on-site monitoring results shows that RPM ($\mu\text{g}/\text{m}^3$) varies between 49 to 76,

PM_{2.5} ($\mu\text{g}/\text{m}^3$) varies between 25 to 34, SO₂ ($\mu\text{g}/\text{m}^3$) varies between 6.8 to 10.8, NO₂ ($\mu\text{g}/\text{m}^3$) varies between 15.6 to 17.2, Ozone (O₃, $\mu\text{g}/\text{m}^3$) varies between 22-36, CO (mg/m^3) found <1.0 and Ammonia ($\mu\text{g}/\text{m}^3$) recorded as <10 at all stations. Thus, all the parameters are found to be within the permissible limit at all the stations.

(vii) Noise Quality

Noise level monitoring was conducted at 6 locations comprising schools & hospitals, residential area and commercial area. Day time noise level [dB(A)] was found to vary between 50.1 to 63.1 wherein night time noise level [dB(A)] was found to vary between 39.2 to 50.2.

B) Ecological Environment

Forests and Sanctuary

The project road passes through Ratapani Sanctuary between existing km 8.300 to km 20.740. The concerned length of the project road falls in Barkhera range of Obaidullaganj Forest Division. After km 20.740, project road passes through the PF/RF of Budni Range of Sehore Forest Division, which is a buffer zone of the Ratapani Sanctuary on Southern side and Budni range continues till km existing 27.2 on both side of the project road. Principal flora are Teak, Sheesham, Bija, Saja, Tendu, Khair, etc. Total 44.6 km project road passes through forest area including 12.44 km sanctuary. Itarsi range of Hoshangabad forest division starts at km 62.8 and continues till km 66.35 wherein Sukhtawa range of same forest division starts and continues till km 69.1. Thereafter, forest area exists at different locations of Bhaunra, Shahpur and Betul range of North Betul Division.



About 17000 trees exist on either side of the project road. The tree species include Teak, harra, Mahua, Saja, Karraiya, haldu, Dhawda, Sal, Semal, Tendu, Plalas, Kusum, Arjun, Bahera, Khair etc.

Fauna: Common animals like dogs, cats, monkey, pig and cattle are also present. Avifauna includes peacock, myna, kingfisher, pigeon, kite, egret.

C) Cultural Environment

There is no Protected Monument by ASI within corridor of direct impact and even 200 m radius of the corridor. No historical and cultural conserved sites present within the direct area of influence. 12 number of educational institutes, 23 number of religious properties are located (partially/fully) within proposed RoW.

3. ANTICIPATED ENVIRONMENTAL IMPACT AND MITIGATION MEASURES

A) Anticipated Impacts

The impacts of the project have been categorized into three phases: pre-construction, construction and operation phase.

(i) Pre-construction Phase: Impacts during the preconstruction phase primarily relate to preconstruction activities such as acquisition of new Right of Way and site clearance activities will result in cutting of road side trees. The estimated total revenue land requirement for the project is about 431 Ha. There are number

of amenities and utility services located along the highway such as restaurants, hand pumps, water taps, repair and spare parts shops, resting spaces, parking lots, PCOs, electric transformers, OFC etc. which will be impacted directly or indirectly due to widening of road. About 17000 trees are likely to be impacted. Total about 73 ha Protected/Reserve Forest and 42 ha sanctuary is likely to be diverted due to the implementation of the project.

(ii) Construction Phase: Impacts during construction phase are primarily on account of negligence while undertaking the construction works. Impacts include nuisance on account of air, noise and vibration effects during road construction, hindrance of access to road side properties during shifting of utilities and construction of road side drains and road safety issues from construction materials and equipments.

The microclimate is likely to be affected due to removal of roadside trees and addition of increased pavement surface. In addition, temporary loss of shade giving roadside trees will cause discomfort to the slow moving traffic and pedestrians. The road widening will involve about 1674256 cum of excavation (including cutting in hill section) and 4925775 cum of filling (including 615633 cu m median filling). Fly ash may be used for embankment filling, if it is economically viable. The acquisition of agricultural land would cause loss of productive soil. The erosion potential of these soils is moderate (20-40 tonnes/ha/yr). All bridge locations where elevated embankments are required would be more sensitive to erosion during the construction period. Spillage of construction materials like bitumen, asphalt, oil & grease, fly ash etc. and the unwarranted disposal of construction spoils and debris will affect the core characteristics of the soil, which in turn can become unsuitable for agriculture. 25 borrow areas & 10 quarry areas have been identified as source of earth and aggregates and 5 sand mining areas identified in the project influence area. These sites and haul roads will have impact in terms of dust and noise. During construction, the disposal of solid and liquid waste from labour camps, fuel and lubricant spills or leaks from construction vehicles, pollution from fuel storage & distribution sites is likely to affect water quality. The negative impacts on air quality during construction will be mostly localized and concentrated in the Right of Way (RoW)/COI. However, it is likely that impacts due to dust generation are felt downwind of the site rather than the site itself. The noise levels in the project area during construction will increase though it will be intermittent and temporary in nature. The noise levels will be more pronounced around settlements and in inhabited areas. The 23 religious structures and 12 educational institutes located within the proposed RoW are likely to be affected due to construction of the project. Sewage and domestic solid waste will be generated at the construction workers colony. Improper management of these wastes may lead to health and hygiene related problems among the construction workers and the local population.

(iii) Operation Phase: Soil pollution due to accidental vehicle spills or leaks is a low probability but potentially disastrous to the receiving environment, if they occur. These impacts can be a long term and irreversible depending upon the extent and type of spill. Pollutants from vehicles, and accidental fuel spills may also make their way into surface water bodies across/along the project corridor. Higher traffic volume and speed will have impact on the ambient air quality as the road has to be widened to 4-lane. Increase in the number of vehicles would increase the pollutant load. Higher noise levels due to increased traffic volume and speed will affect the residential areas and sensitive receptor like educational institutes, hospitals and nursing homes.

B) Environmental Mitigation Measures

(i) Pre-construction Phase: Alignment has been selected as eccentric right, eccentric left and concentric depending upon the social and environmental considerations to minimize cutting of trees standing along the project corridor and destruction of structures. Bypasses are also considered at 3 locations to minimize the displacement of people and enhance Road safety for the user of the corridor. As a part of the compensatory plantation 2 trees shall be planted for each tree cut. Net Present Value shall be deposited to the Forest Department for diversion against Reserve/Protected Forests and Sanctuary as per demand note of the

forest department. Compensation shall be paid for acquisition of land structures as per the Entitlement matrix developed for the project in line with the National R&R Policy. The amenities like hand pumps, water tap, tube wells etc. which comes under direct impact will be compensated and relocated with community consultation and others will be shifted as per resettlement action plan. Net present value, cost for compensatory afforestation shall be paid by NHA to Forest Department towards mitigation measures for loss of forests. Compensatory plantation shall be carried out by NHA on incidental space on either side of the carriage way for loss of revenue trees.

(ii) Construction Phase:

Compensatory plantation and landscaping, to be carried out as part of the project, shall help in restoring the green cover along the corridor. Cut and fill is being balanced in the design to the extent feasible and fly ash is also to be used to minimize impacts on the physiography of the area. The permanent loss of topsoil proposed to be avoided by conserving the topsoil from such areas and using it at other places for tree plantation, landscaping etc. Adequate slope protection measures need to be provided next to water bodies mainly during the rainy season. Disposal of construction waste shall be undertaken at landfill sites to minimize impacts. If a spill occurs, measures for safe incineration of spilled oil shall be taken to prevent seepage into the ground. Exhausted borrow areas shall be rehabilitated in environmentally sound manner. Aggregates will be sourced only from the licensed quarry sites, complying with the environmental and other applicable regulations, Quarry and crushing units will have adequate dust suppression measures like sprinkler in work area and along approach road to quarry site. To avoid contamination of the water bodies and drainage channels from fuel and lubricants, oil interceptor shall be provided at fuelling locations, construction vehicle parking area, vehicle repair area and workshops. The sewage system (including septic tanks and soak pits) for construction camps will be properly designed and built so that no water pollution takes place in any water body or watercourse. The asphalt plants, crushers and the batching plants will be sited at least 500 m in the downwind direction from the nearest settlement. All precautions to reduce the level of dust emissions from the hot mix plants, crushers and batching plants will be taken up. Construction vehicles, equipments and plants shall strictly adhere permissible noise standard during construction period. All necessary and adequate care has been taken to minimize impact on cultural properties. The affected temples will be relocated with proper compensation and community consultation to avoid any kind of local conflict.

(iii) Operation Phase

Widening of existing 2-lane road to 4-lane along with bypass will reduce the traffic congestion. Smoothing of road surface shall further reduce the emission of the vehicles and noise level. Growth of the vegetative cover along the corridor with time shall again reduce impact of the air pollution. Plantation of green vegetative noise barriers have been proposed in front of the schools and hospitals depending on the space available. These will reduce noise level. Air quality and noise level monitoring shall be conducted as per monitoring plan during operation phase of the project to confirm whether further mitigation measures required.

4. ENVIRONMENTAL MONITORING PROGRAMME

Provisions have been made for monitoring of environmental attributes during construction and operation phase of the project. The details of the parameters, frequency and duration are given in Table 3.

Table 3: Details of Environmental Monitoring

Attribute	Project Stage	Parameter	Frequency	Duration	Location
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Attribute	Project Stage	Parameter	Frequency	Duration	Location
Air	Construction	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , O ₃ , Pb, CO & NH ₃ .	Once in a season (excluding monsoon) throughout the construction period	24-hours for SPM, RSPM, SO ₂ , and NO _x ; 8 hours for CO and HC	9 locations along the corridor and plant sites
	Operation	PM ₁₀ , PM _{2.5} , SO ₂ , NO ₂ , O ₃ , Pb, CO & NH ₃ .	Once in season excluding monsoon season for 2 years of Operation period	24-hours for SPM, RSPM, SO ₂ , and NO _x ; 8 hours for CO and HC	6 locations along the corridor
Water	Construction	(i) pH, DO, BOD, COD, TDS, Cl, Pb, Oil & Grease, As, Hg, Cn, total coliform, faecal coliform and Detergents for Surface Water (ii) pH, TDS, Total Hardness, Sulphate, Chloride, Fe, Pb, Cn, Oil & Grease, As, Hg, total coliform, faecal coliform for Ground Water	Once in a season (excluding monsoon) throughout the construction period	Composite sample	9 locations including 3 drinking water sources at construction camps.
Noise	Construction	Noise levels on dB (A) scale.	Once in a season (excluding monsoon) throughout the construction period	Readings to be taken at 15 seconds interval for 15 minutes every hour and for 24 hours.	Wherever the Contractor decides to locate the equipment yard (5 locations).
		Noise levels on dB (A) scale	Once in a season (excluding monsoon) throughout the construction period	Readings to be taken at 15 seconds interval for 15 minutes every hour and for 24 hours.	6 locations along the project corridor and plant locations
	Operation	Noise levels on dB (A) scale	Once every season (except monsoons) for 2 years after completion of construction activity.	Readings to be taken at 15 seconds interval for 15 minutes every hour for 24 hours.	10 locations along the project corridor
Soil	Construction	Monitoring of Pb, SAR and Oil & Grease	Once in a season (excluding monsoon season) throughout the construction period	Grab Sampling	- 2 locations at productive agricultural lands close to intersections - any accident or spill locations involving bulk transport carrying hazardous materials

5. PROJECT BENEFIT

Implementation of the Project will have following benefits:

- Accelerate regional economic development in terms of industry, tourism and agriculture,
- Reduce vehicle operating and maintenance costs by improving road conditions,
- Reduce travel time by minimizing congestion in settlement areas and providing a four lane facility,
- Minimize road accidents by increasing road widths, improving intersections and road geometry,
- The project may also generate local employment opportunities through the construction activities and local business.
- Abatement of ambient air and noise pollution in comparison to a do-nothing situation.
- Increase in safety due to construction of median between two directions of traffic flow and plantation of shrub in median
- Provision of pedestrian and cattle underpasses shall provide safe movement from one side of the project road to the other side of the project road
- Construction of Road Over Bridge (ROBs) shall reduce travel time and enhance smooth flow of the traffic
- Construction of Fly Over at important intersections shall reduce congestion and enhance smooth flow of the traffic.

- Project facilities included in the project preparation are Rest Area, Bus Bays, Truck Lay Bye, Road Side Furniture, Street Lighting, Traffic Aid Post, Highway Patrolling, Medical Aid Posts, Vehicle Rescue Posts etc.

6. ENVIRONMENTAL MANAGEMENT PLAN

Several mitigation measures have been suggested along with the agency responsible for planning, execution, supervision and monitoring of the Environment Management Plan for pre-construction, construction and operation stages to avoid or mitigate the adverse impacts.

Pre-construction Phase

Pre-construction activities include acquisition of land and structures, relocation of utilities, removal of trees, relocation of common property resources viz. temple, hand pumps, obtaining Environmental Clearance, Forest Clearance and Wildlife Clearance from MoEF, Consent to Establish from MPPCB etc. NHAI, Concessionaire and concerned departments shall be responsible for those activities.

Construction Phase

Concessionaire activities during this phase include setting up of Construction Camp, setting up of plants namely crusher plant, concrete batching plant, hot mix plant; clearing and grubbing, collection, storage and utilization of topsoil, identification of borrow pit & aggregate quarry (if other than those identified by design consultant), operation of the quarry, plantation along the road side & at median, environmental protection & monitoring. Concessionaire shall be responsible for obtaining consent for establish and operate of those plants. Concessionaire shall also be responsible for implementation of the environmental protection measures during construction. The Independent Engineer shall be responsible for monitoring & supervision of the Concessionaire's activities as per Contract & report it to PIU, NHAI time to time. Project Implementation Unit (PIU), NHAI shall be responsible for regulatory compliance.

Operation Phase

Operation phase activities include environmental monitoring and monitoring of survival rate of the plantation etc. The PIU and Concessionaire shall be responsible for those activities.

Environmental costs

The costs for mitigation and management measures have been estimated for inclusion into the Economic Analysis. These costs along with the social costs have to be incurred by the implementing agency to include environmental and social safeguard measures into the proposed project. The environmental cost estimates are presented in Table 4.

Table 4: Environmental cost estimates

Particulars	Amount (Rs)
<i>Construction Phase (A)</i>	
Environmental Monitoring	2,304,000
Environmental Protection and Enhancement	8,800,000
Forest Clearance, Compensatory Plantation, Median Plantation and Maintenance	285,286,000
Sub Total	296,390,000
<i>Operation Phase (B)</i>	
Air Quality and Noise Level Monitoring and Maintenance of plantation for 20 year	32080000
Total (A+B)	328,470,000

*Environmental monitoring has been considered for 3 year construction and 20 year operation period.