CHAPTER- 8 : ASSESSMENT OF IMPACTS

8.1 BACKGROUND

The impacts on various environmental components can occur at any of the following stages of the project planning and implementation:

- Planning and design stage;
- Construction stage; and
- Operation stage.

8.2 IDENTIFICATION AND ASSESSMENT OF IMPACTS

The proposed project will have both positive and negative impacts on the surrounding environment. This chapter assesses the nature, type and magnitude of the potential negative impacts on the various relevant physical, biological and cultural environmental components along the project corridor. For the assessment of impacts, the baseline information has been supplemented by the field visits and the primary surveys of the various environmental components carried out during the independent review.

8.3 NATURAL & BIOPHYSICAL ENVIRONMENT

8.3.1 Meteorological Parameters

Though no change in the macro-climatic setting (precipitation, temperature and wind) is envisaged due to the project, the microclimate is likely to be temporarily modified by the loss of vegetation all along the roadside hill slopes. This shall result in increased micro temperatures, as the rock faces stand exposed devoid of shade giving vegetation. Moisture loss from the soil will also increase due to loss of cover. Cumulatively, the construction of the road will make itself felt in terms of increased temperatures.

As such no change in the wind patterns or precipitation is envisaged as only the roadside hill faces are likely to be cut.

Although the impact is significant, it is reversible nature and shall be compensated for by additional plantation of trees and groundcover. All the lost vegetation cover shall be replaced in 3 years

8.3.2 Air

Along almost the entire upgradation corridor, widening is to be carried out by cutting the hill rather than filling up the valley. Air quality along the project corridor will be adversely impacted both during the construction and initial few years of operation till the slopes are stabilized. Since massive cutting is involved, effects of the increased PM10 concentrations during pre-splitting/blasting and earthworks will dominate the construction stage impacts. Localised degradation in air quality will occur in areas close to hot-mix plants and batching plants.

- **Generation of Dust**

Generation of dust is the most likely impact during this stage due to:

- Cutting of slopes towards hillside for widening of the Upgradation corridor
- Activation of Landslides and rock fall etc during construction
- Quarrying operations
- Handling and storage of aggregates in the asphalt plants:
- Concrete batching plants;
- Asphalt mix plants due to mixing of aggregates with bitumen; and
- Construction and allied activities on new re-alignments.

The impacts will mostly be concentrated in the CoI. It is likely that impacts due to dust generation are felt downwind of the site rather than on the site itself.

Generation of dust will trigger further secondary impacts which are likely to be more severe, prime among which is impact on health of construction workers, especially workers in quarries, borrow areas and stone crushing units.

Generation of Dust is envisaged during operation for the first 3 years till the cut slopes are relatively stabilized and covered with vegetation. In the dry seasons during the operation stage, dust is likely to be generated from cut sections or slope faces.

- **Generation of exhaust gases**

Generation of exhaust gases is likely during the construction stage due to movement of heavy machinery, oil tankers etc. Movement of heavy machinery and vehicles uphill on steep slopes shall contribute to relatively higher emissions of gases.

High levels of SO_2, HC and NO_x are likely from hot mix plant operations. Volatile & toxic gases are released through heating of bitumen during the production of hotmix. Although the impact is very localised, the effect shall be felt in the downwind direction.

Major impact on air quality during operation stage will be due to plying of vehicles. The impacts on air quality will, at any given time depend upon traffic volume/rate of vehicular emission within a given stretch and prevailing meteorological conditions. .

- **Dumping of Debris**

Since substantial cutting is envisaged along the upgradation corridor and fill sections are short and the disposal of the excess cut material poses a real problem for the project. This will have to be done during the construction period and before road works begin. Both, transportation and tipping of the material are sources of dust into the environment. While the former is felt over the entire stretch between the cutting location and dumping site, the latter is more location specific albeit more intense.

Potential sites for dumping are away from the habitation and hence impact of dust on humans due to dumping of debris is not anticipated. Generation of dust due to debris disposal can be minimised through judicious selection of dumping grounds. The impacts due to disposal of debris shall be minimised by enforcing requisite precautions by the contractor.

8.3.3 Water Resources

Following impacts (Table 8.1) on the water resources are envisaged during construction period.

Table 8.1: Impacts on water resources due to construction activities

Impacts Due To Construction	Indicators
Loss of water bodies	Area of water bodies affected

Impacts Due To Construction	Indicators
Loss of other water supply sources	Number of hand pumps, water drums affected
Alteration of drainage, run off, flooding	No. of cross drainage channels
Depletion of Ground Water recharge	Area rendered impervious
Use of Water Supply for Construction	Quantum of water used
Contamination from fuel and lubricants	Nature and quantum of contaminators
Contamination from improper sanitation and Waste Disposal in Construction Camps	Area of camp / disposal site and proximity to water bodies / channels

8.3.4 Land

- **Destabilization of slopes and erosion**

Slopes in Mizoram are generally of shale and rockbound clays, which have poor strength and stability in cuts. Cutting of the hill faces to widen the road will have direct and long-term impact on various factors including stability of hills, safety, loss of vegetation, etc. Some of the impacts due to cutting of the hill are

- Disruption to stability of the cut slopes.
- Modification of drainage patterns and resulting erosion.
- Denudation of the hill slope, which triggers various secondary impacts.
- Increase in overburden on the valley slopes due to dumping of the debris from cut slopes resulting in their instability

When natural conditions are modified by the construction activity, it marks the start of a race between the appearance of erosion and the growth of vegetation. Disturbances of the slopes will result in erosion, which will further trigger cumulative impacts far beyond the road itself, affecting slope stability, increasing turbidity in downstream water sources and causing other impacts as well. The above photograph shows mass wasting due to erosion of the slopes and poor drainage.

- **Earthwork for Upgradation corridor**

Construction of the road will involve substantial quantities of earthworks including rock cuts. While balancing a portion of this excavated material has been achieved by designing the road in fill, massive quantities of cut material shall have to be disposed off.

Loss of Productive soil

The most immediate, direct and long-term effect of cutting of the slopes is the elimination of the productive capacity and topsoil. Removal of topsoil will not only have implications in terms of loss of micronutrients to sustain growth of vegetation but also other socially useful plants and crops such as bamboo etc.

- **Alteration of Drainage Pattern**

Streams are observed cascading down the hills of the upgradation corridor. The proposed road entails cutting of the hill slopes to accommodate the widened road. Alteration of these drainage regimes brought about by road building can induce instability through erosion or release of pore pressure. The resultant impact could also bring out a new drainage pattern altogether, which has the potential to trigger other impacts.

- **Impacts due to Quarrying and Borrowing operations**

Impacts due to quarrying will last for the construction period. The aggregate for construction shall be procured only from quarries operating with NoC from mining and geology department and with permission from forest department. However impacts will include generation of dust during haulage of the material. Also noise levels in the area will go up due to blasting operations.

No borrowing of river sand is proposed. This will be substituted by stone dust, which will be procured from licensed quarries

8.3.5 Noise Levels

Though the level of discomfort caused by noise is subjective, there is a definite increase in discomfort with an increase in noise levels. Road noise depends on factors such as traffic intensity, the type and condition of the vehicles plying on the road, acceleration/deceleration/gear changes by the vehicles depending on the level of congestion, smoothness of road surface (IRC: 104-1988) and grade of the road.

Noise levels during the pre - construction stage shall be prevalent baseline levels apart from localised noise levels at locations where pre construction stage activities are taking place such as at workers camps, stockyards. These increased noise levels will prevail only for a short duration during the pre construction stage. Moreover, as these activities are not likely to be near settlements, impact due to increased noise will be negligible.

Due to various construction activities, there will be temporary noise impacts in the immediate vicinity of the project corridor. The construction activities will include excavation for foundation, grading of the site and construction of structures and facilities. Crushing plants, asphalt production plants, movement of heavy vehicles, loading, transportation and unloading of construction materials produce significant noise during construction stage. Typical noise levels associated with various construction activities and various construction equipments are presented in Table 8.3:

Table 8.3: Typical noise levels of principal construction equipments

(Noise Level in dB (A) at 50 Feet)

CLEARING		**STRUCTURE CONSTRUCTION**	
Bulldozer	80	Crane	75-77
Front end loader	72-84	Welding generator	71-82
Jack hammer	81-98	Concrete mixer	74-88
Crane with ball	75-87	Concrete pump	81-84
		Concrete vibrator	76
EXCAVATION & EARTH MOVING		Air compressor	74-87
Bulldozer	80	Pneumatic tools	81-98
Backhoe	72-93	Bulldozer	80
Front end loader	72-84	Cement and dump trucks	83-94
Dump truck	83-94	Front end loader	72-84
Jack hammer	81-98	Dump truck	83-94
Scraper	80-93	Paver	86-88
GRADING AND COMPACTING		**LANDSCAPING AND CLEAN-UP**	
Grader	80-93	Bulldozer	80
Roller	73-75	Backhoe	72-93
		Truck	83-94
PAVING		Front end loader	72-84

CLEARING		STRUCTURE CONSTRUCTION	
Paver	86-88	Dump truck	83-94
Truck	83-94	Paver	86-88
Tamper	74-77	Dump truck	83-94

Source: U.S. Environmental Protection Agency. Noise From Construction Equipment and Operations. Building Equipment and Home Appliances. NJID. 300.1. December 31. 1971

Though the noise levels presented for various construction activities far exceed the permissible standards, it is important to note that the construction noise is generally intermittent and depends on the type of operation, location and function of the equipment. Though the noise level is within permissible limit in project area, the construction traffic and the use of construction machinery will increase the noise level causing, disturbance to the local residents. Blasting to cut into the hillsides is another important source of noise. Though intermittent, extremely high sound pressure levels present a real risk to the workers on the site.

8.3.6 Flora

- **Loss of Road side plantation & forest cover**

Cutting of hill faces for the proposed widening means a loss of forest cover to the cut heights of almost 5-10m on an average. Based on a most conservative estimate, about 2250 bamboo plants will be felled in the entire project corridor due to earth cutting along the hillside of the road. In addition, ground cover, bryophytes & pteridophytes are likely to be lost during construction, along the road and at locations where construction camp and yard are sited. The cutting of the slopes may trigger further landslides, which may bring down with it the green cover of the higher reaches.

- **Loss of Bio diversity and Impacts on Ecological Identity Areas.**

During site survey, a number of locations were identified which were rich in bio diversity sustaining diverse species of plants, bryophytes and other plant associations. The project may have adverse impact on many such locations.

Impact on Biodiversity

Any developmental project is likely to have impact or *intrusion* on the characteristic design of these *Ecological Identity Areas*[1], leading to possible erosion of aesthetic, cultural, economic or ecological (in terms of biodiversity, ecosystem health and integrity etc. values. Hence, these areas need to be protected. Debris generated from cut sections, which if dumped in an unplanned manner, would destroy the flora, fauna and ecological balance of the area. Hence, dumping sites for the debris would have to be selected with utmost care. Furthermore, the common tendency to dump debris into the deep valleys which offer easily available dumping sites would lead to a destruction of the flora and associated fauna on the slopes. Besides, the exposed areas due to earth-cutting would be highly erosion-prone, and lead to a vicious cycle of erosion, habitat destruction and more erosion, thereby causing irreparable impact on the flora, fauna, ecology and aesthetics of the area. Though the region is rich in biodiversity, such areas are limited to the E.Id.As' identified. No adverse impacts are anticipated on the rest of the stretches.

Loss of Endangered species

The baseline survey identifies locations where Tree Ferns (Cyathus sp) exist in clusters. These locations are in most case along the roadside and are likely to be disturbed during road construction. Most of these plants were observed on the valley side. Movement of heavy machinery etc., could damage these endangered species and their associations within the CoI.

Loss of Medicinal Plants

There are some medicinal plants along the upgradation corridor. These are used extensively by the locals for treatment of various diseases. Medicinal plants located within the corridor of impact will be lost. Since the plants are lost only within the CoI and rest of the areas remaining undisturbed, their loss does not have severe environmental connotations (loss of biodiversity) or social implications.

[1] The concept of *Ecological Identity* Area is recent and the importance of identifying, defining and protecting such areas in any developmental project is now being increasingly emphasized in all Environmental Impact Assessment studies. Such areas can provide valuable ecological assessment at the landscape level, which may also be defined as areas of *visual containment*, or areas that have stable landscape characters.

8.3.7 Fauna

- **Impact on Endangered Species and their Habitats**

The movement of fauna will be disturbed if adequate care is not exercised during construction of the project road. Impacts shall be direct during the construction period. Impacts on these habitats are likely due to hill cutting, induced landslips, and contamination due to other allied activities.

8.4 SOCIO ECONOMIC ENVIRONMENT

8.4.1 R&R Issues in the Project

The project requires land for widening, strengthening, realignments and other development of the project highway stretches, siting of construction sites and labour camps etc. The project shall involve the acquisition of:

- Private properties, within the settlements, with a valid pass from the Village Council;
- Agricultural properties, with or without permission from the Government;
- Lands belonging to community organisations as NGOs;
- Lands belonging to the governmental agencies/departments, and;
- Free lands.

The total land required for widening the project corridor is about 90 ha. Impact on People due to Land Acquisition

The project affects and displaces a number of properties, (residential, commercial and agricultural)

Cultural properties impacted

There are no major protected or archaeological monuments to be directly impacted due to the project. However, there are several structures as graves located within the formation width of the road apart from which there are lands belonging to church etc that will be

impacted. These include compound walls, quarters, farms and other buildings of the churches.

8.4.2 Loss of Access

The proposed project will have a beneficial impact in terms of improved connectivity and access. There are link roads to every settlement from the upgradation corridor. The link roads or village roads located towards the hillside of the upgradation corridor are likely to be impacted in the proposed widening.

Although the existing link road alignment and slope shall be integrated with the new upgradation corridor, adverse impacts in terms of difficulty of access, temporary re-routes etc shall be felt during the construction period. This impact though direct is temporary.

8.4.3 Road Safety

The proposed road will benefit the road users in terms of improved driving conditions and geometrics, which translates into higher vehicle speeds. The change though mutually beneficial to road users as well as the local people increases the risk to life of people living along the edge of the Project Road. The road is not only the lifeline of the local people in terms of connectivity but also a space where all daily activities are carried out.

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8.4.4 Other Social impacts

Other social impacts due to the project such as increased risk of HIV/AIDS etc have been dealt with in detail in the R&IPDP.

8.5 INDUCED IMPACTS

8.5.1 Jhum Cultivation

With the New Landuse Policy in place, negative impacts associated with Jhum cultivation are likely to be offset. With the improved connectivity due to the road, local populace will be moving towards settled cultivation from the present Jhum cultivation. This phenomenon is observed along the national highway is applicable to this stretch also. Hence, the project is likely to contribute positively towards reduction in Jhum cultivation.

8.5.2 Trade and Tourism

Influx of tourists and visitors may increase due to improved accessibility. This may increase the extraction of forest produce, if uncontrolled. If, on the other hand, eco-tourism can be promoted, the protection, measures to be provided can be made sustainable.