

CHAPTER 7 – ENVIRONMENT MANAGEMENT PLAN

7.0 Environment Management plan

7.1 Introduction

In order to mitigate the adverse effects of the proposed construction an ‘Environment Management Plan (EMP)’ has to be prepared to ensure that the environment quality of the project influence area does not deteriorate beyond the expected level due to the construction and operation of the facility. The baseline assessment is expected to list the impacts on physical, ecological/ biological and social environments likely to arise during the execution and operation of the project.

The recommendations of the ‘Environment Management Plan’ are expected to be implemented right from the conception till commissioning and operation phases.

For the sake of implementation the recommendations can be divided into

- (a) Pre-construction and design phase,
- (b) (b) Construction phase and
- (c) (c) Operation phase.

It may be necessary to give an additional chapter, in the EMP, to provide for enhancement measures to mitigate the impacts.

7.2 Pre-Construction Phase

The mitigation measures against the foreseen impacts on the natural or built up environment of the project influence area need to be taken up, with a holist approach, in the pre-construction and design phase and systematically presented in the following categories:

- a. Environment Management Plan for implementation of mitigation measures against the foreseen impacts on physical environment
- b. Environment Management Plan for implementation of mitigation measures against the foreseen impacts on ecological/ biological environment

c. Environment Management Plan for implementation of mitigation measures against the foreseen impacts on social environment

A brief description of the background of the issue is discussed along with the mitigation measures.

7.2.1 Pre-Construction Phase consideration for the Environment Management Plan for implementing of Mitigation Measures against the foreseen impacts on Physical Environment

The impacts due to the project on the physical environment are evaluated in quantitative as well as qualitative terms during environment assessment and measures to mitigate these impacts worked out in EMP during the pre-construction and design phase. For this purpose it is essential to quantify the existing levels of various impacts and to ensure that the construction of the facility does not increase these beyond acceptable levels. These measures are based on the design philosophy, analysis of alternatives and its impact on the environment and ecology of the project influence area. The measures are generally proposed over following components of 'Physical Environment.

Physical Environment.

i) Impacts due to Air Pollution and Fugitive Dust Generation

- Measurement of 'Ambient Air Quality' at few locations along the project corridor, making a detailed analysis of the causes for air pollution and working out alternate to mitigate ill effects.
- Estimating the likely effect on the air quality that may be caused by increase in vehicular traffic due to development of road network.
- Working out alternates decisions for proper management of traffic to reduce Traffic Jams etc
- Making suggestions for improving Driving Habits

- Put in place a system for increasing awareness of drivers against evils of Air pollution and its relation to vehicle maintenance

ii) Impacts due to noise Pollution

- Measurement of Noise level along the corridor, at junctions and at cultural and academic institutions and suggesting mitigation measures to ensure these remain in tolerable limits during the Construction and Operational Phases by providing suitable mitigation measures
- Increase awareness among people against Noise pollution by placement of hoarding, better geometric designs, improved vehicular maintenance etc
- Limiting overloading of vehicles leading to high noise generation from engine and mechanical components
- Suggesting ways and means for improving driving habits

(iii) Impacts on the Hydrological System of the Project Influence area

- Measurement of various parameters about the quality of water flowing in the streams, anticipating additional pollution due to road construction and making suggestions for mitigating the adverse effects
- Anticipating water shortage if any due its use for construction during dry seasons
- Ensuring that water bodies are not adversely affected due to construction or dumping of construction waste

(iv) Impacts due to excessive Soil Erosion Land Slides, Mass Wasting etc. due to the proposed highway project.

The project roads would be aligned through hilly areas and may result in cutting of hills resulting in instability of existing hill slopes. Adequate mitigation measures must be designed to protect the slopes and mitigate erosion. Major part of soil erosion and slope protection measures are based on Bio-Engineering Techniques

(v) Impacts due to Soil Contamination due to normal prevailing practices

- Soil contamination due to burning of Bitumen-Practice to be stopped
- Soil Contamination due to leeching from the dumps of waste material from cut-
Avoid dumping of toxic material in such dumps and protecting the toe

(vi) Impacts due to change of Land Use

- Loss of Trees and Green Cover along road under- Creation of similar land under the process of ‘Compensatory Afforestation’ for the affected number of trees and green cover

(vii) Impacts due to transfer of Forest Land for Permanent Conversion into Non-Forestry Land Use

- As in (vi) above

(viii) Impacts due to Cut and Fill Exercise, Mass Movement of Excavated Natural Material

- Effort to be made to ensure minimum amount of construction waste that may need disposal
- Identification of site for disposal of such construction waste and to ensure such dumps do not effect the drainage of the area/ region
- To protect the dump fills to ensure that the waste does not slip further

(ix) Impacts due to introduction of Construction Material in the Ecological System in and around project Influence Area

- Introduction of large quantities of construction material such as bitumen cement etc- Identify proper storage sites and to ensure these materials are not mishandled
- Introduction of large volume of Exhaust and Burnt gases by Hot-mix Plant-Keep adequate provision for use of environment friendly Hot-mix plant with clearance from State Pollution Control Board

(x) Impacts due to Solid Waste Generated as Road construction activity

- Introduction of non-biodegradable materials such as Polythene Bags, wrappers, water bottles due to the habit of throwing these away haphazardly- Coordination with construction and supervision authorities and developing proper system of safe disposal
- Physical introduction of Biological Solid Waste in ecosystem- Disposal as above with proper coordination
- Threat due to solid waste generated by labor- Disposal with friendly coordination with local authorities

7.2.2 Pre-Construction Phase consideration for the Environment Management Plan for implementing of Mitigation Measures against Ecological and Biological Impacts

The Biological Environment is very rich in the state of Mizoram with extensive forest cover. The development of road network would result in transfer of large tracks of land for non-forestry, felling of trees and clearing (uprooting) of shrubs. The roads may also cause fragmentation of ecosystems and may effect free movement of wild and other animals. It may have a severe adverse impact on the biodiversity of the project influence areas. These problems must be carefully analyzed and mitigation measures provided. Some of the following measures can be considered while finalizing the detailed project report

- i) Mitigation Measures for environment management against loss of Forest Cover**
- Work out compensation package to regenerate the loss of trees and green cover
 - Loss of Biodiversity- Provide similar species of plants in ‘Compensatory Afforestation’ by doubling the number which is lost so that ecological balance is not lost
 - Ensuring actual regeneration of plants-Keeping strict watch and replanting of lost plants
 - Minimizing damage to existing plants

- ii) Mitigation Measures for environment management against Impact over flora under non Forested Area- Most of the measures suggested above would be required
- iii) **Mitigation Measures for impacts on Wildlife**
- Normally avoid aligning the road through dense plantation area . Plan for alternate alignment
 - For each case specific prior consent is required under the wild life act by making application.
 - Specific recommendations of Chief Wild Life Warden should be strictly followed
- iv) Mitigation Measures for environment management for the impact over components of Biodiversity.

7.2.3 Pre-Construction Phase consideration for the Environment Management Plan for implementation of mitigation measures against the foreseen impacts on social environment

The issues identified during the Environment Assessment need to be analyzed and mitigation measures included in the Environment Management Plan. The salient features of the socio-economic characteristics and the impacts over the socio environment and the mitigation measures can be worked out under the following heads:

(i) Mitigation measures for impacts over Cultural and Religious Heritage

Mizoram has a long background of Cultural and Religious history. The location of such religious structures near the corridor of influence should be studied during the Environment Assessment. The alignment finalized should not have any adverse impacts on these structures. In fact some of these could be identified for enhancement by building compound walls if the boundaries fall very close to ROW.

(ii) Impacts due to Displacement of Population

There is a need to identify the residential, commercial buildings and the persons or families adversely affected due to the requirement of providing adequate width of ROW for the road. Adequate compensation need to be worked out for their resettlement by providing alternate accommodation. The state is expected to lay down policy and set up a mechanism for their resettlement. The expenditure shall be a charge on the project.

(iii) Consideration for Loss of livelihood

The project document and RAP shall list out persons whose livelihood is affected because of uptake of their agricultural lands or/ and commercial establishment. These persons must be compensated as per policy of the state government

(iv) Consideration for Impacts over Educational System and Academic Institutions

EMP should provide for compensation if any of Educational of Academic Institution is adversely impacted

(v) Consideration for Impacts over Health services and System

The facilities available along the corridor of influence should be studied as a part of Environment Assessment and some facilities may need to be augmented to provide for trauma centers. Information about such Medical and Health centers should be made known to the traveling persons. Further the areas neighbouring the roads should be declared as silent zone

(vi) Consideration for Impacts over Loss of Drinking Water Source

Detailed survey is expected to be carried out during Environment Assessment of the existing water sources and those likely to be affected by the proposed facility and concerned department of the state requested to make good the loss by providing funds chargeable to the project. It should be ensured that reallocation of all services is carried out before the start of construction in the affected length.

(vii) Consideration for Impacts over Tourism

The impact on the tourism due to better transport facilities need to be studied and suitable rest places for passenger, hotels, fuel filling station and other conveniences provided for in the EMP. The tour Operators can be informed of the likely schedule of construction

(viii) Consideration for Impacts over transports Services. The mitigation measures during pre-construction phase for mitigating the transport system are as under:

- Keeping drivers informed about the schedule of construction and the driving precautions they have to take in construction phase
- The Construction Methodology should take care of the requirement of the traffic management during execution of the works
- The project will bring new avenues of in the transport sector of the state, would strengthen the economic development and provide greater employment
- The road projects bring increased passenger facility, decreased travel time, shortened distance, better and smooth geometrics and increased road safety.

(ix) Consideration for Impacts over Communication

- The postal system of communication will certainly get benefited as the transport time for postal material will decrease and will benefit the social environment
- It would be easier to lay ‘Optic-Fibre Cables’ along the new roads

(x) Pre-construction Phase for Impact over Culture and Values.

- The culture and values of the project influence area is expected to get a positive impact by increase in the modern communication and no adverse impact is expected

A study would reveal that some of the Impacts may be beneficial to the society and the others may have adverse effects. The EMP should suggests ways and means to mitigate the adverse Impacts

7.3 Construction Phase

The construction phase is the most important phase in the entire life cycle of the project since all the Mitigation Measures, planned during ‘Pre-construction Phase’ are implemented and actually executed. It is important that the EMP is followed both in letters and spirit. Any let down may have long term affect on the operation of the facility created at a huge cost and may also cause misery to the community.

7.3.1 The mitigation measures planned in the in the Pre-Construction Phase for physical Environment have to be implemented during the Construction Phase. Some of the activities, which have to be executed to mitigate the adverse impacts on Physical Environment, are as under:

i) Mitigation measures against Impacts due to Air Pollution and Dust Generation

- Excessive generation of dust and rise in SPM due to construction activity- continuous sprinkling of water during entire process, control of quality of fuel and public awareness
- Continuous monitoring of ambient air quality within the project corridor
- Monitoring of Wind Velocity to ascertain dispersal pattern of Dust and pollutants
- Public awareness against the rise of fugitive dust, air pollution and degradation in the ambient air quality and its impacts over the people residing in the adjoining areas
- Public awareness for possible impact bovver persons suffering from Asthma and Other respiratory disorders

ii) Mitigation measures for the Impacts due to Noise Pollution

- Regular Noise Monitoring of noise pollution
- Workers safety from noise pollution- providing protective devices
- Rise in noise level due to use of blasting for hill cutting- Use limited explosives and take necessary steps and provide protective devices
- Rise in noise level due to use of construction machinery- Use of modern machines and timely maintenance
- Rise in noise level due to crushers, hot mix-plant and batching plant etc- Use proper muffling devices and keep machinery in good working condition by timely maintenance
- Rise in noise level due to construction in the vicinity of educational institutions- The location of plant and machinery away from such institutions

iii) Mitigation measures for Impacts on the Hydrological System of the Project
Influence area -Besides the recommendations made in the ‘Pre-Construction Phase’ some additional recommendation specific to the ‘Construction Phase’, are as under:

- Dumping of construction waste in the water body and streams-Project Proponents to monitor and ensure that unwanted materials are dumped only at the appropriate identified site
- Leaching of bituminous or oily materials in the river- Project Proponents to monitor and ensure that unwanted materials are dumped only at the appropriate identified site to avoid contamination of water
- Contamination of water due to cement or concrete- Project Proponents to monitor and ensure that unwanted materials are utilized in the sub-grade or stacked only at the appropriate identified site for later use
- Water contamination due to anthropogenic activities/ labor settlement etc. during ‘Construction Phase’- To ensure that labor camps are sited away from the river and proper water needs are provided as per the Factory Act. Labor department officers are expected to inspect these facilities.
- Consumption of water from natural streams for construction purposes- It need to be ensured that the basic requirement drinking water for the community is not adversely impacted.

iv) Mitigation measures against Impacts due to excessive Soil Erosion, Land Slides, Mass Wasting etc. due to the proposed highway project

- To monitor and ensure that the mitigation measures suggested in the Pre-Construction Phase are followed and hill slopes suitably armored to avoid soil erosion and slippage

v) Mitigation measures for Impacts due to Anticipated Soil Contamination due to normal prevailing practices during ‘Construction Phase’

- Soil contamination due to spillage of Bitumen and other oils-Contractor to ensure that Handling of Bitumen Diesel and other fuels shall be carried out with adequate

precaution leaving no room for wastage. Proper oil traps to be provided at labor camps and workshops where machines are repaired and overhauled. Further he shall ensure that such material do not leech into adjoining areas.

- Recycling of Bituminous Material along the abandoned stretches- Effort to be made to use such materials in the new construction by recycling to the extent possible and disposing the balance at safe identified locations.
- Contamination due to heavy materials and other Toxic materials- The contractor shall dispose such materials at safe locations Project proponents to monitor and ensure that disposal of waste is carried sites away from water source and piled in a way that it does not get washed away during rains.
- Contamination of ground water due to leeching from the human waste in and around labor camps- Project proponents to monitor and ensure that such waste is disposed properly away from source of water

vi) Mitigation measures against Impacts due to change of Land Use within Forest Areas as also in non-forest areas

- Contribute towards Re-plantation
- Maintenance of Green Cover with local grasses
- Re-plantation and Naturalization of land after De-mobilization and removal of plant and machinery

vii) Mitigation measures for Impacts due to Cut and Fill Exercise, Mass Movement of excavated Natural Material

- Mass scale cut and fill- Project proponents to monitor and ensure that the treatment of slopes are executed in a coherent and homogenous manner with local topography using technically sound and environmentally friendly and sustainable technology without impacting biodiversity of the project influence area.
- Most of the cut material, if found suitable, shall be utilized for filling. The balance of excavated material shall be dumped and previously approved site, properly compacted and covered with vegetation.
- Loss of grasses and shrubs shall be made good by plantation on the slopes and in the ROW. Project proponent to monitor the growth

- Disturbance of regional hydrology due to dumping of waste material in the natural stream-Contractor to be restricted to dump waste material in the natural stream

viii) Mitigation measures for Impacts due to introduction of Construction

Material in the Ecological System in and around the project Influence Area

- Introduction of large quantity of the construction material such as Bitumen and cement-Contractor to ensure creation of proper storage facility at identified site sand to ensure that these materials are not mishandled or dumped in the natural streams

ix) Mitigation measures for Impacts due to Solid Waste Generated as Road construction activity

- Physical induction of non biodegradable materials such as polythene bags, wrappers and used water bottles- Contractor to maintain general cleanliness and make arrangement for the removal of such waste material from the corridor of influence
- Physical introduction of Biological Solid waste along the corridor of influence due to lack of civic sense among road users-Increase awareness amongst the community by putting hoardings and through media, providing Garbage Bins and by cleanliness drive
- Estimated Threat due to the Introduction of substantial quantity of Solid Waste by Labor-Providing adequate Facilities for proper disposal of such waste

7.3.2 The mitigation measures planned in the in the Pre-Construction Phase for impacts on Biological Environment have to be implemented during the Construction Phase. Issues identified for implementing, during ‘Construction Phase’ and details of the mitigation measures are as under:

i) Mitigation Measures for Environment Management against loss of Forest Cover

- It is recommended that project proponent should monitor the success rate of plantation and replace any of the dead plants

- The project proponent is expected to ensure that the construction work is restricted to ROW and felling of trees restricted only to those required for removal due to construction and other trees left undisturbed even within ROW.
- ii) **Mitigation Measures for Environment Management for the Impacts over Flora under Non-Forested Area**
 - The above criteria would be applicable even in the non-forested areas
- iii) **Mitigation Measures and Environment Management for the impact over Wild Life**
 - Impact on Aquatic wild life- Under no circumstances any type of debris or the construction waste shall be thrown in the water bodies
 - Impact on resident Wild life- Construction of animal crossings at identified locations
 - Disturbance of Drainage Pattern- The project proponent should monitor and ensure that the drainage pattern is not adversely impacted by blockage and no debris should be dumped in flowing water or water bodies
 - Loss of Grasses, Shrubs etc- Local species of shrubs and grasses planted on the new faces of slopes and disturbed areas. This should be monitored by project authorities

7.3.3 Mitigation Measures and Environment Management- For Impacts on Social Environment during ‘Construction Phase’. Many of the mitigation measures planned in the in the Pre-Construction Phase for Social Environment have to be implemented during the initial stages of Construction Phase. These specific are given below for the identified issues:

- i) **For Impact over Cultural and religious Heritage**
 - The recommendations made in the ‘Pre-construction Phase’ shall be implemented during the early stage of construction. The entire process shall be implemented in consultation with the local District Administration, Affected Communities, Members of Village Councils and other Stake-holders

ii) Construction Phase Consideration for displaced persons

- The issues of compensation are expected to be resolved during the ‘Pre-construction Phase’.

iii) Consideration for the Loss of livelihood

- The ‘Construction Phase’ is expected to provide employment opportunity to the local residents. Other parties having roadside shops are expected to see rise in their incomes due to increased human activity.

iv) Consideration for the Impact over Educational system and Academic Institution

- The recommendation made during ‘Pre-construction Phase’ should be followed

v) Consideration for the Impact over Health Services

- Local medical authorities should be kept informed of the schedule of construction as the labor injured due to accidents would have to be treated in these facilities

vi) Consideration for the Impact over loss of Drinking Water

- The concerned department must ensure that relocation of water supply services are carried out before the start of construction
-

vii) Consideration for the Impacts over Tourism and Transport System

- The tourist and transport services are expected to feel inconvenience during the ‘Construction Phase’. It is recommended that suitable diversions are provided for free flow of traffic and minimum inconvenience is felt by traveling public

viii) Consideration for Safety Issues during construction

Safety to general public and the construction workers is of paramount importance. The recommendation of Factory act 1940 must be observed. Arrangement for ambulance and medical services may be kept in readiness

to take care of unforeseen accident. Consideration must be given for attending to the following issues:

- Information to public by placing signboards along the project road
- Information and training to the workers about safety provisions and arranging for protective equipment.
- Restriction to access and governing traffic with the help of safety guards
- Safety for use of explosives- as per Annexure B
- Safety of construction equipment- Employ only trained manpower and follow the instructions of machinery manufacturer
- Special safety measures must be taken while working on hill slope as suggested in Annexure A

ix) Consideration for the Impact over Communication

- It is expected that the affected parties having some infrastructure within the ROW would have implemented the relocation during the Pre-construction Phase. However there may be some overlap. The problems faced by any party should be sorted out by mutual discussion or by intervention of the project supervision authority.

x) Consideration for the Impact over Culture and Values of the Region

- The induction of large number of outside workers may, sometimes, impact the cultural values of the local community. Mizoram expects that workers from other states shall seek and obtain inner line permits to work within the state. This needs to be made known to the contractors

xi) Consideration for Workers Camp- Construction workers are generally a much neglected group and the environment issues of construction site management cannot be implemented unless they are trained properly and provided with basic amenities. The following recommendations are made for the Environment Management of Workers Camps. It needs to be understood that it is the responsibility of the contractor to provide basic amenities and they will be liable to penal action in case of any Violation.

- Location- Construction Camps will be located away from Water bodies and streams and at least 500m away from habitations.

- Construction- Construction of these Camps/ Housing shall be protective enough to provide appropriate comfort to the workers.
- Water-Clean and potable water for drinking and Household shall be provided by the contractor
- Sanitation-Contractor shall provide the facilities for adequate sanitation at the workers Camps
- Waste Management-The contractor to arrange for proper disposal of solid waste and sanitary waste from the workers Camps
- Creche for the children of Workers-Contractor is expected to provide crèche for the children of the workers as per Labor law
- School for the Children of Workers- The civic authorities to arrange for admission of the children of workers in the nearest school
- First Aid and Other Health Facilities-First Aid kit shall be provide at the camp site. And information about the nearest medical facilities made known to the worker. The Contractor is expected to arrange for immediate transport of workers to the nearest trauma centre in case of any accident.
- Fuel for Cooking- The contractor is expected to provide for Fuel and cooking media to the workers so that they may not cut the trees for fuel

7.4 Operational Phase

The roads are generally planned to strengthen the life style of the area, linking the areas directly to the rest of the country and establishing linkages agricultural, industrial and commercial areas to boost the economic development. The issue of environment friendly ‘Operation Phase’ should be planned to ensure that providing mitigating measures in the Environment Management Plan mitigates foreseen adverse impacts. The issue of environment friendly ‘Operation Phase’ which needs to be included in the EMP for mitigating the foreseen impacts in the post construction scenario can be under the following heads:

7.4.1 Mitigation Measures for Impacts on Physical Environment-

The ‘Operation Phase’ Impacts over Physical environment need to be thoroughly evaluated and mitigation measures planned against adverse impacts. The following mitigation measures need to be considered and provisions made in EMP:

(i) Mitigation Measures and Environment Management for the Impacts due to Air Pollution and Fugitive Dust Generation

It is expected that all the recommendations made in the Pre-construction and Construction Phases have been fully complied. In order to control over the Ambient Air Quality, it is recommended to permanently establish air quality monitoring stations along the road corridor. Further action to identify the dispersal pattern and mitigation measures shall be planned based upon the pollution scenario during the ‘Operation Phase’.

(ii) Mitigation measures and Environment Management for the Impacts due to Noise Pollution

As above, it is expected all the recommendations made in the Pre-construction and Construction Phases have been fully complied. It is recommended to permanent establish “Noise Pollution Monitoring Stations” to carry out regular monitoring along the road corridor. Further action to identify the mitigation measures can be suggested after review of the noise pattern along the corridor.

(iii) Mitigation Measures and Environment Management for the Impacts over the Hydrological System of the Project Influence Area

- The post construction period is expected to be completely different and possible threats reduced and limited in the ‘Operation Phase’. But the system may continue to have threat due to various anthropogenic activities. The following mitigation measures are suggested against the possible threats:
- Throwing of Non-Biodegradable waste, Sanitary waste solid waste in the water bodies and natural streams-Increase awareness among Road Users against such habits and imposing penalty on habitual offenders

(iv) Mitigation Measures and Environment Management for the Impacts due to Soil Contamination

The road operating agencies are expected to follow the recommendations made in the project DPR for the protection of slopes against erosion during the ‘Construction Phase’. The success of the protection measures shall be monitored during the ‘Operation Phase’. Further mitigation measures can be suggested after review of the adopted measures.

(v) Mitigation Measures and Environment Management for the Impacts due to change in Land Use

- The recommendations made during the ‘Construction Phase’ will be valid during the ‘Operation Phase’

(vi) Mitigation Measures and Environment Management for the Impacts due to transfer of Forest Land for Permanent conversion for road use

- The boundaries of the ROW having been demarcated, it shall be ensured that no further encroachment takes place on the forest land

(vii) Mitigation Measures and Environment Management for the Impacts due to Cut and Fill exercise, Mass Movement and dumping of Excavated Natural Material

- It shall be ensured that the implementation of recommendations of Pre-construction and Construction Phases are achieved before the start of Operation Phase and the road sites cleared of all debris and waste materials. Further the road authorities shall start awareness drive for cleanliness.

(viii) Mitigation Measures due to Introduction of Construction Material in the Ecological System in and around Project Influence Are

- The recommendations made during the ‘Construction Phase’ will be valid during the ‘Operation Phase’

(ix) Measures and Environment Management for the Impacts due to Solid Waste generated as a result of Construction Activity

- The recommendations made during the ‘Construction Phase’ will be valid during the ‘Operation Phase’

7.4.2 Mitigation Measures for Impacts on Biological Environments

- The Biological Environment is expected to establish the equilibrium once the construction is completed. It however requires sensible treatment towards the various components. The following recommendations are being made towards these considerations:
- Implementation of recommendations made during pre-construction period during the Operation Phase
- Regeneration of green cover over the new ROW and the freshly cut slopes
- Increase awareness among people against threatened aquatic and other wild life and issues related with its conservation, by placement of hoarding etc.
- Putting in place a system for immediate removal of carcass of dead animals to avoid foul smell and spread of diseases

7.4.3 Mitigation Measures for Impacts (Benefits/ Losses) on Social Environments

Operational Phase is expected to bring large number of positive benefits over the Social Environment, in the form of increased opportunity for the local population as well as for the road users. The recommendations made in the ‘Pre-construction Phase’ and ‘Construction Phases’ will pave the way for larger socio-economic benefits. However specific Mitigating Measures on some of the issues are as under:

- Impact over Cultural and Religious Heritage-Increased accessibility
- Displaced Population- Road may bring new accessibility to general population especially displaced persons
- Loss and Gain of Livelihood- Better connectivity would new set of opportunity and result in increased employment
- Impact on Educational System and Academic institutions- Provide better Educational opportunities due to ease of access
- Impact on Health Services- Provide better Health Facilities due to ease of access of habitants
- Impact over Tourism-Due to improvement of Infrastructure and improved modes of transport

- Impact on Transport System- Would result in general improvement of safe Road network
- Impact on road safety- Road safety may improve due to improved geometrics but number of accidents may increase if proper controls are not exercised
- Impact over communication – Postal and other modes of communications would improve
- Impact over Culture and Value of the Region- Provide an opportunity for propagation of culture and values of the region \

While study of the environment setup of the project influence area and working out the mitigation plans for the environment management of the road network, some of the issues require enhancement of the corridor

7.5 Environment Enhancement

. These additional requirement need identification and provision made in the EMP. Some of the requirements are as under:

7.5.1 Road Service Facilities

- Underpasses
- Parking Spaces
- Lay-byes
- Road median
- U-turn Facilities

7.5.2 Public amenities

- Policing of management of traffic
- Cattle crossings/ cattle rest areas
- Traffic signs

7.5.3 Water Bodies/ beautification

- Landscaping
- Fencing and crash barriers
- Public rest areas and toilets

7.5.4 Tourism Entertainment and Pilgrimage

- Location of fuel filling station/ auto repair shops
- Hotels, Motels, rest places etc
- Tourist view points
- Enhancement of existing religious places of worship

7.5.5 Availability of Emergency Health Services

- First aid posts
- Information about availability of trauma centers and other primary health centers

7.6 Management and Institutional Issues

7.6.1 Environmental Specialists within the road authority are required to undertake studies, plan and manage larger environmental issues and coordinate with specialists in other government agencies, NGO's and other stake holders. Legal and policy issues need to be closely monitored and coordinated with other government branches.

The road authority is expected to ensure follow up EMP during the “Operational Phase” under the guidance of Environment Specialists specifically appointed for the purpose

7.6.2 Environment sections of tender documents

The contractor is expected to implement the “Construction Phase” as indicated above at **clause 7.3** of this document. It shall be responsibility of supervisory staff or consultant to ensure that it is observed and implemented as per clauses of contract.

7.6.3 Prequalification of contractors may require submission of an environmental protection statement and health and safety statement, which should be developed into full action plan in the final bid. Contract specifications would vary with the projects and surrounding environment issues, but may include the following:

- Likely location and working methods in borrow pits and quarries
- Requirement of full reinstatement of land to its ultimate stable and productive use
Protection of water bodies and ensuring free flow of storm water
- Control on location, design and operation of contractor's camps and facilities

- Control on use of fuel wood for any purpose, and provision of alternate fuel for the work force to minimize the demand of local firewood
- Arrangement of provision of food and other supplies for workers to minimize local price inflation
- Control of waste disposal methods and location of waste disposal area
- Provision of health facilities for the work force

Annexure A

Code of Practice concerning roads, other land uses and relations of road authority with community

1. This is a practical guide which, if followed by the departmental staff, will help to ensure that roads do not conflict with other land uses. It would also help to improve relationships with rural roads neighbours (local people).
2. The impact of every operation on the surrounding land must be considered before it is undertaken. A full site investigation must be made. Consideration must be given to the potential damage to surrounding farm land.
3. No operation should be permitted (without compensation) that gives rise to damage to farmland, water supply lines, irrigation system or other form of infrastructure.
4. Where there is likely to be any adverse impact or conflict, the contact should be made with the people concerned. Adequate time must be allowed for discussion and agreement. Possible alternatives should be considered.
5. In every case, the requirement of law should be followed where compensation may be due.
6. On every road section, a number of safe tipping site must be designated. All staff must be instructed to use them. Such sites must be away from houses and farmland; they must be on stable slopes; and the must be marked on lower side.
7. No tipping of material should be permitted anywhere except in designated tipping sites.
8. The discharge of all drains should be checked on recurrent basis. Any damage resulting from excess flows should be rectified.
9. Any change (e.g. small landslides) to roadside slopes that might affect either the road or the adjoining land should be investigated promptly. Repairs, if necessary, should be undertaken at the earliest opportunity.
10. Any complaint by a road neighbour should be investigated promptly and action taken as necessary.
11. Where a road neighbour is undertaking activities causing damage to the road, a through investigation should be made. This should start from a sympathetic approach, but where the department's interests are affected, reference should be made to the laws. The legal

standing of the Department of Roads should be ascertained as possible in each particular instance.

12. Where there is a conflict, a compromise solution that suits both sides should be sought wherever possible.

Annexure B

Site safety:

- The engineer is always responsible for the safety of the persons working with him. Where a contractor is engaged, then the responsibility is delegated to him. The executive authority must ensure that safe practices are followed. Road construction is intrinsically dangerous.
- Slopes in mountainous areas are also dangerous by nature. As well as the obvious dangers of falling off the slopes, there are dangers of falling debris or tools hitting other workers, and of the slope itself giving away.
- The safety code of practice for working on slopes must always be followed.

Safety Code of Practice for working on slopes

- 1) The code is designed to promote the safety of all Department and Contract personnel while working on slopes at site where persons are at risk of falling by more than two meters.
- 2) No one may be allowed access to the site unless authorized by the engineer or the contractor
- 3) No person may work unaccompanied unless they are on a very gentle slope (less than 30 degree slope). All persons must leave the slope together to take refreshments, meals etc.
- 4) All fragile slopes should be clearly marked off and personnel informed of the dangers.
- 5) Extreme care must be exercised on slopes during adverse weather conditions as wind, rain; fog and darkness create their own hazards inherent in slope work. The site in-charge must assess the conditions with care before allowing access to the slopes. Only in emergencies may persons go on to the slopes in heavy rains or during hours of darkness. In such cases no person shall be allowed to go on the slopes unaccompanied.
- 6) All access equipment, ropes and tackle must be regularly inspected and maintained in good condition.
- 7) Where persons could fall over the edge of a slope, temporary guard rails or ropes are to be installed where practicable. All persons exposed to a risk of falling must be provided with a secure and well anchored safety line. Such a rope must be of sufficient strength to provide them with safe arrest in the event of a fall.

- 8) Care must be taken to prevent tools and loose objects falling from the slopes. Loose articles should be raised or lowered in a safe manner. They should not be carried up or down ladders unless, in the case of small items, which may be carried in a suitable shoulder bag.
- 9) Any scaffolding that is used must be composed of good quality materials. Scaffolding must be of appropriate capacity and correctly erected by competent workmen.
- 10) Ladders must be in good condition and adequate for the job. Ladders must extend one meter beyond the landing point and must be on a firm base, correctly pitched and lashed as soon as possible.
- 11) If there is any potential hazard to personnel below where the slope work is taking place, adequate temporary warning notices, barriers and “look out” persons need to be employed. Where appropriate standards traffic warning and control measures must be taken.
- 12) Appropriate protective clothing shall be issued, including, where necessary, protective helmets and boots with steel toe caps and slip resistant soles.

Annexure C

Safety in blasting:

Safety in blasting is mostly commonsense with the knowledge of the dangers associated with explosives if misused. Explosives have a wide variety of use in the road construction and development of an accident free routine by the large number of wide-spread centres of use. Because of large potential energy content of explosives and the damage which can result from an accidental detonation, the need for caution in their use must be obvious. The majority of explosives require a severe shock before detonating and consequently can be handled with care. Detonators are most susceptible to accidental initiation from shock or fire although this tendency has been reduced in the recent years. Fire will probably cause detonators to explode and high explosive to burn and possibly explode.

1. Supervision

With any safety programme both training and supervision are vital. The training should impart knowledge of the various explosives and accessories, their use in practice and the routine to be adopted for their correct safe use. Supervision must follow training to ensure that correct procedures are used and safety requirements are strictly enforced. A suitably trained and licensed person must be employed for all blasting.

2. Precautions

The following briefly outlines the fundamental requirements for the use of explosives.

2.1. Storage

This is important not only from the aspects of safety to the general public but also to prevent deterioration of the materials due to heat, cold and moisture. Explosives must be stored in approved magazines which must be securely locked except when removing or replacing stocks. Amongst the storage requirements are:-

2.1.1 A magazine keeper must be appointed and he be made responsible for the upkeep and control of magazine and contents.

2.1.2 A magazine book must be kept in the magazine to enable a check to be made on the issue and receipt of high explosives and detonators.

2.1.3 High explosives and detonators are not to be stored together.

2.1.4 The magazine must be kept clean, dry and cool inside and an area for about 10 m around must be cleared of vegetation and rubbish at all times. The magazine must be efficiently marked.

2.1.5 All explosives not required for immediate use must be kept in the magazine. Explosives and detonators are not to be carried in clothing or left lying about camp sites., or in vehicles.

2.1.6 Ammonium Nitrate does not have to be stored in a magazine but it must be protected from heat and moisture.

2.1.7. AN/FO is a high explosive

2.2 Transport

The transport of explosive between magazine and the job site is a necessary part of most excavation work and must be carried out in a safe manner.

2.2.1 The vehicle must be in sound working condition and effectively marked.

2.2.2 A fire extinguisher must be carried.

2.2.3 High explosives and detonators are not to be carried in the same receptacle.

2.2.4 No smoking is allowed.

2.2.5 Explosives must be not be stored within 15m of drilling and it is advisable to remove all drilling equipment from the site before commencing charge.

2.3 Use.

2.3.1 No smoking is allowed while handling explosives.

2.3.2 A suitable crimping tool must be used when attaching the detonator to the fuse. The fuse must be inspected to ensure that it is not damaged. Safety fuse should be ignited with a fuse igniter and the minimum length of two meters used for primary fuse. In case of misfire with safety fuse one hour must be elapse before any person can enter the firing area.

2.3.3 Wired circuits must be tested for faulty connections, earthed or broken wires in case of wire electric firing.

2.3.4 Detonating fuse is an explosive but is relatively safe in handling and storage. It must be cut with a sharp instrument and must be connected properly.

2.3.5 After holes have been charged access to the area should be properly restricted and no member of the public should be allowed near the holes.

2.3.6 Hard protective hats must be worn by all the personnel associated with the blasting.

2.3.7 An acoustic devise, such as siren, should be used as a warning for blasting.

2.3.8 Suitable sign should be placed where they can be read by everyone.

2.4 Misfires

Misfires are apt to be both dangerous and expensive. They can be avoided by adequate testing and care. In the event of misfire no person should be allowed into the firing area for about one hour in case of fuse firing and ten minutes for detonating fuse.

2.4.1 No explosive is to be removed from the misfire hole.

2.4.2 A misfire hole must not be re-drilled.

2.4.3 In re-firing a misfired hole a check must be made to ensure that there is adequate burden.

2.4.4 In cleaning up broken rock, after a misfire has been treated, un-detonated explosives or detonators must be sought and removed if located.

2.5 Disposal

Explosives tend to deteriorate after a long period particular in hot and moist climate. Such deteriorated explosives must be effectively disposed by controlled burning , detonation in a safe place.

Annexure D

Measures to be adopted during dumping of debris or waste material

- During the site clearance and disposal of debris, the Contractor will take full care to ensure that public or private properties are not damaged /affected, there are no dwellings below the dumpsite and that the traffic is not interrupted. Adequate measure is to be provided to protect the vegetation and habitation down below the dumping site.
- Contractor will dispose off debris only to the identified places (identified and described in EIA report) or at other places only with prior permission of PWD / Engineer (Supervision Consultant).
- In the event of any spoil or debris from the sites being deposited on any adjacent land, the Contractor will immediately remove all such spoil debris and restore the affected area to its original state to the satisfaction of the client and PWD / Engineer.
- The Contractor will at all times ensure that the entire existing stream courses and drains within and adjacent to the site are kept safe and free from any debris.
- Where possible, the vegetation below should be already disturbed, avoiding mature forest to the extent practicable.
- Contractor will utilize effective water sprays during the delivery and handling of materials when dust is likely to be created and to dampen stored materials during dry and windy weather.
- Materials having the potential to produce dust will not be loaded to a level higher than the side and tail boards and will be covered with a tarpaulin in good condition.
- During cutting of hills and disposal of debris, proper warning signs to be installed to the satisfaction of PWD / Engineer.
- Any diversion required for traffic during disposal of debris shall be provided with traffic control signals and barriers after the discussion with local people and with the permission of PWD / Engineer.
- During the debris disposal, Contractor will take care of surrounding features and avoid any damage to it.
- While disposing debris / waster material, the Contractor will take into account the wind direction and location of settlements to ensure against any dust problems.
- Adequate arrangements will be made to ensure that the debris / waste material is disposed off nearest to the designated dumping site. The report on this activity shall be prepared regularly by NGOs / Village Council Presidents (VCPs).

Guidelines for rehabilitation of dumping sites

The dumpsites filled only up to the ground level could be rehabilitated as per guidelines below and to be decided by the Engineer and the Supervision Consultant

- The dumpsites have to be suitably rehabilitated by planting local species of shrubs and other plants. Local species of trees (e.g. bamboo etc.) has also to be planted so that the landscape is coherent and is in harmony with its various components.
- In cases where a dumpsite is near to the local village community settlements, it could be converted into a play field by spreading the dump material evenly on the ground. Such playground could be made coherent with the landscape by planting trees all along the periphery of the playground.
- Some of the dumpsites could be used either for plantation or for growing agricultural produce such as growing agricultural produce such as ginger, turmeric or oranges etc.
- Care should always be taken to maintain the hydrological flow in the area.