



PUBLIC WORKS DEPARTMENT
GOVERNMENT OF MIZORAM

MIZORAM STATE ROAD PROJECT - II
REGIONAL TRANSPORT CONNECTIVITY PROJECT

ENVIRONMENTAL MANAGEMENT
FRAMEWORK

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STUP Consultants Pvt. Ltd

ABBREVIATIONS

AE	:	Assistant Engineer
BSR	:	Basic Schedule Rates
CADC	:	Chakma Autonomous District Council
CSC	:	Construction Supervision Consultant
CPCB		Central Pollution Control Board
DPR	:	Detailed Project Report
E&S	:	Environment and Social
EC	:	Environmental Clearance
EIA	:	Environment Impact Assessment
EMP	:	Environment Management Plan
GoI		Government of India
GRC	:	Grievance Redressal Committee
JE	:	Junior Engineer
LA	:	Land Acquisition
M&E	:	Monitoring and Evaluation
MoEF	:	Ministry of Environment and Forest
MSRP	:	Mizoram State Roads Project
MSPCB		Mizoram State Pollution Control Board
NAAQS		National Ambient air quality Standard,
NE	:	North East
NGO	:	Non-Government Organization
NH	:	National Highways
PCCF		Principal Chief Conservator of Forest
PIU	:	Project Implementation Unit
R&IPDP	:	Resettlement and Indigenous Peoples Development Plan
R&R	:	Resettlement and Rehabilitation
RAP	:	Resettlement Action Plan
ROW	:	Right of Way
SIA	:	Social Impact Assessment
SLAO	:	Special Land Acquisition Officer
SMF	:	Social Management Framework
SPCB		State Pollution Control Board
ToR	:	Terms of Reference
TSU	:	Technical Support Units
U/s	:	Under Section
YMA	:	Young Mizo Association

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Executive Summary

1. Background

The Government of India has requested World Bank for financing rehabilitation, widening and strengthening of State Highways and District Roads which are managed by Public Works Department (PWD) in the State of Mizoram. The proposed improvements are expected to enhance the quality of service level. In line with this request, Mizoram State Roads Project – II is proposed.

Considering the proposed implementation of different corridors under the project, it is felt necessary to upfront define an Environmental Management Framework (EMF) which will: (i) guide the process of preparation of corridor level EA/EMPs as well as institutional structure for better overall environmental management at project level in addition to corridor level specific EMP implementation; and (ii) add to institutional capacity of PWD in streamlining the environmental management aspects within PWD for construction and management of any future road projects. The principles of EMF are based on the regulatory requirements of Government of India and Mizoram, and World Bank Safeguards. The EMF provides the overall framework in the form of a methodology to carry out Environmental Assessment and guidance in to minimize and mitigate negative impacts of the proposed project, preparation of Corridor specific Environmental Management Plans (EMP), and Generic EMPs

2. Project Objective

The Mizoram State Roads Project II (MSRP-II) key objective is to improve existing road connectivity through rehabilitation, strengthening and widening efforts. Such an effort would also lead to incidental benefits of improving the quality of existing connectivity to Bangladesh and Myanmar. The project also envisages enhancing the institutional capacity building of PWD for road construction and maintenance.

As part of the project preparation, about 157 km of existing road length, under Group 1 will be strengthened and upgraded, as they are already designed; and as part of project implementation, design additional 284 km of existing roads under Group 2 for upgradation. The proposed road corridors under Group I and II are given in the table below:

Proposed Project Roads under MSRP II Project		
Group -1	District(s)	Length
i. Lunglei - Tlabung - Kawrpuichhuah	Lunglei	87.9 km, (E-W corridor)
ii. Champhai – Zokhawthar (CZ Road)	Champhai	27.5 km, (E-W corridor)
iii. Chhumkhum-Chawngte (CC Road)	Lunglei	41.7 km, (N-S corridor)
Group – 2		
i. Junction NH44A (Origination) Chungtlang – Darlung – Buarpui	Mamit & Lunglei	83 km
ii. Buarpui – Thenlum – Zawlpui	Lunglei	95 km
iii. Chawngte to BungtlangSouth up to Multimodal Road junction	Lawngtlai	76 km
iv. Zawlpui – Phairuankai	Lunglei	30 km

3. Benefits of the project

Given that the road infrastructure is the only mode transport in the state, the MSRP-II is expected to improve basic access in a remote, hilly, and mountainous region. This will facilitate enabling environment for development and growth by reducing freight and passenger transport costs and providing quicker and safer accessibility. Improvements in road access, capacity, quality, and safety would foster: (a) increased economic and social development; (b) better access to health and education services for a large portion of the State's population; (c) lower cost for goods and services within the State; and (d) improved market access for agriculture-based products. The Project is also expected to result in more effective management of State road assets, which should lead to improved value-for-money for Government of India's (GoI's) and Government of Mizoram's (GoM's) spending on road infrastructure. The roads built and improved under the Project will also provide public amenities such as covered bus shelters and toilets. Usable land will be reclaimed by the controlled and/or safe disposal of excavated materials. Abandoned worker and contractor camp sites and water harvesting structures will be given to the communities for their use after implementation.

The Environmental benefits to be generated by the Project are: (a) improved roads; (b) improved drainage; (c) reduced landslides and soil erosion; (d) increased road safety; (e) recycling of debris and surplus excavated material to create new sites for development and prevent the negative impacts of indiscriminate dumping; (f) afforestation (10 native trees will be planted for each tree lost), enhancing degraded forests; and (g) introduction of "environment sensitized" construction management and machinery and landscaping of the Project's surrounding areas, thus improving the aesthetics.

4. Potential Environmental Impacts

While the project is expected to have significant benefits, potential environmental impacts cannot be ruled out. Unless the project factors necessary measures to minimize and mitigate the potential environmental impacts during construction and post construction phases, the benefits of the project may not lead to sustainable benefits. The nature of potential environmental impacts of the project would include:

(a) Stability of Slopes

The hill road strengthening and widening would involve hill cutting which is expected to affect stability of natural slopes and if unattended could lead to landslides. In case of Mizoram, parts of the hill ranges are weak and vulnerable geological formations. Such areas could be prone to serious impacts including loss of livelihood, safety hazard, blocking of drainage pattern, disruption of traffic and damages to native species of natural flora. Thus, balancing cut and fill as far as possible, and slope protection need to be integrated in to the corridor level designs.

(b) Disposal of Construction Debris

Earthwork along almost the entire up-gradation of project roads will be carried out mostly by cutting on the hillside. Some of the spoil (not more than 10 to 15%) will be utilized and remaining spoil will be disposed in designated disposal sites which will create- Loss of land as disposal sites, Loss of agriculture land, change in land use pattern Loss of biodiversity and block the drainage channels. Given this, the debris need to be put to productive use, which can include: creation of flat in designated community lands, disposal in protected sites with adequate erosion control measures, etc.

(c) Disruption to Natural Drainage System

Construction of roads in the region may modify the overland (surface) flow patterns causing no flow or reduced flow in some natural channels and high/concentrated flow in the others. Such alterations in drainage patterns could affect the community water sources as well stability of slopes. Hence drainage aspects require effective integration in technical designs of the corridor level plans

(d) Impacts on Biodiversity

The proposed road widening activities in these areas could affect the biodiversity in terms of: clearing of land in biodiversity rich areas and/or impacts during construction phase, although land diversion would be limited. Based on environmental screening, it is noted that the Group 1 roads do not disturb any designated and/or critical Natural Habitats

(e) Effects on Water source and water Quality

If the construction activities are not controlled with relevant construction management measures, there would be potential impacts relating to pollution of water sources. Such impacts could arise from activities relating to cutting and filling, disposal of construction waste and spoil, erosion and soil movement due to road construction activities like quarrying and borrowing, etc.

(f) Water for Construction - Storage and Harvesting

Water scarcity in Mizoram during the non-monsoon months is a result of the topography as well as the poor water retention capacity of the soil. Contractor will face serious water scarcity problem which will also affect the local people.

(g) Safety issues associated with road construction

Construction of project roads involves occupational health and safety risks. Accidents may occur during the construction and operation of roads, operation of quarries which will also lead to injuries or loss of property and life.

(h) Cultural and Historical Areas

Cultural and historic sites in the form of grave yards and memorial stones may be threatened by road construction and associated works. It can destroy the sites or alter their character.

(i) Change in land use pattern

The proposed project requires acquisition of Jhum cultivation and limited area of forest spread over different corridors. This agriculture and forest land will change its land use pattern to a limited extent. These changes could impact the socio-economic pattern affecting the livelihood. However, if addressed appropriately through slope protection measures by native terracing methods, the loss of livelihood could be restored considerably. Further in terms of land use, there may not be significant impact except the current Ribbon development all along the road corridors would firm up with the improved road facility.

(j) Cumulative Impacts

Given the nature of construction in hilly areas, the project could lead to cumulative impacts mainly due to construction activities. These include: (i) cutting of slopes could lead to unstabilized slopes, especially given the unconsolidated nature of the hills and could trigger landslides which in turn lead to property damages and loss of agricultural lands on valley side, alteration of drainage patterns, and traffic safety hazard; (ii) if cut slopes and not secured with adequate measures or safe disposal debris is not arranged, there could be serious risk of erosion and pollution of water courses; and (iii) if necessary measures are not put in place, forest diversion could open up areas which could lead to potential risk of logging and forest degradation and impacts on wildlife; . On the other hand, if managed well with a systematic environmental management plans, the project could lead to chain of positive impacts including road safety, creation of flat land using the debris generated, better access and thereby socio-economic development, etc.

5. Need for Environmental Management Framework

The key components of the project includes: (a) widening and strengthening of 157km of Group 1 roads and preparation studies for 284km roads under Group 2 Roads, and (b) institutional development for better road management. The project appraisal requirements agreed with Department of Economic Affairs (DEA), Government of India (GOI), the project preparation envisages completing detailed investment plans and initiation of procurement for **CC Road** and **CZ Road** referred in above table under Group 1. In line with this agreement, the DPRs and independent EAs are nearing completion and the preliminary designs and environmental screening for the third road under Group 1 are completed. It is further agreed that the detailed designs and procurement of implementation contract for the third road (Lunglei - Tlabung - Kawrpuichhuah Road) will be processed post appraisal but before first year of project implementation. In case of Group 2 Roads, the preparation will be completed during the project implementation period. Currently, proposed alignments for Group 1 roads are known, and in case of Group 2 roads, the road links are known but the detailed studies will be completed during project implementation period – preferably during 1st year of project implementation.

Addressing environmental impacts during road construction would be of significant importance given the fragile environment of Mizoram state and proposed project roads have to be subjected

to detailed EAs. EAs prior to appraisal were targeted for the above referred two roads since the design scheduled for these roads initially followed by other roads during implementation. However, in order to address and minimize/mitigate the potential project risks it is essential and prudent to agree on a framework for EAs/EMPs for one of the Group 1 and the Group 2 roads based on understanding of the environmental impacts identified in the context of EAs for CC, CZ Roads as well as broad baseline environmental scenario in Mizoram. Further, a well defined Environmental Management Framework (EMF) will be of relevance to streamline the environmental aspects in PWD road management practices under Institutional Development and Road Sector Modernization component of the project. In this context, EMF is prepared on the basis of environmental baseline, typical impacts due to the project (based on screening of Group 1 roads); and National/State environmental regulatory norms, and World Bank's safeguard policies. Adequate budget has been allocated to carry out EAs for Group 1 roads and preparation of EMF as part of project preparation budgets and the budgets for Group 2 roads are covered under project implementation components.

6. Elements of EMF

The EMF comprises four key elements: (i) overall qualitative assessment of baseline environmental status of project corridors in the larger context of Mizoram, and the expected impacts of the proposed project across the corridors; (ii) "No Regret" and "Gene Environmental Management Measures" which are essential and could be applicable for road construction activities in Mizoram, as well as the environmental regulatory/policy framework under which the project's safeguards need to operated; (iii) a detailed process and protocols to be followed for ensuring adequate EA/EMP preparation, implementation for individual corridors supported by 19 good practice guidance notes; and (iv) institutional framework for effective implementation of EMF document which includes staffing requirements, monitoring and supervision protocols, and training and capacity building requirements.

7. Stakeholder Consultations and Disclosure

While preparing the EMF extensive prior informed consultations in line with OP 4.10 provisions were held with range of stakeholders including, communities along the proposed road corridors, various citizens groups, and Government officials from line departments including PWD, Water Supply, Rural Development, Agriculture, Forest, Pollution Control, etc. The consultations were primarily focus group discussions, interviews, workshops and informal discussions with communities. The preliminary draft prepared based such consultations was shared with the stakeholders in advance and stakeholder consultation workshop was held to discuss the provisions of EMF. Subsequently, based on the feedback in workshop the current report has been prepared. In country disclosure of this report has been completed and made available for general public in all the offices of PWD in the project districts. With regard to preparation of corridor specific investments, the specific EAs/EMPs will be disclosed time to time along with other project documents, complying with World Bank's Access to Information Policy.

8. Institutional Arrangements

Prior to defining the institutional arrangements, a detailed capacity assessment of PWD was carried out and noted that the institutional arrangements for implementation of environmental safeguards are always tied to multi-lateral funded projects. Once the projects are completed the staff involvement is decommissioned though the safeguards management provisions form part of the PWD operations. Given this, the EMF has stipulated the following arrangements for the MSRP II Project and also identified long terms strategy which will be incorporated as part of the PWD institutional set up.

As part of project implementation, a PIU will be set up with an Environment cell headed by Executive Engineer under the Project Director of PIU. The Executive Engineer will be assisted by two Assistant Engineer (AEs) who will be responsible for Group-1 and Group-2 roads. Each AE will be supported by Junior Engineers (JEs). Each road project will have at least one JE during project preparation stage and may be more considering size of the road contract packages. The PIU will be supported by Project Preparation Consultant (PPC) environment team during project preparation stage and by Supervision Consultant's environment team during project implementation stage. The roles of PIU staff include facilitating preparation of EAs as an integral part of the design of project corridors, ensuring all the studies are carried out in an integrated manner with necessary environmental management provisions and regulatory requirements are integrated in construction contracts, provide extensive monitoring and supervision during implementation. The team of environmental specialists is expected to continue environmental management as part of PWDs long term plans. To this effect, the institutional development component of the project will dovetail their role in PWD. The institutional arrangements also include training and capacity building needs

In addition to the above, the extensive network of forest department's human resources in Mizoram state is also proposed to be integrated in to the project implementation arrangements. This will be mainly in terms of keeping the forest department informed about the proposed project implementation schedules, and compliance forest department's conditional protection and mitigation measures which are mandatory to be followed in places where the road passes next to the forested areas and/or areas of forest diversion.

9. Budget for Implementation of EMF Provisions

The estimated budget for EMF implementation is INR 14 million which include PWD staffing and consultants, training and capacity building (including integration of established forest conservation measures and human resources under forest department), monitoring and supervision. These costs are integrated as part of Institutional Development Component of the project.

Chapter-1 PROJECT OVERVIEW

1.1 Background

The “seven sisters” of North eastern India are landlocked states and lag significantly behind the rest of India in terms of income and human development indicators. The State of Mizoram, bordering Bangladesh and Myanmar, is among the poorest states in India. Recognizing the need to share prosperity and promote growth in lagging states, the Government of India in its 2012 budget speech, committed to significant investments in infrastructure development and trade promotion for lagging states, including the landlocked states of the Northeast. In this context, The Government of India has requested World Bank for financing rehabilitation, widening and strengthening of State Highways and District Roads which are managed by Public Works Department (PWD) in the State of Mizoram. The proposed improvements are expected to enhance the quality of service level. In line with this request, Mizoram State Roads Project – II is proposed.

Considering the proposed implementation of different corridors under the project, it is felt necessary to upfront define an Environmental Management Framework (EMF) which will: (i) guide the process of preparation of corridor level EA/EMPs as well as institutional structure for better overall environmental management at project level in addition to corridor level specific EMP implementation; and (ii) add to institutional capacity of PWD in streamlining the environmental management aspects within PWD for construction and management of any future road projects. The principles of EMF are based on the regulatory requirements of Government of India and Mizoram, and World Bank Safeguards. The EMF provides the overall framework in the form of a methodology to carry out Environmental Assessment and guidance in to minimize and mitigate negative impacts of the proposed project, preparation of Corridor specific Environmental Management Plans (EMP), and Generic EMPs

1.2 Project Objective

The Mizoram State Roads Project II (MSRP-II) key objective is to improve existing road connectivity through rehabilitation, strengthening and widening efforts. Such an effort would also lead to incidental benefits of improving the quality of existing connectivity to Bangladesh and Myanmar. The project also envisages enhancing the institutional capacity building of PWD for road construction and maintenance. The Project Implementation Unit (PIU) within the Public Works Department (PWD) of the Government of Mizoram will be the implementing agency for the project. The PIU is located in the capital of Mizoram State, Aizwal.

1.3 Project locations

As part of the project preparation, about 157 km of existing road length, under Group 1 will be strengthened and upgraded, as they are already designed; and as part of project implementation,

design additional 284 km of existing roads under Group 2 for upgradation. The proposed road corridors under Group 1 and 2 are given in the table below:

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Group -1	District(s)	Length
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Group – 2		
i. Junction NH44A (Origination) Chungtlang – Darlung – Buarpui	Mamit & Lunglei	83 km
ii. Buarpui – Thenlum – Zawlpui	Lunglei	95 km
iii. Chawngte to BungtlangSouth up to Multimodal Road junction	Lawngtlai	76 km
iv. Zawlpui – Phairuangkai	Lunglei	30 km

The proposed road works involve widening and improvement of existing roads for which centre would be altered depending on the availability of Right of Way (RoW). The Group-1 road alignments have been finalised, while Group-2 corridors are identified but the feasibility of existing alignments for the proposed works would be assessed as part of project implementation activities. Thus, the proposed EMF is primarily based on environmental information from Group 1 roads. However, the overall EA considerations encompass the regulatory framework and the application of World Bank Policies will be for Group 2 corridors as well. It is proposed to develop these roads to 2-lane National Highways standard (roadway width of 12m – comprising 2-lane carriageway width (7m) and shoulders of 2.5m on either side of the carriageway with optimization of road shoulders in sensitive ecological areas, if encountered). Upgrading of project roads will be undertaken mostly on hill side. Bypasses and realignments have been considered to avoid adverse impacts in view of linear settlements along the road and also to address safety concerns. As mentioned above, as part of the project implementation, the identified road corridors under Group 2 will be subjected to detailed feasibility studies and detailed designs including corridor level Environmental Screening and detailed Environmental Assessments.

1.4 Summary of Identified Project Activities with Potential Environmental Risks

Based on the proposed road configuration, screening and environmental assessment of Group 1 roads, and the following proposed project activities are identified, which could cause potential environmental impacts. These activities would be typical in nature and applicable for road upgradation activities in Mizoram

- (a) Realignment / Diversion of the roads for geometric improvements through hill cutting, especially in case of box cuts and in places of unconsolidated geological formations
- (b) Disposal of Excess earth from hill cutting, after efforts for balancing cut and fill
- (c) Realignment / Diversion of the roads through prime agriculture lands in plains and Jhum cultivation areas in hill slopes
- (d) Realignment of roads into forested areas
- (e) Realignment of sharp Zigs and hair pin bends
- (f) Blasting
- (g) Extraction of material and resources including road construction material and from quarries, ground/surface water for construction
- (h) Establishment of construction facilities such as Hot mix plants, workers camp sites, etc.

1.5 Anticipated adverse Social impacts

Based on the preliminary surveys and interactions with the various stakeholders including communities in the project area, the following adverse social and economic impacts are envisaged:

- Loss of agricultural, homestead, commercial land
- Loss of trees, crops;
- Loss of structures used for residential, commercial and other purposes e.g. cattle shed, poultry shed, etc.;
- Loss of livelihood i.e., loss of livelihood due to impacts on sources of earning;
- Loss of other properties and assets such as boundary walls, hand pumps, water pipes, ponds etc.;
- Loss of common property resources
- Likelihood of increased accidents due to road widening due to faster movement of vehicles;
- Construction stage impacts leading to temporary disruptions or permanent damages to assets
- Likelihood of increase in HIV/AIDS due to influx of outsiders during construction

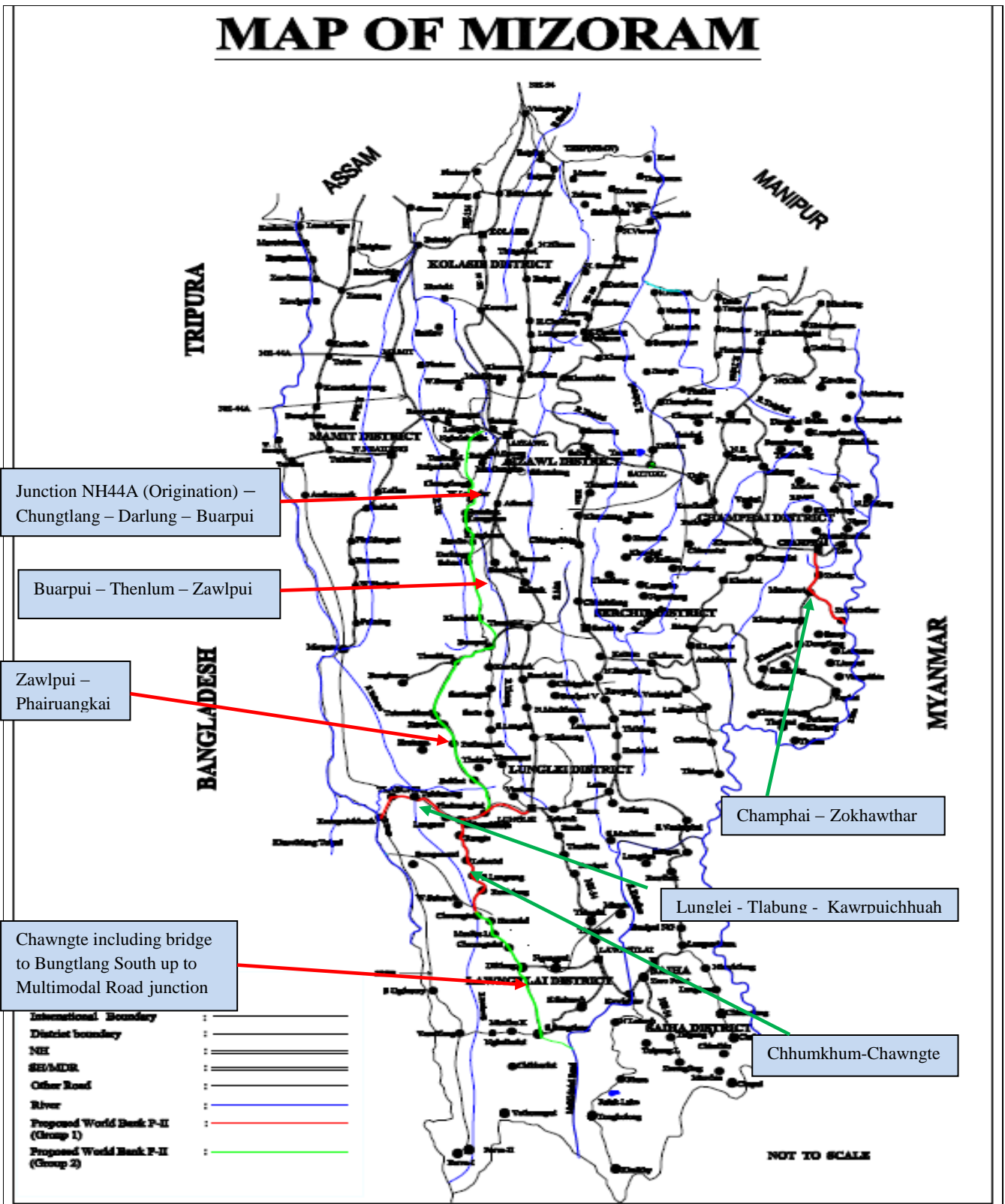


Fig 1-1: Map of Mizoram showing MSRP-2 project roads (Group1 and 2)

CHAPTER-2 BIOPHYSICAL ENVIRONMENT & SOCIOECONOMIC BASELINE OF THE PROJECT AREA

The intent of this chapter is to ascertain typical nature of baseline conditions relevant for the road projects and such information has been utilized in drawing the broad framework to set the boundaries for corridor specific detailed Environmental Assessments. The baseline information presented in this chapter is based on the detailed site visits and collection of primary data from the Group 1 of the projects roads as part of the environmental screening, and relevant information collected through secondary sources of information for the broader project area, including Group 2 roads as well as qualitative information for Mizoram State.

In such a situation, where sub-projects traversing multiple districts are located different parts of the state with almost similar geographical, topographical and socio-economic conditions, base line bio-physical environmental status will be almost similar.

2.1 Meteorological baseline

Temperature

In the Project region the climate is generally pleasant with summer temperatures ranging between 18° C to 32°C, and winter temperatures between 8° C to 24° C.

Rainfall

The annual rainfall in the region ranges between 1700 mm to 3300mm spread over eight to ten months. Main raining months are – May to September. In other months rainfall is sporadic. In the southern part of Mizoram, the rainfall is higher and decreases towards the north. Following Table 2-1 shows the rainfall in the project area of Aizawl and Lunglei districts.

Table 2-1: Rainfall in Project Districts

S.No	Districts	Rainfall (mm)	
		2010	2011
1	Aizawl	2025.90	2306.00
2	Lunglei	3023.00	3326.00

Source: Statistical Handbook Mizoram – 2011

Relative Humidity

Relative humidity in the dry season is 60 –70% and in the monsoon period is about 90%. During southwest monsoon, February to April is comparatively dry when humidity is between 60 –70%.

2.2 Natural and biophysical environment

Physiography

The topography of the region is largely immature except for the eastern part. There are N-S trending mostly anticlinal strike ridges with steep slopes and narrow intervening synclinal valleys and series of parallel hummocks or topographic highs. The elevation difference between the hilltops and the valley floors greatly varies from west to east and range from 200 to 600 meters. Locally the ridges display en-echelon pattern. (Refer map 2.1)

Drainage

The project region is hilly with precipitous slopes forming deep gorges culminating into several streams and rivers. The other surface water bodies in the project districts are - ponds, streams, springs and waterfalls. There are several rivers, streams in the region. In the north, the Tlawng (Dhaleswari), the Tuirail (Sonai) and the Tuivawl start from the middle of Mizoram and flowing north fall in the Barak River in Cachar district in Assam. In the south, the Karnafuli flows north from the southern tip of the state and from near Kawrpuichhuah in West Central Mizoram, it flows to Bangladesh. The Tiau and Koladyne River enters Mizoram from Burma and near Lunglei it takes a U turn and re-enters Burma again. (Refer map 2.2)

Soil Types

The project area has mostly residual soils weathered from shale. Red soils predominate with thin patches of Laterite over the higher ridges. The soils in general, have been derived from parent rock such as ferruginous sandstone, shale, alluvial and colluvial materials. In general, the soil formations in the project regions have been categorized into following groups.

- (a) Hill Soil: It includes colluvial soil, formed along the steep side slopes because of accumulation of material on slope surface.
- (b) Valley Soil: Occurs as a mixture of colluvial and alluvial materials. It is restricted to the rolling valleys along the river courses.
- (c) Terrace Soil: These are the remnants of deposits of cobbles and pebbles which make it excessively drained

Incognizant practice of Jhum cultivation, deviating from the traditional method is leading to further degradation of the soil productivity. This is also affecting forest coverage, biodiversity and contributing to soil erosion. (Refer map 2.3)

Geology

The general geology of the area mapped exhibits repetitive succession of Neogene sedimentary rocks of Surma Group and Tipam Formation. Barail Group of rocks is found in and around Champhai subdivision, Aizawl district and Bhuban Formation exposed in the west. Barail Group comprises a monotonous sequence of shale interbedded with siltstone and hard compact, thinly bedded, grey to khaki, fine grained sandstone. Locally they include minor bands of weathered, micaceous felspathic sandstone. These sequences are folded into a series of approximately N-S trending longitudinal plunging anticlines and synclines which may results in to tectonic movements and leads to slope instability and landslides. (Refer map 2.4)

Hydrogeology

Ground water occurs under confined and unconfined conditions in sandstones, sandy shales etc. In the northern and north western part of the State, the relief is much subdued. Recent study suggests that there is good scope of tapping ground water in the riverbeds with sumps connected to infiltration galleries.

Ground Water resources can be categorised on basis of their occurrence as shallow aquifers such as wells, hand pumps and deep aquifers such as tube wells or bore wells. Water table along the corridor is reported to be low in dry seasons. Many of these hand pumps are seasonal in nature and bear water only during the rainy season when the water table is relatively high.

Geomorphology & Landslides

Geomorphology of the study area is characterized by presence of weathering products of typical thickness between 4m and 10m on original hilltops, material usually being shale and siltstone. Geological setting of the corridor is closely observed and it is divided into Geomorphological zones based on the characteristics of the geological formations. These zones will be explained broadly on basis of the geological setting of the up-gradation corridors in EA report.

The topography of region is geologically immature. There are N-S trending mostly anticlinal strike ridges with steep slopes and narrow intervening synclinal valleys with series of parallel hummocks or topographic highs. The other landforms are dissected ridges with deep gorges, spurs, keels, etc. Faulting in many areas has produced steep fault scarps.

Landslides are closely associated with the tectonically active Himalayan regions, and can be considered as the most common natural hazards which lead to damage in the road sector and residential areas in the region. The vulnerability of human settlements to landslide is continuously increasing due to concentration of population and developmental activities in urban and rural areas. There are several records of severe landslide disaster within project districts during the last two decades. More landslides recorded in N-S project districts in comparison to the E-W districts, this is due to the variation in geological nature of the terrain.

Seismicity

As stated earlier, the project region is part of Northeast India, which is seismically one of the six most active regions of the world. The complete project alignment falls in Zone V of the seismic zoning classification of India (Refer map 5.5). Though the region is not reported to have any earthquakes, but has experienced many shocks/tremors due to earthquakes occurring in the neighbouring region till recent past. As the project regions are in active seismic region and potential high hazard region there is high potential of tectonic movements which may lead to slope instability, landslides and damage to the bridges and other structures. (Refer map 2.5 and 2.6)

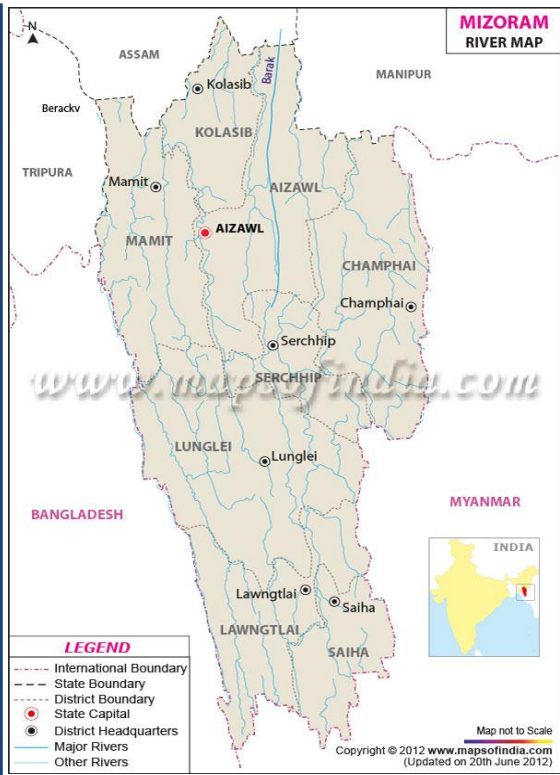
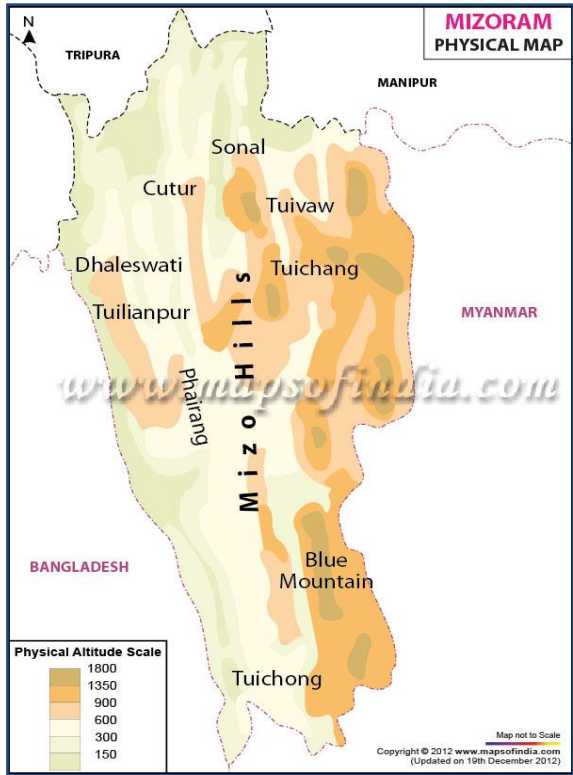


Fig 2.1: Physiographic map of Mizoram

Fig 2.2: Drainage map of Mizoram

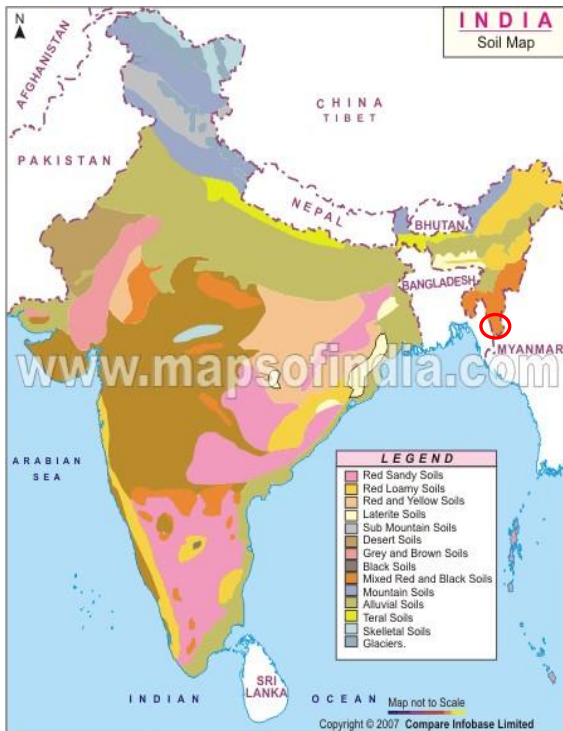


Fig 2.3: Soil map of India showing Mizoram

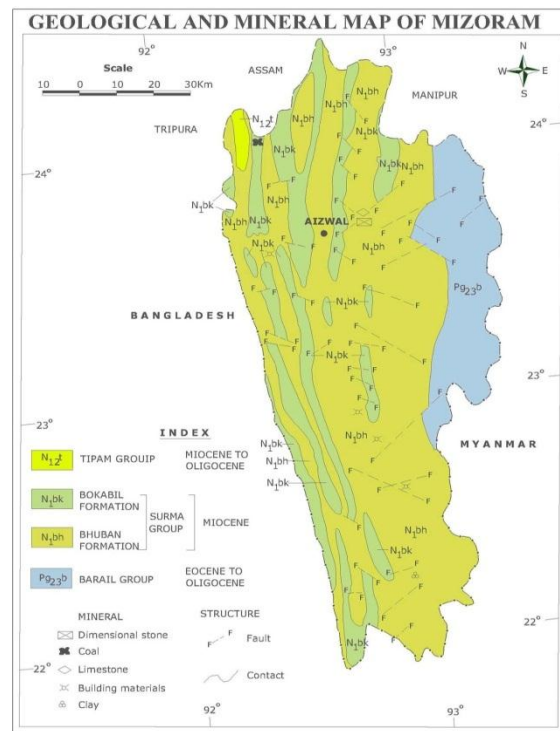


Fig 2.4: Geological map of Mizoram

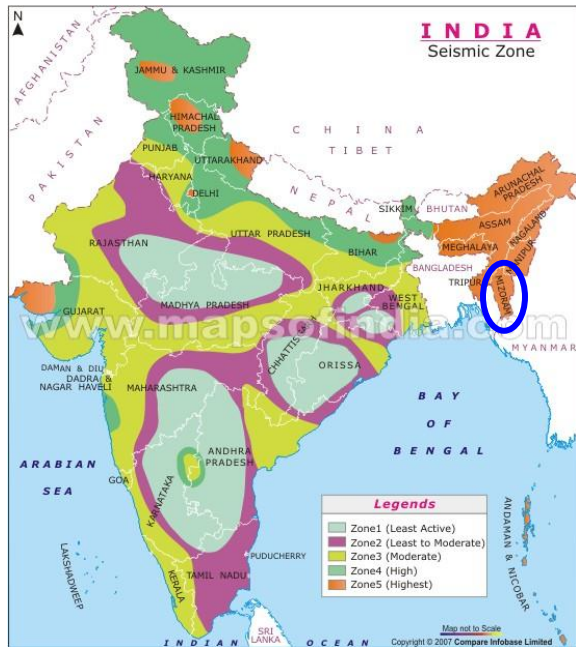


Fig 2.5: Map showing seismic zones of India

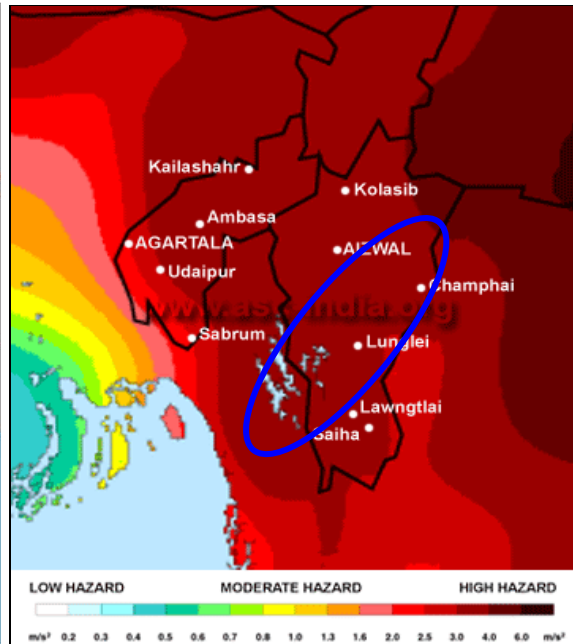


Fig 2.6 Hazard map of Mizoram

Air Quality

Being an industrially backward state with no major polluting sources, in terms of air quality, the ambient air quality in the project region is generally pristine. Low traffic volumes along the existing roads also point to lower pollutant concentrations even when close to the roads. The results of air quality monitoring conducted by consultant indicate that the ambient air quality is within the acceptable limits¹ in the project region.

Ambient Noise Quality

The results of noise quality monitoring conducted by consultant indicate that the noise levels vary from silent (<34 dB(A)), below detectable level to about 56 dB (A). The reasons for low / noise levels are:

- Project road alignment has limited traffic.
- Sparse density of population, lesser activities.
- No industries in the project area.

There is no other source contributing to the noise level. All the observations were within the prescribed limits of residential zone as per National Ambient Noise Standards, CPCB Government of India.

¹ National Ambient air quality Standard, GOI (NAAQS) 1994/2011

2.3 Biological / Ecological Environment

The project-districts are situated within the tropical belt having the tropical wet evergreen, mix deciduous forest and other wild plants. Some parts of the area near the project corridor are still covered with thick forest. However, the project corridor alignment passes through mostly the area where shifting cultivation or jhuming cultivation is still in practice. That means the project corridor traverses frequently cultivated jhum land, mostly bamboo and secondary vegetated areas managed by village councils and and riverine forests.

Forest Resources and Protected Areas

The forests in the project districts are classified as – National park, Wild life Sanctuary, Reserve forest, protected forest and village forests. Forests cover has been categorized into open forest, moderate dense forest, very dense forests. Forest types in the project districts are - tropical semi evergreen forest ,tropical moist deciduous forest, sub-tropical pine forest and sub tropical broad leaved forest .(Refer fig 2.8)

None of the project roads taken up as part of group -1 roads pass through reserved forests, wildlife sanctuaries or national parks but pass through small patches of village plantation forests.

Table 2-2: Wild Life Protected Areas of Mizoram

PROTECTED AREAS: 1240.75 sq.km. (5.88% of the geographical area of the State)

Sl. No.	Name of Protected Areas	Area in sq.km.	District	3	Forest Type	4	P
						ect route in 5 km area of influence	
1	Dampa Tiger Reserve	500	Mamit	5 6	Sub tropical Semi evergreen	7	None
2	Murlen National Park	100	Champhai	8 9	Sub Tropical Semi evergreen	10	None
3	Phawngpui National Park	50	Lawngtlai	11 12	Sub montane Tropical Forests	13	None
4	Ngengpui Wildlife Sanctuary	110	Lawngtlai	14 15	Sub Tropical, Semi Evergreen	16	None
5	Khawnglung Wildlife Sanctuary	35.75	Lunglei	17	Sub montane	18	None
6	Lengteng Wildlife Sanctuary	60	Champhai	19 20	Sub tropical Forest, Semi Evergreen Forests	21	None
7	Tawi Wildlife Sanctuary	35	Aizawl	22 23	Sub tropical Forest, Semi Evergreen		None

8	Thorangtlang Wildlife Sanctuary	50	Lunglei	24 25	Sub tropical Semi evergreen	None
9	Pualreng Wildlife Sanctuary	50	Kolasib	26	Sub tropical Forest, Semi Evergreen Forests	None
10	Tokalo Wildlife Sanctuary	250	Saiha	27	Sub tropical Forest, Semi Evergreen Forest	None

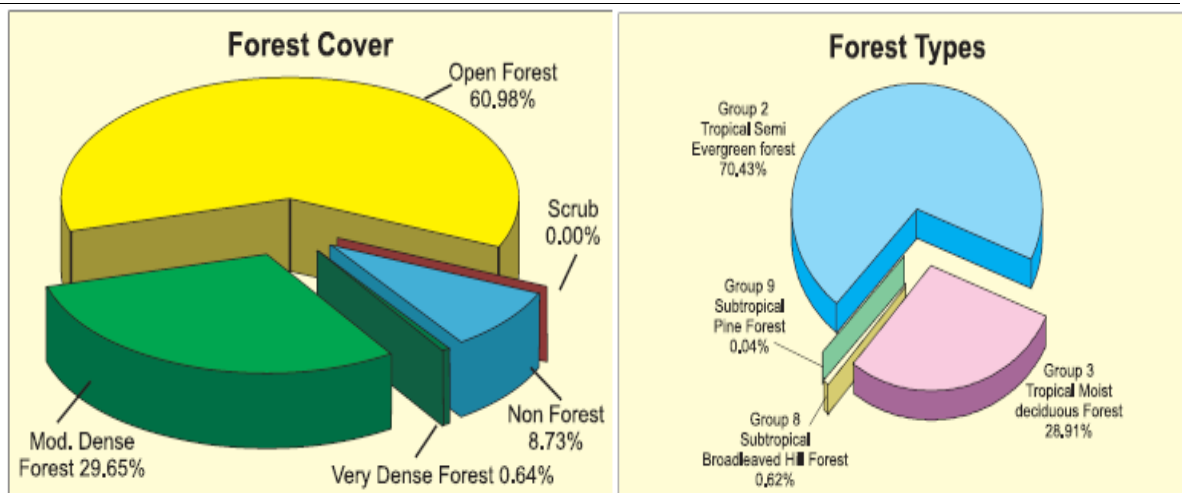


Fig 2.7 Forest cover and forest types in project districts (Source: India state of forest report, 2011)

Biodiversity

Mizoram has important areas of biological significance having gene pools of a variety of flora and fauna, which is a characteristic of north-eastern states of India. To assess the biodiversity richness along the up-gradation corridor, an assessment was carried out by a team of botanists and ecologists. Though degraded, areas of ecological relevance have been identified in the Group -1 road projects. These are neither designated Natural Habitats nor any such areas located within the direct influence zone of the project activities. However, it is important to assess the impacts proposed project roads from cumulative impacts point of view and the same has been addressed as part of detailed EAs for specific corridors.

Rare and endangered flora and Fauna

Following flora and fauna has been identified as rare and endangered during the biodiversity assessment of the Group-1 roads –

Tree Fern, “*Cyathea spp*” -The endangered tree fern was found in clusters along the project corridors. Endangered species of Orchids, *Dendrobium sp.*, *Vanda sp.*, *Aerides sp.* were found to be present along the project corridors.

Threatened and Endemic Plants reported in the project influence area have been attached as Annexure-1 of this report.

No endangered fauna have been reported in the project area of Group -1 road. Sub project road wise detail assessment will be done during EA preparation.

Medicinal Plants

The state is rich in medicinal plants and herbs. The biodiversity survey of the Group-1 roads identified 41 species/genera of medicinal plants. The project area is having wild medicinal plants.

Animal migratory route

No animal movement route or migratory route has been reported in the Group -1 project roads.

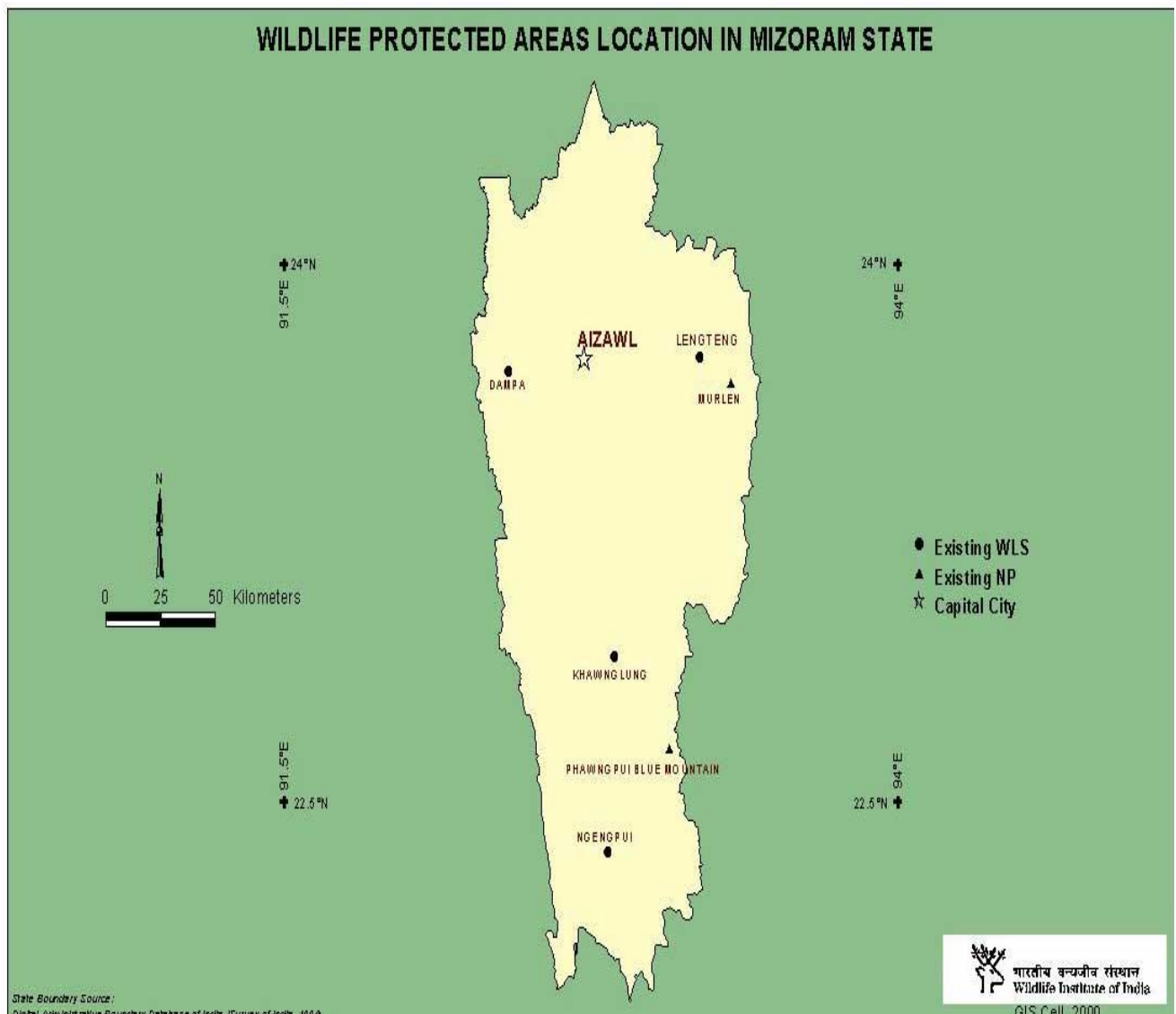


Fig 2.8 Protected areas of Mizoram

Agro-biodiversity

Agriculture is the mainstay in Mizoram, with about 70% of the population dependent on agriculture. Main products are – rice, ginger, citrus Banana and vegetables. Shifting cultivation (Jhum) in Mizoram is cultivation on a periodic cycle on the hilly slopes, over a traditional 8-year cycle. With the increasing pressure on land, the jhum cycle has come down to 3 or 4 years. In the areas along the up-gradation corridor, vast stretches of land are under Jhum cultivation. Larger areas are lying fallow. To a conservative estimate, 70% of the area abutting the road is under Jhum cultivation. The remaining area is unfit for such cultivation, either as the slope is unsuitable, or as the area is inaccessible. Loss of Jhum land will have impact on agriculture production in the region.

Prime agriculture land

Champhai valley land – are the prime agriculture land. These types of land are only present in Champhai valley. These are only irrigated land in Mizoram and used for Paddy production throughout the year and produce paddy three times in a year. Loss of prime agriculture land will have impact on rice production of Mizoram.

River valley land are also prime agriculture land and used for paddy production. Loss of riverine prime agriculture land will have impact on rice production of Mizoram.

Loss agriculture land not only effects the agriculture production but also will affect the biodiversity of the region

2.4 Cultural environment

Archaeological/Protected Monuments and Cultural Properties

No archaeologically² significant property or site exists along the Group-1 project roads.

Cultural properties in the form of memorial stone in different shape have been noticed adjacent to the existing roads which are memorial stones. In addition, there are several structures as graves located within the formation width for the road apart from which there are lands belonging to church etc., which will be impacted. The details of the same will be provided in EA report.

2.5 Socio economic profile of Project districts

Mizoram is the cradle of diverse communities like the Lusei, Ralte, Paite, Bete, Powi, Lakher, Hmar, Riang, Tlanglau, Pangs, Bawm, Bru, Chakma and others. They are mostly of Mongoloid race. The entire population is designated as “Scheduled Tribes”, as per Schedule VI of the Constitution. The Mizos are a close-knit society with no class distinction and no discrimination on grounds of sex. Ninety percent of them are cultivators and the village exists like a big family. Christianity is predominant religion of the state. Birth of a child, marriage in the village and

² Indian Archeological sites and Monument Act 1948/1994

death of a person in the village or a community feast arranged by a member of the village are important occasions in which the whole village is involved.

The inhabitants of the project districts are mostly Christians followed by Buddhists, Hindus, Muslims and others. As per Census 2011, it has a population of 1097206 comprising 50.61% male and 49.39% female populations. The sex ratio stands at 976 indicating substantial difference between male-female populations. The decadal growth of population was 23.48% during 2001-2011. The population in the age group of 0-6 years constitutes 15.36% of the total population. The Scheduled Caste population comprises 0.11%, whereas tribal population constitutes 94.43% of the total population. The population density is 52 persons/ sq. km as compared to 382 persons/ sq. km at national level (Census 2011). The literacy rate (91.33%) of Mizoram is one of the highest in the country. In Census 2011, gender wise literacy rates were 47.22% (male) and 44.11% (female), implying a difference of 3.11%. Workers constitute 44.36% of the total population. Of the total workers, main workers and marginal workers comprise 85.27% and 14.73% respectively. Among main workers, those engaged in agricultural activities comprise 55.18%. Non-workers constitute 55.64% of the total population indicating high dependency ratio. Urban population of Mizoram is more than 50% and a large majority of urban population are residing in Aizawl.

Livelihood opportunities prevalent in rural areas are limited to agriculture and other primary activities e.g. piggyery, poultry, Bamboo. Lack of infrastructure facilities has constrained growth and diversification of alternative livelihood opportunities. The project is likely to boost access to markets, increased trade and thereby enable diversification of livelihoods.

2.6 Places of tourism and unique landscape

The Places of tourism and unique landscape in the project districts are given in below table. None of these areas would be affected by the proposed project corridors. The benefits could be improved tourism

Place	Tourist interest
Reiek village	About 30 kms to the West of Aizawl sprawls a prominent mountain on which Reiek village is located. At Reiek, a typical Mizo village consisting of the distinctive traditional huts
Champhai	Champhai is a commercial town located near Myanmar border. The breezy hills around here are lush and strewn with beautiful rhododendron blossoms. Within a few kilometers away are some villages of historical significance where the age-old Mizo way of life is still preserved.
Zokhawthar	Zokhawthar, the border township through which the Indo-Myanmar trade is being conducted The town is also a convenient base for trekking and visiting landmarks and historical places in the vicinity including Rih Dil, the legendary lake located 5 kms within Myanmar which is associated with the Mizo Animist religion of yore.
Rih lake	The legendary lake is believed to have been the inevitable passage that spirits of the dead crossed on their way to their future abode known as Mitthi Khua. Some even believed it was the final abode of the spirits.
Phawngpui	The highest peak in Mizoram, Phawngpui or the Blue Mountain is situated near the state's south-eastern border overlooking the bend of the mighty Chhimtuipui River and the hill ranges of Myanmar.

Lunglei

An engraved image of Buddha found near Mualcheng village, about 50 kms from the town remains an enigma till date since no other Buddhist relics has been found elsewhere in the state.



Photographs 2.1 : Landslides along the Champhai Zokhawthar road



Photographs 2.2 : Forest and riverine forest on project roads



Photograph 2.3: Some Graveyard stones along Champhai – Zokhawthar road



Reiek village



Typical mizo village at Reiek



Photograph 2.4 : Some tourist places in project districts :Phawngpui & Rih lake

CHAPTER 3: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

Based on the baseline environmental parameters quality ascertained, a quick environmental screening has been carried out for the Group 1 roads to understand the nature of impacts. Such an exercise was carried out to determine the needs of the detailed EA for the entire project and also set out the framework for conducting EAs as well as to implement the EMPS with relevant institutional framework. The screening also revealed that the project need to be classified as Category A requiring detailed EAs. This is based on the review of findings from the preliminary and detailed screening exercises. The following sections of the framework summarize possible environmental issues and their impact that have been predicted and could arise for other subproject roads during implementation of the road projects.

3.1 Potential Environmental Issues and Impacts

Environmental Screening of Group 1 Roads

Main Environmental sensitive features of the Group-1 roads are summarized in following table-

Table 3.1 Environmental sensitive features of Group-1 roads

Roads	Environmental sensitive features/sites
Champhai – Zokhawthar	<ul style="list-style-type: none"> • Loss of 0.28 ha of forest land at Ch Km9.300 to Km9.530 • High hill cutting at diversions at Km 7+640 to Km 9+200 and Km 17+050 to Km 24+300 • Generation of 2.7 million M³ of spoil due to cutting of which 30% could be utilized for filling • Land slide risk zone –at Km. 8+700 , Km. 8+900, Km. 9+400,Km. 14+900Km 15+300,Km 15+500 Km 15+900,Km16+300,Km. 18+600,Km 19+200, Km 22+800 • Loss of 12.6 ha prime agriculture land 35 ha jhum and other land • Loss of champhai valley land – 4 ha at km 0+000 to km 2+530 of spur road • Loss of agriculture land along Tiau river at km 19+400 to km 23+700 • Blasting of rocks – at hard rock area from km 3+700 to 7+700 .i.e. 4km length • Impact on graveyards- at Km 3+200, Km 5+450 Km 10+500, Km 16+ 600 and Km 16+ 600
Lunglei - Tlabung - Kawrpuichhuah	<ul style="list-style-type: none"> • Loss of 22.59 ha of forest land <p>Riverine Forest (RF) - 18.53 ha in</p> <p>Phairuang RF Area- km 29.700 to km 35.100 Tuichawng RF Area- km 60.800 to km 63.700 Khawthlang-Tuipui RF km74.00 to km 77.900 and km 85.600 to km 87.842</p> <p>Forest Plantations: 4.06 ha at km 20.830 to km 21.750, km 44.000 to km 44.430 and km 63.940to km 65.970. The above losses to be compensated for afforestation as per regulatory norms.</p> <ul style="list-style-type: none"> • Loss of 100 ha of jhum and other land • And High hill cutting at diversions at Km 0.000 to 7.000, Km 12.00 to Km 15.00, Km 52.45 to Km 56.20, Km 70.95 to Km 73.65, and Km 85.00 to 99.80.

	<ul style="list-style-type: none"> • Generation of 9.0 million M³ of spoil due to cutting • Land slide risk zone –at 88+100,72+450, 41+300, 41+600, 40+200, 39+600 to 40+000, 39+100, 36+200 33+600,31+100, 23+600, 14+100 , 13+900 • Blasting of rocks – at hard rock area from km 3+200 to 5+700 , 22+400 to 23+100, 39+200 to 41+300,82+250 to 83+300i.e 6km length
Chhumkhum- Chawngte	<ul style="list-style-type: none"> • Loss of 3.85 ha of forest land Loss of forest plantation area at km13.500 to 15.500 and km 25.840 to km 27.05 • Loss of 54 ha of jhum and other land • High hill cutting at diversions at 41+300 to 41+600, 40+300 to 40+500, 39+000 to 39+400, 36+200 to36+600, 33+600 to 34+000,31+000 to 31+ 300, 23+23+600, 14+100 to 14+300, • Generation of 1.02 million M³ of spoil due to cutting • Land slide risk zone –at 88+100,72+450, 41+300, 41+600, 40+200, 39+600 to 40+000, 39+100, 36+200 33+600,31+100, 23+600, 14+100 , 13+900 • Blasting of rocks – at hard rock area from length 12+ 250 to 12+850 i.e. 600m length

Potential environmental issues/ risks identified include-

- Loss of forest land which is not attached to any designated Natural Habitat
- Loss of agriculture land
- Change in land use pattern
- High hill cuttings which could lead to safety hazards
- Generation of huge amount of spoil
- Land slide risk zones
- Blasting of rocks which could lead to safety and slide hazards if not done scientifically
- Loss of graveyards if alternative alignments are not put in place.
- Loss of water harvesting structures

3.2 Generic/Typical Environmental Impacts Expected due to the Project

Based on the overview of baseline environmental status in representative areas of the project, and the expected impacts identified through environmental screening, the following section presents the generic/typical environmental impacts expected due to the project. Effort is also made to identify different types of possible cumulative impacts, while the actual assessments of such impacts can be better addressed at corridor level EAs. This section also provides summary of possible approaches to aggregate the issues such that a common framework can be derived for assessing the impacts and address the same during planning, construction and operation of the roads.

An effort is also made to identify construction approaches and practices that are more sensitive to natural environment than others. In mountain terrain gradual widening, i.e. construction of narrow track in the first year and widening later provides opportunity to natural stabilization of the slopes and growth of vegetation. This helps to control slope failure and soil loss in the hills

and mountains. Similarly, use of labor and hand tools instead of heavy machinery and blasting will lessen the chances of instability and soil loss. Balancing cut and fill and other construction methods and practices that incorporate soil and vegetation conservation aspects are desirable. The road construction approach in the project region should give due consideration to the above aspects and use precautionary and mitigation measures wherever possible.

Instability, Landslide and Soil Erosion

Instability, landslide and soil erosion are the major environmental impacts associated with road construction in project districts. This is particularly due to hilly and mountainous terrain and weak and vulnerable geological areas. The problem generally results from interaction between water flow and soil, both of which are disturbed by road construction. The situation gets worse if vegetation is also cleared. Fresh cut slopes and embankments are relatively more vulnerable to landslides and soil erosion, particularly due to improper water management in the vicinity. During the construction period, instability, landslides and soil erosion problems may result because of:

- Steeper cut and fill (embankment) slopes and their construction qualities
- Haphazard disposal of construction spoils
- Unsuitable locations of quarry sites and borrow pits
- Rash quarrying and borrowing activities
- Construction carried out in rainy season without proper water control and drainage facilities; and
- Improper construction methods which leave soils exposed unnecessarily, etc. During the operational phase the instability, landslides and soil erosion result not only from the road and its structures but also from the activities of road neighbors.

The common causes of the problem are:

- Deficiency of or improper drainage structures,
- Modification of water paths leading to concentrated flows (may also be caused by blocked ditches),
- High gradient in cut or fill slopes, and
- Cleared areas which have been left without re-plantation.
- Improperly disposed construction spoil may worsen this situation.

Cumulative Impacts: Consequences of landslides and soil erosion not only affect the safety and serviceability condition of roads but also have chain effects on the farmers (loss of crops or farmland), land (degradation due to silt/debris deposition), water (degradation of quality), river and streams (change in regime), vegetation (loss and impact) and on other infrastructures like reservoirs (silting).

These problems may be avoided by choosing the right alignment, reducing the area of ground clearance, re-plantation in the slopes promptly and their routine maintenance, controlling speed and volume of water flows, etc.

Type, size, frequency and location of the landslides and mass movement are important information needed for their control and management. It is necessary to periodically check the conditions and effectiveness of protective measures in use and reasons of mass movement.

Loss of Natural Habitat and/or Critically Endangered Areas

One of the project roads requires diversion of forest land which is not a designated Natural Habitat or Wildlife Sanctuary or critically endangered areas. Table 2.2 under Chapter 2 confirms that none of the project corridors pass through or near to any designated wildlife (especially tiger) sanctuaries and/or national parks. However, the estimated forest loss is about 27 ha of forest land for widening of the Group-1 roads. Similarly Group-2 roads may also require diverting forest land forestland. Although these forests do not belong to biodiversity and or national parks, there could be indirect impacts on forest resources. Given this, the government has elaborate procedures to permit diversion and requires at least twice the area as compensation with relevant provisions to afforest such areas. These provisions need to be addressed by PWD. In addition, there should be necessary measures to be devised (dovetailing forest department protection measures) to prevent logging, poaching/trade of wildlife

Measures that may be employed to avoid/minimize such pressure are the establishment of barriers to control entrance to forest areas, strict enforcement of environmental work-code, reduction of human dependency on forest or forest resources, supply of alternate energy such as kerosene, bio-gas, micro- hydropower, etc. Similarly, preparation of land-use plan that incorporates environmental sensitive locations of at least the environmental influence corridor and strict adherence to the same can help to preserve the forest and wildlife.

Change in land use pattern

It is estimated that 203 ha Jhum land and 27.03 ha forest land is required only for Group-1 roads. This agriculture and forest land will change its land use pattern. This type of impact is also expected for Group-2 roads. The existing ribbon development along the project corridors will continue, though there will several impacted road side settlements which need to be addressed as part of the Resettlement Action Plans. Otherwise the loss of productive areas would lead to direct impacts on communities as well as indirect/cumulative impacts relating socio-economic factors

Disruption to Natural Drainage System

Construction of roads in the project districts may modify the overland (surface) flow patterns causing no flow or reduced flow in some natural channels and high/concentrated flow in the others. The actions that result in such modifications are diversion of or obstruction to the natural drainage system. In many cases, the speed of water flow may be increased. Road may also disrupt or alter sub-soil drainage, for example, road cut may intersect water-table. Interruption of sub-surface flow may be indicated by the seepage on the exposed road-cut surfaces. This may cause significant changes in the sub-surface flow leading to reduction in/drying-up of local spring flow or may cause instability in the cut slope. Road drainage and excavation can lower

the water table, while embankment and structures can raise the water table by restricting the natural flow.

Cumulative Impacts: The changes in flow of surface water and ground water may lead to a variety of consequences like increased bank-cuttings, inundation of areas which were normally not inundated (flooding), creating water-logging in some areas, non-availability of water in other areas, scouring and siltation of streams, instability, erosion, deterioration of soil and vegetation, loss of water for drinking and agriculture use, etc. These changes in turn can have substantial effects on natural vegetation, fish, wildlife and human. These chain effects extend well beyond the immediate vicinity of the road.

Some common problems likely to be encountered in project district roads are termination of road drains on agricultural land which gets damaged by silt and gravel deposits, flooding of farms and settlements because of inadequate number of culverts and their improper placing (particularly in valley region and in the upstream side of the embankments).

It is, therefore, advisable that natural drainage patterns be left undisturbed as far as possible. Whenever it is necessary, appropriate mitigation measures and drainage works such as flow reduction measures, settling basins, intercepting drains, energy dissipaters (like cascade), etc. be provided. A well-designed road drainage system in MSRP-2 can also improve the surrounding environment by retaining water for human and nature benefits or by reducing floods or/and by draining out the unhealthy stagnant water.

Effects on Water source and water Quality

Uncontrolled construction activities such as cutting and filling, disposal of construction waste and spoil, erosion and soil movement due to road construction activities like quarrying and borrowing, etc. cause increase in turbidity/silt content of streams and rivers. Improper sanitation of workers in camp or local inhabitants may also pollute water, particularly drinking water sources. Surface water may be polluted by road run-off containing oil, grease, lubricants and other chemical spills. Other water pollution sources include wastewater generated by the new activities (hotels, industries, settlements) and bad sanitation practices (open field defecation, discharging wastewater into water bodies, dumping solid wastes into or near to the water bodies, etc.).

The construction camp, if needed, should be provided with appropriate waste disposal and sanitation facilities in order to avoid such pollution. Typical effect of water pollution could be health hazards to the downstream water users. Water may become unfit for bathing, drinking, animal consumption, irrigation, etc. or effect on fish and other aquatic life. Increased silt content could also cause unnecessary sediment deposition in downstream which causes the rising of river beds resulting floods in downstream areas.

Protection measures that may be used are soil erosion control measures, construction of settling basins, good house-keeping of construction activities, reuse or controlled

disposal of oil/grease/chemicals, precaution to avoid accidental spills, controlling of open-field defecation and restricted entrance to drinking water sources.

Implication on Public Health

Stagnant water bodies created due to road construction such as borrow-pits and quarries may become breeding sites for disease vectors. This may contribute to increase in number and type of disease vectors and incidence of water-related infectious diseases. Increased movements of people (from or to outside) may introduce new diseases to the area (particularly, communicable diseases like Tuberculosis, VD, AIDS, etc.).

Dust raised by construction activities and blown by air may pose health risks to the workers and inhabitants near the road alignment. Construction practice should employ dust control practices/measures and construction activities should be scheduled taking this into account.

Gathering of people and contact among them may lead to transmission of various infectious/communicable diseases. Regular health check-ups help to detect and control transmission of such diseases. Timely and appropriate landscaping, filling and draining of stagnant water can avoid or reduce chances of water-borne infectious diseases while public awareness is important in the control of STD.

Air and Noise Pollution.

Air pollution due to vehicle emission and noise are generally not major issues in these project roads since the traffic volume is extremely low. However, the dust raised and blown by vehicles may significantly pollute the air in the areas adjacent to construction sites or earthen/gravel roads. Direct effects of dust could be health hazards to road workers, residents adjacent to road and/or interference on plant/crop growth in the vicinity. Careful management of construction sites, storage of construction materials, management of road surface and simple dust control measures like water sprinkling in sensitive places can reduce this problem.

Safety issues associated with road construction

Construction of project roads will involve occupational health and safety risks. Accidents may occur during the construction and operation of roads causing injuries or loss of property and life. Some common reasons for accidents in road works include high hill cutting, unsafe excavation, collapse of trenches, injuries from unsafe tools/equipment, lack of protective clothing, debris falling from hill slopes, inappropriate disposal of construction wastes, etc. Similarly, traffic operation may result in accidents because of careless driving, inadequate traffic signs, inappropriate road standards and designs, natural disasters, etc.

Cultural and Historical Areas

No such cultural, historical and heritage sites have been noticed along the Group-1 project roads except some graveyards and memorial stones. Road may result in illegal occupation or encroachment of the culturally and historically important areas or the land belonging to these sectors. On the other hand, the increased accessibility may attract visitors to these areas which

encourage better use, care and conservation of the same. Road development works should, wherever appropriate, include measures to protect such sites.

Induced Roadside Development and Social conflicts

Road attracts people to migrate to roadside (from outside the area or local people). It may lead to development of new settlements or old settlements may become larger. Temporary houses or sheds built during the construction period may become permanent and continue to be used during the operation period also. Road generally stimulates ribbon settlement along its alignment. Establishment of industries, increase in commercial activities may lead to the increase (or in some cases decrease) in land values (adjoining and others).

Operation of road may bring about changes in the agricultural practices, productivity, crop-variety, etc. and land-uses (increase in built-up areas, decrease in agricultural areas, forest areas, etc.), farmers' livelihood and may also encourage tourism. The induced changes are not necessarily limited to the immediate vicinity of the road route. Both positive and negative social and environmental consequences are possible from such changes.

Road construction activities may cause damage or increase risks to the communities living in the right-of-way or in the vicinity. Special precaution is required at the time of construction if such risk is unavoidable. Location of and activities at construction camps may also create problems and conflicts. Where construction camps are necessary, the sites should be properly located from social point of view and they should be carefully managed. The activities of workers living in the camp or working in the project may create social conflicts. To avoid conflicts, alcohol consumption and other socially unacceptable activities should be controlled. Adequate efforts should be made to maintain social harmony and co-operation among the workers and local residents.

While some of the project corridors are expected to improve the incidental benefit of increased cross border trade, there could be some negative impacts such as conflicts, influx of migrants etc.

Impact on Aesthetic Qualities

Roads in the region can be visually attractive or unsightly depending on its physical layout within the surrounding landscape and how far the attention is given to detailed designs, road-side planting and maintenance. Road can result in landscape distorted by cuts, quarries, slides, etc. These will lead to depreciation and loss of scenic values and sites, view points, etc. Road induced activities may lead to the generation and mismanagement of wastes (solid and liquid) in the roadsides and create scars on the landscape. Proper and controlled disposal of construction wastes and use of good- house-keeping are some ways which can help maintain good aesthetic qualities. Construction of road may cause loss of or encroachment to unique geological and geographical sites, natural beauty spots and scenic sites and sites of scientific interests.

3.3 Anticipated adverse Social impacts

Based on the preliminary surveys and interactions with the various stakeholders including communities in the project area, the following adverse social and economic impacts are envisaged:

- Loss of agricultural, homestead, commercial land that would be required for project purposes and also for purpose of debris disposal;
- Loss of trees, crops;
- Loss of structures used for residential, commercial and other purposes e.g. cattle shed, poultry shed, etc.;
- Loss of livelihood i.e., loss of livelihood due to impacts on sources of earning;
- Loss of other properties and assets such as boundary walls, hand pumps, water pipes, ponds etc.;
- Loss of common property resources such as: i) land (shifting jhum land/fallow land) and ii) to structures (religious places, graveyard, public conveniences, stairways (flight of steps), foot paths, village gates, passenger shelters, rural market sheds, etc.);
- Likelihood of increased accidents due to road widening due to faster movement of vehicles;
- Construction stage impacts leading to temporary disruptions or permanent damages to assets e.g. cutting of slopes may trigger landslides causing damage to assets and/or loss of access in hilly sections; and
- Likelihood of increase in HIV/AIDS due to influx of outsiders during construction

3.4 Positive Impacts/Project Benefits

- The proposed Project Development Objective is to improve existing connectivity, and to provide safe hill roads. The improved connectivity is expected to enhance the accessibility to agricultural markets and thereby improve socio-economic status of the region. The improved accessibility is also expected to generate incidental benefits of improving cross-border trade with better quality of connectivity with Bangladesh and Myanmar. Overall, the project will enhance transport connectivity between this isolated state with the rest of the national economy.
- The rehabilitation/major maintenance of parts of the core road network will address cumulative impacts arising due to poorly maintained road network, leading to landslides and thereby affecting the connectivity as well as agricultural produce in hill slopes.
- Significant social benefits in the form of better access to basic amenities and services including health, public distribution, etc.;
- Improvement in the capacity and effectiveness of the Mizoram Public Works Department (PWD) to deliver comprehensive road sector services

The Project will improve basic access in a remote, hilly, and mountainous region. Investing in road infrastructure, the only mode of transport within the State should create the necessary enabling environment for development and growth by reducing freight and passenger transport

costs and providing quicker and safer accessibility to all parts of the State and beyond. Improvements in road access, capacity, quality, and safety should foster: (a) increased economic and social development; (b) better access to health and education services for a large portion of the State's population; (c) lower cost for goods and services within the State; and (d) improved market access for agriculture-based products. The Project is also expected to result in more effective management of State road assets, which should lead to improved value-for-money for Government of India's (GoI's) and Government of Mizoram's (GoM's) spending on road infrastructure. The roads built and improved under the Project will also provide public amenities such as covered bus shelters and toilets. Usable land will be reclaimed by the controlled disposal of excavated materials. Abandoned worker and contractor camp sites and water harvesting structures will be given to the communities for their use after implementation.

The Environmental benefits to be generated by the Project, which include cumulative benefits are: (a) improved roads; (b) improved drainage; (c) reduced landslides and soil erosion; (d) increased road safety; (e) recycling of debris and surplus excavated material to create new sites for development and prevent the negative impacts of indiscriminate dumping; (f) afforestation (10 trees will be planted for each tree lost), enhancing degraded forests; and (g) introduction of "environment sensitized" construction management and machinery and landscaping of the Project's surrounding areas, thus improving the aesthetics.



Photographs 3.1: Tiau river riverine agriculture land and Champhai valley agriculture land - will be impacted



Photographs 3.3: Water Points along the project road of Group-1 - will be impacted



Photographs 3.3: Land slide during construction in some roads in the project region

3.5 Generic Environment Management Plan

Most of the expected impacts due to the project are typical in nature and many of these impacts relate to pre-construction preparation, construction, and post-construction maintenance. Also such impacts can be addressed through: (i) well defined preparation of corridor level technical designs to minimize impacts; (ii) good construction practices and protocols; and (iii) better management of maintenance practices. In view of this, a Generic Environmental Management Plan is prepared which will be applicable to all the corridors, in addition to corridor specific EMPs. Table 3.2 below presents Generic EMP with supporting guidelines attached with the report in the form of Annexures 1 to 19

Table-3.2: Generic Environmental Management Plan

Environmental issues /category	Potential Problem	Prevention	Minimization	Mitigation Measures
Slope stability	Landslides or other forms of mass instability on the slopes Development of erosion or gullyng Road crosses major areas of deep- seated instability	Review and modification in design to minimize and avoid such areas.	Geological investigation to identify such locations and avoid disturbing such areas.	<ul style="list-style-type: none"> • Slope of the hill side cut shall not be higher than those suggested in DPR • All areas of cutting shall be covered with vegetation. • Bioengineering techniques as appropriate shall be undertaken at all vulnerable locations. • A combination of bio-engineering techniques and hard engineering solutions at locations vulnerable to landslides shall be provided, based on the suitability at site, as decided by the geotechnical expert of the engineer. • Measures taken to avoid undercutting of slope toes. • Quarrying prohibited in river beds, where flood discharge is significant
Disposal of excavated soil	High volume of waste/spoil Spoil tipped away from designated areas Spoil failing or being washed on the farmland	Change in design to minimize the cutting to minimize the spoil and to minimize the need of dumping site.	Reuse of cut material for road construction, As fill materials, for embankments, the sub grade of the existing pavement shall be used as embankment fill material. , filling, construction of play field and village markets	<ul style="list-style-type: none"> • The disposal of debris shall be carried out only at sites identified for the purpose. (Refer annexure 2&3) • Slope of the disposal side shall not be higher than those suggested in DPR • All slopes of the site shall be covered with vegetation. • Bioengineering techniques as appropriate shall be undertaken at all vulnerable locations.(Refer annexure-4)A combination of bio-engineering techniques and hard engineering solutions shall be as toe walls, shall be provided
Blasting of rocks and associated cumulative impacts	Land slide Accident and Loss of life Damage to water body Air pollution and noise pollution problems Health Safety problem Impact on flora and fauna	Control blasting should be part of contract document.	All the statutory laws, regulations, rules etc., pertaining to acquisition, transport, storage, handling and use of explosives shall be strictly followed.	<ul style="list-style-type: none"> • Only control Blasting shall be carried out. • Blasting shall be carried out during fixed hours (preferably during mid-day), • The timing should be made known to all people within 500m (200m for pre-splitting) from the blasting site in all directions.

Environmental issues /category	Potential Problem	Prevention	Minimization	Mitigation Measures
Loss of forest land	Loss of trees and biodiversity Disturbance to wildlife	Change the design or modify the design to avoid or to save forest and biodiversity rich area.	Avoid the forest land biodiversity rich area and try to minimize the COI in such area to use minimum forest land with analysis of alternatives of the alignment	<ul style="list-style-type: none"> • Compensatory forestation as per GOI rule and as per direction of Forest Department GOM, issued during forest clearance. • Bamboo fencing shall be erected to delineate the area rich in biodiversity as identified. • Drains will be provided in the area to prevent exposure to contaminated run-off during the construction phase. (Refer Annexure-5) • Introduction of exotic species will be prevented in the roadside plantation for such stretches.
Loss of agriculture land	Reduction in agriculture production Impact on food security Depreciation and loss of scenic values and sites	Change the design or modify the design to avoid or to save agriculture lands.	Avoid the agriculture area and minimize the COI in such area to use minimum land with analysis of alternatives of the alignment	<ul style="list-style-type: none"> • Fencing shall be erected to delineate the agriculture land from further damage during construction. Drains will be provided in the area to prevent entry of contaminated run-off during the construction phase. • Law enforcement to protect the agriculture land
Extraction of stone from Quarry	Pollution, disturbance and danger from quarry operations Safety risks from abandoned quarries Land seriously disturbed or lost from production Quarries continue to be used by unauthorized persons	Material should be taken only from quarries licensed by the SPCB	Use existing quarries and minimize opening of new quarries. Existing quarries should have an environmental due diligence report before using for the project.	<ul style="list-style-type: none"> • The Contractor shall obtain materials from quarries only after consent of the Department of mining or other concerned authorities and only after development of a comprehensive quarry' redevelopment plan. Alternatively the Contractor shall acquire the required material from quarries licensed by the SPCB. The quarry operations shall be undertaken within the rules and regulations in force.
Water management	Contamination of water resources Scour and erosion	Plan the water demand during construction. Identify the source of water	The Contractor may use the natural sources of water subject to the provision that any claim	<ul style="list-style-type: none"> • While working across or close to the Rivers, the Contractor shall not prevent the flow of water. • Contractor to serve notice on the downstream users of water sufficiently

Environment al issues /category	Potential Problem	Prevention	Minimization	Mitigation Measures
	below unprotected drainage out falls Disruption of drinking or irrigation water	which will not create any conflict with local people. Modify the design to minimize the damage on drinking water collection points	arising out of conflicts with other users of the said natural source shall be dealt with entirely by the contractor. The contractor will minimize wastage of water in the camp and worksite	in advance. <ul style="list-style-type: none"> • Construction over and close to the non-perennial streams shall be undertaken in the dry session. • Construction work expected to disrupt users and impacting community water bodies will be taken up after serving notice on the local community. • Mattresses check dams and other protection measures constructed as necessary. • Cascades constructed, to be as long as necessary. • Reconstruction and enhancement of drinking water collection points
Impact on Cultural and historical areas	Damage to the memorial stones Damage to the graveyards	Change in alignment to save the structures without compromising the safety , technical and financial aspect of the project	All necessary and adequate care shall be taken to minimize impact on cultural properties.	Structures if impacted are to be shifted in suitable location in consultation with local people.
Stone crushing & asphalt plants	Dust and noise pollution	Use dust control measures Use noise barrier	Plants should be located as per guideline given in annexure – guideline for camp location	<ul style="list-style-type: none"> • Use water sprinkler to suppress dust • Plants re-sited or compensation arranged if pollution is caused. • Large earth bunds constructed and vegetated to reduce hazard.
Camp operation	Pollution from work and labor camps Laborers cut trees for firewood Land remains damaged after construction	All measures suggested in camp operation guideline should be implemented. Ensure NOC from state pollution control board.	Minimize the wastage of water Ensure proper sanitation in the camp Regular monitoring of health and hygiene in the camp	<ul style="list-style-type: none"> • Checks to ensure that camps are not polluting neighboring areas, especially from sewerage and rubbish disposal • Gas / Kerosene stoves and gas / kerosene provided to laborers. • Checks to ensure camp areas are fully restored, including re-top soiling and tree planting if appropriate.

Environmental issues /category	Potential Problem	Prevention	Minimization	Mitigation Measures
Hazardous materials	Spills, leaks or injuries from any type of hazardous material (e.g. bitumen, cement, paint, explosives, fuels, lubricants)	All measures suggested in camp operation guideline related to storage and handling of hazardous material should be implemented. Ensure NOC from state pollution control board.	Minimize the wastage of hazardous materials Proper storage of hazardous material as per GOI guidelines.	<ul style="list-style-type: none"> • Checks to ensure that storage is good and that there are no losses or leaks. • Checks to ensure that protective clothing and safety measures are used.
Dust and noise	<p>Dust generated from construction works</p> <p>Dust from a road with an earth or gravel surface</p> <p>Noise from large work sites</p>	Ensure dust suppression measures incorporated in EMP and BOQ	Regular sprinkling of water in construction area.	<ul style="list-style-type: none"> • Speed controlled using speed bumps. • If water is available, the road surface can be sprayed on a frequent schedule • Permanent speed bumps installed in villages and bazaars to reduce traffic speeds in inhabited areas. • Bitumen surface constructed in bazaars, with speed controls. • Dense vegetation planted on roadside • Large earth bunds constructed and vegetated to reduce noise. • Work schedule to minimize disturbance.

CHAPTER 4 - REGULATORY FRAMEWORK

This section is provided as a reminder that all activities under the proposed project must be consistent with all applicable laws, regulations, notifications that are relevant in the context of the proposed project interventions. It is the responsibility of the various Project Implementing Entities to ensure that proposed activities are consistent with the regulatory/legal framework, whether national, state or municipal/local. Additionally, it is also to be ensured that activities are consistent with World Bank's operational policies and guidelines.

4.1 Key Applicable National Laws and Regulation – Project Preparation Stage

The following paragraphs highlight some salient features of select laws, which have a particularly important bearing on the design and implementation of the proposed project. A summary of such applicable rules and regulation is furnished in the table below:

Table 4-1 Summary of Environmental Legislation Applicable to the Proposed Project roads

Act	Year	Objective	Responsible Institution
Environment (Protection) Act.	1986	To protect and improve the overall environment	MoEF, CPCB
Notification on Environment Impact Assessment of Development projects (and amendments) (referred to as the Notification on Environmental Clearance)	2006 2009 2010 2013	To provide environmental clearance to new development activities following environmental impact assessment	MoEF,
Wildlife Protection Act	1972	To protect wild animals and birds through the creation of National Parks and Sanctuaries	MoEF
Water (Prevention and Control of Pollution) Act (and subsequent amendments)	1974	To provide for the prevention and control of water pollution and the maintaining or restoring of wholesomeness of water.	CPCB
Air (Prevention and Control of Pollution) Act (and subsequent amendments)	1981	To provide for the prevention, control and abatement of air pollution, and for the establishment of Boards to carry out these purposes.	CPCB and Road Authorities
Forest (Conservation) Act	1980	To protect and manage forests	MoEF
Central Motor Vehicle Act Central Motor Vehicle Rules	1988 1989	To control vehicular air and noise pollution. To regulate development of the transport sector.	State Transport Department
Ancient Monuments and Archaeological Sites and Remains Act	1958	Conservation of Cultural and historical remains found in India.	Archaeological Dept. GOI and Govt. of Mizoram

Act	Year	Objective	Responsible Institution
The Land Acquisition Act	1894 & 1989	Set out rule for acquisition of land by Government.	Land and Revenue Dept.GOI
Noise Pollution (Regulation and Control) rules 2000	2001	Noise pollution regulation and controls	MOEF/CPCB
Ramsar Convention on Wetlands of International Importance	1971	Sustainable utilization of wetlands and conservation of wetlands	MOEF/SPCB/ state fishery dept.

4.2 Key Applicable State level Laws and Regulation – Project Preparation Stage

The state level legislation in the environment and Social sectors of relevance to the projects are-- **Environmental conservation and protection**

- Assam Forest Regulation of 1891.
- The Mizoram (Forest) Act, 1955 (as passed by Mizo District Council).
- The Pawi Autonomous District Council (Forests) Act, 1979.
- The Lakher Autonomous District Council (Forests) Act, 1981.
- The Chakma Autonomous District Council (Forests) Act, 1992.
- Mizoram Wildlife (Protection) Rules, 1990.

Quarrying and Blasting

Mizoram Minor Minerals Concession Rules 2000

Land and Revenue Administration

- The Liushai Hill Districts (House Site) Act 1953;
- The Mizo District (Land & Revenue) Acts, 1956;
- The Mizo District (land & Revenue) Rules, 1967;
- The Mizo District (Agricultural Land) Act, 1963;
- The Mizo District (Agricultural Land) Rules, 1971, and;
- The Mizo District (Transfer of Land) Acts, 1963.

4.3 Key Statutory Clearance Requirements - Pre- Construction stage

GoI Requirements- Environment clearance

EIA Notification on Environmental Clearances (September 14, 2006) -According to this, latest gazette notification, there are two categories of projects via, category A and Category B.

Category A project is cleared by the Ministry of Environment and forests at central level (Expert Appraisal Committee or EAC constituted by MOEF)) and the category B project

will be cleared by the State Environmental Impact Assessment Authority (SEIAA) constituted by MOEF at State level.

With regards to the eco-sensitive roads, there is no change in the notification. This means that even if the project comes under Category B projects, if it passes through eco-sensitive areas then it will have to undergo GOI-MOEF clearance at central level.

Present projects are State Highway projects and State Highway expansion projects, so as per EIA notification, 2009 and 2013 –Road expansion on hilly terrain (above 1,000m AMSL) has been categorised as category “B” project and requires prior environmental clearance from the State level Expert Appraisal Committee (SEAC), Government of Mizoram. In Group-1 road Champhai –Zokhawthar and Lunglei – tlabung road need Environmental clearance from Expert Appraisal Committee or EAC constituted by MOEF (Refer annexure-

GoI Requirements- Forest clearance

As per Forest (Conservation) Act 1980- diversion any amount of forest land for non forest purpose and cutting of trees need prior clearance from State Forest department and GOI forest department depending on the size of the land need diversion as –

Forest area	Forest clearance authority
Forest area < 1 ha	State PCCF
Forest area up to 5 ha	State PCCF with approval from Regional MOEF office
Forest area 5 ha to 40 ha	Regional MOEF office
Forest area > 40 ha	MOEF ,GOI

Construction Stage

During the construction stage, some of the key statutory requirements that need to be obtained by the Contractor as part of mobilization have been listed in the table given below.

Table 4.2 Key Statutory Clearances to be obtained by the Contractor

S.No.	Clearance Required for	Statute under which clearance is required	Statutory Authority
1	Hot mix plants, Crushers and Batch Mix Plants	Air (Prevention and Control of Pollution) Act, 1981 and Noise Pollution (Regulation and Control) Rules, 2000	State Pollution Control Board
2	Storage, handling and transport of hazardous materials	Hazardous Waste (Management and Handling) Rules, 1989 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board

S.No.	Clearance Required for	Statute under which clearance is required	Statutory Authority
3	Location/ layout of workers camp, equipment and storage yards	Environment Protection Act, 1986 and Manufacturing, Storage and Import of Hazardous Chemicals Rules, 1989	State Pollution Control Board
4	Quarries (in case of opening of new quarries)	Environment Protection Act, 1986	Dept. of Mining; Concerned District Administration
5	Discharges from Labor Camp	Water (Prevention and Control of Pollution) Act, 1974	State Pollution Control Board
6	Permission for withdrawal of groundwater for construction	Environment Protection Act, 1986	State Ground Water Board
7	Permission for sand mining from river bed	Environment Protection Act, 1986	Irrigation Department; Concerned District Administration
8	Disposal of bituminous wastes	Hazardous Waste (Management and Handling) Rules, 1989	As per state norm/ Local Civic Body

4.4 World Bank Policies

The World Bank's environmental and social safeguard policies (ten of them) are a cornerstone of its support to sustainable poverty reduction. The objective of these policies is to prevent and mitigate undue harm to people and the environment in the development process. These policies provide guidelines for the identification, preparation, and implementation of programs and projects. The following operational policies are relevant in context of the Project from an environmental viewpoint:

Table 4-3: Applicable Safeguards Policies of the World Bank

WB Policy	Description	Status	Applicability	Measures to be incorporated
Environmental Assessment OP 4.01	This policy is triggered if a project is likely to have significant adverse environmental impacts in its area of influence. For category A projects, a comprehensive EIA is required with emphasis on integrating environmental measures in project planning, design, implementation and operation	Triggered	The project may have impacts on the environmental components such as on water bodies, trees, and hill slopes.	Application of EMF in project planning, DPR preparation and project implementation. Integration of EHS requirements in standard bidding documents will provide enabling mechanism for required enforcement.
Natural Habitats OP 4.04	This policy supports the protection, maintenance and rehabilitation of natural habitats. The Bank doesn't finance projects that involve the conversion of designated critical Natural habitats.	Triggered	While Group 1 roads do not pass through and/or affected designated/critical Natural Habitats, the possibility cannot be ruled out in case of Group 2 roads	Development of environmental screening tool and conduction of the said exercise to determine the nature and magnitude of impacts on sensitive and ecologically critical areas. Appropriate measures to deal with such findings, including exclusion of some project roads, as may be necessary.
Forestry OP 4.36	Policy covers all projects that affect natural or planted forests, whether positively or negatively.	Triggered	Some projects are in close proximity to or traverse forest areas and would need forest land diversion.	Avoidance and/or minimization of forest uptake by appropriate methods in the engineering design; Forest Clearances prior to award of works; Use of EMF to address impacts as necessary; Compensatory Afforestation.
Physical Cultural Resources (OP 4.11)	Defines physical cultural resources as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance.	Triggered	Some corridors are likely to be in close proximity to sensitive cultural properties	Avoidance and/or minimization of impacts on such structures by appropriate methods in the engineering design; Structures may be relocated in consultation with local people and mitigation measures in EMP to minimize the impact. Use of EMF to address impacts as necessary;

Access to Information Policy Requires PWD to conduct consultations at various stages of the project and also disclose the EA instruments for the project

4.5 Environmental, Health, and Safety (EHS) Guidelines

Environmental issues during the construction and operation of roads are similar to those of other large infrastructure projects involving significant earth moving and civil works and their prevention and control recommendations are presented in the General EHS Guidelines. These impacts include, among others, construction site waste generation; soil erosion and sediment control from materials sourcing areas and site preparation activities; fugitive dust and other emissions (e.g. from vehicle traffic, land clearing and movement, and materials stockpiles); noise from heavy equipment and truck traffic; and potential hazardous materials and oil spills associated with heavy equipment operation and fuelling activities. This guideline contains the followings -

- Environmental issues specific to construction and operation of roads
- Occupational Health and Safety Guidelines
- Community Health and Safety
- Performance Indicators and Monitoring

EHS guideline stated above will be applicable for this project and will be part of the contract document.

4.6 MORTH and IRC Specifications

All road works in Mizoram are to be in accordance with the MORTH specifications for Road and Bridge works and guidelines of Indian Roads Congress (IRC). The MORTH specifications have special provisions towards protection of environment under Clause 501, Annexure A and the contractor is to satisfy the provisions. Apart from the Annexure A to clause 501, there are provisions for control of erosion, drainage, dust suppression, borrow area and haul road management under relevant sections.

4.7 Other Applicable Laws – Labour Laws

Environmental issues during road construction stage generally involve equity, safety and public health issues. The contractor will be required complying with laws of the land, which include inter alia, the following:

- Workmen's Compensation Act 1923
- Contract Labour (Regulation and Abolition) Act, 1970
- Minimum Wages Act, 1948
- Payment of Wages Act, 1936
- Equal Remuneration Act, 1979
- Child Labour (Prohibition and Regulation) Act, 1986
- Inter-State Migrant Workmen's (Regulation of Employment and Conditions of Service) Act, 1979

- The Building and Other Construction Workers (Regulation of Employment and Conditions of Service) Act, 1996 and the Cess Act of 1996
- The Factories Act, 1948
- Hazardous Wastes (Management and Handling) Rules, 1989
- Chemical Accidents (Emergency Planning, Preparedness and Response) Rules, 1996

4.8 Applicability of Regulations/Policies

The applicability of any of the national/state level regulation and World Bank safeguard policy needs to be ascertained separately for each sub project/road considered in the MSRP-2 as each law/rule/regulation has its own legal implication and process for compliance. The regulatory framework as described in this EMF as serves as a guiding document and a quick point of reference on the applicable regulatory framework.

Each of the proposed candidate roads identified till date for inclusion in the project has already been screened from this perspective. However, the precise applicability of the regulations will ultimately depend on the location, proposed intervention and design of the sub-project and this will be determined during the detailed (sub-project specific) environmental assessment exercise.

Should there be any changes in the provisions in the various acts rules or notifications enacted by the Government of India/concerned state Government during the course of implementation of the project, then compliance to the amended rules and regulations as applicable on the sub-projects will become mandatory.

4.9 Other Relevant Technical Guidance Materials

The guidelines endorsed by MoEF for the application of Environmental Protection Act, 1986 for highway projects (including the Environmental Impact Assessment Guidance Manual for Highways, February 2010) and World Bank's operational policies on environment shall be adopted/followed for the environment screening, conducting EIA and preparing/implementing the EMP. Other relevant technical guidelines applicable to this project are-

- IS: 5182-1977 - the methods of measuring air pollution
- IS: 3028-1980 for measurement of noise emitted by moving road vehicles;
- IS: 4758-1968 for measurement of noise emitted by machines;
- IS: 10399-1982 for measurement of noise emitted by stationary road vehicles
- IRC: SP: 21-1979 - Manual on Landscaping of roads and its subsequent revised versions
- Roads and the Environment Handbook, World Bank, 1997.

4.4 Identification of Gaps Between National Policies and Relevant Bank safeguard Policies

National Policy	WB Policy	Comparison	Addressed in EMF
Notification on Environment Impact Assessment 2006 for Development projects (and amendments) and Environment clearance EC	Environmental Assessment OP 4.01	WB policy categories this project as category A project for which EA has to be prepared for each road. As per GOI one of the project roads require EIA clearance. Though others do not require EIA, forest clearances and consents from Pollution Control Board are must.	Considering the impact and ecological sensitivity of the region EA along with EMP report will be prepared for each project road.
Wildlife Protection Act 1972.	Natural Habitats OP 4.04	This policy supports the protection, maintenance and rehabilitation of natural habitats. The Bank doesn't finance projects that involve the conversion of designated critical Natural habitats. GOI also do not support conversion of natural habitat but allow road development through protected areas with proper EMP.	There is need for diversion of protected forest which are not designated and/or critical natural habitats. Project legally has to compensate for afforestation During EA details of the protected areas and biodiversity rich areas within core influence area to be considered.
Forest (Conservation) Act 1980	Forestry OP 4.36	WB Policy covers all projects that affect natural or planted forests, whether positively or negatively. GOI forest act consider notified forest land and road side trees.	Forest land required for road widening and diversion of existing need to be assessed and clearance from Forest department need to be obtained. Compensatory afforestation should be proposed.
Environment Impact Assessment notification 2006	Access to Information policy	The WB policy requires the borrower to consult Project Affected People and local NGOs through the various phases of the project: before EIA TORs are finalized and when the draft EIA is available. As per GOI notification disclosure of the EA is done by SPCB before the Public hearing for EC. The project stretch which donot require EC , EIA is not disclosed. But then liable to provide information under RTI Act 2005.	EA for all roads will be disclosed as per WB policy. Public hearing will be conducted by SPCB for all roads which require EC
Ancient Monuments and Archaeological Sites and Remains Act 1948 and 1984	Physical Cultural Resources (OP 4.11)	Defines physical cultural resources as movable or immovable objects, sites, structures, groups of structures, natural features and landscapes that have archaeological, paleontological, historical, architectural, religious, aesthetic, or other cultural significance. GOI policy deals with Conservation of notified Cultural and historical remains found in India which has been notified by GOI or State Government .	Change in alignment to save the structures without compromising the safety is necessary All necessary and adequate care shall be taken to minimize impact on properties / structures which has attachment with local people sentiment.

CHAPTER 5: ENVIRONMENT MANAGEMENT FRAMEWORK AND ENVIRONMENTAL MANAGEMENT - APPROACH AND TOOLS

5.1 Environment Management Framework (EMF) for MSRP-II

The intent of Environmental Management Framework (EMF) is set the processes and mechanisms to be followed for addressing the safeguards requirements for MSRP-II Project. The EMF is prepared based on: (i) filed level information on baseline environmental scenario, the expected impacts in the context of proposed project, and plausible generic environmental management measures which should necessarily be included in the project designs; and (ii) GoI and GoM's environmental regulatory requirements, and applicable Bank Safeguards policies. The EMF defines the requirements to be met for ensuring compliance with safeguards policies as well as to "do good" for the project recipient communities.

EMF provides general policies, guidelines, codes of practice and procedures to be integrated into the implementation of the Project. It defines the steps, processes, and procedures for screening, alternative analysis, assessment, monitoring and management of the environmentally-related issues. In addition, EMF presents overview of environmental policies and legal regime and WB safeguard policies; includes institutional and capacity assessment related to environmental management; and describes the principles, objectives and approach to be followed while designing the site-specific environmental mitigation measures. A generic sample environmental mitigation and environmental monitoring plans are included in the document. The EMF is intended to be used as a practical tool during program formulation, design, implementation, and monitoring of MSRP-2 related activities.

5.1.1 Need for Environment Management Framework

The key components of the project includes: (a) widening and strengthening of 157km of Group 1 roads and preparation studies for 284km roads under Group 2 Roads, and (b) institutional development for better road management. The project appraisal requirements agreed with Department of Economic Affairs (DEA), Government of India (GOI), the project preparation envisages completing detailed investment plans and initiation of procurement for *CC Road* and *CZ Road* referred in above table under Group 1. In line with this agreement, the DPRs and independent EAs are nearing completion and the preliminary designs and environmental screening for the third road under Group 1 are completed. It is further agreed that the detailed designs and procurement of implementation contract for the third road (Lunglei - Tlabung - Kawrpuichhuah Road) will be processed post appraisal but before first year of project implementation. In case of Group 2 Roads, the preparation will be completed during the project implementation period. Currently, proposed alignments for Group 1 roads are known, and in case of Group 2 roads, the road links are known but the detailed studies will be completed during project implementation period – preferably during 1st year of project implementation.

Addressing environmental impacts during road construction would be of significant importance given the fragile environment of Mizoram state and proposed project roads have to be subjected to detailed EAs. EAs prior to appraisal were targeted for the above referred two roads since the design scheduled for these roads initially followed by other roads during implementation. However, in order to address and minimize/mitigate the potential project risks it is essential and prudent to agree on a framework for EAs/EMPs for one of the Group 1 and the Group 2 roads based on understanding of the environmental impacts identified in the context of EAs for CC, CZ Roads as well as broad baseline environmental scenario in Mizoram. Further, a well defined Environmental Management Framework (EMF) will be of relevance to streamline the environmental aspects in PWD road management practices under Institutional Development and Road Sector Modernization component of the project. In this context, EMF is prepared on the basis of environmental baseline, typical impacts due to the project (based on screening of Group 1 roads); and National/State environmental regulatory norms, and World Bank's safeguard policies. Adequate budget has been allocated to carry out EAs for Group 1 roads and preparation of EMF as part of project preparation budgets and the budgets for Group 2 roads are covered under project implementation components.

5.1.2 Purpose and Objectives of Environment Management Framework

Good environmental management practices are essential and integral elements of sound project preparation and implementation. The application and implementation of the EMF therefore, will:

- Support the integration of environmental aspects into the decision making process of all stages related to planning, design, execution, operation and maintenance of sub-projects, by identifying, avoiding and/or minimizing adverse environmental impacts early-on in the project cycle.
- Enhance the positive/sustainable environmental and social outcomes through improved/ sensitive planning, design and implementation of sub-activities.
- Minimize environmental degradation as a result of either individual sub-projects or through their indirect, induced and cumulative effects, as much as possible.
- Minimize impacts on cultural property.

The use /implementation of the EMF will also support the achievement of compliance with applicable laws and regulations as well as with the requirements of relevant Bank policies on environment aspects.

5.1.3 Key Contents of the Environment Management Framework

Specifically, the Environmental Management Framework includes the following:

- Information on GoI's environmental legislations, standards and policies and World Bank safeguard policies that are relevant in the over-all project context.
- Process to be followed for environmental screening to guide decision-making about proposed sub-projects

- Steps and process to be followed for conducting environmental impact assessment and preparation of Environmental Management Plans for selected sub-projects
- Preliminary assessment of anticipated environmental impacts in the context of broad/known project interventions.
- Generic environment management measures to avoid, minimize and mitigate anticipated impacts
- Institutional arrangements for environment management, including monitoring and reporting.

5.1.5 Application of the EMF

The EMF needs to be integrated into the preparation and implementation stages of the various project components. It is an essential ingredient aligned with the project/sub-project activities and is to be followed through the entire project cycle from planning, including site identification; design; implementation and operation/maintenance to attain the above outlined purpose and objectives.

5.1.5 Revision/Modification of the EMF

The EMF will be an ‘up-to-date’ or a ‘live document’ enabling revision, when and where necessary. Unexpected situations and/or changes in the project or sub-component design would therefore be assessed and appropriate management measures will be incorporated by updating the Environment Management Framework. Such revisions will also cover and update any changes/modifications introduced in the legal/regulatory regime of the country/state. Also, based on the experience of application and implementation of this framework, the provisions and procedures would be updated, as appropriate in consultation with the World Bank and the implementing agencies/ departments.

5.2 Environment Assessment (EA) approach and tools

This describes the principles and approach to be followed for selecting, avoiding, minimizing and/or mitigating the adverse environmental impacts that are likely to arise due to the project. Each of the sub-projects proposed under the project will follow the approach suggested here to achieve the objectives of environmental management. EA is integral part of the project identification and feasibilities studies, as well as project implementation and operation and will be related with the various stages of the project cycle as discussed in table 5.1

Table 5.1: Environmental Assessment within the Project Cycle

Stages	Steps in the Assessment Process
Project Identification & Pre-Feasibility Studies	<ol style="list-style-type: none"> 1. Preliminary Environmental Screening including consultations 2. Categorization of the project (category A /B as per WB requirement) 3. Environmental screening and Categorization of the project (category A /B as per GOI requirement)

Project Design	4. Scoping: identify significant potential impacts and project alternatives, and propose terms of reference for the EA and SIA.
	5. Baseline Data Collection: identifies current and future environmental and conditions without the project.
	6. Predict Environmental Impacts: assess impacts in terms of characteristics such as magnitude, extent and duration in quantitative terms as far as possible; describe all reasonable alternatives, including preferred and ‘no action’ options.
	7. Design Mitigation Measures: to avoid, reduce and minimize adverse environmental impacts and enhance beneficial impacts.
	8. Public Consultation and Participation: occurs at various stages in the assessment process to ensure quality, comprehensiveness and effectiveness, and that stakeholders’ views are adequately addressed.
	9. Prepare EA Report: summarizes all information obtained, analyzed and interpreted in a report form; should contain a non-technical summary including methods used, results, interpretations and conclusions.
Review /Approval	10. Review and Approval of EA Report: reviews report to assess if all possible issues have been adequately addressed and to facilitate the decision-making process; decide if project should proceed, or if further alternatives must be examined. Public Disclosure of Draft EA including draft EMP
Implementation Plan Engineering Design	11. Finalize Environmental Management Action Plan (EMP): determines specific actions to take during engineering design and construction stages to minimize or mitigate impacts – Final Disclosure.
Implementation	12. Environmental and Social Monitoring: determines compliance with EMP

5.2.1 Key Steps to be followed

A comprehensive environmental management approach for the project will involve the following key steps and processes:

- Preliminary Environmental Screening
- Detailed Environmental Screening
- Environmental Impact Assessment
- Environmental Management Plans
- Environmental Monitoring (including Audits) and Reporting

The following section aims to provide a description of the environment management approach and tools to evaluate the potential impacts from the proposed project interventions. The Environment Management tools aim to support at the early stages of planning and decision-making and selection of environmental measures including mitigation/technologies based on the nature and scale of identified potential impacts.

Step 1: Preliminary Environmental Screening

This step will involve an initial desk review of the available information about the road and the sub-project area. A preliminary environment screening format would be filled-up using such available information and field visits would be undertaken to understand the general

overview in context of the scope of the proposed operation. The exercise will help in identifying the key/significant potential environmental impacts and in determining the project specific context and the focus required for carrying out the detailed environmental screening exercise.

Without narrowing the focus of the detailed field investigations/assessments, having this knowledge provides an early sense on the spatial and temporal dimension about the likely issues on-hand.

Step 2: Environmental Screening

Detailed screening exercise is the second step in the EMF process. The purpose of environmental screening is to get an overview of the nature, scale and magnitude of the issues in order to determine the project feasibility and further if findings permit, it allows for proper scoping of the detailed EA that would be subsequently carried out. After identifying key issues, the applicability of the Bank's environment safeguard policies is to be established along with Government of India's / State Government's regulatory requirements. Based on this, boundaries and focus areas for the EA along with the use of specific instruments would be determined.

The key sub-steps involved in the screening process are outlined below:

- Ascertain presence of any environmentally sensitive areas (as detailed in screening checklist) through primary/secondary information.
- Confirm applicability of regulations and policies in context of broad sub-project interventions.
- Conduct reconnaissance site visits for ground truthing and incorporate required/ additional information in the screening format
- Obtain details about land availability and broad categories of ownership (forest/govt./private)
- Preparation of a screening report as per the structure provided
- The outcome of the screening process will help select and/or prioritize the various investments and where required, start the clearance process in a timely manner.

Safeguards screening usually consist of checking and identifying environmental risks, impacts and opportunities and the requisite measures that are applicable within the local context for addressing them. Findings from the screening will be used to determine ecological and as well as economic viability of the sub-projects. Particular focus will be required for proposed realignments and bypasses.

The process enables proper targeting of issues requiring further technical research and in-depth assessments during the EA preparation. Without the proper screening, deficient planning and engineering design of sub-projects using unreliable information can result in weak arrangements to conserve critical natural ecosystems and may result in creating adverse environmental impacts.

Key outputs of the detailed environmental screening would include:

- Determination (with a degree of confidence), of all national and state and local regulations and policies that will apply to the sub-projects
- Preliminary judgment on the sub-project category per the MoEF EIA Notification, 2006 (including recent amendments)
- Decision on the environmental categorization (A, B, or C) in line with World Bank's safeguards policies; and
- Process, timeframe and responsibilities for securing the requisite clearances and permissions per GoI guidelines.

It is critical at this stage for Consultants to review the list of applicable legislations or policies and regulations with the project proponent and the World Bank first to diffuse inconsistencies in understanding and second, to mobilize assistance both at the central and state levels to facilitate applications process.

The screening process enhances implementation by screening out or enhancing acceptability of sub-project proposals on the basis of environmental criteria. Apart from the screening of sub-projects for proposed inclusion in the project (MSRP-2), the results/findings from this exercise would be used to determine the scope of Environmental (Impact) Assessment requirement.

***Prior Review:** PWD shall submit all the screening reports under the project for information to WB and in case of any of the project roads are expected to be categorized as Category B/C, prior approval of the Bank shall be necessary*

Step 3: Environmental Impact Assessment

An EA consists of a comprehensive study that involves thorough documentation of existing conditions, and identification of impacts with a comparison of alternative project design options including without the project option. If implemented early, the EA can be an excellent “preventative tool”.

Usually, EA has three objectives:

- Assist decision makers in getting a clear picture of the potential impact on the overall environmental quality;
- Provision of impact prevention and enhancement of benefits and minimization of impacts in the long term; and
- Provide a forum that allows direct input from stakeholders in the managements of the project.

Towards this end, the MoEF has developed an EIA Guidance Manual for Highways, which will be used along with WB's operational policy notes.

Ideally, an EA will have:

- A general information on highway project, requisite environmental clearance process and a gist of the project component
- Location of the road corridor, map and topographical sheets including the potential benefits and need for the project, description of alignment options, implementation schedule and the projected costs for the project
- Characterize the relevant features of the current (“baseline”) state of the receiving environment biological, physical and socioeconomic description of the corridor and the region
- Description of the potential interactions between the intervention and the baseline environment
- Analysis of alternatives with particular reference to location of project corridor and the applicable engineering technologies
- Management measures to avoid, mitigate, compensate and monitor any potentially significant adverse impacts and cost of management measures in an environmental management plan
- Summarize significant concerns and recommend needed actions to address each concern
- Conclusion – stating that either (a) the EA is the completed environmental assessment for the intervention or (b) further assessment work is required and will be incorporated in a revised EA. For example, project roads that would need follow up biodiversity assessments to track changes will be stated in the EA
- Disclosure of the Consultants that prepared the EA

Key steps for EA preparation will include the following:

- Define the scope of the EA:
- Characterize the project interventions
- Building on findings from screening exercise,
- Establish an effective stakeholder participation program
- Identify key environmental issues and assess range and potential severity of impacts on the existing environment (adverse; and beneficial, direct and indirect) by (i) project phase; (ii) engineering technologies and other non-built infrastructure mechanisms to be used and (ii) by ecological component, community and other sub-units of the study area. The analysis of environmental issues shall necessarily include cumulative impacts due to the proposed project

*Among other areas, the EA shall also necessarily cover - **Environmental Impacts:** (i) induced impacts such as logging, threat to wildlife including wildlife corridors / biodiversity areas; (ii) cumulative/induced impacts due to hill cutting – landslides leading to hazards and distortion of water courses; and (iii) cumulative impacts on surface water sources including pollution and siltation due to unprotected cut slopes, debris disposal, etc. All the proposed consultations shall prior informed and shall comply with public consultation provisions under OP 4.10*

- Assess the risks and implications of improper operation, failures, disasters and other (lower probability) events
- Consider the implication of project alternatives with and without the interventions with respect to both location and technologies.
- Prepare an EMP, which is implementable program of measures to avoid, mitigate, manage and monitor adverse impacts and enhance benefits.
- Assess the residual impacts remaining after implementation of EMP measures

The following is the recommended table of contents of EA:

- Executive summary
- Policy, legal and institutional framework
- Project description
- Status of the environment (baseline data)
- Environmental impacts including cumulative
- Analysis of alternatives
- Additional studies (if applicable)
- Project Benefits
- Environmental Management Plan
- Stakeholder consultations
- Summary and recommendations
- Conclusions
- Annexes

Step 5: Preparation of Environmental Management Plan (EMP)

EMP is the next step in the EA process after identifying potential impacts. It involves the identification and development of measures aimed at avoiding, mitigating, offsetting and/or reducing impacts to levels that are environmentally acceptable during implementation and operation of the project road. EMPs provide an essential link between the impacts predicted and mitigation measures specified within the EA and implementation and operation activities.

For each sub-project road, an EMP should address the following:

- Mitigation, enhancement, protection and compensation measures for each phase including design pre-construction, construction, operation and maintenance
- Mitigation performance monitoring (i.e. monitoring the operation and maintenance of mitigation measures and their targeted impacts)
- PAP participation arrangements by project development phase
- Disaster management contingency plan where applicable especially in areas with potential flooding, earthquake zones
- Institutional arrangements for implementation, monitoring and reporting

- Cost estimates for all EMP activities
- Implementation Schedules
- Reporting Procedures
- Standard construction environmental safeguards clauses for engineering and civil works

EAs/EMPs for the respective road corridors under the project shall be prepared in line with guidelines provided in the Annex C of OP 4.01 and shall be subjected to Bank's prior-review as well as compliance with Access to Information Policy including Disclosure. The EMPs will include streamlining of protection of forest resources along the project corridor with the Forest Department's ongoing systems and to include necessary provisions for monitoring to ensure no logging and wildlife threats arise

Step 6. Implementation of mitigation measures

The mitigation measures should be integrated into project design and tender documents. Using this approach, the mitigation measures will automatically become part of the project construction and operation phase. By including mitigation measures in the contract or in specific items in the Bill of Quantities, monitoring and supervision of mitigation implementation could be covered under the normal engineering supervision provisions of the contract.

Project Design: The mitigation measures should be integrated in the design of the project itself. Such a step will enhance the mitigation measures in terms of specific mitigation design, cost estimation of the mitigation measure, and specific implementation criteria. The mitigation measure integration in the design phase will also help in strengthening the benefits and sustainability of the project.

Project Contract: The project contractor should be bound by the parameters identified in the environmental and social assessment pertaining to specific mitigation measures in the contract. The final acceptance of the completed works should not occur until the environmental clauses have been satisfactorily implemented.

Bill of Quantities: The tender instruction to bidders should explicitly mention the site-specific mitigation measures to be performed, the materials to be used, labor camp arrangements, and waste disposal areas, as well other site specific environmental requirements. Such a definition would clearly exhibit the cost requirement to undertake mitigation measures, which otherwise might be lost as the bidders in an attempt to be more competitive may not include the price realistic enough to fund mitigation measures and other protection measures.

Supervision and Monitoring: The purpose of supervision is to make sure that specific mitigation parameters identified in the environmental and social assessment and as bound by the contract is satisfactorily implemented. Likewise, monitoring is necessary such that the mitigation measures are actually put into practice.

A categorized mitigation measures, its implementation is given in the table 5.2 below.

Table 5.2 Mitigation Implementation

Mitigation activities	Implementation Responsibility			
	Project Design	Contract	Bill of Quantity	Monitoring
Slope stability	Specify bio-engineering and relevant techniques	Contractor clause with BoQ.	Identify stabilization area. Provide list of vegetation to be planted.	Adequacy, quality of vegetation. Survival rate of plants.
Spoil disposal Identify mass balance techniques.	Work out mass balance techniques Safe tipping areas identified and enforced Design for disposal area management	-Do-	Quantify disposal and extraction volume.	Presence of scouring, erosion, damage to property, water supply disruption. Complaints from local people
Blasting of rocks	Identify hard rock area Make provision of control blasting in contract	-Do-	Quantify the volume	Implementation of EHS measures Damage to the property Any accident Damage o the land at valley side
Loss of Forest	Modify the design with minimum forest land Forest clearance document	-Do-	Quantify the number of trees to be planted or area need compensatory afforestation	Check habitats re-created on roadside land and forestation land
Loss of Agriculture land	Modify the design with minimum agriculture land	-Do-	Physical works for safe discharge drainage. Damage to the irrigation structures	Evidence of fresh surface erosion, presence of gullies, increase in water turbidity, loss of agriculture land. Public complain
Stone extraction from quarries	Design bunds to screen noise and dust. Design re-grading Slopes. Use bio-engineering techniques for rehabilitation.	-Do-	Quantify restoration costs and present technical specifications.	Check for water ponding, formation of gullies, Check Slope stabilization Check unauthorized quarrying activities. Dust and noise control
Water management	Design safe discharge drainage and techniques (check dam) to natural water course.	-Do-	Physical works for safe discharge drainage listed.	Evidence of fresh surface erosion, presence of gullies, increase in water turbidity, loss of agriculture forest land.
Stone crushing and asphalt plants		-Do-	Amount to be included in contractor's own expense	Dust control equipment being utilized. Public complaints.

Camp operation	Identify camping grounds.	-Do-	Amount to be included in contractor's own expense through work camp item expense	Latrine construction and effective waste disposal. Check disruption in water supply. Replantation, rehabilitation of site
Mitigation activities	Implementation Responsibility			
	Project Design	Contract	Bill of Quantity	Monitoring
Hazardous materials	Specify storage facilities for explosives and toxic materials	Do	Amount to be included in contractor's own expense through rate for supplying materials	Checks to ensure that storage is good and that there are no losses or leaks. Checks to ensure that protective clothing and safety measures are used.
Dust and Noise	Indicate use of safe pollution level equipment.		Specify buffer area requirements. Amount to be included in Contractor's own expense through work camp item expense.	Air pollution control equipment. Dust deposition on crops and vegetation. Survival rate of plants. Public complaints

Step 6 Monitoring Plan

In order to ensure that the proposed mitigatory measures have the intended results and comply with GoI and World Bank requirements, an environmental performance monitoring program will be included in the EMP with the following suggested details:

- Monitoring indicators to be measured for evaluating the performance of each mitigatory measure. Indicators should include principles adopted for alignments, applicable GoI engineering standards for road widening, etc)
- Monitoring mechanisms and methodologies
- Monitoring frequency
- Monitoring locations
- Expected cost of monitoring
- Responsibility

Institutions/parties responsible for implementing mitigatory measures and for monitoring their performances will be clearly identified along with any legal instruments that define their obligations. Where necessary, mechanisms for institutional co-ordination will be identified as often monitoring tends to involve more than one institution.

5.3 Key Principles/Guidelines for Engineering Design

More so, findings from the environmental screening report provide the basis for developing engineering designs. In certain cases where results from the field assessments are not duly factored into project drawings, ecological footprints that could result from such proposed engineering designs are found to be significant. To eliminate such complexities, Highway Engineers will work hand in hand with the respective Environmental and Social Experts

ensuring that proposed designs are environmentally, socially and economically viable. Until the EAs are publicly disclosed and approved, engineering drawings would undergo a series of changes to incorporate all recommendations from the environmental and social stand point.

5.4 Consultation and Disclosure Requirements

Consultation with affected people, subject/domain experts and NGOs in preparing the EA/EMP is critical for Category A projects. For all Category A projects/sub-projects, the project proponent is expected to consult project-affected groups and local nongovernmental organizations (NGOs) about the project's environmental aspects and take their views into account. The project proponent should initiate such consultations at each stage of the project cycle. The disclosure of documents shall be as per requirements of GoI and WB procedures.

5.5 Integration of EMP into Bidding Documents

Sections relevant for the construction stage will be integrated into the Bid Documents. More guidance has been provided in Annexure. Contract documents will need to be incorporated with clauses directly linked to the implementation of environmental management measures. Mechanisms such as linking the payment schedules to implementation of the said clauses need to be explored and implemented, as appropriate.

5.6 World Bank review and clearance of sub project EAs

PWD will officially submit a EA report to the Bank for review and approval. Based on Bank's comments, the EAs will be finalized and placed for public disclosure. PWD will also provide consent for the disclosure of EAs by the World Bank in their Infoshop. The final EMPs will be integrated as part of the bid documents for construction contracts

CHAPTER 6: STAKEHOLDER CONSULTATION FRAME WORK

Stakeholder consultations form a very crucial part of all development projects, including infrastructure and are usually carried out as a continuous process through the project cycle. Public and stakeholder consultations and workshops during the design and project planning stages provide the medium for sharing information about the project objectives and scope, alternative design options, and stakeholder perceptions regarding proposed investment plans. Ensuring an open and transparent information exchange about the project at this stage, lays a good foundation for an inclusive and participatory implementation process.

In view of the scope of interventions giving reference to the GoI regulatory policies on EIAs along with provisions under the Bank's safeguard requirements, the project is generally categorized as A. It has triggered the World Bank O.P 4.01- Environmental Assessment. For a category A operation, both the GoI EIA guidelines and the World Bank's safeguards policies require comprehensive consultations with all key stakeholders including communities residing in the project corridor particularly women, disabled, youth; NGOs; civil society groups; road users; private sector; local traditional leaders, district and state government officers involved in the project; and other categories of stakeholders that may be peculiar to the area under consideration such as scheduled castes, scheduled tribes, forest dwellers, etc.

6.1 Objectives of Community Consultations

Community consultations in the project will be undertaken with objectives, which may be grouped into

- information sharing;
- appraisal and assessment of the community needs, and
- Development of specific design solutions.

6.2 Stages of consultations

Conforming to the GoI Right to Information Act, 2006 and the World Bank Access to Information Policy, and prior-intimated consultation requirements under OP 4.10, and to meet the project's needs for an inclusive participatory process during project planning, design, implementation, supervision and monitoring, PIU with guidance and assistance from the World Bank will facilitate prior informed consultations/workshop plan for each project road that covers the following key stages:

- Preliminary Screening of the project
- Environmental screening of the project
- Preliminary consultative session at the very early stages of the project design when the first set of engineering designs are developed
- Second round of consultations on the engineering design once recommendations from the first consultations have been considered in revised designs taking into considerations concerns about bypasses, realignments, land acquisitions, forest diversions, tribal forest land concerns

- Stake holder consultation for formulation draft EMF
- Public consultations on the draft EAs
- Public hearing to be conducted by SPCB for environmental clearance
- Once the final EA are cleared for official release into the public domain

Community meeting, which should be open to all, is the primary means of community consultation and information dissemination.

The consultation framework presented below offers types of activities that should be carried out in each project phase, as well as who should be responsible for each activity-

Table 6.1 Stages of community consultations

	Responsibility	Activity	Output	Evidence of Participation	Remarks
Preliminary environmental Screening stage					
	Consultant	Attend community meetings and inform participants of the project - Mobilize community members to help carry out environmental and social screening Project awareness	Consultation report - draft Environmental screening Identification of major environmental issues	Minutes of community meeting	Positive and negative views expressed by participants are recorded
Environmental Screening stage					
	Consultant /PIU	Participate in stakeholders meetings - Identify major issues related to the project.	Suggestions on more environmental issues and management	Minutes of community meeting	Participants suggest - major issues –to be incorporated in to draft screening report
	Responsibility	Activity	Output	Evidence of Participation	Remarks
Feasibility stage / Early stages of the project design					
	Consultant	- Inform community members of positive and negative project impacts - Identify environmental and impacts	Modified alignment design Draft EA	Minutes of community meeting	Community members must understand project impacts. Participants suggest - major issues – and their management to be incorporated in to draft EA
Draft EA stage / Finalization of Design					

	Consultant	Inform community members of positive and negative project impacts of realignment, by pass etc - Consult community members to develop EMP, and other policy frameworks	EMP, and other mitigation plans Draft EMF	Minutes of community meeting	EMP and other impact mitigation plans must be developed
Draft EMF stage					
	PIU/ consultant	Understand project component and mitigation measures to be carried out Consult community members to develop EMP and other policy frameworks	Final Draft EMF	Minutes of community meeting	Stake holders suggestions should be incorporated in Draft EMF
Public hearing to be conducted by SPCB for environmental clearance					
	SPCB	Disclosure of EA and EMP and community suggestions for its improvement	Draft EA and EMP	Minutes of community meeting Videographs	Stake holders suggestions should be incorporated in Draft EA and EMP

6.3 Outcome of consultation

- Over-all, the consultations would:
- Learn about the community needs and preferences with respect to the project objective to improve connectivity through widening and rehabilitating project roads
- Identify and agree on alignment options that have relatively lesser impact on affected people
- Discuss the environmental and social safeguard implications/impacts that might be associated with the suggested alignment or bypass options, along with the impact mitigation guidelines and measures adopted in the EMF
- Where voluntary lands are involved, identify the donors
- Discuss compensatory afforestation plans
- Have the community identify grievance and redress mechanisms for resolving project design and implementation concerns
- Determine the main pillars of a communication/consultation strategy that will be adopted throughout the project phases
- Determine options for engaging local community and NGOs in the operation

6.4 Community Consultation Process

In order to gather further information and local perception about environmental issues, public consultations at Village levels shall be conducted at various times during the project preparation. The following section describes the objective and methodology for consultation programme during the project preparation stage.

The consultation programs are to be conducted with all the stakeholders of the project, such as:

- Heads of the households likely to be impacted;
- Members of the households likely to be impacted;
- Clusters of PAPs;
- Villagers;
- Village Council Presidents;
- Local voluntary organizations, and CBOs/NGOs;
- Government agencies and departments;
- Other project-stakeholders such as women, prominent persons from the villages (such as teachers, health workers, doctors).

6.5 Local Level Consultations (Household and Village Level)

The main objectives of the household/village level community consultation are to generate feedback to minimise negative impact inflicted upon the local communities by the project, and to spread awareness regarding the project. During the consultations, efforts will be made to:

- Understand views of people affected with reference to the environmental impacts of the road;
- Identify and assess all major environmental and social characteristics of the village to enable effective planning and implementation;
- Resolve issues relating to impacts on community property; and,
- To establish an understanding for identification of overall development goals and benefits of the project.

a. Methodology

The following steps are to be adopted in general for conducting the village level meetings:

- Dissemination of information through public address system and requesting villagers to attend the public consultation meeting.
- Conducting a public meeting fulfilling all the objectives of EA.
- Conveying information (related to the scope, purpose, design of the project, and impacts of the project) during the social surveys to the community and the likely PAPs.
- Gathering information related to the opinions and preferences of the community and the likely PAPs.

- Recording the perceptions of the people on various issues related to environment management and Resettlement & Rehabilitation
- Involvement of the community and the likely PAPs in the decision making process.

b. Tools for Consultation

The consultation process established for the project has employed a range of formal and informal consultation tools including, in depth interview with key informants, village meetings, workshops and even door-to-door personal contacts. Techniques like participatory rural appraisal (PRA), formal questionnaire-based interviews, personal interviews, and other consultative and assessment techniques are to be deployed. Such consultation sessions are to be carried out at all stages of the project preparation and will be continued during the implementation, which will subsequently be monitored during the operation of the project.

Efforts are to be made to contact each and every PAP while conducting the census and the baseline socio-economic survey, which was conducted door-to-door. A 100% sample is to be taken up for individual household consultation. The household level consultations are to be carried out with the help of a questionnaire prepared and circulated in advance to the various groups through the Village Council Presidents’.

At the village level, PAPs and local government leaders (the Village Council Leaders), the local voluntary organisations (including the “Young Mizo Associations”) should be consulted. Most of the village meetings are to be conducted in the form of group discussions, based on an open-ended schedule. The minutes of the village need to be recorded/ documented.

c. Measures for feed back to the stake holders and community

Recording and documentation of all public meetings held with people and PIU officials with dates, location and the information provided and the major emerging issues is mandatory. The EA report shall include these documents as attachments. Where public announcements are made, the details, together with a copy of the text of the announcements shall be provided in the documents. Minutes of the consultation will be available in the PIU environment cell.

Minutes of the consultation and public hearing for environment clearance will be available free with the pollution control board.

6.6 Outcome of Consultations held for finalizing EMF/Group 1 Road EAs

In line with the provisions of OP 4.10, prior intimated consultations were conducted. Principal issues rose during the various stages of community consultation in Group-1 roads and the perceptions about the project are summarised in Table 6.2

Table 6.2: Principal Issues, Opinions & Perceptions of the Communities

S.N	Issue	Perceptions, Opinions & Suggestions
1	Water Harvesting structures	The location of one of their stream water collection is very good. As it is not steep, women and children can carry water easily from there, but it lies within COI. In most cases villagers depend on stream pit (Tuikhur in Mizo) for water. And most of this stream pits lie at the bottom of the valley or hill. Villagers were concerned that if the residue mud is pushed down then their source of water will surely be damaged.
2	Water	Water Scarcity being felt throughout the year, water required for road construction was the chief concern. Measures are being taken by the state P.H.E Deptt., to make the water available by way of harvesting rain water, collection from the roof top (mainly), to meet the requirement during non monsoon period.
3	Degraded forest land	The forests and land is degraded due to jhuming cultivation leaving no place for natural vegetation older than 6-10 years in the vicinity of priority road
4	Landslide	People want a good road, but our lands may be acquired and landslide may occur due to the hill cutting.
5	Construction waste disposal	Dumping of earth/soil residue should be done at a sites designated by the respective village representatives. If crop or land is damaged due to waste disposal, the affected persons should be compensated fully. Fear of landslides due to cutting down of trees and bringing down of hill slopes.
6	Natural Resources	Bamboo and other trees proposed to be cut in the project should be compensated appropriately.
7	Bypasses/diversion	In most of the villages, the communities were in favour of developing the road along existing alignment through the village. Conversely, people were not in favour of bypasses. (This is related to the fact that the village settlement pattern in Mizoram, otherwise a difficult terrain, was entirely dependent on the roads and the road-form.)
8	Power supply - PAPs	Delay in providing adequate power/electricity connection to the building structures, which are relocated or rehabilitated, was a big concern. To avoid any inconvenience to the PAPs the concerned departments of the state government should work in close co-ordination.
9	Road Safety	People expressed concern about safety of the local inhabitants (as the residential and/or commercial properties in the villages are located very close to the road, and the roadway is not very wide). Due to increase in motorized traffic, the people are willing to limit their commercial activities on the roadside and shift their residence away from the road, for the safety of their children.
10	Cutting towards hillside	People living on the valley side of the road were concerned about the difficulty to move their properties away from the road (as the valleys were very steep), and had suggested cutting the hillside for widening the road.
11	Labour Camps	People want that the labour camp should be established away from the village and habitation. People do not want that the labourers should settle down, in their neighborhood, after completion of the project.
12	Quality Control	There was apprehension about timely completion of, and quality control in the project. (The implementation schedule and arrangements, including the procurement of supervision consultants and technical auditors were explained to the people.)
13	Dust pollution	Dust, rubbles from demolished (or cut) hillside, and those from dismantling of building structures worried the community. Without proper precaution, the houses and gardens (or orchards) on the valley side would be impacted due to dust, debris or construction wastes.
14	Noise Pollution	Noise pollution was also an issue (particularly on the stretch with in the villages).
16	Community Involvement	The communities were of the view that they should be consulted at various stages of the project, from preparation to project implementation

6.7 Plan for continued participation

The following plan for the continued participation of the various stakeholders, especially the project affected has been worked out to ensure time bound and effective achievements of the implementation of the various EA measures proposed.

6.8 Future Consultation Program

The Environmental Impact assessment (EIA) will provides detailed information regarding the consultation process. It describes information disclosure at preparation stage. Different techniques of stakeholders consultation is to be used during project preparation namely in-depth interviews, public meetings, Focus Group Discussions etc. The key informants will include both individuals and groups namely:

- Heads of households and members of households affected by the project
- Clusters of PAPs
- Village Panchayats;
- Local voluntary organizations, and CBOs / NGOs;
- Government agencies and departments;
- Other project stakeholders with special focus on women and PAPs belonging to the vulnerable groups.

All of them will again be consulted, as applicable, at the 3 board levels:

- Local (Village level / Block level)
- District level
- State level.

6.9 Information disclosure

The EA documents have to be disclosed and will be placed for public reference at the State Public Library, Aizawl and in the reference section of the libraries and at the residence of the Village Council Presidents of the affected villages along the project road. All these places will be open to the public without any restriction whatsoever on access.

The report shall also be available at the World Bank Info shop at Washington DC, as per the World Bank disclosure policy. In addition to this, the copy of the report shall be available with the PWD headquarters at Aizawl. The report from these places will be available to the public on request for reference.

PWD project implementation unit office will provide actual information on policies and other provision in the EMP to the people, in a regular basis.

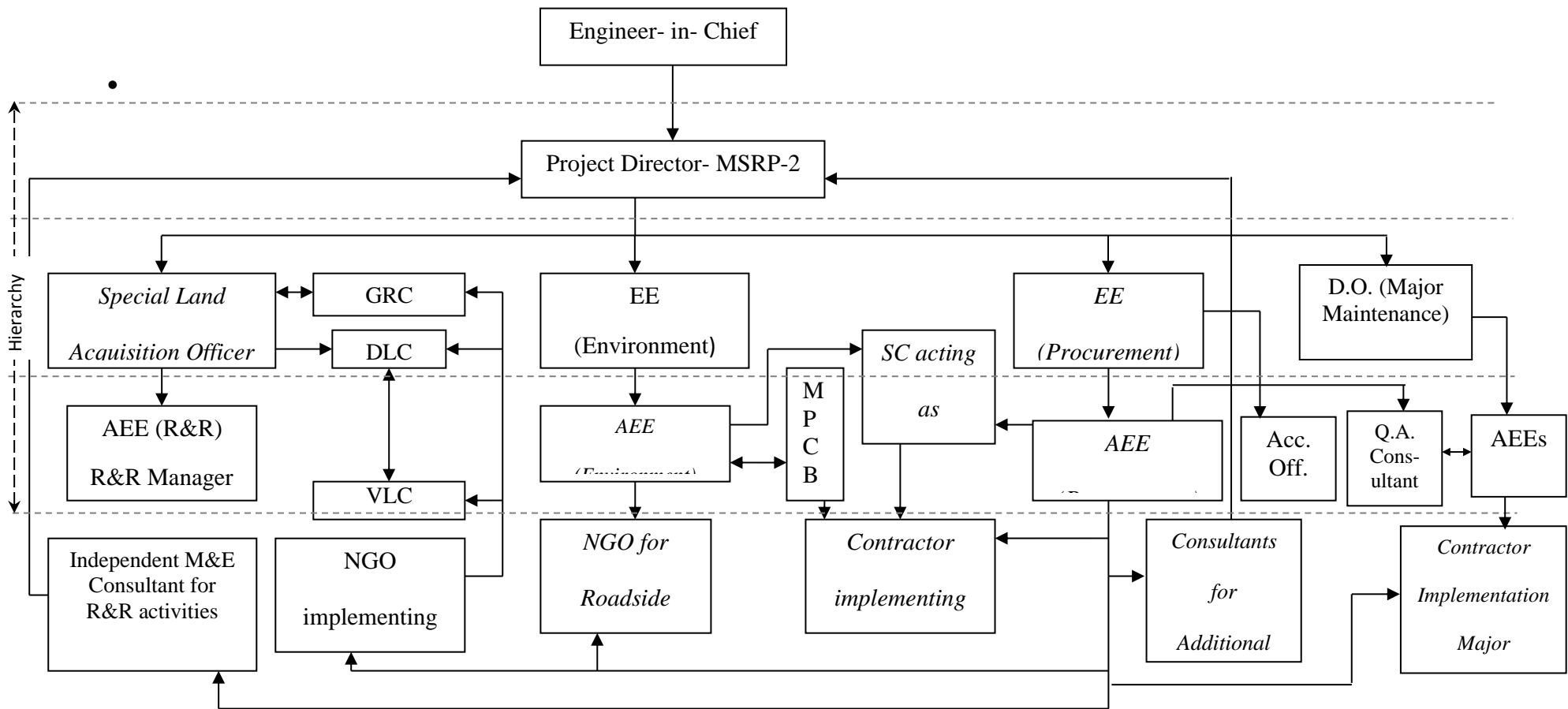
CHAPTER 7 – INSTITUTIONAL CAPACITY ASSESSMENT & IMPLEMENTATION ARRANGEMENTS OF EMF

This chapter discusses the capacity assessment, implementation arrangements including the reporting, monitoring and training requirements for the project. The PWD has extensive experience in building and maintaining roads over the years. However, the traditional emphasis is now shifting with other concerns such as environmental and social impacts of the proposed development now becoming important for the successful implementation of major projects. As road and other works of PWD works expands, environmental work load will increase. The organisational set-up of the PWD and modifications required in order to meet these new challenges are discussed in the following sections.

7.1 Capacity Assessment of Mizoram PWD for environment management

- In the past, WB funded project and in other donor funded/ADB projects – ad hoc consultant support provided during implementation, civil engineers assigned from PWD to cover environmental aspects.
- Two engineers with environmental engineering education, but lack experience
- There is no dedicated unit in PWD for environment and social management/oversight
- Those staff assigned for environmental works in the donor funded project – gain experience. But get transferred to other works. Knowledge and expertise - not sustained.
- Therefore, during implementation also needed external support/ HR/ Consultant. Also needed orientations and training to various stakeholders including PWD staff, contractor, and communities on environmental management and mitigations subjects. Indicate what these training, orientations, HR needs are.
- For longer term, PWD needs to establish a dedicated unit for Environmental and Social Oversight and Management. An assessment needs to be done during early stage of implementation for establishment of such unit: detailed ToR of the unit, staff, logistics, mandate etc.

Figure 7-1 shows the proposed organizational arrangements for the implementation of the MSRP-2



KEY			
MSRP= Mizoram State Roads Project	GRC= Grievance Redressal Committee	DO -	Divisional Officer
EE=Executive Engineer	DLC=District Level Committee	QA -	Quality Assurance
AEE=Assistant Executive Engineer	SC=Supervision Consultant		
Acc. Off.=Accounts Officer	VLC=Village Level Committee		
MPCB=Mizoram Pollution Control Board	M&E=Monitoring & Evaluation		

Fig 7.1 : Existing MSRP-2 implementation arrangement

7.2 Proposed institutional set up for MSRP-2 implementation

As part of project implementation, a PIU will be set up with an Environment cell headed by Executive Engineer under the Project Director of PIU. The Executive Engineer will be assisted by two Assistant Engineer (AEs) who will be responsible for Group-1 and Group-2 roads. Each AE will be supported by Junior Engineers (JEs). Each road project will have at least one JE during project preparation stage and may be more considering size of the road contract packages. The PIU will be supported by Project Preparation Consultant (PPC) environment team during project preparation stage and by Supervision Consultant’s environment team during project implementation stage. The roles of PIU staff include facilitating preparation of EAs as an integral part of the design of project corridors, ensuring all the studies are carried out in an integrated manner with necessary environmental management provisions and regulatory requirements are integrated in construction contracts, provide extensive monitoring and supervision during implementation. The team of environmental specialists is expected to continue environmental management as part of PWDs long term plans. To this effect, the institutional development component of the project will dovetail their role in PWD. The institutional arrangements also include training and capacity building needs

In addition to the above, the extensive network of forest department’s human resources in Mizoram state is also proposed to be integrated in to the project implementation arrangements. This will be mainly in terms of keeping the forest department informed about the proposed project implementation schedules, and compliance forest department’s conditional protection and mitigation measures which are mandatory to be followed in places where the road passes next to the forested areas and/or areas of forest diversion. The focus of such inter-departmental (PWD & Forest Department) will be to minimize/mitigate logging in the forested areas next to the road corridors, prevent wildlife poaching and illegal trade activities. Each of the EA document for the respective project corridors shall include joint monitoring provisions with the forest department

Figure 7-2 shows the proposed organizational arrangements for the implementation of the EMF in MSRP-2

7.3 Institutional frame work for EMF implementation

Institutional frame work for EMF implementation has been discussed in table 7.1 It indicate the proposed responsibilities of PIU environment cell, consultant and contract at different stages of the project starting from project preparation stage to implementation of the project .

Table 7.1 Institutional frame work for EMF implementation

Activity Phase	PIU Environment cell	Consultant	Contractor
Pre-	Preparation of ToR for :	Environmental activities:	

<p>Construction:</p> <p>Project Identification & Pre-feasibility Studies.</p> <p>Environmental Screening</p>	<p>Preliminary screening Screening Scoping Employ environmental Consultants Consultation with stake holders</p>	<p>Conduct field survey Prepare preliminary screening report Categorization of the project as per WB requirement Prepare environmental screening report Categorization of the project as per GOI requirement</p>	
<p>Feasibility Study: Environmental Assessment</p>	<p>Preparation of ToR for EIA (if required)</p>	<p>Conduct EIA/SIA Study: Collect baseline data Ensure continuing public consultation & participation Communities Identify & predict impacts Prescribe/develop mitigation measures with local inputs Prepare EIA/ report & submit to PIU</p>	
<p>Engineering Design</p>	<p>Employ consultant-engineers</p>	<p>Finalise analysis of alternatives Minimise the impact by design change Monitor EMP & other impact mitigation</p>	
<p>Project Appraisal & Approval</p> <p>Contract awarding</p>	<p>Review/Approve of EIA Conduct Survey & Design Participate in design of alignment, etc Implementation</p>	<p>Modify EIA Modify and Prepare EMP Submit the report to PIU</p>	<p>Implement EMP Establish & maintain support activities (in health, education & other services & infrastructural facilities for labourers & communities)</p>
<p>Construction Phase</p>	<p>Contract consultants & contractors Prepare work schedule Monitor & review reports Encourage contractors to employ local labourers Check the ToRs & ensure that social & environmental action plans are followed TOR for cumulative</p>	<p>See that environmental damages are avoided or mitigated See that beneficial impacts are taken identified and enhanced</p>	<p>Assure local labourers & stakeholders participate in construction & implementing EMP, Manage labour arrangements</p>

	impact assessment Engage consultant for cumulative impact assessment		
Activity Phase	PIU Environment cell	Consultant	Contractor
Monitoring Compliance Monitoring	Monitor technical works Monitor environmental works	Prepare monitoring report for client Conduct impact monitoring	Maximize employment of local labourers
Operations & Maintenance	Conduct post construction evaluation	Observe road maintenance & compliance with contract norms Monitor appropriate road safety measures compliance Evaluate construction works conformance with standard specifications	Maximize employment of local labourers Employ local petty contractors for patchwork Employ locals/migrants in construction to reduce unemployment

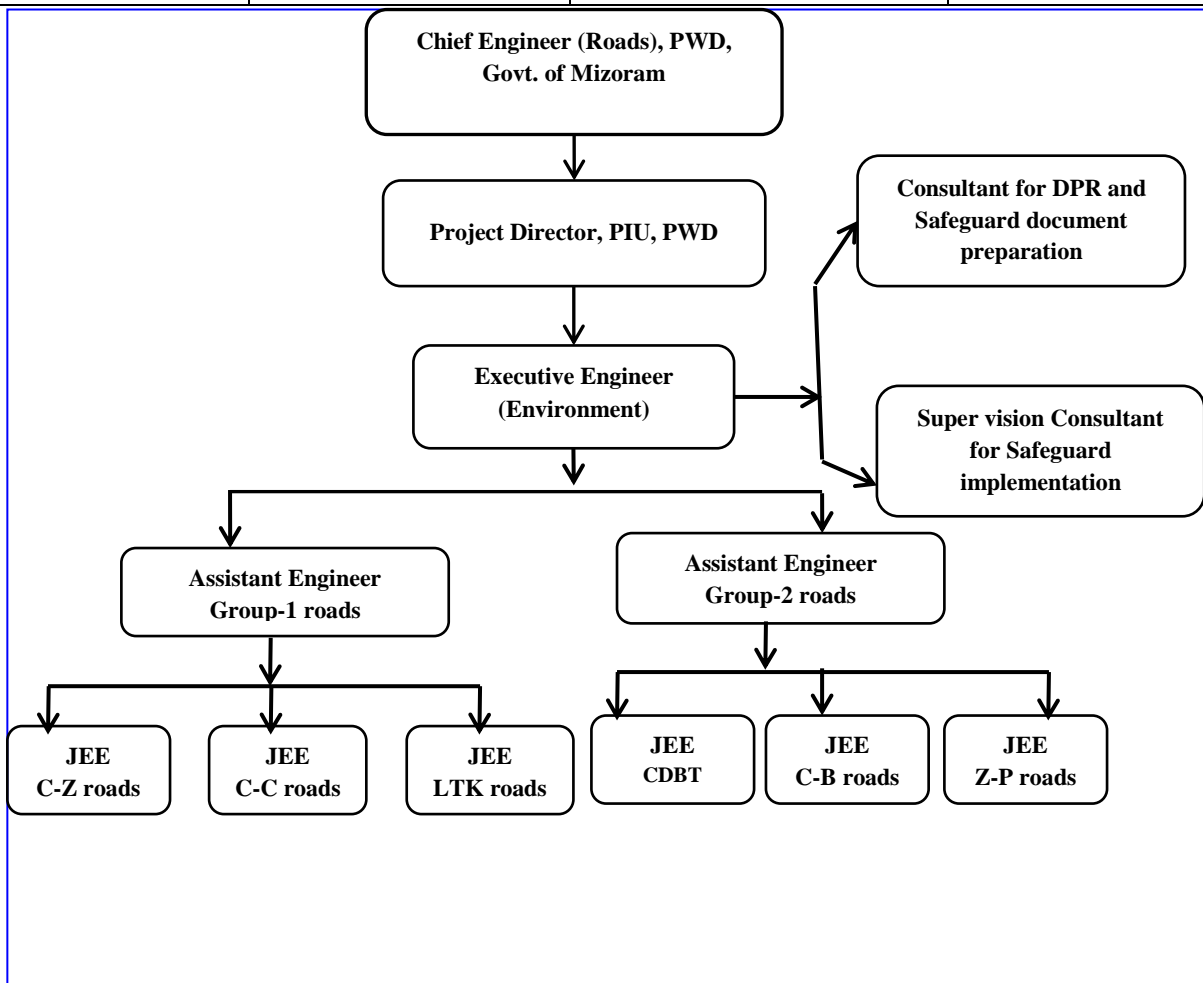


Figure 7.2 Proposed Environment cell for MSRP-2

7.4 Training for Capacity enhancement

7.4.1 Need for training

To enable the PWD in integrating the social and environmental issues in its day-to-day operation and in internalising the environmental and social issues in the existing and future road development projects training is conceived. To achieve this goal, the MPWD, needs training on road development and environment management and the effective implementation of the environmental issues.

7.4.2 Targets of proposed training

The training programme will equip the environmental personnel of MPWD to implement and supervise the EMP and expose senior members of the PWD to environmental and social issues associated with the highway projects. Such a group of senior staff can then be given the responsibility of active dissemination of the culture of environmental/social consciousness and ethics within the rest of the organisation.

Once the environmental staff of MPWD have received training and have gained experience through the implementation of the EMP, they should be ready to resume leadership role within the MPWD in providing training and in implementing future projects. In order to disseminate environmental experience gained by the MPWD, each staff would be required to maintain good records and prepare dissemination notes on specific issues and problems encountered and resolved, and how the experience gained could be integrated in future road projects. Competent members of the MPWD should be offered additional environmental training and should be encouraged to train other staff.

7.4.3 Proposed training components

The environmental training aspects of the environmental personnel of PWD should encompass the following:

- Understanding of the relevant environmental regulations and their application to the project.
- Environmental management practices in hill roads upgradation and maintenance
- Main impacts of the project on the environment.
- Mitigation measures as given in the EMP and their implementation through incorporation in the design, construction supervision and monitoring.
- Duties and responsibilities of the Contractors, Supervisor Engineers, Supervision Consultants and the MPWD.
- Public/community consultation and its role during the implementation of the project.
- Liaison with other departments and relevant agencies (such as Forestry).

- Supervision of the implementation of the EMP and social issues during construction and operation. Resolution of environmental and social issues and their reporting.
- Monitoring during construction and operation.
- Weekly, monthly and quarterly report preparations and submission.
- Preparation of dissemination notes, holding of workshops, and training of other staff in MPWD.

The training modules to be worked out for the project need to be of relevance to the specific context of the roads in Mizoram, focussing on the following issues:

- Conservation of biodiversity
- Slope stability and vulnerability to landslides
- Siting criteria for identification of dumping sites
- Harnessing water resources, including rain water harvesting
- Concepts of bio-engineering and application of bio-engineering techniques for slope protection

The training modules suggested in Table 7.2 incorporate the training as envisaged for the implementation of EMF

Table 7.2: Proposed Training Modules for Implementation of Environmental Management Framework

S. No.	Training Recipients	Mode of Training	Environmental & Social Aspects to be covered training module	Training Agency Conducting
Module – I	Environmental staff of “Environmental and Social Management Cell”. Associated NGOs in implementation and staff associated with construction supervision	Lecture System Workshops & Presentation	Environmental overview: Key issues Methodology Public Consultation Value Addition	External trainers, Environmental Specialist, Supervision consultant
Module – II	Members of PWD staff involved in supervising up-gradation corridor, NGO representatives;	Lectures; Group discussions	Mizoram State Road Project: Environmental Impact Assessment Social Impact Assessment Environmental Management Plan Slope protection	External Trainers; Environmental Specialist, Supervision consultant
Module - III	Contractors’ representatives; NGO representatives; Supervision Consultants’ representatives; Members of PWD staff involved in supervising up-gradation corridor,	Lectures and Presentations	Institutional Framework for Implementation of MSRP: The role of the PWD The responsibilities of the Supervision Consultant and the NGO Reporting requirements Contractual Obligations and Environmental Protection	Specialist trainers, Environmental Specialist, Supervision consultant, PWD
Module – IV	Members of PWD staff involved in supervising Major Maintenance, Upgradation; NGO staff implementing the R&IPDP; District Officials & Members of special committees – MVAC and GRC	Presentations; Site Visits; Demonstration Sessions	Special Issues in MSRP-2: Bio-Diversity Assessment and Conservation Geo-morphological Assessment and Slope Protection Consultation and Counselling Income generation and Economic Rehabilitation Preparation of Micro-plans	Specialist Trainers, PWD and PCC Consultant

S. No.	Training Recipients	Mode of Training	Environmental & Social Aspects to be covered training module	Training Conducting Agency
Module – V	Members of the PWD; Selected Officers of the line Departments such as Forests, Officials of the Pollution Control Board, Mining and Geology department	Lectures; Group Discussions	Improved Co-ordination with other departments: Overview of the MSRP Environmental & Social Impacts of the proposed improvements Statutory permissions – procedural requirements Co-operation with the Forests Department Co-operation with the Revenue Department	External agency.
Module – VI	Members of PWD involved in MSRP	Lectures; Demonstration sessions; Group Discussions	Long-term issues in Planning Roads development in Mizoram Environmental & Social Assessment Methodology Preparation of EMP & RAP Stability of Hill Roads and mitigation measures Conserving bio-diversity along roadside Highway related diseases and AIDS Consultation tools and techniques	External Agency

7.5 Institutional arrangement for monitoring of EMP implementation

In order to ensure that the proposed mitigatory measures have the intended results and comply with GoI and World Bank requirements, an environmental performance monitoring arrangement in the form of Framework for Monitoring of Environmental Issues has been proposed as described in table 7.3

Table 7.3 Framework for Monitoring of Environmental Issues

SN	Issue	Procedure	Timing	Responsibility
A. Pre-Construction				
1	Integration of local people's environmental concerns.	Review of study and design reports, discussion with local residents, representatives, and designers.	During the study and design process and prior to approval.	PIU, PWD
2	Undertaking required level of environmental assessment	Review of screening, scoping, and IEE/EIA documents	Prior to project approval.	PIU, PWD
3	Incorporation of mitigation measures and environmental guidelines	Review detail design/drawings of the project	During project approval	PIU, PWD
B. During Construction				
4	Construction and location of drainage facilities.	Site inspections at places where such drains are required.	During active construction	PIU, Contractor, Local NGOs.
5.	Proper use of explosives for blasting.	Site observation and discussion with local people and workers	Whenever blasting takes place.	PIU, Contractor,
6	Care and safe storage of top soil for later use.	Inspection of site clearance practices, top soil storage sites	Monthly during construction.	PIU, Contractor,
7.	Care for vegetation in the RoW and immediate vicinity	Inspection of site clearance Activities.	Bi-Weekly during construction.	PIU, Local NGOs, Contractor
8.	Safeguarding of drinking water sources.	Site observation	During and immediately after construction in the water source vicinity.	PIU, Local NGOs, Contractor
SN	Issue	Procedure	Timing	Responsibility
9.	Disposal of spoil materials and other construction wastes	Disposal site observation and disposal practice	Weekly.	PIU, Local NGOs, Contractor

10.	Impacts on agricultural land due to spoil disposal/soil erosion/water-logging due to construction	Site observation and discussion with local people	Weekly	PIU, Local NGOs, Contractor
11.	Reclamation of disposal sites	Observation of reclaimed disposal sites	Periodically	PIU, Local NGOs, Contractor
12	Plantation of vegetation in the cut slope	Observation of sites	Periodically	PIU, Local NGOs, Contractor
13	Timely construction of other slope protection measures, such as, retaining walls.	Observation of sites	Immediately after construction	PIU, Local NGOs, Contractor
14	Quality of surface water.	Water testing	Construction site near a water body	PIU, Local NGOs, Contractor
15	Operation and closure of quarries and borrow pits confirmed to the requirements related to location, vegetation protection, soil conservation, erosion control, siltation and stability concerns.	Site inspection, discussion with workers and local people.	During quarry operation or bi-weekly	PIU, Local NGOs, Contractor
16	Air pollution near settlements	Observation of construction practices and consultation with local residents and workers	Periodically	PIU, Local NGOs, Contractor

7.6 Environmental Budget for EMF implementation

In view of the environmental management measures suggested above and factoring in the limited implementation capacity of the PIUs, necessary budgetary provisions should be made for EMF implementation and EMP implementation. Tentative budget for EMF implementation is 14 Million INR which include-

- EA preparation for Group-2 road
- Additional HR/ Consultant,
- Training & orientation,
- Monitoring,
- Institutional assessments for unit establishment,
- Induced & cumulative impact assessment, etc.

Based on previous experiences Specific EA and EMP cost of Group-2 road has been worked out.

Table 7.4: Budget for EMF implementation **MSRP-2 (in INR)**

Budget Head	Upgradation / Improvement
EA preparation for Group-2 road	50,00,000.00
Institutional assessments for unit establishment,	10,00,000.00
Training of MPWD and forest Department	20,00,000.00
Monitoring	10,00,000.00
Induced & cumulative impact assessment	50,00,000.00
Total	140,00,000.00

Checklist of Threatened Endemic Plants identified in the project influence area

Checklist of Threatened Plants identified in the project influence area

Sl.No	Scientific name	Family	Red data book status
1.	<i>Begonia lushaiensis</i>	Begoniaceae	Rare
2.	<i>Begonia wengeri</i>	Begoniaceae	Indeterminate
3.	<i>Coelogyne rossiana</i>	Orchidaceae	Vulnerable
4.	<i>Paphiopedilum hirsutissimum</i>	Orchidaceae	Rare
5.	<i>Paphiopedilum villosum</i>	Orchidaceae	Vulnerable
6.	<i>Renanthera imschootiana</i>	Orchidaceae	Endangered

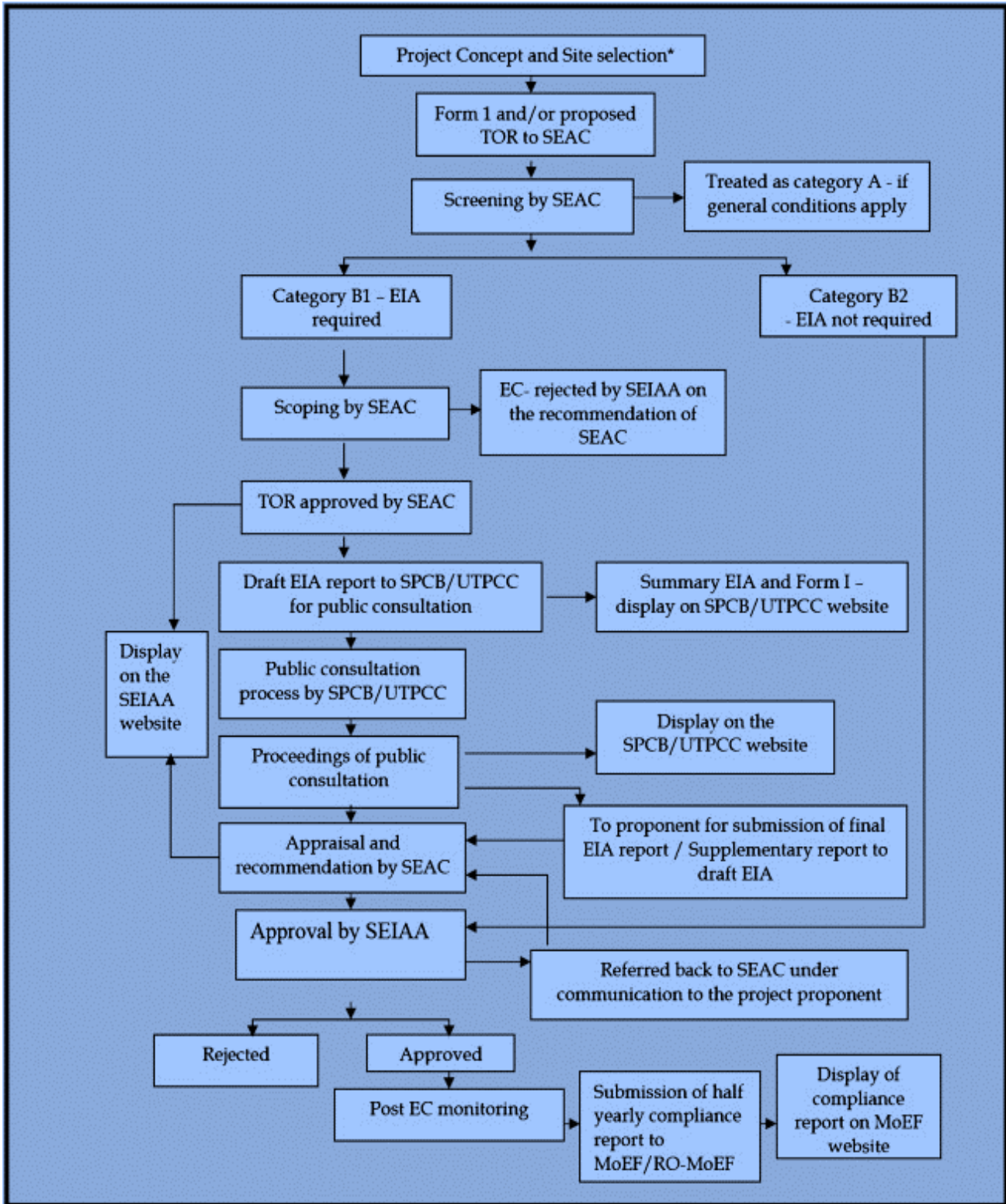
Source: Red Data Book Plants of India (Nayar & Sastry 1987-88) - Checklist of Threatened Plants of Mizoram, Observed on *Renanthera imschootiana* June 4, 2013

Checklist of Endemic Plants identified in the project influence area

Sl.No	Scientific name	Family
1.	<i>Arundinaria phar</i>	Poaceae
2.	<i>Begonia lushaiensis</i>	Begoniaceae
3.	<i>Bulbophyllum parryae</i>	Orchidaceae
4.	<i>Chasalia lushaiensis</i>	Rubiaceae
5.	<i>Derris lushaiensis</i>	Fabaceae
6.	<i>Dichrocephala minutifolia</i>	Asteraceae
7.	<i>Didymocarpus adenocarpus</i>	Gesneriaceae
8.	<i>Didymocarpus parryorum</i>	Gesneriaceae
9.	<i>Didymocarpus rodgeri</i>	Gesneriaceae
10.	<i>Didymocarpus wengeri</i>	Gesneriaceae
11.	<i>Eria lacei</i>	Orchidaceae
12.	<i>Glycosmis cyanocarpa</i>	Rutaceae
13.	<i>Jasminum wengeri</i>	Oleaceae
14.	<i>Mahonia borealis</i>	Berberidaceae
15.	<i>Mantisia wengeri</i>	Zingiberaceae
16.	<i>Mussaenda parryorum</i>	Rubiaceae
17.	<i>Mussaenda pentasemia</i>	Rubiaceae
18.	<i>Orthosiphon glandulosus</i>	Lamiaceae
19.	<i>Petrocosmea parryorum</i>	Gesneriaceae
20.	<i>Rhododendron witchianum</i>	Ericaceae
21.	<i>Senecio lushaiensis</i>	Asteraceae
22.	<i>Sinarundinaria longispiculata</i>	Poaceae
23.	<i>Sonerila villosa</i>	Melastomataceae
24.	<i>Stereogyne lushaiensis</i>	Orchidaceae
25.	<i>Strobilanthes parryorum</i>	Acanthaceae
26.	<i>Trisepalum lineicapsa</i>	Gesneriaceae
27.	<i>Vernonia parryae</i>	Asteraceae

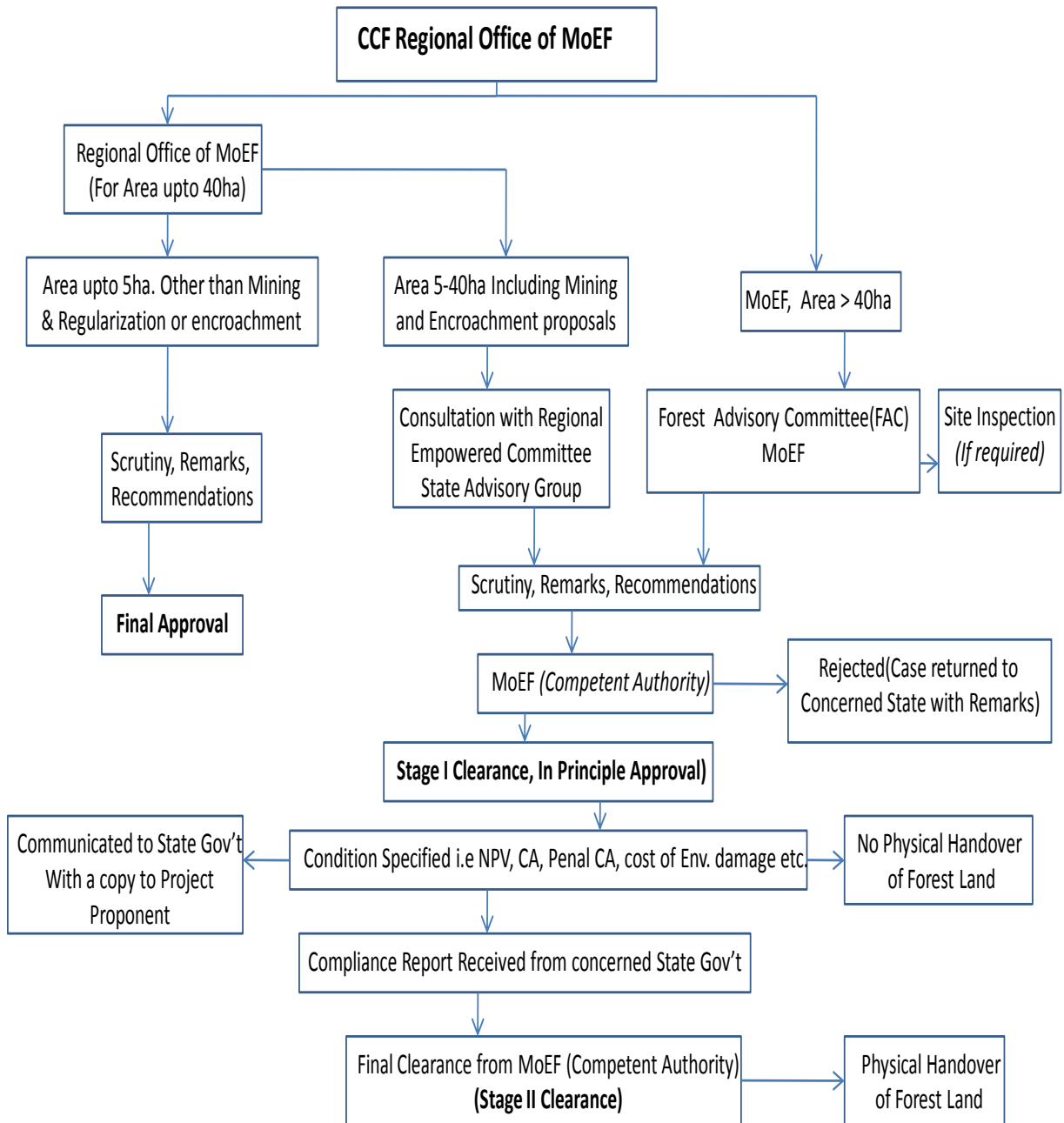
Annexure – 2

ENVIRONMENT AND FOREST CLEARANCE PROCEDURE



ENVIRONMENT CLEARANCE PROCEDURE

Submission of Proposals :



FOREST CLEARANCE PROCEDURE

Annexure - 3

Guidelines for identification of debris disposal sites

The efforts shall be put to use the debris for productive purposes as far as possible. As a first step, communities along the corridor shall be informed about the availability of spoil and use for community purposes such as creation of community flat land (during MSRP-I several communities used spoil to create play grounds in village land), followed by private uses by individuals based on first come first serve basis in a transparent manner.

Subsequently, if there is still debris is left over, the following principles shall be used for disposal:

- All the disposal sites shall be screened for environmental impacts in line with the mandatory screening principles documented under Chapter 5 of EMF and screening reports shall be cleared by the project supervision consultants prior to disposal
- None of the disposal shall be productive lands and/or forested and/or vegetated areas.
- Dumping sites are located at least 1000m away from locations given in Annexure - V, biodiversity assessment of the location is to be carried out for identified locations. Biodiversity expert hired for the purpose by the contractor will conduct the assessment.
- Dumping sites shall be located at least 1000m away from nearest surface water source.
- Prior to awarding the construction contracts, dumping sites for the estimated quantity of debris shall be secured as far as possible.
- Each of the dumping site shall be custom designed with necessary provision for toe protection, slope protection (preferably with bio-engineering measures) and appropriate drainage to prevent pollution and erosion. While conceptual designs can be part of the EMP, detailed designs shall be mandatory with prior approval from project supervision consultants.
- Public perception about the location of debris disposal site has to be obtained before finalizing the location.
- Permission from the Village Council President is to be obtained for the dumping site selected

Annexure – 4

Guidelines for disposal of debris

The cutting activities shall generate an earthwork of 0.1 million cu.m./km i.e in MSRP-2 amount of excavated earth will be about 46.6 million cu.m . The disposal of which is an issue of concern. Earth generated from cutting will be utilised as construction fill material and also for building road subgrade. Remaining needs to be disposed at dumping locations. This remaining earth shall be disposed off in an environmentally suitable manner. Certain guidelines for debris disposal are given below.

- The debris generated shall be disposed of within designated areas only.
- The filled up area shall be used for designated purposes such as:

a) Playing fields

- These will be created by leveling of the filled up area and compacting the fill with several passes of a roller.
- This compacted area will be covered with topsoil from excavation for a depth of 15-30 m.
- The soil will be watered and grassed to develop a green cover over an area of the playing field.

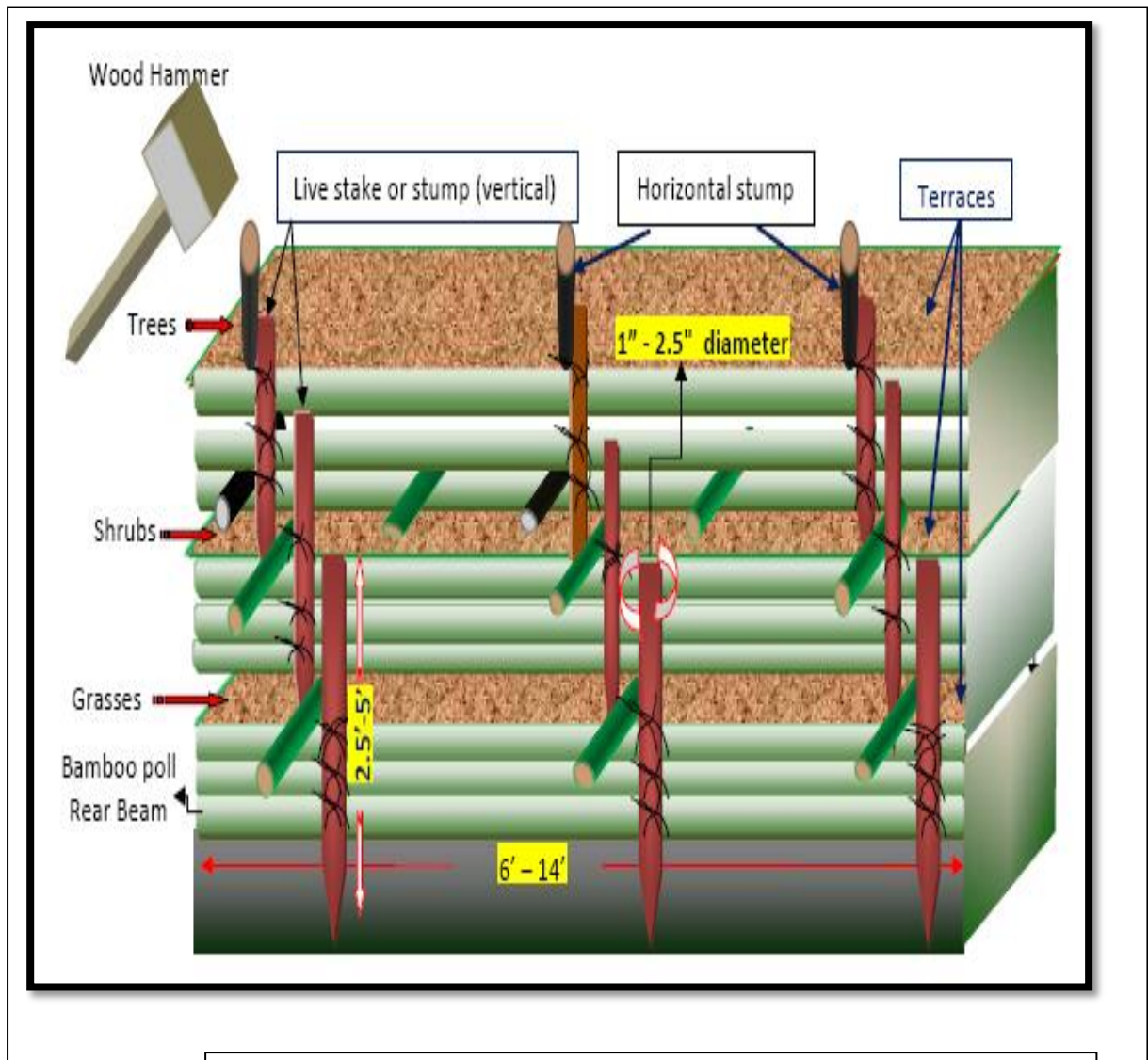
b) Short realignments

- The short realignments provide ideal disposal sites for substantial quantities of debris of cutting.
- The valley between the sharp curve shall be filled to the level of the sub-grade.
- A retaining wall of dimensions as per engineering design shall be constructed and the road section shall be constructed on the filled area.

Debris will be continued to fill till the level of the top of the pavement is reached between the new and old roads.

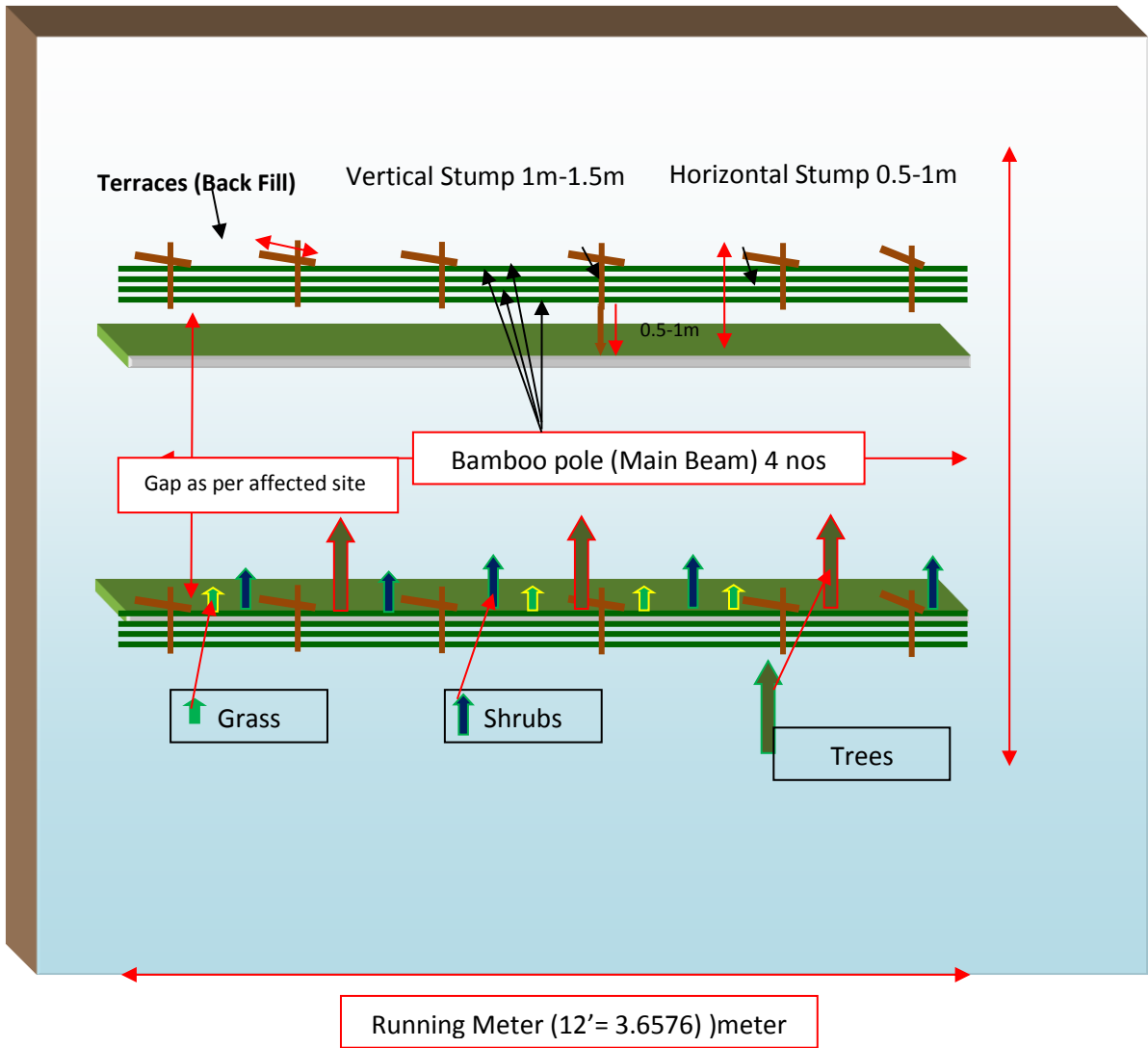
ANNEXURE -5

BIOENGINEERING METHODS APPLIED IN MIZORAM FOR SLOPE PROTECTION



Schematic Triple Bamboo Crib wall

CRIB WALL DESIGNED





Bamboo crib wall during implementation



Bamboo crib wall after implementation



Bamboo matting for potection of slopes



Bamboo mating for potection of disposal site

ANNEXURE -6

TREE PROTECTION AND WATER HARVESTING STRUCTURES

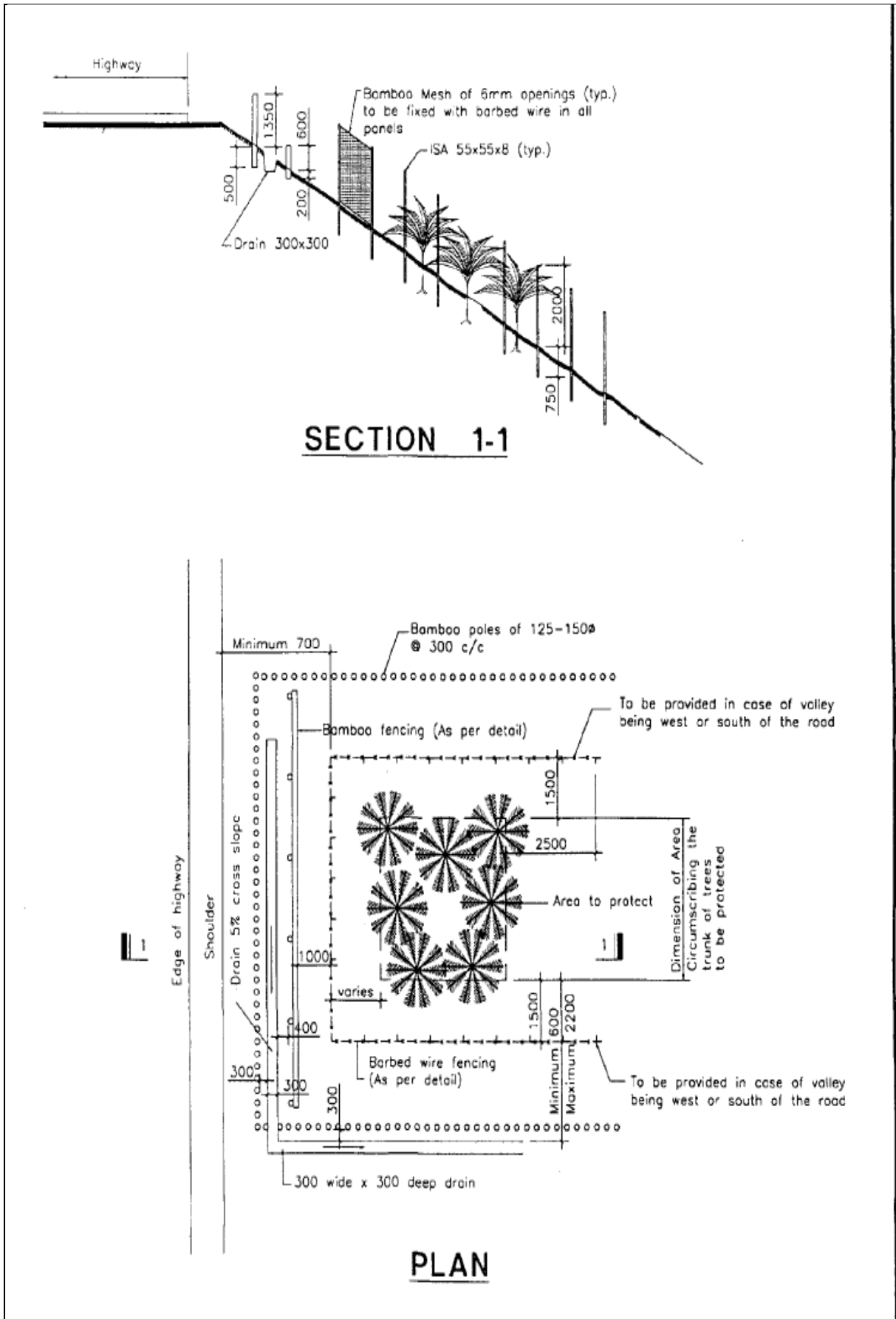


Fig 1 : Scheme -1 for protecting trees during construction

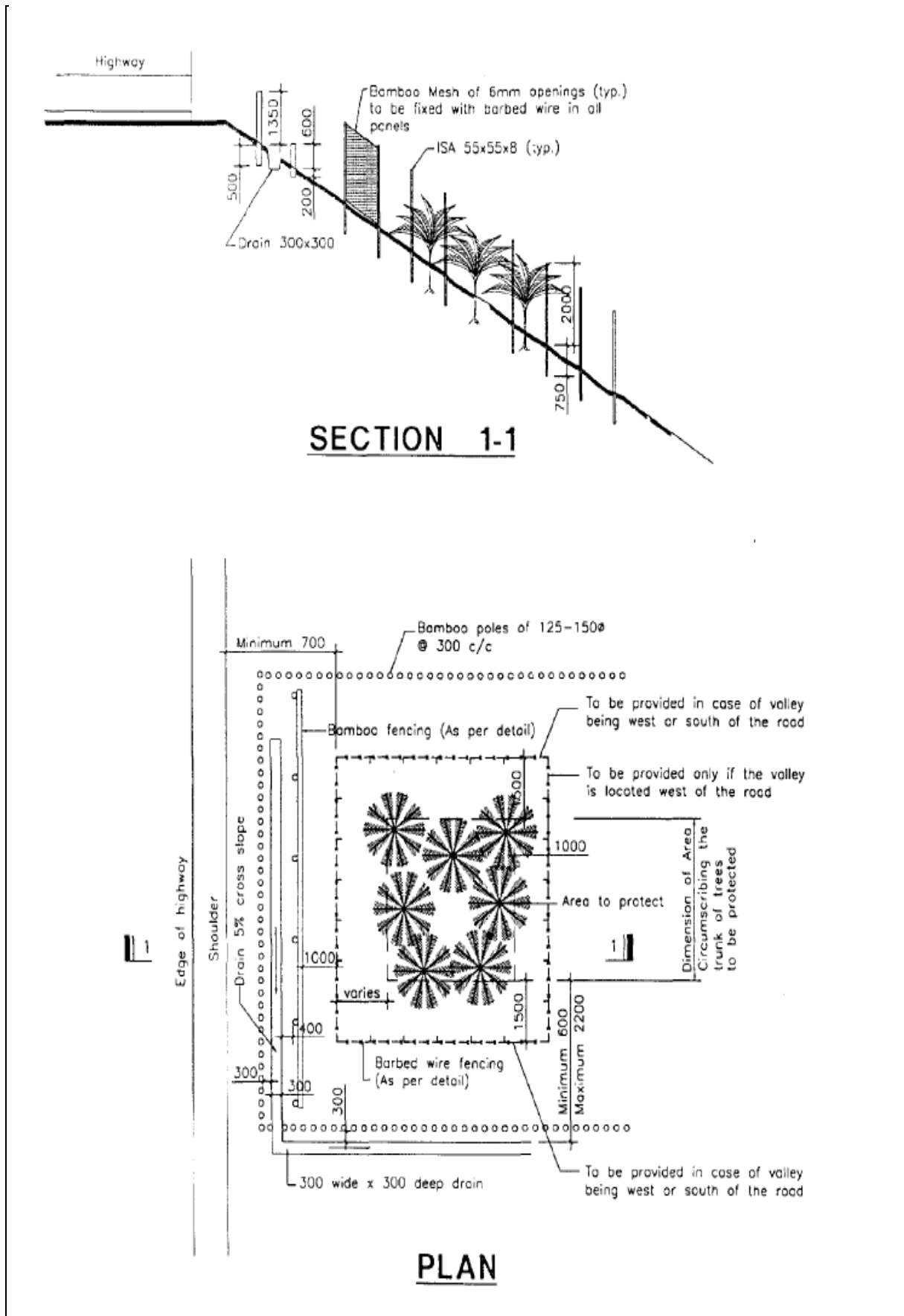


Fig 2: Scheme -2 for protecting trees during construction

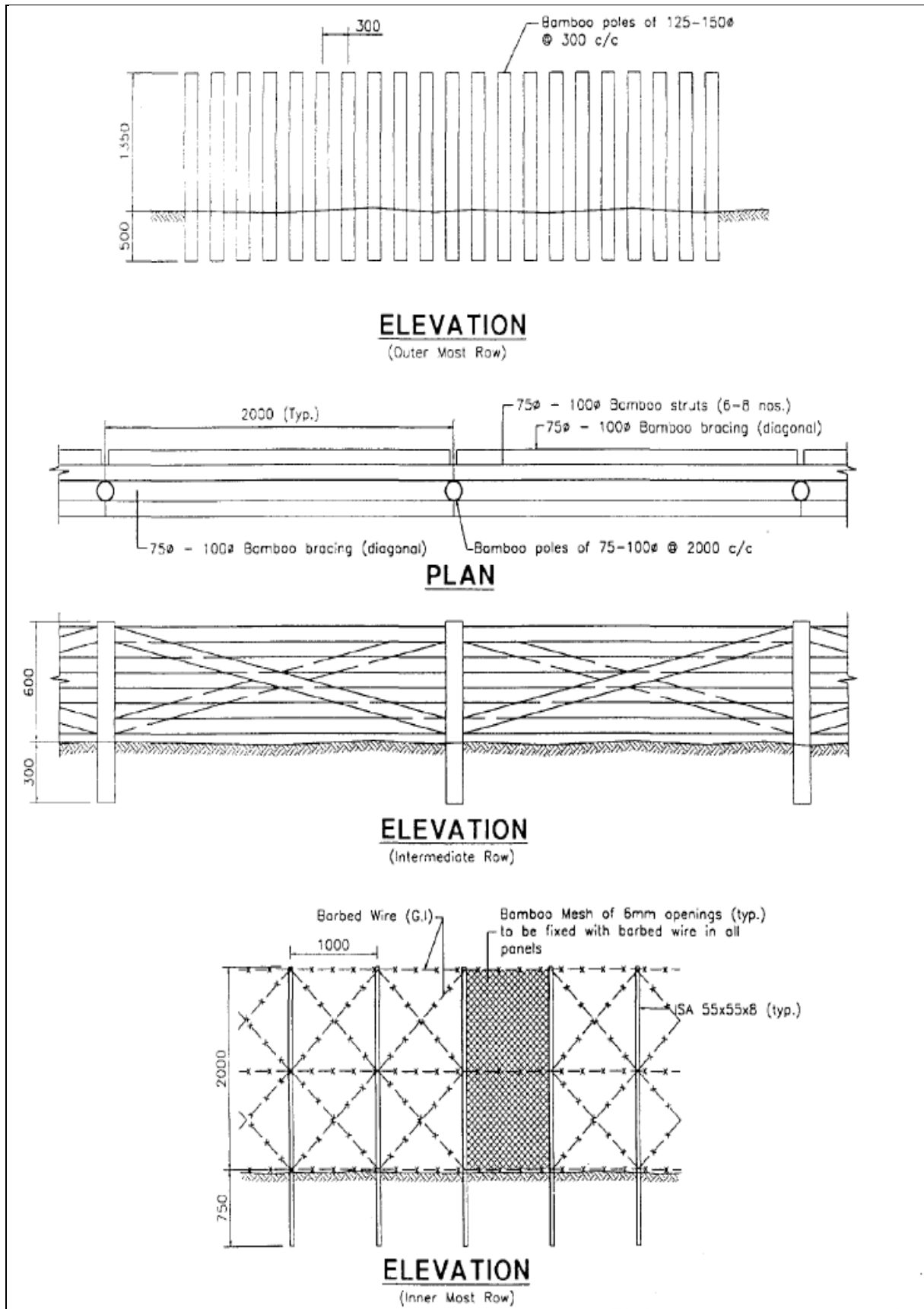


Fig 3 :Barriers for protecting trees

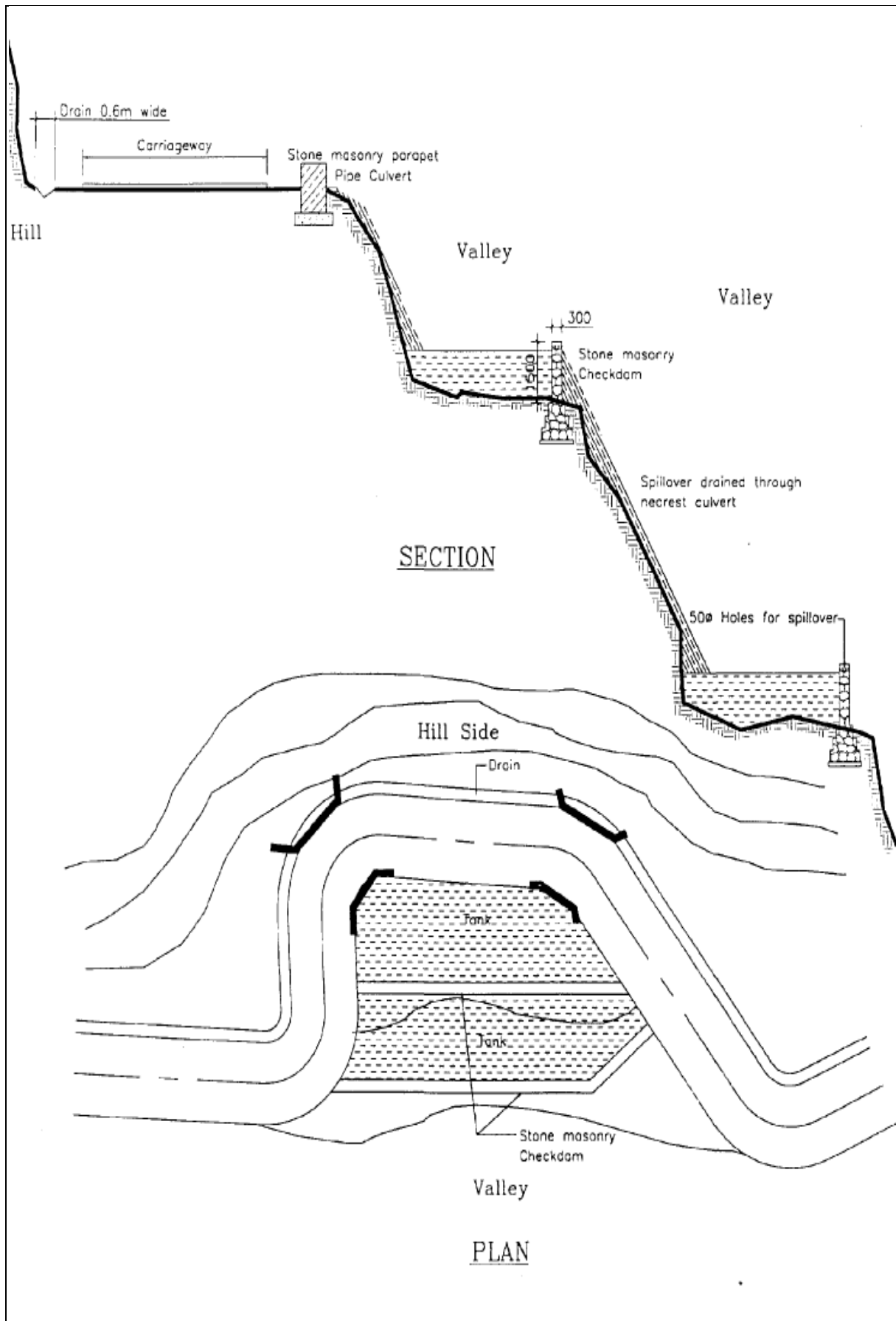


Fig 4: Water harvesting arrangement on valley side

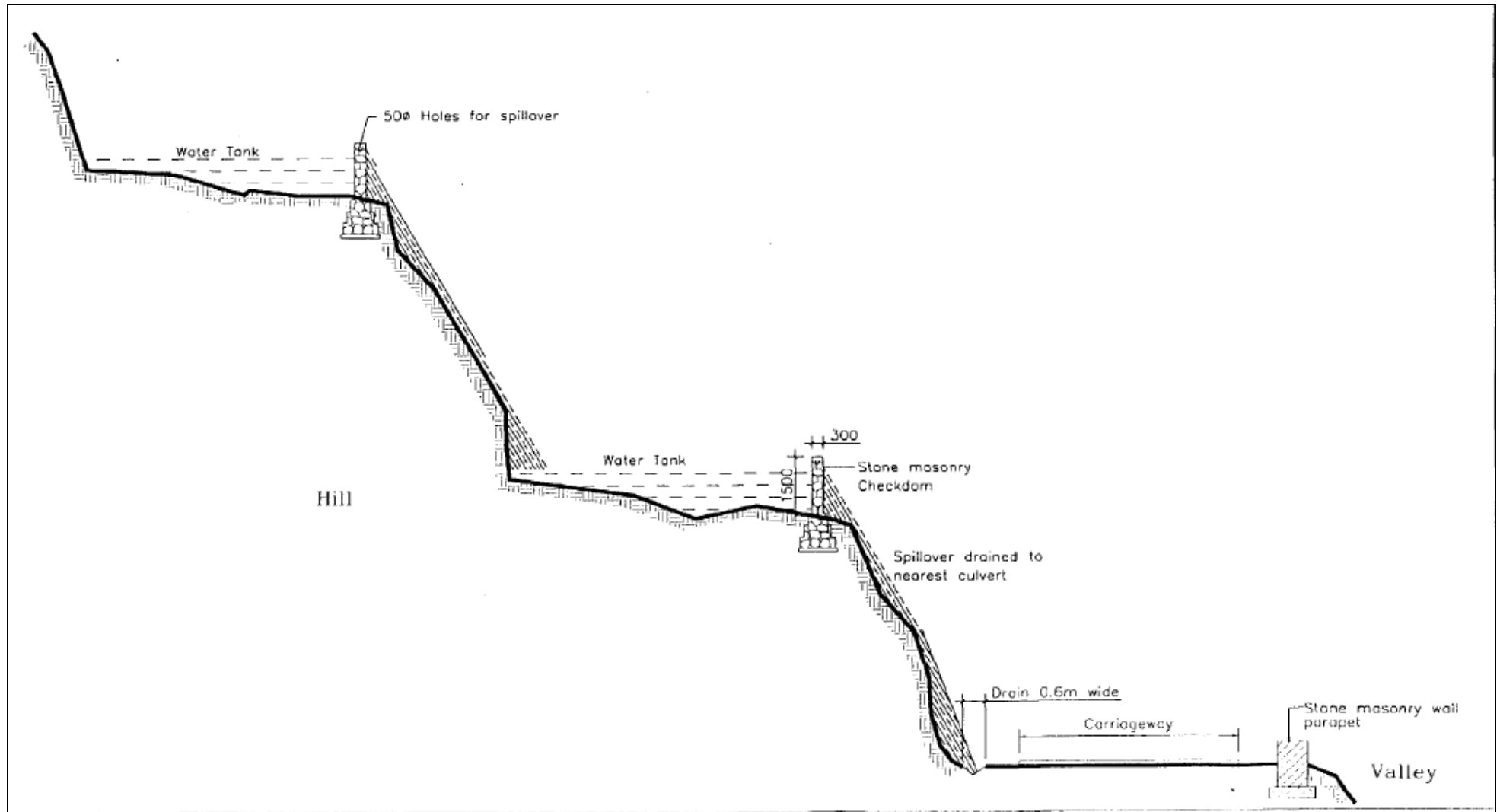


Fig 5: Water harvesting arrangement on hill side

Annexure -7

Guideline for construction camp

GUIDELINES FOR SANITATION AND HOUSE KEEPING AT THE LABOUR /CONSTRUCTION CAMPS

SITE SELECTION

- The construction camps will be located at least 200 - 500 m away from habitations at identified sites. The living accommodation and ancillary facilities for labour shall be erected and maintained to standards and scales approved by the resident engineer.
- All sites used for camps must be adequately drained. They must not be subject to periodic flooding, nor located within 200 feet of swamps, pools, sink holes or other surface collections of water unless such water surface can be subjected to mosquito control measures.
- The camps must be located such that the drainage from and through the camps will not endanger any domestic or public water supply.
- All sites must be graded, ditched and rendered free from depressions such that water may get stagnant and become a nuisance.

WATER SUPPLY

- An adequate and convenient water supply, approved by the appropriate health authority, must be provided in each camp for drinking, cooking, bathing and laundry purposes.
- Potable water supply systems for labour camps occupants shall be as per the design approved by the Local Public Health Engineering Department and meet the water quality standards as prescribed by the State Pollution Control Board. In addition, the design of water system facilities shall be based on the suppliers Engineer's estimates of water demands.
- The drinking water system must be monitored in accordance with the water quality parameters as prescribed by the State Pollution Control Board. The water supply system used for cooking purposes that is drained seasonally must be cleaned, flushed, and disinfected prior to use. Furthermore, a water sample of satisfactory bacteriologic quality, i.e. a sample showing not more than one coliform bacteria per 100 ml sample must be obtained before being placed into service.
- At all construction camps and other workplace, good and sufficient water supply shall be maintained to eliminate chances of waterborne/water -related/water -based diseases to ensure the health and hygiene of the workers.

TOILET FACILITIES AND HYGIENE

- There shall be adequate supply of water, close to latrines and urinals.
- Within the precincts of every workplace, latrines and urinals shall be provided in an accessible place, and the accommodation, separately for each of these, as per standards set by the Building and other Construction Workers (regulation of Employment and Conditions of Service) Act, 1996. Except in workplaces provided with water - flushed latrines connected with a water borne sewage system, all latrines shall be provided with dry - earth system (receptacles) which shall be cleaned at least four times daily and at least twice during working hours and kept in a strict sanitary condition. Receptacles shall be tarred inside and outside at least once a year.

- Toilet facilities adequate for the capacity of the camp must be provided. Each toilet room must be located so as to be accessible, without any individual passing through any sleeping room.
- A toilet room must be located within 200 feet of the door of each sleeping room. No toilet may be closer than 100 feet to any sleeping room, lunch area or kitchen.
- Where the toilet rooms are shared, such as in multifamily shelters and in barracks type facilities, separated toilet rooms must be provided for each sex. These rooms must be distinctly marked “for men” and “for women” by signs printed in English and in the native language of the persons occupying the camp, or marked with easily understood pictures or symbols. If the facilities for each sex are in the same building, they must be separated by solid walls or partitions extending from the floor to the roof or ceiling.
- Urinals must be provided on the basis of one unit or 2 linear feet of urinal trough for each 25
- men. The floor from the wall and for a distance not less than 15 inches measured from the
- outward edge of the urinals must be constructed of materials impervious to moisture. Where
- water under pressure is available, urinals must be provided with an adequate water flush.
- Urinals troughs in privies must drain freely into the pit or vault, and the construction of this drain must be such as to exclude flies and rodents from the pit.

WASTE DISPOSAL

- The sewage system for the camp must be designed, built and operated to the satisfaction of the concerned local State Govt. Department so that no health hazard occurs and no pollution to the air, ground or adjacent watercourse takes place. Compliance with the relevant legislation must be strictly adhered to.
- Garbage bins must be provided in the camps and regularly emptied and the garbage disposed off in a hygienic manner to the satisfaction of relevant norms.
- Unless otherwise arranged for by the local sanitary authority, arrangement for disposal of excreta by incineration at the workplace shall be made by means of a suitable incinerator approved by the local medical health or municipal authorities. Alternatively, excreta may be disposed off by putting a layer of night soils at the bottom of permanent tank prepared for the purpose and covering it with 15 cm layer of waste or refuse and then covering it with a layer of earth for a fortnight (by then it will turn into manure).
- On completion of the works, all such temporary structures shall be cleared away, all rubbish burnt, excreta tank and other disposal pits or trenches filled in and effectively sealed off and
- the outline site left clean and tidy, at the Contractor’s expense, to the entire satisfaction of the
- engineer

FIRST AID

- Injuries might occur during the construction period. It is therefore pertinent to provide first aid facilities for all the construction workers. At construction camps and at all

workplaces first aid equipment and nursing staff must be provided. Since many of the workplaces may be far away from regular hospitals, an indoor health unit having one bed facility every 250 workers needs to be provided.

- Adequate transport facilities for moving the injured persons to the nearest hospital must also be provided in ready to move condition.
- The first aid units should apart from an adequate supply of sterilized dressing material should contain other necessary appliances as per the factory rules

MAINTENANCE

- All buildings, rooms and equipment and the grounds surrounding them shall be maintained in a clean and operable condition and be protected from rubbish accumulation.
- All necessary means shall be employed to eliminate and control any infestations of insects and rodents within all parts of any labor camp. This shall include approved screening or other control of outside openings in structures intended for occupancy or food service facilities.
- Each structure made available for occupancy shall be of sound construction, shall assure adequate protection against weather, and shall include essential facilities to permit maintenance in a clean and operable condition. Comfort and safety of occupants shall be provided for by adequate heating, lighting, ventilation or insulation when necessary to reduce excessive heat.
- Each structure made available for occupancy shall comply with the requirements of the Uniform Building Code. This shall not apply to tent camps

Annexure- 8

The specific roles and responsibilities of the persons / agencies involved in EMP implementation

The specific roles and responsibilities of the Executive Engineer (Environment) and the Assistant Engineer (Environment) are presented in the following section.

Executive Engineer (Environment)

The overall responsibility of the Executive Engineer (Environment) shall be to guide and assist the PWD to develop, implement and strengthen the environmental management practices in road development projects for the current and future projects in Mizoram, drawing upon the experiences gained in the implementation of the MSRP-2. The principal duties entrusted to the Executive Engineer (Environment) include:

- Review the preparation of the Environmental Assessments for the project and finalization in close co-ordination with the World Bank;
- Ensure that the project design and specification adequately reflect the Environmental Management Plan;
- Co-ordinate the obtaining of requisite Environmental Clearances for the project;
- Develop training programme for the PWD staff, the contractors and others involved in the project implementation, in collaboration with the Environmental Specialist of the Supervision Consultant;

- Review and approve the Contractor's Implementation Plan for the environmental measures, as per the EMP;
- Liaise with the Contractors, Supervision Consultants and the PCC on the implementation of the EMP;
- Liaise with the various Central and State Government agencies on environmental and other regulatory matters;
- Continuously interact with the NGOs and Community groups to be involved in the project (for the maintenance of additional plantation suggested for the project);
- Establish dialogue with the affected communities and ensure that the environmental concerns and suggestions are incorporated and implemented in the project;
- Review the environmental performance of the project through an assessment of the periodic environmental monitoring reports submitted by the Supervision Consultants; provide a summary of the same to the Project Director, and initiate necessary follow-up actions;
- Provide support and assistance to the Government Agencies and the World Bank to supervise the implementation of the EMP during the construction as well as operation stage of the project;
- Document the good practices in the project on incorporation and integration of environmental issues into engineering design and on implementing measures in the road construction and maintenance programs, and dissemination of the same. This shall form a useful tool to other similar agencies in other parts of the country especially on the environmental management of hill roads;
- Report to the Project Director on the environmental aspects pertaining to the project.

Assistant Engineer (Environment)

Reporting to the Executive Engineer (Environment), the Assistant Engineer (Environment) shall play a key role in the implementation of the EMP. The principal duties assigned to the AE shall be as follows:

- Review the preparation of the Environmental Assessments for the project;
- Liaise with various Governmental Agencies during the obtaining of requisite Environmental Clearances for the project;
- Assist the Environment Engineer and the Environmental Specialist of the SC in preparation of the training materials and in conducting training;
- Review the Contractor's Implementation Plan for the environmental measures, as per the EMP along with the Environmental Specialist of the Supervision consultant;
- Liaise with the Contractors, Supervision Consultants and the PCC on the implementation of the EMP;
- Liaise with the various Central and State Government agencies on environmental and other regulatory matters;
- Carrying out consultations with the NGOs and Community groups to be involved in the project (for the maintenance of additional plantation suggested for the project);

- Establish dialogue with the affected communities and ensure that the environmental concerns and suggestions are incorporated and implemented in the project;
- Carry out site inspections, check and supervise periodic environmental monitoring, carried out by the Supervision Consultants and other monitoring agency, and initiate necessary follow-up actions;
- Document the good practices in the project on incorporation and integration of environmental issues into engineering design and on implementing measures in the road construction and maintenance programs, and dissemination of the same.
- Report to the Environment Engineer / Project Director on the environmental aspects pertaining to the project
- Prepare periodic (monthly, quarterly and annual) reports for dissemination within the PWD, for the World Bank etc.

Project Co-ordinating Consultants

The Project Co-ordinating Consultants have been appointed to assist the PWD during project preparation. The Environmental and Social experts of the PCC have been responsible for the preparation of EA as per the ToR approved by the World Bank. The major inputs of the PCC will end with project appraisal. However, their specialist technical inputs will continue for a limited period within the project duration.

Construction Supervision Consultants

The Construction Supervision Consultants, to be selected through ICB, are expected to have the in-house capacity to advise on and supervise the implementation of the EMP including making the decisions regarding applicability of enhancement design options and any modifications, if needed, the appropriate landscape section to be applied etc. For this purpose, the SC will employ a Senior Environmental Specialist and two full time environmental specialist. The prime duty of the Environmental Specialist would be to supervise the implementation of the EMP by the Contractors and to ensure that the day-to-day construction activities are carried out in an environmentally sound and sustainable basis. The scope includes development of environmental procedures and good construction practices, development and delivery of training programmes etc.

Environmental Specialist – Supervision Consultant

The Environmental specialist, preferably with postgraduate specialization in environmental engineering, shall have 15 years of working experience related to the integration of environmental and social issues in the design, construction and operation of transport projects. Experience in construction management and operational maintenance of highways is preferred. The specific roles and responsibilities of the Environmental Specialist of the Supervision Consultant is presented below:

- Supervise the implementation of the EMP by the Contractors.
- Develop, organise and deliver environmental training programmes and workshops for the staff of the PWD, Contractors (of both upgradation and maintenance

routes), Field Supervision Staff, PWD officials (responsible for the supervision of the Maintenance works) and the Quality Auditors.

- Review and approve site specific environmental enhancement/mitigation designs worked out by the Contractor (for water falls, bio-diversity rich locations etc)
- Hold regular consultation meetings with the Environmental Cell of the PWD
- Review the Contractors' Environmental Implementation Plans to ensure compliance with the Environmental Management Plan (EMP)
- Develop good practice construction guidelines to assist the contractors in implementing the EMP
- Monitor tree plantation programmes and the periodic environmental monitoring (air, noise, water, etc.) programmes to ensure compliance with the State requirements and the EMP
- Prepare and submit regular environmental monitoring and implementation progress reports
- Assist Environmental Cell to prepare good practice dissemination notes based on the experience gained from site supervision
-

Non Government Organisation

As part of the project implementation, the MSRP-2 plans to undertake plantation and maintenance and protection of the vegetation along the project roads (in addition to the compensatory afforestation that will be proposed by the Forest Department, Government of Mizoram). The maintenance of these plantations would be entrusted to an NGO. The environmental responsibilities of the NGO include the maintenance of roadside plantations and conservation of biodiversity. The specific roles and responsibilities of the NGO include:

- Provide, plant and maintain three year old saplings on the valley side along the Free lands and Unclassified forest lands along the project road and along either sides of the road in sections through non-hilly terrain. Indigenous species would be selected for plantation, and maintained for five years, including protection and monitoring of the survival.
- Undertake adequate measures to ensure maximum survival of the saplings during transportation to the site, and post plantation by proper handling and maintenance.
- Ensure proper watering, removal of weed, litter and debris from the vicinity of the plantation. The NGO will ensure the protection of the fencing provided to the saplings from trampling and browsing by the cattle.
- Identify locations of medicinal plants and other endangered plant species, and create awareness amongst the population, the importance of the conservation of the same.
- Conduct awareness campaigns for the settlements against poaching and on conservation of biodiversity.
- Periodically visit the construction activities in the Ecological Identity Areas identified along the corridor and ensure that the construction activities are taken with due precautionary arrangements. In case of any non-compliance, will report to the Environmental Engineer, PWD and the Environmental Specialist of the Supervision consultant for further action

- Will depute 4 personnel (preferably graduates) to undergo training by the Environmental Specialist of the SC, or for participation in other income generation programmes as Orchid cultivation, creation of gene pools for medicinal plants etc. These trained personnel will in turn carry out training in each of the project villages, in co-ordination with the Village Councils.

Contractor

The execution of the works will be responsibility of the contractor. It is expected that the environmental measures will also be implemented by the same contractor who executes the road works. This will ensure that the construction of the road and mitigation/enhancement designs will progress smoothly and efficiently. It follows that the contractor has enough environmental/social expertise to incorporate environmentally-sensitised construction practices. As executioners of the emps, the contractors are expected to follow the letter and spirit of the specifications. Though each contractor will have a set-up for executing works specified in the EMP, it is expected that a certain portion of its staff will have enough environmental awareness necessary for the successful completion of the works entrusted.

The Contractors too will have to employ an Environmental Engineer and will form an EHS committee. The best situation would be the use of Civil Engineers with relevant implementation experience of highway projects and with an understanding of the environmental issues. The roles and responsibilities that shall be entrusted to the

Environmental Engineer shall be as follows:

- Develop and detail out an implementation plan for the Environmental Provisions as envisaged in the EMP, and get it approved by the SC
- Continuously interact with the Environmental Specialist of the SC and the Environmental Cell of the PWD regarding the implementation of the environmental provisions;
- Identify suitable locations for siting of labour camps, construction waste disposal locations, construction and vehicle parking/maintenance sites and obtain the approval of the Environmental Specialist of the SC of the same.
- Ensure the implementation of the various mitigation measures proposed for the protection of bio diversity etc, prior to the commencement of construction activities at that particular sub-section of the project road.
- Ensure that proper environmental safeguards are being maintained at borrow sites and quarries from which the contractor procures material for construction.
- Supervise the proper construction and maintenance of the facilities for the labour camps, including the provisions for the safety and health of workers and their families.
- Ensure that proper facilities are available for the monitoring of ambient air quality and collection of water and soil samples as provided for in the environmental monitoring plan
- Liaise with the various Government Agencies (including the State Pollution Control Board) during the construction period and obtain the requisite clearances
- Carry out the measurement of quantities for environmental enhancement, prepare the bills of quantities for the work carried out for enhancement.

Annexure - 9

Generic Terms of Reference for Conducting an EIA

Environment Assessment (EA) is a decision support mechanism to ensure that the project design and implementation are environmentally sound and sustainable. During the preparation phase, the objective of the EA is to provide inputs to the selection of sub-projects, feasibility study; preliminary and detailed design as well as assist development of a holistic development of the project package. During the implementation phase, environmental management plans (developed as a part of the EA during the preparation phase) are to be used for executing the environmental mitigation, enhancement and monitoring measures.

Objectives of EA

In the preparation phase, the EA shall achieve the following objectives:

1. Identify and analyze upstream environmental issues that may affect the project and the sector.
2. Establish the environmental baseline in the study area, and identify any significant environmental issues (direct/indirect/induced/cumulative)
3. Assess impacts of the project, and provide for measures to address the adverse impacts by the provision of the requisite avoidance, mitigation and compensation measures
4. Integrate the environmental issues in the project planning and design; and
5. Develop appropriate management plans for implementing, monitoring and reporting of the suggested environmental mitigation and enhancement measures.

The environmental assessment studies and reporting requirements to be undertaken under these TOR must conform to the GoI/GoB regulations and the Bank guidelines.

Description of the Project

(Include description of the project; covering geographical location, type of development envisaged, including a description of project activities. Also include current status of the project. Provide brief information on any other study already completed/on-going or proposed) ... to be added by Client.

Scope of Work

The EA comprises the following 3 components: (i) Environmental screening for the entire project; (ii) Environmental Assessment (EA) for the individual project/sub-projects, as required; and (c) Environmental Management Plans (EMPs) for the individual project/sub-projects.

The following section gives the detailed scope of work in each of these stages.

Inception

The Consultants shall use the inception period to familiarize with the project details. The Consultants shall recognize that the remaining aspects of the project, such as engineering and social, would be studied in parallel, and it is important for all these aspects are integrated into the final project design to facilitate their successful project implementation. The Consultants should also recognize that due care and diligence planned during the inception stage helps in improving the timing and quality of the EA reports.

During the inception period the Consultants shall: (a) study the project information to appreciate the context within which the EA has to be carried-out; (b) identify the sources of secondary information on the project, on similar projects and on the project area; (c) carry out a reconnaissance survey and (d) undertake preliminary consultations with selected stakeholders.

Following the site visits and stakeholder consultations, as well as a review of the conditions of contract with the Client, the consultant shall analyse the adequacy of the allocated manpower, time and budget and shall clearly bring out deviations, if any. The Consultant shall study the various available surveys, techniques, models and software in order to determine what would be the most appropriate in the context of this project.

The Consultant shall interact with the engineering and social consultants to determine how the EA work fits into the over-all project preparation cycle; how overlapping areas are to be jointly addressed; and to appropriately plan the timing of the deliverables of the EA process. These shall be succinctly documented in the Inception Report.

Environmental Screening

Consultants shall summarize the known sub-project/s into different categories that relate to the magnitude potential environmental impacts. During such categorization, consideration shall be paid to: (i) location of sub-project with respect to environmentally sensitive areas; and (ii) volume, nature and technology of construction. The screening parameters should be such that their identification and measurement is easy, and does not involve detailed studies. The screening criteria shall also contain exclusion criteria, for sub-projects, which should not be taken up due to potential significant environmental impacts that cannot be mitigated (including, but not limited to, permanent obstruction to wildlife corridors, or opening up increased access to threatened biodiversity resource hotspots, or construction on top of eroded and vulnerable flood embankments).

Environmental Scoping

Based on result of the environmental screening exercise, consultants shall suggest the scope of Environmental Assessment to be undertaken. It shall include a listing of other environment

issues that do not deserve a detailed examination in the project EA (covering, for example, induced impacts that may be outside the purview of the client) along with a justification. The scoping needs to identify and describe the specific deviations or inclusions vis-à-vis the EA ToR provided, if any, along with a justification; modify this ToR for the sub-project EA, if required; and recommend studies that need to be conducted in parallel but are outside the EA process.

Baseline

All regionally or nationally recognized environmental resources and features within the project's influence area shall be clearly identified, and studied in relation to activities proposed under the project. These will include all protected areas (such as national parks, wildlife sanctuaries, reserved forests, RAMSAR sites, biosphere reserves, wilderness zones), unprotected and community forests and forest patches, wetlands of local/regional importance not yet notified, rivers, rivulets and other surface water bodies. and sensitive environmental features such as wildlife corridors, biodiversity hotspots, meandering rivers, flood prone areas, areas of severe river erosion, flood embankments (some of which are also used as roads). Consultants shall consolidate all this information in a map of adequate scale.

Stakeholder Identification and Consultation

Consultation with the stakeholders shall be used to improve the plan and design of the project rather than merely having project information dissemination sessions. The consultants shall carry out consultations with Experts, NGOs, concerned Government Agencies and other stakeholders to: (a) collect baseline information; (b) obtain a better understanding of the potential impacts; (c) appreciate the perspectives/concerns of the stakeholders; and (d) secure their active involvement during subsequent stages of the project.

Consultations shall be preceded by a systematic stakeholder analysis, which would: (a) identify the individual or stakeholder groups relevant to the project and to environmental issues; (b) include expert opinion and inputs; (c) determine the nature and scope of consultation with each type of stakeholders; and (d) determine the tools to be used in contacting and consulting each type of stakeholder group. A systematic consultation plan with attendant schedules will be prepared for subsequent stages of project preparation as well as implementation and operation, as required.

Identification of Relevant Macro/Regional Level Environmental Issues

Consultants shall determine the Valued Environment Components (VECs) considering the baseline information (from both secondary and primary sources), the preliminary understanding of the activities proposed in the project and, most importantly, the stakeholder (and expert) consultations, which would need to be carefully documented. Use of iterative Delphi techniques is recommended.

Based on the identification of VECs, consultants shall identify information gaps to be filled, and conduct additional baseline surveys, including primary surveys. The consultants shall conduct a preliminary analysis of the nature, scale and magnitude of the impacts that the project is likely to cause on the environment, especially on the identified VECs, and classify the same using established methods. For the negative impacts identified, alternative mitigation/management options shall be examined, and the most appropriate strategy/technique should be suggested. The preliminary assessment should clearly identify aspects where the consultants shall also analyse indirect and cumulative impacts during all phases and activities of the project. For the positive measures identified, alternative and preferred enhancement measures shall be proposed.

Environmental Assessment

The Consultants shall undertake necessary impact analysis on the basis of primary and secondary information and outputs from the stakeholder consultation process.

In the cases of very significant environmental losses or benefits, the consultants shall estimate the economic/financial costs of environment damage and the economic/financial benefits the project is likely to cause. In the cases, the impacts or benefits are not too significant, qualitative methods could be used. In addition, wherever economic and financial costs of the environmental impacts cannot be satisfactorily estimated, or in the cases of significant irreversible environmental impacts, the consultants shall make recommendations to avoid generating such impacts.

Environmental Management Plan

The consultants shall prepare an EMP to address identified planning, design, construction and operation stage issues. For each issue, the consultants shall prepare a menu of alternative avoidance, mitigation, compensation, enhancement and/or mitigation measures, as required/necessary. Consultants shall provide robust estimates of costs for environmental management measures. These costs shall be verified for common works items in line with the rate analysis for other works. The consultants shall organize consultations with line departments and will the finalize the EMP.

Environmental Inputs to Feasibility Study and Preliminary Project Design

The EA consultants shall make design recommendations, related to alignment, cross-sections, construction material use, mitigation and enhancement measures. The EA consultants shall interact regularly with the Client and familiarize themselves with the project's over-all feasibility analyses models, so that the EA inputs are in conformity to the needs of the over-all feasibility study.

Capacity Building and Training Plan Preparation

Based on the preliminary findings of the environmental screening, stakeholder consultations and institutional analysis of the implementing agency's capacity to manage environmental issues, the consultants shall prepare a Capacity Building Plan to mainstream environmental management in the implementing agency's activities by the end of project implementation period. Earmarking staff for environmental management and improving their skill-sets would be simultaneously pursued during project preparation and implementation. In addition, recommendations should be made concerning any changes to guidelines, standards and regulations, which would improve medium and long term environmental management in the line departments works.

A detailed training plan shall be prepared to develop and strengthen environmental capacities of the client and other associated agencies/departments. The strategy should include a mix of hands-on training for key staff involved in project preparation, site visits to similar projects, and whenever required, full-fledged academic programs on environmental management at well-recognized institutions.

The consultants shall conduct orientation training for the key client, early in the assignment. Periodic training at various levels should continue during project preparation to ensure that the knowledge, skills and perspectives gained during the EA assignment are transferred to the Client and are utilized effectively during project implementation.

Mechanisms for improved co-ordination between Client and Line departments

The consultants shall examine the various options available for improved and timely co-ordination between various state government departments. These could take the form of written MoUs for specific activities, apex co-ordination committee of top bureaucrats, or any such mechanism that can be effective in reducing delays in ancillary activities such as, but not limited to, shifting of utilities and obtaining required regulatory permissions.

Co-ordination among Engineering, Social, Environment and Other Studies

The consultants, with assistance from the Client, shall establish a strong co-ordination with the other project-preparation studies – engineering, social and/or institutional development. The consultants shall keep in mind the specific requirements of the project in general, and the engineering/design studies in particular, and shall plan their outputs accordingly. It is recommended that some of the consultation sessions may be organised in co-ordination with the social and engineering consultants, as feasible, and when the stakeholders consulted are the same.

The consultant shall review the contract documents – technical specifications, and rate analysis, to ensure that there are minimal conflicts between the EMP stipulations and specifications governing the execution of works under the project.

Public Disclosure

The consultants shall prepare a non-technical EA summary report for public disclosure and will provide support to the client in meeting the disclosure requirements, which at the minimum shall meet the World Bank's policy on Public Disclosure. The consultants will prepare a plan for in-country disclosure, specifying the timing and locations; translate the key documents (including executive summary of EA/EMP) in local language; draft the newspaper announcements for disclosure; and help the client to place all the EA reports in the client's website.

Consultant's Inputs

The Consultants are free to employ resources as they see fit. Additional expertise, shall be provided as demanded by the context of the project. The consultants are encouraged to visit the project area and familiarize themselves, at their own cost, before submitting the proposal; and propose an adequate number and skill-set for the senior specialists and technical support staff for the EA assignment. Further, the consultant will allocate adequate number of field surveyors, distinct from the technical support staff, to complete the study in time. Timing is an important essence for any EA study, which shall be closely co-ordinated with the works of the engineering and social teams, simultaneously involved in preparation of the project.

The consultants shall provide for all tools, models, software, hardware and supplies, as required to complete the assignment satisfactorily. These should be widely recognized or accepted. Any new model or tool or software employed should be field-tested before use or the purpose of this EA.

The consultants shall make formal presentations, co-ordinated by the client, at key milestones on the (a) proposed work plan after submitting the Inception Report; (b) recommendations from the environmental screening; and (c) EA findings, design and EMP recommendations. All supporting information gathered by the consultant in undertaking these terms of reference would be made available to the client.

Consultant's Outputs

The consultant is expected to provide the following outputs, as per the schedule given in the ToR. The Consultants are expected to allocate resources, such as for surveys, keeping this output schedule in mind.

Annexure - 10

Guidance Note for Incorporation of Environment Management Plan into Contract Documents

The purpose of the annex is to provide some guidance on the integration of the EMP/ GEMP into the contract documents of a sub-project.

Environment requirements in the pre-bid documents

1. The project implementing agency, i.e. PIU / the Line Departments issue the pre-bid documents to shortlist a few contractors, based on their expression of interest and capability. While details on environmental requirements are really not required in the pre-bid stage, it is useful to mention that the contractor is expected to have good environmental management capability or experience.

Incorporating EMP in the Bid Document

2. The project implementing agency (line department) issues the bid documents to the pre-qualified contractors. There are two kinds of bid documents, for International Competitive Bids (ICB) and National Competitive Bids (NCB). In Bank projects, these documents are prepared based on templates (separate for ICB and NCB) provided by the Bank. The ICB documents are based on the FIDIC (i.e., an acronym for the International Institute of Consulting Engineers) guidelines, while the NCB is closer to the national contracting procedures, i.e. the Central PWD contract documents in India. The bid documents contain separate volumes. For instance, a typical ICB document contains:(i) General Conditions of Contract, which is based on the FIDIC; (ii) Technical Specifications, which is based on the applicable specifications in India for similar infrastructure related works; (iii) Bill of Quantities and (iv) Drawings.
3. The EMP parts/sections should be included in the relevant locations of the bid documents in the following way:
 - **Mitigation/enhancement measures & monitoring requirements tables**

The cross-reference to these tables should be included in the “conditions of particular application (COPA)”, which is a part of the General Conditions of Contract (e.g. Section IV, Item 19.1 of the ICB). As a standard practice, there is an over-all reference to the laws that have to be followed in this section/item. The relevant laws need to be mentioned here. In addition, the adherence to the mitigation/enhancement measures and table on monitoring requirements should be included. The two tables will have to be added as Annexes or the entire EMP (without cost and drawings) as a whole should be attached. Either the Annexes or

the appropriate section in the EMP should be cross-referred in the description of this item.

➤ Modifications/additions to the technical specifications

Due to the mitigation/enhancement measures included in the EMP, there may be (a) additions/alterations required to the applicable specifications and/or (b) there may be a need to add new specification/s. These are to be referred in the section on “Supplementary Specifications” in the Technical Specifications Volume of the bid document. Generally, the GoI applicable specifications are already referred/listed and are not repeated in the bid documents. However, changes and additions to these specifications are made through the inclusion of a section “Supplementary Specifications.” This section should also include additional technical specifications related to the EMP or should provide a cross-reference to the specific section of the EMP.

➤ Cost table

All the items in the EMP cost table relevant to the contractor have to be referred in the Bill of Quantities (BoQ) table, which is a separate volume of the bid documents. It is to be noted that the BoQ table in the bid document includes the various tasks to be done by the contractor under different categories. Against each task, the contractor will have to indicate a unit rate while completing the bid documents.

➤ Drawings

All EMP drawings are to be reflected in the ‘Drawings’ volume of the Bid document. If the drawings are included in the EMP, then a cross-reference should be provided in the Drawings Volume.

Developing the EMP to suit the bid/contract document

4. As one of the intentions is to integrate the EMP requirements into the bid documents/contract Agreement, the EMP should be developed keeping the following in mind:
 - a. Mitigation/enhancement measures: In the Mitigation/Enhancement Measure table, the text describing each measure should not include/repeat what is already covered under the technical specification/s, and this should only be cross-referred. The text should be short, clear and succinct. The description should focus on “what” and “where” of the mitigation / enhancement measure as the “how” of the measure is covered under the specification.

- b. Monitoring requirements table: There are certain monitoring requirements for the contractor. While developing the Monitoring Requirement table, those that pertain to the contractor should be clearly mentioned.
- c. Technical specifications: The modifications to the specifications and the additional specifications should be separately listed. These should be included as Annexure in the EMP. The (added or modified) technical specifications should be adequately detailed to avoid problems (including that of interpretations) at site.
- d. Drawings: The modifications to the drawings and the additional drawings should be included as Annexure in the EMP. It is important to note that all drawings included/ added should be “execution drawings” detailed as per requirement of the particular item so as to execute at site with adequate quality control and workmanship. Also, it is important to note that the quality of BoQ [or cost estimate] and technical specifications part of the contract document depends on the degree of detailing in the drawings.
- e. Cost table: The items pertaining to the contractor should be clearly separated from the expenditures that are to be incurred by the project implementing agency, supervision consultant and/or any other agency/organization.
- f. Timing for finalizing EMP: It is best to finalize the EMP before the finalizing the bid documents. This is required to fully reflect the sections of the EMP relevant to the contractor in the bid document and to ensure its proper integration.

Other Notes

Once the completed bids have been received from prospective contractors, the project implementing agency takes a decision based on the costs and the technical merit of the bids. Following the decision, the implementing agency and the chosen contractor sign and counter-sign the completed bid documents. It becomes the contract agreement thereafter. If issues have been missed in the bid documents, it cannot be amended at the time of signing the contract agreement stage unless there is a really strong justification for the same. If there is an EMP cost item that is not reflected in the BoQ of the signed contract agreement, the supervision consultant/engineer may issue a variation order, if such case has merit. Contractor will quote a rate and the task gets done. This issue of variation orders is a standard practice and can be used, if found necessary. However, the intent of the good contracting practices should be to minimize variation orders and therefore EMP should be carefully prepared and integrated in the bid document.

Annexre - 11

Environmental Guidelines For Developing Environment Management Plans

General Issues

Issue	Key Principle / Mitigation Standard	Mitigation Measures
Water supply affecting ecology or neighboring community water supply.	Camp to provide its own water supply that does not affect village water supply.	<ul style="list-style-type: none"> ▪ Any water supply sources should be located so that it does not adversely affect the villages supply. ▪ The intake of water from streams for water supplies should leave residual flows in the watercourses. ▪ Storage tanks should be used to buffer water supplies.
Wastewater discharges affecting water quality	Wastewater to be treated prior to discharge.	<ul style="list-style-type: none"> ▪ Sewerage disposal methods should be designed to the standards outlined by the Vietnamese government
Solid waste polluting the environment and causing health hazards	No waste to be burnt or buried on site.	<ul style="list-style-type: none"> ▪ All solid wastes shall be removed from site and disposed of at a municipal landfill.
Camps using local services and resources, at the expense of villagers.		Refer to section on Village impacts
Workers intruding on village life and disrespecting traditional cultural values.		Refer to section on Village impacts

General Construction Issues

Issue	Key Principle / Mitigation Standard	Mitigation Measures
Noise of machinery associated with construction activities	Noise must not unreasonably intrude on traditional village life.	<ul style="list-style-type: none"> ▪ Keep a current list of all noise producing machinery and noisy activities ▪ Operate machinery only during designated hours in agreement with local communities ▪ Adopt a complaint mechanism that will enable capturing and addressing issues upfront ▪ Work to be carried out in daylight, in typical working hours. ▪ Concrete batching plants and other noisy equipment to be located as far as practical from settlements

Issue	Key Principle / Mitigation Standard	Mitigation Measures
Dust generation from construction activities	Dust must not cause a hazard or nuisance to village life.	<ul style="list-style-type: none"> ▪ Dusty operations to occur only during designated hours. ▪ Adopt complaint mechanism ▪ Concrete batching plants and other dusty equipment to be located as far as practical from settlements.
Vibration disturbance from construction activities	Vibration must not unreasonably intrude on traditional village life.	<ul style="list-style-type: none"> ▪ Keeps a list of all vibration producing machinery and activities causing vibration. ▪ This machinery operation to occur only during designated hours (to be confirmed by contractor in agreement with villages). ▪ Use of complaints register and procedures to address issues as they arise.
Increased utilization of roads by traffic associated with construction activities	There should be no significant increased risk to local populations from traffic associated with the development.	<ul style="list-style-type: none"> ▪ Road upgrades, including signage, speed humps, re-grading. ▪ Training of locals regarding the hazards of traffic. ▪ Training of vehicle drivers regarding the driving risks through villages and along remote roads. ▪ Use of complaints register and procedures to address issues as they arise.
Pollution risk activities occurring on site	<p>Develop appropriate storage, transport and use practices for storage and handling of mixed classes of dangerous goods in packages and intermediate bulk containers.</p> <p>There shall be no solid or liquid waste disposal directly or indirectly to any water course (whether flowing or not).</p>	<ul style="list-style-type: none"> ▪ Keeps a current list of all potentially contaminating materials used on site. ▪ Develop and implement appropriate storage, transport and use practices to recognized standards. ▪ Solid waste disposal shall be taken off site.

Excavation and Blasting

Issue	Key Principle / Mitigation Standard	Mitigation Measures
Noise disturbance of local populations	Noise must not unreasonably intrude on traditional village life.	<ul style="list-style-type: none"> ▪ Keep lists of all noise producing equipment. ▪ This machinery operation to occur only during designated hours (to be confirmed by contractor in agreement with villages). ▪ Blasting to occur at the same time each day, and / or a warning siren should sound prior to blasting.
Vibration disturbance of local populations	Vibration must not unreasonably intrude on traditional village life.	<ul style="list-style-type: none"> ▪ Keep current lists of all vibration producing machinery ▪ This machinery operation to occur only during designated hours (to be confirmed by contractor in agreement with villages). ▪ Blasting to occur at the same time each day, and / or a warning siren should sound prior to blasting.

Material Stockpiling

Issue	Key Principle / Mitigation Standard	Mitigation Measures
Runoff of suspended sediments from stockpiles	<p>Stockpiling activities should not give rise to storm water containing elevated suspended solids.</p> <p>Provide treatment to achieve 75% reduction in suspended solids.</p>	<ul style="list-style-type: none"> ▪ No direct discharge of sediment laden water without treatment. ▪ Stockpiles should be compacted as much as practical and not be exposed for extended periods. ▪ Storm water should be diverted around stockpiles.
Dust generation from stockpiles	Dust must not cause a hazard or nuisance to village life.	<ul style="list-style-type: none"> ▪ Stockpiles should be compacted and not exposed for extended periods. ▪ Stockpiles should be reused as soon as practicable.

Soil / Overburden Removal and Placement

Issue	Key Principle / Mitigation Standard	Minimum Mitigation Measures
Generation of suspended solids from bare ground and runoff into watercourses	<p>Development activities should not give rise to storm water containing elevated suspended solids.</p> <p>Provide treatment to achieve</p>	<ul style="list-style-type: none"> ▪ No direct discharge of sediment laden water without treatment. ▪ Earthworks and land clearance should be minimized and phased. ▪ Any discharges to watercourses should occur during high flow and / or discharged as close

	75% reduction in suspended solids.	<p>to the outfall as possible to maximize mixing.</p> <ul style="list-style-type: none"> ▪ Stockpiling should occur at least 10m from a water course. ▪ Re-vegetation of exposed areas as soon as practicable. ▪ Timing of works around the drier seasons where possible. ▪ Provision of storm water cut off drains wherever possible.
Introduction of invasive species	Fill material should not contain invasive species.	<ul style="list-style-type: none"> ▪ The use of imported fill shall be minimized. ▪ Machinery should be cleaned prior to working on site to reduce the opportunity of the spread of weed seeds.
Disturbance of natural habitats for spoil / alluvial material.	Soils should be reused where possible in the development – to reduce the need for spoil sites and the need to import fill.	<ul style="list-style-type: none"> ▪ Stockpile and reuse soils before excavating new soils / alluvium.
Efficiency of control measures over time	Control measures should continue to work appropriately throughout the construction period.	<ul style="list-style-type: none"> ▪ Earthworks control measures should be inspected and maintained in efficient operating condition over the construction period.

Concrete Manufacture

Issue	Key Principle / Mitigation Standard	Minimum Mitigation Measures
Contaminants in water discharged from concrete manufacturing, including rise in pH.	<p>No direct discharges of concrete batching water to any water course.</p> <p>Provide treatment prior to discharge to achieve 75% reduction in suspended solids.</p>	<ul style="list-style-type: none"> ▪ Settlement ponds and / or sediment infiltration gallery. ▪ Monitoring immediately upstream and 50m downstream of the discharge with a clarity tube to estimate any effects on clarity; for pH to detect alkali discharges. ▪ Any storm water discharges to watercourses should occur during high flow and / or discharged as close to the outfall as possible to maximize mixing. ▪ Water to be reused where possible in the process. ▪ Procedures for handling of un-hydrated cement material and wet cement to avoid spills.
Community nuisances.	Noise and dust must not unreasonably intrude on traditional village life.	<ul style="list-style-type: none"> ▪ Concrete batching plants and other noisy / dusty equipment to be located as far as practical from villages.

Fuel Storage and Use

Issue	Key Principle / Mitigation Standard	Minimum Mitigation Measures
<p>pollution risk associated with the storage and use of fuels for all plant, generators and vehicles</p>	<p>No oil, lubricants, fuels or containers should be drained or dumped to ground or waterways.</p> <p>Accidental spills shall be minimized, and procedures put in place to clean up the environmental damage.</p>	<ul style="list-style-type: none"> ▪ Keep a current list of all fuels stored on site. ▪ Keep the Safety Data Sheet of all hazardous materials used on site. ▪ Develop appropriate storage, transport and use practices to recognized standards. ▪ Diesel to be stored in truck tankers or in overhead tanks to a maximum of 5000 liters. ▪ Diesel to be stored on flat ground, and 100m from a waterway. ▪ Dikes to capture 100% of fuel must be placed around fuel storage areas. ▪ All refueling of vehicles and plant to be done on flat ground. ▪ All significant vehicle and plant maintenance shall be undertaken offsite where possible. ▪ Spill kits and emergency procedures should be used and staff trained. ▪ There shall be no deliberate discharge of oil, diesel, petrol or other hazardous materials to the surrounding soils and waterways.

Works in and near Rivers

Issue	Key Principle / Mitigation Standard	Minimum Mitigation Measures
<p>Sediment discharges arising from working in and near the river.</p> <p>For blasting in or near the river, refer to the blasting issues, above.</p>	<p>Work in the wetted area of the riverbed should be minimized, and only in relation to the construction of the power house, weir and intake structure or to insert culverts for stream crossings.</p>	<ul style="list-style-type: none"> ▪ Stabilize works at the end of each working day and prior to storm events. ▪ Do the work during low flow periods. ▪ Works shall be minimized. ▪ Diversion of the river around the work area where possible.

Village impacts

Issue	Key Principle / Mitigation Standard	Minimum Mitigation Measures
<p>Key Considerations for a Communication Strategy to avoid deterioration of current quality of life and traditional livelihoods</p>	<p>Communication channels are established between Villagers, Construction Supervisors, and state PCUs to facilitate information flow and easier process for lodging complaints</p>	<ul style="list-style-type: none"> ▪ Set up a communication network for discussing issues between Construction supervisors Contractors and the villagers and the state PCUs built on recognized negotiation structures ▪ Construction Supervision Consultant and the

Issue	Key Principle / Mitigation Standard	Minimum Mitigation Measures
		<p>Contractors will have an Environmental Specialist on site to ensure daily conformance with environmental health and safety guidelines and to respond to complaints</p> <ul style="list-style-type: none"> ▪ A Health Program to be included in the Contractor's Construction and Workers Camp Management Plan. This will be made available to the communities ▪ Education and orientation of outside workers to local culture and social norms before the start of work. ▪ Camps to be self sufficient in resources and services. (refer to the workers camp table below) ▪ Villagers shall be adequately informed of all potential hazards to health and safety with regards to increased traffic, blasting, machinery operation.
Traffic causing safety risks to road users	Construction traffic will be managed to minimize the impact on existing road users.	<ul style="list-style-type: none"> ▪ Signage to be used to identify current risks to road users. ▪ Construction Supervision consultancy and Contractors to discuss major traffic issues with village representatives prior to the event to discuss course of action. ▪ Heavy traffic to avoid the hours when school children walk to and from school.
Sediment affecting river water uses.	Sediment discharges to the river shall be minimized.	<ul style="list-style-type: none"> ▪ Refer to the sections above discussing erosion and sediment control.

Annexure – 12

Forest clearance procedure – a typical activity

Step No.	Activity
1	Preparation of case / application letter that is submitted to Revenue and Forest Department
2	Area calculation to identify land diversion requirement with the help of Revenue Department represented by(provide name of person responsible)
3	Joint visit by Executive Engineer, and District Forest Officer(DFO)
4	Enumeration of trees by the Forest Department after the visit of Forest Guard and Range Officer
5	List is forwarded by the Range Officer to DFO for approval
6	Preparation of a combined ‘case’ papers (documents prepared by Revenue Department, list of trees enumerated by Forest Department and actual area calculation for diversion of forest land are enclosed)
7	Case submitted to DFO - DFO Office will examine the case and further send to Conservator of Forests
8	Conservator of Forests will examine the papers and further forward the case (subject to the fact that no short-comings/deficiencies are found) to Prin. Chief Conservator of Forests
9	Case is further examined by the Prin. Chief Conservator of Forests and forwarded to Additional Secretary (Forests)
10	Additional Secretary (Forests) recommends the case for the approval of the Forest Minister.
11	Forest Minister approves the case and returns the case file to Additional Secretary (Forests)
12	Case file is sent to CF, Chandigarh (MoEF) after the counter signature of Chief Secretary, GoHP. (The case file is counter-signed by the Chief Secretary as the case file goes to MoEF).
13	CF (Chandigarh) examines the case. May opt for conducting a site inspection or may provide an ‘in- principle’ clearance without conducting the site visit.

Step No.	Activity
14	If CF, Chandigarh provides 'in-principle' approval, it is conveyed to DFO. The concerned DFO works out the cost for compensatory afforestation and NPV and the total cost/amount is conveyed to the concerned Executive Engineer.
15	Executive Engineer requests RIDC for releasing the said amount. The Project Director's Office/RIDC directly deposits the specified amount into the bank account of the concerned DFO.
16	The DFO communicates the amount deposition to CF, Chandigarh and requests to provide final/formal approval
17	CF, Chandigarh conveys (in writing) the final/formal approval to the concerned DFO.
18	DFO conveys the final/formal sanction to the Executive Engineer
19	DFO further directs the concerned Range Officer (Forest Department) to mark (process is formally known as 'hammering') the trees for cutting.
20	Range Officer hammers/ marks the trees in presence of Executive Engineer or his field representative
21	The Range Officer sends the final list of trees to the concerned DFO for information
22	DFO forwards the case to Forest Corporation to call 'tender' for cutting the marked trees
23	DM, Forest Corporation calls for bid and fixes date/s to receive the tender documents
24	After opening of the tenders and their evaluation, tree cutting work is awarded to the selected contractor
25	Contractor mobilizes the required lab our and machinery at site
26	Contractor cuts the trees.

Annexure- 13

Tree cutting procedure – a typical activity

Step No.	Activity
1	Preparation of case / application letter to the Revenue and Forest Department for felling of trees falling within the Right of Way
2	Area to be cleared of trees is verified on the ground with the help of Revenue Department
3	Joint visit by Executive Engineer, DFO and Revenue Department staff for the verification of the land and trees falling within the ROW
4	Enumeration of trees by Forest Department after the visit of Forest Guard and Range Officer (both from Forest Department). The details cover number of trees to be cut along with chainage, species and girth information.
5	List of trees to be cut is forwarded by the Range Officer to the concerned DFO for approval
6	The combined case paper is prepared by enclosing the documents received from Revenue and Forest Department (as prepared in the steps mentioned above).
7	Case is submitted to the concerned DFO – the DFO Office examines the case and if there are no observations, sends it to the Conservator of Forests (CF)
8	The CF office will examine the case and if there are no observations, will approve the felling proposal.
9	The approval from CF office is conveyed to the concerned DFO, who further conveys the final sanction (in writing) to Executive Engineer.
10	DFO further directs the concerned Range Officer (Forest Department) to mark (process is formally known as ‘hammering’) the trees for cutting.

Step No.	Activity
11	Range Officer hammers/ marks the trees in presence of Executive Engineer or his field representative.
12	The Range Officer sends the final list of trees to the concerned DFO for information.
13	DFO forwards the case to Forest Corporation to call 'tender' for cutting the marked trees.
14	DM Forest Corporation calls for bids and fixes date/s to receive the tenders.
15	After opening of the tenders and their evaluation, tree cutting work is awarded to the selected contractor.
16	Contractor mobilizes the required labor and machinery at site.
17	Contractor cuts the trees

Good Practice guidelines for Blasting

Where hard rock is met with and blasting operations are considered necessary, the contractor shall obtain the approval of the Engineer-in-Charge in writing for resorting to blasting operation.

The contractor shall obtain license from the competent authority for undertaking blasting work as well as for obtaining and storing the explosive as per the Explosive Act, 1884 as amended up to date and the Explosive Rules, 1983. The contractor shall purchase the explosives fuses, detonators, etc. only from a licensed dealer. The contractor shall be responsible for the safe transportation, storage and custody as per explosive rules and proper accounting of the explosive materials. Fuses and detonators shall be stored separately and away from the explosives. The Engineer-in-Charge or his authorized representative shall have the right to check the contractor's store and account of explosives. The contractor shall provide necessary facilities for this.

The contractor shall be responsible for any damage arising out of accident to workmen, public or property due to storage, transportation and use of explosive during blasting operation.

Blasting operations shall be carried out under the supervision of a responsible authorized agent of the contractor (referred subsequently as agent only), during specified hours as approved in writing by the Engineer-in-Charge. The agent shall be conversant with the rules of blasting. In case of blasting with dynamite or any other high explosive, the position of all the bore holes to be drilled shall be marked in circles with white paint. These shall be inspected by the contractor's agent. Bore holes shall be of a size that the cartridge can easily pass down. After the drilling operation, the agent shall inspect the holes to ensure that drilling has been done only at the marked locations and no extra hole has been drilled.

The agent shall then prepare the necessary charge separately for each bore hole. The bore holes shall be thoroughly cleaned before a cartridge is inserted. Only cylindrical wooden tamping rods shall be used for tamping. Metal rods or rods having pointed ends shall never be used for tamping. One cartridge shall be placed in the bore hole and gently pressed but not rammed down. Other cartridges shall then be added as may be required to make up the necessary charge for the bore hole. The top most cartridge shall be connected to the detonator which shall in turn be connected to the safety fuses of required length. All fuses shall be cut to the length required before being inserted into the holes. Joints in fuses shall be avoided. Where joints are unavoidable a semi-circular notch shall be cut in one piece of fuse about 2 cm deep from the end and the end of other piece inserted into the notch. The two pieces shall then be wrapped together with string. All joints exposed to dampness shall be wrapped with rubber tape.

The maximum of eight bore holes shall be loaded and fired at one occasion. The charges shall be fired successively and not simultaneously. Immediately before firing, warning shall be given and the agent shall see that all persons have retired to a place of safety. The safety fuses of the charged holes shall be ignited in the presence of the agent, who shall see that all the fuses are properly ignited.

Careful count shall be kept by the agent and others of each blast as it explodes. In case all the charged bore holes have exploded, the agent shall inspect the site soon after the blast but in case of misfire the agent shall inspect the site after half an hour and mark red crosses (X) over the holes which have not exploded. During this interval of half an hour, nobody shall approach the misfired holes. No driller shall work near such bore until either of the following operations have been done by the agent for the misfired boreholes.

(a) The contractor's agent shall very carefully (when the tamping is of damp clay) extract the

tamping with a wooden scraper and withdraw the fuse, primer and detonator. After this a fresh detonator, primer and fuse shall be placed in the misfired holes and fired, or

(b) The holes shall be cleaned for 30 cm of tamping and its direction ascertained by placing a stick in the hole. Another hole shall then be drilled 15 cm away and parallel to it. This hole shall be charged and fired. The misfired holes shall also explode along with the new one.

Before leaving the site of work, the agent of one shift shall inform the another agent relieving him for the next shift, of any case of misfire and each such location shall be jointly inspected and the action to be taken in the matter shall be explained to the relieving agent.

The Engineer-in-Charge shall also be informed by the agent of all cases of misfires, their causes and steps taken in that connection.

General Precautions

For the safety of persons red flags shall be prominently displayed around the area where blasting operations are to be carried out. All the workers at site, except those who actually ignite the fuse, shall withdraw to a safe distance of at least 200 metres from the blasting site. Audio warning by blowing whistle shall be given before igniting the fuse.

Blasting work shall be done under careful supervision and trained personnel shall be employed. Blasting shall not be done within 200 metres of an existing structure, unless specifically permitted by the Engineer-in-Charge in writing.

All procedures and safety precautions for the use of explosives drilling and loading of explosives drilling and loading of explosives before and after shot firing and disposal of explosives shall be taken by the contractor as detailed in IS 4081, safety code for blasting and related drilling operation.

Precautions against Misfire

The safety fuse shall be cut in an oblique direction with a knife. All saw dust shall be cleared from inside of the detonator. This can be done by blowing down the detonator and tapping the open end. No tools shall be inserted into the detonator for this purpose.

If there is water present or if the bore hole is damp, the junction of the fuse and detonator shall be made water tight by means of tough grease or any other suitable material.

The detonator shall be inserted into the cartridge so that about one third of the copper tube is left exposed outside the explosive. The safety fuse just above the detonator shall be securely tied in position in the cartridge. Water proof fuse only shall be used in the damp bore hole or when water is present in the bore hole.

If a misfire has been found to be due to defective fuse, detonator or dynamite, the entire

consignment from which the fuse detonator or dynamite was taken shall be got inspected by the Engineer-in-Charge or his authorized representative before resuming the blasting or returning the consignment.

**GOOD PRACTICE GUIDELINE ON
SAFETY, HEALTH AND ENVIRONMENT AT WORK PLACE**

1. PREAMBLE

- 1.1 The Constitution of India provide detailed provisions for the rights of the citizens and also lays down the Directive Principles of State Policy which set an aim to which the activities of the state are to be guided.
- 1.2 These Directive Principles provide :
- a) for securing the health and strength of employees, men and women;
 - b) that the tender age of children are not abused;
 - c) that citizens are not forced by economic necessity to enter avocations unsuited to their age or strength;
 - d) just and humane conditions of work and maternity relief are provided; and
 - e) that the Government shall take steps, by suitable legislation or in any other way, to secure the participation of employee in the management of undertakings, establishments or other organisations engaged in any industry.
- 1.3 On the basis of these Directive Principles as well as international instruments, Government is committed to regulate all economic activities for management of safety and health risks at workplaces and to provide measures so as to ensure safe and healthy working conditions for every working man and woman in the nation. Government recognizes that safety and health of workers has a positive impact on productivity and economic and social development. Prevention is an integral part of economic activities as high safety and health standard at work is as important as good business performance for new as well as existing industries.
- 1.4 The formulation of policy, priorities and strategies in occupational safety, health and environment at work places, is undertaken by national authorities in consultation with social partners for fulfilling such objectives. A critical role is played by the Government and the social partners, professional safety and health organizations in ensuring prevention and in also providing treatment, support and rehabilitation services.
- 1.5 Government of India firmly believes that without safe, clean environment as well as healthy working conditions, social justice and economic growth cannot be achieved and that safe and healthy working environment is recognized as a fundamental human right. Education, training, consultation and exchange of information and good practices are essential for prevention and promotion of such measures.
- 1.6 The changing job patterns and working relationships, the rise in self employment, greater sub-contracting, outsourcing of work, homework and the increasing number of employees working away from their establishment, pose problems to management of occupational safety and health risks at workplaces. New safety hazards and health risks will be appearing along with the transfer and adoption of new technologies. In addition, many of the well known conventional hazards will continue to be present at the workplace till the risks arising from exposure to these hazards are brought under adequate control. While advancements in technology

- have minimized or eliminated some hazards at workplace, new risks can emerge in their place which needs to be addressed.
- 1.7 Particular attention needs to be paid to the hazardous operations and of employees in risk prone conditions such as migrant employees and various vulnerable groups of employees arising out of greater mobility in the workforce with more people working for a number of employers, either consecutively or simultaneously.
 - 1.8 The increasing use of chemicals, exposure to physical, chemical and biological agents with hazard potential unknown to people; the indiscriminate use of agro-chemicals including pesticides, agricultural machineries and equipment; industries with major accident risks; effects of computer controlled technologies and alarming influence of stress at work in many modern jobs pose serious safety, health and environmental risks.
 - 1.9 The fundamental purpose of this National Policy on Safety, Health and Environment at workplace, is not only to eliminate the incidence of work related injuries, diseases, fatalities, disaster and loss of national assets and ensuring achievement of a high level of occupational safety, health and environment performance through proactive approaches but also to enhance the well-being of the employee and society, at large. The necessary changes in this area will be based on a co-ordinated national effort focused on clear national goals and objectives.
 - 1.10 Every Ministry or Department may work out their detailed policy relevant to their working environment as per the guidelines on the National Policy.

2. GOALS:

The Government firmly believes that building and maintaining national preventive safety and health culture is the need of the hour. With a view to develop such a culture and to improve the safety, health and environment at work place, it is essential to meet the following requirements:-

- 2.1 providing a statutory framework on Occupational Safety and Health in respect of all sectors of industrial activities including the construction sector, designing suitable control systems of compliance, enforcement and incentives for better compliance.
- 2.2 providing administrative and technical support services.
- 2.3 providing a system of incentives to employers and employees to achieve higher health and safety standards .
- 2.4 providing for a system of non-financial incentives for improvement in safety and health.
- 2.5 establishing and developing the research and development capability in emerging areas of risk and providing for effective control measures.
- 2.6 Focusing on prevention strategies and monitoring performance through improved data collection system on work related injuries and diseases.
- 2.7 Developing and providing required technical manpower and knowledge in the areas of safety, health and environment at workplaces in different sectors.
- 2.8 Promoting inclusion of safety, health and environment, improvement at workplaces as an important component in other relevant national policy documents.
- 2.9 Including safety and occupational health as an integral part of every operation.

3. OBJECTIVES:

3.1 The policy seeks to bring the national objectives into focus as a step towards improvement in safety, health and environment at workplace. The objectives are to achieve:-

- a) Continuous reduction in the incidence of work related injuries, fatalities, diseases, disasters and loss of national assets.
- b) Improved coverage of work related injuries, fatalities and diseases and provide for a more comprehensive data base for facilitating better performance and monitoring.
- c) Continuous enhancement of community awareness regarding safety, health and environment at workplace related areas.
- d) Continually increasing community expectation of workplace health and safety standards.
- e) Improving safety, health and environment at workplace by creation of “green jobs” contributing to sustainable enterprise development.

4. ACTION PROGRAMME

For the purpose of achieving the goals and objectives mentioned in paragraphs 2 and 3 above, the following action programme is drawn up and where necessary time bound action programme would be initiated, namely:-

4.1. Enforcement

- 4.1.1 by providing an effective enforcement machinery as well as suitable provisions for compensation and rehabilitation of affected persons;
- 4.1.2 by effectively enforcing all applicable laws and regulations concerning safety, health and environment at workplaces in all economic activities through an adequate and effective labour inspection system;
- 4.1.3 By establishing suitable schemes for subsidy and provision of loans to enable effective implementation of the policy;
- 4.1.4 by ensuring that employers, employees and others have separate but complementary responsibilities and rights with respect to achieving safe and healthy working conditions;
- 4.1.5 by amending expeditiously existing laws relating to safety, health and environment and bring them in line with the relevant international instruments;
- 4.1.6 by monitoring the adoption of national standards through regulatory authorities;
- 4.1.7 by facilitating the sharing of best practices and experiences between national and international regulatory authorities;
- 4.1.8 by developing new and innovative enforcement methods including financial incentives that encourage and ensure improved workplace performance;
- 4.1.9 by making an enabling legislation on Safety, Health and Environment at Workplaces;
- 4.1.10 by setting up safety and health committees wherever deemed appropriate;

4.2 National Standards

- 4.2.1 by developing appropriate standards, codes of practices and manuals on safety, health and environment for uniformity at the national level in all economic activities consistent with international standards and implementation by the stake holders in true spirit;

4.2.2 by ensuring stakeholders awareness of and accessibility to applicable policy, documents, codes, regulations and standards;

4.3 Compliance

4.3.1 by encouraging the appropriate Government to assume the fullest responsibility for the administration and enforcement of occupational safety, health and environment at workplace, provide assistance in identifying their needs and responsibilities in the area of safety, health and environment at workplace, to develop plans and programmes in accordance with the provisions of the applicable Acts and to conduct experimental and demonstration projects in connection therewith;

4.3.2 by calling upon the co-operation of social partners in the supervision of application of legislations and regulations relating to safety, health and environment at work place;

4.3.3 by continuous improvement of Occupational Safety and Health by systems approach to the management of Occupational Safety and Health including developing guidance on Occupational Safety and Health management systems, strengthening voluntary actions, including mechanisms for self-regulatory concept and establishing auditing mechanisms which can test and authenticate occupational safety and health management systems;

4.3.4 by providing specific measures to prevent catastrophes, and to co-ordinate and specify the actions to be taken at different levels, particularly in the industrial zones with high potential risks;

4.3.5 by recognizing the best safety and health practices and providing facilitation for their adoption.

4.3.6 by providing adequate penal provisions as deterrent for violation of laws for the time being in force;

4.3.7 by encouraging all concerned to adopt and commit to “Responsible Care” and / or “Corporate Social Responsibility” to improve safety, health and environment at workplace performance;

4.3.8 by ensuring a suitable accreditation machinery to recognise institutions, professionals and services relating to safety, health and environment at workplace for uniformity and greater coverage as also authenticating safe management system;

4.3.9 by encouraging employers to ensure occupational safety and health management systems, establish them in efficient manner to improve workplace safety and health;

4.3.10 by specifically focusing on such occupational diseases like pneumoconiosis and silicosis; developing a framework for its prevention and control as well as develop technical standards and guidelines for the same;

4.3.11 by promoting safe and clean technology and progressively replacing materials hazardous to human health and environment;

4.4 Awareness

4.4.1 by increasing awareness on safety, health and environment at workplace through appropriate means;

4.4.2 by providing forums for consultations with employers’ representatives, employees representatives and community on matters of national concern relating to safety, health and environment at work place with the overall objective of creating awareness and enhancing national productivity;

4.4.3 by encouraging joint labour-management efforts to preserve, protect and promote national assets and to eliminate injuries and diseases arising out of employment;

- 4.4.4 by raising community awareness through structured, audience specific approach;
- 4.4.5 by continuously evaluating the impact of such awareness and information initiatives;
- 4.4.6 by maximizing gains from the substantial investment in awareness campaigns by sharing experience and learning;
- 4.4.7 by suitably incorporating teaching inputs on safety, health and environment at work place in schools, technical, medical, professional and vocational courses and distance education programme;
- 4.4.8 by securing good liaison arrangements with the International organisations;
- 4.4.9 by providing medical criteria wherever necessary which will assure insofar as practicable that no employee will suffer diminished health, functional capacity, or life expectancy as a result of his work place activities and that in the event of such occupational diseases having been contracted, is suitably compensated;
- 4.4.10 by providing practical guidance and encouraging employers and employees in their efforts to reduce the incidence of occupational safety and health risks at their places of employment and to impress upon employers and employees to institute new programmes and to improve existing programmes for providing safe and healthful working conditions, requiring employers to ensure that workers and their representatives are consulted, trained, informed and involved in all measures related to their safety and health at work;

4.5 Research and Development

- 4.5.1 by providing for research in the field of safety, health and environment at workplace, including the social and psychological factors involved, and by developing innovative methods, techniques including computer aided Risk Assessment Tools, and approaches for dealing with safety, health and environment at workplace problems which will help in establishing standards;
- 4.5.2 by exploring ways to discover latent diseases, establishing causal connections between diseases and work environmental conditions, updating list of occupational diseases and conducting other research relating to safety, health and environmental problems at workplace;
- 4.5.3 by establishing research priorities as per national requirements; exploring partnerships and improving communications with various national and international research bodies;
- 4.5.4 by ensuring a coordinated research approach and an optimal allocation of resources in Occupational Safety and Health sector for such purposes;

4.6 Occupational safety and health skills development

- 4.6.1 by building upon advances already made through employer and employee initiative for providing safe and healthy working conditions;
- 4.6.2 by providing for training programmes to increase the number and competence of personnel engaged in the field of occupational safety, health and environment at workplace;
- 4.6.3 by providing information and advice, in an appropriate manner, to employers and employees organisations, with a view to eliminating hazards or reducing them as far as practicable;
- 4.6.4 by establishing occupational health services aimed at protection and promotion of health of employee and improvement of working conditions and by providing employee access to these services in different sectors of economic activities;
- 4.6.5 by integrating health and safety into vocational, professional and labour related training programmes as also management training including small business practices;

4.6.6 by adopting Occupational Safety and Health training curricula in workplace and industry programmes;

4.7 Data collection

4.7.1 by compiling statistics relating to safety, health and environment at work places, prioritizing key issues for action, conducting national studies or surveys or projects through governmental and non-governmental organisations;

4.7.2 by reinforcing and sharing of information and data on national occupational safety, health and environment at work place information amongst different stake holders through a national network system on Occupational Safety and Health;

4.7.3 by extending data coverage relevant to work-related injury and disease, including measures of exposure, and occupational groups that are currently excluded, such as self-employed people;

4.7.4 by extending data systems to allow timely reporting and provision of information;

4.7.5 by developing the means for improved access to information;

4.8 Review

4.8.1 An initial review and analysis shall be carried out to ascertain the current status of safety, health and environment at workplace and building a national Occupational Safety and Health profile.

4.8.2 National Policy and the action programme shall be reviewed at least once in five years or earlier if felt necessary to assess relevance of the national goals and objectives.

5. CONCLUSION

5.1 There is a need to develop close involvement of social partners to meet the challenges ahead in the assessment and control of workplace risks by mobilizing local resources and extending protection to such working population and vulnerable groups where social protection is not adequate.

5.2 Government stands committed to review the National Policy on Safety, Health and Environment at Workplace and legislations through tripartite consultation, improve enforcement, compilation and analysis of statistics; develop special programmes for hazardous operations and other focus sectors, set up training mechanisms, create nation-wide awareness, arrange for the mobilization of available resources and expertise.

5.3 The National Policy and programme envisages total commitment and demonstration by all concerned stake holders such as Government and social partners. Our goals and objectives will be that through dedicated and concerted efforts consistent with the requirements of safety, health and environment at work place and thereby improving the quality of work and working life.

Safety, Security and Protection of the Environment

The Contractor shall take all steps to comply with the Central and West Bengal State Environmental Protection Acts and the rules there under.”

Safety Provisions

1. The Contractor shall comply with all the precautions as required for the safety of the workmen by the I.L.O. Convention No. 62 and Sp 70 (of BIS) Handbook on Construction Safety Practices as far as they are applicable to the Contract. The Contractor shall provide all necessary safety appliances, gears like goggles, helmets, safety belts, masks, etc. to the workmen and the staff.
2. Suitable scaffolds shall be provided for workmen for all work that cannot safely be done from the ground, or from solid construction except for such short period work as can be done, safely from ladders. When a ladder (which should of good and adequate

construction) is used, an extra labourer shall be engaged for holding the ladder and if the ladder is used for carrying materials as well, suitable foot-holds and hand-holds shall be provided on the ladder, which shall be given an inclination not steeper than 1/4 to 1 (1/4 horizontal in 1 vertical).

3. Scaffolding or staging more than 3.25 m above the ground or floor, swung or suspended from an overhead support or erected with stationary support, shall have guard rail properly attached, bolted, braced and otherwise secured at least 1 m high above the floor or platform of such scaffolding or staging and extending along the entire length of the outside and ends thereof with only such openings as may be necessary for the delivery of materials. Such scaffolding or staging shall be so fastened as to prevent it from swaying from the support or structure.
4. Working platform, gangways, and stairways shall be so constructed that they do not sag unduly or unequally, and if a height of a platform or gangway or stairway is more 3.25 m above ground level or floor level, it shall have closely spaced boards, have adequate width and be suitably provided with guard rails as described in (b) above.
5. Every opening in floor of a structure or in a working platform shall be provided with suitable means to prevent fall of persons or materials by providing suitable fencing or railing with a minimum height of one (1) m.
6. Safe means of access shall be provided to all working platforms and other working places. Every ladder shall be securely fixed. No portable single ladder shall be over 9 m in length. Width between side rails in a rung ladder shall in no case be less than 30 cm for ladders up to and including 3 m in length. For longer ladders the width shall be increased at least 6 mm for each additional 30 cm of length. Spacing of steps shall be uniform and shall not exceed 30 cm.
7. Adequate precautions shall be taken to prevent danger from electrical equipment. No materials on any of the sites shall be so stacked or placed as to cause danger or inconvenience to any person or the public. The Contractor shall provide all necessary fencing and lights to protect public from accidents and shall be bound to bear expenses of defending every suit, action or other proceedings at law that may be brought by any person for injury sustained owing to neglect of the above precautions and to pay any damages and cost which may be awarded in any such suit, action or proceeding to any such person or which may with the consent of the Contractor be paid to compromise any claim by any such person.
8. Excavation and Trenching All trenches, 1.5 m or more; in depth, shall at all times be supplied with at least one ladder for each 20 m in length or fraction thereof. Ladder shall be extended from bottom of trench to at least 1 m above surface of the ground. Sides of a trench that is 1.5 m or more in depth shall be stepped back to give suitable slope or securely held by timber bracing, so as to avoid the danger of collapsing of sides. Excavated material shall not be placed within 1.5 m of edge of trench or half of depth of trench whichever is more. Cutting shall be done from top to bottom. Under no circumstances, undermining or undercutting shall be done.
9. Demolition - Before any demolition is commenced and also during the process of the work:
 - A. All roads and open areas adjacent to the work site shall either be closed or suitably protected;
 - B. No electric cable or apparatus which is liable to be a source of danger over a cable or apparatus used by operator shall remain electrically charged;
 - C. All practical steps shall be taken to prevent danger to persons employed by the Employer, from risk of fire or explosion, or flooding. No floor, roof or other part of a building shall be so overloaded with debris or materials as to render it unsafe.
10. All necessary personal safety equipment as considered adequate by the Engineer shall be available for use of persons employed on the Site and maintained in a condition suitable for immediate use; and the Contractor shall take adequate steps to ensure proper use of equipment by those concerned.
11. Workers employed on mixing asphaltic materials, cement, lime mortars/concrete shall be provided with protective footwear and protective goggles.

12. Those engaged in handling any material which is injurious to eyes shall be provided with protective goggles.
13. Those engaged in welding works shall be provided with welder's protective eye-shield.
14. Stone breakers shall be provided with protective goggles and protective clothing and seated at sufficiently safe intervals.
15. When workers are employed in sewers and manholes, which is in use, the Contractor shall ensure that manhole covers are open and manholes are ventilated at least for an hour before workers are allowed to get into them. Manholes so open shall be cordoned off with suitable railing and provide warning signals or boards to prevent accident to public.
16. The Contractor shall not employ men below the age of 18 years and women on the work of painting with products containing lead in any form. Whenever men above the age of 18 years are employed on the work of lead painting, the following precautions shall be taken;-
 - i) No paint containing lead or lead products shall be used except in the form of paste or ready made paint.
 - ii) Suitable face masks shall be supplied for use by workers when paint is applied in the form of spray or a surface having lead paint dry rubbed and scrapped.
 - iii) Overalls shall be supplied by the Contractor to workmen and adequate facilities shall be provided to enable workers to wash during and on close of day's work.
17. When work is done near any place where there is risk of drowning all necessary equipment shall be provided and kept ready for use and all necessary steps taken for prompt rescue of any person in danger and adequate provision made for prompt first aid treatment of all injuries likely to be sustained during the course of the work
18. Use of hoisting machines and tackle including their attachments, anchorage and supports shall conform to the following:
 - i) These shall be of good mechanical construction, sound material and adequate strength and free from patent defects and shall be kept in good working order and properly maintained.
 - ii) Every rope used in hoisting or lowering materials or as a means of suspension shall be of durable quality and adequate strength, and free from defects.
19. Every crane driver or hoisting appliance operator shall be properly qualified and no person under the age of 21 shall be in charge of any hoisting machine including scaffold or of signals to operator.

In case of every hoisting machine and of every chain hook, shackle swivel and pulley block used in hoisting, lowering or as means of suspension, safe working load shall be ascertained by adequate means.
20. Every hoisting machine and all gear referred to above shall be plainly marked with safe working load. In case of a hoisting machine or a variable safe working load, each safe working load and conditions under which it is applicable shall be clearly indicated. No part of any machine or any gear referred to above in the paragraph shall be loaded beyond safe working load except for the purpose of testing.
21. In case of the Employer's machine, safe working load shall be notified by the Engineer or his representative. As regards Contractor's machines, the Contractor shall notify safe working load of each machine to Engineer or his representative whenever he brings it to site of work and get it verified by him.
22. Motors, gearing, Transmission, electric wiring and other dangerous parts of hoisting appliance shall be provided with efficient safeguards; hoisting appliances shall be provided with such means as will reduce the risk of accident during ascent and descent of load to the minimum. Adequate precautions shall be taken to reduce to the minimum risk of any part of a suspended load becoming accidentally displaced. When workers are employed on electrical installations that are already energised, insulating mats, working apparel such as

gloves, sleeves and boots, as may be necessary, shall be provided. Workers shall not wear any rings, watches and carry keys or other material, which are good conductors of electricity.

23. All scaffolds, ladders and other safety devices mentioned or described herein shall be maintained in a safe condition and no scaffold, ladder or equipment shall be altered or removed while it is in use. Adequate washing facilities shall be provided at or near places of work.
24. These safety provisions shall be brought to the notice of all concerned by display on a notice board at a prominent position at the workplace. Persons responsible for ensuring compliance with the Safety Code shall be named thereon by the Contractor.
25. To ensure effective enforcement of the rules and regulations relating, to safety precautions, arrangements made by the Contractor shall be open to inspection by the Engineer or his representative and the Inspecting Officer of the Labour Department of the Government.
26. Notwithstanding anything contained in conditions (a) to (m) above, the Contractor shall remain liable to comply with the provisions of all Acts, rules, regulations and byelaws for the time being in force in India and applicable in this matter.
27. The Contractor shall be responsible for observance, by his sub-contractors, of the foregoing provisions.
28. For work carried out in the vicinity of any wharf or quay, the Contractor shall abide by all the provisions of the Dock Workers (Safety, Health and Welfare) Scheme, 1961.
29. The Contractor shall at his own expense provide footwear for all labour engaged on concrete mixing work and all other types of work involving the use of tar, cement, etc., to the satisfaction of the Engineer or his Representative, and on his failure to do so, the Employer shall be entitled to provide the same and recover the cost from the Contractor.

Annexure – 16

GOOD PRACTICE GUIDELINES FOR SETTING UP STONE CRUSHING PLANT

Stone Crushing Industry is an important industrial sector in the State engaged in producing crushed stone which is raw material for various construction activities like construction of Roads, Highways, Bridges, Buildings, Canals, etc. Transportation of stone over long distances adds to cost of the crushed stone products, crushers need to be necessarily located nearer to the demand centers such as Cities, Bridges, Highways, Canals, etc. Stone Crushers also need electricity supply and man power for operation. It also needs access roads for the movement of mined stone as well as crushed stone products.

These stone crushers though socio-economically an important sector, give rise to substantial quantity of fugitive fine dust emissions resulting in to health hazards to the workers as well as surrounding population. The dust also adversely affects visibility, reduces growth of vegetation and hampers aesthetics view of the area. In order to prevent/control these emissions and complains thereof, GPCB decided to come up with the guidelines to be considered for setting up of Stone Crushing Plant in the State, which is as under:

1) The siting criteria :

Minimum distance criteria for The Stone Crushing Plant shall be as under:

Sr. No	Distance from	Distance
1	Class A and above town and cities limit	1 Km
2	Other towns	1 Km
3	Village	500 meters
4	Wild Life Sanctuary	5 Km or buffer zone declared for the same
5	National Highway (From centre line)	200 meters *
6	State highway (From centre line)	200 meters *
7	Sensitive areas such as Educational institute/ religious places/rivers/lakes	500 meters

In case of Stone Crushing Plant operating with CTE /CCA of the Board existing since long, which are located at a distance less then 200 meter from highways, the unit shall provide minimum 6 meter high compound wall or barrier of GI sheets along their plot periphery towards highway/road side.

2) Operational Measures:

- a) Provide optimum inclination of crusher discharge chute for smooth falling of material over conveyer belt

- b) Improve efficiency of screen by counterweight adjustment over the screen eccentric shaft
- c) Reduce spillage from screen hopper to conveyer belts by providing box type arrangement
- d) Use screen for separating dust from grit to avoid stone carry over along with grit
- f) Segregate small/large size stones manually/mechanically during loading at mines only
- g) Suitable exhaust and venting system of adequate capacity to be provided to guide the dust emanating from the crushers in to the the staff through cyclone to collect the dust
- h) Suitable safety measures shall be provided to protect workers from the ill effect of dust pollution

3) Air Pollution Control Measure:

- a) Hood for Screening, Classifier and Crusher
- b) Cover conveyor belts with semi circular eco friendly sheet.
- c) Rotary screen to be completely closed leaving space at bottom for collection of the sieved jelly
- d) Considering predominant wind direction, wind breaking wall shall be constructed.
- e) Provide dust containment facility at 1) Below crusher discharge area, 2) Vibratory screen and Belt conveyer transfer points
- f) Provide dust suppression system (i.e. water spray through nozzles) comprising of 1) A water tank 2) Pump 3) On-line water filter 4) GI pipes with valves and fittings and 5) Water spray nozzles
- g) All roads/ vehicle movement areas at the site Plant shall have metal road
- h) Regular sprinkling of water shall be ensured on such roads so that no dust is generated due to vehicular movement.
- i) Provide water sprinkling system for suppression of dust in the premises
- j) Regular cleaning and wetting of ground within premises
- k) Adequate plantation all along the periphery of premises
- l) The suspended Particulate matter measured between 3 to 10 meters from any process equipment of a stone crushing unit shall not exceed 600 microgram/m³

4) Maintenance Measure:

- a) To clean water tank once in a week.
- b) To clean the pump foot valve, discharge connections of the pump once in a week
- c) To clean the filter by back washing everyday
- d) To change the gasket of the filter once in a six months
- e) To check the valve once in a three months
- f) To flush the pipe line fitting the nozzle to flush out dirt in the pipelines
- g) To clean the nozzles periodically using thin wire

NOTE: In case of stone crushers, the mining areas are located nearby or generally integral part of quarry plant itself. Many quarries situated in clusters hence in such cases activity 1(a) of Environment Clearance Notification 14/09/2006 attracts in common because total mining of mineral area crosses threshold limit of 5.0 ha, hence in case of mining cluster going beyond threshold limit, Environment Clearance per EC Notification shall be obtained.

Good practices for Guidelines for handling Bitumen

BURNS**Risk**

Bitumen products are supplied and stored at elevated temperatures up to 230°C, which makes them much hotter than boiling water. Bitumen burns may cause severe damage to eyes and skin. Sadly, accidents have resulted in workers requiring skin grafts. Boil-over of tanks or containers can occur if water comes into contact with hot bitumen.

Precaution

When transferring hot bitumen products ensure you have full skin protection to avoid burns in the event of an accident. Always wear one piece overalls which are buttoned up at the wrists and neck, gauntlet style heat resistant gloves, safety helmet with full face visor and neck apron attachment and industrial safety boots or wellingtons. Never tuck trouser legs inside boots. Before loading or receiving hot bitumen products always check the contents of previous load to prevent water Contamination and boil-over.

FUMES**Risk**

Hot bitumen products may give off irritant fumes resulting in sore eyes, nose and throat.

Precaution

Take care not to overheat products above recommended temperature as they may release these irritant fumes. You may require the use of respiratory protection such as an approved disposable face mask.

BITUMEN FIRE

Use foam, dry chemical powder, inert gas extinguishers or water sprays.
NEVER use water jets.

When safe to do so, switch off heaters, pumps and close all valves.

FIRST AID**Burns**

Cool effected area with cold running water for as long as possible, preferable until medical assistance is obtained. If the person has collapsed, ensure that bitumen splashed in difficult areas such as back of legs, are also well cooled with water. Do not attempt to remove bitumen as it forms a protective sterile barrier on burnt skin. Take immediately to hospital, or call the ambulance service.

No attempt should be made to remove the bitumen from the burned area.

Further treatment, first aid and medical care

The bitumen layer will be firmly attached to the skin and removal should not be attempted unless carried out at a medical facility under the supervision of a doctor. The cold bitumen will form a waterproof, sterile layer over the burn which will prevent the burn from drying out. If the bitumen is removed from the wound there is the possibility that the skin will be damaged further, bringing with it the possibility of complications.

Furthermore, by exposing a second degree burn in order to treat it, there is the possibility that infection or drying out will make the wound deeper.

Second degree burns

The bitumen should be left in place and covered with a Tulle dressing containing paraffin or a burn ointment containing paraffin, e.g. Flamzine (silver sulphadiazine). Such treatment will have the effect of softening the bitumen enabling it to be gently removed over a period of days. As a result of the natural re-epithelialisation of the wound any remaining bitumen will peel off in time.

Third degree burns

Active removal of the bitumen should be avoided unless primary surgical treatment is being considered due to the location and depth of the wound. In such cases removal of the bitumen is best carried out in the operating theatre between the second and fifth day after the burn occurred. By the second day the capillary circulation has usually recovered and the bed of the wound is such that a specialist can assess the depth to which the burn has penetrated. There are normally no secondary problems such as infections to contend with before the sixth day. However, it is essential to commence treatment using paraffin based substances from the day of the accident to facilitate removal during surgery.

Circumferential burns

Where hot bitumen completely encircles a limb or other body part the cooled and hardened bitumen may cause a tourniquet effect. In the event of this occurring, the adhering bitumen must be softened and / or split to prevent restriction of blood flow.

Eye burns

No attempt should be made to remove the bitumen by unqualified personnel. The patient should be referred urgently for specialist medical assessment and treatment.

Fumes

Move the worker to fresh air and seek medical assistance if symptoms of respiratory irritation persist.

BITUMEN SPILLS

Clean up

- For large spills, keep the public away. Call the fire brigade.
- Isolate source of spillage and turn off all pumps and valves if safe to do so.
- Eliminate nearby ignition sources.
- Contain the product by using sand.
- Ensure all drains are covered to stop access to water ways.
- Allow bitumen product to cool.
- Scrape up and dispose of in an approved land fill site.

In the event of spillage of cutback bitumen or emulsion, or when heavy rainfall occurs after spraying:

It is important to ensure that the product is prevented from entering waterways. Dam the product to stop it entering waterways. Place a boom or barrier to stop any contamination travelling downstream.

Remove bitumen globule residues which deposit in the vegetation on the sides of streams. Contact local authorities or emergency services. Check for any wildlife coated by bitumen products and contact the Environmental Agency for assistance. Dispose of bitumen residues to local approved land fill site

Good Practice Guidelines for Archaeological Chance Find Procedure

Sites and properties that are buried or not identified by the survey undertaken by the consultant may be discovered during project implementation, especially in the course of construction or excavation. Such unanticipated discoveries of remains of an archaeological and/or historical nature are termed archaeological chance finds. Most often they are concentrations of pottery, worked stone, and human and animal bones, without commercial value, but of significance to archaeologists, historians, anthropologists, and paleontologists.

The following archaeological chance find procedures are adopted in project design and construction contracts:

- The responsibility for preservation, maintenance and assessment of historical and cultural monuments rests with the Department of Archaeology, State Govt., and in specific cases, with the Archaeological Survey of India.
- Whenever chance finds of cultural or historical artifacts (moveable and immovable) are made the Department of Archaeology of the state Government, the Archaeological Survey of India will be informed. Should the continuation of work endanger the historical and cultural artifacts, the project work will be suspended until a solution is found for the preservation of these artifacts, or advice from the Archaeological Survey of India is obtained.
- Failure to report a chance find within the 48 hours of discovery, is a punishable offence under the relevant Indian legislation. Similarly, (intentional) damage to a historical or cultural artifact is a punishable offence.
- PIU will also seek the support of the Archaeological Survey of India, local Office to periodically inspect the sites of construction, excavation and muck disposal to detect any chance finds.
- The Project Head will request for a representative of the State Department of Archaeology, or the Archaeological Survey of India, local Office to make a site inspection.

Project Head will order cessation of work in the vicinity of the chance find until the visit of a representative (usually required within 48-72 hours of notification); and follow the advice by the State Department of Archaeology, and/or the Archaeological Survey of India on possible salvage or excavation (usually required within 48-72 hours of notification). Contractors, employees of the contractors and all project employees will be responsible for informing the Project Director immediately after discovery of the chance find, without any judgment on their own on the value of the chance find. The Project head will be responsible to inform the Department of Archaeology of the State Government, and the Archaeological Survey of India, local Office, within 48 hours of such discovery.

Recommendations for management/conservation measures required to be taken by PIU.

- A joint body may be formed either by involving local people i.e. (gram panchyat/sabha) or (state/ central govt.) with THDC for monitoring and execution of the work.
- Role of MPWD in this respect:
- Conservation of cultural resources providing appropriate infrastructure for the:
 - a. Conservation of archaeological / heritage / sacred sites and objects in the project and its surrounding areas.
 - b. Display of the archaeological / heritage finds/objects collected/acquired in the local site museum.
 - c. Awareness among locals at school, college and village level

An Architect / Archaeologist may be employed in PIU management cell for suggesting conservation and architectural measures.

Archaeological Chance Find Procedures

These procedures were developed in accordance with the Lebanese regulations and the World Bank Guidelines - OP 4.11 of August 1999.

These procedures are included as standard provisions in construction contracts to ensure the protection of cultural heritage.

A clause for "**Protection of Archaeological and Historical Sites**" was added to all bidding documents for the works contract which explains the steps to follow whenever new

archaeological remains, antiquity or any other object of cultural or archaeological importance are encountered during construction.

Protection of Archaeological and Historical Sites'

Excavation in sites of known archaeological interest should be avoided. Where this

is unavoidable, prior discussions must be held with the Directorate of Antiquities in

order to undertake pre-construction excavation or assign an archaeologist to log discoveries as construction proceeds. Where historical remains, antiquity or any other object of cultural or archaeological importance are unexpectedly discovered during construction in an area not previously known for its archaeological interest, the following procedures should be applied:

- a) Stop construction activities.
- b) Delineate the discovered site area.
- c) Secure the site to prevent any damage or loss of removable objects.

In case of removable antiquities or sensitive remains, a night guard should be present until the responsible authority takes over.

d) Notify the responsible foreman/archaeologist. Who in turn should notify the responsible authorities, the General Directorate of Antiquities and local authorities (within less than 24 hours).

e) Responsible authorities would be in charge of protecting and preserving the site before deciding on the proper procedures to be carried out.

f) An evaluation of the finding will be performed by the General Directorate of Antiquities. The significance and importance of the findings will be assessed according to various criteria relevant to cultural heritage including aesthetic, historic, scientific or research, social and economic values.

g) Decision on how to handle the finding will be reached based on the above assessment and could include changes in the project layout (in case of finding an irrevocable remain of cultural or archaeological importance), conservation, preservation, restoration or salvage.

h) Implementation of the authority decision concerning the management of the finding.

i) Construction work could resume only when permission is given from the General Directorate of Antiquities after the decision concerning the safeguard of the heritage is fully executed.

2- In case of delay incurred in direct relation to Archeological findings not stipulated in the contract (and affecting the overall schedule of works), the contractor may apply for an extension of time. However the contractor will not be entitled for any kind of compensation or claim other than what is directly related to the execution of the archeological findings works and protections.

Good practices guideline for stockpiling

Common Concerns: Stockpiling

Stockpiles take up a lot of land. At small operations, the stockpile might represent half of the total land base. In tight urban areas, stockpiles may be the most significant visual feature of an aggregate operation and their placement or concealment requires careful consideration. Because of their large footprint, stockpile sites can also generate a large portion of an operation's stormwater, requiring appropriate management attention.

Handling and storage are major cost elements of both extraction and processing. Accordingly, there should be a plan for each aggregate operation showing how and where materials and products will be handled and stored.

A stockpiling plan will help to ensure quality control by keeping finished product from becoming unintentionally blended, segregated or contaminated. When stockpiles are well placed between extraction, processing and loading facilities, hauling distances are minimized, saving time, fuel and machinery maintenance. Stockpiling planning will also organize placement of overburden, topsoil and by-products, helping to avoid double handling of low-value materials.

Basic Stockpiling: What and Where?

Stockpiles can be constructed using front-end loaders, trucks or conveyor systems. The types of stockpiles and stockpiling procedures will depend upon the available land and equipment, the flow characteristics of the material, the climate and length of the processing season, quantity of material and range of products.

General Stockpiling Guidelines

- Sites for stockpiles should be clean and level prior to storing materials.
- Aggregates should not be removed from stockpiles within 0.3 metre (1 foot) of the ground until final cleanup/removal of the stockpile.
- Layering can help to minimize moisture absorption in stockpiles. Tarps can also be used for products that need to be kept dry.
- Stockpiles can be located to function as sight and sound barriers.

Stockpiling issues, significance, notes and suggested BMPs.

Issue	Significance	Notes	Suggested BMPs
<p>Segregation - the unintentional and undesirable separation of aggregate into size fractions</p>	<p>Depends upon type and height of stockpile, drop height, handling equipment and procedures</p>	<ul style="list-style-type: none"> • Segregation can be triggered by any movement and/or vibration • Avoid end-dumping or dozing over the sides of piles • Fix improperly placed or malfunctioning conveyors • Segregated material can be re-blended by dozing stockpiles and dead surge areas • Frozen crust can increase segregation and decrease product quality 	<ul style="list-style-type: none"> • <u>Drop Height</u>
<p>Degradation - the breaking of aggregate pieces into smaller size fractions</p>	<p>Occurs if the aggregate is falling far enough to break on impact or if machinery is driven on top of it</p>	<p>Aavoid excessive machine time on top of aggregate</p>	<ul style="list-style-type: none"> • <u>Drop Height</u>
<p>Location/Space</p>	<p>Depends upon available land</p>	<ul style="list-style-type: none"> • Keep stockpile sizes to a minimum, as the material in stockpiles represents an investment in inventory • Provide room for loaders and trucks to manoeuvre • Locate to reduce noise escaping the site • Consider prevailing wind patterns • Allow sufficient distance from fences and property boundaries to prevent overflow or spillage 	<ul style="list-style-type: none"> • <u>Material Corrals</u>

		<ul style="list-style-type: none"> • Avoid proximity to utilities, whose underground structures may be damaged by ground deflection from the weight of the stockpiles • Avoid locating stockpiles under overhead wires where equipment may contact the wires • Provide sufficient area for both stockpiles and operations, such as: <ul style="list-style-type: none"> • Subsequent crushing and processing • Sub-contracting • mixing plant • weigh scales • Parking and mobile buildings 	
Drainage	wet handling areas due to collected rainwater increase costs	<p>use high, dry and well drained ground</p> <p>Avoid ponding</p> <p>Stockpiles may compact the ground, decreasing local infiltration rates</p> <p>Compact material with high fines to reduce water absorption</p>	<ul style="list-style-type: none"> • <u>Ditches</u> • <u>Settling Pond</u>
Safety	<ul style="list-style-type: none"> • depends upon size and whether automatic reclaim systems are installed • frozen ground can also be dangerous 	<p>Avoid creating hazardous slopes, or stabilize</p> <p>Prevent inadvertent and unauthorized access</p> <p>Keep stockpile back from perimeter and fences to avoid entry breaches</p> <p>Prevent access to top of stockpile (i.e. remove access ramp)</p> <ul style="list-style-type: none"> • falling frozen chunks/crusts can be very dangerous 	<ul style="list-style-type: none"> • <u>Fences</u> • <u>Signage</u>

<p>Accessibility/ Orientation</p>	<p>Depends upon traffic flow from and to stockpiling area</p>	<p>Provide for year round accessibility</p> <p>for multiple vehicle access types (e.g., haul trucks and highway trucks), consider separate access roads to avoid traffic conflicts</p> <p>Design for safe, orderly and efficient access</p> <p>Ensure optimum utilization of space for efficient existing or anticipated removal and processing operations</p> <p>Provide for adequate separation from the various operations</p> <p>Limit height to avoid loading out faces from becoming too high</p>	<ul style="list-style-type: none"> •
<p>Ground Stability</p>	<p>Generally only a concern in low, wet areas</p> <p>Frozen ground can also be unstable</p>	<p>Stockpile areas should be on stable ground during all weather conditions</p> <p>stockpiles should not be adjacent to unstable ground, either up or down slope</p>	<ul style="list-style-type: none"> •
<p>Proximal Activities</p>	<p>Depends upon proximity to non-industrial neighbours</p>	<p>Avoid locating stockpiling areas adjacent to public or residential areas</p> <p>stockpiles can be a major source of dust</p> <p>place stockpiles so that the prevailing wind will not create adverse dust effects on sensitive areas</p> <p>consider placing buffers on the downwind side of stockpiles</p> <ul style="list-style-type: none"> • can be used for noise and visual screens from other activities on site 	<ul style="list-style-type: none"> • <u>Water Spray</u>

