

CHAPTER 6 - ASSESSMENT OF IMPACTS

6.1 Background

The proposed Project Road, **Kaladan Multi-Modal Transport Route** takes off at 76.400km of NH-54 at Lawngtlai Town, running towards South and joins Kaletwa (Myanmar) to River Zocha road sector at Indo Myanmar border road. The Projected length of the road from Lawngtlai to the Indo Myanmar border is 99.830 Km. The Projected road alignment passes through frequently cultivated jhum land. It also crosses Lawngtlai to Diltlang Parva road, which runs towards south west of Lawngtlai town.

It also crosses Nalkawn Chamdul Valley road at four points. The road also passes through the villages of Saizawh east and Zochachhuah . The height of the road at various locations varies from 26 m near River Zocha to 780 m Lawngtlai Town, above mean sea level (MSL).

The proposed alignment of the project passes through Lawngtlai District in North-South direction. The whole length of the project will be fresh cutting of mountainous as steep terrain with broken contours. The alignment of the project road traverses through frequently cultivated jhum lands where the cycle of cultivation by cutting and burning of trees and bamboos is 4 – 5 years. At some places the project corridor is within few kilometers of natural forest and virgin land of thick undergrowth of evergreen bushes and creeping plants. The project road is proposed as a new link that is expected to develop as international trunk route in due course of time. The project road is proposed to be compatible with NH-54. Accordingly it has been proposed to provide carriageway width of double lane standards. The formation width has also been proposed for 12m. The cross-drainage structures and bridges are also proposed to be of two-lane standards. Altogether 7 bridges and 530 culverts have been proposed for this road .

As free land is not available the Government of Mizoram needs to acquire land from the land owners to make the road to two lane standard having a formation width of 12m as per Hill Road Manual IRC: SP - 48 - 1998.

Total land requirement for the project is about 239.59 ha .The road passes through mainly degraded jhumland and private holding. Out of the total proposed 239.59 hectares, only 15.24 hectares is found to be forest area by the concerned authorities.

This chapter deals with the potential environmental impacts anticipated on different environmental components during the construction and operation phase of the proposed project and the mitigation measures to be adopted to minimize the same has been discussed in preceding chapter of this report.

6.2 Assessment of Impacts

6.2.1 Meteorological Parameters

The entire area of the project road is in a sub tropical region with marked monsoon affects. Though no change in the macroclimate setting (precipitation, temperature and wind) is envisaged due to the project, the microclimate is likely to be temporarily modified during the pre construction and construction period. However, the status of the microclimate will get restored within 3-4 years after completion of the construction work, high regeneration growth and afforestation program. Therefore, the overall impact on meteorology of the region is insignificant and has been categorized as low.

6.2.2 Physical Settings:

The impact on physical settings means the impact of the project on Land Use, Geomorphology, Drainage, Geology, Soils erosion problem, Material Quarry area and Borrow Pits etc.

Impacts on the above elements during construction and operation of the project have been discussed in the subsequent sections.

Impact on Land:

- **Construction Stage**

The project road is proposed to be compatible with NH-54. Accordingly it has been proposed to provide carriageway width of double lane standards. The formation width has

also been proposed for 12m. The cross-drainage structures like 7 bridges and 530 culverts are also proposed to be of two-lane standards. Total land requirement for the project is about 239.59 ha .The road passes through mainly degraded jhumland and private holding. Out of the total proposed 239.59 hectares, only 15.24 hectares is found to be forest area by the concerned authorities.

The loss of productive soil is identified in the construction stage because most of the road alignment is through the jhum land (224 ha) which is the agriculture land for the people of Mizoram. It is envisaged that at locations of Worker's camp, stockyards, storage go-downs etc. if these are located on fertile areas there will be impact on productivity of the soil in future. In the proposed project there is provision of earth fill high embankments. This will require huge quantity of earth. As most part of the project area passes through hilly area so fallow land is scarce. So there is chance that agriculture lands will be used for borrow area, which will be serious impact on productive soil.

Provision has been made in EMP to ensure that no productive areas are used for these purposes. Effort has been proposed that earth generated during cutting will be used for the high embankment and other filling purposes. Use of fresh earth will be minimum. A guide line has been given in the EMP document for use of earth generated during hill cutting to minimize the impact on agriculture lands and hence the productivity of the soil.

If EMP will be followed during implementation of the project then the impact on soil productivity will be low in nature.

Land Use:

○ Construction Phase

Preparatory activities like use of existing access roads with/without improvements, construction of new haulroads, construction of temporary staff quarters, camp, storage go-downs, stockyards etc. will be spread over the entire project area. This will change the land use pattern of the project influence area for a temporary period. In the EMP provision has been made to ensure proper restoration of the land after the use. Though it will be a direct impact but the scale will be low in nature except marginally altering the land use pattern in these places for a short period.

- **Operation Phase**

The project is a road-development project and as stated earlier it requires about 259.5 Ha of land for development of the road. So land use pattern of the acquired land and the existing vacant land will change permanently. This will be a direct impact on land use pattern but side by side it will improve the socioeconomic condition of the area, which is a positive social impact.

Due to the development of the new roads there are chances of economic development and in the long run there is chance of ribbon development along the roads in most of the commercial areas which will have additional impact on the land use pattern of the project area in long run..

6.3 Geomorphology and Drainage:

6.3.1 Geology

The construction and operation of the project road will have no any significant impact on the regional geology.

Drainage

- **Construction stage**

The project is crossing over many canals, streams and Rivers. Provision has been made in the EMP that during construction of the road contractor will adopt all possible measure not to disturb the flow of any natural and irrigation channel. No natural drainage channel will be diverted during the construction of the road. So Impact on drainage during construction stage will be insignificant.

- **Operation Stage:**

Sufficient number of cross drainage structure like culverts and bridges have been provided in the design so that widening of road and construction of embankments will not impede the normal flow of the water channels in the operation stage. Hence impact will be insignificant.

6.5 Soil / Borrow Areas

Potential Impacts-

○ Construction Phase

The average embankment height of the project road is 1m and in some places 3m to 3.5m (high embankment regions) which requires quantity of material for embankment construction.

For the construction of shoulder and sub-base considerable amount of earth material is required. Material considered for the same is will be taken from the barren land and debris the project area and will be transported from shortest possible distance.

Provision in the will be made in the EMP that borrow areas will be selected as per the guideline of the EMP. River banks and fertile agriculture lands will not be used as borrow area.

In this project design effort has been given for minimum use of the borrow soil for embankment construction. To use a land for borrow area contractor has to submit consent of that land owner along with a borrow area reclamation plan for the approval of the environmental expert of the supervision consultant. After getting approval from the supervision consultant and the client contractor will use that land as borrow area.

In some places the depression formed due to extraction of soil from the field will be used as ground water recharge area and will also act as a water body.

Provision has been made in EMP to ensure that no productive areas are used for these purposes. Effort has been proposed that earth generated during cutting will be used for the high embankment and other filling purposes. Use of fresh earth will be minimum. A guide line has been given in the EMP document for use of earth generated during hill cutting to minimize the impact on agriculture lands and hence the productivity of the soil.

If EMP will be followed during implementation of the project then the impact on soil will be low in nature.

So construction of this project road will have no any significant adverse impact on soil of that locality.

6.6 Erosion

Potential Impact

Construction Phase.

All major construction activities tend to create certain changes in the soil condition of the area. Excavation denudes the topsoil and makes it loose. Destruction of topsoil leads to reduction of fertility and removal of vegetation cover with associated hazards of soil erosion. Hill cutting and dumping of spoil in improper dump site with out erosion protection measures will lead to soil erosion. Construction of contractor's camp will also lead such problems.

During construction of high embankments there is chances of soil erosion due to rain-wash especially during the monsoon but provision for slope protection measures has been provided in the design. Implementation of such protection measures during construction¹ of the road will not create any adverse impact on erosion potentiality of the embankments.

Provision has been made in the EMP for proper disposal of earth spoil and guideline for Selection dumpsites and disposal techniques of spoil and its management. If EMP will be followed properly then impact will be minimum.

○ Operation Stage:

During the operation phase the soil condition of the project site would be allowed to stabilize. The topsoil in the dumpsites areas would be restored and major portions of the area would be subjected to extensive plantation.

In case with the other highways it has already been observed that the highways pass through old stable soil and presently the impact of soil erosion from these highways is very less.

¹ As suggested in EMP

There may be chances of soil erosion at high embankment. But, the impact will be minimum as due consideration has been given for the slope protection in high embankment areas during embankment design².

6.7 Quarries

Potential impacts

- **Construction Phase.**

The quantity of stone aggregates for the road construction (pavement and concrete) works conforming to specifications is to be sourced from the existing quarry sites and hauled to work sites. No quarry is available on the project road and with in 20 Km distance from the project area. Quarry identified for the project road are out side the project area.

As these quarry sites are sufficient to the requirement of road construction so there is no need to open a new quarry site. Therefore no more impact on natural resource for stone materials.

- **Operation Phase:**

As discussed earlier no quarry sites are getting to be exhausted since the available stone materials are more than sufficient. During the operation phase there will be least impact on quarry sites as the stone requirement during the operation phase will be negligible because material required for maintenance of the road very less.

6.8 Water Resources

Hydro-geology/Ground Water

Potential Impacts

- **Construction Phase**

² Refer DPR for Protective designs of high embankments

Due to good availability of surface water resources along the project road throughout the year the construction water demand will be mainly depended on surface water not on Ground Water Resources. In some places especially water for the work force camps and construction activities ground water will be required but the quantity will be less. Therefore, there will be no potential impacts on ground water for the construction works.

The average recommended ground water yield of the region is up to 40 cum. per hour for shallow tube wells, 50-100 cum- per hour for medium tube wells and up to 200 cum. per hour for deep tube wells.

Consultation with CGWB, revealed the fact that considering the ground water yield/potential construction water demand for highway construction works would not have any significant impact on the geo-hydrology of the region.

- **Operation Phase.**

During operation of the highways there will be no any impact on the ground water sources except percolation of accidental spillage or hazardous material, if any in future.

6.9 Surface Water Resources:

Potential Impacts

- **Construction phase:**
 - 7 minor bridge and several other 530 culverts and Hume pipes have also been proposed for streams and canals. Thus these developmental activities will not have any significant impact on existing drainage systems.
 - There are chances of improper drainage of wastewater from the construction sites and thereby the formation of stagnant pool. The stagnant pool will promote breeding of mosquitoes and create generally insanity conditions. But implementation of the guidelines as provided in EMP in construction camp will minimize all such problems.
 - Discharge of bridge construction wastewater with high concentration of suspended solid load will disturb the aquatic ecosystem of the receiving water body. But implementation

of the guidelines as provided in EMP for bridge construction sites will minimize all such problems.

- Liquid and solid waste discharges from petroleum, oil and lubricant (POL) storage areas, work force camps and all other operational areas may impact the water quality of the receiving water body if disposed off directly. But implementation of the guidelines as provided in EMP in construction camp will minimize all such problems.

- **Operation Phase:**

- Accidental spillage and highway runoff containing hazardous material may contaminate the receiving surface water body and the aquatic ecosystem may be disturbed.
- Garbage dumping on highways may also contaminate the aquatic eco-system.
- Waste discharge from the wayside amenities and the storm water run-off from the Project highway may impact the watercourses.

But implementation of the guidelines as provided in EMP during operation will minimize all such problems.

6.10 Traffic Growth Pattern in the area:

Potential Impacts:

The traffic growth pattern in the project area will not have a significant increase pattern in the future years.

Construction Stage:

- In the construction period the type of effect is limited to construction vehicles like dampers, trucks and other construction vehicles. The movement of these heavy vehicles through haulage roads will have air and noise pollution problems in pollution free areas.

- Particulate matter would be the predominant pollutant affecting the air quality during the construction phase. Mostly the construction heavy vehicles will generate undesirable gases such as SO₂, NO_x, and CO. However, this would not lead to any tangible effects, as the expected traffic volume is very low and are mostly concentrated to the construction camp areas, haulage roads etc. Implementation of the EMP will minimize the problems significantly.

Operation Phase:

During the operation phase impact on air and noise quality due to traffic growth (Refer table 5.21 of DPR) has been assessed in subsequent sections. It has been found that due to faster movement (80 km/hr) and good pavement condition impact on air quality in terms of concentration of carbon monoxide, Oxides of nitrogen and Hydrocarbon will be insignificant i.e. concentrations of the pollutants will be well within the limit of the CPCB govt. of India for residential and sensitive areas.

Operation Phase:

Vehicular emission is a major contributor to the air pollution both in urban and rural environment. The vehicular emissions are determined by several factors like fuel composition, level of engine maintenance, vehicle age, speed and congestion, traffic and road condition. Human health, terrestrial flora and faunal health are the most immediate receptors of the vehicular pollution/emissions.

Simulation model Used:

TRRL model developed by the Transport Road Research Laboratory, U.K has been used for air-quality modeling. The model considered forecasted traffic up to the year 2035 and the emissions factors recommended by the Indian Institute of Petroleum, an autonomous body of Government of India mentioned below:

Diesel Driven Vehicles								
Speed								
Pollutan	10	20	30	40	50	60	70	80

t								
CO	37.8	18.80	12.53	9.40	7.52	6.27	5.37	4.70
	0							
NOx	66.8	33.42	22.28	16.71	13.37	11.14	9.55	8.36
	3							
Petrol Vehicles (Independent of speed)								
Pollutan	Cars			Two wheelers		Three Wheelers		
t								
CO	2.72			2.0		4.0		
NOx	0.58			0.05		0.05		

The projected concentrations at all stages of the Project Highway development were within the National Ambient Air Quality except for the suspended particulate matter.

The construction of improved highway will provide improved speed for the through traffic and reduction in congestion of traffic and improved pavement. So the project development will not have any significant impact on the air quality along the roadside as compared to present situation. As the proposed road is on a virgin land and most of the residential areas are away from the proposed alignment i.e. at least 30m away from the edge of the road, so it will have no any significant impact on the residential areas due to road construction.

- The through traffic will cruise at 60- 80 kmph as compared to present situation of 20-40 km/h with a stop and go pattern through the settlements/ ROBs. The design speed (100 Km/h) of project highway is optimal for minimum emissions.
- The highway construction will provide service areas, parking lay-byes and rest areas away from the human settlements, thereby diverting the trucks and other vehicles away from the human settlements/villages This will aid in improvement of air quality near the human settlements/villages along highway particularly at nighttime,

Government of India is committed EURO II & III emission norms and providing cleaner fuels, the emissions can be expected to be lower than present levels in the coming years with the increased availability and usage of cleaner fuels.

6.12 Noise & Vibration

6.12.1 Potential Impacts:

Construction Phase:

Different types of noise impacts are-

- Due to haulage operation the movement of heavy vehicles will produce shearing noise, which will have impact on the surroundings village people.
- The construction activities like the operation of hot mix plant, batch operation etc may have some impact on the existing noise environment of the project area.

If EMP guidelines are followed, impact of noise in construction stage will not be significant.

Operation Phase:

The noise impact during the operation stage is generally beyond the purview of the highway authorities.

The major factors contributing to highway noise impacts are vehicular noise, driving behavior, and pavement condition and road geometry. Vehicular noise is the dominant factor.

As the proposed road passes through a predominantly virgin area and the existing noise level along the project corridor is very low and well within the permissible limit. But, due to traffic growth in the operation phase the noise intensity will increase in the study area .

Simulation model Used:

TRRL model developed by the Transport Road Research Laboratory, U.K has been used for Noise quality modeling. The model considered forecasted traffic up to the year 2035 and the emissions factors recommended by the Government of India.

6.13 Biological Environment:

Potential Impacts:

○ **Construction Phase:**

- The vegetative cover within the project corridor will be marginally impacted due to cutting of bamboos of trees. Most of the trees are small girth size planted along the road as part of social plantation. The tree enumeration has indicated that on an average 150 bamboo clumps /km are getting effected.
- Within the project Corridor, the vegetation and fauna include the common herb, shrub, trees and some domesticated animals. No any endangered species of plant and animals have been reported within the project corridor. So highway development through the corridor will not have any impact on bio-diversity rather the bio-diversity will improve with the plantation of 10000 different tree species along the highway and in the rest areas.

The clearing operations of the corridor will not have any impact on wild life species, threatened or endangered species as these are not known to occur along the Project Corridor.

Operation Phase:

- The project road is existing road and is passing through mostly agricultural Land (degraded jhum land) and few settlements and therefore during the operational phase due to traffic growth concentration of air pollutants will have impact on flora, fauna and human health. Although air quality model study indicate no significant impact.
- A proposal for landscaping has been included in the in EMP as a part of the scope of work. Implementation of the landscaping program will give the area a good scenic beauty and bio-diversity of the area will improve. Due to development of green belt impact of air quality in the settlements and human health will be insignificant.

Forest clearance

Forest clearance for the project road was sought from the concerned authorities in the prescribed Form vide Public Works Department, Mizoram letter dated 31.10.2008 for a land

totaling 239.59 hectares (99.83 km by 24.00) right of way for construction of the road to required specification. The application, accompanied by a map showing the proposed alignment in the prescribed scale also clearly mentioned that the alignment was the best possible one.

The Forest authorities accordingly conducted a detailed survey of the alignment and the following is the findings of that survey:

- The proposed road alignment does not form part of National Park, wild life sanctuary, biosphere reserve, tiger reserve, elephant corridor, etc.
- No rare/endangered/unique species of flora and fauna are found in the area.
- No protected archeological/heritage site /defence establishment or any other important monument is located in the area.
- The requirement of forestland as proposed by the user agency in is unavoidable and barest minimum for the project. No alternative for the project exists.
- No work in violation of the Forest Act has been carried out.

The road passes through mainly degraded jhumland and private holding. Out of the total proposed 239.59 hectares right – of – way, only 15.24 hectares is found to be forest area by the concerned authorities.

After due verification and assessment, the Estimate for Net Present Value and Compensatory Afforestation has been been duly framed by the concerned Mizoram Forest Authorities.

6.14 Construction Debris

6.14.1 Potential Impacts

Construction Phase

The proposed road construction work will generate debris from hill cutting excavation and embankment construction. Spoil generated during the construction activities will be dumped in to designate dumpsites with protection measures. More than 50% of the spoil will be reused in road construction for filling and embankment construction. Part of the spoil may be used for filling low areas and development of playground and community hall etc.

So construction debris will have no significant impact on the environment.

6.15 Impacts on Archaeological/Historical Monuments

There are no protected/ declared archaeological/ historically important monuments along project Corridor of impact.

6.16 Cultural Heritage/ Sensitive/ critical natural habitats.

There are no any cultural heritage sites, sensitive arid/or critical natural habitats, national parks, wild life sanctuaries, and sacred groves in the project area.

6.17 Religious place

No religious structure is getting affected within the project corridor. These will be suitably relocated to adjoining places in consultation with the villagers if interferes with construction activities.

6.18 Social Impacts & Mitigation

The social impacts due to the project up-gradation have been separately assessed and documented in Social Impact Assessment report.

A separate Resettlement Action Plan (RAP) has been prepared to compensate the project affected persons who are likely to be impacted due to the development of the Project.