

# **EXECUTIVE SUMMARY**

**UMNGOT HEP (210 MW)  
EAST KHASI HILLS & JAINTIA HILLS DISTRICT ,  
MEGHALAYA**

**Sector 1 (c) (i), Category A  
January, 2021**

**Project Proponent:  
M/s Meghalaya Power Generation Corporation Ltd.  
Lumjingshai, Short Round Road  
SHLLONG-793001**

**EIA Consultant:**



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## **EXECUTIVE SUMMARY**

### **PART-I ENVIRONMENT IMPACT ASSESSMENT**

#### **1.0 Need for The Project**

The need for Umngot HEP in Umngot Basin, has therefore been considered in context of power shortage in the country as whole. The project has been conceptualized as storage scheme. Umngot H.E.P. (3 x 70MW) alone would be able to supplement 210 MW of peaking power to the requirements of the state and provide an annual design energy (90% dependability) of 708.98 GWh.

#### **2.0 Location and Approach**

From Shillong, the project is accessible by road on the left bank through the NH-44 E which runs through the neighbouring Jaintia Hills District of Meghalaya to Tamabil, a dry port on the Bangladesh border. On the right bank the Project is also accessible from N.H-44 via a District/village road in East Khasi Hills District where most of the hydraulic structures will be located.

#### **3.0 Project Features**

The proposed Hydro Electric Project comprises the following structures:

- 362m long and 111 metres high concrete dam across river Umngot to impound 71.31 MCM. of water.
- 3.40m diameter head race tunnel of length 5.646 Km,
- A restricted orifice surge shaft of 12m diameter and 68.1m height at the junction of HRT and pressure shaft opens into the atmosphere at the top.
- 2.50m diameter steel lined pressure shaft of length 2.209Km,
- Surface Power House of length 107.5m and width 22m for generation of 210 MW of peak power.
- Three tail race tunnels of 41m length and 3.78m diameter.
- Tail Race channel of cross-section 6.60mx2.80m.

#### **4.0 Environment Impact Assessment**

M/s. EQMS India Pvt. Ltd, Karkardooma, Delhi, has conducted the Environment Impact study, as per ToR issued by the MoEF&CC vide letter No. J-12011/1/2016-IA-I dated 12-04-2016.

#### **5.0 Existing Status of Environment**

##### **5.1 Land use/Land Cover**

The dominating classes are dense forest (33.95%), open forest (24.29%), Open Scrub Land/Rocky area (22.24%), settlement (5.28%), shifting cultivation (4.64%), Barren Land/Stony waste area (1.88%) and water body (0.30%).

##### **5.2 Land Requirement for Construction of the Project**

For execution of the project 390.50 ha land shall be required of which the apportionment between, Forest land and private land shall be 93.53 ha and 296.97 ha respectively.

##### **5.3 Archaeological / Historical Monuments/Sensitive Area**

No archaeological monument of national importance, Defence Establishments, exists within 10 km from the project.

**5.4 Soil Quality**

The soils of study area are Sandy Loam and Silty Clay with pH ranging from 6.51 to 7.45, thereby indicating the soils are slightly acidic to slightly alkaline in nature. The low EC values indicate low salt content. The organic carbon content of soil varied from 0.51 to 0.82, thereby implying that soils are medium and high organic content. Available nitrogen content in the surface soils ranges between 271.8 to 302.6 kg/ha, thereby indicating that soils are low to medium in available nitrogen content. Available phosphorus content ranges between 6.2 to 12.6 kg/ha, thereby indicating that soils are low to medium in available phosphorus content. Available potassium content in these soils ranges between 144.2 to 172.5 kg/ha, thereby indicating that the soils are medium in potassium content.

**5.5 Air and Noise Environment**

The pollutants concentration in the air is well below the permissible limit, the maximum concentration of PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub> and SO<sub>2</sub> was 52.0µg/m<sup>3</sup>, 25.0µg/m<sup>3</sup>, 9.8µg/m<sup>3</sup> and 6.3µg/m<sup>3</sup> respectively. There are no industries in the area and the density of vehicular traffic is not alarming. The noise monitoring shows day and night time noise levels are higher at dam site and near power house site due to flow of river. The noise levels for the rest of stations are within the prescribed limits.

**5.6 Water Environment**

The pH values of all analyzed samples ranged between 7.52 – 7.66 and are within the acceptable limit (6.5-8.5). Total hardness levels ranged from 8 to 20 mg/l and were well below the acceptable limit of 200 mg/l. The dissolved oxygen values ranged between 7.0-8.0 mg/l and were within the acceptable limit of 6mg/l. Chlorides level in surface water samples ranged from 4 -7 mg/l and were within the acceptable limit of 250 mg/l. The sulphates level ranged from 0.2 to 1.2 mg/l and were within the acceptable limit of 200 mg/l. The nitrate was not detected in any of samples. The concentration of various heavy metals was below the detectable limits, indicating the suitability of water for meeting domestic requirements. The BOD values ranged between 1.0 to 1.6mg/l and were within the CPCB criteria of less than 2mg/l for Class A water. The Total Coliform level were less than 50 MPN/100ml, the limits specified for Class A water under CPCB Water Quality Criteria for designated best use. The water is suitable for meeting drinking water requirements after conventional treatment and disinfection. All physical and general parameters for ground water were observed within the desirable limit as per IS10500:2012 (Second Revision).

**5.7 Status of Biological Environment**

***Flora of the Project Area***

- During Primary survey, 203 species of the flora comprising of 74 trees, 70 shrubs, 40 herbs and 19 climbers were found.
- 16 economically important plant species were recorded from the study area.
- 57 important medicinal/ethnobotanical importance plant species were recorded.
- 8 RET species falling under IUCN Red List was recorded/reported from study area.

***Fauna of the Project Area***

- 28 mammalian species were recorded /reported during the survey of which one belongs to Schedule-1 of WPA, 1972.
- 97 bird species were observed /reported during the survey.

- As many as 16 species of herpetofauna were recorded /reported of which four belong to Schedule-1 of WPA, 1972.
- 28 species of butterflies were recorded/reported
- 16 species of fish were recorded/reported

## **5.8 Social and Cultural Background of The Area**

### **Demography of Project Affected Villages**

As per the Census of India 2011, the total population of the project affected villages comprising of 1338 households' aggregates to 7946 of which male and female population is 4076 and 3870 respectively. The overall sex ratio is 950 females per thousand males. The Literate male and female in the study are 1655 and 2122 which implies that the literacy rate is 62.62%. The main workers are 2846 (35.82%) and marginal workers are 676(8.50%) respectively of the total workers population. The village-wise details of project affected families and assets to be acquired is shown in **Table-1**

**Table -1: Village Wise Details of Land**

<b>S. No.</b>	<b>Name of Village</b>	<b>No. of PAF</b>	<b>Arable Land (ha)</b>	<b>Non-arable Land (ha)</b>	<b>Total Land (ha)</b>
1	Moosakhia	37	16.51	13.34	29.85
2	Samanong	27	10.85	34.79	45.64
3	Sohmynting	20	14.85	3.25	18.1
4	Ksanrangi	32	8.62	4.69	13.31
5	Mawdulop	40	4.94	3.28	8.22
6	Mawjatap	8	4.98	1.97	6.95
7	Mawlang	22	5.59	4.56	10.15
8	Mawsir	38	13.51	21.3	34.81
9	Syntung	38	25.2	16.5	41.7
10	Jatah Nonglyer	23	3.84	1.74	5.58
11	Pashang	28	9.23	4.5	13.73
12	Siangkhnai	35	23.45	29.04	52.49
13	Umsawwar	30	10.86	5.58	16.44
<b>Total</b>		<b>378</b>	<b>152.43</b>	<b>144.54</b>	<b>296.97</b>

## **6.0 Identification, Prediction and Evaluation of Impacts**

### **6.1 Impacts on the Micro-Climate of the Area**

Due to construction activities, there shall be temporary and nominal effect on the ambient temperature and humidity. The operation stage project may not create any impact on the meteorology and climatology of the area. Due to submergence, the increase in water surface area due to creation of reservoir will result in increased evapo-transpiration and humidity.

### **6.2 Change in Land use / Land Cover**

- The land use class of 253.75 ha involved in submergence shall change into waterbody. The change shall be permanent and irreversible.
- The land use class of forest land required for project components shall have land use class changed to built-up area.

- The land use class of forest land required for project components and internal roads shall have land use class changed to built-up area.
- The land use class of forest land required for quarry sites shall remain unchanged as the quarry sites shall later on developed with vegetal cover.
- The land use class forest in respect of forestland required for underground components will not cause any change in the present land use.

**6.3 Soil Erosion and Siltation**

Soil erosion due to excavation of different components of the project, construction of roads will accelerate soil erosion. Soil erosion due to project activities will not exist in the operation phase as the construction would be completed and landscape restoration work would also be implemented.

**6.4 Impact on Geology**

The intensity of anticipated environmental impact on geology of the area will be weak and extent of anticipated impact will be local. No impact is anticipated on the geology of the area during the operation phase.

**6.5 Impact on Hydrology**

Since, the quantity of the water abstracted from the river for non-consumptive use of power generation is again returned from tail race to the system without any consumption, there shall not be any remarkable change in hydrological cycle in context to the project absolutely.

**6.6 Environmental Degradation due to Labour Immigration**

During the construction phase congregation of approximately 1000 workers is likely to take place in the project area, which will increase pressure on land and water resource. Conflict between the migrants and the local population may occur for employment. Labour engaged in construction activity will also move away once the project work is completed; therefore, no additional impact is expected.

**6.7 Impacts on Air Environment**

Temporary changes in air quality during construction phase are expected due to emission of hydrocarbons from vehicles and gases from blasting operations. Inside dam complex excavation area, the maximum GLC of pollutants PM<sub>10</sub>, PM<sub>2.5</sub>, NO<sub>x</sub> and SO<sub>2</sub> was found to be 17.85 µg/m<sup>3</sup>, 1.55 µg/m<sup>3</sup>, 9.52 µg/m<sup>3</sup> and 1.19 µg/m<sup>3</sup> respectively.

Due to increased transportation during construction phase at 25 m, predicted concentration for PM<sub>10</sub> is 11.6 µg/m<sup>3</sup> which reduces to 7.3 µg/m<sup>3</sup>, 3.2 µg/m<sup>3</sup> and 1.3 µg/m<sup>3</sup> at 50m, 150m and 500m respectively. Thus, the impact on the pollutant level (PM<sub>10</sub>) due to increased traffic due to transportation of material shall be minimal. The increased GLC in respect of NO<sub>x</sub> were insignificant being 0.13 µg/m<sup>3</sup> up to 25m and 0.11 µg/m<sup>3</sup> up to 50m and 0.10 µg/m<sup>3</sup> up to 1km.

**6.8 Impacts on Noise Environment**

Temporary increase in noise levels is expected during construction phase only. The maximum noise level of 71 dB(A) gets attenuated to 45 dB(A), 39 dB(A) and 33 dB(A) about 300m, 600m and 1200 m respectively from the point source (Dam site).

**6.9 Impacts due to Ground Vibration and Air-overpressures**

Due to blasting, the resulting PPV shall be 0.67 mm/sec and 0.53 mm/sec at Siangkhnai and Moosakhia village which shall be considerably lower than the limiting values 5.0 mm/sec for excitation frequency less than 8 Hz, in case of temporary structures. Predicted air over

pressure due to blasting at Siangkhnai and Moosakhai shall be 105.2 dB(A) and 103.3 dB(A) respectively.

**6.10 Impacts on Water Environment**

During the construction phase, the river water is supposed to catch considerable amount of sediment from the surface and underground works for which the water coming out from such area will be dislodged of sediment in the silt trapping tanks before being released to river. The discharge coming out of batching and crushing plants would also bring considerable sediments in water due to washing of plants and aggregate material.

In the operation phase for downstream usages of river course will have a minimum environmental flow of 0.37 cumec released downstream of dam site for downstream riparian use of d/s 20 km length, during lean months (January-April). During non-monsoon and monsoon season the ecological flow requirement of 3.43 cumec and 10.33 cumec respectively shall be released d/s of dam.

**6.11 Impacts on Flora**

It is evident from the study that from the submergence and influence zone of the proposed project none of tree species, shrub, herb or any climber or grass species are either vulnerable or endangered. Interestingly the vegetation composition of the submergence zone is also widely distributed in the influence zone in abundance and there will be no significant loss to the habitat. However, any loss of riverine vegetation during the project activity period will be restored in the reservoir periphery in due course of time.

The floral abundance of the project area in post construction phase will increase by many folds as the plantation under catchment area treatment, reservoir rim treatment, green belt, restoration and landscaping will be completed.

**6.12 Impacts on Fauna**

As the project activity is not going to submerge all the major habitats, there is little concern for these niche birds. There will be no alteration to the existing habitat of endangered and threatened species. There is also no wildlife sanctuary, national park and biosphere reserve near the project area. As the project is having its submergence mostly along the river valley, the project is not likely to be a threat to any of the recorded butterfly species. Increase in temporary stress levels of wildlife during construction phase due to noise, human interference and reduction in present habitat. Threat due to poaching might increase. Due to reservoir creation, there will be improvement in the habitat for mainly water birds, reptiles, mammals, amphibians and plankton and Improvement in food chain of some reptiles, birds and carnivorous mammals due to creation of reservoir and increase in humidity level. The butterfly diversity in the area would be enhanced, as scrub habitat around the submergence will receive substantial amount of moisture, which will help in natural regeneration of forest canopy. The construction of project shall have impact on the fisheries as their movement from downstream to upstream of dam shall be impacted.

**6.13 Summary of Positive and Negative Impacts**

**The positive impacts are:**

- Additional annual generation of 708.98 MU of energy in a 90 % dependable year
- Employment opportunities and benefits to economy and commerce.
- Access to improved infrastructure facilities.
- Recreation and tourism potential.

- Improvement in environment through implementation of CAT, Compensatory Afforestation, Green belt Development and different other plans.

**The negative impacts are:**

- The change of river status from riverine to lacustrine regime
- Land of 13 Villages shall be partially affected due to acquisition of land for project purpose.
- 378 families shall be impacted due to land acquisition.
- The loss of agriculture land (152.43 ha) and agriculture produce.
- The loss of forest due to construction of dam, reservoir and appurtenant works
- Disturbance to the fauna of the study area during construction
- Pressure on the existing provincial / state road will increase.

## **PART-II**

### **ENVIRONMENT MANAGEMENT PLAN**

#### **1. CATCHMENT AREA TREATMENT PLAN**

A well designed Catchment Area Treatment (CAT) Plan is essential to ameliorate the above mentioned adverse impacts of soil erosion. In a hilly catchment area, erosion due to water is a common phenomenon and the same has been studied as a part of the Catchment Area Treatment (CAT) Plan. The cost to be encountered under this Plan will be Rs. 2917 lakh. Soil erosion in hilly regions is mostly due to rains and further propagated by runoff from hilly slopes.

The total annual rainfall in the Umngot HEP catchment area varied between 2890 to 4904 mm during the years 1991-92 to 2005-2006. Hence soil erosion in this area will be very high.

The catchment Area Treatment (CAT) Plan highlights the management techniques to control erosion in the catchment area of HE project. The catchment area treatment involves understanding of the erosion characteristics of the terrain and suggesting remedial measures to reduce the erosion rate. In the present study 'Silt Yield Index' (SYI) method has been used. In this method, the terrain is sub-divided into various small sub-watersheds and the erodibility is determined on relative basis. SYI's provide comparative erodibility criteria of catchment (low, moderate, high, etc.)

**The activities to be undertaken under this Plan are:**

1. Afforestation Program
2. Enrichment Plantation
3. Civil Engineering measures under Soil and Water Conservation measures
4. Control of Shifting Cultivation
5. Crop Management
6. Silvi-pasture Plantation
7. Medicinal Plantation
8. Training Programs
9. Others

#### **2. COMPENSATORY AFFORESTATION**

It is proposed to raise compensatory afforestation in an area of 93.53 ha in lieu of submergence of dense forest (12.91 ha) and open forest (80.62 ha). The cost of afforestation would be borne by the project proponents at the cost of Rs. 2308 lakhs. Compensatory afforestation will be under taken in degraded open forest lands. Twin objective of this proposal of compensatory afforestation would fulfill largely the goal of compensating the loss of forest area going under submergence. Besides, these plantation sites would also fulfill the need based causes of treating the catchment area of the reservoir in preventing silting of the reservoir and soil runoff as the plantation sites are proposed in the catchment Zone. The diverted land of 93.53 Ha would be handed over to the State Forest Department.

#### **3. WILDLIFE AND BIO-DIVERSITY MANAGEMENT PLAN**

As per the primary survey no RET species were recorded. However, as per secondary data records 8 RET species have been reported from the Khasi and Jaintia Hills. A Wildlife and Bio-diversity Management Plan has been formulated that intends to preserve the Rare, endangered and Threatened species. For this plan, the projected cost would be Rs. 100 lakhs for its implementation.

#### **4. RESETTLEMENT AND REHABILITATION PLAN**

The total land required to be acquired for the construction of Umngot HEP includes the area to be submerged from the construction of a dam, area for construction of Power House and colonies, and other appurtenances like intake, tunnel, surge shaft, roads, etc. For this, a total area of 296.97 Ha of private land is needed. The rates of land in the project area has been provided by the Deputy Commissioner of East Khasi Hills District and West Jaintia Hills District. The total cost for acquisition of private land R&R entitlement and Tribal Plan is Rs. 30417 lakhs. The acquisition of the land shall be in consonance with “The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013”, (RFCTLARRA 2013) which has come into force from 1-1-2014, notified by Government of India. The provision/procedure under “Meghalaya Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Rules, 2017” shall also be followed.

#### **5. GREEN BELT DEVELOPMENT PLAN**

The Green belt helps in maintaining ecological balance of the nature. A “Green Belt Development Plan” by using the local species has been proposed around the project area, colonies and the project roads. Planting stocks are readily available from the Social Forest Department as well as from the local private nurseries. All plants are locally adapted. The provision of land for this plan is 30 Ha. The cost for implementing the Green Belt Development Plan would be Rs 76 lakhs.

#### **6. RESERVIOR RIM TREATMENT PLAN**

Detailed investigations were carried out along the periphery of proposed reservoir along river in order to delineate the active as well as potential landslide zones. The study reveals that there are no active or dormant landslide/landslip zones along the periphery of the reservoir extending in the river. Though no active slide zone exists in the reservoir area which has the exposed rocks on either bank of river, yet the fluctuation of the reservoir can trigger landslides in this portion for which mitigative measures are suggested. The cost envisaged for the implementation of this Plan is Rs. 85 lakhs.

#### **7. FISHERIES MANAGEMENT PLAN**

The plan includes provisions for Training of Fisherman Cooperative Societies, Stocking and Selection of Species Seed Requirement, Infrastructure facilities like providing Fishing Nets, Fishing Boats, etc. Total cost of Fisheries Development for works out to be Rs 192 lakh. This will help increase the fish population in the area.

#### **8. MUCK MANAGEMENT PLAN**

For construction of different components of Umngot HEP, open excavation for foundation of dam, coffer bunds, intake and surface power house besides substantial underground excavation in over burden and rock for diversion tunnel, headrace tunnel, adit, surge shaft would be required. The excavation shall result in large quantity of excavated material i.e. muck which shall have to be evacuated, disposed of and roller compacted or laid on mild slopes *pari-passu* with the excavation work, to such designated areas where the muck piles do not substantially interfere with either environment / ecology or the river flow regime and cause turbidity impairing the quality of water.

The muck which is suitable for use as aggregate material for concrete on non-wearing surface, backfill concrete and for widening of the road shall be properly stacked. The muck unsuitable for use

in concrete etc. shall be dumped on slopes and treated to mix and match with the surrounding environment with least change in landscape. Total cost of Muck Management Plan for works out to be Rs 912 lakhs which includes construction of retaining structures, crate walls and gabions as well as plantations for restoration of the disposal site. 4 muck disposal sites have been identified for this purpose.

## **9. RESTORATION PLAN FOR QUARRY SITES AND LANDSCAPING**

Part of the stone material required for the construction of the dam will be met with from the muck generated during exploration of foundations, tunnel excavations etc. Stone quarries have been identified near the Umngot river. Sand is proposed to be transported from sand quarries at Umiew river in East Khasi Hills District and from Kharkhana in West Jaintia hills district. These quarries will be restored with plantations. Total cost of restoration of quarry sites for works out to be Rs 60 lakhs.

## **10. DISASTER MANAGEMENT PLAN**

A disaster is an unwarranted, untoward and emergent situation that culminates into heavy toll of life and property and is a calamity sometimes caused by “force majeure” and also by human error and lack of disaster prediction. This Disaster Management Plan lays out the different aspects to mitigating disaster and risks like flood forecasting, Emergency Action Plan, evacuation plan, fire detection and protection system, portable fire extinguishers, communication facilities, emergency power supply, emergency safety equipment, emergency alarms as well as training programs. Total cost of Disaster Management works out to be Rs 75 lakhs.

## **11. WATER, AIR AND NOISE MANAGEMENT PLAN**

During the construction of the project, a lot of activities taking place in dam site, tunnel, power house, as well as in colonies area which creates water, air and noise pollution. It is essential to control this to prevent hazards in the project area as well as nearby villages. Several measures have been proposed to be taken up to control the impacts. Total cost of water, air and noise management plan works out to be Rs 62 lakhs.

## **12. PUBLIC HEALTH MANAGEMENT PLAN**

During the construction of project, various measures have been planned to promote public health like setting up of dispensary near the project site, distribution of medicines and first aid kits to the labour and villages within a 6 year period. There will also be health camps and vaccination drives as well as routine disinfection of vector breeding sites. Total cost of public health management plan works out to be Rs 334 lakhs.

### **13. LABOUR MANAGEMENT PLAN**

Generally, the workers come from the rural areas and agricultural background and do not have adequate training in construction safety and some time workers from varied trades are drawn into construction activities. Thus, workers are exposed to various risks and occupational diseases and health hazards which sometimes cause grave injuries and prolong illness. Hence, the project authority has developed a Labour Management Plan to overlook the overall wellbeing of the labourers. The project authority will ensure proper licenses for the labourers and contractors as per Government guidelines. Total cost of public health management plan works out to be Rs 55 lakhs.

### **14. SANITATION AND SOLID WASTE MANAGEMENT PLAN**

During the construction phase of the project, there will be an influx of technical staff, laborers and other service providers into the project area. Sewage and solid waste will be generated from the colonies. It is very essential that from the planning stage, sewerage management and solid waste disposal facilities should be conceptualized to maintain the health of the people and the environment. The sewage generated from the labour camps will be subjected to treatment in septic tanks. Septic tanks shall be located so as not to pollute drinking water. Distribution of dustbins as well as appointment of waste collectors and construction of public latrines will be implemented. Total cost of sanitation and solid waste management plan works out to be Rs 232 lakhs.

### **15. LOCAL AREA DEVELOPMENT PLAN**

The Minister of Environment and Climate Change (MOEF&CC), New Delhi, vide OM dated May 01,2018 and OM dated 22.6.2018, has made it mandatory for project proponent of Greenfield as well as Brown field projects, except for such projects where there is no increase in air pollution load, R&R element etc., to undertake CER initiative in project affected areas. The following activities are to be taken up under this plan:

- Human Resource Development such as Training Courses, Tailoring, Knitting& Embroidery Training Center, Computer Courses, Income Generating Activities/Projects, Vocational Training
- Infrastructure Development and Public Utilities such as Community Centers, Hospital Facilities, Sports and other activities, Setting up of Recreation Facilities, Assistance to Schools, Development of concrete paths from Village to Road heads & drainage system, Community Toilets, Enhancing Medicare in Govt. hospitals, etc.
- Social services such as Widow Grant, Assistance to Physically Handicap, Assistance for female marriages, Medical Camps, Assistance to Critically ill.

Total cost of Local Area Development plan works out to be Rs 1284 lakhs.

## **16. ENVIRONMENTAL SAFEGUARDS DURING CONSTRUCTION ACTIVITIES**

During construction phase, construction activities can enhance soil erosion as well as increase particulate matter in the air which can impact human health as well as the environment. To mitigate these impacts, proper drainage will be provided along with plantations/grass turfing along road side. To reduce air pollution arising from particulate matter sprinkling of water along the road construction activities will be taken up. Total cost of environmental safeguards during construction works out to be Rs 150 lakhs.

## **17. ENERGY CONSERVATION MEASURES**

To eliminate dependency on firewood for domestic use, the project authorities will ensure the use of LPG gas, kerosene, electricity as well as solar power as an alternative to energy consumption. CFL/LED bulbs will also be provided at to the workers at lower cost. Total cost of energy conservation measures works out to be Rs 62 lakhs.

## **18. ENVIRONMENTAL MONITORING PLAN**

Monitoring of all the impacts on water, air and noise and their mitigation measures detailed in the Plans above will be taken up during construction phase as well as post-construction phase (operation phase). A Monitoring Committee will be set up to monitor all the plans laid out above. Total cost of environmental monitoring plan works out to be Rs 60 lakhs.

The cost of the management plans is shown in **Table -2**.

**Table -2: Summary of Total Cost Estimate of EMP**

<b>S. No.</b>	<b>Plans</b>	<b>Cost (Rs. Lakh)</b>
1.	Catchment Area Treatment Plan	2917.00
2.	Compensatory Afforestation Scheme	2308.00
3.	Wildlife and Bio-diversity Management plan	100.00
4.	Resettlement & Rehabilitation Plan	30417.00
5.	Green Belt Development Plan	76.00
6.	Reservoir Rim Treatment Plan	85.00
7.	Fisheries Management Plan	192.00
8.	Muck Management Plan	912.00
9.	Restoration Plan for Quarry Sites and Landscaping	78.00
10.	Disaster Management Plan	75.00
11.	Water, Air and Noise Management Plan	62.00
12.	Public Health Delivery Plan	334.00
13.	Labour Management Plan	55.00
14.	Sanitation and Solid Waste Management Plan	232.00
15.	Local Area Development Plan	1284.00
16.	Environmental Safeguards During Construction Activities	150.00
17.	Energy Conservation Measures	62.00
18.	Environmental Monitoring Plan	60.00
<b>Grand Total</b>		<b>39399.00</b>