

ENVIRONMENTAL IMPACT ASSESSMENT
FOR
FOR THE PROPOSED 540 MW (4X135 MW) COAL BASED
THERMAL POWER PLANT AT BHENGARI VILLAGE,
GHARGHORA TEHSIL, DISTRICT RAIGARH, CHHATTISGARH

EXECUTIVE SUMMARY

Sponsor :

Mahavir Global Coal Limited
Gharghora Tehsil, Raigarh District, Chhattisgarh

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1.0 INTRODUCTION

Mahavir Global Coal Limited (MGCL) proposes to establish a greenfield 540 MW (4X135 MW) power plant at Bhengari village, Gharghora tehsil of Raigarh district, Chhattisgarh state.

The estimated cost of the project is Rs. 2074.457 Crores, including Rs. 80.5 Crores for environmental protection measures.

The total land requirement for the project is 205 ha. The land acquisition for the proposed project is underway and some portion of the land has already been acquired for the proposed project. The project will comprise four pulverised coal fired boilers and each boiler will be generating 135 MW of power. The coal will be brought from the South Eastern Coal Fields Limited, up to nearest railway sliding, and then to site by road. The fresh water requirement of the proposed power project will be met from Mahanadi and Mand rivers.

1.1 Location of the Project

The project is located near Bhengari village of Gharghora tehsil, Raigarh district, Chhattisgarh. The environmental setting of the proposed plant site is given in **Table-1**.

TABLE-1
ENVIRONMENTAL SETTING OF THE SITE

Sr. No.	Description	Details
1	Location	Bhengari Village, Gharghora Tehsil, Raigarh District, Chhattisgarh
2	Latitude Range	22° 08' 12" to 22° 08' 47.3" N
3	Longitude Range	83° 14' 18.3" to 83° 14' 58" E
4	Elevation at site in a MSL	299-m
5	Present land use at the site	Unirrigated single crop agriculture land
6	Ash pond area	Within project site
7	Nearest IMD	Raigarh
8	Site specific meteorological data (Monitored)	
A	Maximum temperature	41.5 °C
B	Minimum temperature	20.3 °C
C	Relative Humidity	22.3 to 42.0 %
D	Predominant Wind direction	North East
E	Average windspeed	1.7 m/s (6.1 kmph)
9	Nearest habitation	Bhengari Village, 1-km,E
10	Nearest town/City	Gharghora Town, 11.2-KM NE
11	Nearest highway	State Highway-1, 9.4-km, ESE
12	Nearest railway station	Robertson Railway Station, 16.8-km, SSW
13	Nearest airport	Raipur, 250-km, SW
14	Topography	Plain Land with gentle slope towards south and southwest.
15	Archaeologically important places	None within 25-km radius of the proposed plant site
16	Protected area as per Wildlife Protection Act,1972	None within 25-km radius of the proposed plant site



Sr. No.	Description	Details
	(Biospheres, Tiger reserves, Elephant reserves, National parks, Wildlife sanctuaries, Conservation reserves and community reserves)	
17	Reserved / Protected Forest	Suhai RF (1.0-km, S); Lamikhair RF (2.0-km, NW); Chhindpani PF (2.2-km, NE); Dhumapahari RF (3.0-km, W); Katangi PF (3.1-km, NE); Marpahar RF (3.8-km, NNE); Lotan RF(4.7-km, SW); Nawagarh PF (5.4-km, NNE); Bojia RF (5.6-km, NW); Rabo RF (6.6-km, S); Samaruma RF (7.7-km, ESE); Kurket PF (8.1-km, NE); Taraimal RF (9.0-km, SE); Pochpedi RF (10.9-km, NW); Rabo Dongri RF (11.5-km, NNE); and Garabahari RF (11.5-km, WNW)
18	Seismicity	Zone-III as per IS 1893 (Part 1) 2002.
19	Water source	About 2232 m ³ /hr water will be sourced from Mahanadi and Mand Rivers
20	Rivers/Streams	Kunket River-3.8-km, ESE Rabo Dam- 5-km Mand River- 13.6-km, SSW Mahanadhi River- 60-km
21	List of Industries	Sponge Iron Plant at 6-km in NE direction
22	Rehabilitation and resettlement	Rehabilitation and resettlement will be addressed as per Chhattisgarh State R& R policy –2005

The 10-km radius study area of the project site is given in **Figure-1**.

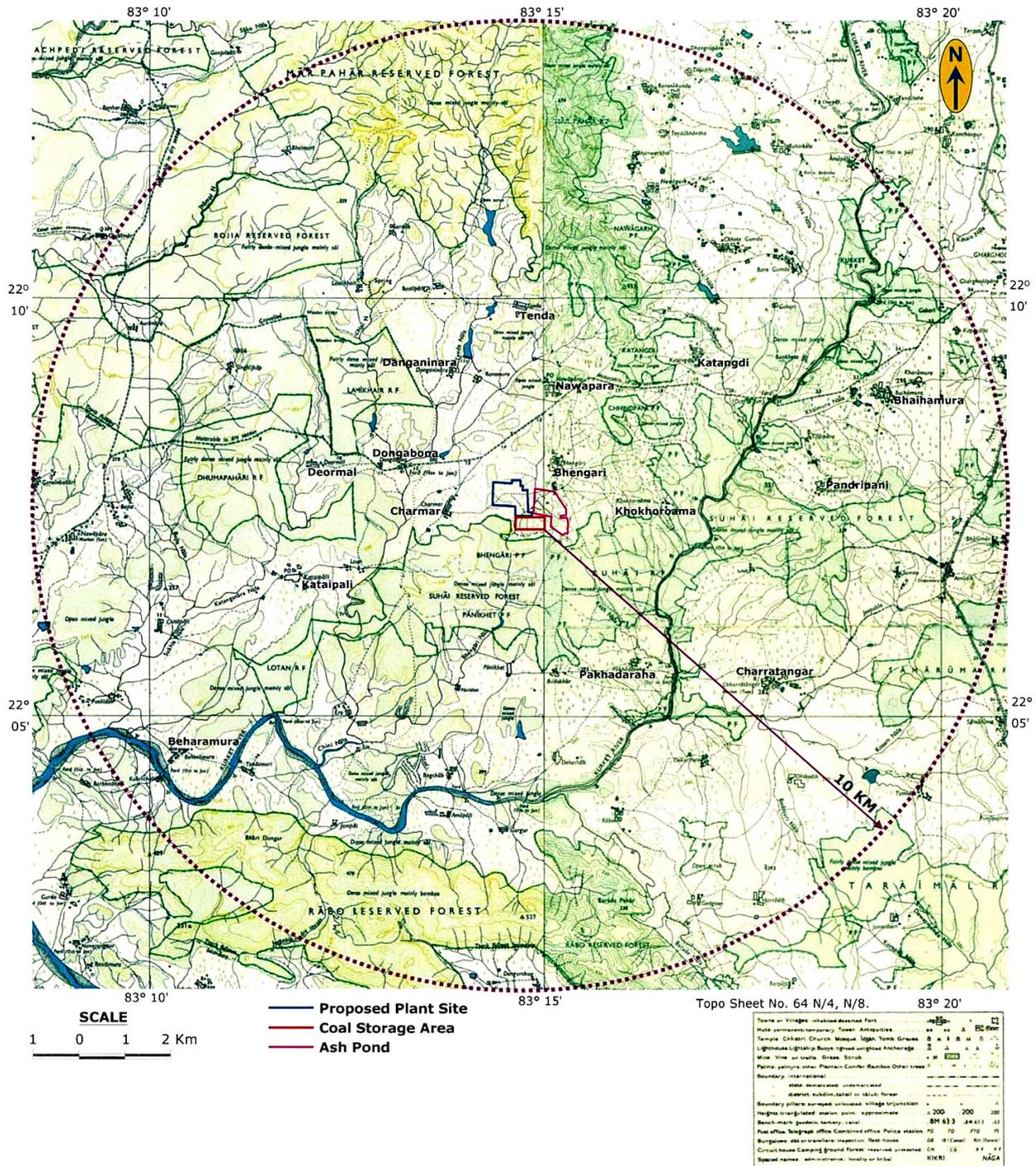


FIGURE-1
10-KM RADIUS STUDY AREA OF THE PROJECT SITE

2.0 **PROJECT DESCRIPTION**

The size of the project is 540 MW (4x135 MW) and will operate at 85% PLF capacity by using Indian Coal Grade-F as raw material.

The details of proposed power plant are presented below in **Table-3**.

TABLE-3
DETAILS OF PROPOSED POWER PLANT

Sr. No.	Features	Details
1	Capacity	540 MW
2	Configuration	4 x 135 MW
3	Type of Boilers	Pulverized Coal fired Boilers
4	Boiler Capacity	440 TPH
5	Power Evacuation	The power will be evacuated from the plant at 132 KV level fed into the grid for use in the State and export to other power deficient regions
6	Type of Fuel and Source	Coal from SECL by rail upto the nearest railway siding, and then to site by road
7	Coal Requirement	3.35 MTPA (85% PLF)
8	Sulphur Content	0.4%
9	Ash Content in Indian coal (SECL-Grade-F)	45%
10	Ash Generation	1.51 MTPA
A	Bottom Ash	0.30 MTPA
B	Fly Ash	1.21 MTPA
11	ESP Efficiency	99.8%
12	Stack	Two twin flue stacks of 220-m height
13	Water Requirement	2232 m ³ /hr (0.62 Cumecs) Water will be sourced from Mahanadi and Mand rivers

3.0 **DESCRIPTION OF ENVIRONMENT**

The 10-km radial distance from the proposed plant boundary has been considered as study area for Environmental Impact Assessment (EIA) baseline studies. Environmental monitoring for various attributes like meteorology, ambient air quality, surface and ground water quality, soil characteristics, noise levels and flora & fauna have been conducted at specified locations. The field studies were conducted from March, 2008 to May, 2008 representing pre-monsoon season.

3.1 **Land Use Studies**

The land use pattern of the study area has been studied by land use records of Census of India – 2001 as well as remote sensing satellite imagery. It is observed that the cultivated land (both irrigated and un-irrigated) is the predominant land use (51.4%) of the 10-km radius area, followed by culturable waste land (19.8%) and forest land (19.2%).



3.2 Soil Quality

The soil samples were tested at six locations during the study period. It has been observed that the pH of the soil ranged from 7.4 – 7.9 indicating that the soils are slightly alkaline to moderately alkaline in nature. The soil in the study area is predominantly of sandy clay type. The soil from the study area shows moderate fertility.

3.3 Meteorology

The maximum and minimum temperatures recorded during the study period are 41.9°C and 20.3°C. The relative humidity found varying from 22.3% to 42%. Predominant winds from NE direction were observed for 27.6% of the total time.

3.4 Ambient Air Quality

To establish the baseline status of the ambient air quality in the study area, the air quality was monitored at nine locations during the study period. The TSPM and RPM is observed to vary from 85-131 $\mu\text{g}/\text{m}^3$ and 26-45 $\mu\text{g}/\text{m}^3$ respectively. Sulphur dioxide values ranged between 5.0 to 7.8 $\mu\text{g}/\text{m}^3$ and oxides of Nitrogen values ranged between 6.0 to 7.8 $\mu\text{g}/\text{m}^3$. SO_2 , NO_x as well as CO concentrations are found to be well below the CPCB standards for rural and residential areas.

3.5 Water Quality

The surface water quality was monitored at two locations in the study area. The analysis results indicate that the pH ranges from 7.7 – 7.8 and TDS fall in the range of 78 - 86 mg/L. The DO values ranging from 5.3 – 5.4 mg/L are observed to be well within the permissible limits. Other parameters like Chlorides, Sulphates and Nitrates are also within the prescribed standards.

Six groundwater samples were analysed during the study period. The analysis results indicate that the pH and conductivity of the ground waters are in the range of 4.6 – 6.3 and 29 -525 $\mu\text{S}/\text{cm}$. The TDS is well within the limits ranging from 44 - 372 mg/l. Other parameters like Chlorides and Sulphates are also observed to be low and well within the prescribed limits. The physico-chemical and biological analysis revealed that all the parameters are found to be well within the prescribed limits of IS: 10500 (drinking water standards).

3.6 Ambient Noise Levels

The noise monitoring has been conducted at eight locations in the study area. The daytime (L_d) noise levels at all the monitored locations were observed to be in the range of 46.6 – 49.1 dB dB(A). The night time (L_n) noise levels at all the monitored locations were observed to be in the range of 42.0 – 44.2 dB (A). In general the noise levels are found within the acceptable levels.

3.7 Flora and Fauna Studies

There are around 6 major forest blocks which include Protected Forests (PF), Reserved Forests (RF) and open mixed forest blocks within 15-km radius from the project



boundary. 89 animal species were recorded/reported from study area during study period, out of which 6 species belongs to Sch-I, 8 species belong to Sch-II, 4 species belongs to Sch-III and rest of the species belongs to Sch-IV and Sch-V as per Wildlife Protection Act, 1972.

3.8 Demography and Socio-Economic Profile

As per 2001 census, the study area consists of a total population of 30118 persons residing in 6540 households. The configuration of male and female indicates that the males constitute to about 50.1% and females to 49.9% of the total population as per 2001 census records. About 8.3% of the population in the study area belongs to Scheduled Castes and 57.1% to Scheduled Tribes. The study area demonstrates a literacy rate of 58.2%. The number of main workers in the study area is 35.3% of the total population. The marginal workers and non-workers constitute to 15.7% and 49.1% of the total population respectively.

4.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

The environmental impacts during construction and operation phases of the proposed project have been assessed and adequate management plan has been evolved to mitigate the impacts.

4.1 Impacts during Constructional Phase and Mitigation Measures

The environmental impacts during the construction stage will be short term, temporary in nature and will be confined very close to project sites. The manpower required for these activities should preferably be employed from nearby villages.

4.1.1 Impacts on Land Environment

The construction activities on the proposed site will convert the land category into industrial land use category. Construction of plant will lead to permanent change in land use pattern at the site as a direct impact. The proposed project involves construction of large scale civil works including levelling within project premises. The earthen material generated during construction of large scale water storage reservoirs within the project premises will be used for level rising of plant area. The dust will be suppressed using water sprinkling.

4.1.2 Impact on Air Quality

The impact during construction phase will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries. The impact will, however, be reversible, marginal and temporary in nature. Proper maintenance of vehicles and construction equipment will help in controlling the gaseous emissions. Water sprinkling on roads and construction site will prevent fugitive dust. The industry will go for tree plantation programme along the boundaries of the proposed plant site.



4.1.3 Impact on Water Quality

The construction will be more related to mechanical fabrication, assembly and erection; hence the water requirements will be meager. Temporary sanitation facilities will be set-up for disposal of sanitary sewage generated by the work force through contractors. The overall impact on water environment during construction phase due to proposed project is likely to be short term and insignificant.

4.1.4 Impact on Noise Levels

Heavy construction traffic for loading and unloading, fabrication and handling of equipment and materials are likely to cause an increase in the ambient noise levels. However, the noise will be temporary and will be restricted mostly to daytime. The noise control measures during construction phase include provision of caps on the equipment and regular maintenance of the equipment.

4.1.5 Impact on Terrestrial Ecology

The initial construction works at the project site involves land clearance. During construction, vegetation may be disturbed. Greenbelt will be developed in phase-wise manner during construction to improve the aesthetic value in the area and to screen out the fugitive dust generated during construction.

The wastewater coming from heavy machinery will be treated to remove oil and grease and suspended solids in the detention tank before utilizing for greenbelt and sprinkling to suppress the dust.

4.2 **Impacts during Operational Phase and Mitigation Measures**

4.2.1 Air Environment

The impact on air quality is assessed based on the proposed coal based thermal power project. Suspended Particulate Matter (SPM), Sulphur dioxide (SO₂) and Oxides of Nitrogen (NO_x) will be the important pollutants emitting from power plant.

The maximum incremental short term 24 hourly ground level concentrations for Particulate Matter, SO₂ and NO_x likely to be encountered during pre-monsoon season are 0.8, 20.9 and 13.0 µg/m³ respectively, occurring at a distance of about 1.4 km in the SW direction. The incremental concentrations have been worked out for 100% plant load factor with 0.4% Sulphur content in coal.

The following methods of abatement will be employed for the air pollution control.

- Particulate matter will be controlled below 50 µg/Nm³ by providing efficient Electrostatic Precipitators (ESPs);
- Provision of two twin-flue 220-m high stacks for wider dispersion of gaseous emissions;
- Providing Pulverized Coal Fired boiler, which controls the NO_x emissions ;
- Dust extraction system will be provided at transfer points of conveyor system;
- Enclosed conveyor belt to prevent dust generation;
- Provision of water sprinkling system at material handling and storage yard;
- Transportation of ash by closed bulkers to potential users;



- Asphaltting of the roads within the plant area; and
- Development of greenbelt around the plant to arrest the fugitive emissions.

4.2.2 Impact on Water Resources and Water Quality

No ground water source will be tapped for meeting the water requirements during operation of power plant. The entire water requirement of the project will be met from the Mahanadi River and Mand River. No waste water will be discharged outside the plant premises. Hence, no adverse impact on water sources is envisaged.

4.2.2.1 *Wastewater Management*

Blow down from cooling towers will be the main sources of the wastewater. Besides this, domestic waste from canteen and toilets will be generated in the plant. The wastewater will be treated through Effluent Treatment Plant (ETP) and reused in fire protection; dust suppression, ash/coal handling, fly ash conditioning, ash disposal, service water and greenbelt development.

Garland drains around the ash storage site will be provided for the collection of run-off water during monsoon season.

4.2.3 Solid Waste Generation and Management

Ash is the main solid waste generated in the coal based thermal power plant. The quantity of fly ash and bottom ash generated will be 3304 TPD and 826 TPD respectively. Ash utilization Plan will be developed in line with the requirements of MoEF Notification. Ash will be supplied to potential users free of cost to the maximum possible extent and balance ash will be disposed of in ash disposal area using High Concentration Slurry Disposal (HCSD) method.

Municipal solid waste generated from employees colony, will be vermicomposed and used in greenbelt. Solid waste generated from Sewage treatment plant will be used in greenbelt.

4.2.4 Impact on Ecology

Extensive plantation comprising of pollutant resistant trees will be undertaken in the plant premises and around the plant site, which will serve not only as pollution sink but also as a noise barrier. It is expected that with the adoption of these measures, the impact due to operation of the power plant will be minimal on the terrestrial ecosystem.

4.2.5 Noise Environment

The major noise generating sources at project site are Turbine units, Cooling tower, Air compressors, Transformer, Boilers. It is seen from the simulation results that the incremental noise levels will be well within the CPCB standards.

Personal protective equipment will be provided and their proper usage will be ensured for eardrum protection of the workers. The use of damping materials for wrapping the work places like turbine halls, compressor rooms etc will be followed.



4.2.6 Socio-Economic Environment

It may be understood that the project activities in the region may create considerable beneficial impacts. Some of these impacts would be more effective for the immediate vicinity with short-term effects whereas the others would be higher order or of long term in nature.

The R&R Plan has been prepared based on the "Adarsh Punarwas Niti-2007" of Chhattisgarh State Government and National R&R Policy, 2007 and the same will be submitted as a separate document. The Plan will be implemented in consultation with the State Government.

The major benefit due to the proposed project will be in the sphere of generating temporary employment for substantial number of people. As part of the Corporate Social Responsibility, MGCL proposes to take steps in developing education, health, infrastructure development, women empowerment, sports and vocational training facilities. These will be taken as a part of social development of the neighboring villages.

5.0 **ENVIRONMENTAL MONITORING PROGRAM**

A detailed post project monitoring in respect of air, water, soil, landuse, occupational noise etc to assess the changes has been evolved covering constructional phase and regular operational phase. A network of sampling locations around the operational facilities will be established as per Chhattisgarh Environment Conservation Board/MoEF guidelines.

6.0 **RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN**

The hazard potential of oil and estimation of consequences in case of their accidental release during storage, transportation and handling has been identified and risk assessment has been carried out to quantify the extent of damage and suggest recommendations for safety improvement for the proposed facilities. Risk mitigation measures based on MCA analysis and engineering judgments are incorporated in order to improve overall system safety and mitigate the effects of major accidents.

An effective Disaster Management Plan (DMP) to mitigate the risks involved has been prepared. This plan defines the responsibilities and resources available to respond to the different types of emergencies envisaged. Training exercises will be held to ensure that all personnel are familiar with their responsibilities and that communication links are functioning effectively.

7.0 **PROJECT BENEFITS**

The proposed 4x135 MW Thermal Power Plant will result in improvement of infrastructure as well as upliftment of social structure in the area. The people residing in the nearby areas will be benefited indirectly.

The construction workers shall be taken from the study area to the extent possible. MGCL will develop necessary infrastructure like accommodation, water supply,



sewerage, medical facility etc. for catering to the needs of the project personnel and their families. Existing road shall be further strengthened by MGCL. This will be also beneficial to the locals residing in the area. Construction phase of power plant, construction of other facilities and colony involves movement of material of great magnitude.

8.0 ADMINISTRATIVE ASPECTS OF IMPLEMENTATION OF EMP

Environment Management will be headed by a senior manager and will constitute environmental engineer, scientists, chemists and supervisors. The Manager (Env) will be responsible for Environment management activities in the proposed project. The Environmental Management Cell also co-ordinate all the related activities such as collection of statistics of health of workers and population of the region, afforestation and greenbelt development.

9.0 CONCLUSIONS

The proposed power plant has certain level of marginal impacts on the local environment. However, for the betterment of the Project Affected Families (PAFs), MGCL would follow the *Adarsh Punarwas Niti-2007* of Chhattisgarh State Government and National R&R Policy, 2007. For the economic rehabilitation of the PAF, a nominated member of each PAF would be provided with employment as per eligibility criteria, in the proposed project on the basis of priorities. Training for skill upgradation for enhancing the employability will be provided.

However, development of this project has certain beneficial impact/effects in terms of bridging demand and supply gap and providing the employment opportunities that the same will create during the course of its setting up and as well as during operational phase of the project.