Environmental Impact Analysis Study of Gare Sector- III Coal Block, Mand-Raigarh Coalfield

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Abstract- One of most important of world concern demanding international communication and cooperation is that of environment. More and more people are becoming aware of the urgent need to understand the effects of man actions in and on his environment and to control these actions, so as to preserve the ecological relationships necessary for his present and future survival. The Mining industry is a boon at one hand a curse in another. Boon because we get all comforts of life by making money out of mining and curse because the atmosphere gets polluted. The pollution may be in the air, water, or land, one way is not to have any mining activity and that mean we have to go to the Stone Age and the other alternative is to fight back by analyzing the impact.

Keywords: Atmosphere, environment, ecological, impact, mining, pollution, survival

I. INTRODUCTION

Gare Sector-III Coal Block spread over villages Dholnara, Bajarmuda, Milupara, Khamariya and Karwahi in District Raigarh of Chhattisgarh state. The area of the block is 6.39 km^2 (639 Ha.).

The Gare Sector-III Coal Block, Mand Raigarh Coalfield is located in Raigarh district of the state of Chhattisgarh. The Block is a portion of Survey of India Toposheet no. 64 N/8 & 64 N/12. The block lies between latitude 22°10'26" to 22°11'02" and longitude 83°27'50" to 83°32'02".

Gare sector-III Coal Block exhibits gently undulating topography. The ground elevation in this block ranges from 378 m to 260 m. The drainage of the area is mainly controlled by the Kelo River which joins Mand River and ultimately joins Mahanadi River flowing south of the Coal Block (fig.2).

The climate of the study area is of humid and subtropical type, and is characterized by hot summer, cold winter and well distributed rainfall during the monsoon season.

The study area fall near the Isohyets 1600 mm. The annual normal rainfall of study area as considered for Raigarh district is 1639.2 mm. The monsoon rainfall is 1523.5 mm i.e. 93% where as non-monsoon rainfall is 115.7 mm i.e. 7%.

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II. GEOLOGY

The coal bearing Barakar formation is exposed over a major part. Barakars in the southern part are conformably overlain by the younger Barren measure formation and in the north Barakars abut against Barren measure and Raniganj formation along a strike fault trending in an ESE-WNW direction and heading against the prevalent dip direction i.e. south. (Fig.3).

Local Geology of the area:

Age	Formation	Lithology
Recent / Sub Recent	Soil / Alluvium	Alluvium, Soil & Sandy soil
Lower Permian	Barakar	Sandstone, and shale with coal seams

III. GEOLOGICAL RESERVES

The Geological Report indicated 10 coal seams viz., seam I to X in ascending order occurring in proposed Gare Pelma Sector III. The coal seams VI to X are in-cropping and suitable for opencast mining. The coal seams I to IV at depth, will be worked by underground method. The maximum depth of seam I is 400m. The annual rated capacity of opencast mine is presently planned for 4.0 MTPA with extractable reserve of 94.70 Mte and overall stripping ratio of 1:3.10. The underground mine target will be 1.0 MTPA. The total geological reserves are estimated as 210.20 Mte (Consisting of 141.50 Mte proved & 68.70 Mte Indicated Reserves). The corresponding Overburden has been estimated as 293.50 Mcum at an average stripping ratio of 3.10 cum/t. The grade of the coal as per the Geological Report is A to G. The weighted average quality of OCP is expected of Grade 'G' and that of UGP as 'D'.

IV. ENVIRONMENTAL SCENARIO

1. Topography

Gare pelma Sector-III coal block is generally characterized by a gently undulating topography with slope towards Kelo River in the East. However, in the area adjacent to Kelo River and in the eastern part the topography is relatively rugged. The elevation of the area varies from 377.747 m near the northern boundary in the central part, to 260 m in the eastern part near Kelo River. The northern, northwestern, central and east central parts of the

block are covered by hills and reserve forest. The remaining part is mostly covered by paddy field.

It is bounded by latitude $22^0$10'22" and 22^o 11'15"N and longitude 83^o 27'57" and 83^o 32'08" E. The block is covered under Survey of India Top sheet no. 64N/8 and 64N/12 on RF 1:50,000. The perimeter of the block is 15003 m or 15.003 Km.

2. Drainage

The drainage of the area is controlled by Kelo River which is a tributary of the Mand River. It is flowing from north to south in the property. There are also local streams/ nalas within the block that drain into Kelo River. The HFL of Kelo River in the coal block is 266.0 m above MSL.

3. Climate

The climate of this area is mainly tropical and is influenced by the conditions in Bay of Bengal. South-West monsoon season starts from May and extends up to October with an annual rainfall of 1471.6 mm, 90% of this rainfall can be observed in monsoon season. The summer is severe during May-June with temperature as high as 41.73^{o}C. A pleasant winter starts from December to January and the minimum average temperature recorded during December is 12.81^{o}C. The relative humidity varies from 27% (May) to 85 % (August).

4. Ecology

The study area has a moist and dry deciduous type of forest. The forest type is categorized under North Indian Moist Deciduous Peninsular sal Forest (3C/C2e) and Northern Tropical Dry Mixed Deciduous Forest (5B/C2) as per the Indian forest classification of Champion and Seth.

The forest is mainly of Sal type, where the soil is derived from the parent rock. Soil is invariably deep sandy loam, brownish in colour and conductive to excellent growth of Sal.

V. HYDROLOGICAL CONDITION

(a) Surface water

Kelo river is the main perennial surface water source or surface water body with in the study area; it ultimately drains into Mand river.

(b) Ground water

Study area comprise three types of hydro-geological unit.

1. The hard and compact pre-cambrian formations.
2. The consolidated and semi-consolidated Gondwana sandstones.
3. The unconsolidated alluvial sediments.

The nature and occurrence of ground water varies depending upon the hydrological characters of these hydro-geological units. The water level in shallow aquifer varies between 2.81 to 10.6 m below the ground level during pre-monsoon season and it ranges between 0.5 to 4.05 m below ground during post-monsoon season.

VI. WATER QUALITY

Ground water samples collected from 10 locations showed the result as given in Table 3.

TABLE 3
SUMMARY OF WATER TEST RESULTS

S. No.	Parameters in mg/l	Observed range, mg/l
1	pH	3.4-7.3
2	Total hardness	44-1056
3	Iron as Fe	0.14-0.62
4	Chloride as Cl	12-28
5	Dissolved as solids	70-1260
6	Calcium as Ca	8.0-209.6
7	Sulphate as So4	2.9-90.6
8	Nitrate as No3	6.7-9.5
9	Fluoride as F	0.12-0.92

The pH of surface water lies between 6.7 and 7.7, Fe between 0.24 and 0.87 mg/l and Fluorides between 0.18 and 0.21 mg/l.

The review of chemical analysis data indicates that the ground water and surface water over the study area is more or less within the permitted limit of human consumption except for Gare IV/1 mine bore well where the pH is lower than desirable limit. The mine sump water in Gare IV/1 mine has got very low pH and acidic which is much lower than even desirable limit.

VII. AMBIENT AIR QUALITY AND NOISE LEVEL

The ambient air quality was studied at 5 locations. It is found that the suspended particulate matter (SPM) varies from minimum of 89 µg/m³ to 106 µg/m³ and maximum values between 147 µg/m³ to 161 µg/m³. The concentration of SO2 varies between 6.9 µg/m³ to 9.5 µg/m³. The concentration of CO was always found below 1000 µg/m³. The noise level recorded at various locations indicates that the average 24 hours Leq lies between 47.30 and 64.60 dB (A).

VIII. ENVIRONMENTAL IMPACT ANALYSIS

Methodology

Identification of impact and assessment of environmental impact has been done through widely accepted "Modified Leopold matrix". The matrix essentially contains a no. of project activities that can cause environmental impact and a number of environmental attributes (descriptors) in a tabular form.

The impact on various environmental descriptors is described.

Impact on air quality

In an opencast mine, the common air pollutant happens to be air borne dust (SPM). The normal sources are drilling, blasting, loading, crushing and transport operations. Relevant dispersion modeling has been carried out to estimate GLC of various pollutants. The following results are obtained which is shown in Table 4.

TABLE 4
IMPACT ON AMBIENT AIR QUALITY DUE TO MINING ACTIVITIES (µg/m³)

Pollutant	Max.GLC in ambient air	Incremental anticipated GLC max. at 500m	Total resultant Concentration
SPM	141-160	22.0	163-182
SO2	6.9-8.1	5.84	12.74-13.94
NOX	8.3	11.67	19.97-20.87

Impact on water quality and resources

No impact on the surface water resources is envisaged as no surface water will be drawn. However , in view of availability of ground water at shallow level , most of water requirement is planned to be drawn from ground water (mine sump), which will have some impact on the ground water resources. The surface water quality is likely to be affected with higher load of suspended solids. No ground water pollution from dump leachates will take place as there are no chemical substances in the OB waste. The percolation of sewage waste from the pit-head area will not be allowed as the same will lead to the soak-pits through septic tank.

IX. CONCLUSION

Environmental Impact analysis is the basic tool for maintaining balance between ecology and economy. Site dependent and Site independent impact needs to be analyzed on the basis of background data and information about the site while the analysis of site independent impacts is basically the scrutiny of technological option.

The mining operation is not anticipated to cause any adverse impact on topography outside the core zone. Negative impact on land can be caused by proposed excavation and dumping, if appropriate control measures not adopted. No impact on the surface water resources is envisaged

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