Environmental Impacts & Mitigation Measures for Khursipar Iron Ore Mine

Chetna A. Kore1[1] Arif Khan[2]
[1]P.G. Student [2]Principal
[1,2]Nuva College of Engineering, Nagpur (India)

Abstract— Environment and development should be considered as mutually complementary, interdependent, and an instrument of reinforcing the quality of life. Environmental Impact Assessment (EIA) is the important aspect of overall environmental management strategy and an important tool for sustainable development. It identifies major impacts of mining and associated activities. The reasons which will affect the environment viz., impacts on flora & fauna of that area, surface drainage, and change in air, water and soil quality. While for purpose of development and economic up-liftment of people, there is need for establishment of industries and mining, but these have to be environmental friendly. Therefore, it is essential to assess the impacts of mining on different the increasing awareness among the people about ecological imbalance and environmental degradation has raised many apprehensions. The impacts on different environmental parameters due to this mining project are discussed in this paper.

Key words: Water Environment, Noise Environment, Soil Environment, Mine Waste, Air Environment and Mitigation Measures

I. INTRODUCTION

A. Water Environment

1) Baseline Status

Total water requirement for the project is 13000 L/D sourced from nearby bore well/ tube well. Breakup of the same is given here:

Sr. no	Purpose	Requirement (LD)
1	Drinking and other	1000lt
2	Dust Suppression	10000lt
3	Plantation	2000 lit
Total		13000 lit

Table 1:

Water quality: The results of the analysis of Surface water are compared with IS 2296 1982 norms. The results of the analysis of Ground are compared with 1S 10500 1991 norms.

Surface Water Samples within 10 km Radius:

- pH of the surface water samples collected was in the range between 7.72-7.86.
- Total dissolved solids in the samples were in the range between 407-488 mg/l.
- Total hardness was found to vary between 78-84 mg/l
- Chlorides concentration was found to vary between 120 -140 mg/l
- Fluoride concentration was found to vary between 0.28 – 0.37 mg/l
- Sulphates concentration was found to vary between 44 – 58 mg/l
- Heavy metal concentration in all the samples were found to be well within the limits.

Groundwater Samples within 10 km Radius:

- pH of the ground water samples collected was in the range between 7.15 – 7.65
- Total dissolved solids in the samples were in the range between 644 – 880 mg/l
- Total hardness was found to vary between 178 – 256 mg/l
- Chlorides concentration was found to vary between 250 – 288 mg/l
- Fluoride concentration was found to vary between 0.71 – 0.82 mg/l
- Sulphates concentration was found to vary between 162 – 193 mg/l
- Heavy metal concentration in all the samples were found to be well within the limits.

B. Impact on Water Environment Due To Mining

1) Impact on ground water environment

About 20 m3/day (peak demand) of water is required for the project. The entire water requirement will be met from a bore well in the core zone. The safe yield of tube wells in this region ranges from 1.5 to 3.0 lps. As such, the groundwater with drawl for the project will have little impact on water availability in the study area The general ground level is 170.14m. The water table in the buffer zone is at a depth of 50m below the general ground level and hence the workings which shall be at a maximum depth of 205m will not intersect the water table. Hence there will not be any ground water release due to mining till ultimate pit limit depth in the quarries.

Fig. 1: Ground dewatering of mine

The mining operations do not intersect any significant flowing springs and does not act as a drain to an established water table. Quality of ground water in the bore-wells in buffer zone is within the drinking water desirable standards (IS 10500). Mining and allied activities shall have

no direct or indirect impacts on these natural nalahs and streams.

2) Surface water environment

No soluble waste is generated from the mine. Storm water from mining and waste dump areas is the major source of pollution of surface water bodies with excess silt, turbid particles (colloidal matter). The mine will not seriously affect the flow of storm water, especially much of the rain water rapidly infiltrates through the rock fissures. Excess storm water require effective management plan which includes collection of storm water through garland drains and contour trenches before being discharged into natural nallahs. In the Core and Buffer zones The proposed mining operations shall not interfere with the natural nallahs and streams are present. No change of natural stream course is anticipated. The mining process does not involve any wet process and hence no waste water other than the domestic waste is generated.

C. Proposed Mitigating Measures

1) Raw water treatment

Withdraw of 20 cu.m/day of water from ground water resources for dust suppression, green belt development, drinking and sanitation is planned.

For drinking water, chlorination shall be done along with an UV and water filter for drinking.

2) Waste water

The mine as such would not produce any significant quantity of waste water on a continuous basis except nominal amount of sanitary and canteen waste water 5 cu. m/day. It is proposed to treat this water in a septic tank. The treated water would be used for greenbelt development and the sludge (removed every 3 years) used as manure for the vegetation. Silt water control: There shall not be any significant silt as there shall be very less amount of solid waste generated. During the monsoon period, run-offs from the overburden dump and top soil dump would be checked with the help of garland drains and retaining wall. The retaining walls would be made from boulders by cement pointing. In addition the overburden dump would have garland drains all around for each terrace of adequate size so that velocity is appreciably reduced to enhance the settling of the fine particulate. Contour trenches shall be dug within the core zone to assist in ground water recharge.

D. Impact On Water Environment Due To Proposed Beneficiation Plant

1) During Construction Phase

During construction, water will be required for construction activities, sprinkling on pavements for dust suppression and domestic & non domestic usages. Runoffs from the construction yards and worker's camps during monsoon may affect the quality of water bodies in the project area. Impact on water quality during the construction phase may arise due to non-point discharges of sewage from the workers camp stationed at the project site

Mitigation Measures

- The earth work (cutting and filling) will be avoided during rainy season and will be completed during the winter and summer seasons only.
- Stone pitching on the slopes and construction of concrete drains for storm water to minimize soil erosion in the area will be undertaken.
- The development of green belt in and around plant will be undertaken during the monsoon season.
- Soil binding and fast growing vegetation will be grown within the plant premises to arrest the soil erosion.
- Septic tanks followed by soak pit will be provided for constructor labour water environment during construction phase of the proposed plant will be temporary and insignificant.

II. MINE WASTE MANAGEMENT

Removal of ore from earth generates large quantities of waste such as soil, debris, overburden etc. The bigger the scale of mining, greater is the quantum of waste generation. Open cast mines generate much higher quantities of waste as compared to the underground mines producing 8 to 10 times as much waste as underground mines. However, these are variable and depend on the type of deposit and geology of the project location. All types of mineral mining generate waste materials.

A waste audit will provide information on sources and types of all wastes produced, their characteristics, generation pattern, and cost of storage, treatment and disposal.

A. Active Overburden Dump

Fig. 2: Overburden Dump of Khursipar Iron Ore mine

The waste rock generated from both opencast and underground mines varies every year and may require external dumping when opening up. In case of opencast mines progressing internal dumping may be resorted to as far as possible.

The anticipated impacts are:

- Impact of run off from overburden, topsoil,
- low-grade ore and other stockpiles on water bodies (siltation, contamination etc)
- Loss of vegetation and wildlife habitat
- Impact on surrounding agricultural land
- Impact on groundwater quality due to leachate from stockpiles, tailings dam
- Sliding of waste dumps The dumps should have the following protection measures:
- The individual dump should have maximum slope of 37o and an overall slope not exceed 28o.
- The external dump should have stretches of retaining wall at suitable locations.

- The wall should be constructed with suitable height and top surface. The wall will have weep holes to drain out water to the garland drain.
- The back-filled areas should be levelled to match with adjoining ground level.
- The completed dumps and the back-filled areas should be afforested in a planned way to increase their stability.
- Over burden in most cases are not contaminated. However, composition of the leachebility of heavy metals of over burden and low grade ore dumpsites are very important.
- Excavation of new pit should begin only after an existing pit is exhausted. This should ensure that the over burden and inter burden generated is use for back filling instead of being dumped elsewhere.

B. Overburden Dumps

Fig. 3: Overburden Dumps

- The top soil prior to drilling and blasting should be stacked at designated area surrounded by embankment to prevent erosion.
- The over burden and top soil dumps should be stabilized by plantation and ankering with coir nets / blankets.
- Phase-wise waste management should be shown on surface plan in the mine leased area for the 5th year, 10th year, 15th year 20th year, 25th year and 30th year.
- Waste generated from treatment of mine drainage, if normally designated as hazardous waste as per the relevant rules should be disposed off as landfill. Used oil should be stored properly and sold to registered reprocessor.
- The solid waste from the township should be subjected to aerobic composting or vermin composting to produce organic manure and the residues should be disposed off in landfill.
- The over burden disposal underground mines should be explored for putting it inside the void. The method of stowing should be worked out. The mine waste management should be as per the approved mine plan.

III. Soil Environment

A. Anticipated Impact

No major impact on soil of the study area is envisaged due to mining activities as there is no waste water, heavy metal, and fugitive emission shall remain confined locally within working area and emission at haul roads will be controlled by water sprinkling and plantation.

Fig. 4: Plantation done by officers of mine

B. Mitigation for Soil Environment

There is no waste water & toxic water will be generated.

IV. Noise Environment

A. Anticipated Impact

- Transportation vehicles used for the transportation of mineral are a source of noise pollution at the site.
- Loading & unloading of waste & minerals also source of noise pollution.

B. Mitigation Measures

- Periodical monitoring of ambient noise will be done as per CPCB guidelines.
- No other equipment except the transportation vehicles and excavator for loading will be allowed.
- Noise generated by these equipments shall be intermittent and does not cause much adverse impact.
- Proper maintenance of all equipments/machines will be carried out which help in reducing noise during operations.

V. Air Environment

A. Climatic conditions

During the monsoon season the wind blow mostly from directions between south-west and northwest. In the period October to February, the winds are mainly northerly to north-east in the morning and northeasterly to easterly in the afternoon.

The minimum speed of wind is observed in the month of December that is 2 Km/Hrs. and maximum speed is observed in the rains. Predominant wind direction is North-East

Average Humidity – 62% (ranging 43-83%)
Temperature – 46.0 Degrees (max) 6.0 Degrees (min)
Highest rainfall in district ranges from 1300 to 1500mm.
Average rainfall – 1200mm

B. Mitigation Measures

Measures to reduce the emissions of pollutants during mining, loading, unloading, transportation, drilling, blasting, crushing etc to maintain the air quality

As it is a small mine having capacity of 35000 TPA (117 Te per day) and ore being soft in nature, mining is carried out by manual open cast method. And if in case hard

strata is found in near future wet manual drilling will be adopted. No machinery is proposed in the working. Extent of Air pollution will be minimal. The dust emissions are likely to be confined to the mine premises only. The tractor/trucks movement will cause emission of particulate matter. However, this will be fugitive in nature and will be restricted to the proximity of the haul road only. Sprinkling of water on haul roads, waste dumps etc. are regularly done and the mine workers are provided with dust masks. Iron Ore obtained from the area is sold without beneficiation after screening and sizing.

The present air quality in the area is clean and not polluted as there is no active industry. Predominant wind direction is North-East. The machinery required does not produce any harmful effects such as noise, vibrations, pollution etc. Hence quality of air will not be affected.

Adoption scientific mining methods to reduce dust emission from point and line source

Dust generation shall be reduced by using sharp teeth of shovels;

- wet manual drilling will be adopted if hard strata is found
- Sprinkling of water, in the pit at loading faces, haul roads and on dumps, will be religiously carried out, this will help in reducing considerable dust pollution;
- Number of tankers/ trips will be increased depending upon the actual requirement.
- The treated mine water (rain water stored in the pit) and water from bore well present outside lease area can be utilized for dust suppression in and around mine areas;
- Regular maintenance of vehicles shall be carried out in order to Control emissions
- All the trucks will be covered by tarpaulin to check any spillage of iron ore
- Monitoring the quality of air will be done at regular interval.
- Workers will be provided with the dust mask during working hours.
- Health of the workers will be periodically checked as to know the health status of workers.
- Cabins for shovel and dumpers and dust masks to workmen shall be provided;
- Advantage of wind direction and meteorology should be considered while Planning, so that pollutants, which cannot be fully suppressed by engineering Technique, will be prevented from reaching the residential areas; and
- Regular cleaning and removal of spillage Iron ore if any from the roads will be done regularly;

Planned green belt development

- Dense plantation shall be carried in and around the mine lease, which would also help in combating air pollution;
- Plantation of grass on dumps is planned to temporary stabilize the dumps
- Comprehensive green belt on and around overburden dumps has to be carried out to reduce the fugitive dust emissions in order to create clean and healthy environment;

VI. Conclusion

This paper discusses the concepts of environmental impacts associated with mining methods. The project has positive impact to the local people as direct and indirect employment opportunity have been generated.

There will be no significant pollution of air, water, soil and noise. Regular monitoring of all the components of environment will be done. Increased social welfare measures taken by the company. All possible environment aspects have been adequately assessed and necessary control measures have been formulated to meet statutory requirement.

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