GEO ENVIRONMENTAL IMPACT & ITS MANAGEMENT AT OPEN CAST IRON ORE MINE

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Abstract: Mining is widely considered as having adverse effects on environment both in magnitude and diversity. Some of these effects include erosion, formation of sinkhole, biodiversity loss and contamination of groundwater by chemical from the mining process in general and open cast mining in particular. As such, a repeatable process to evaluate these effects primarily aims to diminish them.

The environmental components can be defined as public health and safety, social relationships, air and water quality, flora and fauna hence, various impacting factors from the mining activities were estimated for each environmental component.

There is an Open cast Iron Ore mine in district Bhilwara. It is located near Pur-Banera village, tehsil Mandal, district Bhilwara. The impact of this mine activities on environment and surrounding villages is hazardous but as per economical it is faithful for us.

The working mine of iron ore deposit is well knows that how to minimize the damages on environment. The mine owner doing all the management for protecting environment and for the development of the villages i.e. subsidence control, air pollution control, water pollution control, noise control, biological management, top soil management, management of area reclamation and rehabilitation, management of dumps, management of flora and fauna, and also mitigation against population growth, socio-economic benefits, funds for environment protection, and monitoring schedule.

As we all know that plantation is very helpful to reduce air and noise pollution. So that Plantation is going on simultaneously with mining activities in the surrounding areas by the mine owner like both side of the mine road, nearby villages- Suras, Dhoolkhera, Tiranga & Dhedwas etc.

The exploitation of a mineral in an unorganized manner cannot be termed mining, it is simply quarrying. The mining required systematic and organized work of exploitation of mineral and all related aspects, with proper usage of science and technology.

Keywords: Environmental Impacts and its Management at Open Cast Iron Ore Mine, Mitigation Against Population Growth, Socio-Economic Benefits, Monitoring Schedule.

I. INTRODUCTION

The effects of open cast/open-pit mining and mineral processing plants on the environment include land degradation, noise, dust, poisonous gases, pollution of water, etc. Figure 1 shows typical pathways of common pollutant transfer from a tailing dam or from a processing plant to a river if the waste management is not efficient. If there is no impermeable layer, below the deposit, the infiltration of meteoric precipitation through deposit can transfer the pollutant(s) via groundwater flow. The extraction process could itself modify the water flow and accelerate this transfer. Infiltration may also occur below a decantation basin (Charbonnier 2001).

The above activities may change the topography and vegetation, as well. From the noise and vibration point of view, drilling and blasting operations as well as application of heavy vehicles, crushers, and mills are very important (Ashtiani2005).

Blasting, haulage and transportation are the main reasons for the dust however, it may be produced in nearly all the phases of the processing plant, from the beginning point (crusher) to the end (drying of ore concentration) (Shu et al. 2001).

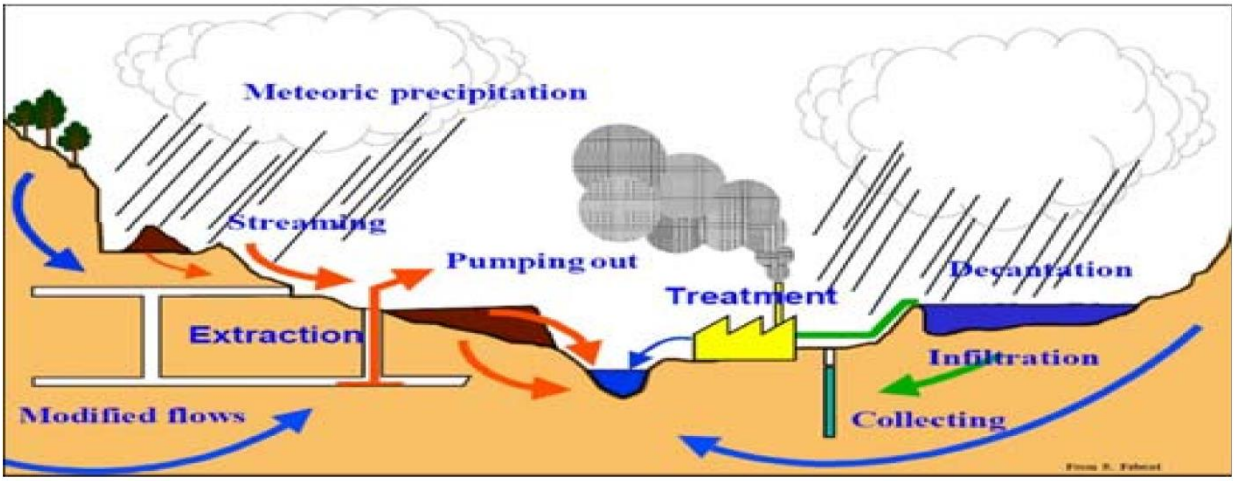

Fig- 1. Pollutant transfer (Charbonnier 2001)

Water pollution is another aspect of mine operations greatly impacting the environment if as pringhead is situated in the mine area; the pollution endangers springs existed in the area. Similarly, the contaminated water in the mining operation has vital impacts on the rivers, agriculture, fresh drinking waters and ecosystems, because of abundance of heavy metals, suspended solid particles and decreasing level of pH. Decreasing water level in the mines due to drainage not only causes undesirable changes in the nearby lakes but it can also threat the aquatics. The main reason of environment pollution of the fresh water is acidic water, draining from mines (Shu et al. 2001).

Mining operations with degradation of the land largely contribute to the corrosion of soil-a phenomenon that can be seen more in the surface mining activities (Sengupta1993).

Mine waste can be defined as part of the materials resulting from the exploration, mining and processing of substances governed by legislation on mines and quarries. It may consist of natural materials without any modification other than crushing (ordinary mining waste, unusable mineralized materials), processed to varying degrees during the ore-dressing and enrichment phases, and possibly containing chemical, inorganic and organic additives. As overburden and top soil are classified as waste (Charbonnier 2001), the characteristics of such spoil could be variable and are influenced by the minerals and process methods involved the specific environmental situation, and the type of dumping and alteration.

Mining activities will have definite impact on environment therefore remedial measures will be taken to eliminate the ill effect or minimize to the extent possible. The working mine of iron ore deposit in pur-banera belt is simultaneously protecting the environment by controlling the factors which generates pollution.

The major source of dust production in the mine is drilling, blasting and vehicle movement. Drilling is done by wet drilling method by providing water injection system and also dusts extractors which are fitted at the collar level to collect the dust. Continuous work on improving the powder factor is down to produce minimum quantity of dust. After blasting, the muck is sprayed with water so that fines become wet and will not rise during mucking.

The water used in the beneficiation plant is containing suspensions and fines of quartzite schist. This water containing tailing of the plant is discharged into tailing dam where it is allowed to settle for three to four days. Two such dams are constructed to allow charging in one for three days and draw clear water from other during above period.

The noise minimized by the proper maintenance of all machinery and plantation of trees around grinding units.

Before drilling and blasting near the surface, the top soil layer, present if any, is scrapped and stacked on a ground level and is used for plantation every year.

The area is devoid of any water body. The area is semi-arid region and as such does not support any luxuriant flora and fauna. Due to scarcity of water the wild trees are very small in height as well as in diameter. Wild animals like hare, fox and birds have to travel long distances for water and therefore their number is very limited. Mining activity has very little impact on them.

II. ENVIRONMENTAL IMPACTS – OPEN CAST IRON ORE MINING

It is recognized that minerals and metals are the mainstay of the economic development and welfare of the society. However, their exploration, excavation and mineral processing directly infringe upon and affect the other natural resources like land, water, air, flora and fauna, which are to be conserved and optimally utilized in a sustainable manner. The mineral sector in India is on the threshold of expansion with more and more open cast iron ore mines being opened-up in the state of Jharkhand, Orissa, Karnataka, Chattisgarh and Rajasthan. Under such scenario, systematic and scientific exploitation of iron ore, compatible with environment is essential for survival of our future generation.

Mining being site specific activity, excavation is bound to be done at a place where mineral actually exist. Hence, the mining process change the land uses of the area and is of no use to the mining companies once mineral is exhausted completely.

In the process, mining affects all the components of environment and the impacts are permanent/temporary, beneficial/harmful, repairable/irreparable, and reversible/irreversible. Mines especially open cast iron ore mines, due to its own peculiarities can cause disturbance in ecology, resulting in various pollution problems. The environmental problems are more significant in India, as most of the iron ore mines located on top of hills and in dense forest areas.

The environmental problems associated with the iron ore mining are diverse. The removal of vegetation, top soil, overburden/waste and ore, brings about the inevitable natural consequences, which manifest in many ways, deforestation, climatic change, erosion, air and water pollution and health hazards. Iron ore mining and processing of ore, affects the environment in myriad ways causing:

(a) Land disturbance and change in land use pattern.
(b) Affecting floral and faunal habitat.
(c) Disturbing the natural watershed and drainage pattern of the area.
(d) Disturbing the aquifer causing lowering of the water table.
(e) Air pollution due to dust and noxious fumes.
(f) Water pollution due to surface run off from different areas of mines, spoil dumps, seepages/overflow from tailings dam leads to siltation of surface water bodies and blanketing the agricultural fields.
(g) Noise and ground vibrations due to blasting.
(h) Socio-economic impacts.

The magnitude and significance of these impacts on environment and ecology due to mining will depend on the size and scale of mining activity in conjunction with the topography & climatic conditions of the area, the nature of mineral deposits, method of mining & capacity of mines, agricultural activities in the region, forest reserves etc. A line diagram showing various unit operations of iron ore mines and its associated environmental aspects is given below in Fig. 2.

(i). Impact on Land

Mining is a temporary land use of the area. Being a site-specific industry there is no choice in siting a mining project, a luxury available to most other industries. Land is required not only for the mine excavation proper and laying approach/haul roads, but also for beneficiation plant, ore handling & dispatch units, waste dumps, tailing ponds etc. Land is also required for ancillary facilities and statutory buildings (workshops, stores, offices, canteen, and creche). In addition to these, residential colony and related welfare amenities like school, hospital, shopping centre, recreation centre etc. also require land.

The major impact on the land use during the pre-mining phase is removal of vegetation and resettlement of displaced population. During mining and post-mining phases, drastic changes in land scape with landform take place. The major associated impacts are soil-erosion, loss of topsoil, creation of waste dumps and voids, disposal of wastes, deforestation etc. The impacts of iron ore mining on land are as outlined hereunder;

(a) Topography and land scenario changes due to excavation of open pits and dumping of overburden rock mass in the form of land heaps.
(b) The land-use pattern undergoes a change due to the use of the land for mining, dumping, and other mining and associated activities.
(c) The land-use in the surrounding areas may get affected due to the impacts of mining on water regime.
(d) Leachates from overburden dumps and other rock masses and polluted water from the pits affect the characteristics of the top-soil affecting the land-use.
(e) In the mines having mineral concentration/processing plants, it is required to make tailings pond to store the tailings generated from the processing plants. These tailing ponds require massive area and may cause pollution of ground and surface water bodies, if proper care is not taken.
(f) The drainage pattern of the area undergoes a change due to the alterations in the surface topography due to mining and associated activities.

It is evident from the above that the mining and associated activities can significantly change the land use and drainage pattern of the region. These changes can be minimized by careful planning the surface layout of the mining areas and by integrating the environmental aspects of each and every unit operation of mining activity. Another important aspect of the land management is the planning and design of the land reclamation programme right from the inception, including the development of the post mining land use planning for optimum utilization of land in an efficient manner and for overall improvement in environmental scenario.

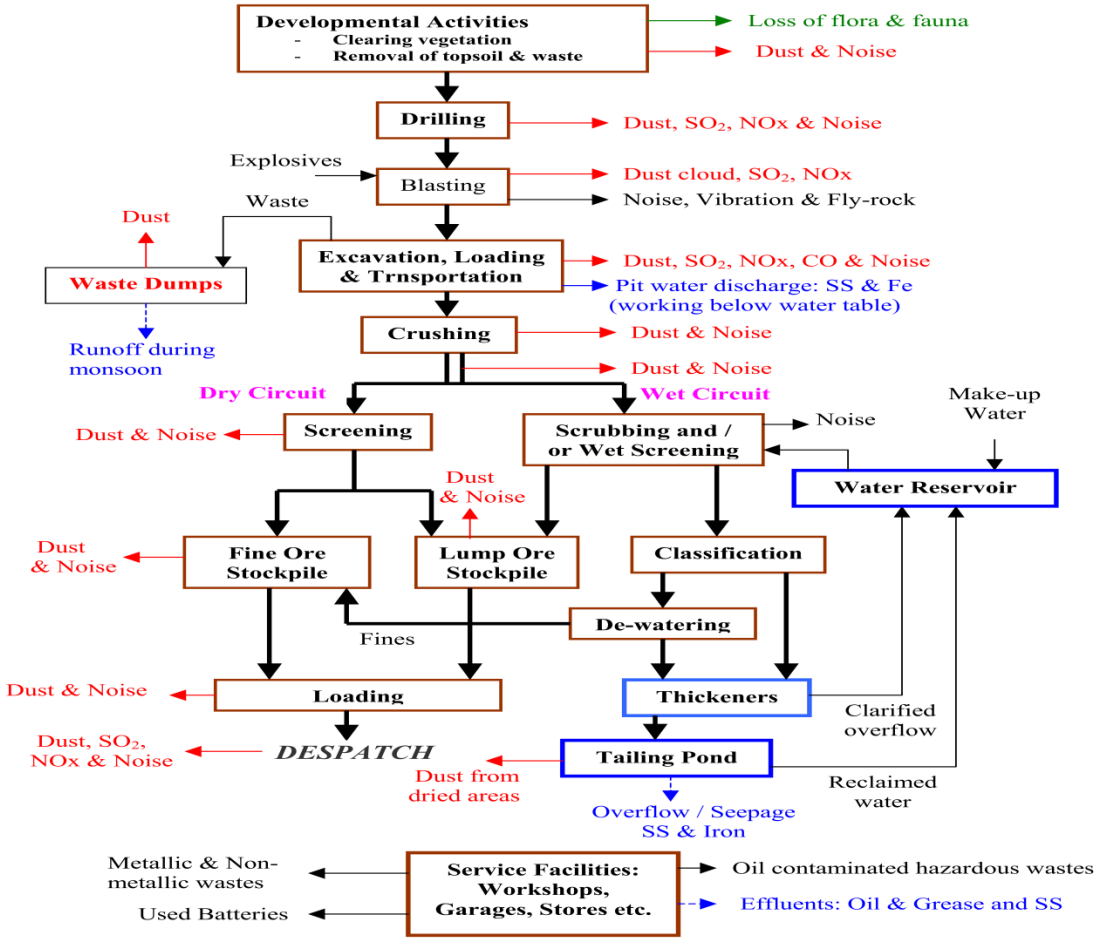

FIG-2 Environmental Aspect of Iron Ore Mines (Source: Ministry of Environment and Forests, Govt. of India)

(ii). Impact on Ecology

The mining activities like excavation, transportation and processing of ore, disposal of overburden & tailings etc., are posing various complex situations for managing the ecology. Over the years the large-scale mining operations in the forest areas, have caused substantial impact on the ecosystem like degradation of land, deforestation, displacement of wildlife, effect on aquatic co-system etc.

The major adverse impacts due to premining and mining phases are loss of habitat, biodiversity, rare flora & fauna, other aquatic life, migration of wildlife and overall disruption of the ecology of the area. Major impacts of iron ore mining on ecology are as follows;

(a) Removal of vegetation (flora) from the area required for mining and other purposes, and there by displacement of fauna.
(b) Pollution of water in the surrounding water bodies due to leaching from overburden dumps, seepage/overflow water from tailings pond and from the other activities. These affect the aquatic ecology of surrounding water bodies.
(c) Dust in the atmosphere, contributed by mining and associated activities, when deposits on the leaves of the plant in the surrounding area hampers the process of photosynthesis and retards their growth.
(d) Noise and vibrations due to blasting, movement of HEMM/vehicles and operation of fixed plants and machineries drive away the wild animals and birds from the nearby forests.
(e) Water scarcity caused due to the impacts of opencast mining on water regime affects the growth of vegetation and agricultural crops in and around the mines.
(f) Discharge of mine effluents to the nearby surface water bodies without proper treatment may affect vegetation in the surrounding area.

It is evident that mining and associated activities have considerable impacts on the ecology of the mining and surrounding areas. The ecological impacts are more severe in India as most of the iron ore mines are located in the dense forest areas and on hill tops. These impacts are evident in most of the iron mining zones in our country. By proper reclamation of mined out areas and rehabilitation of waste dumps through massive afforestation with local saplings, the ecological impacts can be minimized.

(iii). Impacts on Water Regime

Mining and associated activities have quantitative and qualitative impacts on the water regime in and around the mines. These are briefly outlined here under;

(a) All the surface water bodies have to be removed from the area designed for the mining and associated activities.

(b) All the aquifers, including the water–table aquifer, above the mineral deposit to be extracted are damaged.

(c) If there are high pressure aquifers below the mineral deposit it becomes necessary to pump the water from the aquifers to reduce the water pressure to facilitate mining.

(d) Water in the nearby water bodies gets polluted due to leaching from the over burden dumps, discharge of pumped mine water, and other activities in the vicinity of the water bodies.

(e) During rainy season the run-off water from the areas surrounding the mines carries with large quantity of the suspended solids into the nearby water bodies.

It is evident from the above that the mining and associated activities changes in ground water flow patterns, lowering of water table, changes in hydrodynamic conditions of river/underground recharge basins, reduction in volumes of subsurface discharge to water bodies/rivers, disruption and diversion of water courses/drainages pattern, contamination of water bodies, affecting the yield of water from bore wells and dug wells etc. Therefore, it is necessary to plan the mining and associated activities in such a manner that their impacts on the water regime are as minimum as possible.

(iv). Air Pollution

The mining activity does have some impacts on air quality. The major contribution to the air pollution by open cast mining is the rise in Suspended Particulate Matter (SPM) due to generation of dust by drilling and blasting and by movement of fleet of dumpers, trucks, jeep etc. Blasting is also giving rise to NO_X and SO_2 and concentration. Heavy vehicles cause emission of NO_2, SO_2 and CO.

(v). Noise Pollution

The noise level in the working environment are compared with the standards prescribed by Occupational Safety and Health Administration (OSHA-USA) which has been adopted and enforced by the Govt. of India through model rules framed under Factories Act. These standards have been established with emphasis on reducing the hearing loss and consequential effects. The summary of the permissible exposures in cases of continuous noise as per above rules is give below: -

S.No.	Total time of exposure per day in hour	Sound pressure (dBA)	Remarks
	1	2	3
1	8.0	90	No exposure in excess of 115 dBA is permissible
2	6.0	92	
3	4.0	95	For any period of exposure falling in between any figure and lower figure as indicated in column (1), the permissible sound is to be determined by extrapolation or proportion ale scale.
4	3.0	97	
5	2.0	100	
6	$1\frac{1}{2}$	102	
7	1	105	
8	$\frac{3}{4}$	107	
9	$\frac{1}{2}$	110	
10	$\frac{1}{4}$	115	

Source- Dhedwas Iron Ore, Copper and Associated Minerals Mine, Jindal Saw Limited

Noise at lower levels (sound pressure) is quite acceptable and does not have any bad effect on human being but when it is abnormally high, it incurs some maleficent effects on human beings.

Excessive loud noise may cause the following adverse effects: - Damage hearing and health, Interfere with work task, Interfere with speech communication, Cause irritation, Affect inter-room privacy, Interfere with sleep, Cause annoyance.

(vi). Water Pollution

Water pollution from the mining operations mainly depend on topography of the area, intensity of rainfall, type of ore, method of mining & ore processing, etc.

The mining operations interfere with natural drainage pattern. Mining will affect the quality of water if the rain water flows down to the river or dam if check dam is not provided to desilt the water before reaching the river or dam.

Water to be used in beneficiation plant will get mixed with fines of Schist. It will need treatment before it can be re-cycled in the plant.

(vii). Impact on Soil

The mining is cause removal of top soil from the area. It is to be scrapped and stacked at designated place for further use. Unsystematic removal of top soil is causing its degradation and make it unfit for growth of grass or plants.

The analyses of soil samples results collected from the area shows that the soil is deficient in Nitrogen, Phosphorous and Organic matter. The yield of major crops grown will be poor without adequate doses of organic matters and Nitrogenous fertilizers. The mining activity will have no impact on the same.

(viii). Impact on Socio-Economy

The major source of employment in the area as well as buffer zone is agriculture which depends upon the rain, which is erratic. In the year of good rain fall, the Meja dam provides water for irrigation along the canal in the command areas. In the other area it depends on rain only. Since last 8 to 10 years Meja dam has remained empty for most of the time, therefore employment in agricultural fields also become erratic. With opening of the major mine, about 600 people are getting employment, thus the living standard of people is rise. There is no displacement of villagers/human settlement. Schools and Hospitals are established in the area.

(ix). Impact on Vibration Level

Heavy mechanization and deep hole blasting are cause vibration which is cause damage to buildings in nearby area. Since the pits is located at a distance of almost 2.0 kms from village, the effect of vibration is not be there as the number of blast hole is restricted to 50 to 60 per day.

(x). Impact on Historical Monuments

There are no historical monuments within 10 km of the iron ore belt in Dhedwas, Dhulkhera, Samodi and Suras villages hence it is applicable.

III. ENVIRONMENTAL MANAGEMENT AT OPEN CAST IRON ORE MINE

The exploitation of a mineral in an unorganized manner cannot be termed mining, it is simply quarrying. The mining required systematic and organized work of exploitation of mineral and all related aspects, with proper usage of science and technology.

(i). Subsidence

The damages and consequential effects of subsidence can be alleviated or countered by undertaking precautionary measures on surface for protecting installation(s) in subsidence prone areas or by adopting appropriate modifications of the mining method adopted to minimize deformation of the surface and by filling the abandoned mine/non-working mines where possible by slowing in a carefully planned manner.

(a) Structural units in the mining area should include safety designs.

(b) Sites of such structures should be away from natural geological weak points such as faults, thrusts, fissures or fractures etc.

(c) Structures should be designed in subsidence prone areas taking rigidity, flexibility factors into consideration.

(d) If the mining in a subsidence prone area is inevitable the operations should be planned to permit controlled subsidence over the entire overlying ground.

(e) Mine planners can possibly modify extraction methods and sequence(s) of operations to keep the damage within acceptable limits.

(f) Adequate support should be provided in the underground workings, (especially in areas closer to surface) to control subsidence. In case of worked out mines stowing should be carried out if technically and economically feasible.

(g) The worked-out areas, especially for steeply dipping metalliferous ore bodies, should be filled with sand or other suitable packing materials.

(h) The procedures and plans drawn for mine closure operations, which are now mandatory, adequate attention, should be given to prevent subsidence of land in underground mine workings in future.

(i) The magnitude of surface strain, ground movement and slope change can be predicted with empirical models or with finite element computer simulations. Scientific data for such models should be collected before the actual mine operations are started.

(ii). Air Pollution Control

(a) Drilling: - The major source of dust production in the mine is drilling, blasting and vehicle movement. Drilling is done by wet drilling method by providing water injection system and also dust extractors which are fitted at the collar level to collect the dust. Dust extractors are cleaned regularly to maintain their efficiency.

(b) Blasting: - Continuous work on improving the powder factor is down to produce minimum quantity of dust. Similarly drilling pattern is adopted which produces minimum fines.

(c) Mucking: - After blasting, the muck is sprayed with water so that fines become wet and will not rise during mucking.

(d) Grinding: - Before the mineral is fed to the crusher and grinding unit, water is spread to quench the dust.

(e) Transport: - The haul roads are sprayed with water by water tankers, three to four times a day, so that the fines lying on the haul road are wet and will not be raised by movement of dumpers or trucks.

(f) Monitoring: - For monitoring the concentration (SPM) in the air at various points quarterly, adequate no. of High- Volume Air Samplers is procured. One each for two pits and air samples is collected at the following points: -

(i) Mine office

(ii) Each pit rest shelter

(iii) Nearest Village

(iv) Haul road entrance to each pit
Monitoring is done quarterly.

(iii). Water Management and Water Pollution Control

Water is required at the mine for spraying on roads, muck and domestic use. The water sprayed on roads gets soaked on road and that on muck is in a very small quantity which wets the much and gets evaporated with in few hours of dumping in dump yard.

Domestic water is discharged as waste in the mine office or colony. It is treated in septic tank and soak pits provided in adequate number in office premises and in the staff colony.

The water used in the beneficiation plant is containing suspensions and fines of quartzite schist. This water containing tailing of the plant is discharged into tailing dam where it is allowed to settle for three to four days. Two such dams are constructed to allow charging in one for three days and draw clear water from other during above period.

Water from the wells located nearby the proposed beneficiation plant tailing dams in villages Suras and Dhedwas is sampled half yearly to monitor the effects of the tail dam and beneficiation plant on the ground water.

(iv). Noise Control

The noise produced by machinery is minimized by the following measures: -
(a) Proper maintenance of all machinery,
(b) Only trained operators are allowed to operate,
(c) All machines are used at optimum capacity,
(d) Plantation of trees around grinding units. Haul roads are done to damper the noise,
(e) Monitoring is done quarterly,
(f) Blasting is carried out only in day time,
(g) Workers and operators working new D.G.Sets, Crushers and Drilling sites are provided with ear muffs.
The monitoring of noise level is done quarterly at Mine Office, Pit Shelter, and Haul road entrance to pits.

(v). Biological Management

Greenbelt Development- Greenbelt is an important sink of air pollutants including noise. Green cover in mining area not only help in reducing pollution level, but also improves the ecological conditions and prevent soil erosion to great extent. It further improves the aesthetics and beneficially influences the microclimate of the surrounding. It also helps to stabilize the slope of external overburden dumps. Many a times, it attracts the animals to re-colonize the area when the mine is abandoned. However, green belts may be developed with plant species suitable to the area. Plant species, selected for greenbelt should have rapid growth, ever green, large crown volume and small/pendulous leave with smooth surface. All these characteristics are difficult to get in a single species. Therefore, a combination of these is sought while selecting trees for vegetation cover. Greenbelt is developed in following areas:
(a) Along mine lease boundary,
(b) Around office buildings, garages, stores etc.
(c) Along the side of major roads,
(d) On external overburden dump,
(e) On backfill areas,
(f) Upper benches/slope of mine pits,
(g) Post plantation care

The species of plantation is selected considering the soil quality, place of plantation, chances of survival, commercial value etc. Only indigenous species is planted. Mixed plantation is done keeping optimum spacing between the saplings. The species suitable and guideline for greenbelt development given in Central Pollution Control Board's publication "Guidelines for Development of Greenbelt CPROBES/75/1999-2000" should be followed. In order to supply of seedlings for the continuing greenbelt development plan, a nursery is developed. Sapling is done from seeds or seedling collected from nearby forest areas.

(vi). Management of Top Soil

Before drilling and blasting near the surface, the top soil layer, present if any, will be scrapped and stacked on a ground level and will be used for plantation every year.

(vii). Management of Area by Reclamation and Rehabilitation

The detailed management plan will be formulated after completion of proposed exploration. The deposits of iron ore of this area will last about 30 years; hence reclamation of pits will be done after about 30 years by back filling with overburden from the dumping yard. The top soil stacked and available at that time will be laid over the fill to convert it into agricultural or social forestry use.

(viii). Management of Dumps

The dumps will be provided with retaining walls of 2.5-meter thickness and 2.5 m height all around except the haul roads to check the rolling of boulders. After the second lift is started, the slope of the first lift will be planted with shrubs for its stabilization. At the end of mining, after about 30 years, the pits will be filled back with these dumps.

The tailing dams will get filled in 3 to 5 years. After a dam is filled up completely, top soil will be laid out and plants and shrubs will be planted to make it a green belt.

(ix). Management of Flora and Fauna

The area is devoid of any water body. The area is semi-arid region and as such does not support any luxuriant flora and fauna. Due to scarcity of water the wild trees are very small in height as well as in diameter. Wild animals like hare, fox and birds have to travel long distances for water and therefore their number is very limited. Mining activity is very little impact on them.

IV. MITIGATION AGAINST POPULATION GROWTH

The development activities will increase the population density of the surrounding villages. To check the natural population growth people are educated through slides and film shows and family planning camps to be arranged in the nearby villages.

The medical check-up camps are arranged regularly to check the status of workers as well as villagers and emphasis is given for arousing consciousness about family planning, restricting size of family and how to keep one self-healthy.

V. SOCIO-ECONOMIC BENEFITS

The study of the buffer zone reveals that the area is moderately backward where majority of people depend on agriculture in semi-arid area. The area has provided job to some 600 workers directly employed for mining work earning Rs. 250/- to 450/- per day. Technical and other qualified people are earning much more than the above wage.

A number of schools, private as well as Government are run in the buffer zone. Market, Carpentry, Black-smithy and vehicle repair shops are come up giving employment to a large number of persons.

Thus, the mining has been benefitting about 2,500 persons in the area.

Working of masonry stone pits and crushers is continuing as these are far away from Iron Ore mineralization zones. How technical persons of those mines may get better opportunity to learn about mechanized mine, adopting pollution control measures.

VI. MONITORING SCHEDULE

(a) Monitoring of Water: - Both ground water and surface water/rain water flowing during rains are monitored bi- annually to determine pH, suspended solids, dissolved salts, hardness, chlorides, nitrates, fluorides, alkalies, sulphates, BOD.

(b) Monitoring of Ambient Air Quality: - Monitoring is done every quarter to determine the SPM, SO_2 and NO_2, besides recording the wind speed, wind direction, dry and wet bulb temperature.

(c) Soil Monitoring: - Soil analysis of the area is done at least once a year to determine pH, Ca, Mg, SO_4, P_2O_5, Chloride, Nitrogen, Potassium and Alkalinity.

(d) Noise Monitoring

(i) Working Environment - Once a quarter - level of dB (A)

(ii) Residential Colony- Once in six months -d (BA), wind direction and wind speed.

(e) Flora and Fauna: - Once a year- Census of all the trees in areas where surface rights have been obtained including Government waste land and of wild animals.

(VII). CONCLUSION

We know that there is negative effect of mining on environment but there is number of positive factors which favor mining; are as follows:

- Before mining mine owner needs to get certificate of Environment clearance which is given by Ministry of environment forestry for lessen the negative effects of mining on environment and under EC terms mining is done by the mine owners.
- Under EMP (Environment management plant) is aimed at mitigating the possible adverse impact of a project and for ensuring to maintain the existing environmental quality. In order to minimize impacts of mining on different environmental parameters and keep air, noise, water quality within prescribed limits a comprehensive environmental management plan has to be prepared.

Under EMP no of process is done which give positive influence such as Air monitoring, Green belt plantation, Water pollution control, Rain water harvesting.

- Under CSR (corporate social responsibility) work is done for social welfare by mine owners like provides education facilities to the school, employment to the local people, development of hospitals, water tank, roads, parks etc.

Hence mining is not only profitable economically but it's also profitable for social welfare by providing facilities which are good for development.

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