Chapter 10
Executive Summary of EIA Report

10.1 Introduction

Steel Authority of India (SAIL) proposes to expand the capacity of Processing/Beneficiation Plant at Dalli Rajhara lease area in Balod Taluka in Durg District in Chhattisgarh for its upcoming mining project at Rowghat Lease area in Baster District in Chhattisgarh State. The proposed location of Beneficiation plant is in non-forest area in Dalli Mine area. The aerial distance Dalli Rajhara Lease and Rowghat mine is around 90 kms. SAIL has plans to produce 14 MTPA ROM from Rowghat mine which will be beneficiated in the proposed beneficiation plant at Dalli Rajhara. The crushed ROM will be transported from Rowghat mine face to Beneficiation Plant at Dalli Mine by rail and from beneficiation plant to Bhilai steel Plant by rail. The nearest railhead to Dalli Rajhara Beneficiation Plant is Rajhara. Rajhara railhead is on a sideline and bifurcated from Howrah-Nagpur-Bombay broad gauge rail line of Southeast Central Railway.

Rowghat mine will be developed with full capacity till 2015-16. Till that time, the ore and accumulated fines from Dalli-Rajhara mine will be used in proposed benefication plant.

With the objective of attaining sustainable development and environmental concerns related to capacity expansion of iron ore beneficiation plant at Dalli Rajhara and to plan and implement appropriate strategies for the protection of environment and maintenance of ecological balance in the region, SAIL retained National Environmental Engineering Research Institute (NEERI), Nagpur for conducting Environmental Impact Assessment Studies encompassing baseline scenario with respect to different components of the environment viz. air, noise, water, land, biological and socioeconomic including parameters of human interest for evolving suitable cost effective Environmental Management Plan.

The EIA report is being submitted for the purpose of requirement of obtaining environmental clearance from statutory authorities. The EIA report will

cover the identified impacts with elaborate EMP so as to prevent any damage to environment and ecological balance of the area.

10.2 Project Profile

10.2.1 Location

The Dalli Rajhara Beneficiation Plant lies between Latitude - 20º 33' 00" to 20º 35' 00"N and Longitude - 81º 45' 00" to 81º 07' 00"E and falls within the Survey of India toposheet no 64H/2.

Iron Ore beneficiation Plant at Rajhara Hill Lease comes under Durg District of Chhattisgarh State. It is at a distance of 95 kms from Durg railway station and around 90 km from Rowghat Iron ore mine and around is present 100 km south of Bhilai on Howrah-Bombay broad gauge line of S.E. railway. Presently one wet beneficiation plant, one dry processing crushing palnt with a capacity of 9.55 MTPA and Hitkasa Tailing Dam are present in Rajhara Lease. Proposed expansion consist of expansion of a benefication plant with a total capacity of 14 MTPA and a new tailings pond. All these units will be established on non forest area. The tailing pond of 24.252 ha has been envisaged.

10.2.2 Justification for Proposed Beneficiation Plant

SAIL proposes to expand the capacity of the Beneficiation Plant at Rajhara Hill Lease to process the ROM coming from SAIL's newly developing Rowghat Mine. The mines in Rajhara Lease are on the verge of depletion within next 5 years. Thus this will be the ideal site for the processing of ROM from Rowghat Mine which is now the lifeline of Bhilai Steel Plant. This will also save the forest land at Rowghat from diversion for Beneficiation Plant. This Beneficiation Plant would serve to process 14 MTPA ROM brought from Rowghat mines.

10.2.3 Drainage System and Water Bodies

There are no major rivers in the study area. The drainage is dendritic. Several seasonal small streams or nalla which originate from the various hill areas drains the water into plain. They remain dry during non-monsoon season. Two small perennial nalla namely Jharan Nalla (located on the southern foothills of Rajhara hill and passing from the plains of Kondekasa village) and Kusum nalla flowing through

Rajhara Town are important from hydrological angle. On regional scale, small seasonal nallas and tributaries meets the Tandula River. Tandula River meets Sheonath River which is tributary of Mahanadi River.

The study area has one relatively large man made water body namely Boirdih Reservoir at a distance of 6 km from mine on South West direction. Another Tandula Reservoir is located at a road distance of 25 km from mine on North East direction. Hitkasa tailing dam a man-made slurry disposal tank built by SAIL for its industrial requirement and Jharan dam or Rajhara dam are another water bodies near Rajhara mine lease in study area.

10.2.4 Beneficiation Process

The capacity enhancement of Beneficiation Plant involves following aspects:

- Receipt and unloading of pre crushed Iron Ore from Rowghat Iron ore Mines.
- Conveying of Iron Ore to secondary stock pile.
- Conveying of ore from secondary stock pile to screening plant.
- Screening Plant
- Jigging Plant
- Milling & WHIMS plant
- Conveying of Iron Ore (Lumps & Fines) to stock pile.
- Conveying of Iron Ore (Lumps & Fines) from to stock pile to loading plant.
- Loading of Lumps & fines for dispatch to Bhilai steel Plant.
- Tailings to tailings pond.
- Tailings from tailings pond to Pellet Plant.
- Tailing of Pellet plant to existing Tailing Pond.
- Conveying Pellet to Stockpile.

The 14.0 Mt/yr of tertiary crushed iron ore (-) 30 mm will be transported by BOBRN type railway wagons from Rowghat to Dalli Complex. Railway siding has been extended upto the Beneficiation Plant for loading and unloading purpose which has been fully mechanised. The ore will be stocked in secondary stockpile and then after reclaimed by stacker will be conveyed to Screening plant through belt conveyor.

The ore will undergo beneficiation with the production of BF and BFO which is then dispatched to Bhilai steel Plant by train and fine slime is disposed of in Tailings pond.

Manpower

The requirement of manpower has been envisaged as under:

Manpower	Nos.
Non-executives, skilled/highly skilled	315
Un-skilled	113
Executive	81
Total	**509**

10.3 EIA and EMP

For the environmental impact assessment studies, an area covering 10 km radial distance from the center of beneficiation plant area (covering around 10 km area from the boundary of beneficiation plant on all sides) was identified as impact zone admeasuring around 707 km^2. Sampling points have been chosen from both the Impact zone.

The study was carried out for EIA for each individual environmental component during winter season (January - March, 2010) are briefly reported below and the details of which are presented in the report.

The salient findings and features of the report are presented below and in **Table 10.1**.

10.3.1 Air Environment

10.3.1.1 Baseline Environmental Status

- The micro-meteorological data was collected with respect to wind speed, wind direction, humidity, rainfall and temperature.
- The climate of the study area is subtropical characterized by hot summer and mild winters. The area is located in the central part of India and falls in Agro Eco region 11 as per National Bureau of soil Survey and Landuse Planning Records (hot sub-humid eco region with red, black and yellow soils). Durg generally has a dry tropical weather which is moderate but on a warmer side in summer season. The peak temperatures are usually reached in May/June and can be in the range of 28^0C (min) to 43^0C

(max), whereas winters experiences high temperature as 45 ^{0}C. The onset of monsoon is usually from July and the season extends up to September, with monsoon peaking during July and August. Maximum, Average & Minimum Rain fall of study area are 1994.00 mm, 1251.91 mm and 571.00 mm per year respectively (Meteorology Department, Chhattisgarh Government).

- The winds from SE, E and NE directions were observed to be predominant with speed ranging between 0.5 and 3.6 m/s. Local prevailing wind pattern during the study period was in conformity with the climatological normals of the region. The data indicate that temperature and relative humidity varied in the range of 11-31^{O}C and 42-69% respectively.

- Baseline data for air pollutants of significance to biological environment viz. Sulphur Dioxide (SO_2), Nitrogen Dioxide (NO_2), Ammonia (NH_3), Carbon monoxide. Particulate Matter of 10µm (PM_{10}), Particulate Matter of 2.5µm ($PM_{2.5}$), Benzene (C_6H_6), Hydrocarbons (HCs) and Volatile Organic Carbons (VOCs) and heavy metal content of SPM, was collected by establishing requisite number of AAQM stations. In all 20 ambient air quality monitoring stations were selected.

- The levels 98th percentile of SPM was observed to be 336 µg/m^3 near existing beneficiation plant, being below standards for industrial area (AAQS, 1994). This was due to bad quality roads and good amount of traffic on the state highway.

- PM_{10} concentration was observed to be below the stipulated standards for residential, rural or mixed area at rural and residential areas as well as below standards (35 – 98 µg/m^3) for industrial/mining area in case of mining areas during winter season.

- $PM_{2.5}$ was observed to vary from 25 to 47 µg/m^3 and was below the stipulated standards

- Carbon monoxide varied from 215 to 358 µg/m^3 in the study area and was below the stipulated standard

- Methane concentration varied from 0.52 - 2.10 ug/m^3, Non Methane concentration varied from 1.25 - 3.63 ug/m^3 and total hydrocarbon varied from 2.87 to 4.23 ug/m^3.

- Total VOC content in ambient air varied from BDL - 0.597 ug/m^3.

- Dust fall rate ranged from 22.45 to 36.28 tonnes / km^2 / month at different sampling stations in the impact area.

- Major contributors for SPM, PM_{10}, and $PM_{2.5}$ are mining activity and transportation activity on semi-permanent road network

- The heavy metal concentrations in the dust samples were found to be well within the limits.

10.3.1.2 Prediction of Impacts

- The Fugitive Dust Model (FDM), a steady state Gaussian Dispersion Model was used for predicting GLCs of fugitive dust due to mining activity

- Cumulative ground level impacts were predicted with respect to PM_{10} in terms of 24 hourly Ground Level Concentrations (GLCs) was predicted to be 22.5 μg/m^3 near beneficiation plant.

- With EMP Implementation, there will be decrease in incremental maximum PM_{10} concentration from 9.5 μg/m^3 to 32.7 μg/m^3 during winter season due to Beneficiation Plant Activities and Crushing Activities.

- There will be decrease of more than 50% of PM_{10} concentration from Beneficiation plant after employing control methods at various activities within the study area.

- There will be decrease of of PM_{10} concentration due to Beneficiation plant activity with existing and proposed capacity of 14 MTPA during winter season without EMP

10.3.1.3 Environmental Management Plan

- Regular grading or stabilization of haul roads and service roads

- Afforestation with dust filtering trees around Beneficiation Plant and Crushing Plant for control of dust
- Water sprinkling on haul roads at regular intervals by water sprinklers
- Dust Emitting Sources : Wet suppression by water sprinkling on dust emitting surfaces
- Crushing Plant : Water will be sprayed in the form of fine jet to suppress the dust generated while loading and unloading operations
- The storage area will be provided with retaining wall and the material will be covered with polyethylene/canvas sheets
- Dry fog system for dust suppression at all transfer points and tertiary crusing points at crushing plant and beneficiation plant

10.3.2 Noise Environment

10.3.2.1 Baseline Environmental Status

- Ambient noise monitoring was carried out in the study region at 26 locations including core zone and impact zone around Beneficiation Plant.
- Blasting: at 50-200 m distance, PSPL of 118 dB(A); The Peak Particle Velocity (PPV) and Zero Crossing Frequency (ZCF) for the Dalli mine varies around 0.19 to 7.97 mm/sec and 6.2 to 64Hz respectively.
- Traffic noise: Leq 56.2 dB(A) to 61.8 dB(A)
- Residential areas: 38.3-64.6 dB(A), Commercials areas: 45.3-70.6 dB(A) and Silence zones: 40.9-63.4 dB(A).
- Local transport and human activity are responsible for higher noise levels in residential and other areas

10.3.2.2 Prediction of Impacts

- The noise level in plant was estimated to be 100.9 dB(A). The isopleuths of noise levels due to beneficiation activity, without any attenuation or

barrier, will be around 64 dB(A) at 200m, 60 dB(A) at around 400m and 56 dB(A) at 600m. However, these noise levels will be further reduced due to building walls of plant and green belt around it.

- The predicted noise levels due to increase in local traffic on the main road would be 69.4-74.5 dB(A)

10.3.2.3 Environmental Management Plan

- Proper and regular maintenance of equipments, machinery, trucks, and dumpers
- Worker's safety : Insulated enclosure for staff near noise generating machine, ear muffs for staff, scientific method of blasting and control charging
- Green belt in and around Beneficiation Plant
- Avenue plantation to reduce noise due to traffic

10.3.3 Water Environment

10.3.3.1 Baseline Environmental Status

- The surface and ground water samples were collected from 5 surface water bodies and from 7 handpumps in the study area for physico-chemical, bacteriological and biological analysis.
- Physico-chemical and inorganic quality of surface water and ground water were observed to be good when compared with drinking water quality standards.
- However nutrient demand and organic parameters indicate marginally polluted surface water sources with low productivity.
- The surface water sources in study area showed low concentrations of heavy metals except iron, which was recorded higher than standards at some places and some groundwater samples showed higher concentration of heavy metals like iron and lead.

- The bacteriological and biological observations indicate that the surface groundwater quality is good.

10.3.3.2 Prediction of Impacts

- Surface and groundwater quality will not be adversely affected due to capacity expansion of beneficiation plant
- The baseline data did not show any impact on the surface water or groundwater due to existing beneficiation plant and tailings pond
- The anylisis of water samples from 5 piezometers on the downstream of existing tailings pond did not show pollution of ground water due to Hitkasa tailings pond which is in operation for last 30 years
- The run off water from stockpiles and mine area will be collected and led to sedimentation pond for removal of sediments before disposal
- The tailing pond water will be collected in sump and will be recycled back in the beneficiation plant for reuse and will not be disposed off in water bodies to avoide water pollution
- There is full scale sewage treatment plant for the treatment of domestic sewage and the effluent is utilized for irrigating plantation.
- Gully plugs have been placed at proper places on nallas to arrest the sediments in run off water

Impact on Groundwater due to Proposed Tailings Dam

- The existing Hitkasa tailings dam has been in operation since a long time. The baseline survey of groundwater and surface water in the impact zone did not show any impact due to operation of tailings dam
- The proposed tailings dam is being designed scientifically to prevent any seepage or disposal of tailings pond water, as a result there would not be any impact on surrounding surface and groundwater bodies

10.3.3.3 Environmental Management Plan

- Overflow from tailing dam: recycled and reused in beneficiation plant to conserve surface water for domestic use and for wildlife
- Tailing dam will be scientifically constructed with proper treatment of bottom with impervious material to control the seepage and groundwater pollution
- Toe dam will be constructed to control water pollution due to seepage water and also to control seepage water
- Overburdens in the mines have been stabilized, plantations have been developed, and check dams have been constructed in gullies to arrest silt in run off water, so there would be negligible pollution due to activity in mine lease area
- The surface water balance of Boirdih dam is found to be satisfactory as a source of water for beneficiation plant maintaining the enough water in dam to maintain its ecological function.
- Public health will not be affected as the surface water is being treated before public water supply to remove the impurities from the water

10.3.4 Land Environment

10.3.4.1 Baseline Environmental Status

- Soil samples were collected from ten sampling stations and analyzed for physicochemical quality. Predominant texture of soil is clay followed by clay loam and loam with porosity varying from 44.91% - 74.26 % and water holding capacity from 20.78% - 60.39 % indicating good quality of soil. Soil porosity is a measure of air filled pore spaces and gives information about movement of gases, inherent moisture, and development of root system and strength of soil. The bulk density of soils in the study area is in the range of 1.00 – 2.13 g/cm^3 which, is considered as moderate.

- Soils are strongly neutral with moderate soluble salts content and very high adsorption capacity but with poor fertility.

- The soils have micronutrients (trace metals) and moderate microbial flora in soil.

- Land use pattern of impact area shows 25% forest area and 42.50% of cultivated land showing predominance of agricultural activity.

- The land use of lease area was studied from remote sensing data. Landuse pattern indicate 46.4% forest cover and 38.8% grazing land. Afforestation has been done in 108.14 ha area (13.3% of total land)

10.3.4.2 Prediction of Impacts

- The silt content in the run off water from dump area is removed in sedimentation pond by directing run off water through garland drains into sedimentation tank and construction of gully plugs and check dams to arrest sediments. The environment would not be affected by pollution.

- Good amount of afforestation has been carried out in mine lease area which would reduce Soil erosion from mining lease area

- No change in land use pattern in mine lease area.

10.3.4.3 Environmental Management Plan

- Soil erosion control and water conservation through afforestation in and around beneficiation areas and afforestation in open areas

- Greenbelt will be developed around beneficiation plant

- Tailings from tailing pond will be reused after pelletisation. Excess tailings may be used for land filling and then stabilised with plantation over its surface

- **Top Soil Managemnet:** Topsoil Management Plan will be prepared to save this non renewable resource. The top soil will be carefully collected and this soil which harbours propagagules of several species in the form of seeds, bulbs or rhizomes will be spread out in an identified nearby

area/degraded forest land to facilitate regeneration of herbaceous and micro-flora.

- Measures of control of soil erosion such as contour trenches on overburden slopes, gully lining, vegetated water ways, vegetative stabilization of overburden dumps. \

- **Closure of Tailing Pond:** In the unlikely event of closure of the tailing pond, it will be closed in an environmentally safe manner as per approval of local Government agencies. It will be covered with 0.5 m waste rock, 0.5 m compacted clay and 0.5 m compacted soil before taking up vegetation.

- WHIMS will be used for recovery fines from jigging plant through sepretion of magnetic and non-magnetic material

10.3.5 Biological Environment

10.3.5.1 Baseline Environmental Status

- The hills, valleys and plains in iron bearing area and impact area are profusely covered by dense forests of good biodiversity

- The forest in the study area is tropical deciduous dense mixed type, open mixed type and in the river banks and gullies, the vegetation is evergreen and semi-evergreen type.

- Notified forest areas of Fangunda RF, Putarwahi PF, Gidhili PF, Ghorad PF, Bhagatola PF and Bhimatola PF bound Dalli Rajhara Ore Mines on all sides

- A total of 272 plant species were recorded, out of these, 110 tree species, 75 shrub species 17 herb species, 36 species of bamboo and grasses, 29 climber species, 5 species of epiphyte and parasites were recorded from the study area.

- Terminalia tomentosa, Madhuca indica, Bombax ceiba, Bauhinia racemosa, Boswellia serrata, Mangifera indica, Ficus benghalensis, Ficus

religiosa, are very widespread. Acacia catechu is often present indicating the relation to forest.

- Wild species are represented by commonly occurring species like hyena, jackal, fox, barking deer etc.

- There is no river in study area therefore fishing activity is not prominent and is used for family consumption purpose only.

10.3.5.2 Prediction of Impacts

- Beneficiation activity will not affect the flora and fauna of the area as it is in non forest land in Dalli Rajhara lease area.

- The biodiversity of plants will be increased due to plantation drive and bird population will be attracted towards the wetland of tailings pond.

- There will not be any discharge from the tailings pond or sewage treatment plant in township so terrestrial and aquatic flora and fauna will not be affected.

- The agricultural activity will be improved due to availability of infrastructure through social welfare activities of BSP-SAIL

- Public health will not be affected as no pollutants are released in the environment from beneficiation plant

10.3.5.3 Environmental Management Plan

- Use of diverse local plant species in the green belt to increase plant biodiversity as well as to reduce dust and noise pollution

- Avenue plantation of dust filtering and shade giving trees

- Encouragement to villagers to undertake social forestry programme to develop village forests and village grasslands in collaboration with forest department to satisfy their demands and fodder

- Strict curb on poaching and hunting and special protection to rare and endangered species

- Development of nurcery for raising plant seedlinks for afforastation and greenbelt development
- Protection and conservation for natural regeneration in the forest and green belt
- Development of botanical garden for conservation of medicinal plants

10.3.6 Socio-economic Environment

10.3.6.1 Baseline Environmental Status

- Total population of the 56 villages in study area is 48156 with 71.3% population of scheduled tribe and 5.77% of scheduled caste. Out of total population, main workers form 33.86%, marginal workers 5.94% and maximum people are non-workers i.e. 60.20%.
- Sex ratio (No. of females per 1000 males) is 977
- Literacy rate is poor (67.00%).
- Agriculture activity is dominant apart from collections of forest produce and labour work i.e. mine labour, agriculture labour, bidi making labour are the occupation of local people.
- The tribal people are dependent on forest related activities like hunting, collection of fuel wood, edible fruits, edible seeds, mushroom, honey and wax, medicinal and other plants/plant parts, timber, seeds, and leaves, Mahua, timber, oil seeds & flowers, tendu leaves, mango fruits, chiranji, Kusum oil seeds, and Bamboo.
- Public health facilities viz. education, transportation, power, medicinal are good
- Almost all the respondents have positive opinion about the project.

10.3.6.2 Prediction of Impacts

Positive Impacts

- Due to beneficiation plant activity, it is expected that additional people will get employment hence job opportunities for the local people as well as immigrants from nearby areas would increase.

- Primary and secondary employment opportunities are expected to be improved in the region.
- There would be increase in the commercial, business and shopping centers to cater the needs of existing population as well as the employee of the beneficiation plant
- Due to CSR policy of SAIL, the life of people is happy and existing and proposed peripheral development plans will improve the quality of life of local people
- Infrastructural facilities will be improved. It would also result in the appreciation of land values around these areas

Negative Impacts

No adverse impacts on socio-economic environment due to capacity expansion of Beneficiation Plant are expected.

10.3.6.3 Environmental Management Plan

- Preference will be given to local population for employment in addition to awarding contract work
- Cottage industries will be promoted
- Improvement of infrastructural facilities like education, medical, transport etc.
- Economic upliftment activities such as improving agricultural practices, dairy development, polultry, development of forest based income generating activities
- Control of air and water pollution through scientific methods
- Providing safe drinking water supply
- Schemes for women empowerment and cultural development
- Development of low cost sanitation facilities in villages

- Development of rainwater harvesting methods to augment groundwater recharge; construction of ponds for rainwater harvesting in villages near villages for domestic and agricultural use
- Occupational Health and Safety
  - An ambulance van is provided to meet any eventuality
  - First aid station is provided near the mining lease. Also first aid boxes are provided at the mine pit and on the shovel and dumpers
  - First aid pouches would be made available with shift foreman and mate

10.4 Conclusions

The development of Beneficiation Plant at Dalli Rajhara is environmentally, technically and economically feasible. SAIL has envisaged to develop beneficiation plant to supply the finished product to Bhilai Steel Plant which is now necessary for the survival of the Bhilai Steel Plant. Basic infrastructure for capacity expansion of Beneficiation Plant is already available in the lease. All the activities are confined to non forest area of the lease, and minimum possible emissions are allowed to enter the environment. So the environment will not be adversely affected in any way. On the contrary, the development of plantation, green belt and wetland of tailings pond will help to increase the biodiversity of plants and birds in the area.

The environmental study indicate that the mechanization of all activities in Beneficiation Plant would be greatly helpful in reducing environmental pollution of air, noise, water and soil. Apart from this, the environmental management plan has delineated many measures to reduce pollution by ore crushing and beneficiation operations, apart from other measures viz. rain water harvesting, recycling of tailing pond water, passive enclosures/dust extraction/dust suppression method for dust generating machines, development of green belt/plantation around Beneficiation Plant areas, sedimentation pond to reduce silts in runoff water.

The CSR policy of BSP-SAIL would further bring out the development of the surrounding villages and the area and Quality of Life of local people will be improved.

The summary of the cost of environmental control and monitoring measures are given in **Table 10.2**.

Table 10.1

Summary of Impacts, Problems and Appropriate Management Plan for Proposed Beneficiation Plant at Patharbasa

Environmental Component	Activity	Impacts	Management Plan for Mitigation of Impacts
Air Environment	Loading / unloading at railway siding, crushing plant	Dust pollution	• Development of green belt around beneficiation plant and tailing pond • Dust extraction / Passive enclosures, Dust suppression at loading/unloading operations beneficiation plant area, and railway siding
	Haul roads around beneficiation plant and Dalli mine	Dust pollution	• Stabilization of unpaved village roads, parking lots, active overburden dumps • Wet suppression: application of water or solution of chemical agent or micron sized foam to the dust emitting surfaces. • Development of avenue plantation with dust filtering trees • Development of green belt around crushing plant, beneficiation plant, railway yard and haul roads, township and use of diverse local tree species, fodder plants, fruit trees and grass species in green belt
Noise Environment	crushing, and beneficiation operations	Occupational Exposure at mining site and at ore processing plant, Hearing problems, psychological effect	• Procurement of less noise generating machines • Insulated enclosures for the staff working near noise generating machines • Ear muff for staff working near noise generating machines • Proper maintenance of equipments, machines, silencers, mufflers.
Land Environment	Stockpiles of ROM and product ore	Leaching of pollutants and soil erosion	• Retention wall and garland drains around stockpiles to collect run off water and to lead it to sedimentation tank
	Tailings pond	Disposal of tailings after the life of tailings pond	• Tailings should be palletized in pellet plant for its reuse in Steel Plant • Excess tailings can be stabilized with vegetation cover

Environmental Component	Activity	Impacts	Management Plan for Mitigation of Impacts
	Domestic Solid Waste from Township	Pollution of land due to land disposal	• Composting of biodegradable waste to prepare manure • Inorganic waste for land filling
Water Environment	Land erosion and leaching of pollutants	Pollution of surface water	• Stabilization of active overburden slopes • Check dams in gullies on hill slopes to arrest silt load in run off water
	Tailings dam	Ground water contamination due to seepage and surface water pollution due to discharge of tailings pond water	• Tailing dam should be constructed with proper treatment of bottom with impervious material to control seepage and groundwater contamination • The tailing dam overflow should be recycled & reused in beneficiation plant to save water resource and to avoid surface water pollution
	Exploitation of Boirdih Dam water for mining complex	Ecological function of the dam will be hampered	• Minimum quantity of dam water will be used maintaining sufficient water in the dam • Recycle and reuse of railings pond water to save dam water resource
Biological Environmental	Proposed beneficiation plant operation	Noise and dust pollution	• Plantation of diverse trees and shrubs in and around beneficiation plant and tailings pond • Avenue plantation using dust filtering, shade giving and aesthetically important plants • Plantation and wetland of tailings pond would attract birds and increase biodiversiy
Socio-economic environment	Contamination of water due to run off water and domestic waste	Unsafe drinking water	• Treatment of water before water supply to public • Development of rainwater harvesting projects to augment groundwater recharge as groundwater is the main source of water in the area • Construction of ponds for rainwater harvesting in villages near villages which would be useful for drinking water and agriculture
	Increase in population	Basic infrastructural facilities needs	• Preference to local people for employment and contract works in addition to promoting cottage

Environmental Component	Activity	Impacts	Management Plan for Mitigation of Impacts
		further improvement	industries, handicrafts and small scale industries and providing vocational training to local aspirants • The facilities like education, medical, transport need to be improved regularly
Management of Beneficiation Plant Activity		Salient points of activities to be carried are summarized	• Adoption of Scientific beneficiation process and EMP implementation • Regular monitoring of surface and groundwater quality and ambient air quality to measure the success of scientific mining activity • Adoption of pollution control measures at crushing plant, ore beneficiation plant and railway siding • Judicious exploitation of Boirdih dam water for beneficiation plant to conserve ecological role of dam • Construction of technically sound tailings pond to avoid groundwater contamination and recycling and reuse of tailings pond water to avoid surface water pollution Social welfare activities: craftsmanship training to tribals, providing employment opportunities, hospital and education facilities, rain water harvesting, and water supply to tribal people in study area and efforts to conserve tribal culture and traditions

Table 10.2

Cost of Environmental Control and Monitoring Measures

Sr. No.	Activity	Capital Cost (Lakhs Rs.)	Annual Recurring Cost (Lakhs Rs./yr)
1	Pollution Control • Air Pollution • Noise Pollution • Water Pollution	1815	90
2	Pollution Monitoring • Air Pollution • Noise Pollution • Water Pollution	60	20
3	Tailing Pond's associated facilities	100	15
4	Occupational Health	485	18
5	Green Belt • Beneficiation Plant	10	8
6	Biological Environment	92.26	
7	Socio-economic Development	360	
8	Rainwater Harvesting	50	-
9	Others	24	30
Grand Total		**3177.26**	