



## 1.0 Project Description

### 1.1 Background to the Project

Hindalco proposes to set-up a Greenfield integrated aluminum smelter complex project under the name of 'Mahan Aluminium' with a production capacity of 3.25 LTPA (Primary Aluminium Metal) near Bargawan village, Deosar Tehsil in Sidhi District, Madhya Pradesh. To cater the demand of power on continuous basis, 5 x 150 MW (750 MW) coal based Captive Power Plant (CPP) is also proposed in the complex.

### 1.2 Location Details of the Project

The proposed Mahan Aluminium project is located near Bargawan village, Deosar Tehsil in Sidhi District of Madhya Pradesh. The site geographically extends from Longitude 82° 26' 14" E and Latitude 24° 13' 15" N and fall in Survey of India Topo-sheet No. 63-L/8. The site does not involve any forest land. No major water stream and road are passing through the plant site.

The site is located at a distance of about 70-km east of Sidhi, which is the district Headquarter. The nearest railhead is at Bargawan at a distance of about 4-km from the proposed site on East-Central railway line. The site can be approached through Ranchi-Rewa National Highway (NH-75E). The 10-km radius study area of the project site is given in **Figure-1**.

### 1.3 Details of Proposed Project

Hindalco proposes to install a 3.25 LTPA capacity of aluminium smelter by using pre-bake cell technology with 360 Kilo amp current in aluminium smelter. The CPP configuration will be 5 x 150 MW capacity and the main fuel will be coal to be sourced from Mahan Coal Limited.

The total land required for the proposed project (which includes smelter plant, captive power plant, township, ash disposal area, corridor for various utilities/facilities etc) is about 2025-ha.

Coal requirement of CPP will be met from Mahan Coal Limited, which is located at a distance of about 18-km from the project site. The fresh water requirement of 4600 m<sup>3</sup>/hr shall be met from Gopad River by laying pipe line. Total cost of the proposed project is estimated to be about Rs.7,700 crores. The details of operation of the proposed project are given in **Table-1**.

**TABLE-1**  
**SIZE OF OPERATIONS OF THE PROJECT**

Sr. No.	Description	Details
1	Aluminium production capacity	3,25,000 TPA Ingots
2	Captive power generation	5 x 150 MW (750 MW)
3	Total land requirement	2025 ha
4	Water requirement	4600 m <sup>3</sup> /hr (45.12 cusec)
5	Power requirement	549 MW



Sr. No.	Description	Details
6	Alumina requirement	6.4 LTPA will be sourced from captive alumina refineries from Orissa/ Jharkhand.
7	Fuel requirement	
	Coal	3.5 MTPA from Mahan Coal Ltd.
	Fuel oil	56,353 metric TPA
8	Manpower requirement	1495 personnel

### 1.3.1 Infrastructure Facilities

#### 1.3.1.1 Raw Material Requirement

The raw material required for the proposed smelter plant and captive power plant is given in **Table-2**.

**TABLE-2  
RAW MATERIAL REQUIREMENT**

Sr.No.	Raw Materials	Consumption per annum
<b>Smelter Plant</b>		
1	Calcined Petroleum Coke	1,20,450 MT
2	Alumina	6,31,450 MT
3	Pitch (HSP)	29,200 MT
4	Furnace oil	21,353 MT
5	Aluminium fluoride	5,475 MT
6	Raw water	7.23 Million KL
<b>Captive Power Plant</b>		
1	Coal	35,00,000 MT
2	Fuel oil	35,000 KL
3	Raw Water	29.7 Million KL

Alumina is the main raw material of the process and will be received from its own alumina refineries in Orissa/ Jharkhand. Special captive alumina wagons will be provided for transportation of alumina to the proposed smelter plant site. Calcined Petroleum Coke will be received in gunny bags. Coal tar pitch is received in liquid form and stored in melting or storage tanks. Aluminium fluoride will be received in 50-kg bags. These bags will be delivered through truck, unloaded manually and stacked in fluoride storage building. Fuel oil will be transported to the plant site by rail tanker wagons and will be stored in steel tanks common with the adjacent captive power plant.

The layout of the smelter is designed to minimize the transport distance of raw materials and intermediate products. The project will be employing best material handling techniques.

#### 1.3.1.2 Power and Fuel Requirement

The total power requirement of the proposed smelter project is about 549 MW. The power requirement will be met from the proposed 750 MW (5 x 150 MW) coal based captive thermal power plant with one additional unit of 150 MW as stand by in the smelter complex. The power requirement for construction and station start-up together with emergency back-up power will be met from the nearby located Morwa sub-station of MSEB.



Coal is the main fuel of the CPP. The coal consumption is estimated at 3.5 Million tpa for the CPP.

#### 1.3.1.3 Water Requirement

The total fresh water requirement during operation phase of the project will be 4600 m<sup>3</sup>/hr, which shall be met from Gopad River, which is at a distance of about 35 km by laying pipe line. Suitable arrangement will be made for drawl & conveying of water to the power plant.

#### 1.3.1.4 Manpower Requirement

The total manpower of smelter complex including CPP during operation period will be 1495.

#### 1.3.1.5 Township

The proposed site of the township has an area of 800 hectares. 320 hectares for staff colony is located east of smelter and captive power plant and 480 hectares for workers colony located west of the plant complex.

## 2.0 DESCRIPTION OF ENVIRONMENT

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

### 2.1 Land Use Studies

On the basis of Census records, it is observed from the land use studies that the agricultural land is the predominant land use (54.31%) in the study area followed by Culturable Waste Land (25.73%). The forest land occupies about 6.34 % of area and remaining land is the area, which is not available for cultivation.

### 2.2 Soil Quality

The soil samples were tested at eight locations during the study period. It was observed that the soil in the study area is predominantly of clayey type. The pH of the soil samples ranged from 7.8 to 8.1 indicating moderately alkaline in nature. The Electrical Conductance of the soil samples varied from 149 to 214  $\mu$ S/cm. The phosphorous values are varied from sufficient to more than sufficient category. The nitrogen values are varied from very less to less category, hence not very suitable for agriculture. The potassium values are varied from less to more than sufficient category.



*EIA for the proposed 3.25 LTPA capacity Greenfield Integrated Aluminium Smelter and 750 MW Coal based Captive Power Plant at Bargawan, Sidhi District, MP*

*Executive Summary*

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



### 2.3 Meteorology

On-site monitoring was undertaken for various meteorological variables in order to generate the site-specific data. Data was collected at every hour continuously from December 2006 to February 2007. Predominant winds from W direction were observed for 11.5% of the total time. The secondary meteorological data is collected from the IMD-Sidhi which is the nearest IMD station to the proposed project. The study area receives good rainfall with annual mean total rainfall of 1234.6-mm.

### 2.4 Ambient Air Quality

To establish the baseline status of the ambient air quality in the study area, the air quality was monitored at 8 locations during winter season 2006-07. The TSPM and RPM is observed to vary from 59.4 - 143.7  $\mu\text{g}/\text{m}^3$  and 20.7 - 47.5  $\mu\text{g}/\text{m}^3$  respectively. Sulphur dioxide and oxides of Nitrogen concentrations are found to vary from 6.1 - 10.2  $\mu\text{g}/\text{m}^3$  and 7.2 - 10.8  $\mu\text{g}/\text{m}^3$  respectively. CO concentration was found to range between 247 - 399  $\mu\text{g}/\text{m}^3$ . Fluoride concentration was found  $<0.1 \mu\text{g}/\text{m}^3$ . In general, the ambient air quality levels in the study area are of good quality and devoid of any pollution.

### 2.5 Water Quality

The surface water quality was monitored at five locations in the study area. The analysis results indicate that the pH ranges in between 7.6 and 8.2, which is well with in the specified standard of 6.5 to 8.5. TDS concentration was observed in the range of 148 - 221 mg/l. The physico-chemical and biological analysis revealed that all the parameters are well within the prescribed limits of IS: 2296 Class 'C' limits, indicating their suitability to use for drinking after conventional treatment followed by disinfection.

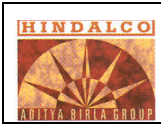
Eight groundwater samples were analysed during the study period. The pH and Conductivity were found varied from 7.4 - 8.0 and 582-900  $\mu\text{s}/\text{cm}$  respectively. Chlorides and sulphates in ground water ranged between 22.7-73.8 mg/l and 9.7-80.4 mg/l respectively. The heavy metal contents are found to be well within the limit. The physico-chemical and biological analysis revealed that the all the parameters are found to well within the permissible limits of IS: 10500 (drinking water standards).

### 2.6 Ambient Noise Levels

The noise monitoring has been conducted at eight locations in the study area. Day time and night time noise levels at residential areas found varying from 48.9 to 59.2 dB(A) and 40.5 to 48.1 dB(A) respectively. In general, the noise levels are found within the acceptable levels in residential areas. The noise levels were observed exceeding the limits at locations where commercial activities & traffic movement exist.

### 2.7 Ecological Environment

Maximum 355 numbers of plant species (except algae, fungi and bryophytes) were



recorded in the study area. As per Wildlife Protection Act (1972), 4 species of Schedule-I, 7 species of Schedule-II, 4 species of Schedule-III and rest belong to Schedule-IV are recorded/reported during study period from study area. As per recent forest working plans and discussion with local forest officials, there are no migratory paths reported from the study area.

## **2.8 Socio-Economic Environment**

The study area as a whole consists of 60653 persons inhabited. The males and females constitute 51.42% and 48.58% of the study area population respectively. The average household size of the study area is 5.7 persons. As per 2001 census, 19.6% of the population in the study area belongs to Scheduled Castes and 30.0% to Scheduled Tribes. The study area experiences a literacy rate of 34.9%. The main workers of the study area are 30.65% of the total population. The marginal workers and non-workers constitute to 14.36% and 54.99% of the total population respectively.

## **3.0 ENVIRONMENTAL IMPACT ASSESSMENT**

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

### **3.1 Impacts during Constructional Phase**

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

#### **3.1.1 Impact on Land Use**

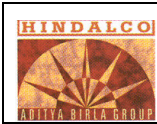
Present land use of the selected site is barren and agricultural land. There will be change in land use of the area and the selected site will be categorized as industrial area.

#### **3.1.2 Impact on Soil**

The construction activities will result in loss of vegetation cover and topsoil to some extent in the plant area.

#### **3.1.3 Impact on Air Quality**

The main sources of emission during the construction period are the movement of equipment at site and dust emitted during the levelling, grading, earthwork, foundation works and exhaust emissions from vehicles and equipment deployed during the construction phase is also likely to result in marginal increase in the levels of SO<sub>2</sub>, NO<sub>x</sub>, SPM and CO. The impact will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries.



#### 3.1.4 Impact on Water Quality

Impact on water quality during construction phase may be due to non-point discharges of solids from soil loss and sewage generated from the construction workforce stationed at the site. However, due to the construction being carried out on the flat terrain, the soil losses will be negligible.

#### 3.1.5 Impact on Terrestrial Ecology

The initial construction works at the project site involves land clearance. During construction vegetation may be disturbed including tree cutting. However, tree cutting will be kept at bare minimum. Greenbelt will be developed during construction to improve the aesthetic value in the area and to screen out the fugitive dust generated during construction.

#### 3.1.6 Demography and Socio-Economics

The non-workers in the study area constitute major population. This indicates the availability of sizeable manpower required for the construction activity. The project will provide either direct or indirect job opportunities to the local population as far as possible.

### **3.2 Impacts during Operational Phase**

#### 3.2.1 Impact on Land Use

The present land use of the area falls under agricultural and fallow category. After commissioning of proposed plant, this land use will change to industry category. Along with the development of plant activities, greenbelt will also be developed along the plant boundary, which will be a beneficial impact.

#### 3.2.2 Air Environment

The impact on air quality is assessed based on combined emissions of the proposed smelter plant & CPP. The major emissions from the proposed plant include SO<sub>2</sub>, Suspended Particulate Matter (SPM) and NO<sub>x</sub>. The maximum incremental short-term concentrations for particulate, SO<sub>2</sub> and NO<sub>x</sub> likely to be encountered due to proposed plant operation have been estimated using air dispersion model. The incremental concentrations when superimposed over the existing baseline concentrations, the resultant concentrations will be within the permissible levels for residential/rural conditions.

#### 3.2.3 Water Environment

The total requirement of water for domestic, industrial and allied activities including water requirement for greenbelt development during operation phase is about 4600 m<sup>3</sup>/hr. The raw water requirement shall be met from Gopad River which is at a distance of about 35-km by laying pipe line. No ground water source will be tapped for meeting the water requirements during operation of proposed smelter and CPP.



The wastewater generation in the smelter complex along with CPP will be 492 m<sup>3</sup>/hr. The complete wastewater generated will be treated and routed to smelter for utilisation in process.

The domestic wastewater generated from canteen and toilets of smelter plant will be treated and used in greenbelt development. Thus, wastewater generated in smelter project will not be discharged out side the premises.

#### 3.2.4 Impact of Solid Wastes

Around 5800 tonnes of Spent Pot Lining (SPL) will be generated annually, which will be put into secure land fill area as per the CPCB guidelines.

The burnt coke fines from bake oven will be recycled in green anode plant. The refractory from the bake oven from ladle cleaning and cast house, the sundry waste and sweeping dust from the plant will be utilized or stored along with SPL. The aluminum dross and cast iron scraps will be supplied to authorized secondary metal processing industries. The ash generated in the plant will be utilized to maximum extent possible and balance will be stored in the ash pond using High Concentrate Slurry Disposal method along with the ash generated in the CPP under implementation.

Sludge from Sewage Treatment Plant will be dried and used as manure for greenbelt maintenance. Canteen/sanitary waste will be composted and used as manure for greenbelt development.

With the implementation of above precautionary measures, the impacts due to solid waste disposal will be insignificant.

#### 3.2.5 Noise Environment

The main noise generating sources from the smelter plant will be pumps, compressors along with cooling tower and boiler at paste plant. The noise levels at the source for these units will be in the range of 80-90 dB(A). The increment noise levels will be less than 40 dB(A) at all of the surrounding habitations. It is seen from the simulation results that the incremental noise levels will be well within the CPCB standards.

#### 3.2.6 Ecological Environment

Extensive plantation comprising of pollutant resistant trees will be undertaken in and around the project site, which will serve not only as pollution sink but also as a noise barrier. The tree species selected for green belt shall include fast growing local native species.

There is no ecologically sensitive area like National parks or Wildlife Sanctuaries or Biosphere Reserves within 25-km radius of the study area.

#### 3.2.7 Socio-Economic Environment

The activities of the project operations will improve the socio-economic levels in



the study area. The proposed project activities will provide employment to persons of different skills and trades. The local population will have preference to get an employment. The employment potential will improve economic conditions of these families directly and provide employment to many other families indirectly who are involved in business and service oriented activities.

Adequate facilities like sanitation, drinking water etc will be provided in the rehabilitated area. Educational and medical facilities of the Hindalco township at project site will be extended to the local people.

#### **4.0 ENVIRONMENTAL MANAGEMENT PLAN**

##### **4.1 Environment Management Plan during Construction Phase**

###### **4.1.1 Air Quality Management**

The mitigation measures recommended to minimize the impacts are water sprinkling in construction area, asphaltting the main approach road, proper maintenance of vehicles and construction equipment and tree plantation in the area earmarked for greenbelt development.

###### **4.1.2 Water Quality Management**

The mitigation measures recommended to minimize the impacts are construction of sedimentation tank to retain the solids from run-off water, oil and grease trap at equipment maintenance centre and Septic tanks to treat sanitary waste at labour colony. The wastewater will be utilized in greenbelt development.

###### **4.1.3 Noise Level Management**

Recommended mitigation measures are good maintenance of vehicles and construction equipment and restriction of construction activities to day time only. Trees will be planted around the plant boundary to attenuate the noise and earplugs and earmuffs will be provided to workers.

###### **4.1.4 Ecological Management**

The felling of trees will be kept at minimum. The possibility of transplantation of existing matured trees will be explored and implemented to the maximum extent possible. The greenbelt having tree density of 2000 - 2500 trees/ha will be developed.

##### **4.2 Environment Management Plan during Operation Phase**

###### **4.2.1 Air Pollution Management**

Bag filters will be installed to limit the SPM concentrations to below 100 mg/Nm<sup>3</sup>. Dry scrubbers with standby exhaust fans will be installed to control the fluoride emissions from FTP. Latest generation Pre bake technology will be adopted to minimise the emissions of Coal tar pitch, volatiles and Greenhouse gases. Sacks with adequate height for wider dispersion of gaseous emissions will be provided.



Highly efficient ESPs to CPP will be provided to restrict particulate matter emissions below 100 mg/Nm<sup>3</sup> as per CREP guidelines. Low NOx burners will be provided to reduce the NOx emissions in CPP. Roads within the plant area will be asphalted and greenbelt will be developed around the plant to arrest the fugitive emissions; and

#### 4.2.2 Water Pollution Management

The wastewater will be generated from cooling towers in the smelter plant and CPP. Besides, domestic wastewater from canteen and employees wash area will also be generated. Treatment and recycle of waste water is recommended to minimise the impacts and conservation of fresh water. Sewage Treatment Plant will be provided to treat domestic sewage from plant and treated domestic wastewater will be utilized in greenbelt development and dust suppression. Adequate storm water management system will be provided. Treatment of storm water will be done to remove fluoride concentration, if present, before discharging into water streams.

#### 4.2.3 Noise Pollution Management

In the process, various equipment like pumps, cooling tower, compressors etc generate the noise. Equipment will be designed to conform to noise levels prescribed by regulatory authorities. Acoustic enclosures for noise generating equipment and thick greenbelt will be provided.

#### 4.2.4 Solid Waste Management

Solid waste like Spent Pot Lining (SPL), used oil, used batteries and dross will be generated in the proposed smelter. These are categorized as hazardous waste and need to be disposed off in proper manner with great care to prevent contamination of the surrounding areas.

Waste will be segregated onsite and managed in accordance with the CPCB Guidelines. Spent Pot Lining waste which is categorized under hazardous waste will be reused in areas of steel making, cement and alternatively will be disposed-off in secured land fill. The design of the secured landfill will be based on CPCB design. The storm water drainage will be carefully designed to collect the run-off water and prevent it from getting it in contact with the waste. The anode butts generated from the pots will be cleaned and recycled in the green anode plant. The waste batteries will be returned back to the supplier and used oil and treated dross will be given to authorized recyclers. The organic portion of solid waste generated in STP will be used as manure in greenbelt development after composting.

As per fly ash Notification, Hindalco will put all efforts to utilize 100% of the ash generated within the nine years from the commissioning of the plant.

#### 4.2.5 Greenbelt Development

Total greenbelt in the project complex will spread over an area of 602 ha including area around ash pond. The greenbelt width of 50-m will be maintained around the plant site. In the proposed greenbelt, about 12,00,000 number of trees will be planted with a density of 2000 trees/ha. Annual budget of Rs.4 crores will be earmarked for social afforestation and related works.



## **5.0 ENVIRONMENTAL MONITORING PROGRAMME**

A detailed post project monitoring in respect of air, water, soil, land use, occupational noise, etc to assess the changes has been evolved covering Constructional Phase and regular Operational Phase. A network of sampling locations around the operational facilities will be established.

The monitoring shall include the compliances to legal and statutory controls imposed on the operation as well as other corporate commitment to responsible environment management. The environment monitoring cell of the integrated complex will be given the charge of the proposed smelter and CPP expansion project.

## **6.0 RISK ASSESSMENT AND DISASTER MANAGEMENT PLAN**

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

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

## **7.0 PROJECT BENEFITS**

The proposed project would enable to meet the growing demand of aluminium. The proposed project will result in improvement of infrastructure as well upliftment of social structure in the area. The people residing in the nearby areas will be benefited directly as well as indirectly.

The major benefit due to the proposed project will be in the sphere of generating temporary employment for substantial number of personnel.

The manpower requirements for the operational phase of the project are about 1495 people. In addition, there will be an indirect employment for skilled/ semi skilled people with implementation of this project.

In order to mitigate the anticipated adverse impacts, if any due to the proposed projects, an action plan covering mitigative measures on environmental and social issues have been developed. The action plan suggests for construction of approach roads to villages and internal roads, primary health centers, community halls, Industrial Training Institute, rainwater harvesting structures, schools and public buildings, provision of provision of water supply, electricity and post offices to the villages, training programmes for self-employment, plantation activities and support to *Anganwadi* and *Balwadi kendras*.



## **8.0 REHABILITATION & RESETTLEMENT ACTION PLANS**

The rehabilitation and resettlement plan is under progress. The plan will be prepared based on the State Government Rehabilitation and Resettlement Policy and National R&R Policy. The best of these policies will be considered during preparation of the plan.

## **9.0 ADMINISTRATIVE ASPECTS OF IMPLEMENTATION OF EMP**

The environmental cell of the smelter and CPP project under implementation will be headed by a senior executive (Head HSE department) having adequate experience and qualification. The department will be the nodal agency to co-ordinate and provides necessary services on environmental issues during construction and operation of the project. This group will be responsible for implementation of Environment Management Plan and interaction with the environmental regulatory agencies, reviewing draft policy and planning. This department will interact with Madhya Pradesh Pollution Control Board (MPPCB), Ministry of Environment and Forests (MoEF), Central Pollution Control Board (CPCB) and other environment regulatory agencies.

## **10.0 CONCLUSIONS**

The proposed smelter and power project has certain level of marginal impacts on the local environment. The employment opportunity would be provided to the local population to the extent possible, based on the need of the project and the qualification.

Thus, it can be concluded that with the judicious and proper implementation of the pollution control and mitigation measures, the proposed project will be beneficial to the society and will help reduce the demand-supply gap of aluminium and will contribute to the economic development of the region in particular and country in general.