

***EVALUATION OF ENVIRONMENTAL PARAMETERS,  
COMPLIANCE AND RELATED ADVICE FOR KATHAUTLA  
OPEN CAST COAL MINE, DALTONGANJ, JHRKHAND***

**(POST MONSOON SEASON & WINTER SEASON)  
(OCTOBER, 2018 TO MARCH, 2019)**

*Prepared*

*For*



**M/s HINDALCO INDUSTRIES LIMITED  
Daltonganj-822101  
Jharkhand**

*Prepared*

*by*



**NATURAL RESOURCES AND ENVIRONMENT MANAGEMENT  
(NREM)  
CSIR-CENTRAL INSTITUTE OF MINING & FUEL RESEARCH  
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**(MAY-2019)**

## **Report**

On

### ***Evaluation of Environmental Parameters, Compliances and Related Advice for Kathautia Open Cast Coal Mine, Daltonganj, Jharkhand***

**(POST-MONSOON & WINTER SEASONS)  
(OCTOBER, 2018 TO MARCH, 2019)**

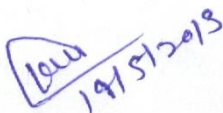
**Project No.: SSP/310/2018-19**

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## **1.0 INTRODUCTION**

Mining is a site specific and ecologically sensitive industry. For sustaining national development, mining of coal and minerals is of paramount importance for developed as well as developing countries. To meet the energy requirements of the country, increased coal production has been possible due to large-scale surface mining activities. Surface mining causes environmental disturbance in the form of land degradation, removal of OB material stress on air and water regime and finally interferes in the balance of the ecosystem. To meet these problems, sound environmental management system for pre-mining, active mining and post mining stages in the form of Environmental Impact Assessment, Environmental Management Practice for concurrent mining and Environmental Audit has been made necessary by the regulating state and central authorities. Regular monitoring of the different components of environment is made necessary for evaluating the requirements of environmental management system and its impact in the society. This report presents such study conducted by CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR), Dhanbad for **Kathautia Open Cast Coal Mine** belonging to **M/S Hindalco Industries Ltd, Daltonganj**.

### **i) LOCATION**

The lease area of KOCCM covers land in villages: Kathautia, Kajari, Garikhas, Palhekhurd, Sakhui, Sikka and Batsara in Patan and Pandwa Blocks of district Palamau (Jharkhand). Kathautia Open Cast Coal Mines (KOCCM), is located in southern boundary of the block is about 10 KM from Daltonganj. The project area is situated between the latitude  $24^{\circ} 07' 02''$  N and  $24^{\circ} 08' 52''$  N and longitude  $84^{\circ} 03' 42''$  E &  $84^{\circ} 06' 52''$  E. The site is well connected by road and 15 km away from Daltonganj. The project came into operation in the year 2008.

M/S Hindalco Industries Ltd, Daltonganj; approached CSIR-Central Institute of Mining and Fuel Research (CSIR-CIMFR), Dhanbad for doing the following work for one year i.e. 2018-2019.

- Environmental study of Air, Water, Soil, Noise, Flora & fauna of the core and buffer zone.
- The Environmental monitoring will be conducted on seasonal basis.
- Advice into the adoption of necessary control measures.
- Preparation of Environmental Statement as stipulated in consent to operate of JSPCB, Ranchi.

The detailed studies with respect to air, water and noise will be carried on seasonal basis in the year 2018-19 while soil samples, for the adjoining mining area, will be collected once in a year and analyzed in the CSIR-CIMFR laboratory.

## **2.0 (i) MINING SCENARIO**

Presently the mine is not in operation. At KOCCM, Pandwa Top & Rajhara B seams have been worked out by opencast mining with shovel and dumper combinations. Shovels of different capacities such as 3.0 cubic meters, 2.7 cubic meters and 2.1 cubic meters are used along with 25 T Volvo Dumpers.

The coal seams in this OCP are as follows:

- |       |                 |    |                       |
|-------|-----------------|----|-----------------------|
| (i)   | Rajhara A seam  | -> | 0.4 – 2.67 mts thick  |
| (ii)  | Rajhara B seam  | -> | 0.42 – 2.60 mts thick |
| (iii) | Pandwa Top seam | -> | 0.25 – 3.11 mts thick |

The average grade of coal is 'B' & 'D'. The open cast mine is worked by Shovel-Dumper combination with an average stripping ratio of 1:9.66. OB was dumped outside the quarry during initial years. Till the bottom most seams are worked out and quarry

benches advance sufficiently, backfilling will be allowed and backfilling of Overburden has already been started.

The working area by opencast method is having the seams Pandwa Top, Rajhara B & Rajhara A. The grades of coal of the seams are mostly found as B & D. The total Block area of this block is approximately 938.27 ha out of which, 687.93 ha is granted for Mining Lease.

## **(ii) REGIONAL GEOLOGY**

The Daltonganj coalfield occupies an elongated area of 250 sq km along a narrow east west trend north of Daltonganj (24° 02' 00"; 84° 04' 00") and falls between latitude 24° 00' 00" and 24° 12' 00" N and longitudes 83° 59' 00" and 84° 15' 00" E. However, the lower Gondwana coal seams underlie only 95 sq km, the Talchir Formation occupying the entire remaining area. Sequence of Karharbari seam is given below:-

### **SEQUENCE OF KARHARBARI COAL SEAMS, DALTONGANJ COALFIELD**

<b>S. N.</b>	<b>Particulars</b>	<b>Thickness range (meters)</b>
1	<i>Major coal seams</i>	
	a) Top cover over Rajhara A seam	10.25 – 44.75
	Rajhara A seam	0.4 – 2.67
	b) Parting cover over Rajhara B seam	4.20 – 15.30
	Rajhara B seam	0.42 – 2.60
	(c) Parting cover over Pandwa Top seam	4.70 – 13.87
	Pandwa Top seam	0.25 – 3.11
2	<i>Gradient of strata (degree)</i>	<i>1 in 22.16 (2° 35' 1.67")</i>
3	Category of excavation :	
	(a) Weathered rock (cat)	
	(b) Overburden rock (cat)	
	(c) Coal (cat)	



### **3.0 ENVIRONMENTAL SCENARIO IN THE MINING AREA**

#### **3.1 AIR ENVIRONMENT**

##### **3.1.1 SOURCES OF AIR POLLUTION**

Coal transportation, OB removal, drilling, blasting, haul road and movements of mining equipments are the major sources of air pollution in the area. Generally, dust generation is of major concern. NO<sub>2</sub> is liberated in the time of blasting and during the movement of mining machineries. This coal contains very less sulphur and as such the concentration of SO<sub>2</sub>. In Indian coal, it is low, except Assam where sulphur content is high.

##### **3.1.2 METHODOLOGY & INSTRUMENTS USED:**

The methodology and instruments used for air quality monitoring and analysis are given in **Table 1** as below:

**Table 1: Methodology and Instrument Used for Air Quality Analysis**

<b>Parameters</b>	<b>Method</b>	<b>Instrument</b>
PM <sub>2.5</sub>	IS-5182 (Part 23):2006 Gravimetric Method Beta attenuation Method	Fine Particulate Sampler
PM <sub>10</sub>	IS-5182 (Part 23):2006 Gravimetric Method Beta attenuation Method	Fine Particulate Sampler / Respirable Dust Sampler (RDS)
SO <sub>2</sub>	IS-5182 (Part 2):2001 (Improved West & Gaeke method)	Fine Particulate Sampler/RDS with gaseous attachment
NO <sub>x</sub>	IS-5182 (Part 6):2006 (Jacob & Hochheiser modified method)	Fine Particulate Sampler/RDS with gaseous attachment

##### **3.1.3 AIR QUALITY**

Air quality monitoring in core and buffer zone of the Kathautia Open Cast mine has been carried out in post-monsoon and winter seasons for the year 2018-19 to assess the impact of mining activities on the ambient air quality. During the study, one sampling location for ambient air quality had been fixed in buffer zone and three in core zone area. Details of sampling stations along with the source of air pollution are given in **Table 2**.

The air quality at these locations is presented from **Tables 3-6**. The results show that the ambient air quality of the villages, in and around the mining site, is least affected as the mine is not in operation during the study period.

**Table 2: Details of Sampling Locations**

Stn. Code	Location	Source of Air Pollution
<b>CORE ZONE</b>		
CA <sub>1</sub>	Near Mine Site Office	Mining activity, Kachha road and vehicular movement.
CA <sub>2</sub>	Near Haul Road	Mining activity and vehicular movement.
CA <sub>3</sub>	Near Stockyard	Mining activity and vehicular movement.
<b>BUFFER ZONE</b>		
BA <sub>1</sub>	R. R. Colony	Household coal burning and vehicular movement, etc.

**Table 3: Ambient Air Quality Report for Core Zone**

Sampling Code	Sampling Location	Season	Date of Sampling	Parameters ( $\mu\text{g}/\text{m}^3$ )				Remarks
				PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	
CA <sub>1</sub>	Near Mine Site Office	Post monsoon	29/11/2018	48.3	77.1	25.4	30.8	
CA <sub>2</sub>	Near Haul Road	Post monsoon	30/11/2018	53.1	80.1	24.5	40.7	
CA <sub>3</sub>	Near Stockyard	Post monsoon	29/11/2018	50.2	77.7	22.3	34.7	
<b>Standards as per NAAQS-2009</b>				<b>60</b>	<b>100</b>	<b>80</b>	<b>80</b>	

**Table 4: Ambient Air Quality Report for Buffer Zone**

Sampling Code	Sampling Location	Season	Date of Sampling	Parameters ( $\mu\text{g}/\text{m}^3$ )				Remarks
				PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	
BA <sub>1</sub>	R. R. Colony	Post monsoon	30/11/2018	46.6	64.5	24.8	26.3	
<b>Standards as per NAAQS-2009</b>				<b>60</b>	<b>100</b>	<b>80</b>	<b>80</b>	

**Table 5: Ambient Air Quality Report for Core Zone**

Sampling Code	Sampling Location	Season	Date of Sampling	Parameters ( $\mu\text{g}/\text{m}^3$ )				Remarks
				PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	
CA <sub>1</sub>	Near Mine Site Office	Winter	28/01/2019	53.2	80.6	25.4	41.4	
			01/04/2019	55.9	88.7	23.8	36.7	
CA <sub>2</sub>	Near Haul Road	Winter	30/01/2019	61.2	109.3	26.5	48.8	
			01/04/2019	54.8	97.8	22.3	40.2	
CA <sub>3</sub>	Near Stockyard	Winter	28/01/2019	56.1	92.0	24.1	42.6	
			31/03/2019	53.7	86.5	21.3	37.7	
<b>Standards as per NAAQS-2009</b>				<b>60</b>	<b>100</b>	<b>80</b>	<b>80</b>	

**Table 6: Ambient Air Quality Report for Buffer Zone**

Sampling Code	Sampling Location	Season	Date of Sampling	Parameters ( $\mu\text{g}/\text{m}^3$ )				Remarks
				PM <sub>2.5</sub>	PM <sub>10</sub>	SO <sub>2</sub>	NO <sub>2</sub>	
BA <sub>1</sub>	R. R. Colony	Winter	29/01/2019	50.1	68.5	26.3	35.8	
<b>Standards as per NAAQS-2009</b>				<b>60</b>	<b>100</b>	<b>80</b>	<b>80</b>	

### 3.1.4 RESULTS AND DISCUSSIONS

#### Post-monsoon Season:

During post-monsoon season PM<sub>2.5</sub> concentration level at Near Mine Office in core zone was found 48.3  $\mu\text{g}/\text{m}^3$  and concentration of PM<sub>10</sub> was found 77.1  $\mu\text{g}/\text{m}^3$ . At Haul Road concentration level of PM<sub>2.5</sub> was 53.1  $\mu\text{g}/\text{m}^3$  and PM<sub>10</sub> was found 80.1  $\mu\text{g}/\text{m}^3$ . Near Stockyard concentration level of PM<sub>2.5</sub> was found 50.2  $\mu\text{g}/\text{m}^3$  and PM<sub>10</sub> was 77.7  $\mu\text{g}/\text{m}^3$ . In the core zone, all the PM<sub>2.5</sub> and PM<sub>10</sub> values are within the threshold value i.e. 60  $\mu\text{g}/\text{m}^3$  for PM<sub>2.5</sub> and 100  $\mu\text{g}/\text{m}^3$  for PM<sub>10</sub> as per the guideline of National Ambient Air Quality Standard (NAAQS), 2009 around the entire sampling site. Concentration of SO<sub>2</sub> and NO<sub>2</sub> are also found within the limit of 80  $\mu\text{g}/\text{m}^3$  as per the guideline of NAAQS, 2009 in all the sampling sites of core zone of the mine.

During post-monsoon season, the PM<sub>2.5</sub> concentration at R. R. Colony in buffer zone was found 46.6 µg/m<sup>3</sup> and the concentration of PM<sub>10</sub> was found 64.5 µg/m<sup>3</sup>. In the buffer zone both the concentration levels are within the threshold value i.e. 60 µg/m<sup>3</sup> for PM<sub>2.5</sub> & 100 µg/m<sup>3</sup> for PM<sub>10</sub> as per the guideline of NAAQS, 2009. Concentration of SO<sub>2</sub> and NO<sub>2</sub> are also found within the limit 80 µg/m<sup>3</sup> as per the guideline of NAAQS, 2009 in all the sampling sites of core zone of the mine.

#### **Winter Season:**

During winter season, PM<sub>2.5</sub> concentration level at Near Mine Office in core zone varies from 53.2 µg/m<sup>3</sup> to 55.9 µg/m<sup>3</sup> and PM<sub>10</sub> from 80.6 µg/m<sup>3</sup> to 88.7 µg/m<sup>3</sup>. At Haul Road concentration level of PM<sub>2.5</sub> varies from 54.8 µg/m<sup>3</sup> to 61.2 µg/m<sup>3</sup> and PM<sub>10</sub> from 97.8 µg/m<sup>3</sup> to 109.3 µg/m<sup>3</sup>. Near Stockyard concentration level of PM<sub>2.5</sub> varies from 53.7 µg/m<sup>3</sup> to 56.1 µg/m<sup>3</sup> and PM<sub>10</sub> from 86.5 µg/m<sup>3</sup> to 92.0 µg/m<sup>3</sup>. In the core zone the PM<sub>2.5</sub> and PM<sub>10</sub> values are within the threshold value i.e. 60 µg/m<sup>3</sup> for PM<sub>2.5</sub> and 100 µg/m<sup>3</sup> for PM<sub>10</sub> as per the guideline of NAAQS around the entire sampling site. Concentration of SO<sub>2</sub> and NO<sub>2</sub> are also found within the limit of 80 µg/m<sup>3</sup> as per the guideline of NAAQS in all the sampling sites of core zone of the mine.

During winter season, the PM<sub>2.5</sub> concentration at R. R. Colony in buffer zone was found 50.1 µg/m<sup>3</sup> and the concentration of PM<sub>10</sub> was found 68.5 µg/m<sup>3</sup>. In the buffer zone both the concentration levels are within the threshold value i.e. 60 µg/m<sup>3</sup> for PM<sub>2.5</sub> & 100 µg/m<sup>3</sup> for PM<sub>10</sub> as per the guideline of NAAQS, 2009. Concentration of SO<sub>2</sub> and NO<sub>2</sub> are also found within the limit 80 µg/m<sup>3</sup> as per the guideline of NAAQS, 2009 in all the sampling sites of core zone of the mine.

## **3.2 WATER ENVIRONMENT**

### **3.2.1. SOURCES OF WATER POLLUTION**

#### **Mine Water**

No adverse impact on surface water is anticipated as the main surface water regime is not proposed to be disturbed except for the drainage having their catchment within the ML area. The mine water, which is mainly rain water and ground water seepage, is used for industrial purposes like dust suppression by water tankers in haul roads, approach roads, stockyards and watering of plants in the overburden dumps & office premises.

#### **Domestic Effluents/Sewage**

There are minimum housing facilities within the ML area for essential services comprising about 100 inhabitants. The domestic wastes from these houses are led to septic tanks. As the domestic waste water is minimum, the possibility of pollution is remote/insignificant. However, proper care has been taken up in the shelters area of inhabitants for sewage discharge.

### **3.2.2 INSTRUMENTS USED**

- a) pH and Conductivity meter
- b) Ion Meter,
- c) COD Analyser,
- d) BOD Analyser,
- e) Water Analysis Kit, (HACH, DR - 2000)
- f) Microwave Digestion
- g) UV-VIS Spectrophotometer (Simazdo)
- h) Atomic Absorption Spectrophotometer (Varian)
- i) Ion Chromatograph (Dionex/Metrohm)
- j) Flame Photometer
- k) ICP-MS (Perkin Elmer)

### **3.2.3 WATER QUALITY OF THE AREA**

To assess the water quality of the area mine water, ground water and surface water were collected and analysed. During the lean periods, mine water is used for water spraying on haul roads, plantation and other mining activities. To assess the water quality of the area water samples from eight locations (Muneswar mine pit water, Bagwania mine pit water, Mistri mine pit water, effluent water from settling pond, hand pump water of R. R. Colony, hand pump water of Batsara village and upstream as well as downstream of Koyal river water to the mine) were collected during post monsoon season. The analysis was carried out in the field as well as CSIR-CIMFR Laboratory and results are presented from **Tables 7 to 12.**

#### **Post-monsoon Season:**

During post-monsoon season, water quality of nearby hand pumps of the mine show that there is no significant impact of mining on water quality of the region. Total suspended solids (TSS), Total dissolve solids (TDS), Oil & Grease, Chemical oxygen demand (COD), anions, cations, trace metals and other parameters are found within their respective threshold limits of drinking water standard IS:10500 (2012). The TDS values in the water samples of Kajari and Batsara villages are also lower than their desirable limit of 500mg/l. The alkalinity and total hardness values at Kajari and Batsara villages are slightly higher than their acceptable limit of 200mg/l but lower than the permissible limit in the absence of alternate value of 600mg/l. The water quality of all the mine pit collected also does not show any high value as it remains within the pit, where the contaminants settle before the mine water used for industrial purposes. The mine water quality is well within the prescribed limit of MoEF&CC Schedule-VI standard. As far as Koyal river water is concerned, its quality shows its acceptability as is not affected by Kathautia mine effluents. The level of TSS, TDS and Dissolve oxygen (DO) in the river water were found within threshold limit during post monsoon season in comparison to standard IS:2296, surface waters Class-C.

**Winter Season:**

During winter season, water quality of nearby hand pumps of the mine show that there is no significant impact of mining on water quality of the region. TSS, TDS, Oil & Grease, COD, anions, cations, trace metals and other parameters are found within their respective threshold limits of drinking water standard IS:10500 (2012). The TDS values in the water samples of Kajari and Batsara villages are also lower than their desirable limit of 500mg/l. The alkalinity and total hardness values at Kajari and Batsara villages are slightly higher than their acceptable limit of 200mg/l but lower than the permissible limit in the absence of alternate value of 600mg/l. The water quality of all the mine pit collected also does not show any high value as it remains within the pit, where the contaminants settle before the mine water used for industrial purposes. The mine water quality is well within the prescribed limit of MoEF&CC Schedule-VI standard. As far as Koyal river water is concerned, its quality shows its acceptability as is not affected by Kathautia mine effluents. The level of TSS, TDS and DO in the river water were found within threshold limit during winter season in comparison to standard IS:2296, surface waters Class-C.

**Table 7: Mine Discharge Water Quality Data**

<b>Area: Core Zone</b>	<b>Season: Post-monsoon</b>
<b>Project: Kathautia OC Mine</b>	<b>Date of Sampling: 01.12.2018</b>
<b>Name of the Sampling Station:</b>	
<b>W<sub>1</sub>- Muneswar Mine Pit Water</b>	<b>W<sub>2</sub>- Effluent water from Settling Pond No.-2</b>
<b>W<sub>3</sub>- Bagwania Mine Pit Water</b>	<b>W<sub>4</sub>- Mistri Mine Pit Water</b>

Sl. No.	Parameters	Station Code				MoEF Sch.-VI Standard
		W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	
1.	Colour, Hazen units, Max	<5	<5	<5	<5	5
2.	Odour	#	#	#	#	#
3.	Total suspended solids, mg/l, Max	42	22	38	28	100
4.	pH	7.96	7.18	8.15	8.31	6.5-8.5
5.	Temperature (°C)	20.4	20.7	20.3	20.5	\$
6.	Oil & Grease, mg/l, Max	1.2	0.3	0.9	0.8	10
7.	BOD (3days at 27°C), mg/l, Max	1.2	0.8	2.0	1.6	30
8.	COD, mg/l, Max	33.0	26.0	42.0	30.5	250
9.	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max	<0.001	<0.001	<0.001	<0.001	1.0
10.	Arsenic (as AS), mg/l, Max	<0.001	<0.001	<0.001	<0.001	0.2
11.	Lead (as Pb), mg/l, Max	<0.001	<0.001	<0.001	<0.001	0.1
12.	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	<0.001	<0.001	2.0
13.	Hexavalent Chromium (as Cr <sup>6+</sup> ), mg/l, Max	0.004	0.003	0.003	0.002	0.1
14.	Total Chromium (as Cr), mg/l, Max	0.006	0.004	0.005	0.004	2.0
15.	Copper (as Cu), mg/l, Max	<0.001	<0.001	<0.001	<0.001	3.0
16.	Zinc (as Zn), mg/l, Max	0.002	0.002	0.001	0.002	5.0
17.	Selenium (as Se), mg/l, Max	<0.001	<0.001	<0.001	<0.001	0.05
18.	Nickel (as Ni), mg/l, Max	0.004	0.003	0.002	0.005	3.0
19.	Fluorides (as F), mg/l, Max	0.91	0.65	0.98	1.11	2.0
20.	Dissolved Phosphate (as P), mg/l, Max	<0.1	<0.1	<0.1	<0.1	5.0
21.	Manganese (as Mn), mg/l, Max	0.002	0.003	0.002	0.002	2.0
22.	Iron (as Fe), mg/l, Max	0.624	0.431	0.613	0.583	3.0
23.	Nitrate (as N), mg/l, Max	3.45	3.88	0.22	0.36	10

# Unobjectionable

\$: Temperature shall not exceed 5°C above the receiving water temp.



**Table 8: Ground Water Quality Data**

<b>Area: Core Zone/Buffer Zone</b>	<b>Season: Post-monsoon</b>
<b>Project: Kathautia OC Mine</b>	<b>Date of Sampling: 30.11.2018</b>
<b>Name of the Sampling Station:</b>	
<b>W<sub>5</sub> - Hand Pump Water, Kajari Village;</b>	<b>W<sub>6</sub> - Hand Pump Water, Batsara Village;</b>

Sl. No.	Parameters	Station Code		IS-10500: 2012	
		W <sub>5</sub>	W <sub>6</sub>	Acceptable Limit	Permissible Limit in the Absence of Alternate
1	Colour, Hazen units, Max	<5	<5	5	15
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity, NTU, Max	0.92	0.86	1.0	5.0
5	pH	7.10	6.95	6.5-8.5	No relaxation
6	Total Hardness (as CaCO <sub>3</sub> )	264	296	200	600
7	Iron (as Fe), mg/l, Max	1.211	0.936	0.3	No relaxation
8	Chloride (as Cl <sup>-</sup> ), mg/l, Max	10.0	8.0	250	1000
9	Total Dissolved Solid, mg/l, Max	378	457	500	2000
10	Calcium (as Ca), mg/l, Max	67.3	50.5	75	200
11	Magnesium (as Mg), mg/l, Max	23.3	41.3	30	100
12	Manganese (as Mn), mg/l, Max	0.006	0.062	0.10	0.30
13	Sulphates (as SO <sub>4</sub> <sup>2-</sup> ), mg/l, Max	7.2	6.3	200	400
14	Nitrate (as NO <sub>3</sub> ), mg/l, Max	10.75	1.16	45	No relaxation
15	Fluorides (as F), mg/l, Max	0.59	0.97	1.0	1.5
16	Arsenic (as AS), mg/l, Max	<0.001	<0.001	0.01	0.05
17	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	0.003	No relaxation
18	Lead (as Pb), mg/l, Max	<0.001	<0.001	0.01	No relaxation
19	Copper (as Cu), mg/l, Max	0.002	0.002	0.05	1.5
20	Hexavalent Chromium (as Cr <sup>6+</sup> ), mg/l, Max	0.005	0.006	0.05	No relaxation
21	Selenium (as Se), mg/l, Max	<0.001	<0.001	0.01	No relaxation
22	Silver (as Ag), mg/l, Max	<0.001	<0.001	-	-
23	Zinc (as Zn), mg/l, Max	0.007	1.021	5	15
24	Total Alkalinity, mg/l, Max	204	272	200	600
25	Mineral Oil, mg/l, Max	<0.001	<0.001	0.001	-

**Table 9: Surface Water Quality Data**

<b>Area: Buffer Zone</b>	<b>Season: Post-monsoon</b>
<b>Project: Kathautia OC Mine</b>	<b>Date of Sampling: 01.12.2018</b>
<b>Name of the Sampling Station:</b>	
<b>W<sub>7</sub> - Koyal River water, U/S of Mine;</b>	<b>W<sub>8</sub> - Koyal River water, D/S of Mine;</b>

Sl. No.	Parameters	Station Code		(IS: 2296)# Surface Waters Class "C" Tolerance Limits
		W <sub>7</sub>	W <sub>8</sub>	
1	Colour, Hazen units, Max	<5	<5	300
2	Odour	Unobjectionable	Unobjectionable	Unobjectionable
3	Dissolved Oxygen, mg/l, Min.	7.6	4.4	4
4	pH	7.87	8.27	6.5-8.5
5	BOD (3days at 27°C), mg/l, Max	1.6	0.8	3
6	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max	<0.001	<0.001	0.005
7	Total Hardness (as CaCO <sub>3</sub> ), mg/l, Max	116	124	NS
8	Iron (as Fe), mg/l, Max	0.27	0.35	50
9	Chloride (as Cl <sup>-</sup> ), mg/l, Max	8.0	10.0	600
10	Total Dissolved Solid, mg/l, Max	158	181	1500
11	Calcium (as Ca), mg/l, Max	11.8	15.1	NS
12	Magnesium (as Mg), mg/l, Max	21.0	20.9	NS
13	Manganese (as Mn), mg/l, Max	0.001	0.001	NS
14	Sulphates (as SO <sub>4</sub> <sup>2-</sup> ), mg/l, Max	9.50	9.81	400
15	Nitrate (as NO <sub>3</sub> <sup>-</sup> ), mg/l, Max	2.28	0.61	50
16	Fluorides (as F), mg/l, Max	0.61	0.78	1.5
17	Arsenic (as AS), mg/l, Max	<0.001	<0.001	0.2
18	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	0.01
19	Lead (as Pb), mg/l, Max	<0.001	<0.001	0.1
20	Copper (as Cu), mg/l, Max	<0.001	<0.001	1.5
21	Hexavalent Chromium (as Cr <sup>6+</sup> ), mg/l, Max	<0.001	<0.001	0.05
22	Selenium (as Se), mg/l, Max	<0.001	<0.001	0.05
23	Zinc (as Zn), mg/l, Max	0.002	0.001	15

# : Class "C"- Drinking water source with conventional treatment followed by disinfection.  
NS: Not Specified

**Table 10: Mine Discharge Water Quality Data**

<b>Area: Core Zone</b>	<b>Season: Winter</b>
<b>Project: Kathautia OC Mine</b>	<b>Date of Sampling: 31.03.2019</b>
<b>Name of the Sampling Station:</b>	
<b>W<sub>1</sub>- Muneswar Mine Pit Water</b>	<b>W<sub>2</sub>- Effluent water from Settling Pond No.-2</b>
<b>W<sub>3</sub>- Bagwania Mine Pit Water</b>	<b>W<sub>4</sub>- Mistri Mine Pit Water</b>

Sl. No.	Parameters	Station Code				MoEF Sch.-VI Standard
		W <sub>1</sub>	W <sub>2</sub>	W <sub>3</sub>	W <sub>4</sub>	
1.	Colour, Hazen units, Max	<5	<5	<5	<5	5
2.	Odour	#	#	#	#	#
3.	Total suspended solids, mg/l, Max	54	28	42	48	100
4.	pH	7.58	8.26	7.70	8.10	6.5-8.5
5.	Temperature (°C)	23.8	23.7	23.5	23.7	\$
6.	Oil & Grease, mg/l, Max	1.0	0.4	0.8	1.2	10
7.	BOD (3days at 27°C), mg/l, Max	3.8	1.2	4.6	3.8	30
8.	COD, mg/l, Max	39.0	21.0	45.0	36.5	250
9.	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max	<0.001	<0.001	<0.001	<0.001	1.0
10.	Arsenic (as AS), mg/l, Max	<0.001	<0.001	<0.001	<0.001	0.2
11.	Lead (as Pb), mg/l, Max	<0.001	<0.001	<0.001	<0.001	0.1
12.	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	<0.001	<0.001	2.0
13.	Hexavalent Chromium (as Cr <sup>6+</sup> ), mg/l, Max	0.005	0.002	0.004	0.003	0.1
14.	Total Chromium (as Cr), mg/l, Max	0.006	0.003	0.005	0.005	2.0
15.	Copper (as Cu), mg/l, Max	<0.001	<0.001	<0.001	<0.001	3.0
16.	Zinc (as Zn), mg/l, Max	0.003	0.001	0.002	0.004	5.0
17.	Selenium (as Se), mg/l, Max	<0.001	<0.001	<0.001	<0.001	0.05
18.	Nickel (as Ni), mg/l, Max	0.004	0.003	0.005	0.004	3.0
19.	Fluorides (as F), mg/l, Max	0.61	0.94	0.89	0.93	2.0
20.	Dissolved Phosphate (as P), mg/l, Max	<0.1	<0.1	<0.1	<0.1	5.0
21.	Manganese (as Mn), mg/l, Max	0.003	0.002	0.003	0.001	2.0
22.	Iron (as Fe), mg/l, Max	0.612	0.328	0.603	0.561	3.0
23.	Nitrate (as N), mg/l, Max	2.83	0.81	0.49	0.23	10

# Unobjectionable

§: Temperature shall not exceed 5°C above the receiving water temp.

**Table 11: Ground Water Quality Data**

<b>Area: Core Zone/Buffer Zone</b>	<b>Season: Winter</b>
<b>Project: Kathautia OC Mine</b>	<b>Date of Sampling: 31.03.2019</b>
<b>Name of the Sampling Station:</b>	
<b>W<sub>5</sub> - Hand Pump Water, Kajari Village;</b>	<b>W<sub>6</sub> - Hand Pump Water, Batsara Village;</b>

Sl. No.	Parameters	Station Code		IS-10500: 2012	
		W <sub>5</sub>	W <sub>6</sub>	Acceptable Limit	Permissible Limit in the Absence of Alternate
1	Colour, Hazen units, Max	<5	<5	5	15
2	Odour	Agreeable	Agreeable	Agreeable	Agreeable
3	Taste	Agreeable	Agreeable	Agreeable	Agreeable
4	Turbidity, NTU, Max	0.78	0.71	1.0	5.0
5	pH	7.10	7.23	6.5-8.5	No relaxation
6	Total Hardness (as CaCO <sub>3</sub> )	292	272	200	600
7	Iron (as Fe), mg/l, Max	1.125	0.876	0.3	No relaxation
8	Chloride (as Cl <sup>-</sup> ), mg/l, Max	10.14	5.96	250	1000
9	Total Dissolved Solid, mg/l, Max	390	370	500	2000
10	Calcium (as Ca), mg/l, Max	85.7	82.4	75	200
11	Magnesium (as Mg), mg/l, Max	18.9	16.1	30	100
12	Manganese (as Mn), mg/l, Max	0.007	0.054	0.10	0.30
13	Sulphates (as SO <sub>4</sub> <sup>2-</sup> ), mg/l, Max	10.14	5.96	200	400
14	Nitrate (as NO <sub>3</sub> <sup>-</sup> ), mg/l, Max	10.99	12.65	45	No relaxation
15	Fluorides (as F), mg/l, Max	0.56	0.98	1.0	1.5
16	Arsenic (as AS), mg/l, Max	<0.001	<0.001	0.01	0.05
17	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	0.003	No relaxation
18	Lead (as Pb), mg/l, Max	<0.001	<0.001	0.01	No relaxation
19	Copper (as Cu), mg/l, Max	0.003	0.002	0.05	1.5
20	Hexavalent Chromium (as Cr <sup>6+</sup> ), mg/l, Max	0.006	0.007	0.05	No relaxation
21	Selenium (as Se), mg/l, Max	<0.001	<0.001	0.01	No relaxation
22	Silver (as Ag), mg/l, Max	<0.001	<0.001	-	-
23	Zinc (as Zn), mg/l, Max	0.012	1.113	5	15
24	Total Alkalinity, mg/l, Max	260	262	200	600
25	Mineral Oil, mg/l, Max	<0.001	<0.001	0.001	-

**Table 12: Surface Water Quality Data**

<b>Area: Buffer Zone</b>	<b>Season: Winter</b>
<b>Project: Kathautia OC Mine</b>	<b>Date of Sampling: 31.03.2019</b>
<b>Name of the Sampling Station:</b>	
<b>W<sub>7</sub> - Koyal River water, U/S of Mine;</b>	<b>W<sub>8</sub> - Koyal River water, D/S of Mine;</b>

Sl. No.	Parameters	Station Code		(IS: 2296)# Surface Waters Class "C" Tolerance Limits
		W <sub>7</sub>	W <sub>8</sub>	
1	Colour, Hazen units, Max	<5	<5	300
2	Odour	Unobjectionable	Unobjectionable	Unobjectionable
3	Dissolved Oxygen, mg/l, Min.	7.8	9.0	4
4	pH	7.99	7.87	6.5-8.5
5	BOD (3days at 27°C), mg/l, Max	3.8	2.4	3
6	Phenolic compounds (as C <sub>6</sub> H <sub>5</sub> OH), mg/l, Max	<0.001	<0.001	0.005
7	Total Hardness (as CaCO <sub>3</sub> ), mg/l, Max	132	140	NS
8	Iron (as Fe), mg/l, Max	0.24	0.32	50
9	Chloride (as Cl <sup>-</sup> ), mg/l, Max	6.84	6.91	600
10	Total Dissolved Solid, mg/l, Max	208	204	1500
11	Calcium (as Ca), mg/l, Max	40.37	37.00	NS
12	Magnesium (as Mg), mg/l, Max	7.58	11.57	NS
13	Manganese (as Mn), mg/l, Max	0.001	<0.001	NS
14	Sulphates (as SO <sub>4</sub> <sup>2-</sup> ), mg/l, Max	9.98	9.97	400
15	Nitrate (as NO <sub>3</sub> ), mg/l, Max	1.41	1.92	50
16	Fluorides (as F), mg/l, Max	0.61	0.58	1.5
17	Arsenic (as AS), mg/l, Max	<0.001	<0.001	0.2
18	Cadmium (as Cd), mg/l, Max	<0.001	<0.001	0.01
19	Lead (as Pb), mg/l, Max	<0.001	<0.001	0.1
20	Copper (as Cu), mg/l, Max	<0.001	<0.001	1.5
21	Hexavalent Chromium (as Cr <sup>6+</sup> ), mg/l, Max	<0.001	<0.001	0.05
22	Selenium (as Se), mg/l, Max	<0.001	<0.001	0.05
23	Zinc (as Zn), mg/l, Max	0.002	<0.001	15

# : Class "C"- Drinking water source with conventional treatment followed by disinfection.  
NS: Not Specified

### **3.3 NOISE ENVIRONNENT**

Noise is undesirable and unpleasant sound produced by the vibration of bodies or molecules of the medium and propagates as a pressure perturbation. It disturbs man's work, sleep and communication. It damages hearing and evokes other physiological reactions. Mining is the third largest industry in terms of employment and the recent trends of mechanization has changed the working environment to noisy environment leading to higher sound levels.

#### **3.3.1 SOURCES OF NOISE**

Noise produced at different levels by different equipments in the open cast mine are summarized in the **Table 13**.

**Table 13: Noise Generating Mining Equipments**

<b>S. N.</b>	<b>Equipment / Operation</b>	<b>Noise level dB(A)</b>
1.	Feeder breaker	82-100
2.	Dumpers	100-115
3.	Shovels	80-107
4.	Dozers	84-107
5.	Front End loader	83-101
6.	Electric motors, gear drivers, hoppers, drilling & main pump	85-95
7.	Belt conveyer	90-92
8.	Drill	110-115

Noise level study at Kathautia Open Cast Coal Mine was carried out in buffer as well as core zone. Five noise level monitoring locations in core zone and two noise level monitoring locations in buffer zone were fixed-up and get representative values during post-monsoon season.

#### **3.3.2 INSTRUMENTS USED**

Sound level study is carried by using Mip-oy Integrated Sound Level Meter Meeting IEC-179A measuring average peak and Low values in Day and Night time.

#### **3.3.3 RESULTS & DISCUSSION**

Results are shown from **Table 14** to **19** for ambient noise levels of core and buffer zones during post-monsoon season. The average peak values at the nearby villages are found well below the standard values of 55 & 45 dB (A) for day & Night. In core zone

maximum noise levels and average noise levels are also well within the prescribed limit of 75 & 70 dB (A) for Day & Night respectively.

**Table 14: Noise Level in Core Zone of the Study Area (November, 2018)**

Date of Sampling:		Noise level dB(A) average					
28.11.2018 to 30.11.2018		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N <sub>1</sub>	Near Mine Office	38.2	65.4	52.5	35.9	57.7	43.2
N <sub>2</sub>	Coal Face	36.2	62.5	53.4	35.5	54.3	42.2
N <sub>3</sub>	Near OB dump	36.0	61.2	51.3	35.4	55.0	41.5
N <sub>4</sub>	Stockyard	36.6	62.6	53.2	36.4	55.2	42.3
N <sub>5</sub>	Haul Road	37.0	66.9	57.4	36.0	59.8	48.2
Standards as per CPCB		75			70		

**Table 15: Noise Level in Buffer Zone of the Study Area (November, 2018)**

Date of Sampling:		Noise level dB(A) average					
28.11.2018 to 30.11.2018		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N <sub>6</sub>	R. R. Colony	36.2	59.8	48.6	35.2	48.4	43.2
N <sub>7</sub>	Batsara Village	35.6	57.2	46.2	34.0	47.2	40.0
Standards as per CPCB		55			45		

**Table 16: Noise Level in Core Zone of the Study Area (January, 2019)**

Date of Sampling:		Noise level dB(A) average					
28.01.2019 to 31.01.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N <sub>1</sub>	Near Mine Office	37.4	68.2	55.8	36.2	60.3	46.8
N <sub>2</sub>	Coal Face	36.5	64.2	54.1	35.1	58.2	44.0
N <sub>3</sub>	Near OB dump	36.2	61.0	51.1	35.2	56.2	42.4
N <sub>4</sub>	Stockyard	36.4	64.7	53.8	36.6	55.7	43.5
N <sub>5</sub>	Haul Road	37.3	69.5	58.2	36.5	62.4	49.2
Standards as per CPCB		75			70		

**Table 17: Noise Level in Buffer Zone of the Study Area (January, 2019)**

Date of Sampling:		Noise level dB(A) average					
28.01.2019 to 31.01.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N <sub>6</sub>	R. R. Colony	36.5	62.2	50.5	35.5	51.8	42.7
N <sub>7</sub>	Batsara Village	35.2	59.4	47.3	34.5	46.6	41.2
<b>Standards as per CPCB</b>		<b>55</b>			<b>45</b>		

**Table 18: Noise Level in Core Zone of the Study Area (March-April, 2019)**

Date of Sampling:		Noise level dB(A) average					
31.03.2019 to 03.04.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N <sub>1</sub>	Near Mine Office	36.8	70.1	54.5	35.5	59.8	45.2
N <sub>2</sub>	Coal Face	36.0	65.1	52.6	35.2	56.6	42.6
N <sub>3</sub>	Near OB dump	36.5	62.5	52.2	35.0	55.8	42.5
N <sub>4</sub>	Stockyard	36.6	66.5	54.7	36.1	59.9	45.1
N <sub>5</sub>	Haul Road	36.9	70.8	59.5	36.4	61.0	49.8
<b>Standards as per CPCB</b>		<b>75</b>			<b>70</b>		

**Table 19: Noise Level in Buffer Zone of the Study Area (March-April, 2019)**

Date of Sampling:		Noise level dB(A) average					
31.03.2019 to 03.04.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N <sub>6</sub>	R. R. Colony	36.1	63.5	51.7	35.8	52.6	42.5
N <sub>7</sub>	Batsara Village	35.0	58.7	46.0	34.4	46.9	41.2
<b>Standards as per CPCB</b>		<b>55</b>			<b>45</b>		

#### **4.0 CONCLUSION**

On the basis of the data generated it has been found that the environmental scenario in and around mining area of Kathautia Open Cast Mine with respect to air, water and noise are well within the permissible limits during post monsoon and winter seasons.



## **5.0 RECOMMENDATIONS & FOLLOW-UP ACTION**

The study indicates that air quality around the Kathautia Open Cast Coal Mine is found to be within the threshold limit as per the guideline of NAAQS, 2009. Water quality of the surrounding water resources are also not found polluted by mine effluent. For the best practice of coal mining in future, Environmental Management System should always be considered with following measures:

- ✓ Frequency of spraying of water on the haul roads for controlling the dust to its minimum level may be increased.
- ✓ Regular maintenance of the heavy earth moving machines.
- ✓ Mine water collection in settling tank before its discharge.
- ✓ Garland drainage should be made around the dumps.
- ✓ Reclamation and revegetation of overburden dumps should be done to control soil erosion, denudation of agricultural land and nearby riverine system, wetlands and to improves the aesthetics of the area.
- ✓ Dumps brought under biological reclamation should not be made active.
- ✓ The mine management has been implementing, these measures to make mining operation eco-friendly in this coal mine of M/s Hindalco Industries Ltd, Daltonganj, Jharkhand.