

**ENVIRONMENTAL QUALITY MONITORING, MITIGATIVE
MEASURES AND RELATED ADVICE FOR KATHAUTLA
OPEN CAST COAL MINE, DALTONGANJ, JHRKHAND**

**(SUMMER & MONSOON SEASON)
(APRIL, 2019 TO SEPTEMBER, 2019)**

Prepared

For



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

Prepared

by



**WATER RESOURCE MANAGEMENT
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Report

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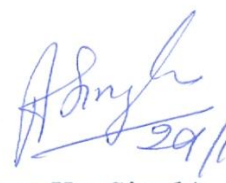
Environmental Quality Monitoring, Mitigative Measures and Related Advice for Kathautia Open Cast Coal Mine, Daltonganj, Jhrkhand

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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. 2019-2020.

- 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 2019-20 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

S. N.	Particulars	Thickness range (meters)
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. NO₂ 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 SO₂. 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

Parameters	Method	Instrument
PM _{2.5}	IS-5182 (Part 23):2006 Gravimetric Method Beta attenuation Method	Fine Particulate Sampler
PM ₁₀	IS-5182 (Part 23):2006 Gravimetric Method Beta attenuation Method	Fine Particulate Sampler / Respirable Dust Sampler (RDS)
SO ₂	IS-5182 (Part 2):2001 (Improved West & Gaeke method)	Fine Particulate Sampler/RDS with gaseous attachment
NO _x	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 summer season for the year 2019-20 to assess the impact of mining activities on the ambient air quality. During the study, two sampling locations 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 3-4**. 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
CORE ZONE		
CA ₁	Near Mine Site Office	Mining activity, Kachha road and vehicular movement.
CA ₂	Near Haul Road	Mining activity and vehicular movement.
CA ₃	Near Stockyard	Mining activity and vehicular movement.
BUFFER ZONE		
BA ₁	R. R. Colony	Household coal burning and vehicular movement, etc.
BA ₂	Batsara Village	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 _{2.5}	PM ₁₀	SO ₂	NO ₂	
CA ₁	Near Mine Site Office	Summer	29/06/2019	51.8	67.8	21.9	41.8	
CA ₂	Near Haul Road	Summer	25/06/2019	43.4	74.1	23.4	43.1	
CA ₃	Near Stockyard	Summer	27/06/2019	58.3	76.9	24.9	42.1	
Standards as per NAAQS-2009				60	100	80	80	

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 _{2.5}	PM ₁₀	SO ₂	NO ₂	
BA ₁	R. R. Colony	Summer	28/06/2019	44.5	54.4	27.4	34.7	Light rain
BA ₂	Batsara Village	Summer	26/06/2019	30.8	69.0	24.7	28.2	
Standards as per NAAQS-2009				60	100	80	80	

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 _{2.5}	PM ₁₀	SO ₂	NO ₂	
CA ₁	Near Mine Site Office	Monsoon	23/07/2019	42.2	62.3	13.2	18.5	
CA ₂	Near Haul Road	Monsoon	24/07/2019	41.5	57.0	14.8	16.2	
CA ₃	Near Stockyard	Monsoon	24/07/2019	44.6	54.3	13.7	15.6	
Standards as per NAAQS-2009				60	100	80	80	

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 _{2.5}	PM ₁₀	SO ₂	NO ₂	
BA ₁	R. R. Colony	Monsoon	25/07/2019	33.6	52.6	14.8	16.4	Light rain
BA ₂	Batsara Village	Monsoon	25/07/2019	36.6	50.1	13.2	15.8	
Standards as per NAAQS-2009				60	100	80	80	

3.1.4 RESULTS AND DISCUSSIONS

During summer season PM_{2.5} concentration level at Near Mine Office in core zone was found 51.8 µg/m³ and concentration of PM₁₀ was found 67.8 µg/m³. At Haul Road concentration level of PM_{2.5} was 43.4 µg/m³ and PM₁₀ was found 74.1 µg/m³. Near Stockyard concentration level of PM_{2.5} was found 58.3 µg/m³ and PM₁₀ was 76.9 µg/m³. In the core zone, all the PM_{2.5} and PM₁₀ values are within the threshold value i.e. 60 µg/m³ for PM_{2.5} and 100 µg/m³ for PM₁₀ as per the guideline of National Ambient Air Quality Standard (NAAQS), 2009 around the entire sampling site. Concentration of SO₂ and NO₂ are also found within the limit of 80 µg/m³ as per the guideline of NAAQS, 2009 in all the sampling sites of core zone of the mine.

During summer season, the PM_{2.5} concentration at R. R. Colony in buffer zone was found 44.5 µg/m³ and the concentration of PM₁₀ was found 54.4 µg/m³. At Batsara Village, the PM_{2.5} concentration was found 30.8 µg/m³ and the concentration of PM₁₀ was found 69.0 µg/m³. In the buffer zone both the concentration levels are within the threshold value i.e. 60 µg/m³ for PM_{2.5} & 100 µg/m³ for PM₁₀ as per the guideline of NAAQS, 2009. Concentration of SO₂ and NO₂ are also found within the limit 80 µg/m³ as per the guideline of NAAQS, 2009 in all the sampling sites of core zone of the mine.

During monsoon season PM_{2.5} concentration level at Near Mine Office in core zone was found 42.2 µg/m³ and concentration of PM₁₀ was found 62.3 µg/m³. At Haul Road concentration level of PM_{2.5} was 41.5 µg/m³ and PM₁₀ was found 57.0 µg/m³. Near Stockyard concentration level of PM_{2.5} was found 44.6 µg/m³ and PM₁₀ was 54.3 µg/m³. In the core zone, all the PM_{2.5} and PM₁₀ values are within the threshold value i.e. 60 µg/m³ for PM_{2.5} and 100 µg/m³ for PM₁₀ as per the guideline of National Ambient Air Quality Standard (NAAQS), 2009 around the entire sampling site. Concentration of SO₂ and NO₂ are also found within the limit of 80 µg/m³ as per the guideline of NAAQS, 2009 in all the sampling sites of core zone of the mine.

During monsoon season, the PM_{2.5} concentration at R. R. Colony in buffer zone was found 33.6 µg/m³ and the concentration of PM₁₀ was found 52.6 µg/m³. At Batsara Village, the PM_{2.5} concentration was found 36.6 µg/m³ and the concentration of PM₁₀ was found 50.1 µg/m³. In the buffer zone both the concentration levels are within the threshold value i.e. 60 µg/m³ for PM_{2.5} & 100 µg/m³ for PM₁₀ as per the guideline of NAAQS, 2009. Concentration of SO₂ and NO₂ are also found within the limit 80 µg/m³ 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 (Pit-A mine pit water, Pit-B mine pit water, Pit-C mine pit water, Pit-D mine pit water, hand pump water of R. R. Colony/Kajari Village, tube well water of Batsara village and upstream as well as downstream of Koyal river water to the mine site) were collected during summer and monsoon seasons. The analysis was carried out in the field as well as CSIR-CIMFR Laboratory and results are presented from **Table 7** to **Table 11**.

Water quality of nearby well and tube well show that there is no significant impact of mining on water quality of region. TSS, TDS, Oil & Grease, COD, trace metals and other parameters are found within their respective threshold limits. During summer season the TDS value in the sample of R. R. Colony is lower than acceptable limit of 500mg/l but in the sample of Batsara village, TDS value is lower than the permissible limit in the absence of alternate sources i.e 2000mg/l. The alkalinity value at R. R. colony and Batsara village is slightly higher than the acceptable limit 200mg/l while lower than the permissible limit in the absence of alternate sources of 600mg/l. The mine water quality of all the pits 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 MoEFCC Schedule-VI standard.

During monsoon season the TDS value in the sample of R. R. Colony is lower than acceptable limit of 500mg/l but in the sample of Batsara village, TDS value is lower than the permissible limit in the absence of alternate sources i.e 2000mg/l. The alkalinity value at

R. R. colony and Batsara village is slightly higher than the acceptable limit 200 mg/l while lower than the permissible limit in the absence of alternate sources of 600 mg/l. The concentration of Calcium at the samples at R. R. colony and Batsara village are slightly higher than the acceptable limit 75 mg/l while lower than the permissible limit in the absence of alternate sources of 200 mg/l. The mine water quality of all the pits 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 MoEFCC 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 in comparison to IS:2296, surface waters Class-C.

Table 7: Mine Discharge Water Quality Data

Area: Core Zone	Season: Summer
Project: Kathautia OC Mine	Date of Sampling: 29.06.2019
Name of the Sampling Station:	
W₁- Pit-A Mine Water	W₂- Pit-B Mine Water
W₃- Pit-C Mine Water	W₄- Pit-D Mine Water

Sl. No.	Parameters	Station Code				MoEF Sch.-VI Standard
		W ₁	W ₂	W ₃	W ₄	
1.	Colour, Hazen units, Max	<5	<5	<5	<5	5
2.	Odour	#	#	#	#	#
3.	Total suspended solids, mg/l, Max	45	43	58	54	100
4.	pH	8.05	8.25	7.64	8.05	6.5-8.5
5.	Temperature (°C)	28.1	28.2	28.0	28.1	\$
6.	Oil & Grease, mg/l, Max	1.6	1.3	1.2	1.6	10
7.	BOD (3days at 27°C), mg/l, Max	1.6	2.6	0.8	2.6	30
8.	COD, mg/l, Max	32.6	38.0	45.0	35.0	250
9.	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	<0.001	1.0
10.	Arsenic (as AS), mg/l, Max	0.002	<0.001	0.003	<0.001	0.2
11.	Lead (as Pb), mg/l, Max	0.003	<0.001	0.002	<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 ⁶⁺), mg/l, Max	0.004	0.002	0.005	0.004	0.1
14.	Total Chromium (as Cr), mg/l, Max	0.005	0.004	0.003	0.006	2.0
15.	Copper (as Cu), mg/l, Max	0.004	0.006	<0.001	0.003	3.0
16.	Zinc (as Zn), mg/l, Max	0.006	0.005	0.004	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	0.006	0.004	0.005	0.005	3.0
19.	Fluorides (as F), mg/l, Max	1.36	1.03	1.08	1.63	2.0
20.	Dissolved Phosphate (as P), mg/l, Max	<0.1	0.3	<0.1	0.3	5.0
21.	Manganese (as Mn), mg/l, Max	0.010	0.002	0.006	0.005	2.0
22.	Iron (as Fe), mg/l, Max	0.455	0.356	0.556	0.476	3.0
23.	Nitrate (as N), mg/l, Max	0.47	0.47	0.55	0.89	10

Unobjectionable

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

Table 8: Ground Water Quality Data

Area: Core Zone/Buffer Zone	Season: Summer
Project: Kathautia OC Mine	Date of Sampling: 29.06.2019
Name of the Sampling Station:	
W₅ - Hand Pump Water, R. R. Colony/Kajari Village	W₆ - Hand Pump Water, Batsara Village

Sl. No.	Parameters	Station Code		IS-10500: 2012	
		W ₅	W ₆	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	0.65	0.78	1.0	5.0
5	pH	6.91	6.94	6.5-8.5	No relaxation
6	Total Hardness (as CaCO ₃)	320	356	200	600
7	Iron (as Fe), mg/l, Max	0.85	0.466	0.3	No relaxation
8	Chloride (as Cl ⁻), mg/l, Max	41.98	39.98	250	1000
9	Total Dissolved Solid, mg/l, Max	460	584	500	2000
10	Calcium (as Ca), mg/l, Max	65.6	75.7	75	200
11	Magnesium (as Mg), mg/l, Max	31.8	38.1	30	100
12	Manganese (as Mn), mg/l, Max	0.019	0.053	0.10	0.30
13	Sulphates (as SO ₄ ²⁻), mg/l, Max	25.16	26.46	200	400
14	Nitrate (as NO ₃), mg/l, Max	14.20	12.13	45	No relaxation
15	Fluorides (as F), mg/l, Max	0.74	0.63	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	0.003	0.01	No relaxation
19	Copper (as Cu), mg/l, Max	0.007	0.007	0.05	1.5
20	Hexavalent Chromium (as Cr ⁶⁺), mg/l, Max	0.009	0.003	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	0.018	0.89	5	15
24	Total Alkalinity, mg/l, Max	232	270	200	600
25	Mineral Oil, mg/l, Max	<0.001	<0.001	0.001	-

Table 9: Mine Discharge Water Quality Data

Area: Core Zone	Season: Monsoon
Project: Kathautia OC Mine	Date of Sampling: 23.07.2019
Name of the Sampling Station:	
W₁- Pit-A Mine Water	W₂- Pit-B Mine Water
W₃- Pit-C Mine Water	W₄- Pit-D Mine Water

Sl. No.	Parameters	Station Code				MoEF Sch.-VI Standard
		W ₁	W ₂	W ₃	W ₄	
1.	Colour, Hazen units, Max	<5	<5	<5	<5	5
2.	Odour	#	#	#	#	#
3.	Total suspended solids, mg/l, Max	52	48	65	61	100
4.	pH	8.11	7.93	7.96	8.04	6.5-8.5
5.	Temperature (°C)	27.9	28.1	28.2	28.0	\$
6.	Oil & Grease, mg/l, Max	1.5	1.2	1.0	1.4	10
7.	BOD (3days at 27°C), mg/l, Max	1.43	1.98	1.26	2.96	30
8.	COD, mg/l, Max	28	25	38	36	250
9.	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	<0.001	<0.001	1.0
10.	Arsenic (as AS), mg/l, Max	0.008	0.004	0.006	<0.001	0.2
11.	Lead (as Pb), mg/l, Max	0.006	<0.001	0.004	<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 ⁶⁺), mg/l, Max	0.005	0.003	0.007	0.003	0.1
14.	Total Chromium (as Cr), mg/l, Max	0.010	0.007	0.009	0.005	2.0
15.	Copper (as Cu), mg/l, Max	0.011	0.008	0.006	<0.001	3.0
16.	Zinc (as Zn), mg/l, Max	0.013	0.006	0.004	0.005	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	0.007	0.006	0.004	0.005	3.0
19.	Fluorides (as F), mg/l, Max	0.95	1.19	1.23	1.07	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	0.005	0.004	0.003	0.001	2.0
22.	Iron (as Fe), mg/l, Max	0.567	0.423	0.444	0.501	3.0
23.	Nitrate (as N), mg/l, Max	0.63	0.58	0.52	0.76	10

Unobjectionable

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

Table 10: Ground Water Quality Data

Area: Core Zone/Buffer Zone	Season: Summer
Project: Kathautia OC Mine	Date of Sampling: 25.07.2019
Name of the Sampling Station:	
W₅ - Hand Pump Water, Kajari Village	W₆ - Hand Pump Water, Batsara Village

Sl. No.	Parameters	Station Code		IS-10500: 2012	
		W ₅	W ₆	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	0.82	1.12	1.0	5.0
5	pH	7.07	7.10	6.5-8.5	No relaxation
6	Total Hardness (as CaCO ₃)	296	274	200	600
7	Iron (as Fe), mg/l, Max	0.398	0.275	0.3	No relaxation
8	Chloride (as Cl ⁻), mg/l, Max	36.98	42.82	250	1000
9	Total Dissolved Solid, mg/l, Max	429	463	500	2000
10	Calcium (as Ca), mg/l, Max	83.64	78.46	75	200
11	Magnesium (as Mg), mg/l, Max	21.35	19.12	30	100
12	Manganese (as Mn), mg/l, Max	0.012	0.034	0.10	0.30
13	Sulphates (as SO ₄ ²⁻), mg/l, Max	19.36	12.68	200	400
14	Nitrate (as NO ₃ ⁻), mg/l, Max	12.19	11.96	45	No relaxation
15	Fluorides (as F), mg/l, Max	0.76	1.29	1.0	1.5
16	Arsenic (as AS), mg/l, Max	0.004	0.002	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	0.002	<0.001	0.01	No relaxation
19	Copper (as Cu), mg/l, Max	0.006	0.007	0.05	1.5
20	Hexavalent Chromium (as Cr ⁶⁺), mg/l, Max	0.005	0.004	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	0.033	1.006	5	15
24	Total Alkalinity, mg/l, Max	264	284	200	600
25	Mineral Oil, mg/l, Max	<0.001	<0.001	0.001	-

Table 11: Surface Water Quality Data

Area: Buffer Zone	Season: Winter
Project: Kathautia OC Mine	Date of Sampling: 25.07.2019
Name of the Sampling Station:	
W₇ - Koyal River water, U/S of Mine;	W₈ - Koyal River water, D/S of Mine;

Sl. No.	Parameters	Station Code		(IS: 2296)# Surface Waters Class "C" Tolerance Limits
		W ₇	W ₈	
1	Colour, Hazen units, Max	<5	<5	300
2	Odour	Unobjectionable	Unobjectionable	Unobjectionable
3	Dissolved Oxygen, mg/l, Min.	6.8	6.6	4
4	pH	7.53	7.52	6.5-8.5
5	BOD (3days at 27°C), mg/l, Max	2.8	3.2	3
6	Phenolic compounds (as C ₆ H ₅ OH), mg/l, Max	<0.001	<0.001	0.005
7	Total Hardness (as CaCO ₃), mg/l, Max	155	156	NS
8	Iron (as Fe), mg/l, Max	0.30	0.25	50
9	Chloride (as Cl ⁻), mg/l, Max	7.96	8.92	600
10	Total Dissolved Solid, mg/l, Max	106	104	1500
11	Calcium (as Ca), mg/l, Max	43.08	35.33	NS
12	Magnesium (as Mg), mg/l, Max	11.58	16.55	NS
13	Manganese (as Mn), mg/l, Max	0.004	0.003	NS
14	Sulphates (as SO ₄ ²⁻), mg/l, Max	11.66	9.76	400
15	Nitrate (as NO ₃), mg/l, Max	12.76	7.44	50
16	Fluorides (as F), mg/l, Max	0.59	0.99	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	0.004	0.004	1.5
21	Hexavalent Chromium (as Cr ⁶⁺), 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	0.012	0.003	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 12**.

Table 12: Noise Generating Mining Equipments

S. N.	Equipment / Operation	Noise level dB(A)
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 summer and monsoon seasons.

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 13** and **Table 16** for ambient noise levels of core and buffer zones during summer and monsoon seasons. 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 13: Noise Level in Core Zone of the Study Area (June, 2019)

Date of Sampling:		Noise level dB(A) average					
25.06.2019 to 29.06.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N ₁	Near Mine Office	31.2	65.4	52.6	30.8	57.8	43.2
N ₂	Coal Face	36.5	74.9	56.4	34.8	57.6	45.3
N ₃	Near OB dump	36.2	73.6	54.2	32.5	56.1	42.6
N ₄	Stockyard	35.7	71.3	53.5	32.8	58.2	43.6
N ₅	Haul Road	37.2	73.1	57.8	35.5	65.8	47.7
Standards as per CPCB		75			70		

Table 14: Noise Level in Buffer Zone of the Study Area (June, 2019)

Date of Sampling:		Noise level dB(A) average					
25.06.2019 to 29.06.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N ₆	R. R. Colony	31.2	57.4	50.2	30.6	55.8	41.7
N ₇	Batsara Village	32.0	58.6	50.8	31.5	56.4	42.2
Standards as per CPCB		55			45		

Table 15: Noise Level in Core Zone of the Study Area (July, 2019)

Date of Sampling:		Noise level dB(A) average					
23.07.2019 to 25.07.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N ₁	Near Mine Office	34.4	62.8	50.4	32.2	58.4	44.6
N ₂	Coal Face	35.8	72.2	54.8	34.4	56.6	45.0
N ₃	Near OB dump	35.2	70.1	52.3	33.5	55.7	44.2
N ₄	Stockyard	35.1	70.5	52.6	32.4	56.5	43.8
N ₅	Haul Road	36.5	73.8	57.1	35.0	62.5	46.2
Standards as per CPCB		75			70		

Table 16: Noise Level in Buffer Zone of the Study Area (July, 2019)

Date of Sampling:		Noise level dB(A) average					
23.07.2019 to 25.07.2019		Day Time			Night Time		
Stn. Code	Location	Min.	Max.	Average	Min.	Max.	Average
N ₆	R. R. Colony	34.0	65.5	50.5	31.2	56.2	42.1
N ₇	Batsara Village	33.5	60.1	50.1	31.0	54.2	40.4
Standards as per CPCB		55			45		

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.

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. However, the mine is not in working during the monitoring period. 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.