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Environment Appraisal of Rajnagar – Ramnagar Colliery, Hasdeo Area, South – Eastern Coalfield Ltd.

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Abstract

Environmental appraisal is an assessment of coal mining exercises which impact on human wellbeing and society. Coal possibility adds to the improvement of a nation yet coal mining devalues the earth by contaminating air, water and soil. The Proximate Analysis of coal demonstrated the properties of coal comprise moisture, ash, volatile matter and fixed carbon and Ultimate investigation demonstrated the estimations of Sulfur, Nitrogen and Hydrogen. Water investigation recorded the estimation of Physical and substance parameter like pH, TDS, specific conductivity, total hardness, total alkalinity and so forth. The finding of coal investigation demonstrates that Rajnagar – Ramnagar coal is under bituminous coal and it comprises great vitality esteem because of low measure of Ash (9.58%) and moisture (7.5%) substance. The pH esteem (6.3 – 7.0) of coal mine water discovered somewhat acidic and accessible hardness (80 – 880 mg/l) of water in contemplate region cross passable breaking point. TDS (180-770 mg/l) content additionally demonstrates high estimation of colloidal and broke up solids. Sulfur (0.76%) found in the agreeable fixation. Be that as it may, the investigations of coal mining estimated the effect on the ecological and social. Coal mining influences condition through land debasement, de-forestation, contamination of surface and underground water administrations, air contamination and its impact on plants and natural life. The negative effect of coal mining on wellbeing, arrive, water, air and different parts of society.

Keywords: Environment Appraisal, Rajnagar-Ramnagar colliery, Hasdeo area, SECL.

1. Introduction

Coal is the most abundant fossil fuel on the earth (Ramani, 2013**)** that comprises about 75% of the total fuel resources (Elliott, 1981**)**. It contributes more than one third (39%) of total electricity production all over the world (Brown, 2002**)** as well as it is burned to generate heat or liquefied to produce gas and diesel fuel. However, effects of coal mining on the ecosystem cannot be overlooked though it

contributes greatly to economic development of a country (Tiwary, 2001andBiagioni, 2003). The faulty mining operation is a cause of landscape damage, loss of forest, water pollution (both surface and ground) and air pollution that leads to huge deterioration of biological communities (Sarma et. al. 2010, Sadhu et. al. 2012 and Ardebili et. al. 2011).

Coal can play a unique role in meeting the demand for a secure energy supply. Coal is globally most abundant and economical as well of all fossil fuels, which can be used for both power generation and industrial applications. The production and utilization of coal is based on well-proven and widely used technologies. Coal reserves are significantly more abundant and much more widely and evenly dispersed than other fossil fuels. The world currently consumes over 5500 million tons of coal for use in power generation, steel production and cement manufacture, as a chemical feedstock and as a liquid fuel (Singh, 2008).

However, the coal mining area in Rajnagar – Ramnagar is facing various environmental problems due to pollution of the air and water. The present day study was aimed at finding out the impact of the coal mining area on the local environment specifically on air, water and ecology of the surrounding area.

2. Geology of the Study Area

Geological succession of the study area given by Mukhopadhyay and Mukhopadhyay (1999).Sarguja crystalline is the basement of the study area which is underlies Talchir formation. Barakar formation overlies the Talchir formation than all of the other formation Barren measures, Raniganj formation, Pali formation, Parsora formation and the upper most Bansa beds overlies respectively.

Geological Succession of study area:

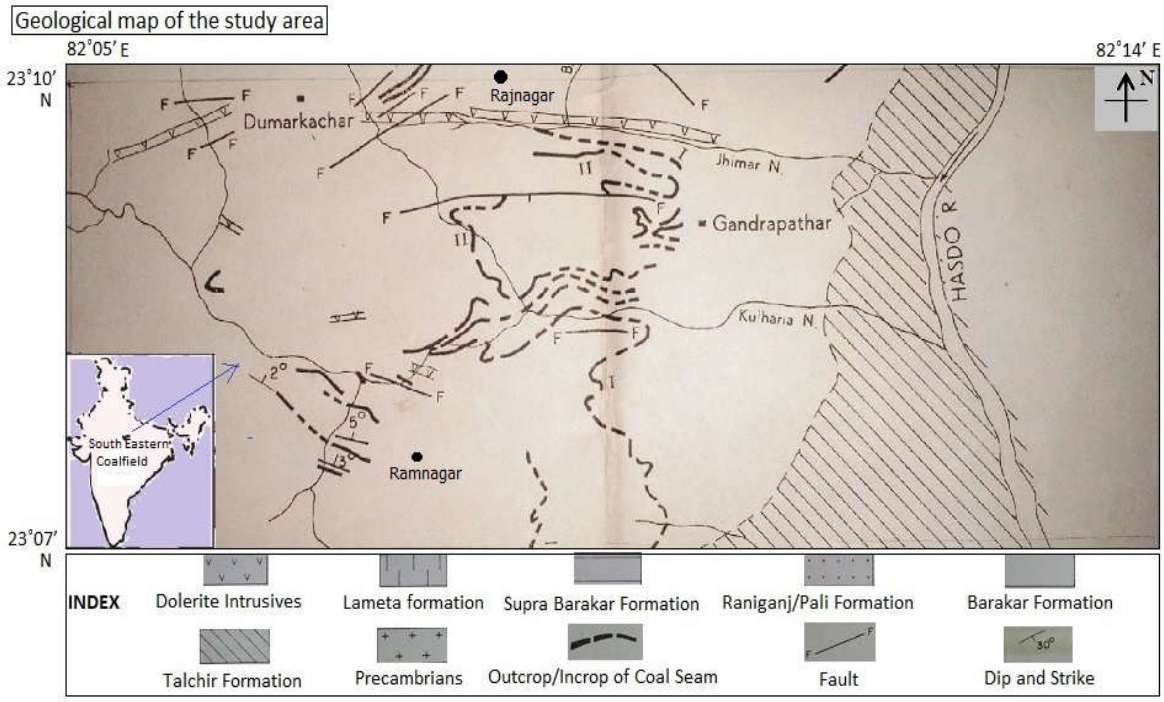
	Age	Formation	thickness
JURASSIC	Early cretaceous	Bansa beds	(+50m)
	.....		
		Parsora Formation	(+ 200m)
TRIASSIC	Late	Pali Formation	(+ 1100m)
	Middle		
	Early		
PERMIAN	Late	Raniganj Fo^{n}.	(+ 550m)
		Barren measures	(200-300m)
	.....		
	Early	Barakar Fo^{n}.	(250-350m)
		Talcher Fo^{n}.	(70-470m)
	.....		
	Early Proterozoic	Sarguja Crystalline	- - - - - - -

[after Mukhopadhyay & Mukhopadhyay (1999)]

In this area Talchir formation shown near the basin of Hasdo river and shown two stream jhimarnala and kulharianala. Main stream flow north to south direction in the geological map. Barakar formation is covering the major part of the study area and all the coal seam found in this formation.

Here coal bearing strata is Barakar formation. Basin is divisible by a fault and divides the area in to North and South block. In Southern part of fault 5 seam are recognized. At some places near Bijuri and Rajnagar area, seam no 3 and 5 are attained thickness 3.5 m. whereas seam 1 and 2 are thin (1 to 2.5 m.). The seam occurs in the Northern part of the fault shows considerable variation from the Southern part. The coal found in the North part of basin is coking type and here 5 seams are

demarcated. The seam 1 and 2 are thin while seam no.3 is relatively thicker and acquire thickness from 2.4 to 8.2 m.



3. Materials and Methods

Location of Study area:
The study area is recognized as the part of the South Eastern coalfields. It is located at 82˚05′and 82˚14′ E longitudes and 23˚07′ and 23˚10′ N latitudes, survey toposheet no. 64I/4. The AMSL level of the study area is 700m.Bijuri is the nearest station of the study area.

Collection of samples:
Coal and water samples were collected different places of the study area. Coal samples taken from seven different seams of Rajnagar – Ramnagar area. The coal samples were grounded for air dry in laboratory environment and preserved in air tight polythene bags. Water samples were taken from different sources like artesian aquifer condition, mines drainage water and drinking water for mine worker available at study area. Samples were stored in plastic air tight bottles to analysis.

Laboratory Analysis:
All of the collected samples were tested for their physical and chemical properties as following standard.

Coal samples were tested for proximate analysis estimated according to IS: 1350 Part – I, 1984 standard procedure (percentage of Moisture, Ash, volatile matter and Fixed carbon) and Ultimate analysis (percentage of Sulfur, Nitrogen and Hydrogen) estimated as per IS: 1350 (Part – IV/SC), 1975 standard procedure.

$$Fixed\ carbon = 100 - (M\% + A\% + VM\%)$$

The water samples were tested for the physical and chemical properties by applying an ISO: 9001-2008 standard protocols. The physical properties i.e. colour, odour and temperature were tested during the sample collecting time. The pH of each samples were determined using pH meter (Analab). Specific conductivity determined using conductivity meter (Systronics-304) and TDS

measured by using conductivity and TDS meter (Systronics-307). The chemical properties i.e. Total hardness, total alkalinity and chloride were determined the titrimetric method.

4. Result and Discussion

Properties of coal samples:
Result is revealed in table 1; moisture was found to be 7.5% in all samples and coal ash remains 9.58% after the combustion in specific condition. These two parameters (Moisture and Ash) were used to define the energy value of the coal; the lower percentage of these value put higher percentage of energy value of the coal. The remains of ash have no directed hazardous on the environment; however, S content has direct hazardous impact on the environment. Acid mine drainage (AMD) occurs in which area where sulphur content is found in the range of 1-5% as SO_2 and pyrite (FeS_2). In our study area S found only 0.76% in the coal which is not hazardous. Coal fire is major problem in coal mining areas. NO_X is the key pollutants in the form of acid rain. Nitrogen got in our area only 1.56%.

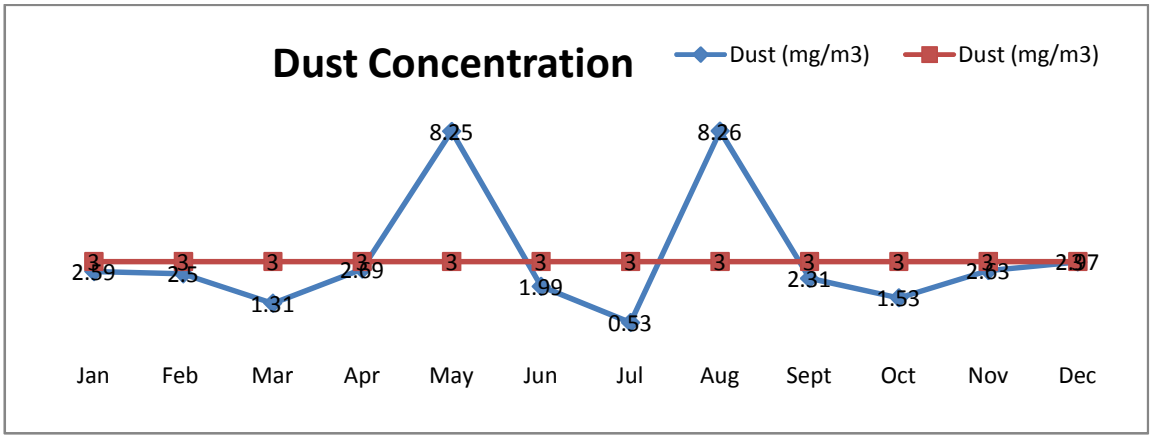
Table 1: The properties of coal of study area

Sr. No.	Properties of coal Sample	Amount (%)
1	Fixed carbon	52.70
2	Volatile matter	30.11
3	Ash	9.58
4	Moisture	7.50
5	Sulfur	0.76
6	Nitrogen	1.56
7	Hydrogen	5.27

Coal Dust: We have recorded the data of dust pollution throughout Jan to Dec which is shown in table 2. Permissible limit of the dust in coal mine area is 3.0 mg/m^3. May and Aug month recorded highly dust producing months of study area.

Table 2: Result of dust pollution

Month	Jan	Feb	Mar	Apr	May	Jun	Jul	Aug	Sept	Oct	Nov	Dec
Dust mg/m^3	2.59	2.5	1.31	2.69	8.25	1.99	0.53	8.26	2.31	1.53	2.63	2.97



Properties of water samples:
The result of water samples are recorded in table 3. The level of pH is the vital factor in environment for survivals. pH value showed 6.3 – 7.0 which is slightly acidic to neutral. TDS shows different materials in water both colloidal and dissolved solids. TDS ranges between 180 – 770 mg/l. Drinking water permissible limit 500 mg/l and industrial water permissible limit 1000 mg/l. however some of sample cross the drinking water standard which is not even use for drinking purpose, its harmful or unsuitable for human consumption but industrial use possible. Total hardness value recorded between 80 to 880 mg/l. permissible limit of total hardness is 600 mg/l, some of samples (A5, A8 and M1) have cross the drinking standard which is not suitable for domestic use.

Table 3: Physical Properties of water of Study area

Sample No.	pH	Sp. Co. (ms)	TDS (mg/l)
A1	6.8	0.1	180
A2	7.0	0.4	480
A3	6.6	0.3	430
A4	7.0	0.5	680
A5	6.7	0.6	770
A6	6.7	0.3	450
A8	7.0	0.4	520
M(1)	7.0	0.2	320
O	6.9	0.3	450
G	6.3	0.2	340

Table 4: Chemical properties of water of study area

Sample No.	K^{++} (mg/l)	Na^{+} (mg/l)	Ca^{++} (mg/l)	Total Alkalinity (mg/l)	Cl^{-} (mg/l)	Total Hardness (mg/l)	PO_4^{2-} (mg/l)	NO_3^{-} (mg/l)
A1	8.84	10.04	29.53	24	29.99	80	BDL	BDL
A2	15.60	28.02	33.10	28	39.98	260	BDL	BDL
A3	15.41	28.18	32.34	44	49.98	200	BDL	BDL
A4	15.52	47.25	37.98	36	69.97	420	BDL	BDL
A5	16.85	42.30	35.74	58	79.97	880	BDL	BDL
A6	6.55	14.04	31.61	40	29.99	400	BDL	BDL
A8	15.52	29.00	33.18	30	49.98	820	BDL	BDL
M(1)	4.72	9.77	31.30	16	29.99	800	BDL	BDL
O	0.92	22.83	32.48	90	39.98	500	BDL	BDL
G	7.74	8.11	31.75	28	29.99	200	BDL	BDL

BDL = Below detected level.

Table 5: Drinking water standard BIS (IS: 10500:1991)

Sr. No.	Parameters	Desirable limits (mg/l)	Permissible limits (mg/l)
Essential Characteristics			
1	Colour Hazen Units	5	25
2	Odour	Unobjectionable	
3	Taste	Agreeable	
4	pH	6.5 – 8.5	No Relaxation
5	Total Hardness	300	600
6	Chlorides	250	1000
Desirable Characteristics			
7	Dissolved Solids	500	2000
8	Calcium	75	200
9	Magnesium	30	100
10	Total Alkalinity	200	600

5. Conclusion

The coal of Rajnagar – Ramnagar is a good quality coal but the mining processes deteriorate the surrounding environment including air, water and soil. The polluted air of coal mining area causes high toxicity of acid rain. The acidic pH may limit the growth of plants. Coal mining processes alter the landscape and it is one of the most hazardous things. Coal mining causes of many health diseases including lung irritant, asthma attack, lung cancer, pulmonary tuberculosis and heart failure.
Hence, people should be aware of the negative impact of the mining activities on human health. Further study needed to determine pollution level of air and effect of coal mining on the health of coal miners and general people of surroundings.

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