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An Assessment of Environmental Impact of a Prominent Contributor in Coalmining Industry of India

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Abstract: The mining industry plays a crucial role in supporting the economic development of nation, but on the darker side it has some undesirable impacts on environment. Being a heavy pollution causing industry and an energy supply industry, mining industry is the focus of environmental protection work. It is evident that despite the increase in Corporate Environmental Disclosure, there remains a substantial heterogeneity in terms of how corporations hold accountability for their environmental impacts. Therefore, to understand this heterogeneity in a better way, this study examines the perceived Environmental Accountability of the NCL, (a prominent contributor in coalmining industry of India), by evaluating its impact on environment from the perspective of different stakeholders.

Keywords: Coalmining Industry, Environmental Accountability, Environmental Performance, Corporate Environmental Accountability.

1. INTRODUCTION

Pollution occurs when pollutants contaminate the natural surroundings; which brings out changes that affect our normal lifestyles adversely. Pollutants are the elements of pollution which are usually waste materials of various forms. Pollution disturbs the balance in the environment and in our ecosystem. With modernization and progress in our lives, environmental pollution has reached its height; and has raised global warming and health problems. Pollution occurs in different forms; air, water, soil, radioactive, noise, thermal, heat and light are some of them. Industrial development has strong footprints in degradation of environment. Contamination to natural surroundings done by an industry is termed as industrial pollution, which emphasizes industrial practices as the immediate source. Lack of policies to control pollution, unplanned industrial growth, use of outdated technologies, and inefficient waste disposal are some major causes behind industrial pollution. Industrial pollution brings out dire consequences for environment, such as water pollution as a result of dumping heavy metals, harmful chemicals, radioactive waste and even organic sludge into oceans or rivers, which seriously impacts the health of our eco-system. The same water is then used by farmers for irrigation purpose which affects the quality of food that is produced.

Coal industry have a huge environmental impact which includes issues such as water & air pollution, waste management, soil degradation, disposition of habitats caused by the coal processing, mining, and the use of coal products. Other than atmospheric pollution, burning of coal produces trillions of tons of solid waste annually, including bottom ash, fly ash, and flue-gas desulfurization sludge that have thorium, arsenic, uranium, mercury, and other heavy metals in it. Burning of coal causes severe health effects also. A report by the World Health Organization in 2008 says that, coal particulates pollution is anticipated to shorten around 1,000,000 lives worldwide annually. Significant adverse environmental impacts are generated by Coal mining. In history, mining of coal has been considered a very risky activity and there is an extensive list of past coal mining disasters. Underground mining dangers include gas poisoning, suffocation, gas explosions and roof collapse. Open cast mining hazards are mainly vehicle collisions and mine wall failures.

India is currently among the top fastest growing economies of the world, as natural corollary India's energy needs are also fast expanding with its increased industrialization and capacity addition in Power generation. In India, coal is the critical input for major infrastructure industries like Power, Steel and Cement.

1.1 Coal India Limited

Coal India Limited (CIL) is a coal mining company of India. It is controlled by state. It's headquarter is in Kolkata, West Bengal, India. Being the largest coal producer company in the world it contributes approximately 82% of the coals produce in India. Coal India Limited came into existence in November 1975,as an organized state owned Coal Mining Corporation with the government attained private coal mines. With a modest production of 79 Million Tonnes (Mt) at the year of its inception, CIL today is the single largest coal

producer in the world. Coal India Limited (CIL) has seven of its wholly owned subsidiaries through which coal is produced. These are South-Eastern Coalfields Limited (SECL), Eastern Coalfields Limited (ECL), Central Coalfields Limited (CCL), Bharat Coking Coal Limited (BCCL), Northern Coalfield Limited (NCL), Mahanadi Coalfields Limited (MCL) and Western Coalfields Limited (WCL). Central Mine Planning & Design Institute Limited (CMPDIL) which is its eighth wholly owned subsidiary disseminates planning, exploration and technical assistance to all the seven production subsidiaries. CMPDIL also renders consultation services to arbitrator market customers in the areas of mining, exploration, testing, allied engineering &training, management-systems, etc. Coal India Africana Limitada (CIAL), a wholly owned subsidiary of CIL in Mozambique, is also there for having coal mining works in that country.

CIL also manages 200 other establishments like workshops, hospitals etc. Further, it also owns 26 technical & management training institutes and 102 Vocational Training Institutes Centres. Indian Institute of Coal Management (IICM) as a state-of-the-art Management Training 'Centre of Excellence' - the largest Corporate Training Institute in India - operates under CIL and conducts multi- disciplinary management development programmes.CIL having fulfilled the financial and other prerequisites was granted the Maharatna recognition in April 2011.

1.2 Northern Coalfields Limited

Northern Coalfields Limited was formed in November 1985 as a subsidiary company of Coal India Limited. Its headquarter is located at Singrauli, Distt. Singrauli (M.P.). Singrauli is connected by road with Varanasi (220 Km), The nearest railway station is Singrauli located on the Katni-Chopan branch line running parallel to the northern boundary of the Coalfield. The nearest railway station for reaching directly to Delhi is Renukoot that is located on the Garhwa-Chopan rail-line. Nearest (private) airstrip is at Muirpur (60 Km.).

The area of Singrauli Coalfields is about 2202 Sq.Km. which can be separated into two basins, viz. Singrauli Main basin (1890 Sq.Km.). and Moher sub-basin (312 Sq.Km.). Sidhi district of Madhya Pradesh has the Major part of the Moher sub-basin and Sonebhadra district of Uttar Pradesh has a small part of it. The western part of the coalfield constitutes with the Singrauli main basin and is mainly unexplored. The current coal mining works and prospect blocks are concerted in Moher sub-basin.

The exploration carried out by GSI/NCDC/CMPDI has proved abundant resource of power grade coal in the area. This in conjunction with easy water resource from Govind Ballabh Pant Sagar makes this region an ideal location for high capacity pithead power plants. NCL, by its coal supplies, has made it likely to produce approximately 10515 MW of electrical energy through pithead power plants of National Thermal Power Corporation (NTPC), Uttar Pradesh Rajya Vidyut Utpadan Nigam Ltd (UPRVUNL) along with Renu power wing of M/s. Hindalco Industries.Thelocality is called the "power capital of India"now days. The eventual capacity of power production of these power plants is 13295 MW and NCL is completelyequipped to meet the increased requirement of coal for the rationale. Additionally, NCL is supplying coal to power plants of Delhi Vidyut Board (DVB), Hariyana State Electricity Board andRajasthan Rajya Vidyut Utpadan Nigam Ltd.

Northern Coalfields Limited (NCL) has voluntarily chosen to implement a companywide comprehensive and unified Integrated Management System (IMS) complying with Standards ISO 9001:2008, ISO 14001:2004 and OHSAS 18001:2007 for simultaneous management of economic, environmental and occupational health and safety. The company has framed its own Corporate Management Policy and committed to achieve the organizational objectives and targets.

NCL, from side to side its community development programmes, has appreciably contributed towards enhancement and progress of the area. It is serving neighboring tribal, non-tribal and venture-affected people inoverall development of quality of their life by providing health care facilities, self-employments schemesand educational assistance.

1.3 NCL's approach towards Environment

Northern Coalfields Limited believes that respect for the environment is very important for the sustainability of its mining activities and is dedicated for continuous improvement in environmental concerns. In the recent years, NCL has been proactively carrying out sustainable and eco-friendly mining for the betterment of the society and environment as the stakeholders are spread over and very important to the company. The Company focuses on environment management not only to comply with the applicable regulatory regime but also to contribute positively to the communities around its operations through varied community initiatives, encouraging biodiversity and nature conservation. NCL is following the Environmental Policy of Coal India Limited and Corporate Management Policy of NCL.

Although NCL is proclaiming to put sincere efforts towards environment protection along with its industrial activities, yetit derives the attention of the researchers to evaluate perception of its stake- holders towards its impact on environment. Therefore, in order to assess the impact of NCL on environment, following objective should be achieved.

1.4 Objectives

1. To identify various indicators of environmental performance in the context of mining activities of NCL.
2. To assess the impact of mining activities of NCL on environment.

REVIEW OF LITERATURE

Coal mining brings prominent positive outcomes for economic and social sectors but its adverse impact on environment and human health cannot be ignored (Riberto et al., 2013; Orem and Finkelman,2004; Younger, 2004). The way of mining of coal becomes the matter of concern for coal industry as it has direct impact on environment. It becomes challenging for coal industry to make a balance as, there is always an existence of a trade-off between financial benefits and environmental harm (Jeantheau 2003). Life cycle of coal has four stages - extraction, transportation, processing, and combustion. Each stage of coal life cycle generates multiple hazards for environment and health (Epstain et al., 2001).

Coal causes mercury contamination in the air, and it is one of the reasons behind global warming by producing greenhouse gases (Fatah 2008). With local, regional, and global effects, air pollution is one of the prominent environmental impacts of mining activities. Apart from dust as a major concern Oxides of sulphur, carbon dioxide, carbon monoxide, nitrous oxide, methane, lead, other volatile organic compounds, and other harmful metallic compounds are the other contaminants produced by mining. Respiratory illness, reduced visibility, irritation of eyes, throat problem, etc. are some of the serious problems caused by air pollution due to mining (Mangena & Brent, 2008). The existence of many coal mines activates many problems to the people living in the vicinity, as they have to give up their land with unfair compensation. Authorities force them to release their farming lands to coal mining in the name of cooperating to development (Fatah 2008).

Subsidence is another problem of coal mining as it often induces collapse of the overlying rock strata resulted from the caving of roof materials following the removal of coal. The impacts of subsidence include, lowering of the topography, deep pit cracks and fissures, as well as troughs and steep offsets (Bell et al., 2001). Subsidence may render the land unusable due to the safety hazard associated with it (Mangena & Brent, 2008). The dumping of the discard material or waste during the mining operation also affects the land in the vicinity of the operation as discarded material may contain soluble salts, which further may be dissolved during rain and deposit into the soil, thus causing acidification and contamination (Mangena & Brent, 2008). Mining companies remove forests and fragment rock with explosives to expose coal seams, the rubble produced sits along edges and is dumped in the valleys below (Epstain et al., 2001).Riberto et al.(2013) reemphasized the potential environmental impacts associated with the coalwaste disposal by mentioning soil, surface and groundwater pollution caused by mobilization of solid particles, leaching of hazardous elements, and deposition of atmospheric particles.They furthermorementioned deteriorationof vegetation caused by acid drainage.Mountain Top Removal is one of the major mining activities in which blasting is used to clear mountain ridges. These explosions and vibrations affect not only mental health but also damage houses and other buildings (Epstain et al., 2001).As a result of coal mining activities, contamination of surface and ground water occurs, that becomes one of the major environmental concerns related to coal mining (Silva et al., 2011, Hobbs et al., 2008). Epstain et al., (2001) mentioned loses in property values, crops, timber resources, corrosion of buildings and monuments, dust from mines explosions as some additional impacts of coalmining.

On the basis of critical literature review, review of guidelines for environment of Coal India Limited, and discussions from concerned people in and around NCL mines and residents of affected area, following indicators have been identified.

S.No.	**Indicators of Impact on Environment**
1	Degradation of Land
2	Soil Erosion and Vegetation
3	Water Pollution
4	Air Pollution
5	Noise Pollution
6	Vibration Effects
7	Mine Subsidence
8	Displacement of Habitats

METHODOLOGY

Sampling

Northern Coalfields Limited. (NCL) is a subsidiary of Coal India Limited. The 10 Coal mines under NCL are Amlohri, Block-B, Bina, Dudhichua, Jayant, Jhingurdah, Kakri, Khadia, Nigahi, &Krishnashila. Its headquarters is in Singrauli.

Population consists of all the units and stakeholders of Northern Coalfields Limited. There are following three types of stakeholders taken into consideration.

1. The employees of the coal mines.
2. The general public residing in the close vicinity of the coal mines.
3. The Controlling and Regulatory bodies (which includes The NGOs working for environment in the mining area, Director General of Mines Safety and Pollution Control Board responsible for that area).

A sample comprising stakeholders was selected on the basis of convenience sampling. First of all 5 coal mines Dudhichua, Jayant, Krishnashila, Nigahi&Khadiya are selected from 10, then from each five coal mines 50 employees, 50 general public residing in close vicinity of coal mines, and all the 10 Controlling and Regulatory bodies were taken insample. Thus,finally sample had510 respondents.

Instrument Design

A structured questionnaire was developedby converting the indicators of impact on environment into statements, and respondents were asked to give theirresponses on a five pointlikert scale(1-Very High, 2-High, 3-Medium, 4-Low, 5-Very Low).Reliability of instrument was assured by the value of Cronbach's Alpha to be 0.823.

4. DATA ANALYSIS

4.1 Demographic profile of Respondents

. Demographic profile of Respondents (Employees) on the basis of their Gender

Employees on the basis of their Gender		
Gender	**Percent**	**Frequency**
Male	20.4	51
Female	79.6	199
Total	**100**	**250**

Employees on the basis of their literacy status		
Literary status	**Percentage**	**Frequency**
Post graduate	56.8	142
Graduate	34.8	87
Secondary	8.4	21
Total	**100**	**250**

Employees on the basis of their work experience		
Work Experience	**Percentage**	**Frequency**
Below 5 years	49.6	124
6-10 years	16.4	41
11-15 years	12.4	31
Above 15 years	21.6	54
Total	**100**	**250**

Demographic profileof respondents of General public (Residents) residing in the close vicinity of NCL mines

Gender of respondents (Residents)		
Gender	**Percent**	**Frequency**
Male	94.4	236
Female	5.6	14
Total	**100**	**250**

Literacy status of the respondents (residents)		
Literacy status	**Percentage**	**Frequency**
Post graduates	33.2	83
Graduates	39.6	99
Secondary	13.6	34
Primary	13.6	34
Total	**100**	**250**

Period of residence of the respondents (residents)		
Period of residence	**Percentage**	**Frequency**
Below 5 years	45.2	113
6-10 years	10	25
11-15 years	5.6	14
Above 15 years	39.2	98
Total	**100**	**250**

Demographic profile of controlling and regulatory bodies

Gender	**Age**	**Marital status**	**Literacy status**	**Work experience**
Male-9	**Minimum-25**	**Unmarried-4**	**Primary-1**	**0-5 yrs-5**
Female-1	**Maximum-58**	**Married-6**	**Secondary-2**	**11-15 yrs-2**
			Graduate-6	**More than 15 yrs-3**
			Post Graduate-1	

4.2 Assessment of Environmental Impact

Assessment of Impact on environment is taken as the extent of the following environmental aspects which are affected by the mining activities of NCL.

For assessment of these parameters, data collected through questionnaire is analyzed by t test.

	Descriptive Statistics			
S.No.	Variables (Indicators)	N	Mean	Std. Deviation
1	Degradation of Land	510	2.2549	.99987
2	Soil Erosion and Vegetation	510	2.3255	1.07295
3	Water Pollution	510	2.0529	1.03150
4	Air Pollution	510	2.0353	1.06872
5	Noise Pollution	510	2.6941	1.10213
6	Vibration Effects	510	2.6529	1.05597
7	Mine Subsidence	510	3.6471	1.34330
8	Displacement of Habitats	510	2.6980	1.15030

Summary of t- Test				
S. No.	Variable	Mean	t	p value
1	Degradation of Land	2.2549	-16.829	.000
2	Soil Erosion and Vegetation	2.3255	-14.197	.000

3	Water Pollution	2.0529	-20.734	.000
4	Air Pollution	2.0353	-20.385	.000
5	Noise Pollution	2.6941	-6.268	.000
6	VibrationEffects	2.6529	-7.422	.000
7	Mine Subsidence	3.6471	10.878	.000
8	Displacement of Habitats	2.6980	-5.928	.000

RESULTS & DISCUSSION

Mean values of all the variables are found to be significantly below 3, except for subsidence in reclaimed or built up area which is above 3, it gives the direction to interpret that degradation of land, soil erosion and vegetation, water pollution, air pollution, noise pollution, vibration effects, and displacement of habitats are highly affected by the mining activities whereas subsidence in reclaimed and built up area is not much affected.

CONCLUSION

In the pursuit of investigating environmental aspect of Corporate Social Responsibility of Northern Coalfields Limited, an attempt has been made to analyze the effectiveness of the organization's effort towards environment protection in which it is operating, (be it volunteered or forced one by external system). It is found that Degradation of Land, Soil Erosion and Vegetation, Water Pollution, Air Pollution, Noise Pollution, Vibration Effects and Displacement of Habitats are the effects of mining activities of NCL. It is necessary to put collective efforts by employees of organization, general public residing in the vicinity of the firm, and controlling and regulatory bodies towards environmental damage being done by the business operations, to avert the undesired consequences.

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