CORPORATE SOCIAL RESPONSIBILITY OF MINING AUTHORITIES OF RANIGANJ COALFIELD IN CONSERVATION OF MINE WATER AND SUPPLY TO LOCAL HABITATS OF DROUGHT PRONE AREAS

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Abstract:
Coal, the most important fossil fuel of India, currently meets two-thirds of its energy needs. Though it is least-cost source of primary energy yet mining activities adversely affects the eco-system as a whole. The primary concerns at the regional levels have to do with the environmental impacts on air, water, land, forest, biodiversity and climate. The impact on water is a cause of major concern as it is vital for living things and human life .Growing depletion of ground water table in project areas of Raniganj coalfields warrants immediate steps to restrict drawn down of water table, and conserve source of water both in quantity and quality .As it is a social responsibility of the coal mining authorities to overcome water problems in the region. proper planning on Water Management is important and to meet the objectives implementation of schemes under Corporate Social Responsibility(CSR) by enhancement of knowledge and technology appears major challenge.

Keywords: Environmental degradation, depletion of water table, pollution, conservation of water source ,Corporate Social Responsibility (CSR), Measures for supply of Water.

Introduction:

Coal is recognized to have been the main source of energy in India for many decades. Coal a predominant source of energy consumption, constitutes the largest share in India’s energy production to approximately 55% and contributes to nearly 27% of the world’s commercial energy requirement (1).

Coal mining though contributes largely towards economic development of the nation like India, it has a great impact upon the workers and people residing in and environment around coal mining areas .

Major environmental issues related to coal mining include erosion, formation of sinkholes, and loss of biodiversity besides contamination of soil, ground and surface water by chemicals arising from mining processes. The wastes also impose a considerable impact on the land, air and water components of the environment around the project areas. (2,3)

A long history of unscientific exploitation of the Ranigunj coalfield over 240 years through over 400 small. medium and large mines , has caused environmental problems, including water resource depletion and contamination. After Nationalization of Coal mines there are 87 regrouped working mines , (Underground mines numbering 60. Opencast -19 and 8 Mixed Mines) are in operation under eastern coalfield ltd with present production of 40.54 Million Tones (2017-18) (3)

Due to continuous process of coal mining in Raniganj Coalfield area the key questions are whether the surface waters in the project area will remain adequate to support native aquatic life and terrestrial wildlife and whether surface and groundwater supplies will remain fit for human consumption. Water is an essential to living things and it is important in all aspect of human life such as for domestic, industrial and other purposes (4).

Unlike surface water, groundwater is almost available everywhere, and although renewable, is not stable. As water penetrates through the ground surface to the subsurface as groundwater, impurities get into it. The people most especially the rural dwellers consume well water without due consideration of its chemical and biological composition (5). Perhaps this may be due to severe water problems in parts of the rural area including in Raniganj Coalfield. The quantities of water are just as important as its quality (6). The exploitation of the mineral resources results in the environmental degradation with large scale consequences. Although mining activities directly affects a relatively limited area of land, its impacts on the environment, as well as on public health, may be found at greater distances from the source and for a long period.

Hence a study is necessary to address the water problem in Raniganj Coalfield and the possible action to be initiated by Coal Mines Authorities as their social responsibilities.

Methodology

The study area for this purpose is - Raniganj Coalfields which covers an area of about 1530 sq km and is bounded by 23°32’30”N to 23°50’25”N and 86°38’30” E to 87°25’00”E The coalfield mainly spreads over the districts of Burdwan, Birbhum, Purulia, and Bankura of West Bengal and partly in Jharia Dhanbad districts of Jharkhand.

Besides field survey and collection of primary and secondary data ,interviews of local villagers, Mine employees and habitants constitutes major data input and support the base of this paper.

Lowering of ground water table:

Mining due to its associated activities not only uses a lot of water but also affects the hydrological regime of the district and often affects the water quality. The major hydrological impact of a large and deep opencast mine, however, is on the ground water table of the region.
The water seeping into and collected in the mine sump is partly used in the mine. for spraying on haul roads, conveyors, at loading and unloading points, bunkers etc. are lost by evaporation. A deep mine is likely to have longer haul roads requiring more spraying water. The excess mine water is discharged into the surface drainage system (7)

The reason for falling ground water table in Raniganj Coalfield Area is due to:-

(i). Coal mining process, where large scale mine water pumping cannot be avoided. Consequently the mine dewatering would drain out some area around the mine with decline in ground water levels. Depletion of ground water table has affected an area of 12.45 km 2 in this coalfield.

(ii) Existence of deep goafs leads to gradual fall of ground-water level in dug wells. There has been a significant fall in groundwater level at Sanctoria, Patmohana, Bartaria, Kankardanga etc. of Asansol ubdivision.

(iii). Subsidence of the surface destroys hydrological stability as a result of which the water level fluctuates widely during pre and post monsoon periods, and small water tanks which have traditionally sustained the various needs of local communities get permanently dry. Such instances are there in villages like Sanctoria, Poidih, Methani, Barachwak, Sripur, Bhanora, Kajora Kenda of Raniganj Coalfields.

Due to rampant illegal coal mining to extract coal from shallow depth in and around closed mines of Ranganj areas, subsidence often takes place and water table gets depleted.

(iv). Again, working of lower seams of the abandoned, water-logged mines sometimes induces cracks which drain out the water. Even in the case of open cast mining, cracks resulting from blasting lower the groundwater table in surrounding areas. (5,7)

Ground water resource potential in Raniganj Coalfields as per Coal Mines Planning & Design Institute (CMPDIL) are:-
Net ground water availability: 18739 hector meter (HEM)
Existing gross ground water draft for all uses: 2132 hector meter. Additional ground water draft due to mining activities: 5622 HEM.
Stage of ground water development: 41%.

Hydro geological aspects:

Depth to water (DTW) varies from 7-18 meter below ground level (MBGL) around active mine establishments. Due to seepage of ground water into mines DTW declines considerably in wells & even wells get dry during summer in the vicinity of coal mines (5, 8).

Scope for rain water conservation:-
Considering annual rainfall 1271 mm in an area of 1500 sq.km, gross quantity of rainwater 1906.50 mcm (million cubic meter), net quantum of rainwater for domestic consumption (considering 30% of gross and for evaporation and surface runoff) will be 1334.55 mcm (4,9).

Asansol -Raniganj a drought prone area with average rainfall is considered below normal. The capacity of land to retain water is also limited due to underground mining. The people of the town therefore face inadequate supply of potable water and most adversely during summer (Table1). The annual rainfall is from 50 mm to 200 mm and maximum mean annual temperature is 25°C while Maximum temperature is 45°C during summer.

Through random sampling method it has been ascertained in 2017, that water level in the dug well of villages near the following mines in Raniganj get lowered over the years.

TABLE 1. Depth of Water level

Name of Mine	Pre Monsoon (feet)	Post Monsoon (feet)
Dabor	77.54	48.13
Sangramgor	83.32	60.15
Methani	87.43	65.67
Jamuria	191.71	134.31
Belbad	187.34	114.21
Bahula	92.05	64.21

WATER QUALITY

Impacts on water quality and quantity are among the most contentious aspects of mining projects (6,9) (Table1). The discharged mine water varies greatly in the concentration of contaminants and in some cases it may not even meet the drinking water specifications .Many times, the discharged mine water as such is not usable and may contain unacceptable levels of heavy metals, toxic anions, organic and biological contaminant (2,9) (Table2).

Residues of explosives induce heavy metal contamination in to surface water bodies through run-offs and ground water. Water spraying to reduce the fugitive emissions gets contaminated and finds its ways to surface water bodies.

Perhaps the most significant impact of mining project in Raniganj Coalfields is its effects on availability of water resources and water quality within the project area.

In a qualitative assessment of mine water from the Raniganj coalfield, from a number of water samples analyzed to assess water quality and suitability for domestic, industrial, and irrigation uses. The pH of the mine water ranged from 6.5 to 8.8. Total dissolved solids (TDS) ranged from 171 to 1,626mg/L(9).

Much of the mine water, especially of the Barakar Formation area, has high TDS, total hardness, and SO_4 concentrations. Concentrations of some trace metals (i.e. Fe, Cr, Ni) were found to be above the levels recommended for drinking water. However, the mine water can be used for irrigation, except at some sites, especially in the Raniganj Formation area, where high salinity, sodium adsorption ratio, %Na, residual sodium carbonate, and excess Mg restrict its suitability for agricultural uses(9).

Substantial quantity of water pumped out from various collieries (of ECL , Asansol) is estimated to be 0.25 million cubic meter (mcm)/day in dry period & 0.39 million cubic meter(mcm/)day during monsoon (9,10).

Pumped out water if contaminated may pollute the nearby surface water and near surface aquifer.

Hydro chemical aspects: Quality of water in open well.

TABLE 2. Chemical Constituents noted in water from mines

Chemical Constituents	Range in ppm (Parts per million)
Silica	6.8 - 8.4
Calcium	<1 - 44
Sodium	1.2- 100
Magnesium	4 - 302
Potassium	<1-144
Bicarbonate	24 -549
Sulphate	<0.1-590
Fluoride	0.04-1.3
Iron	<0.01-1.9
Nitrate	<1- 180
Total Hardness as CaCo3	20-910
Nickel	Nil-0.13
Chromium	Nil
Copper	Nil-0.12
Nitrate	Nil-Trace
Sulphate	Trace
Ammonical	1.64-0.20
Nitrogen	56-114
Chloride	36-58
Oil and greases	78.80

(After Report of CMPDI- Ref 9)

Toxic waste treatment for water in mining areas:

Study reveals that nearly 25% -35% of rain water is drained back to rivers and streams; which are major sources of portable water for population (8,10). With the exception of particle impurities (coal dust/soil/clay) and bacteriological or biological impurities; the river water is generally fit for domestic use. Normal filtering and disinfectant makes the water acceptable and can be used both in coal mining regions and elsewhere to meet the water requirements. On the other hand, the ground water is not fit for consumption unless treated for hardness.

Rise in population along with rapid urbanization & industrialization has put severe pressure on available water resources.

It is estimated that world could face a 40% global water deficit by 2030 under a business-as-usual (BAU) scenario (2030 WRG, 2009). India is also facing acute water stress. The per capita availability of water has been falling continuously at an alarming rate.

If current trends continued, major regions of the coalfield will face a massive water challenge in the coming decades with potentially devastating consequences for human life and health, business and agriculture, and the environment.

CORPORATE SOCIAL RESPONSIBILITY:

According to the local Executives of mines. as part of its Corporate Social Responsibility (CSR) efforts, Coal India Limited and its subsidiary companies regularly undertake various community development activities in and around the coalfield areas for the benefit of the local people specific. Works done under CSR Community Development Programme are normally:- Installation/Repairing of Hand Pumps. [Digging /renovation of Wells/Ponds/Dam etc] Water Supply through pipelines (10).

It has been told that Eastern Coal Fields Limited (ECL) has given special attention for the improvement of potable water supply to the occupants of employees' residential houses as well as to the people of nearby communities. There are 22 numbers of slow sand filters, 20 numbers rapid gravity filters to provide filtered and treated potable water to the employees and their dependents. There are also 11 numbers of river bed bore wells. and, 5 nos. of pressure filter and electro chlorinators were commissioned. Water is supplied and served to a population of 5,40,000 In the year 2015-16 (10).

In addition to this ECL has also participated with Raniganj Coalfield Area –I (RCFA-1)and RCFA-2 water supply schemes of West Bengal government and Chirkunda water supply scheme of Jharkhand Govt. for augmenting the source of water and despite depletion of fresh water resources in past years, still the situation is not out of hand: But, the problem is that proper water resource management is lacking. It is the time to integrate all possible measures to ensure sustainable use of water resources. Some suggested steps

o. Conservation of available resources

o Improving efficiency of water use

o. Re-cycling and re-use of water use both in Underground & Opencast Mine working

o Checking pollution

o .Channelizing all sources of discharge for gainful use

Managing water resources: way forward under CSR

In the process of coal mining, huge volume of mine water gets collected in mine sumps and subsequently pumped out to surface. By application of appropriate treatment methods, the available mine water may be used for drinking/irrigation purposes (10).

Conservation Measures for Water

The following conservation measures require to be adopted –

The mine discharges are effectively utilized to meet the domestic and industrial needs of the mines. Almost, the entire industrial and domestic water demand of the mines can be met from treated mine water.

After cessation of mining, with plenty rainfall and abundant ground water recharge, the water levels will recoup and attain normalcy. Thus, the impact of mining on groundwater system may be considered as a temporary phenomenon. The abandoned mine working may also turn as water pool and improves the resources availability in the area.

To increase the source of availability, hand pumps and in some places piped water supply is to be provided to nearby villages in consultation with the local Government (10).

The discharged mine water may be also gainfully utilized by the local people for irrigation and domestic use. Thus, the mine water from existing mines in the area and abandoned Open Cast voids become a resource for local villages.

Conclusion and suggested future Strategy:

To assess the impact on local water levels, in time and space coordinates, a monitoring network of dug wells and in the zone of influence may be established .The water levels to be monitored quarterly .

To create the water resources and to increase groundwater recharge in the nearby villages, under community development programme, hand pumps may be installed and tanks/ponds may be constructed or strengthened. Utilization of mine water for irrigation use will also enhance the ground water recharge potential through artificial recharge in the area

Suitable control and remedial measures need to be adopted by the mine authorities in case of any adverse trends being noticed through regular monitoring. Any other measures recommended by the regulatory agencies from time to time will be implemented.

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