

CHAPTER 5

WATER POLLUTION & CONTROL MEASURES

Mining is likely to have significant effects on ground water as well as surface water. Mining operations can both contaminate and cause severe physical dislocation of aquifers.

The major source of water pollution in coal mines is the suspended solids in the drainage system of mine water¹⁸ and storm water¹⁹. In some coal mines, the mine water is acidic due to the presence of sulphur / pyrites / pyritic compounds. Effluent from washeries and coal preparation plants generally contain fine coal particles, suspended solids, washery medium, reagents *etc.* and sometimes oil and grease. In Heavy Earth Moving Machineries (HEMM) and light vehicles workshops, the workshop floors mix oil and oily matter into water along with dirt that is being washed. Besides, the sewage from residential complexes contaminates water mainly with organic matter.

To mitigate water pollution caused by mining activities, measures such as installation of water treatment plants (Effluent Treatment Plant or ETP) for eliminating pollutants from mine water as well as storm water and discharge from the workshops, installation of Sewage Treatment Plant (STP) for treatment of effluents from the residential colonies of the mines were adopted.

5.1 Excessive levels of pollutants

Bureau of Indian Standards (BIS) prescribed (May 2012) the maximum levels of water pollutants in mine water which is subsequently used for drinking and other purposes after treatment.

We observed that during 2013-18, out of 28 mines selected for audit scrutiny, in eight mines across three subsidiaries, *viz.*, BCCL (one²⁰), CCL (four²¹) and MCL (three²²) the pollutants exceeded the prescribed limits as detailed below.

¹⁸ Mine water is water that collects in a mine and which has to be brought to the surface by water treatment method in order to enable the mine to continue working.

¹⁹ Storm water is surface water in abnormal quantity resulting from heavy falls of rain or snow.

²⁰ DBOCP

²¹ Rajrappa (including washery), Piparwar, Kathara and AKK

²² Lakhanpur, Bharatpur and Basundhara (West)

Table 07: Levels of water pollutant in Subsidiaries

Potable water

Parameter	Unit	Maximum prescribed level	Actual level (Range)	Mines where pollutants exceed the limits
Turbidity	NTU ²³	5	7-15	Lakhanpur, Bharatpur and Basundhara (W) mines of MCL
Total Coli form / Faecal Coli form	mg/litre ²⁴	0.0	1.8-22	
Cadmium	mg/litre	0.003	0.05	
Manganese	mg/litre	0.3	0.31-0.94	
PH	Hydrogen ions/litre	6.5-8.5	4.04-8.76	
Biochemical Oxygen Demand	mg/litre	3	3.1-20	
Total Chromium	mg/litre	0.05	0.06-0.36	
Calcium	mg/litre	75	76.8-179	Rajrappa, Piparwar, Kathara and AKK mines of CCL
Alkalinity	mg/litre	200	220- 420	
Total dissolved solids (TDS)	mg/litre	500	512-1860	
Total Hardness	mg/litre	200	236- 744	

Source: CMPDIL monthly monitoring reports.

Effluent water

Parameter	Unit	Maximum prescribed level	Actual level (Range)	Mines where pollutants exceed the limits
Chemical Oxygen Demand (COD)	mg/litre	250	300-980	Rajrappa, Piparwar, Kathara and AKK mines of CCL
Oil and grease	mg/litre	10	12-16	
Total Suspended Solids (TSS)	mg/litre	100	104-12628	AKK mines of CCL
			138-142	DBOCP of BCCL

Source: CMPDIL monthly monitoring reports.

Although MCL claimed (October 2018) that corrective measures were taken, the level of pollutants exceeded the prescribed limits successively during 2013-18. CCL attributed the pollutants in excess of the prescribed limits in potable water to geological deposits and stated (October 2018) that effluent management system would be further strengthened. Further developments are awaited (November 2018). BCCL stated (November 2018) that currently pollution level is under control.

5.2 Zero discharge of water

5.2.1 As per the directives of Odisha State Pollution Control Board (OSPCB), zero discharge of untreated water was to be ensured by March 2016. We observed that during 2013-18, 62 lakh KL of untreated water was discharged in nearby water bodies

²³ Nephelometric Turbidity Units

²⁴ Milligram per litre

by Lakhanpur (2.95 lakh KL) and Basundhara (W) mines (59.05 lakh KL) of MCL thereby contaminating ground water, disregarding the conditions stipulated in EC and the directives of OSPCB.

MCL stated (October 2018) that remedial measures for adherence of zero discharge in these mines were under consideration. The reply is not tenable as we observed that the proposal was only under conceptual stage despite lapse of over 30 months since the date fixed for completion.

5.3 Treatment of acidic mine water

While according EC for Block-B expansion project (5.47 MTPA) of NCL, MoEF&CC stipulated (August 2014) that acidic mine water be treated and the progress thereof be intimated. NCL was also directed by MoEF&CC to implement the acid mine treatment based on report of IIT, Bombay. Further NEERI was to monitor the implementation of acid mine water treatment in the mine and also assess the impact of acid mine water on the nearby villages. NCL engaged (October 2014) CMPDIL for evaluation of the impact of acidity. CMPDIL recommended (March 2017) utilization of the OB materials from the dumps for filling up the mine pits in order to prevent the pyritic material from getting exposed to oxygen and moisture thereby preventing the formation of Acid Mine Drainage. However, no action was taken on these recommendations on the plea that modalities of permitting National Thermal Power Corporation (NTPC) for ash filling in Gorbi mines was under finalization as discussed in paras 7.1.2.1 and 7.1.2.2 *infra*.

NCL stated (October 2018) that the mine voids of abandoned Gorbi mines were identified for fly ash filling and filling of overburden from Block-B mine. We observed that the MOU was concluded with NTPC only in January 2019, though CMPDIL recommended the course of action to be adopted as early as in March 2017. The delay of over 21 months was thus avoidable.

5.4 Drainage of excess mine water

Council of Scientific & Industrial Research in collaboration with Central Institute of Mining and Fuel Research (CSIR-CIMFR), Dhanbad supplied, installed and commissioned (November 2014) a pilot plant with capacity to produce 4000 litres potable water per hour from waste mine water, at BCCL. CIL intimated (January 2016) MCL that with a view to providing treated water to the villages for drinking purpose from the surrounding underground mines, a detailed study be conducted so as to standardise the mechanism for utilization of excess mine water and directed MCL to identify the areas where this technology could be implemented. MCL identified

(November 2016 / May 2017) six locations in two²⁵ areas for implementation. The local administration of these areas was to operate and maintain these plants and distribute the water to the beneficiaries. BoD of MCL directed (January 2018) that CSIR-CIMFR be engaged for preparation of detailed project report for one project on pilot basis and the proposal be resubmitted along with the consent letters from the local administration for operation and maintenance of the plants. We observed abnormal delay ranging between 10 and 16 months in identifying the locations and eight months thereafter in referring the proposal to the BoD. The project is yet to take off (November 2018).

MCL stated (October 2018) that the matter would be pursued with the local administration for concluding Memorandum of Understanding (MoU) for operation and maintenance of the plant. Meanwhile, 51.10 lakh KL²⁶ of surplus mine water remains untapped and is discharged as waste annually.

5.5 Effluent management system at workshop

5.5.1 In its guidelines, CIL stipulated (March 2014) that the treatment plants of workshop re-circulate the treated water for washing purpose, duly adhering to zero discharge concept *i.e.*, reused within the workshop. We observed that facility at workshops of Dabor and Sonapur Bazari of ECL suffered from the following shortcomings, thereby impeding the process of water treatment.

Table 8: Status of Effluent Management System at Workshops of ECL

Sl. No.	Shortcomings	Workshops of	Indicative of
1.	Existence of weeds in HEMM washing facility	Dabor	Lying unutilised for the entire monsoon season
2.	Choked drains and chambers of HEMM washing facility resulting in overflow of sludge	Sonapur Bazari	Poor maintenance



Pic. 06: Para No. 5.5.1 (Sl. No. 01): Existence of weeds in HEMM washing facility at Dabor, ECL



Pic. 07: Para No. 5.5.1 (Sl. No. 02): Choked drains and chambers of HEMM washing facility at Sonapur Bazari, ECL, resulting in overflow of sludge

²⁵ Four in Orient Area and two in Talcher Area.

²⁶ 14000 KL/day x 365 days

ECL stated (November 2018) that weeds outgrew at the HEMM washing facility at Dabor during monsoon season and that the drains and chamber of HEMM washing facility were maintained regularly. While accumulation of weeds is a pointer to absence of plan of action in place to ensure proper maintenance during monsoon season, records indicating the periodicity of actual cleaning vis-à-vis planned, were not maintained and hence the ECL's claims as regards regular maintenance was not susceptible to verification.

5.6 Sewage Treatment Plant

Sewage Treatment Plant (STP) cleans the effluents from the sewage water of the residential colonies of the mines so that it can be recycled before releasing it back to the environment. While according EC for projects from time to time, MoEF&CC stipulated that STP be installed in the following residential colonies of the collieries. We observed that the subsidiaries did not install STP, thereby contaminating the ground water as detailed below:

Table 9: Non-installation of STP in residential colonies of subsidiaries

Sl. No.	Subsidiary	Location where STP was not installed
1	CCL	Residential colonies of Piparwar, Kathara and AKK mines
2	ECL	Residential colonies of Dabor, Kunustoria, Jhanjra and Sonepur Bazari mines
3	MCL	Residential colonies of Lingaraj and Basundhara mines
4	NCL	Residential colonies of Block B mine
5	SECL	Residential colonies of Rajendra mine
6	WCL	Residential colonies of Majri II A, Gokul and Penganga mines

We also observed that the STP installed at Lakhampur mines of MCL was inoperative since May 2008. MCL issued work order only in August 2018 (after a delay of 10 years) for its rectification at a cost of ₹ 98.38 lakh. The work is still to be completed (November 2018). Meanwhile, the sewage water remained untreated.

The subsidiaries stated (October / November 2018) that their residential colonies at mines were equipped with soak pit and septic tanks and that action was on hand to install STPs. We further observed that although MPCB forfeited the BG amounting to ₹ 10.00 lakh in June 2013, STP was constructed in the residential colony of Umrer mines of WCL only in August 2018, involving a delay of 62 months.

The fact remains that delay in installation of STPs by the subsidiaries, exposed the ground water to contamination.

5.7 Pollution in water bodies

5.7.1 We observed that due to absence of mechanical brooming / industrial cleaner in Piparwar OCM, as discussed in para 4.6.1 *supra*, the spillage from overloaded trucks / dumpers accumulated along the sides of the bridge of Safi River. As the spillage was not cleaned periodically, these eventually drained into the river thereby contaminating the river water.

CCL stated (November 2018) that the deployment of mechanical brooming / industrial cleaner would be explored. Further developments are awaited (November 2018).



Pic. 08: Para No. 5.7.1: Spillage from overloaded trucks coal accumulated along the sides of the bridge of Safi River at Piparwar OCM of CCL

5.7.2 .We further observed that the rejects of Kathara washery of CCL was found to be contaminating Damodar River as discussed in para no. 7.3.1.1 *infra*.



Pic. 09: Para No. 5.7.2: Rejects of Kathara washery of CCL contaminating Damodar River

In the Exit Conference, CCL stated (November 2018) that action would be initiated to prevent contamination.

5.7.3 EC relating to cluster of DBOCP of BCCL stipulated (February 2013) that no OB was to be dumped near water bodies and rivers and a safety barrier of at least 60 metres be maintained along the water bodies to avoid their contamination with mine waste.

We observed that OB was dumped on the bank of Khudia river without maintaining the minimum distance, thereby contaminating the river. BCCL stated (November 2018)

that action was on hand for construction of toe wall / stone pitching. Further developments are awaited (November 2018).



Pic. 10: Para No.5.7.3: OB dumped on the bank of Khudia river

5.8 Non-adherence to guidelines of Central Ground Water Authority

5.8.1 In accordance with guidelines issued by Central Ground Water Authority (CGWA), industries / infrastructure / mining projects were required to obtain NOC for the use of ground water. We observed that CCL (Piparwar OCM), BCCL (DBOCP, Kuya, Moonidih UG and Putki Balihari mines) and SECL (Baroud, Gevra and Rajendra mines) continued to use ground water for their mining operations without obtaining NOC from CGWA.

BCCL stated (November 2018) that application for NOC was submitted in off-line mode (February 2013, June 2015 and January 2017) to CGWA and that follow-up action was initiated for submission of application in on-line mode, based on proposals prepared by CMPDIL in March 2018. SECL also stated (November 2018) that application was submitted through on-line mode and that NOC was awaited. In the Exit Conference, CCL agreed (November 2018) to initiate corrective action. Meanwhile, ground water continued to be used without authorization.

5.9 Mercury content

Mercury is one of the natural and harmful components of coal. Central Pollution Control Board (CPCB) recommended (February 2013) that:

- mercury levels be analysed in all coal seam samples of all the projects of NCL on annual basis through Indian Institute of Technology, Banaras Hindu University (IIT BHU) / IIT Kanpur
- mercury level be analysed in blood samples of its employees to generate a data bank and

- a study be conducted through Indian Medical Council for assessing the impact of mercury pollution on the population of the Singrauli region within a radius of 15 km area.

We observed that NCL did not get the coal seam samples analysed for mercury content on annual basis. It engaged Indian Institute of Technology, Banaras Hindu University (IIT, BHU) in July 2013 and Indian School of Mines, Dhanbad (ISM) in June 2016, leaving the intervening spell (June 2014 to May 2016) bereft of analysis. Further, National Institute of Occupational Health, Ahmedabad reported (June 2016) that the level of mercury in 6.8 *per cent* and 8 *per cent* of the samples drawn from the mining group and the residence group respectively, exceeded the permissible limits. ISM also reported (November 2016) that the level of mercury was abnormally high and that it ranged between 13.729 mg / kg and 24.936 mg / kg (against the permissible limit of 0.005 mg / kg) in 22 coal samples. ISM reaffirmed (October 2017) that the results reported were true. Yet, NCL referred (November 2018) these samples to IIT BHU for retesting, the results of which were awaited (March 2019). We also observed that no analysis of coal seam samples was made beyond June 2016, thereby, thwarting the remedial measures of occupational health and safety.

5.10 Threat of Subsidence

Mining operations in Deulbera of MCL which commenced in 1926, was discontinued since July 2006 due to threat of surface water. Four panels having inadequate cover between 18.5 metres and 50 metres were identified for complete stabilization of the water on priority basis. The surface area above the identified panels was stated to pose danger to structures due to subsidence of strata that could take place in future. Sand stowing to the extent of 3.30 lakh cum was required for stabilization. Sand stowing was discontinued in 2016 after stowing to the extent of 1.02 lakh cum on the plea that its sand mining lease period expired and its renewal / compliance with formalities would take considerable time. As the period of lease is pre-determined, MCL should have initiated advance action either for its renewal or for locating alternative sources, more specifically since it was known beforehand that renewal/compliance with formalities for alternative sources would take considerable time.

MCL stated (October 2018) that hydro-pneumatic method of stowing was presently under execution. We further observed that against the residual quantity of 2.28 lakh cum of sand stowing to be completed to mitigate the threat of subsidence, stowing was carried out only to the extent of 2852 cum. The threat of subsidence, therefore, remained unmitigated (November 2018).

Audit Summation

The pollutants exceeded the limits prescribed by Bureau of Indian Standards (BIS) in eight mines across three subsidiaries. Further, during 2013-18, 62 lakh Kilo-litre (KL) of untreated water was discharged to nearby water bodies by Lakhanpur and Basundhara (W) mines of MCL thereby contaminating ground water. CCL, BCCL and SECL continued to use ground water for their mining operations without obtaining No Objection Certificate from Central Ground Water Authority. The subsidiaries did not install Sewage Treatment Plant at the residential colonies of the collieries, thereby contaminating the ground water. Due to absence of mechanical brooming / industrial cleaner in Piparwar OCM of CCL, the spillage from overloaded trucks / dumpers accumulated along the sides of the bridge of Safi River, was not cleaned periodically. These eventually drained into the river thereby contaminating the river water. Further, rejects of Kathara washery of CCL was found to be contaminating Damodar River. NCL did not get the coal seam samples analysed for mercury content on annual basis. Further, no analysis of coal seam samples was made beyond June 2016, thereby, thwarting the remedial measures of occupational health and safety.