

Chapter 4

Environmental Issues

4.1 Coal Mining and Environment

Coal can be extracted through open cast or underground mining. In open cast mining, the overburden i.e. the soil layers above the coal layers, are removed to extract coal. In underground mining, the coal is extracted by means of vertical and inclined shafts. Extraction by open cast mining is more productive and less expensive than underground mining. Open cast mining is the

predominant mode of coal mining worldwide as also in CIL, but it is less environmental friendly. It disfigures the countryside and the surface activities tend to pollute the atmosphere within the locality. On the other hand, land subsidence may occur as a result of underground mining, if appropriate precautionary measures are not taken. Consequently, protection of environment in terms of reclamation of land assumes great significance. Besides, there are other significant



environmental issues such as dust suppression, treatment of effluent and sewage, disposal of slurry and rejects and impact on ground water level.

4.2 Environment Management System

Environmental management system (EMS) refers to the management of an organisation's environmental programs in a comprehensive, systematic, planned and documented manner. It includes the organisational structure, planning and resources for developing, implementing and maintaining policy for environmental protection.

Audit observed that CIL and its subsidiaries have about 470 mines and 159 washeries/hospitals/workshops spread over eight States and has initiated action for EMS certification i.e. ISO:14001 in all its mines and washeries and other units. During the year 2009-10, only 15 projects got ISO: 14001 certification which includes opencast projects, workshops, hospitals and washeries. However, only 47 units of the Company got ISO certification as of March 2010.

The Management in its reply stated (May 2011) that till March 2011, 71 units have obtained ISO 14001 certification.

In brief, the Company should take early action to get EMS certification for the remaining units as EMS enables an organisation to evaluate and continually improve its environmental performance and operating efficiency.

4.3 Environment Management Plan: Implementation and Monitoring set up

The mining operations like drilling, blasting, extraction, transportation, crushing and other associated activities are carried out in underground and opencast mines. Mining operations damage the environment and ecology to an unacceptable degree, unless carefully planned and controlled. There is a need for balance between mining and environmental requirements. Therefore, it is necessary to have Environment Management Plan (EMP) in place to address the environmental concern.

Audit noticed that the Company was addressing the environmental issues through the MoUs signed with the Government of India and with its subsidiaries.

The Company has an Environment Management Division functioning at its Headquarters and Subsidiary headquarters. The Company has an 'Environment Policy' approved in 1995 with defined objectives, principles, strategies and thrust areas. However, the policy was under modification due to revision in various statutes and recent environment concerns. The environment monitoring agency of the company i.e. CMPDIL conducts fortnightly examination of samples in respect of air, water and noise pollution in different mines of its subsidiaries through its regional offices. Reports are compiled every quarter and submitted to the respective subsidiaries for submission to the respective State Pollution Control Boards.

Audit, however, observed that no mechanism exists at CIL headquarters to monitor the deviations reported in these quarterly reports from the subsidiaries so that remedial action required to be taken by the latter could be taken timely.

4.4 Environmental clearance

As per MoEF notification of 14 September 2006, prior environmental clearance is required for all projects except those listed in Environment Impact Assessment (EIA) notification 1994 unless their present status of lease area and/or production was changed in comparison to pre-1994 status.

Audit observed that out of 18 sample test checked open cast mines (OCM) and eight underground mines (UGM), six² mines were running without environmental clearance. In all, 239 mines in seven coal producing subsidiaries, which existed prior to 1994, 48³ opencast, 170⁴ underground and 21 combined opencast and underground mines were working without environmental clearance, although their status had changed in comparison to pre-1994 status.

²Ghanoodih OCP, Begunia UGM of BCCL; Urimari OCP and Jarangdih OCP of CCL; Rajpura OCP and Lakhimata UGM of ECL (OCP-open cast pit; UGM-underground mine)

³BCCL (21), CCL (9), ECL (5), SECL (7), MLC (6)

⁴BCCL (65), CCL (13), ECL (82), MCL (4), SECL (6)

Further, MoEF stipulated (February 2002) that prior environmental clearance should be obtained from them for increasing production above the existing approved levels in case of mines existing prior to 1994.

Audit observed that out of 18 sample open cast and eight underground mines, there was increased production to the tune of 45.70 MMT during April 2002 to March 2010 in 10 mines⁵ (38.46 per cent) for periods ranging from one to six years, but no prior environmental clearance was obtained.

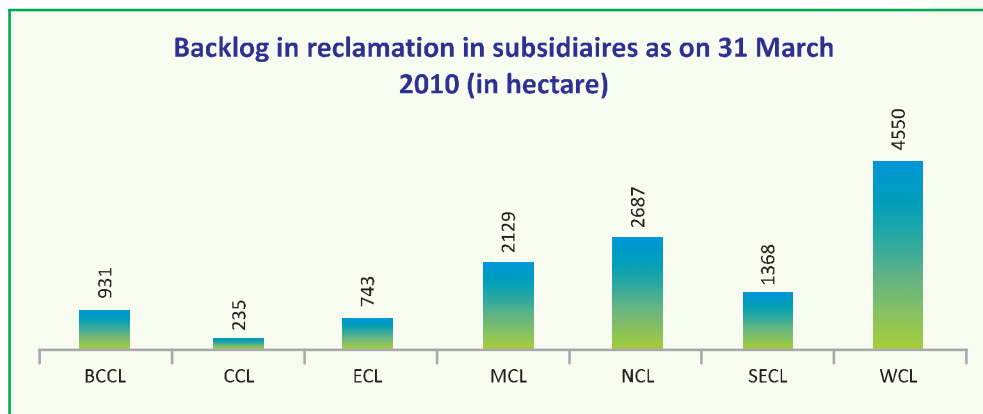
The Management stated (May 2011) that in order to meet the energy needs of the country, including crisis situations in power plants, and to make up the shortfall in production in some collieries, the production in some collieries have to be increased. Further, in respect of 62 mines, environment clearance had been applied for increased production and renewal.

The fact however, remains that mining activities without prior environmental clearance were in total violation of the instructions of the MoEF.

4.5 Backfilling and Technical Reclamation of Land

Mining operations result in voids due to extraction of coal. Land reclamation is necessary to restore the mined area to an acceptable state of physical, chemical and biological quality of land and water regimes which get disturbed by mining. Land reclamation involves backfilling (filling the pit with extracted material), technical reclamation (stabilization of backfilled area against hazards of wind, water and other natural disturbances through bull-dozing, etc.), followed by biological reclamation (restoration of biological productivity of reclaimed land).

The total land to be reclaimed in all the seven subsidiaries as on 31 March 2010 was 12,643 hectare. The status of backlog in land reclamation in different subsidiaries as on 31 March 2010 is given in the graph below:



⁵Jarandih OCP and Urimari OCP of CCL, Nigahi OCP of NCL, Gevra OCP, Rajnagar RO UGM and Bagdewa UGM of SECL, Umrer OCP, Ghorawari OCP, Satpura II UGM and Sasti UGM of WCL

Audit observed that the backlog in backfilling and technical reclamation of land had increased on 31 March 2010 as compared to the previous years in respect of five subsidiaries, viz., BCCL, ECL, MCL, SECL and WCL and the same had decreased in two subsidiaries, namely CCL and NCL. The rate of increase in the backlog was highest in the case of WCL. The subsidiary-wise details are given in **Annexure - 3**.



Backfilling of opencast mines

The Management stated (May 2011) that due to severe constraints in land acquisition, dumping of excavated over burden in the decoaled void is always preferable to CIL and cost effective option for mine operators. But in spite of backfilling being cost effective option, it is not possible to fill the void completely as there is further potential of coal extraction in dip – side and in case of complete filling, it will result in huge cost due to re-handling of filled up material.

The fact remains that backlog in backfilling and technical reclamation of land had increased as compared to previous year. Land reclamation is necessary to restore the mined area to an acceptable state of physical, chemical and biological quality of land and water regimes.

4.6 Biological Reclamation of Land

Biological reclamation of land through conscious plantation is required after physical reclamation of land to restore the natural flora and fauna and the productivity of reclaimed land. Topsoil has to be necessarily preserved for biological reclamation of land.



4.6.1 Preservation of topsoil

Topsoil is the uppermost layer of soil, usually the top 2 to 8 inches. It has the highest concentration of organic matter and micro-organisms and this is where most of the earth's biological activity occurs. It takes approximately 1000 years for one inch of topsoil deposit to be formed. Given the importance of topsoil, MoEF has stipulated that top soil should be stacked at earmarked sites with adequate measures and should be used for reclamation and rehabilitation of mined out areas.



View of an open cast mine showing Top soil, overburden

In a sample of 18 open cast mines, Audit observed that:

- Topsoil was preserved separately in five open cast mines⁶, and in the remaining 13 open cast mines⁷, Management claimed that the topsoil removed was concurrently used for biological reclamation.
- No record was maintained for generation and utilization of topsoil in support of the contention of the Management. Moreover, concurrent use of topsoil violates MoEF guidelines and may defeat the objectives of preservation of topsoil and its use for biological reclamation of land.
- The Management stated (May 2011) that specific instructions have been issued to the respective subsidiaries for maintaining proper records of top soil storage and its re-use which is now being complied with.

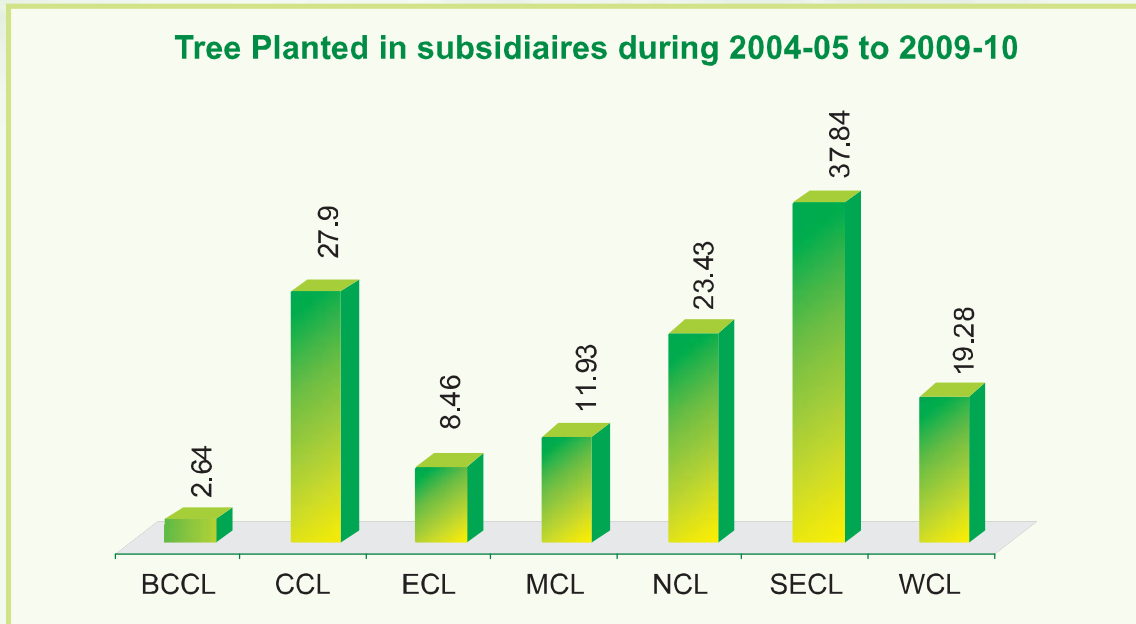
4.6.2 Tree Plantation

Tree plantation mitigates the adverse effects of mining operations and protects the environment. Tree plantation is done by the concerned State forest agencies after receiving payments from the coal subsidiaries. Support and protection to the trees planted are provided by the State forest agencies during the first three years, after which these are handed over to the respective subsidiaries.

⁶ Ghanoodih (BCCL), Rajmahal(ECL), Sonapur Bazari (ECL), Chhal (SECL) and Piperwar (CCL)

⁷ Jagannath, Lajkura and Samaleshwari of MCL, Amlohri and Nigahi of NCL, Jamuna and Gevra of SECL, Ghorawari and Umrer of WCL, Block-II of BCCL, Urimari and Jarangdi of CCL and Rajpura of ECL

The subsidiaries had planted 131.48 lakh trees and incurred expenditure of ₹.72.76 crore during the year 2004-05 to 2009-10. The subsidiary-wise break-up of plantation done is shown in graph below:



Audit observed that

- In a sample of 18 open cast mines, the density of plantation was satisfactory (more than 2500 plants per hectare norms fixed by MoEF) in eight open cast mines, but below the norms in another eight open cast mines. In the remaining two mines (Ghanoodih of BCCL and Umrer of WCL), negligible plantation was done. The details are given in Annexure -4.

The Management stated (May 2011) that the densities of the plantation on these mines are found to be less, since plantation in these mines were done earlier and that time the norms were 1600 plants per hectare.

- No system existed for further monitoring and protection of the trees once the trees were taken over from the State forest agencies. Moreover, the period of three years when support and protection to the saplings was provided by the state forest agencies, was insufficient as the trees were still very young.

The Management agreed with Audit that the contract period of maintenance of saplings by the State forest agencies should be increased to five years.

Mining is only an intermediary use of land and mines have to be closed due to exhaustion of mineable deposit or due to other reasons like policy changes, uneconomic productivity, environment and safety considerations. Closure of mines has to be prompt to ensure speedy reclamation of land for which advance planning action is required. Accordingly, environmental clearance (EC) conditions stipulate that a final mine closure plan along with details of corpus fund shall be submitted to MoEF for approval, five years in advance of final mine closure.

Out of 18 open cast mines and eight underground mines selected in the sample, three mines viz., Rajpura open cast mine of ECL, Jamuna open cast mine of SECL and Satpura-II underground mine of WCL were to be closed within next two to four years as the mineable reserve was due to be exhausted. Audit observed that no mine closure plan had been prepared for any of these three mines.

The Management stated (May 2011) that mine closure plan has been prepared for Rajpur open cast mine and Satpura II. CMPDIL has already taken up the job of preparation of mine closure plans. During 2010-11, mine closure plans for 26 mines have been prepared and sent to the subsidiaries and mine closure plans for 69 mines are under preparation.

(a) Respirable particulate Matter (RPM)

As per the Notification issued by Central Pollution Control Board (CPCB) the, norm for RPM for existing and old coal field/ mines on 24 hourly basis is 300 microgram / cubic meter ($\mu\text{g}/\text{m}^3$) for industrial area and 100 $\mu\text{g}/\text{m}^3$ for residential area.

The air quality data for the year 2008-09 and 2009-10 in respect of three subsidiaries i.e. CCL, BCCL and ECL was examined in selected locations and we observed that:

- In CCL, RPM was above the norm on 34 occasions during 2008-09 and on 15 occasions during 2009-10.
- RPM level in BCCL was within norms during the year 2008-09 and 2009-10.
- In ECL it was within norm during 2008-09 but during 2009-10 it was exceeding the norm on nine occasions only in residential area.

RPM is the dust particulates having diameter less than 10 μm (micron) and they are small enough to be inhaled and may enter deep into respiratory tract and pulmonary system of human beings. RPM because of its small size poses health hazard due to easy inhalation and deep penetration in respiratory system during breathing. Mostly diseases of lungs like asthma, bronchitis, allergic disorders etc. are caused by inhalation of respirable dust.

(b) Suspended Particulate Matter (SPM)

SPM are the particulate having diameter less than 100 µm that tend to remain suspended in the atmosphere for a longer period of time. The atmospheric suspended particulate affect the environment by lowering the visibility, producing hazy condition, participating in secondary reactions in atmosphere and affecting biotic population directly or indirectly.

As per the Notification issued by Central Pollution Control Board (CPCB), norm for industrial SPM on 24 hourly basis is 600 µg/m³ (for existing coal field/ mines) and 700 µg/m³ (for old coal field/ mines). The air quality data for the year 2008-09 and 2009-10 in respect of three subsidiaries i.e. CCL, BCCL and ECL was examined in selected locations and we observed that:

- In CCL, SPM was above the norm on 34 occasions during 2008-09 and on 20 occasions during 2009-10.
- SPM level in BCCL was within norms during the year 2008-09 and 2009-10.
- In ECL, it was within norm during 2008-09 and during 2009-10, it exceeded the norm on eight occasions only in residential area.

In conclusion, the CIL and its subsidiaries should take early action to minimise the RPM and SPM levels as these pose higher risk for respiratory diseases to the employees and the people living in the vicinity of the mines.

(c) Dust Suppression Measures

Mining, handling and transportation of coal generate a substantial amount of dust and gaseous pollutants. Moreover, as Indian coals are believed to be of drift origin, they have very high ash content, necessitating beneficiation of the raw coal. The process involves crushing of raw coal into smaller sizes in coal handling plants (CHPs) and then washing in coal washeries. All these processes generate a large amount of dust and hence, adequate water spraying arrangement is needed to suppress the dust on dust generating points such as receiving hopper of feeder breaker, screening plant, truck loading hopper and ground stocks, haul and transportation, road and railway sidings.

In order to evaluate the adequacy of dust suppression measures in the subsidiaries, Audit selected railway siding in four subsidiaries and observed that:

- (i) Water-spraying arrangements were either non-existent or inadequate in all the railway sidings of BCCL; in Sonpur Bazari and Mugma railway sidings of ECL; and in Talcher, Belpahar, Lakhanpur and Bharatpur railway sidings of MCL. In NCL, however, audit noticed all the railway sidings were equipped with rapid loading system with inbuilt silo, which ensured negligible dust generation during loading of coal.

Spraying of Water through fixed Sprinkler



- (ii) Audit also observed instances of inadequate numbers of sprinklers and water tankers for suppression of dust at haul and transportation roads (Block II of BCCL, Urimari of CCL and Lajkura of MCL), feeder breakers and truck loading points.
- (iii) In order to reduce generation of dust during transportation of coal, the National Dust Prevention Committee had suggested (May 2008) that all trucks should use tarpaulin covers while transporting coal. Audit, however, observed that carrying coal in tarpaulin covered trucks was not stipulated in the transportation contracts.

The Management while agreeing stated (May 2011) that:

- In BCCL, the dust suppression measures are being strengthened in railway sidings. Additional mobile tankers are to be deployed in Block II to mitigate the air pollution in haul roads and coal transportation roads.
- Rapid loading systems with Silos are proposed to be taken up in 3 major mines. In Mahespur, it will be in operation in 2012.
- Adequate dust suppression arrangements have been proposed in the mines in ECL.
- In case of MCL, Talcher railway siding was not in use and action for adequate dust suppression arrangements have been initiated in other three railway siding .

4.9.1 Effluent Discharge

To maintain quality of water for re-use, the prescribed norms by CPCB are given below:

Parameters	Standard--Concentration in milligram/litre (mg/ltr) except pH (not to exceed)
pH⁸	5.5 to 9.0
Total Suspended solids	100
Oil and grease	10
Nitrate Nitrogen	10
COD	250

Discharge water quality data for the year 2008-09 and 2009-10 in respect of three subsidiaries i.e. CCL, BCCL and ECL was examined in selected locations and we observed that:

- In CCL, during the years 2008-09 and 2009-10, elements like Total Suspended solids and COD were much above the prescribed norms.
- In BCCL and ECL, effluent discharge level were within norms.

4.9.2 Effluent and Sewage Treatment Plant

As per the standard industry practice, effluent treatment plants (ETPs) and sewage treatment plants (STPs) should invariably be installed to treat the discharged water to prevent further degradation of water quality. Further, there should be oil and grease traps (OGTs) to trap used oil and grease from the workshop effluent.

Audit observed that out of 18 sample open cast mines, there was no effluent treatment plant in two open cast mines⁹. Four open cast mines¹⁰ did not have STPs. Two mines (Jarangdih of CCL and Jamuna of SECL) did not have OGTs and two mines (Lajkura and Samaleshwari of MCL) had inadequate capacity to trap used oil and grease produced in the workshop. Audit, however, observed that in NCL, all the 10 open cast mines were equipped with ETPs and STPs.

The Management stated (May 2011) that in all major open cast projects, work shops effluent plants/ oil and grease trap have been constructed and action has been initiated to construct the same where it is non-existent. Jarangdih is on the verge of closure. The effluent was within the stipulated limits. Two settling tanks are proposed to be constructed in Jamuna open cast project.

⁸measure of the acidity or basicity of a solution

⁹Ghanoodih of BCCL; and Jarangdih of CCL

¹⁰Block II of BCCL; Urimari and Jarangdih of CCL; and Lajkura of MCL

4.9.3 Acid Mine Drainage

Acid Mine Drainage (AMD) refers to distinctive types of waste bodies that originate from the weathering and leaching of sulphide minerals present in coal and associated strata. Environmental effects of AMD include contamination of drinking water and disrupted growth and reproduction of aquatic plants and animals. It also results in corrosion of mining equipments and structures such as barges, bridges and concrete materials.

Audit observed that such instances were noticed by CIL management in few mines. The issue was referred to CMPDIL, its subsidiary which looks after exploration and drilling work to establish coal reserves, which has taken up a R&D study by bio-treatment in one of the selected area in WCL.

In essence, the Company and its subsidiaries should take early action to construct the effluent treatment plant and make continuous efforts to keep the level of the quality of effluent in the water discharged from the mines within the norm to avoid adverse effect of these chemicals. The Company should also make constructive efforts to arrest the Acid Mine Drainage as it impacts the ground water and aquatic life as well as mining infrastructure.

4.10 Disposal of slurry and rejects

Slurry is a by-product generated during the washing of coal. Slurry is stocked in the slurry ponds created near the washeries. Stockpiling of slurry beyond the capacity can create environment hazards by way of water and land pollution in nearby areas, particularly in the rainy season. Besides, spontaneous fire in summer can also cause air pollution as well as spread of fire to the adjoining areas.

In a test check of washeries in BCCL and CCL, Audit observed that stock of slurry and rejects as on 31 March 2010 was equivalent to 95.04 months' and 85.07 months' of production respectively against the norms of one to three months' suggested by the Central Pollution Control Board. Out of four washeries selected in sample, in Kathara washery of CCL, the stock of slurry as on 31 March 2010 was more than 122.19 months' production and in Nandan washery of WCL, there was no identified location for disposal of rejects and the same were being used to fill low lying areas.

The Management stated (May 2011) that action has been taken for disposal of existing stock of slurry and rejects.

4.11 Impact on ground water level

Ground water is a potential hazard to mining operations. Large scale dewatering is done to reduce ground water pressure, but this may bring about a decline in regional water table. The Central Ground Water Authority conducted (July 2009) studies in 18 mining areas of two of its subsidiaries SECL and WCL in Madhya Pradesh and found that the ground water level had depleted in seven areas during the pre-monsoon period and in 11 areas during the post-monsoon period. As per the standard practices, the depletion of ground water table may be compensated through adequate rain water harvesting arrangement.

Audit observed that out of 10 areas in NCL, rainwater harvesting had started in four areas. Similarly, MCL had started roof top rain water harvesting in residential and non-residential buildings in four open cast projects. Further, BCCL converted an abandoned mine into rain water harvesting pond. Thus, only a handful of projects had the rain water harvesting arrangement.

The Management stated (May 2011) that subsidiaries have been advised to take up rainwater harvesting schemes.

4.12 Using Methane From Coal Mines

Methane gas is formed as part of coal formation process and is released from the coal seam and surrounding disturbed strata during mining operations. Methane is a potent greenhouse gas with a global warming potential 23 times that of carbon dioxide. As per World Coal Association, coal mining accounted for 7.4 per cent of the total human induced methane emissions in 2005.

Audit observed that the Company has made a modest beginning in this area and only one project at Moonidih coal mine of BCCL in Jharia coalfield in Jharkhand has actually been implemented for coalbed methane (CBM) recovery and commercial utilisation while two other projects in Jharia and Raniganj coalfields, were still under development with ONGC since August 2003 and June 2004 respectively. Thus, there is a need for expeditious identification and implementation of CBM recovery projects.

The Management stated (May 2011) that identification and implementation of CBM recovery projects would be expedited.

In conclusion, CIL and its subsidiaries have taken initiatives in areas impacting environment. However, activities like backfilling, land reclamation, preservation of topsoil and plantation of trees and other environmental issues need to be identified so that CIL's vision of increasing coal production from 324 million tonnes in 2004-05 to 782 million tonnes in 2024-25 is achieved. The Company was also lagging behind in taking prior environment clearance for mines.

Recommendation # 2

Topsoil should be preserved at earmarked sites without violating MoEF guidelines and proper record of its storage and use should be maintained.

Recommendation # 3

Contract period of maintenance of saplings by the State forest agencies may be increased from the present three years to five years so that the plants become self sustaining.

Recommendation # 4

In order to arrest depletion of ground water level as a result of coal mining, subsidiaries may take up rainwater harvesting.

The Ministry while accepting the recommendations stated (May 2011) that the instructions have been issued to CIL's subsidiaries.