



SUSTAINABILITY IN COAL MINES



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1.0 Introduction

Sustainable development has commonly been considered as an oxymoron in the setting of a natural resource that is finite. The centuries-old practises of mining have tended to prioritise short-term advantages rather than considering the negative effects on the environment and communities. With the advancement of technology and growing awareness of sustainability issues, the question of how to make mining sustainable has come to the forefront. Sustainability in mining thus involves at least the following:

- The environmental dimension places a focus on the natural environment's sustainability and the availability of natural resources.
- The social dimension emphasises the need for social and cultural sustainability, which connects to questions of benefit distribution, mining costs, and decision-making process.
- The economic dimension focuses on the costs associated with upholding standards of life and the economic sustainability of those standards.

2.0 Sustainable Development Policy of Coal/Lignite PSUs

The coal/lignite PSUs under the Ministry are mindful of promoting sustainability in their mining and allied activities.

(A) Coal India Limited (CIL)

A formal Sustainable Development Policy was developed by Coal India Limited in 2013 to promote sustainable development (SD) and inclusive growth.

This policy encompasses mainly three components:

- i. Environmental sustainability
- ii. Socio-cultural sustainability
- iii. Economic sustainability

The SD Policy reaffirms CIL's commitment to protecting the environment and biodiversity in order to maintain ecological balance, as well as its efforts to improve the sociocultural and economic conditions in the areas where its activities take place. For promoting sustainable development, CIL is committed to:

- i. Adopt world class eco-friendly mining technologies
- ii. Conserve natural resources by reducing, reusing, recycling, redefining and replacing.
- iii. Neutralize the effect of mining through appropriate mitigative measures.
- iv. Create income generation avenues/skill development.
- v. Ensure society a better quality of life by providing basic infrastructure and management of services like water, health care, etc.
- vi. Strive for conducting the business in an ethical and transparent manner.

CIL also complies with the principles of National Voluntary Guidelines as per Business Responsibility Report. It has Board level CSR & SD Committee to look after the CSR and SD efforts. Every year CIL publishes its Sustainability Report as per guidelines of sustainability reporting.



(B) Singareni Collieries Company Limited (SCCL)

Since SCCL has been running coal mines for more than 130 years, environmental management in coal mining areas has been integrated into the development and planning of mines. To continuously evaluate how well environmental standards are being followed in coal mines and to provide appropriate channels for putting environmental protection measures into action and promoting sustainability, SCCL has formed a dedicated Environment Department.

SCCL has developed an Environmental policy, which states that “To be a role model in protection of environment for sustainable development, SCCL is committed to implement the best global practices in all its operations through prevention / mitigation of pollution, proper disposal / recycling of wastes and bringing awareness among all the stake holders for continual improvement in environmental performance”.

(C) NLC India Limited (NLCIL)

NLC India Limited, a Navratna Govt. of India Enterprises, A giant Public sector undertaking in southern India, incorporated in late 50s, is the prime player of open cast Lignite/ coal, Mining, Power Generation and in renewable energy on PAN India for more than six decades.

NLCIL strives hard to achieve its environmental, socio-cultural and economic sustainability goals through its Corporate Environmental Policy, Code of Conduct, Fraud Prevention Policy, Whistle Blower Policy, Internal Code of conduct for prevention of insider trading, Related Party Transaction Policy, Dividend Distribution Policy, CSR Policy, R&R Policy, Training Policy, Career Growth Policy, Occupational Health & Safety Policy, Code of Corporate fair disclosure practices for prevention of insider trading.

3.0 Establishment of Sustainability and Just Transition Division

SDC & JT Section at Ministry Level

The adoption of sustainable development principles in coal mining sector has been gaining ground over the years. Ministry of Coal not only envisions to secure availability of coal to meet the rising energy demand of various sectors but also prioritise due care for local environment and host community. Coal sector envisages to promote sustainable development model in which coal production goes hand in hand with environmental protection, resource conservation, care for society and measures to protect our forests and biodiversity.

With the above goals in forefront, Ministry of Coal has established ‘**Sustainable Development Cell (SDC)**’ in December 2019 to promote environmentally sustainable coal mining in the country and to address concerns during mining operation and till the decommissioning or final closure of mines. This move gains more importance as new private entities are now going to form a significant part of future coal supply matrix. Subsequently, the SDC emerged as **Sustainability & Just Transition (S & JT) Division consisting Sustainable Development Cell (SDC) & Just Transition (JT) Section**. Recognizing the importance of bringing sustainability in coal mining, Sustainable Development Cells (SDC) have also been established in all Coal/Lignite PSUs with following objectives to improve the overall image of coal sector in the country:

- To advise, mentor, plan & monitor the mitigation measures taken by Coal/Lignite PSUs for maximising resource utilisation in a sustainable way.
- To minimise the adverse impact of mining and establish a sustainable environment around coal regions to improve ecosystem services.
- To share and replicate the best practices of sustainable mining



- To take up the issues of climate change on Just Transition aspects of coal sector
- To disseminate best practices of sustainability through reports, films, documentaries etc.

Role of S & JT Division

The S & JT Division advises, mentors, plans and monitors the mitigation measures taken by coal companies for maximising the utilisation of available resources in a sustainable way, minimising the adverse impact of mining and mitigating it for further ecosystem services. It deals the matters environmental sustainability and Just Transition aspects of the coal sector.

S & JT Division adopts a systemic approach, starting from collection of data, analysis of data, presentation of information, planning by domain experts, adoption of best practices, consultations, innovative thinking, site-specific approaches, knowledge sharing and dissemination with an aim to ease the lives of people and communities residing in and around mining areas.

SDC at CIL & its Subsidiaries

SD Cell at CIL has been constituted under the Chairmanship of Director (Technical), CIL. Similarly, SD Cell at each subsidiary consist of multi-disciplinary team under the Chairmanship of respective Director (Technical/P&P). At CMPDI, the Committee has been constituted with Director (Technical/ES) as Nodal Point for SDC. All the SDCs work in unison for achieving the objective of promoting sustainable development in Coal/Lignite Sector.

SDC at SCCL

In compliance of the guidelines issued by Ministry of Coal (MOC), a “Sustainable Development Cell (SDC)” has been established in SCCL under the Chairmanship of Director (Planning & Projects), General Manager (Environment) as Secretary and one officer each from Project Planning, Estates, Forestry, Exploration (Hydro-Geology), Energy Management and Civil Departments.

SDC at NLCIL

NLCIL has also established a “Sustainable Development Cell (SDC)” with Chief General Manager (Land) as Chairman and 3 officers from Civil, Horticulture and Agriculture to assist. Director (Mines) is monitoring the overall activities of SDC.

The SDC Cells are adopting a systematic approach, starting from collection of data, analysis of data, and presentation of information, planning based on information from project authorities, adoption of best environment management practices, innovative thinking and site-specific approaches.

Meetings are conducted at regular intervals by the S&JT Division of Ministry to review the progress of various sustainable activities of coal/lignite PSUs, namely creation of eco-parks, mine tourism, mine water utilization, biological reclamation of OB dump and backfilled areas, ecological studies in mines, promoting alternative usage of OB, energy efficiency measures, air quality management in coal mining areas, publication of status report/good practices and other sustainability related matters of coal/lignite sector etc.

4.0 Environmental Sustainability Management

In order to achieve environmental sustainability, the following is a brief explanation of the environmental protection measures being adopted by coal/lignite PSUs in coal mining areas:

4.1 Air Quality Management

Drilling, blasting, loading, unloading, and transportation of coal and OB are the main causes of dust generation. Wet drilling is used to reduce dust generation. Dust suppression systems are also included with drill machines. Surface miners and BWEs are being used more frequently, which reduces the need for drilling and blasting and, thus, the pollution load. Vehicles get routine maintenance in accordance with the manufacturer’s specifications.



At locations of loading, transfer, and unloading in mines, dust suppression systems are in place. Additionally, washeries, CHPs, Feeder Breakers, Crushers, belt conveyors, haul roads, and coal stock areas have water-spraying systems installed to capture fugitive dust. To keep dust from getting airborne, all of the roads connecting mines, CHPs, workshops, and colonies have been blacktopped.

By planting grasses on slopes and plants on the dump top as soon as they form, it is possible to greatly reduce the amount of dust that is produced by the OB dump due to wind. Roadside avenue plantations are grown to reduce dust. Plantation is done around the quarry and OB dumps, acting as a barrier to stop dust from being carried in the air.

The trucks are being covered with tarpaulin and mist spray systems have been installed. For the purpose of controlling air pollution, fog cannons, wheel washing systems, motorised road sweepers, etc. are being used. It is encouraged to dispatch coal using the rail, MGR, conveyor, and tube conveyor networks.



Fig. Surface Miner with water jets, Gevra OCP, SECL



Fig. Drill Machine with dust extractors

Dust suppression systems are installed at loading, transfer and unloading points in mines. Additionally, water-spraying systems for arresting fugitive dust in washeries, CHPs, Feeder Breakers, Crushers, belt conveyors, haul roads and coal stock areas are installed.



Fig. Air pollution control measures Nigahi OCP, NCL

All roads connecting mines, CHP's, workshops and colonies have been black topped to prevent dust from becoming airborne. Mist spray systems have been introduced and the trucks are being covered by tarpaulin. Fog canon, wheel washing system, mechanical road sweepers etc. are being deployed for control of air pollution. During FY 2021-22 to FY 2023-24, Coal/Lignite PSUs have deployed/installed 431 mist sprayer/fog canon, 19 wheel washing, 26 mechanical road sweeper and 93 CAAQMS.



Fig. Fog canon for dust suppression at Nigahi OC of NCL

Coal companies are commissioning First Mile Connectivity (FMC) Projects aimed to replace the system of convention loading & road transport with rapid mechanized loading system with transport through Rail/ MGR/Conveyors/tube conveyor network. Some of the projects have already been completed and others are in pipeline. These projects are not only minimizing air pollution but also results in substantial reduction in carbon footprint.



Fig. Nigahi OC of NCL: Closed Belt Conveyor System and then rapid loading system



Fig. Krishnashila OC of NCL: Belt Pipe Conveyor

Dust generation from the OB dump due to wind is controlled significantly by planting grasses on slopes and plants on dump top soon after their formation. Avenue plantation is raised along roads for dust control. Plantation is done around the quarry and OB dumps, which serves as a barrier to prevent the dispersion of air borne dust. Wind screens have been created to restrict the movement of dust within a limited area.

The ambient air quality in and around coal mines is routinely monitored as per statutory stipulations and their results are shared with regulatory agencies. Continuous Ambient Air Quality Monitoring Systems (CAAQMS) have also been installed in opencast mines which are connected to SPCB websites for real time monitoring of Ambient Air Quality Parameters. Additional pollution control measures are undertaken, if required, to bring the air quality level within permissible limits.

With various emission control and mitigative measures in place, the standards of ambient air quality in and around mining areas are maintained within the prescribed limits.

NLCIL has an in-house lab (CARD) accredited by NABL with a sufficient number of pollution monitoring devices, and it regularly monitors the air quality on alternate days in accordance with the Consent to Operate (CTO).

In accordance with the TNPCB, NLCIL installed 13 AAQ stations for the purpose of monitoring the Air Quality Parameters. Of the 13 AAQ stations, 10 are located in nearby villages and are under the supervision of the renowned IIT-Madras, whose results are also submitted to statutory authorities. So far, there have been no reported non-compliances.

4.2 Water Quality Management

In Indian coal mines, the mine water is often of good quality. The only criterion for which sedimentation, a physical process, is used to treat, is suspended

solids. The suspended solids are settled in the mine sump before being discharged. High suspended particles and oil & grease concentrations are characteristic of effluents from workshops and CHPs. Effluent treatment plants and/or oil and grease traps have been installed for workshops and CHPs. STP facilities are being installed for treatment of domestic effluent.

Controlling and removing water pollutants and contaminants in order to make the water safe for reuse is the goal of water quality management. Reusing treated water for home and industrial purposes reduces or eliminates the need for freshwater from other sources. Coal/Lignite PSUs strive to leave the smallest possible water footprint on the surface water regime. Only a small number of CIL mines have experienced the issue of acidic mine water, for which appropriate pollution control systems have been built and put into place. Before releasing the run-off water into the natural water regime, steps are taken to prevent soil erosion and arrest suspended solids, such as the building of toe walls, garland drains, settling ponds, gabions, cribs, check dams, and rock fill dams.

The zone of influence caused by mining operations on ground water level is only evident up to 1,000 metres from the mine's boundary, according to scientific research based on routine groundwater level monitoring. The project's domestic and industrial water requirements are sustainably satisfied by using mine water or an old, abandoned quarry. Additionally, following adequate treatment, mine water is also provided to a local town for domestic use.

Additionally, mine wastewater that complies with prescribed statutory norms is released into nearby drainage systems, ponds, and agricultural fields, acting as a continuous source of recharge and raising the water level in the mining area. In mines and colonies, water saving techniques are being used. In every mining area, buildings for collecting



rainwater are being built. To ensure compliance with applicable requirements, the quality of surface water, ground water, and mining effluents are periodically monitored. Both open wells and piezometers built in mining areas are used to measure ground water levels.



Fig. 0.8 MLD STP at Block-B, NCL



Fig. ETP at Kakri OCP, NCL

4.3 Mine Closure, Bio-reclamation & Land Use Management

Before mine operations even begin, planning for mine closure must be completed. Throughout the course of the planning process, it must be periodically reviewed and modified as necessary to be compliant with social and environmental challenges. The planning for the mine closure has several goals, including:

- To construct a self-sustaining ecosystem and to restore the physical, chemical, and biological quality that was damaged by mining to an acceptable level.
- To enable effective and sustainable after-use of the site
- In order to safeguard public health and safety.
- To stop environmental degradation and promote environmental sustainability as an outcome.
- To reduce negative socioeconomic effects.
- To safeguard the local flora and fauna.
- Making good use of the resources.

Plans for mine closure include both final and progressive elements. While the Final Mine Closure Plan aims to leave the site as safe, sustainable, and as close to its pre-mining status as is reasonably possible, the Progressive Mine Closure Designed to address to repair damages as soon as possible to limit their long-term impact. All operating coal and lignite mines currently have mine closure plans that have been approved, and mine closure activities are being carried out in accordance with the approved plan.

The improvement of the landscape affected by mining activities is one of the biggest objectives of the mine closure plans. Since there is no usable mine void during the initial phase of mining, the overburden (OB) produced by the mine is stored outside the excavated area. As the mine voids become available the OB generated is backfilled in the quarry. This continues throughout the life of the mine. Progressively, the non-active external dumps and backfilled sites are subjected to biological reclamation. After 1-2 years of technological reclamation, when the soil has stabilised, biological reclamation is typically started.

The mined-out land's rehabilitation process primarily

focuses on the following:

- Restoring the land to its pre-mining land use or that consistent with the surrounding land.
- Maintaining the long-term stability of the affected land to match with the community and commercial needs.
- Besides plantation, the reclaimed areas are also being developed in parks, flora & fauna sanctuaries, grazing land, ponds and playgrounds with ecological, tourist and commercial values are planned.
- Solar Panels on reclaimed areas are also being planned.
- Hi-tech cultivation has also been taken up on the mined out / reclaimed areas. Bamboo plantation and grassing of OB dumps/back-filled areas are also being done
- Plantation has also been taken up in degraded forest lands of surrounding area with concurrence of State Forest department and also in private lands in the mine surroundings in the form of Social Forestry /CSR.
- Extensive Avenue plantation has been taken up along the approach roads/routes leading to the connecting surrounding villages.
- Some of the coal companies have developed their own nurseries for developing saplings of native species of plants. Seedlings are also distributed to local population to sensitize plantation by local people.

In the Financial Year 2023-24, Coal/Lignite PSUs have planted 54.46 lakh saplings covering an area of about 2782 Ha. In addition to this 398.65 Ha land has been covered under grassing..The target vis-à-vis achievements as per Vision Document is given below:



As per Vision Document		2019-20	2020-21	2021-22	2022-23	2023-24
Plantation Area (Ha)	Cumulative Target	1600	3400	5400	7600	10000
	Achievement	Achieved	3520	5790	8160	10942
Plantation Nos (lakh)	Cumulative Target	40	80	130	176	200
	Achievement	Achieved	81	132	182	236.4

Thus, Coal/lignite PSUs have not only enhanced their production level over the years to meet the rising energy demand but also shown their sensitivity and care towards native environment by adopting various mitigation measures including reclamation of mined out areas and extensive plantation in and around coal bearing areas.

As per the Report on Greening Initiatives of Coal/lignite PSUs prepared by CMPDIL, around 50000 Ha of land has been brought under green cover till 2021-22 thus creating substantial carbon sink and contributing towards India’s NDC target. Further, during FY 2022-23 & FY 2023-24, the corresponding figures has been around around 2370 Ha and 2782 Ha respectively.

Additionally, Coal/Lignite PSUs have envisaged to bring about 30,000 Ha of addition area (in and around coalfields) under plantation by 2030 from 2019,. For the next 5 year, from FY 2024-25 to FY 2028-29, Coal/Lignite PSUs have set target of plantation of about 15,350 Ha.



Steps taken for effective and sustainable plantation at Nigahi OC of NCL



Plantation on NK Area, CCL

In addition to bio-reclamation of mined out areas, green belt is also created around the source of air pollution like mine, infrastructure and roads to reduce air pollution. Green belt is also provided around the mine and residential colony for noise attenuation.

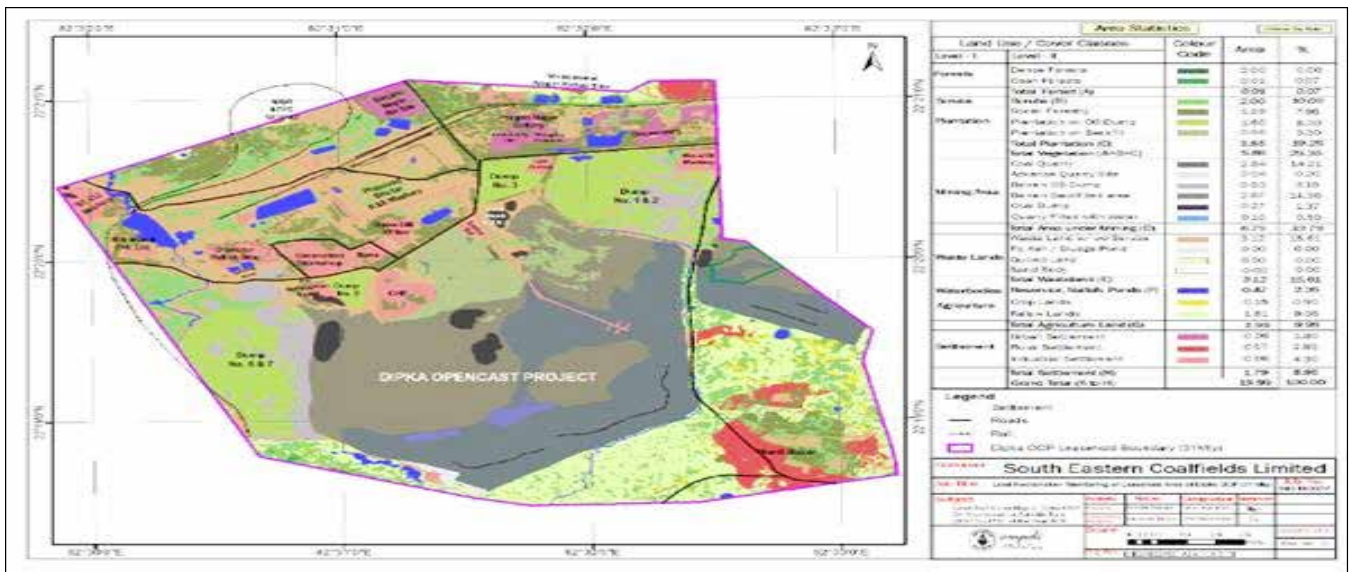


Plantation on overburden dump at Samleswari OCP, MCL

Reclamation of mined out areas is important for sustainable development. Emphasis is being laid on proper reclamation which includes both technical and biological reclamation as well as mine closure. Satellite surveillance for land reclamation is being given the requisite thrust in order to assess the progressive status of reclamation and to take up remedial measures, if any, required for environmental protection.

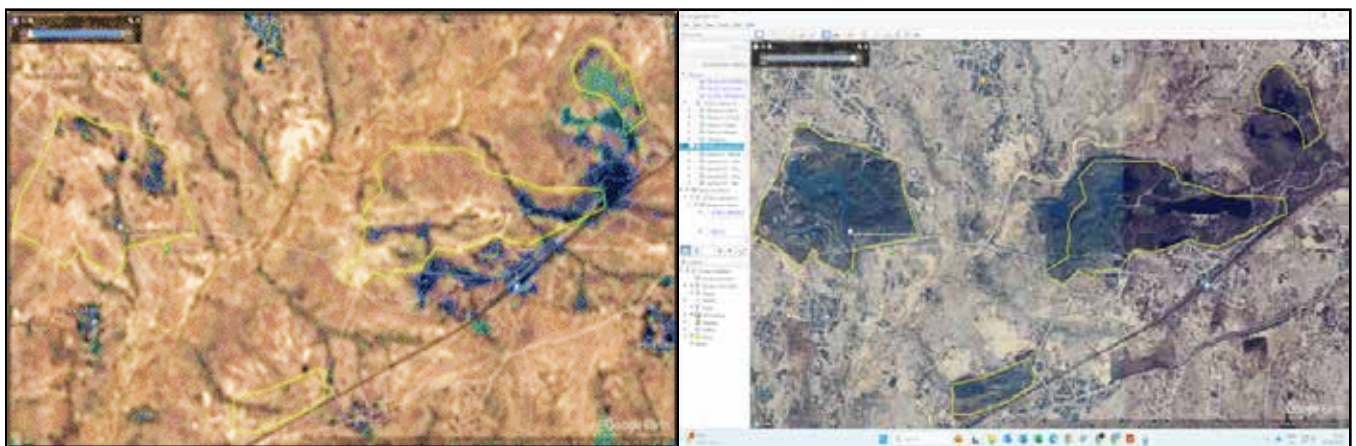
Satellite data-based Image Analysis and satellite surveillance of progressive reclamation activities is being regularly carried out by Coal/Lignite PSUs.





Satellite based monitoring of Dipka OC, SECL

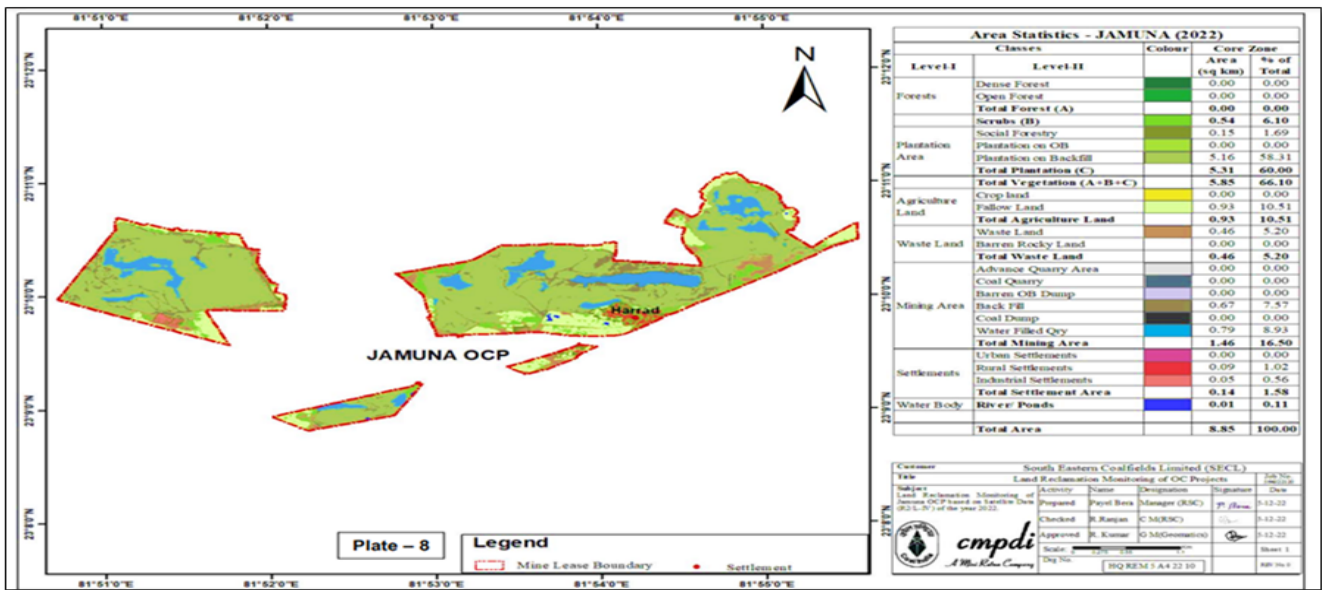
The plantation carried out on non-forest backfilled as well as external overburden dumps is best suitable for Accredited Compensatory Afforestation (ACA). The Ministry of Coal has guided Coal CPSEs to extensively cover non-forest land for compensatory afforestation in future to promote ACA and expedite the Forest Clearance process. As per the Vision Vikasit Bharat 2024, Coal/Lignite PSUs are committed to create an ACA Land Bank of 9200 Ha during FY 2024-25 to FY 2028-29.



Satellite Image of Year 1985 vs 2023 of Jamuna OC, Anuppur, MP



Lush Green Plantation on OB of Jamuna OC, Anuppur, MP



Reclamation Monitoring by Satellite for 2022-23 of Jamuna OC, Anuppur, MP



ACA Bharatpur OCP, Angul, Odisha

5.0 Adoption of Star Rating System for Mines of CIL

1. BACKGROUND

1.1 Coal mining operations are expected to comply with many rules & regulations. These are mainly regarding safety, environment, rehabilitation of project affected families, welfare of workers etc.

Although all the mines are expected to comply with all the regulations, there are some digressions in varying degrees.

1.2 The mining sector has kept evolving and becoming more efficient. Safer mining techniques are coming up. Some mines are leading others in terms of adoption of best practices. Also, there is considerable variation if we consider the economic

performance of different mines. It becomes important to identify the best performers in terms of above-mentioned areas and give them due recognition. The star rating of coal / lignite mines is expected to do the same.

2.0 STAR RATING POLICY

2.1 It had been planned to implement a system of self-evaluation and subsequent validation by Coal controller's organization of all coal mines under various factors covered broadly in seven modules as follows:

- 1) Mining Operations Related Parameters
- 2) Environment related parameters
- 3) Adoption of Technologies: Best Mining Practices
- 4) Economic performance
- 5) Rehabilitation & Resettlement related parameters
- 6) Worker related Compliance
- 7) Safety and security related parameters

2.2 Total 50 evaluation parameters in Open cast Mines and 47 in Underground Mines are specified in these seven modules. In case of mixed mines having both UG and OC operations, the final rating of mines will be calculated on weighted average of coal production target of OC and UG sections of the mixed mine.

3.0 SUBMISSION OF INFORMATION AND DEVELOPMENT OF WEB PORTAL

A web portal has been developed by NIC, MoC for Star Rating of Coal Mines. Each coal mine is provided a login for the portal and the submission of self-evaluation takes place through this portal. The portal has the facility of uploading supporting documents concerning the evaluation parameters. The field offices of CCO are provided with separate logins to the web portal through which they can access the submissions of self-evaluation. The final

remarks of validation committee for each evaluation parameter is recorded on the portal.

4.0 METHODOLOGY FOR SELF EVALUATION

Evaluation of the coal mines are divided into three category i.e. UG mines, OC mines and Mixed mines. The coal mines are to rate themselves as follows:

- 1) The sum of maximum points of all applicable parameters & sum of scored points is calculated.
- 2) The star rating is done on the basis of percentage of scored points.

The criterion for the same are as follows:

CRITERION FOR	STAR RATING
PERCENTAGE SCORE	STAR RATING
91 TO 100%	5 STAR
81 TO 90%	4 STAR
71 TO 80%	3 STAR
61 TO 70%	2 STAR
41 TO 60%	1 STAR
0 TO 40%	NO STAR

5.0 METHODOLOGY FOR VALIDATION

The Coal Controller's Organization is responsible for conducting the validation exercise after submission of self-evaluation. A system of peer review is followed for the top scoring 10 mines each in case of UG and OC mines and 5 in case of mixed mines and 10 mines at random selected by CCO irrespective of marks in order to ensure validation of data. Any falsification of uploaded data if found will attract Zero star rating for the mine for which decision of CCO is final.

6.0 PERFORMANCE

The assessment of Star Rating for performance base year 2022-23 has been completed for all coal and lignite mines of India and result has been published. Total 380 mines have been reviewed by CCO (OC: 216, UG: 150 and MIX: 14) for Star rating 2022-23.



The total number of 5 star rated coal and lignite mines has been increased significantly in 2022-23, in comparison to previous years. Even in UG, OC category the number of 5 star rated coal and lignite mines has increased.

Year-wise performance Five Star rated mines:

Base Year	No. of Five Star Coal & Lignite Mines			
	UG	OC	MX	Total
2022-23	10	33	0	43
2021-22	6	18	0	24
2020-21	5	15	0	20
2019-20	5	11	0	16
2018-19	4	4	0	8

Performance of Star Rating for Base Year 2022-23 is as under: -

Rating Year	Name of Company	No of Mines assessed	Type of Mine	No of mines declared star rating					
			OC+UG+Mixed	5 star	4 star	3 star	2 star	1 star	No star
2022-23	Total	380	216+150+14	43	100	123	72	37	5
	BCCL	33	25+4+4	1	5	13	10	3	1
	CCL	39	35+4+0	4	3	18	10	4	0
	ECL	75	19+49+7	2	4	28	24	17	0
	MCL	18	15+3+0	6	9	3	0	0	0
	NCL	10	10+0+0	9	1	0	0	0	0
	SECL	63	18+45+0	4	17	21	16	5	0
	NEC	01	01+0+0	0	1	0	0	0	0
	SCCL	37	16+20+1	2	18	13	4	0	0
	NLCIL	5	5+0+0	4	1	0	0	0	0
	Others	49	41+7+1	8	17	5	7	8	4

6.0 Development of EPI (Environment Performance Index) and Environmental Audit:

The Ministry of Coal, Government of India had given a commitment to the Standing Committee on “Oral evidence on Compliance of Environmental norms by coal/lignite companies” held on 27th April 2017, for development of an Environment Rating Index of compliance in its coal mines, incorporating status of pollution (air, water, land and biodiversity) due to coal mining. The Index will measure the effectiveness and performance of the mitigation measures implemented to mitigate the negative impact in the form of compliance to EC and EMP.

Auditing and subsequent Index rating of mines will indicate the overall environmental status prevailing in the coal mining projects and also bring competition between mines for achieving excellence in environmental compliance.

CIL under the ambit of its MoU with ICFRE – Dehradun, assigned them the work for “Developing an approach and methodology for an index rating of environmental conditions & performance evaluation and Environment Performance Indexing in respect of compliance of EC conditions and third party mine auditing in selected 35 mines of CIL”. After detailed inspection of all the 35 nos. of mine, ICFRE has submitted Draft Audit for individual mines. They



have also submitted the Final Audit report of all the 35 mines, after incorporating the comments from CIL/Subsidiaries on draft report. The work of indexing of Compliance of EC conditions was started after finalization of the Audit report & the same for all 35 mines is likely to be completed by July 2024.

SCCL awarded the work of third party auditing of compliance of EC conditions of RG OC-1 project and Cluster of GDK Coal Mine projects of SCCL to CSIR-NEERI during 2023-24. Accordingly, CSIR-NEERI conducted Environmental Audit and Final Reports are yet to be submitted.

NLCIL has awarded the work of Environmental Audit of three mines namely, Mine-I, Mine-IA & Mine-II of Neyveli to Annamalai University, Chidambaram. Annamalai University has completed the field study and draft report is awaited.

7.0 Best practices:

In the areas of reclamation, mining water utilisation, promotion of renewables, alternate uses for OB, energy efficiency measures, etc., coal/lignite PSUs have done a number of praiseworthy initiatives. The purpose of showcasing these works and practises is to encourage others to replicate them. Some of the best practices have been compiled hereunder:

- **Glimpse of Chandra Shekhar Azad Eco-park, Bina Project, NCL**



7.1 Development of Eco Parks/ Mine Tourism Sites

Development of eco-parks/tourism sites to promote mine tourism is one of the key thrust areas of S & JT Division of MoC and coal companies. Under the Vision Document of MoC, it was envisaged to create 10 new Eco-parks/Tourism Sites between FY 2019-20 to FY 2023-24. However, till March, 2024, 16 new Eco-parks/Mine Tourism sites have been completed.

Further, as per the Vision Vikasit Bharat 2047, Coal/Lignite PSUs are committed to develop 40 new Eco-Parks/Mine Tourism Sites during FY 2024-25 to 2028-29.

CIL

Till FY 2023-24, CIL has developed around 32 eco-parks and mine tourism projects. Some of the eco parks/mine tourism sites developed by CIL in mined out areas and its command regions are Mudwani Dam Eco-park of NCL, Balgangadhar Tilak Eco-park of WCL, Chandrashekhar Azad Eco-park of MCL, Nigahi Eco-park of NCL, AnanyaVatika in SECL, Ananta Medicinal garden in MCL, Saoner Park in WCL, KayakalpVatika in CCL among others. Additionally, several other eco-parks are under different stages of development.



- Chandra Shekhar Azad Eco-Park, Orient UG No. 4, MCL





- **Mahatma Gandhi Mine Eco-park, WCL**



SCCL

SCCL has developed an eco-park/tourism site in the reclaimed mining area of the Gautham Khani Opencast Project for recreation activities and tourism purposes in order to change the public's perception of coal mining as a polluting industry. The key highlights of eco-parks are lawns and gardens along with theme plantation, cacti and succulent garden, butterfly garden, water fountains, boating facility, bird watching facility, children park, Vinayaka Vanam, canteen and restrooms.

The Eco-Park is situated adjacent to Gouthampur village in Kothagudem mandal of Bhadrachalam district, Telangana State. The nearest railhead to the project is Bhadrachalam Road Railway Station which is at a distance of 12 Km. Railway Station is connected to the South Central Railway Dornakal junction on Chennai-New Delhi grand trunk line by a 55 Km long track which is also meant for coal transport. The park is well connected with State Capital, Hyderabad (280 Km) and the district head quarters, Bhadrachalam Kothagudem (10 Km) by road.



Fig . Eco-Park developed at Gautham Khani OC by SCCL

**Yoga Centr****Open Gym****NLCIL**

NLCIL Eco Tourism Park at Mine-I & Mine-II, Neyveli, Tamil Nadu was inaugurated on the day of Vriksharopan Abhiyan held on 23.07.2020 & 19.08.2021 by the Hon'ble Union Home Minister and the Hon'ble Union Minister of Coal, Mine and Parliamentary affairs, Government of India respectively. Eco Tourism Parks are located 200 km south of Chennai, 65 km from Puducherry and 45 km from Chidambaram. The key highlights of the eco-parks are as under boating facility in artificial lake, birds watching, divine tree park having tree plants for all Stars and Raasi, children play area, cafeteria, medicinal garden, vehicle rides, rearing of livestock. The eco-park is open for public.

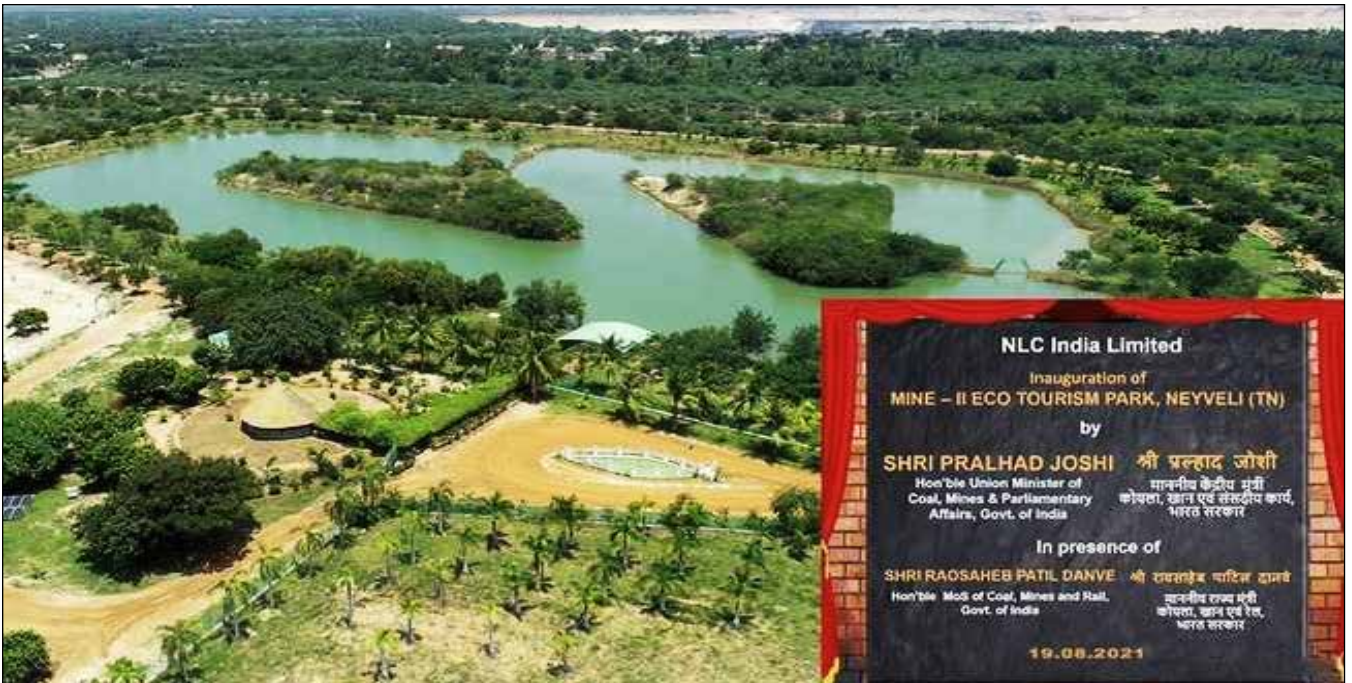


Fig. Bird's eye view of NLCIL Mine-II Eco park



Fig. Boating in Artificial Lake area

On the auspicious occasion of Vijaya Dashami i.e. 05.10.22, an MoU was signed between NLCIL and Pondicherry Tourism Development Corporation Ltd (PTDC) in the august presence of Chief Minister and Minister of Tourism, Puducherry and Director/Mines, NLCIL for promoting Mine Eco Tourism.





Fig. The event of Signing of MoU on 05.10.2022 by NLCIL and PTDC

7.2 Mine water utilization

Mines, when viewed objectively, whether opencast or underground are water harvesting structures. During initial stages, the mines can temporarily effect the water table but once mining operations stabilize, they also act as water storage bodies. Post mining, all mines get filled up with natural precipitation, whether they are carved out areas of underground mines filled up with natural precipitation, whether they are carved out areas of underground mines or backfilled area & voids in opencast mines. The drilling and blasting activities carried out by mining operations contribute to the secondary porosity and permeability by which ground water movement is facilitated to surrounding areas. It has been seen in many cases that once mining operations have been stopped, the water table in areas near to the mine increases.

The mine voids left at the terminal years of mining

is converted into water reservoir and water is being utilized. At present, there is greater emphasis on mine water treatment and its utilization by Ministry of Coal. Action plan is being chalked out and implemented by coal/lignite PSUs for mine water utilization for the community.

Mines have been providing treated mine water to the neighbouring communities both for domestic and irrigation use since past. Institutional arrangements under MoC sustainable development activities are now being undertaken to fulfil societal aspirations. This endeavour is in line with the Jal Shakti Abhiyan for water conservation campaign initiated by Government of India.

The mine discharge water is being treated in filter beds, settling tanks before supplying to employees and colonies. The mine water is being utilised for industrial & domestic purposes such as dust suppression, stowing, washing of machinery,

firefighting, drinking, and plantation. The excess water is discharged into settling tanks before discharging to nearby tanks for community use such as drinking and irrigation. The surplus water after above usages is being discharged into nearby tanks for ground water recharge and for further use of agriculture.

As per the targets envisaged under “Vision Vikasit Bharat 2047 during the FY 2024-25 to 2028-29, Coal/Lignite PSUs is committed to offer 20000 LKL of Mine Water for community use. During last 5 year till March, 2024, volume of mine water supplied for community purposes has been around 18,513

LKL which is anticipated to benefit around 37.63 lakh population in 1,055 villages of coal bearing States. Volume of mine water supplied for irrigation purpose has been 7,010 LKL & for domestic/ drinking purposes has been 11,503 LKL.

During the FY 2023-24, Coal/Lignite PSUs has offered about 4,892 LKL mine water for community use against the target of 4300 LKL. Potential created in FY 2023-24 for 37.63 Lakh people to use mine water for domestic/drinking purpose.

In FY 2023-24, Targets viz-a-viz Achievements for mine water utilisation is as under:

Mine Water Utilization		CIL	NLCIL	SCCL	Total
Target (LKL)	Domestic/Drinking	950	150	20	1120
	Irrigation	2300	250	580	3130
	Total	3250	400	600	4250
Achievements (LKL)	Domestic/Drinking	2212	152	25	2389
	Irrigation	1460	248	795	2503
	Total	3672	400	820	4892

Subsidiaries of CIL have signed MoU's with the State Governments for achieving the common goal of providing surplus water from suitable mines for use by habitations, located in the command areas of subsidiaries of CIL in the respective states. The details are as under:

- **MoU between Jharkhand Govt & CIL** - Utilization of mine water by villages situated in the command area of CCL, BCCL and ECL
- **MoU between West Bengal Govt & ECL** - utilization of mine water by communities for irrigation purposes
- **MoU between WCL & MAHAGENCO** - To provide mine water to MAHAGENCO power plants located near mines of WCL

- **MoU between WCL & Vidarbha Irrigation Development Corporation** - Providing surplus mine water to VIDC from mines of WCL
- **MoU between Chhattisgarh Govt & SECL** - Supply of Mine Water to PHED, Water Resource Department & other govt agencies

In addition, NLCIL supplies mine water to Chennai Metro Water Supply Scheme through Veeranam lake and SCCL is supplying excess mine water to community for drinking and irrigation purposes.

Apart from MoU's, subsidiaries of CIL, for beneficial use of mine water by the nearby community, continuously endeavoured departmentally in planning, designing, implementation and execution of various schemes successfully.





R.O. Plant Facility at WCL



Mine water treatment facility at ECL



Rohini Plantation & Pisciculture by CCL





Fig. View of site – Bishrampur pisciculture and water sports, SECL



Fig. View of fish cages at site – Bishrampur OC, SECL



7.3 Promoting Renewable

In order to minimize the carbon footprints of mining and to progress towards the goal of net zero carbon emission, coal/lignite companies are keen on promoting renewables. Coal companies are going for both roof top solar and ground mounted solar projects.

CIL has already installed 82.6 MW of solar power plants.

SCCL

SCCL is proactive in exploring renewable source of energy. To protect environment, solar power plants are being established in all the mining areas of SCCL on a large scale.

SCCL planned for 300 MW solar power plants out of which 219 MW solar power plants are commissioned till Dec, 2022. Remaining 81 MW solar plants will be commissioned during 2023-24. Further, SCCL is exploring the possibility of setting up another 250 MW Floating Solar PV Projects on the water surface area of reservoirs of Telangana State.



Fig. Solar Power Plant at STTP (10MW)



Solar Power Plant at RG 3 (15 MW)



Eco-friendly Model Colonies:

Developing Eco-friendly Model Colonies in SCCL areas by incorporating effective municipal waste disposal system, establishment of Solar Power Plants, constructing Sewage Treatment Plants and Rain Water Harvesting pits etc. Such colonies are developed in Bhupalpally area and Sathupalli Town.

NLCIL

In line with the Government of India's initiative towards Renewable Energy, NLC India Limited has diversified its Generation portfolio from the basic conventional power generation to Renewable Energy Generation sources. NLCIL was the first Central Public Sector Undertaking to achieve 1000 MW Renewable Energy capacity. The total Renewable Energy installed capacity of NLCIL was 1431.06 MW as on 31.03.2024.

NLCIL has won 150 MW Hybrid Renewable Energy projects from Solar Energy Corporation of India Limited (SECI) tender, for which EPC tender is floated and evaluation is under process. NLC also has won 510 MW Solar PV Power Project from Indian Renewable Energy Development Agency (IREDA) tender against which 10 MW Solar project under Smart City Conversion at Neyveli is under development stage and for balance capacity, two separate EPC tenders are floated for a capacity

of 200 MW & 300 MW for which tendering is in process. As per the approved Corporate Plan 2030 of the company, these projects are expected to be commissioned by 2023 and 2024 respectively. It is proposed to have 4610 MW capacity addition from Renewables by 2030, there by cumulative RE capacity is approximately 35.12 % (6031 MW) of the total installed capacity (17171 MW) by 2030. This shows the directional migration of NLCIL towards green energy. Presently on an average 2000 MUs are being generated from the Renewable projects of NLCIL and thus contributing significantly to the environment through green energy.

To synergize the peer CPSUs, NLCIL has formed a Joint Venture Company with Coal India Limited, the Coal Lignite Urja Vikas Private Limited (CLUVPL) to offer technical & project consultancy services for the mining CPSUs.

NLCIL signed MoU with Assam Power Distribution Corporation Ltd., (APDCL) on 09.08.2022 for the development of 1000 MW renewable Projects in Assam State.

MoU has been signed between NLCIL & Grid Corporation of Odisha (GRIDCO) on 01.12.2022 for setting up of Ground mounted / Floating Solar Power projects, Pumped Hydro Projects, green Hydrogen Projects and other renewable projects.



Fig. Andaman Solar Project



Fig. Wind Mill in Kazhuneerkulam, Tirunelveli District

7.4 Alternative usage of OB

Even as the mandate is to produce and despatch coal to its consumers, Coal/Lignite PSUs has taken up an out of box initiative to produce sand from overburden at a much cheaper price and usages of processed OB for stowing purpose. This will not only help in minimising environmental pollution due to sand siltation from overburden, but will be also an option for getting cheaper sand for construction purpose. Production of sand has already started.

During opencast mining of coal, the strata lying above coal seam is known as overburden comprising of clay alluvial sand and sandstone with rich silica content. The overburden is removed to expose and extract coal from beneath. After completion of coal extraction, the overburden is used for back filling to reclaim the land in its original shape. While extracting overburden from top, swell factor of the volume accounts for 20-25%. Initiative has been taken to utilise at least 25% of overburden in converting to sand by crushing, sieving and cleaning.

The very first initiative of such conversion has been taken by Western Coalfields Ltd. (WCL), a subsidiary of CIL in its mines. Initially a Pilot Project was launched where sand was extracted through machines erected departmentally. This sand has been offered to Nagpur Improvement Trust at

a much cheaper price for constructing low-cost houses under Pradhan Mantri AwaasYojana (PMAY). The price of sand is almost 10% of the market price with better quality. On huge success of the project and with growing demand of cheaper sand, WCL launched commercial production by commissioning the largest sand production plant of the country near Nagpur. This unit produces 2500 cubic metre of sand per day at about half the market price. Major chunk of the sand produced from this plant is being given to Govt. units such as NHAI, MOIL, Mahagenco and other smaller units at one third of the market price. Rest of the sand is being sold through open auction in the market which is helping locals to get sand at a much cheaper price. The use of overburden has minimised the volume of land required for overburden dump. This initiative also lowers the adverse footprint of river bed mining of sand. WCL is also selling overburden for road construction at a cheaper price to NHAI & others.

In this effort to Promote Circular Economy (Waste to Wealth), Coal/Lignite PSUs has commissioned 4 Nos of OB processing plants and 5 Nos of OB to M-sand Plants. Six Nos of OB processing/ OB to M-sand plants are in the different stages of installation in the Coal/Lignite PSUs. Two plants are expected to commission in FY 2024-25.





Processed Overburden Plant at Gonegaom Area by WCL & at Srirampur OC Mines by SCCL



Overburden to M-Sand Plant at Amlohri Plant, NCL



Kajora Plant, ECL



7.5 Energy Efficiency Measures

Efficient use of energy resources and their conservation assume tremendous significance as one unit of energy saved at the consumption level reduces the need for fresh capacity creation by 2 times to 2.5 times. Further, such saving through efficient use of energy can be achieved at less than one-fifth the cost of fresh capacity creation. Most importantly, energy conservation also translates into reduction of carbon footprint. Coal companies also have several areas for implementing energy efficiency measures:

- Colonies, buildings, offices, industrial establishments, rest houses etc.
- Various mining activities – HEMM, Transport, Ventilation, Pumping etc.
- Efficient Power Supply Management and many other avenues

Coal companies have been taking of various energy conservation and efficiency measures over the years and have envisaged various efficiency measures to be taken in coming years:

- Reducing electricity /diesel consumption by taking appropriate measures after comprehensive energy audit
- Replacing conventional lights by LED lights
- Replacing conventional ACs and other

appliances by energy efficient Star rated appliances

- Installation of capacitor banks and other measures to improve power factor
- Use of auto-timers in street lights
- Use of Energy efficient pumps (EESL)
- Deploying E-Vehicles (EESL)

By implementing various energy efficiency measures, Coal/lignite PSUs have envisaged to create additional carbon offset potential of 1 Lakh Ton/annum.

CIL has signed MOU with EESL to implement Energy Efficiency Programs at CIL and Subsidiaries. This shall cover Building Energy Efficiency Projects (BEEP), Replacement of old fans, ACs and conventional light fittings, motors, adoption of e-vehicle, installation of distributed and rooftop solar projects.

Coal companies have been taking of various energy conservation and efficiency measures during FY 2021-22 to FY 2023-24 such as replacement of 4.62 lakh conventional lights with LED lights, 5,847 energy efficient ACs, 88,459 Super Fans, deployment of 252 E-vehicles, 1,758 Efficient Water Heaters, 572 Energy Efficient Motors for Pumps, 3,544 Auto-timer in street lights and installation of Capacitor Banks and have envisaged many more efficiency measures to be taken in coming years.



E-Vehicle at CIL Corporate HQ, Kolkata



Pump House With IE3 Motor at SECL

7.6 First Mile Connectivity Projects

Ministry of Coal has formulated an integrated approach to eliminate road transportation of coal from mines and has initiated steps to upgrade mechanized coal transportation and loading systems under the 'First Mile Connectivity' projects.

Coal Handling Plants (CHPs) and SILOs with Rapid Loading Systems offer benefits such as coal crushing, sizing, and speedy computer-aided loading. With reduced manual intervention, precise pre-weighed quantity and better quality of coal can be loaded. Improved loading time will bring down the wagon idling increasing their availability. Easing the load on road networks promotes cleaner environment

and savings on diesel. It will be an all-round win-win situation for the company, railways and the consumers.

In view of this, coal movement for all mine having capacity >2 MTPA is addressed and 103 FMC projects costing nearly ₹ 24000 cr, with 95- CIL, 5 - SCCL, and 3 - NLCIL, with a total capacity of 1040 MTPA are planned. Currently, 37 projects (35- CIL and 2-SCCL) with a capacity of 360 MTPA have been commissioned. The remaining 66 projects, are scheduled to be commissioned by FY 2029.

It leads to a cleaner & healthier environment, cost (diesel) savings, and reduced loading time thereby reducing turnaround time and increased wagon availability.



