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Chapter

SUSTAINABILITY IN COAL MINES

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1.0 Introduction

Sustainable development in context of a natural resource which is depletable, has often been seen as an oxymoron. The traditional manner in which mining has been carried out for centuries has tended to emphasize short-term gains, with no consideration for the adverse impacts on the environment and communities. Increasing awareness for sustainability concerns, coupled with technological developments, has now focused as how to make mining a sustainable activity. Sustainability in mining thus involves at least the following:

- The environmental dimension emphasizes the sustainability of the natural environment and the stock of natural resources.
- The social dimension underscores social and cultural sustainability, which relates to issues of distribution of benefits, costs of mining and of process, on how to involve stakeholders in decision-making.
- The economic dimension highlights the economic sustainability of living standards and on cost needed to achieve the standards.

2.0 Sustainable Development Policy of Coal Companies

The coal/lignite companies under Ministry are sensitive towards promoting sustainability in there mining and allied activities.

Coal India Limited (CIL)

Coal India Limited to achieve sustainable development (SD) & inclusive growth has come out with a formal Sustainable Development Policy in 2013. This policy encompasses mainly three components:

i. Environmental sustainability

ii. Socio-cultural sustainability

iii. Economic sustainability

The SD Policy affirms CIL commitment to protect and safeguard the environment and conserve the biodiversity for maintaining the ecological balance with improvement in effecting socio-cultural and economic betterment of the surrounding of its operations. 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 is also signatory to Global Compact, the largest global corporate responsibility initiative, coordinated

by the UN and the principles are followed. 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.

Singareni Collieries Company Limited (SCCL)

SCCL is operating coal mines for more than 130 years and the environmental management in coal mining areas is embedded as an integral part of mine planning and development. SCCL has established a separate Environment Department for continuous monitoring of compliance of environmental norms in coal mines and develop suitable mechanisms for implementation of environment protection measures and promotion of sustainability.

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".

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 caste 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 training.

3.0 Establishment of Sustainable Development Cells (SDC)

Recognizing the importance of bringing sustainability in mining practices, Sustainable Development Cells have been established at Ministry level and also in all coal/lignite companies with an aim to channelize the efforts for promoting sustainability with uniformity and adopt the best practices by sharing of knowledge and experience.

SDC at Ministry Level

A Sustainable Development Cell at Ministry of Coal (MoC) has been created under the Chairmanship of Joint Secretary to advise, mentor, plan and monitor the mitigation measures taken by the coal companies for maximizing the utilization of available resources in a sustainable way and minimizing the adverse impact of mining by mitigation to improve ecosystem services and act as nodal agency for such activities.

It works in the role of a mentor as well as a supervisor of coal companies in the above matter. This cell also formulates the future policy framework for the environmental mitigation measures.

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 Sector.

SDC at SCCL

In compliance of the guidelines issued by Ministry of Coal (MOC), a "Sustainable Development Cell (SDC)" has been formed 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 SD Cell of Ministry to review the progress of various sustainable goals assigned to coal companies, namely creation of eco-parks, mine water utilization, physical as well as biological reclamation of OB dump and backfilled areas, environmental audit of mines, ecological studies in mines, promoting alternative usage of OB, publication of status report/ good practices, compliance of conditions stipulated in environmental conditions etc.

4.0 Environmental Sustainability Management

A brief description of the environment protection measures being implemented by coal/lignite companies in the coal mining areas for achieving environmental sustainability are given below:

4.1 Air Quality Management

Sources of dust generation are mainly drilling, blasting, loading, unloading and transportation of coal/OB. To minimize dust generation, wet drilling is practiced. Drill machines are also fitted with dust suppression system. More and more use of surface miners/BWEs minimizes the requirement of drilling and blasting and thus the pollution load. Periodical maintenance of vehicles is carried out as per Manufacturer's standards.

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. All the roads connecting mines, CHP's, workshops and colonies have been black topped to prevent dust from becoming airborne.

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.

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. Coal dispatch through Rail/MGR/Conveyors and tube conveyor network is being promoted.

Fig. Fog canon working at RG OC-I CHP - SCCL

Fig. Fog cannon working at pit head CHP, JVR OC-SCCL

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

Fig. Feeder Breaker with Mist Spraying Arrangements at Gevra OCP, SECL

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 ParametTers. Additional pollution control measures are undertaken, if required, to bring the air quality level within permissible limits.

Fig. Wind screen at Phulbasia Siding, Magadh Area, CCL

Fig. Surface Miner Technology at Koyagudem OC-II project - SCCL

Green Belt along roads

An in-house lab (CARD) accredited with NABL with adequate number of pollution monitoring devices is available in NLCIL which is carrying out periodical monitoring of Air quality on alternate days as per Consent to Operate (CTO).

NLCIL installed 13 AAQ stations in approval with TNPCB for monitoring the Air Quality Parameters, out of 13 AAQ stations, 10 AAQ stations in the surrounding villages are monitored by the renowned institute, IIT-Madras and the results are within the permissible limits and submitted to Statutory officials too. No Non Compliances have been reported so far.

4.2 Water Quality Management

The mine water, in Indian coal mines is generally of good quality. Suspended solids are the only parameter of concern, which is treated through physical process like sedimentation. In the mine sump, the suspended solids get settled before discharge. In workshops and CHPs, effluents are characterized by high suspended solids and oil & grease. For workshops and CHPs, effluent treatment plants and/or oil & grease traps have been installed. STP facilities are being installed for treatment of domestic effluent.

The objective of the Water Quality Management is to control and eliminate the water contaminants/ pollution and make it suitable for reuse. Treated water is being reutilized for industrial & domestic uses thus reducing/eliminating freshwater consumption from other sources. Thus, coal/lignite companies aim to achieve minimal water footprint on the surface water regime.

As regards acidic mine water, only a few mines of CIL have encountered this problem and for which proper pollution control facilities have been designed and implemented.

Measures such as construction of toe walls, garland drains, settling ponds, gabions, cribs, check dams, rock fill dams etc. are taken to reduce soil erosion

and to arrest suspended solids before discharging the run-off water into the natural water regime.

Scientific studies based on periodic ground-water level monitoring reveal that, the zone of influence due to mining operation on ground water is limited up to 1,000 m from the mine periphery. Domestic and industrial water needs of the project are met through mine water or old abandoned quarry in a sustainable manner. Further, mine water after proper treatment is also supplied to nearby community for domestic use.

Also, mine effluent conforming to set statutory standards is discharged into local drainage/ ponds/agriculture fields which acts as constant source of recharge and improves the water level in the mine area.

Water conservation measures are being taken up in mines and colonies to conserve water. Rainwater harvesting structures are being constructed in all the mining areas.

The quality of surface water, ground water and mine effluents are being periodically monitored so as to conform to relevant standards. The ground water levels are being monitored covering open wells as well as piezometers constructed in mining areas.

Fig. ETP in Block - B OCP of NCL

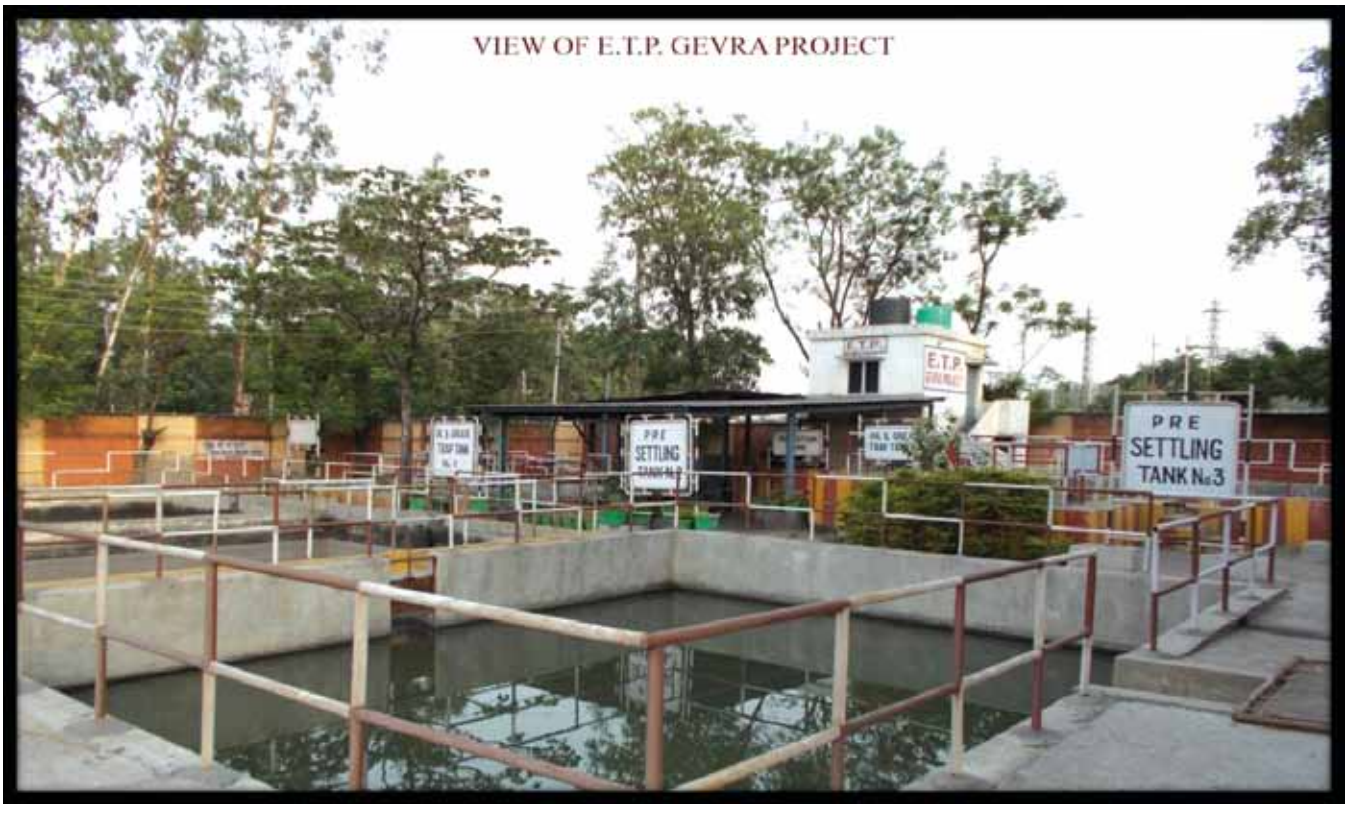


Fig. Oil and Grease trap in Gevra OCP, SECL

Fig. ETP at Gevra OCP, SECL

BASE WORKSHOP

4.3 Mine Closure, Bio-reclamation & Land Use Management

Mine closure planning needs to be done even before the commencement of mine operation and required periodic reviewing and modification, if needed, during its life cycle to ensure that it conforms to the social & environmental challenges. Various objectives of the mine closure planning are:

- To restore the physical, chemical, and biological quality disturbed by the mining to the acceptable level and to create a self-sustained ecosystem
- To allow productive and sustainable after-use of the site
- To protect public health and safety.
- To eliminate environmental damage and thereby encourage environmental sustainability.
- To minimize adverse socio-economic impacts.
- To protect the flora and fauna of the area.
- Effective use of the assets.

Mine closure plans have both progressive and final components. The progressive mine closure plan aims to restore the damages as early as possible to restrict its long term impact, whereas Final Mine Closure Plan intends to leave the site safe, sustainable and to the pre-mining status as far as practicable. Presently all operating coal/lignite mines have approved mine closure plans and mine closure activities are being taken up as per the approved plan.

One of the prime components of the mine closure plans is to improve the landscape disturbed by mining activities. In initial phase of mining, the overburden (OB) generated from the mine is stacked outside the excavated area as there is no mine void available to accommodate. 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. Biological reclamation is generally undertaken after 1-2 years of technical reclamation when the soil gets stabilized.

Rehabilitation process in the mined-out land 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 current fiscal (till December, 2021), Subsidiary Companies of CIL have planted 28.52 lakh saplings covering an area of about 1212 Ha. In addition CIL has covered 36.91 Ha of land under Bamboo Plantation and 159 Ha under grassing. During the last five years i.e. 2017-18 to 2021-22 (as on 30th Nov 2021), CIL has planted 103.38 Lakh saplings over an area of more than 4,353.76 Ha. Within mine leasehold area and 7.65 Lakh no. of saplings over an area of 564 Ha. outside mine lease area.

In FY 2020-21, as on 31st December 2021, SCCL planted about 24.40 lakh saplings over 580 Ha land. Further, SCCL distributed about 10.29 lakh saplings to the local people at free of cost during 2021.

Since Inception, NLCIL has planted 27.06 Lakhs numbers of trees over an area of 2197 Hectares of land in Mine reclaimed area. In FY 2021-22 (up to 31.12.2021), NLCIL Mines have planted 1.25 Lakhs No's of trees in 65 Hectares including Hi-tech Cultivation of 15 Hectares and plans to cover 164 Ha of green cover by March 2022.

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.

Till 2021, coal/lignite PSUs have brought more than 57500 Ha land under green cover by plantation of about 140 million trees thus creating substantial carbon sink and contributing towards India's NDC target. It is envisaged to bring about 30000 Ha of addition area (in and around coal mining areas) under green cover by plantation of around 75 million trees by 2030.

Since the last few years, grass bedding / seed ball stabilization of OB dumps have been taken up in earnest. Its success story is as under-

Fig. JVR OC Dump Plantation-SCCL

Fig. A view of seed ball plantation in Dhori Area, CCL

Fig. Effective and sustainable plantation by grassing at Nigahi OCP, NCL

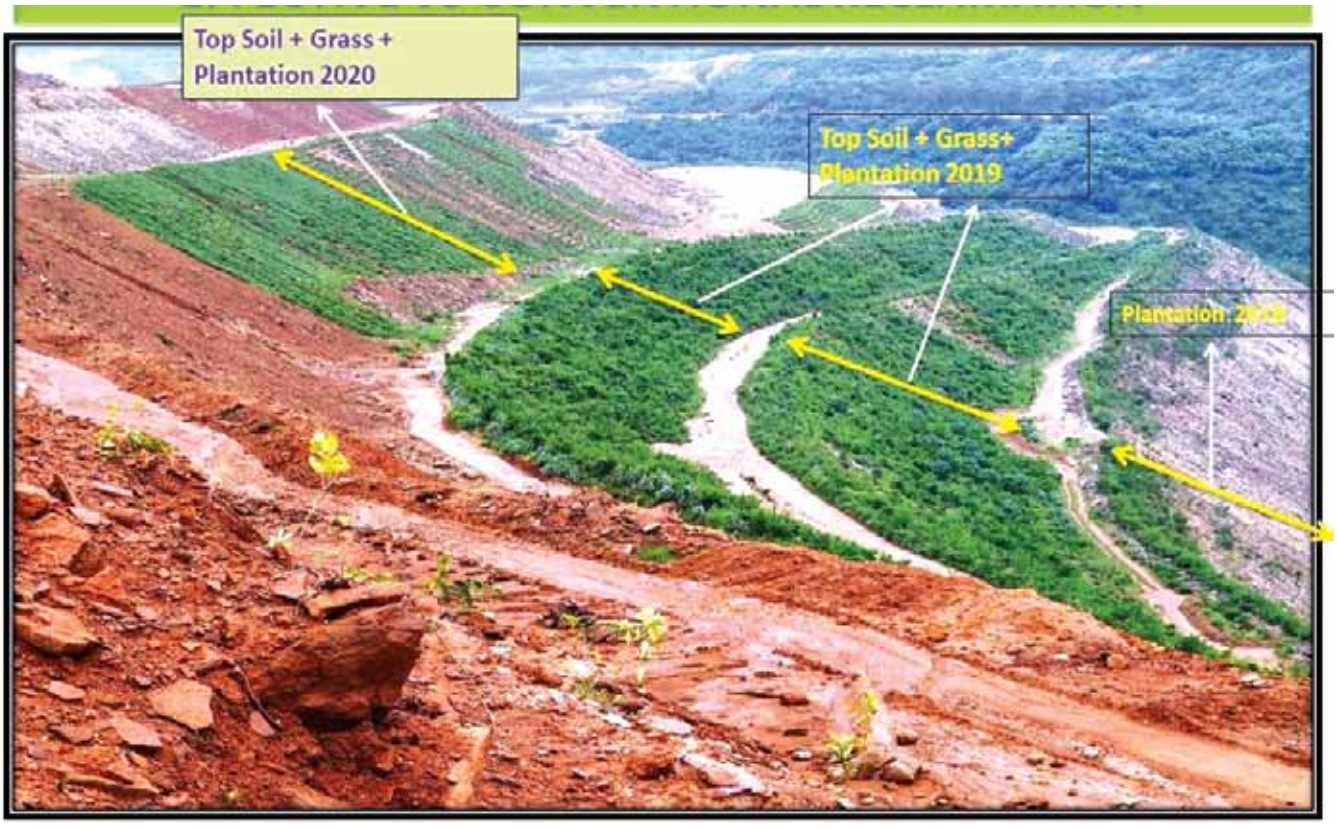


Fig. Steps taken for effective and sustainable plantation by grassing at Nigahi OCP, NCL

Fig. Gravity drip system for Bio-reclamation at Nigahi OCP, NCL

Fig. GK OC Dump Plantation-SCCL

Fig. RG OC-I-Dump Plantation-SCCL

Fig. OB Dump Plantation-NLCIL

Fig. Development of lake with boating Facility, NLCIL

Vriksharopan Abhiyan 2021

In the current fiscal, Ministry's Going Green initiative has been rolled out by launch of Vriksharopan Abhiyan (VA) on 19.08.2021.

Ministry of Coal along with Coal/Lignite PSUs Celebrated "Vriksharopan Abhiyan-2021" on 19.08.2021. Shri Pralhad Joshi, Hon'ble Union Minister of Coal and mines, Parliamentary Affairs, Government of India inaugurated the function through video conferencing in the presence of Shri Raosaheb Patil Danve, Hon'ble Minister of State for Coal, Mines and Rail.

During the event, plantation was carried out at more than 350 sites spread in 12 States and more than 220 sites were connected through video conferencing with online visibility. In total, 6.90 lakh saplings were planted and more than 3.80 lakh saplings were distributed amongst local inhabitants/agencies with an aim to cover more areas and green cover and also to sensitize the host community on importance of plantation.

The Hon'ble Union Minister of Coal and mines, Parliamentary Affairs, Government of India had inaugurated 2 eco-parks (i) Mudwani Dam Eco-park of NCL in Singrauli, Madhya Pradesh, and (ii) Mine -II Eco-Park of NLC India Ltd, Neyveli, Tamil Nadu and laid the foundation stone for 2 Eco-parks - Jhanjra Eco-Park of ECL in, West Bengal and Chandrashekhar Azad Orient UG No. 4 Eco-Park of MCL in Jharsuguda, Odisha

About 30000 people participated in the Abhiyan (on and off line). Among the participants, there were approximately 700 prominent persons including 4 Hon'ble MPs and 23 Hone'ble MLAs. Some glimpses of the Vriksharopan Abhiyan 2020 are as under:

Fig. Plantation by Union Minister of Coal, Mines and Parliamentary Affairs

Fig. Plantation by Hon'ble Minister of State for Coal, Mines and Rail

Fig. Participants connected through VC (MoC and Coal Companies)

Fig. Inauguration of Mudwani Dam Eco-park of NCL in Singrauli, MP

Fig. Mass plantation in CCL & NCL during Vriksharopan Abhioyan-2021

Fig. Massive Plantation programme in Mandamarri area of SCCL on 19.08.2021 in connection with Vriksharopan Abhiyan-2021

5.0 Adoption of Star Rating System for Mines of CIL

Star Rating Policy, approved by MoC, is a policy to implement a system of evaluation and validation by Coal Controller's Organization (CCO) in all coal mines covering broadly seven modules namely:

- Mining Operations related Parameters
- Environment related parameters
- Adoption of Technologies: Best Mining Practices
- Economic performance
- Rehabilitation & Resettlement related parameters
- Worker related Compliance
- Safety and security related parameters.

Total 50 evaluation parameters in Opencast Mines and 45 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.

A web portal has been developed by MoC for Star Rating of Coal Mines. Each coal mine has been provided a login for the portal for submission of self-evaluation ratings. This portal has the facility of uploading supporting documents concerning the evaluation parameters.

The field offices of CCO have been provided a separate login to the web portal through which they access the submissions of self-evaluation by mines. The final remarks of validation committee for each evaluation parameter are recorded on the portal.

The star rating of each operational mine is done on the basis of percentage of scored points. The

criterion for the same are: - 1) 91 to 100% - 5 Star, 2) 81 to 90% -4 Star, 3) 71 to 80% -3 Star, 3) 61 to 70% -2 Star, 4) 41 to 60% -1 Star and 5) 0 to 40% -No Star.

After completion of the validation process, the highest scoring mines in each category in the country are presented an award in a public ceremony. All mines are given an official certificate by the CCO mentioning their star rating and the particular reporting year.

The Star rating System has been implemented and Star rating for 2018-19 has been completed. This system incentivises the mine operator towards self-regulation on compliance of various environmental laws, safety rules, productivity norms and other aspects relating to promoting sustainable practices.

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". Field visits are under progress in CIL subsidiaries for the said purpose.

SCCL awarded the work of auditing of compliance of EC and FC conditions in the following five Opencast Coal Mines of SCCL to ICFRE, Dehradun**.**

a. JVR OC-I.

b. GK OC.

c. Koyagudem OC-II.

d. MNG OC-II Ext.

e. Khairagura OC.

Accordingly, ICFRE conducted Environmental Audit and submitted reports to SCCL. SCCL submitted the reports to MoC. The recommendations given by the ICFRE are being implemented in the projects. Further, SCCL is planning for second phase of auditing of the following mines during 2021- 22.

a. PVK 5 Incline (UG Mine)

b. MNG OC Expansion Project

c. KTK OC III Project

d. RG OC III Project

NLCIL also envisages deputing an agency of repute to take up work of Environment audit/ Ecological study in all mines. It is in process of identifying a suitable agency and likely to award the work at the earliest.

7.0 Best practices:

Coal companies have carried out several commendable jobs in the areas of reclamation, mine water utilization, promoting renewables, alternative usage of OB. This works/practices need to be showcased for facilitating replication of others.

Some of the best practices have been compiled hereunder:

7.1 Development of eco parks/tourism sites.

CIL

CIL has developed Eco Parks/ Mine tourism sites in mined out and its command areas like Gunjan Park in ECL, Gokul Eco-Cultural Park in BCCL, Ananya Vatika in SECL, Nigahi eco restoration site in NCL, Ananta Medicinal garden in MCL, Saoner Park in WCL, Kayakalp Vatika in CCL etc. CIL has established a total of 25 Eco-parks and Mine Tourism Projects as on date.

CIL subsidiaries are also developing many more Eco Parks / Mine tourism sites which are under different stages of implementation.

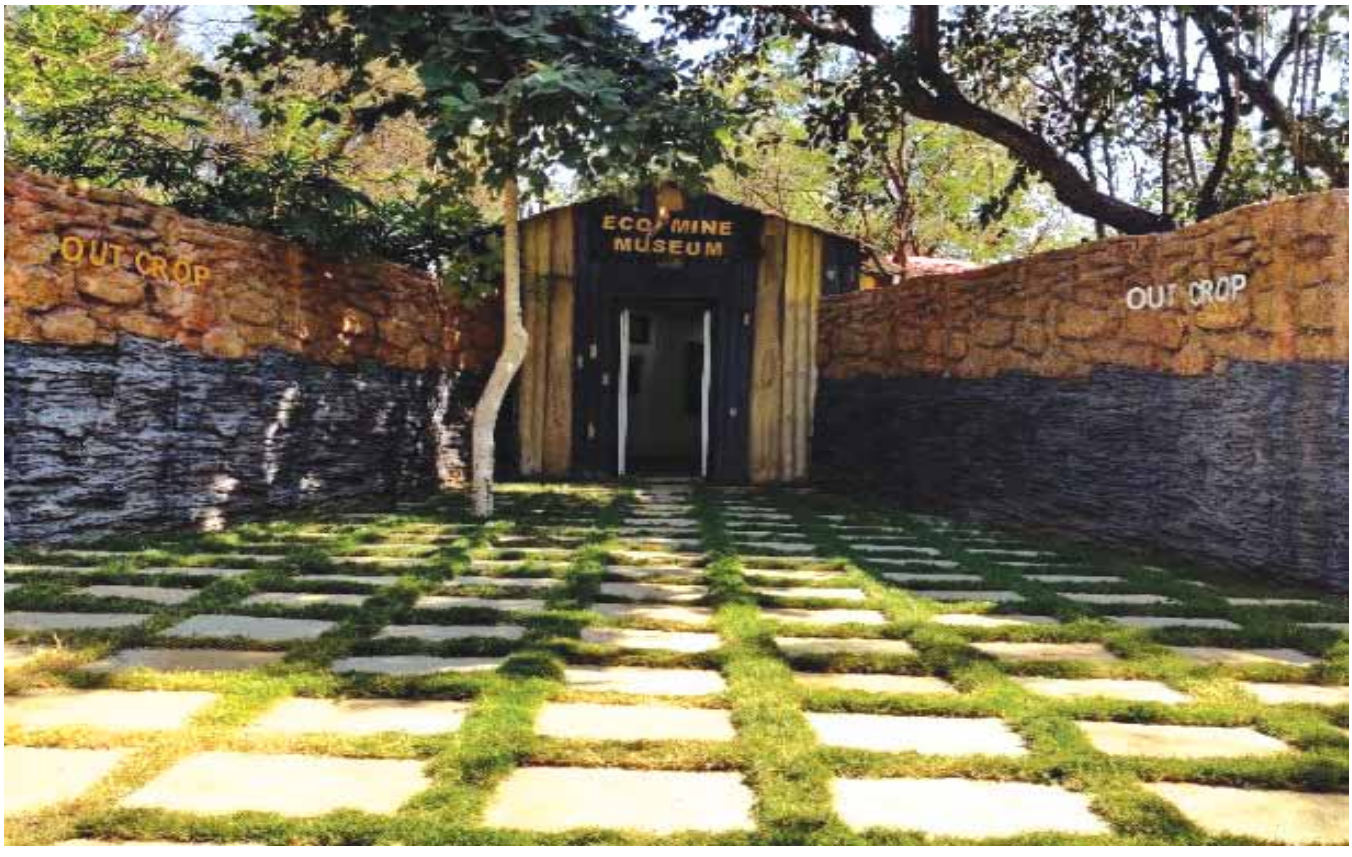
Fig. Chandra Sekhar Azad Park in CCL

Coal Museum at Saoner Eco park, Nagpur Area, WCL

With an intention to provide 360° degree awareness about coal mining to public, a Coal Museum was developed by Western Coalfields Limited at Eco-park, Saoner Sub Area, Nagpur Area. The museum is equipped with information ranging from geological formation of coal, history/types of coal mining, coal reserves, past disasters/ accidents in mines, nationalization of coal industry, formation of Coal India Limited, etc.

The museum showcases information on usage of coal in different industries such as thermal plants, cement, steel, fertilizers, brick kilns. Information on different subsidiaries of Coal India Limited, the production history of Coal India Limited and WCL over the years, various safety measures and safety equipment used in the coal mines, various environment conservation and pollution control measures taken by the Company are also at display.

The museum has an Open Cast Coal mine model for the visitors to have a first-hand glimpse at how open cast coal mining is done. Different coal samples vis anthracite, bituminous, lignite and peat coal are also available at the museum. The museum is equipped with a movie hall and allows visitors to watch videos of origin/ history of coal and the various technologies related to coal mining and innovative projects of the company. Incomplete fossils of coal are also at display at the entrance of the Museum. The Coal Miner statute at the entrance of the museum is a great attraction for the visitors.



SCCL

To change the negative perception of people about Coal Mining as a polluting industry and provide awareness about the hardships that goes in to produce coal to meet the energy demand of the Nation, SCCL proposed to develop Eco-park/Tourism site in the reclaimed mining area of Gautham Khani Opencast Project for re-creation activities and tourism purpose.

Foundation stone was laid for the proposed Eco-Park at Gautham Khani OC on 23.07.2020 by Hon'ble MLA, Kothagudem Constituency and Director (OP) & (PA&W) in connection with VRIKSHAROPAN ABHIYAN – 2020 programme of MoC. The tentative budgetary requirement for the proposed Eco-Park at GK OC project is ₹4.76 Crores. The Eco-Park works are in active stage and likely to complete by July, 2022.

Fig. Foundation stone laying-Eco-Park-SCCL

NLCIL

During Vriksharopan Abhiyan 19.08.2021 the Hon'ble Minister of Coal had inaugurated Mine-II Eco-parks through Virtual mode. This Eco Park at Neyveli, Mine-II is Located 200 KM from south of Chennai and about 67 KM from Puducherry. The salient features of this Eco Park are

- Boat ride in Eco friendly Artificial Lake in the Mine refilled area.
- Cafeteria surrounded by beautiful landscape and flowers.
- Deer enclosure
- Birds watching in Artificial Lake
- Goats rearing for Integrated farming
- Mist Chamber and nursery
- Orchard and Cultivation farm land in OB reclaimed area

- Free roaming Desi Chicken, Cock in the farm land
- Goshala- Natural reclamation of land with cows
- Star and Divine plantations.

Ecotourism: Mine-I and Mine-II Eco Tourism Park were inaugurated on the day of Vriksharopan Abhiyan on 23.07.2020 and 19.08.2021 respectively. Both parks are ready for Ecotourism. The proposal for tie-up with Puducherry Tourism Development Corporation for Ecotourism is under progress.

Fig. New Cafeteria in Reclaimed area of Mine-I.

Fig. Children Play Equipment installed at Mine-II Eco park

Fig. Tree plantation on Vriksharopan Abhiyan at Mine-1

Fig. Migratory Birds at Rainwater harvesting pond in reclaimed area of Mine-II

Fig. NLCIL Mine Eco-Park

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 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 companies 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.

In the “Five Year Vision Document of Coal Sector” under Social & Environmental Responsibility, coal sector is aspiring to cater portable water supply to 45 lakh people (15 LPCD) and irrigate more than 3 Lakh acre land by 2023-24 by supplying about 4300 LKL of mine water.

CIL

In the subsidiaries of CIL, out of 3,823 Lakh Kilo Litre average mine water discharge as on 30.11.2021, around 41 percent of the water is used by the nearby community both for domestic and irrigation purpose in 726 villages covering about 6,589 acres of land and 10.62 Lakh population is benefited. Another 42 percent of the water is used for own domestic and industrial purpose, 14% is used for ground water recharge resulting in zero discharge from mines and water that is acidic in nature and rest is kept as ground water recharge and for future use.

Fig. Pisiculture at Kerketta C Block, N K Area of CCL

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.

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

Fig. Water Filtration Plant at Khottadih colliery Pandaveswar Area, ECL

Fig. Mine water supply for irrigation from Saoner to Borgaon, WCL

SCCL

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.

Water storage tanks have been created near the opencast mines to store the mine discharge water. Two such summer storage tanks of capacity 127 and 51.30 Million Gallons are developed near RG OC II, RG OC III Projects respectively for storage of water.

SCCL supplied 401 LKL (up to Dec., 2021) of excess mine water after proper treatment to surrounding villagers both for drinking and irrigation as against a target of 500 LKL for the Year 2021-22.

Fig. Summer Storage Tank near RG OC-III project of SCCL

Fig. Agricultural fields nearby OB dumps of JVR Open Cast Mine

NLCIL

The Star rating System has been implemented and Star rating for 2019-20 has been completed. This system incentivises the mine operator towards self-regulation on compliance of various environmental laws, safety rules, productivity norms and other aspects relating to promoting sustainable practices.

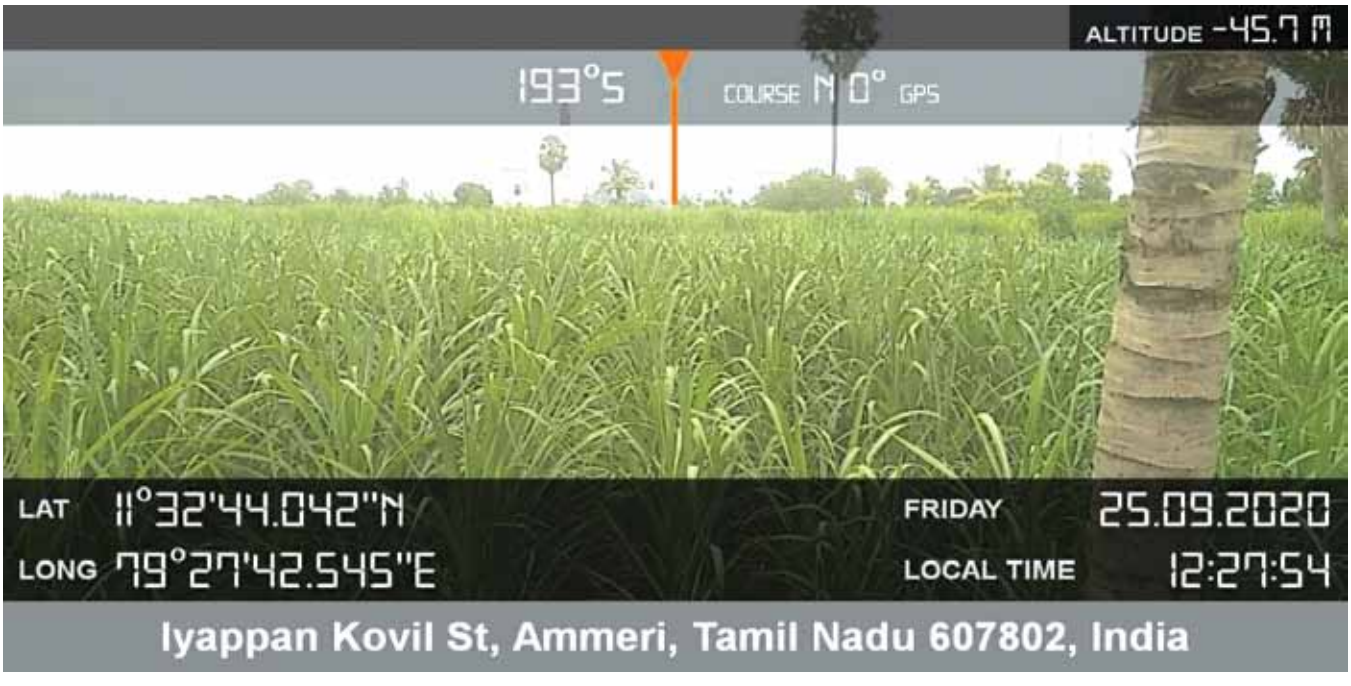
The vast open cast lignite mine is in the monsoonal belt and experienced rain of about 1200 mm/annum on an average. During rainy days, the rainwater flows to sump from benches. This rainwater and mine seepage water from benches are together called as "Storm Water" which poses problems in mine operation. This water is pumped out with float pumps mounted on pontoons. Since the water is pumped out through floating pontoon, only clear water is pumped out. The objectives of mine water utilization management system:

- Storm water control/ storage and rainwater harvest in water harvesting structures in mines areas, and in peripheral areas of NLCIL
- Use of rainwater for reclamation in mine OB soil for Green belt development and vegetable and agriculture crop cultivation.
- Ground water table improvement in mines and in peripheral areas of NLCIL
- Community supply for domestic and irrigation purpose

Some photographs of the best practices for water management are given below:

Fig. Area being Irrigated by NLCIL Mine Water about 10000 Ha

Photographs of Mine water utilization for agriculture in various locations



Chennai Metro Drinking water supply

Fig. 180 MLD Treatment Plant at Vadakuthu (Veeranam)

Fig. Water treatment Plant - NLCIL

7.3 Promoting Renewable

In order minimize the carbon footprints of mining and to progress towards the goal of net zero carbon emission, coal/lignite companies are keen on promoting renewable. Coal companies are going for both roof top solar and ground mounted solar projects. As on 31.12.2021, Coal/lignite PSUs have installed renewable capacity of about 1445 MW (including roof top solar of ~ 4 MW) and during next 5 years it is planned to install additional 5560 MW.

SCCL

SCCL proposed to set up 299.5 MW capacity solar plants with a capital outlay of ₹1361.5 Crores. Of 299.5 MW capacity units, 70 MW capacity solar power plants have been commissioned as on 31.12.2021. Balance 229.5 MW capacity units to be commissioned by 2022.

Fig. Sola Power Plant at STTP (10MW)

7.4 Alternative usage of OB

Mining for coal, especially in open cast mines, envisages removal of the overlying formations. These formations are mainly soil, detrital mantle, rocks like sandstone, shale etc. At some locations, sandy horizons or friable sandstone are encountered which can be segregated / mined and used to fulfil societal needs.

Coal India Limited

CIL has started exploring avenues for gainful utilization of these over burden. Some subsidiaries have tied up with national research institutes for achieving the same and some have already started implementing alternate use of OB.

Most of Indian coal deposits occur in major river basins of Central India, like Damodar, Wardha, Hasdeo etc. Sand is essential ingredient for construction of housing colonies and commands huge demand. Currently it is met through sand mining and dredging from water courses of rivers. This affects the eco-system of rivers and is preventable. CIL has taken proactive steps in this direction and started segregating sand from our overburden formations.

WCL has commissioned three OB to sand processing plants. The sand segregated from OB formations is being provided to agencies which are implementing housing under government schemes like Pradhan Mantri Awas Yojana (PMAY) and the likes. In 2021-22, as on 30th Nov. 2021, 5,820 m^3 sand has been generated from re-handling of 14,550 m^3 OB.

Fig. OB to Sand plant in WCL

SCCL

SCCL received "Golden Peacock Innovative Product/Service Award" for the year 2015 at Dubai for utilisation of Processed Overburden (POB) in stowing operations in place of river sand. About 29.84 Lakh Cu.m of processed overburden material has been used for stowing in 20 different underground mines of SCCL from 2011-12 to 2020-21. About 3.11 Lakh Cu.m of processed overburden material has been used for stowing for the year 2021-22 (upto Nov., 2021).

Further, SCCL is in the process of producing commercial sand from overburden of OC Mines for the purpose of civil constructions. In this regard a study was given to JNTU, Hyderabad to study the properties of the generated sand from OB material for use in civil works. Proposal for making commercial sand from OB was approved in the Board Meeting held on 26.07.2021. Work order has been released on M/s Ahome Consultants Pvt. Ltd., Hyderabad. Preliminary works such as obtaining clearances (CFE & CFO) for the plant by the firm are in progress.

NLCIL

NLCIL is exploring the possibilities for extraction of sand and clay from overburden material and also desires to set up pilot plants for the extraction of the same to expand the business activity from mining of lignite/power generation to sales of industrial minerals such as Sand and Clay.

Centre for Applied Research & Development (CARD), NLCIL has undertaken a research project jointly with IITM Chennai approved by Ministry of Mines during 2018 for conversion of overburden materials into aggregates. Under this project, a small bench scale pilot plant was installed at CARD and testing & trial runs are in progress. The preliminary study indicated that overburden (OB) materials contain 40% to 70% sand and considerable quantity of clay. After investigation, IIT Madras certified that the sand extracted is found to be suitable for construction & plastering works.

Board of Directors of NLCIL accorded approval on 13.11.2020 for setting up of three pilot plants on "Build, Own and Operate (BOO) model for 7 years in Neyveli Mines (2.62 Lm3 per plant). Estimate proposal was approved by CMD on 20.04.2021. Scopes of work, Technical specification, & Special condition for the tender were approved on 19.04.2021.

EC amendment for OB to sand project was uploaded in MoEF&CC portal on 16.07.2021. NLCIL presented EC amendment in MoEF&CC EAC meeting held on 09.08.2021. Regional Director /MoEF&CC, Chennai inspected Mine-IA on 29.07.2021 and issued Compliance report on 31.08.2021 for OB to sand project. MoEF&CC instructed NLCIL to submit approved Mining plan on 29.08.2021. Draft Mining plan for inclusion of OB to sand has been prepared on 02.12.2021 and is in circulation for onward submission to NLCIL Board &MoC.

The Empowered committee has instructed to prepare detailed Feasibility Report (FR) on 14.06.2021 covering assured off take, clearances, financial commitment etc. LOA issued to CRISIL for financial study on 05.08.2021. With regard to finalization, authentication and uploading of Mining plan, LOA awarded to Consultant M/S Matrix Mining Solutions, Gurgoan on 17.08.2021. CRISIL submitted draft financial study report on 17.09.2021.

The note for issue of open tender for technical Feasibility study was approved on 09.11.2021. NIT issued on 19.11.2021 for open tender. Technical bid opened on 10.12.2021. Two firms applied. The bid is under evaluation by Technical section/Mines.

7.5 First Mile Connectivity (FMC) projects

FMC projects in CIL

In order to achieve the planned growth in coal evacuation, CIL has deployed a multi-pronged strategy for improving its air quality in and around mine areas. First Mile Connectivity (FMC) Projects have been strategized for the mines having capacity of 4 MTY and above for easier handling and transportation of coal from pithead to destination and switch over to a seamless mechanized coal transport through conveyor belts which is a covered system for movement of coal reducing the dust pollution.

Total 35 FMC Projects have been identified in CIL. These Projects shall to help increase mechanized evacuation from 150 MTPA currently to 665 MTPA by 2024-25. These infrastructure Projects will help in reducing coal transportation through vehicles thus, generating a positive impact on the environment.

Fig. Silo in Lingaraj OCP in MCL

The benefits by implementation of FMC will be as follows:

- Reduction in air pollution from reduced vehicular exhaust emissions and road dust emissions.
- Lesser energy consumption and savings, carbon footprint and water budget of coal loading and transfer activities.
- Reduction in background sound level in the region.
- Better human health from possible reduction in air pollution.
- Potential economic benefits of the mechanized Conveyor Belt and Silo Loading systems to CIL
- Potential economic and social benefits of the mechanized Conveyor Belt and Silo Loading systems to the population living in the buffer zones of the mines.

FMC Projects in SCCL

Two projects namely Srirampur opencast (3.5 MTPA capacity) and JVR opencast (10 MTPA capacity) have been identified as First Mile Connectivity (FMC) Projects during 2021-22 for easier handling and transportation of coal from pit head to destination for reducing the dust pollution. Of the above two projects SRP OC project was already commissioned and JVR OC will be commissioned by March, 2022.

Fig. Srirampur FMC Opencast project-SCCL

Geo-thermal Energy-SCCL

First time in India, an experimental S&T project has been granted by MoC vide Lr.No.34012/05/2021-CCT (FTS-347903), dated 29.04.2021 for power generation of 20KW by Geo-thermal energy in Gollakothuru village (SCCL Command area), Manuguru Mandal, Bhadradri Kothagudem of Telangana State SCCL Command area.

Technology: Command area based on closed loop Binary Organic Rankine Cycle (ORC) Process technology to produce,supply and utilize clean, reliable and efficient electricity using geo-thermal fluid as heat source. To Standardize and optimize the power generation cost, uninterrupted power supply for commercial viability. To indigenize the process and establish model for scaling up.

Capital: ₹172.28 Lakhs. Duration of the project is18 months.

Implementing agencies: SCCL & Shriram Institute of Industrial Research, New Delhi, (Sub-implementing agency: Renergizr industries private limited (RIPL).

Fig. Work under progress for 20 KW Geo-thermal Project - SCCL

FMC Projects in NLCIL

Railway siding:

- Railway corridor construction divided in five packages being executed by M/s RITES
- Package-I Major Bridge over Bhedenriver: LOA issued on 13.03.2020, Work schedule to start in Feb-2022.
- Package-II: Minor Bridges and allied civil work - LOA issued on 05.06.2020, Work schedule to start in Feb-2022.
- Package-III: Purchase of rails - Purchase order for rails issued on 31.03.2020. Total 2158 MT out of total 2300 MT of rails received at site as on 31.10.2021.
- Packages-IV & V to be issued after completion of 75% progress in Packages-I & II.
- Expected date of Completion: Oct 2023

Coal Handling Plant (CHP) :

- MDO has issued LoA to M/s HOWE Engineering, Ahmedabad on 29.10.2021 for Construction of Coal Handling Plant on 29.10.2021.
- The Scope of Work includes - Design, engineering, civil works, manufacture/ fabrication & assembly, inspection and testing, Erection, commissioning and performance guarantee test of CHP.
- Site has been identified for CHP contractor's camp (M/s HOWE Engineering)
- EGL survey for CHP and Conveyor line under progress.
- Expected date of Completion: Aug 2023