PUBLIC HEARING DOCUMENT OF
EIA/EMP FOR
AMADAND OPENCAST PROJECT
(Jamuna Kotma Area)

Village: Amadand; Post: Malga; Tehsil: Kotma
District: Annupur; State: Madhya Pradesh
Capacity: 5.40 MTPA
Project area: 1443.02 Ha.

South Eastern Coalfields Limited
(A Mini Ratna Company)

June- 2019
Central Mine Planning & Design Institute Limited
Regional Institute – V
CMPDI Complex, Seepat Road,
BILASPUR (C.G.)
1.1 Introduction
Amadand Open Cast Project (OCP) is an operating mine with the capacity of 2.15 MTY under Jamuna Kotma area of South Eastern Coalfields Limited (SECL). Environmental Clearance for the capacity of 2.15 MTY of coal was granted on 18th March, 2015 vide letter number J-11015/46/2002-IA-II (M).

There is a considerable increase in the number of upcoming new thermal projects both by private & public sectors resulting in increase in demand for power grade coal. In order to meet this Coal demand, enhancement of the production capacity of Amadand OCP to 4 MTY (Normative) & 5.4 MTY Peak is necessary.

1.2 Project Description
The Amadand OCP is located 18 Km South East of Kotma town is bounded by latitudes 23°07’ 28’’ to 23° 09’ 46’’N & longitudes 82°02’ 04’’ to 82° 04’ 53’’ E. It falls on the Survey of India Toposheet No. 64 I/4 RF91:50,000) within Anuppur district of Madhya Pradesh.

The Project Report has been formulated to win coal by Surface Miner with FEL and coal body trucks/dumpers & OB by Shovel Dumper combination. In Outsourcing Option both winning of coal and extraction of OBR will be done through outsourced HEMM. In-pit belt conveyer will be used for transportation of coal to Dispatch point to consumer through train. The land details for the Amadand OC are as follows:

Table 1.1: Pre-mining Land Use

<table>
<thead>
<tr>
<th>Forest Land</th>
<th>Agricultural / Tenancy Land</th>
<th>Government Land</th>
<th>Surface Water Body</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nil</td>
<td>1303.84</td>
<td>125.72</td>
<td>13.46</td>
<td>1443.02</td>
</tr>
</tbody>
</table>

Table 1.2: Post-mining Land Use

<table>
<thead>
<tr>
<th>S.No.</th>
<th>Land use</th>
<th>Area in Ha</th>
</tr>
</thead>
<tbody>
<tr>
<td>1.</td>
<td>External dump (Reclaimed)</td>
<td>376.70 Ha.</td>
</tr>
<tr>
<td>2.</td>
<td>Internal Dump (Reclaimed)</td>
<td>464.62 Ha</td>
</tr>
<tr>
<td>3.</td>
<td>Safety zone as green belt</td>
<td>116.00 Ha</td>
</tr>
<tr>
<td>4.</td>
<td>Infrastructure, Explosive Magazine etc</td>
<td>184.49 Ha</td>
</tr>
<tr>
<td>5.</td>
<td>R &amp; R Site</td>
<td>50.80 Ha</td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td>1443.02</td>
</tr>
</tbody>
</table>

1.3 Description of the Environment
For the purpose of the study, an area of about 10 km radius around the mine has been considered. Various types of studies were conducted as below:

1.3.1 Socio-Economic Study
The study included secondary data collection using census data and primary data using household survey. Summary of the data is given below:
- The study area comprises 54 villages, with a total population of 97,887 persons.
- Average household size lies between 4 and 5 persons per family, in the study area.
- Schedule Tribe population comprise major proportion of the total population.
- Literacy rate is below national average.
- Sex ratio in the study area is above national average.
- Primary school is there in most of the area, middle school is available within 10 km of most of the villages.

### 1.3.2 Air Quality Study

Six Ambient Air Quality Monitoring stations were selected as per the Guidelines mentioned in IS: 5182 (Part-14): 2000 for Rapid Environmental Impact Assessment in the project area. On the basis of wind rose pattern, these AAQM stations were so selected that one would be at upwind direction, two at downwind direction, two at crosswind direction & one at the core zone. All the selected stations were situated within the 1.0 to 2.0 km from periphery of the core zone.

<table>
<thead>
<tr>
<th>Location Code</th>
<th>Name of Location</th>
<th>As per Wind Direction</th>
</tr>
</thead>
<tbody>
<tr>
<td>L1</td>
<td>Amadand Village</td>
<td>Core Zone</td>
</tr>
<tr>
<td>L2</td>
<td>Bhad Village</td>
<td>Downwind Direction</td>
</tr>
<tr>
<td>L3</td>
<td>Chokan Village</td>
<td>Downwind Direction</td>
</tr>
<tr>
<td>L4</td>
<td>Gulutola Village</td>
<td>Crosswind Direction</td>
</tr>
<tr>
<td>L5</td>
<td>Kuhka Village</td>
<td>Crosswind Direction</td>
</tr>
<tr>
<td>L6</td>
<td>Phulwaritol Village</td>
<td>Upwind Direction</td>
</tr>
</tbody>
</table>

Different parameters like SPM, PM$_{10}$, PM$_{2.5}$, Oxides of Sulphur, Oxides of Nitrogen, Ozone, Ammonia, CO, Lead, Nickel, Arsenic and Benzene, Benzo (a) Pyrine, Mercury, Chromium and Cadmium were monitored for representing the baseline status of ambient air quality within the study area. The concentration of SPM, PM$_{10}$, PM$_{2.5}$, Oxides of Sulphur, Oxides of Nitrogen, Ozone, Ammonia, CO, Lead, Nickel, Arsenic and Benzene, Benzo (a) Pyrine, Mercury, Chromium and Cadmium are within the prescribed limit.

### 1.3.3 Water Quality Study

The quality of drinking water samples was compared with respect to IS 10500:2012 specification, the surface water quality was compared with respect to IS 2296: 1982 Class-C, and found that the concentration of the analytes were within the limit. “Indian Standards (IS 3025)”, “USEPA” and “APHA 22nd Ed” “were used for water sample collection and analysis.

Drinking water was collected from two hand pumps situated at Chokan Village & Amadand Village to assess the drinking water quality of the project area. Similarly, to assess the surface water quality, three ponds from Kuahka Village & Malga Village were selected.

Various parameters analyzed in water quality analysis for baseline study are within the prescribed limit.
1.3.4 Noise Quality Study
To know the background ambient noise level at the project and surrounding environment, noise level was measured at all the ambient air monitoring stations. The Day time & Night time Noise Level data are given in tabular formats as well as in graphical way for easy interpretation. Day Time means 06:00 am to 10:00 pm & Night Time means 10:00 pm to 06:00 am.

Noise Level Baseline data was collected on the same station as Air Quality Baseline Data generation station.

1.3.5 Soil Quality Study
Soil is fundamental & ultimate natural resources that fulfill a number of functions & provides various services like agriculture, industrial construction & ecological habitat development etc. Some of the most significant impacts on this resource occur as a result of activities associated with the use of chemical fertilizers, unscientific construction activities, unplanned city designs and land filling by toxic materials.

Various soil parameters tested for soil quality analysis are found to be within prescribed limits.

1.3.6 Flora & Fauna Study
Survey is done in the core zone as well as buffer zone. Identification of vegetation in relation to natural forest flora and croplands is conducted through reconnaissance field surveys and insight observations. The plant species identification is done based on the morphological characteristics and reproductive materials i.e. flowers, fruits and seeds. Land use pattern in relation to agriculture practices and crop verities are identified through physical verification of farm lands. Secondary data is gathered from the local villagers.

Natural vegetation, invaded species, avenue trees, home garden plants, hedge vegetation of agriculture fields, plants present in the ponds, rivers, hill areas are noted down. The identity of the herbs, climber, and trees are confirmed using the regional floras, the local names of trees are collected from the villagers.

1.3.7 Hydrogeology
The Project area is traversed by a small first order stream Banki Nala in the south-west. Bhirwa Nala is flowing along the south eastern part of the project. Both Banki Nala and Bhirwa nala is flowing towards south west direction and finally they merge and discharge into Son River as Bhirwa nala.

1.4 Anticipated Environmental Impacts & Mitigative Measures
1.4.1 Socio-Economic
The population of the area is likely to improve due to emigration & increasing industrial activity. This will increase the livelihood opportunities in the area as well as facilities such as educational & healthcare are likely to increase. On the other hand, the pollution due to mining activities may adversely affect the health of the people. The emigration is also going to effect the culture of the local community.
The impacts can be minimized to a large extent if participatory approach is followed in planning as well execution of the project & its activities.

1.4.2 Land Use

The increase in economic activity in the area may result in increase in urbanization & hence, land use accordingly.

Project proponent, will reclaim the mine by planting trees on the dump & the remaining mine void may be converted into a water body.

1.4.3 Air Quality

The cumulative Air Quality Impact Prediction (AQIP) for increase in coal production from Amadand OC mine of SECL has been carried out by using Fugitive Dust Model (FDM) of USEPA.

The combined value of predicted incremental concentration of PM$_{10}$ calculated using the model under controlled condition and arithmetic mean of baseline values is below the prescribed limit of the 100 $\mu$g/m$^3$.

Suitable mitigative measures like dense plantation, water sprinkling etc will be adopted.

1.4.4 Water Quality

Water quality of the area will be affected in the following ways:

- Seepage from coal dump and OB dump rendering ground water contaminated with seepage of mine effluent with Total Suspended Solids (TSS).
- Mine water discharge, Workshop & coal handling discharge and Waste water discharged into surface water course without treatment and mine impoundments.

Project proponent will adopt suitable technologies like ETP and zero discharge units to prevent water quality degradation.

1.4.5 Noise Quality

The noise quality will be affected by the noise generated due to different mining activities like drilling, blasting, vehicles etc. This may have impact upon the workers and the nearby habitants. The impact of noise more than permissible dosage may cause Annoyance and irritation, Mental and Physical fatigue, Interference in normal activities, Health hazards resulting from impaired hearing. In extreme cases, cardio-vascular diseases etc., Task interference, Interference with communication i.e., masking.

1.4.6 Soil Quality

Existing pH of the soil ranges between 6.7 and 7.3. It is an indicative for alkaline nature of the soil. The mining activities of opencast may affect the soil quality to a little extent.

Existing Electrical conductivity (EC) being 201 to 163 $\mu$s/cm is not going to an appreciable change as the mining activities are mainly opencast, therefore, the likely effect on surface soil quality will be to a minimum extent. It will hardly attain harmful germination condition level of EC in this project.
During mine expansion, with the augment in secondary porosity, the storage and permeability of the hydrogeological units close to the mine working face are improved significantly. Due to this, the major impact on groundwater levels is observed, mainly in the unconfined aquifer.

Different soil reclamation and soil quality improvement activities like soil amendments application are adopted by project proponent.

1.4.7 Flora & Fauna
Considering the scale of the project and the type of activities, the effect of the project on flora and fauna (environment) will be insignificant.

Impacts on flora
The impact on the terrestrial ecosystem due to operation of the proposed project would mainly occur from deposition of air pollutants. There will be loss of vegetation by excavation and dumping. The effects of air emissions on nearby vegetation and crop lands are not likely to be injurious and noticeable as the pollutants concentrations are expected to be well within the prescribed standards.

Impacts on fauna
As the fauna is closely related to and dependent on the flora, there will be movement of species away from mine lease area due to noise, vibrations and lights. As this is ongoing project and there will be negligible disturbance to fauna.

1.4.8 Hydrogeological Impact
The impact of mining on local water regime is dependent mainly on hydro-meteorological, mine and aquifer parameters. The impact on local water regime varies, in time and space, at different stages of mining. In opencast mining, only the aquifers lying above the working seam (i.e. unconfined aquifer) gets affected and whereas, the lower aquifers are least affected.

Hydrogeological Data shows that the pre-monsoon water levels vary from 6.05 m (1991) to 11.00 m (2003) with an average of 8.06 m and Post monsoon water level data vary from 2.05 m (1994) to 6.94 m (2015) with an average of 4.26 m. The water level fluctuation varies from 0.21 m (2015) to 8.00 m (2003) with an average of 3.78 m.

Because of the low permeability of aquifers, the impact of mining on local water regime will be marginal and the radius of influence will be limited to a small distance. So also, due to stratification, the individual permeable beds develop individual drawdown cones and the impact is usually limited to few hundred meters.

The Ground Water Annual draft is 17.39 M Cum & annual available ground water recharge is 30.33 M Cum. Stage of groundwater development for the Study area of Amadand OCP is 57.34 i.e. within the safe zone.

1.4.9 Rehabilitation & Resettlement
There are 5 nos. of villages including Amadand itself, involved in the project comprising a total land area of 1443.02 Ha. As on 27/11/2017 a total of 1225.60 ha of
land has been acquired. It involves rehabilitation of 575 families including 1100 land outees. A total of 575 families would be rehabilitated in the rehabilitation site. Handing over of R & R site is in advance stage. R & R is being done as per Coal India Ltd & Madhya Pradesh Government’s R & R policy. R &R Package & employment will be provided to affected people as per the approved norms.

1.4.10 Solid Waste

Solid waste will be generated due to various mining activities like OB removal, blasting, ETP, construction material etc.

OB Dumps will cause obstruction to the surface drainage pattern. Until vegetative cover has not been fully grown up on the dump surface, OB dumps will be source of air and water pollution due to wind and water erosion.

ETP Sludge may contain washed out lubricants, oils, wear out metallic particles, detergents and other hazardous substances, which after leaching may pollute the ground water content. Further, the fine particles present with the sludge may become airborne & cause air pollution.

Improper handling of left out construction materials, may change the natural land use pattern, soil quality & vegetative cover by adding paints, metallic scraps, plastics which could be hazardous in nature.

Organic litter should be collected and stored in designated site not affected by soil erosion. After storing the organic litter, it will be allowed to convert into compost that will be used for biological reclamation of dumps or other areas. The remains of fuses and plastic non-degradable materials, created due to blasting should be manually separated from OB while dumping it.

1.4.11 Impact on Health

Slight expected increase of SPM/RPM can cause minor problems like bronchitis, throat infections, lung infections, etc among workers within mines premises, but, the increase is expected to be nominal.

Water quality affected by mining activities and if not treated will give rise to gastro-intestinal disorders among people if they take in polluted water.

Workers working near higher level noise emitting mining equipment are likely to get affected with annoyance and irritation, mental and physical fatigue, interference in normal activities, health hazards resulting from impaired hearing, in extreme cases, cardio-vascular diseases etc., task interference, interference with communication i.e. masking, Hypertension and higher blood cholesterol.

1.4.12 Mine Closure Planning

Although, the mining activities may last a few decades, but they are liable to leave a long lasting impacts on the landscape, ecology and on local inhabitants. The objective of mine closure plan is aimed at restoration / reclamation of disturbed area, which should be acceptable to local community as well as regulatory authority.
The mine closure cost will cover the various related activities for which a corpus escrow account @ Rs. 6.0 lakh per Ha for Open cast mine of the project area shall be opened with the coal controller organization. The above amount is as per the mine closure guidelines issued in August 2009, which will be updated for the present financial year based on the cost index value.

As per the guidelines of the MoC, the cost of the mine closure is to be computed on the basis of the project area involved in the project. In Amadand OCP total land area involved is 1443.005 Ha. The updated cost of the mine closure as on March’15 is estimated to be Rs. 8.15 lakh per hectare (considering the admissible escalation over Rs. 6.00 lakh per Ha as on August 2009).

Final mine closure cost @ Rs = W.P.I of March 2015 176.10 /W.P.I of Aug.09 129.60 x 6= Rs.8.15 Lakh/ Ha. for 1443.005 Ha = Rs.11760.491 lakhs.

1.5 Analysis of Alternatives

Alternative site for the project is not possible in case of extraction of the minerals & method of work to be adopted for any seam depends on many aspects such as depth of occurrence, thickness and gradient of the seam, parting between the seams, structure, gassiness of the seam, geological disturbances etc. In addition, the presence of village, built up area and other surface features play an important role in deciding the method of work. Coal can be mined through Underground or open cast Mining.

Techno-economically, Surface miner alternative is better option than conventional one. Environmental Impact with effect from deployment of the Surface miner in coal extraction is somewhat lesser than that from the Conventional method.

1.6 Environment Monitoring Programme

The responsibility for implementing environmental Monitoring plan would rest with the environment management structure who would be properly assisted by a team of qualified and trained personnel.

For effective implementation and mid-term corrective measures (if required) monitoring and control of programme implementation is essential. For this purpose a time bound action programme for environmental management has been prepared.

The scope of environmental management includes plantation, surface drainage, industrial water treatment plant, air, water and noise pollution checks etc. For air, water and noise pollution control measures, samples will be collected and tested for all four seasons at strategic places representing all the categories of areas as indicated by CPCB, NAAQS. The implementation authority should be guided and advised as per the feedback data from these tests. CMPDI may be consulted as and when necessary.

1.7 Additional Studies

1.7.1 Risk Assessment

Keeping in view the three basic principles i.e. prevention, preparedness (both pro-active and reactive) and mitigation of effect through rescue, recovery, relief and rehabilitation; a comprehensive blueprint of risk assessment and management plan has been prepared for Amadand OCP incorporating the following:

- Identification and assessment of risks
- Recommendation of measures to prevent damage to life and property against such risks.

The exposed ends of the coal seams and OB will be left with a safe slope to avoid slope failure and collapse of benches. Similarly, at the end of mining operation safe terminal pit slope will be provided to avoid failure.

For proper blasting and minimizing the adverse side effects due to blasting viz noise ground vibration back-breaks, air blast, fly rocks etc. the following precautions have been suggested to avoid dangerous situation:

- The optimal blast design parameters will be implemented.
- Adequate safety zone beyond the quarry limit is envisaged and controlled blasting will be done keeping this aspect in mind.
- The blasting will be done at a fixed time as far as possible.
- All necessary precautions will be taken while blasting.

The exposed ends of the coal seams and OB will be left with a safe slope to avoid slope failure and collapse of benches. Similarly, at the end of mining operation safe terminal pit slope will be provided to avoid failure.

All the working benches will be under the direct supervision of project level officials and all the necessary precautions will be taken to make the workings safe.

The following pit design parameters have been adopted.

- Maximum Bench Height
  - O. B - 15m
  - Coal - 20-25 m (by Surface Miner)
  - Width of the permanent haul road - 40 m
  - Width of the temporary transport ramp - 20 m
  - Usual height of the spoil dump bench - 30 m
  - The width of the active dump bench - 60 m
  - Bench Slope (working)
    - O.B. bench - within 70°
    - Coal bench - Within 50° - 60° (Surface Miner)
    - OB Dump bench - Upto 37°
    - OB Dump height a) Internal - 90 m from surface
      b) External - 120 m from surface
    - Overall OB dump slope (for 250- depth) will be maintained – Within 28°

During the life of the mine, slope stability study will be conducted time to time, if necessary, to take advance action for preventing any possible failure of slope of any working benches of coal & OB and also against the benches of OB dumps.
1.8 **Project Benefits**
The project is going to have socioeconomic benefits for the area in the following ways:
- Improvement in the Social Infrastructure
- Improvement in Literacy rate through Literacy drive
- Primary & Secondary employment generation.
- Increased CSR spending
- There will be infrastructure development in the rehabilitation village.

1.9 **Environment Cost Benefit Analysis**
TOR Granted by Ministry of Environment, Forest & Climate Change has asked for an IRR study which was carried out during June to Sept 2018 by IIT (ISM), Dhanbad.

The study is involved of two stages viz., Valuation of ecosystem goods and services, Calculation of NPV, IRR and B:C ratio. The study is summarized as follows,

The financial and ecological cost (Ct) to be incurred for this project included are: (i) Capital expenditure, (ii) Replacement Capital and (iii) Revenue expenditure (all three items consist of financial cost), (iv) loss of EGS for diversion of 610.84ha for 19 years, and (v) loss of EGS of diversion of other Govt., land (i.e., waste and grazing land) of 125.72 ha (last two consists of ecological loss).

In the approved Expansion Project Report (PR), at 85% of capacity utilization, Net cash flow, IRR and NPV (at 12%) are calculated as Rs. 1086.668 Cr, 15.22% and Rs. 80.678 Cr respectively. While at 100% capacity utilization, Net cash flow, IRR and NPV (at 12%) are calculated as Rs. 1600.408 Cr, 22.64% and Rs. 256.402 Cr respectively.

By considering loss of agriculture land and grazing & waste land, as outflow (i.e., loss of EGS for diversion of Agricultural land + grazing and waste land) and economic gain in terms of EGS from reclaimed afforested areas (as inflow), there is reduction in Net flow of Rs. 63.363 Cr (-5.83%); NPV loss of Rs. 29.10 Cr (-36.07%) and reduction in IRR from 15.22% to 14% (i.e., 1.22%) at 85% capacity utilization.

Similarly, at 100% capacity utilization, the reduction in Net Flow estimated to be Rs. 63.363 Cr (-3.96%) and NPV of Rs. 25.3587 Cr (-9.89%), influencing reduction of IRR to an extent of 1.26%.

Therefore, by incorporating estimated ecological losses, there is net reduction in the NPV and IRR of the project due to environmental dimensions of the order of 1.22% in IRR at 85% of capacity utilization of the project and 1.26% at 100% capacity utilization.

1.10 **Environment Management Plan**
Environmental Management Plan is the key to ensure that the environmental quality of the area does not deteriorate due to the operation of the project. An EMP is a site-specific plan developed to ensure that all necessary measures are identified and implemented in order to protect the environment and comply with environmental legislation.
1.10.1 Conservation plan for Sloth Bear

It is listed in Schedule I of the Indian Wildlife Protection Act, 1972, which provides for their legal protection. Major threats to this species are habitat loss or degradation (due to biotic pressure), retaliation with human–bear conflicts, and (to a lesser degree) poaching.

Planting of fruit bearing trees should be undertaken. Based on knowledge of Sloth Bear behavior and its ecology, safety guidelines should be devised and circulated among the public. It will help people to avoid or minimize chances of being attacked by Sloth Bear.

1.10.2 Air Quality Management

- For Drilling - Dust extractor with fabric filter & Wet Drilling
- For Blasting - Wet stemming, E-det Blasting, Muffle Blasting
- Laying of water pipeline (corrugated/perforated pipe) to moist the OB during the process of loading
- Mobile water sprinkling on OB haul road.
- Mist sprinkling at transfer point between belts

1.10.3 Water Management

Water quality can be managed through:

- Garland development to prevent surface water drainage into the mine.
- Effluent Treatment Plant.
- Water Conservation
  - The entire mine industrial water demand, would be met from the treated mine discharge.
  - The surplus treated mine water will be discharge into the agricultural fields.
  - The final void would be converted into a water reservoir. Thus, in post-mining, the recharge and source potential in core zone will be much higher than the existing.

1.10.4 Noise Management

The following measures are being adopted and will be continued for noise quality management:

1. Every year extensive plantation can be done both on plain and dump.
2. High capacity machines to be deployed in mine. This will ensure reduced number of vehicular trips, thereby reducing noise levels.
3. Reduced quantity of blasting will result in lower noise levels.
4. Lined chutes in Silo to reduce noise.
5. Surface miner deployed to eliminate coal crushing will reduce noise.
6. Provision of ear muffs/ear plugs to workers subjected to noise level above recommended limits.

1.10.5 Reclamation of mine void

In the core zone, after the cessation of mining activity a void will be created. This void will be used as a water body. This will be graded to a gentle slope so that it acts as a safe approach / access to the water body for the faunal species.
1.10.6 Control of forest fire, fire in coal seam and coal stock

Fire can destroy the entire habitats (micro and macro) and its life supporting potential in a forest area. Fire does not spare fauna also. SECL will implement the existing DGMS stipulated fire protection norms on coal seams and coal stock. This will ensure that a congenial atmosphere is created and fire does not affect the fauna and flora as well.

1.11 Disclosure of Consultant

Central Mine Planning & Design Institute Limited. Briefly, it is generally called as CMPDI. It is an ISO 9001 Company. It is QCI/NABET Accredited Environmental Consultancy organization [vide Minutes of Accreditation Committee Meeting No. 76 for Re-Accreditation held on Jan. 13, 2016].

Its registered corporate office is situated at Gondwana Place, Kanke Road, Ranchi-834 008, a capital city of Jharkhand state. It operates through seven strategically located Regional Institutes over six states territories of India.