

DRAFT ENVIRONMENTAL IMPACT ASSESSMENT REPORT

FOR

THE BANHARDIH COAL MINING PROJECT OF 12 MTPA CAPACITY AT LATEHAR & CHANDWA TEHSIL, LATEHAR DISTRICT, JHARKHAND

EXECUTIVE SUMMARY

Project Proponent :



Patratu Vidyut Utpadan Nigam Limited (PVUNL)
Ramgarh-829119


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September 2021

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1.0 EXECUTIVE SUMMARY

Banhardih coal block located in Auranga coal field in Latehar district of Jharkhand State has been allocated to M/s. Patratu Vidyut Utapdan Nigam Limited (PVUNL), a subsidiary of NTPC and Government of Jharkhand. This block is allotted for captive mining for supply of coal to their M/s. Patratu Super Thermal Power Project (PSTPP) by Ministry of Coal (MOC), Government of India vide F.No.103/18/2015/NA dated 25.06.2018 for a total area of 1818.10 ha.

M/s. PVUNL has been assigned proposed Banhardih mine from previous allottee, Jharkhand Urja Utapadan Nigam Ltd (JUUNL). Banhardih coal mine block having an area of 1818.10 ha is located in villages Ate, Banhardih, Bari, Barwadih, Jagaldaga, Rampur, Sabano, Surli, Tota and Udaypura in Latehar & Chandwa tehsil, Latehar district in Jharkhand state.

The mine lease area is 1467.42 ha and mining plan has been prepared for peak capacity of 12.0 MTPA using opencast mining method covering 1467.42 ha only. Ministry of Coal (MOC) has accorded in-principal approval for mining plan including Mine Closure Plan of Banhardih coal block vide Letter No: CC/MP&MC/102/2021-22/Banhardih on 15.07.2021. Accordingly, the present EIA report and application for EC pertains to coal mining of 12 MTPA over an area of 1467.42 ha.

An application for forest clearance has been submitted for 549.484 ha of forest land involved in 1467.42 ha mineable area of mine block. Accordingly, the present EIA report and application for EC pertains to coal mining of 12 MTPA over an area of 1467.42 ha.

1.1 Purpose of the Report


As per Environmental Impact Assessment (EIA) Notification dated 14th September 2006, proposed project falls under Schedule Mining of Minerals-'1(a)' of Category-'A' and requires prior Environmental Clearance (EC) to be obtained from Ministry of Environment, Forest & Climate Change (MoEF&CC). MOEF&CC has accorded Terms of Reference (TOR) vide its letter No. J-11015/13/2020-IA-II (M) dated 02.10.2020.

With a view to assess the environmental impacts arising due to the proposed opencast coal mining project of 12.0 MTPA, M/s. PVUNL has awarded the EIA study works to M/s. Vimta Labs Limited (VLL), Hyderabad, NABET accredited EIA Consultant to prepare EIA report for various environmental components including air, noise, water, land and biological components along with parameters of human interest which may be affected and to prepare an Environment Management Plan (EMP) for mitigating possible adverse impacts.

1.2 Identification of Project and Project Proponent

1.2.1 Identification of Project

Banhardih Coal Mine Block located in Auranga coalfield in Latehar district of state

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of Jharkhand, has been allocated to Patratu Vidyut Utpadan Nigam Limited (PVUNL), a subsidiary of NTPC and Government of Jharkhand. This block is allotted for captive mining for supply of coal to their M/s. Patratu Super Thermal Power Project (PSTPP) by Ministry of Coal, Government of India vide F.No.103/18/2015NA dated 25.06.2018 for a total area of 1818.10 Ha. M/s. PSTPP is situated at a distance (by road) of approximately 100 km in the eastern direction from the project area. Coal production is proposed through both surface miner and conventional drilling & blasting methods.

Mining Plan for this block (excluding western part) was prepared by M/s. United Exploration India Pvt. Ltd, Kolkata (UEIPL) based on the geological report on Coal Exploration (2019) prepared by Department of Mines & Geology, Govt. of Jharkhand on the partly explored block. Mining plan for mine capacity of 12.0 MTPA has been in-principle approved by Ministry of Coal on 15.07.2021.

Background of the Project

The block was initially allotted to Jharkhand Urja Utpadan Nigam Limited (JUUNL) and allotment agreement between nominated authority and JUUNL in this regard was executed on 30.03.2015. The first and second amendment to the allotment agreement was executed on 30.06.2015 & 17.01.2017 respectively.

Subsequent to the formation of the JV company between Jharkhand Bijli Vitran Nigam Limited and NTPC, the block was assigned to M/s. Patratu Vidyut Utpadan Nigam Limited (PVUNL) and a tripartite deed of adherence was executed between Nominated Authority (MOC, Government of India), Jharkhand Urja Utpadan Nigam Limited (JUUNL) and Patratu Vidyut Utpadan Nigam Limited (PVUNL) on 02.07.2017.

A deed of Assignment has been executed between Jharkhand Urja Utpadan Limited (JUUNL) and Patratu Vidyut Utpadan Nigam Limited (PVUNL) towards amendment of the allotment order in favour of M/s. PVUNL on 15.05.2018.


Pursuant to the execution of deed of Assignment between M/s. JUUNL and M/s. PVUNL, Nominated Authority issued a corrigendum no.2 to the allotment order no. 103/18/2015/NA dated 30.06.2015 and allotment order issued in favour of M/s. Patratu Vidyut Utpadan Nigam Limited (PVUNL) vide allotment order No. 103/18/2015 NA dated 25.06.2018.

Status of Mining Plan

Ministry of Coal has accorded in-principal approval for Mining Plan including Mine Closure Plan of Banhardih Coal Block on 15.07.2021.

Status of Forest Clearance

An application for forest clearance has been submitted for 549.484 ha of forest land involved in 1467.42 ha mineable area of mine block.

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1.2.2 Identification of Project Proponent

M/s. Patratu Vidyut Utpadan Nigam Limited (PVUNL) has been incorporated on 15.10.2015 as a subsidiary of NTPC with 74 % stake in the Company and 26 % of stake held by M/s. Jharkhand Bijli Vitaran Nigam Limited (JBVNL) for capacity addition in two phases i.e. Phase-I (3 x 800 MW) and Phase-II (2 x 800 MW). Jharkhand is the principal beneficiary state with 85 % allocation while 15 % of power will remain as unallocated quota at the disposal of Govt of India. Patratu Super Thermal Power Project (PSTPP) is located at Patratu village in Ramgarh district of Jharkhand.


NTPC Limited (A Govt. of India Enterprise), is the largest power generating company in India and first public sector company to be granted "Maharatna" status. Presently, NTPC generates power from coal, gas, hydro and renewable (i.e. solar and wind) projects. with the installed capacity of the company is 66,885 MW (including JVs) (as on July' 2021), NTPC is leading power major in the country. NTPC has stations of 24 coal based, 7 gas based, 1 Hydro, 1 Wind, 13 Solar and 1 Small hydro plant. Under JV, NTPC has 9 coal based, 4 gas based and 13 renewable energy projects. NTPC has also diversified itself into hydro, coal mining, power equipment manufacturing, power trading & distribution.

1.3 Environmental Setting

The general topography of the block characterizes with rolling terrain with low ridges and depressions. Around 25 % of the block is covered with protected forest located in the western part. Partly the villages like Udayapura, Jagaldagga, Banhardih and Sabanu are falling within the forest area. Rest of the area within the block is covered with cultivated land and residential hutments. There is operating coalmine i.e Sikni Colliery (0.3 km, South) from the proposed mine & there is also a brick industry nearby Serak village.

The Bagdagga nala and Rajdaha nala and their tributaries forms the main drainage system of the sector. The courses of nalas have been developed into cultivated lands and some gully head bandhs have been constructed across the nalas for storage of water for irrigation. A canal passes across the area from north to south at the Centre and parallel to main connecting road passes through Surli, Huchlu and Bari villages.

Due to undulating nature of the land, a number of natural ponds have been formed and these ponds are aligned in a definite line indicating a possible presence of fracture. The environmental setting around the proposed coal-mining project is given in **Table-1** and **Figure-1**.

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**TABLE-1
ENVIRONMENTAL SETTINGS**

Sr. No	Particulars	Details
1	Location	Ate, Banhardih, Bari, Barwadih, Jagaldaga, Rampur, Sabano, Surli, Tota and Udaypura in Latehar & Chandwa tehsil, Latehar district in Jharkhand state.
2	Coordinates	23° 43'23.09"N to 23°45'12.995"N & 84°37'19.791"E to 84°39'55.045"E
3	SOI Topo sheet no.	F45A9 & F45A10
4	Elevation	423-459 m
5	Nearest villages	Within the Mine Lease Area: 1. Barwadih 2. Udaipura 3. Banhardih 4. Bari 5. Ate 6. Jagaldagga 7. Rampur 8. Sabano 9. Surli 10. Tota
6	Nearest town	Chandwa (9.4 km, SE)
7	District Head Quarters	Latehar (8.0 km, W)
8	Nearest highway	NH-75 (0.8 km, S) NH-99 (8.3 km, E) SH-10 (14.6 km, N)
9	Nearest railway station	Chetar railway station (6 km, SE)
10	Nearest airport	Ranchi (80.0 km, SE)
11	Nearest seaport	Haldia (400 km, SE)
12	Interstate boundary	Nil
13	Water bodies	1. Bagdagga nala (Within Mine lease area, South) 2. Rajdaha nala (Within Mine lease area, W) 3. Ghaghari nadi (1.6 km, S) 4. River Auranga (1.8 km, SW) 5. Sukri river (3.8 km, N) 6. Gowa nala (3.9 km, SW) 7. Bhubuk nala (7.0 km, NW) 8. Ekchatia nala (7.1 km, N) 9. Deonad nadi (9.2 km, SE) 10. Tatta nala (9.6 km, NNW)
14	Reserve forest	1. Udayapura PF (Within Mine lease area, W) 2. Sabanu P.F (Within Mine lease area, NW) 3. Banhardih P.F (Within Mine lease area, N) 4. Surli P.F (0.2 km, NE) 5. Renchi P.F (0.4 km, N) 6. Serak P.F (0.6 km, E) 7. Aragundi P.F (1.2 km, NW) 8. Jadiang P.F (1.8 km, N) 9. Amwatikar R.F (2.4 km, W) 10. Latdag P.F (3.5 km, SE) 11. Rajbar P.F (3.8 km, NNE) 12. Holang P.F (3.8 km, NE) 13. Obar P.F (3.9 km, NW) 14. Gurtur P.F (4.0 km, NNE) 15. Khariya P.F (4.4 km, S) 16. Mangra P.F (4.6 km, NNW) 17. Masiatu P.F (5.2 km, NNE) 18. Bishrampur P.F (5.3 km, NW) 19. Nagar P.F (5.4 km, E) 20. Nindra P.F (5.9 km, E) 21. Lachipur P.F (6.1 km, NE)



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Sr. No	Particulars	Details
		22. Kuriam P.F (6.2 km, NNE) 23. Tudu P.F (6.3 km, SE) 24. Richuguta R.F (7.0 km, SSW) 25. Arahara P.F (7.0 km, N) 26. Tubed P.F(7.3 km, NNW) 27. Erud P.F (7.5 km, NE) 28. Sugni P.F (7.6 km, S) 29. Hisri P.F (7.9 km, SE) 30. Dihi P.F (8.0 km, N) 31. Peshrar R. F (8.6 km, SSW) 32. Bhang P.F (8.7 km, NE) 33. Balu P.F (8.7 km, N) 34. Lawadag R.F (8.8 km, S) 35. Jawar P.F (9.0 km, N) 36. Jalta P.F (9.4 km, W) 37. Hundi P.F (9.6 km, N) 38. Bhusah P.F (9.9 km, ESE) 39. Sohdag P.F (10.4 km, NNW) 40. Jani P.F (10.5 km, N) 41. Chakla P.F (10.8 km, E) 42. Pakri P.F (10.9 km, NE) 43. Semar Sot P.F (10.9 km, NE) 44. Diridag P.F (11.5 km, NE) 45. Chaea P.F (11.5 km, N) 46. Mahuamilan P.F (11.9 km, E) 47. Bhargaon P.F (12.0 km, NNW) 48. Partu P.F (12.0 km, SW) 49. Lata P.F (12.2 km, N) 50. Manha P.F (12.3 km, SSW) 51. Salaiya R.F (12.6 km, S) 52. Chetang P.F (12.4 km, NE) 53. Ghutam (12.5 km, NNE) 54. Serka P.F (12.8 km, NNE) 55. Patki R.F (13.1 km, W) 56. Lawagara P.F (13.2 km, NNW) 57. Kodag P.F (13.7 km, W) 58. Bidir P.F (13.7 km, N) 59. Kerar P.F (14.0 km, SW) 60. Chiru P.F (14.4 km, N) 61. Jer P.F (14.5 km, W)
15	Sensitive areas	Palamau Tiger Reserve (15.2 km, W), ESZ Boundary (13.1 km, W)
16	Historical places	Nil
17	List of other industries	1. Sikni Colliery (0.3 km, South) 2. Abhijeet Power Plant (10.7 km, E) 3. Essar Power (11.0 km, E)
18	Seismicity	Zone-II

**Note: All distances mentioned above are in aerial distance from the proposed mine boundary*



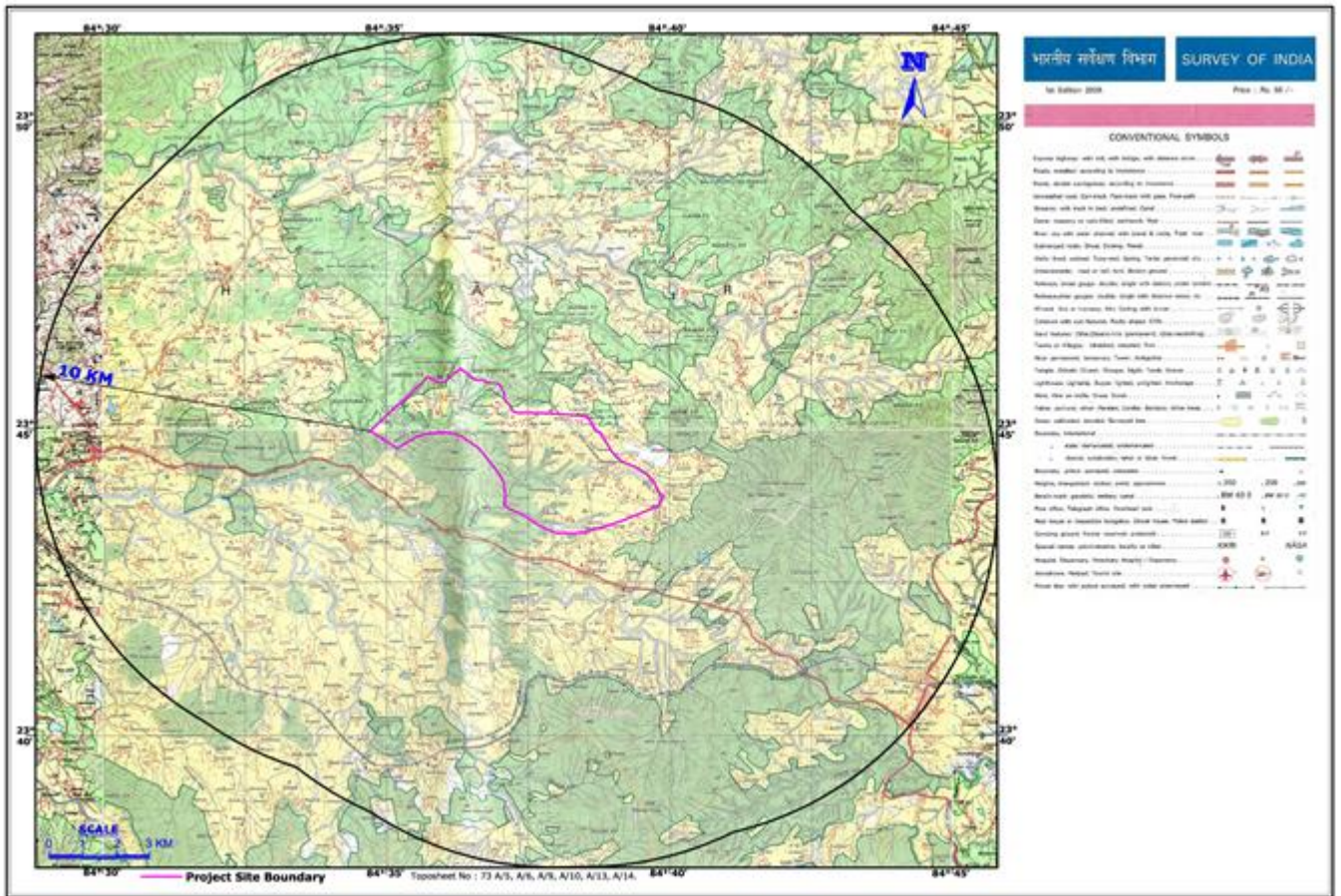
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**FIGURE-1
ENVIRONMENTAL SETTINGS IN STUDY AREA (10 KM RADIUS FROM PROJECT)**

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1.4 Brief Description of the Project

Nature & Size of the Project

Proposed production from the mine is 12 MTPA. The total cost of the project is estimated about Rs. 6,750 crores. Mining is proposed to be carried out by open-cast method. Combination of shovel-dumper and surface miner are proposed for coal extraction whereas OB removal by shovel-dumper. Drilling & blasting is proposed for coal, OB and interburden.


Crushing is proposed for reduction of coal from ROM to (-100) mm size. Coal evacuation within the mine will be done by 60 T coal body dumpers. Coal from the CHP will be transported through a surface conveyor to the silos/load out point located at southern boundary of the block, loading into railway wagon through rapid loading system and to be dispatched through the railways. The coal has to be transported from Banhardih to Patratu STPP by rail, which is at distance of approximate 95 km by rail.

1.5 Salient Features


The salient features of the mine are given in **Table-2**.

TABLE-2
SALIENT FEATURES OF THE PROPOSED COAL MINE

Sr. No.	Description	Details
1	Name of the geological block	Banhardih coal mine
2	Total project area	1818.10 ha
3	Current Mineable area	1467.42 ha
4	Explored area of block	1049.0 ha
5	No. of bore holes drilled within the block	82 boreholes
6	Overall bore hole density	7.82 BH/Sq. km. within the explored area
7	No. of seams	18 no. of major seams. 1B, 1T, 2, 3, 4B, 4M, 4T, 5B, 5M, 5T, 6B, 6M, 6T, R1B, R1M, R1T, R2 & R3.
8	Net Geological reserves	1234.98 MT up to 1200 m
9	Net Geological reserves considered for mining	401.56 Mt up to a depth of 300 m
10	Extractable reserves-Open cast	250.50 Mt
11	Total OB Generation	1173 MCM
12	Average stripping ratio	4.68 m ³ /t
13	% of extraction	62.38 % Upto a depth range of 300 m depth only
14	Capacity of mine	12 MTPA
15	Expected life of mine	30 years
16	Average Gross calorific value	G11 (>4000 – 4300 Kcal/Kg)

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Sr. No.	Description	Details
	(GCV in K.cal/kg) of coal	
17	Type of mine	Opencast
18	Method of mining	Coal extraction - Surface Miner and conventional Drilling and Blasting. OB Removal - Shovel Dumper combination.
19	Coal evacuation	Through MGR system and Indian Railways
20	No. of working days/ Number of shifts/ Working hours/shift	3 shifts of 8 hour each for 330 days
21	Quarriable area	727.24 ha
22	Total excavation volume (Coal + Overburden)	1340 Mm ³
23	Maximum bench height	10 m
24	Ultimate depth of mine	300 m
25	Temporary external dump (within block) area	467.14 ha
26	Internal dump area	727.24 ha
27	No. of External dumps	1
28	No. of Internal dumps	1
29	Topsoil generation	17.94 M.cum
30	Overall pit slope	45°
31	Dump height	30 m
32	Power requirement	40 MVA
33	Source of power	Power shall be drawn from proposed 132/33 kV GSS at Chandwa of Jharkhand Urja Sancharan Nigam Limited by providing additional 132 kV bay
34	Water requirement	11.25 MLD (Potable - 2.3 MLD; Industrial - 8.95 MLD) Source: Potable: Bore wells/Rainfall/ground water, Industrial: Treated mine discharged water
35	Manpower requirement	Approx. 1,306
36	Project cost	₹ 6,750 Crores
37	Pre-Mining land type	Private - 561.92ha Govt - 356.02 ha Forest - 549.48 ha Total - 1467.42 ha An application for forest clearance has been submitted for 549.484 ha of forest land involved in 1467.42 ha mineable area of mine block.
38	No. of PAPs	963 no.s

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1.6 Resource Requirement

- **Land Requirement**

- *Land Use Pattern of the Block Area*

The Banhardih coal block comprises of about 18.18 Sq. km area distributed over 10 nos. of villages. It administratively falls under the Latehar district, Jharkhand state. Out of this, 31.99 % is designated as forest land, tenancy land is 40.69 %, Government/ Non- Forest land is 27.32 %. Present and pre-mining land use is given in **Table-3** and **Table-4** respectively.

**TABLE-3
PRESENT LAND USE OF BANHARDIH COAL BLOCK**


Sr.No	Type		Area in ha
	Within ML Area		
1	Tenancy	Agricultural Settlements	739.89
2	Government	Water Bodies/Tanks Roads	496.60
3	Forest & open scrubs		581.61
Sub-Total			1818.10

Source: Approved Mining Plan

At this planned period, 14.67 sq. km of area has been conceptualized to be worked including a surface dump to be re-handled at a later stage of the project. Notification under Section 9 (1) has already been served as per CBA Act, 1957 for an area of 10.42 sq. km while notification for the remaining area will be issued shortly. As given above **Table-3**, the Forest & open scrub area is about 581.61 ha in total coal block area 1818.10 ha. The land distribution as per the land records obtained from the State Government is furnished in **Table-4**.

An application for forest clearance has been submitted for 549.484 ha of forest land involved in 1467.42 ha mineable area of mine block. Accordingly, the present EIA report and application for EC pertains to coal mining of 12 MTPA over an area of 1467.42 ha.

A village road, passing through the central part of the block needs to be shifted beforehand of mining operation. The detail engineering of the road will be made with due consultation with the Public Works Department, Government of Jharkhand. A village wise break up of 1467.42 ha of project area.

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**TABLE-4
PRE-MINING LAND DISTRIBUTION OF CURRENT MINEABLE AREA**

Pre-Mining Land Use "ha"		
Tenancy	Agricultural	324.45
	Township	-
	Grazing	-
	Barren	208.33
	Water Bodies	8.00
	Road	0.81
	Community	-
	Others	35.78
Govt. Non forest	Agricultural	132.70
	Township	-
	Grazing	-
	Barren	151.40
	Water Bodies	33.44
	Road	27.61
	Others	26.95
Forest	Reserve	-
	Protected	474.25
	Chote Jhad Bade Jhad ka Jungle	43.70
Free hold	-	-
Total		1467.42

Source: Approved Mining Plan of Banhardih Coal Block

- Water Requirement


Total requirement of water is estimated as 11.25 MLD for the block (Potable – 2.3 MLD; Industrial – 8.95 MLD).

Water Source: Borewells/Ground water/Rainfall has been assumed to be the source of potable water requirement. For all industrial usage of water, the treated mine water pumped out from the sumps will be used after treatment of suspended solids.

In usual condition of the mining, this mine will operate in a "Zero Discharge" scenario. The mine pit accumulated water will be pumped and stored in the central sump for workshop, sprinkling and plantation use. Storm water discharge may happen only in the rainy season due to sudden inrush of storm water.

- Power Requirement

Power requirement of this mine is approximately 40 MVA at 132 kV level. An application has been already made by the project proponent in this regard to get the required power from the proposed 132/33 kV GSS at Chandwa and PVUNL has also requested for the provision of additional 132 kV bay for power supply to the Banhardih coal mine.

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- Manpower Requirement

Manpower required for 12 MTPA production based on 330 working days shall be approximately 1306. This manpower includes persons employed from PVUNL and MDO both.

1.7 Mining Methodology

The present proposal is to extract a peak capacity of 12 MTPA of coal reserves by opencast mining with surface miner and shovel dumper combination. After appropriate analysis of aspects such as seam characteristics, techno-financial feasibility and production targets, shovel dumper combination will be used for overburden removal and coal production by surface miner and shovel dumper combination. Conventional drilling and blasting is proposed for coal, over burden and internal burden removal.

Coal produced by surface miner will be dispatched to power plant directly while coal produced through drilling and blasting will be subjected to primary crushing to reduce the size less than 100 mm. Overburden excavation through drilling & blasting while removal through shovel dumper combination.

1.8 Description of Environment

The baseline studies were carried during 1st December 2020 to 28th February 2021, covering winter season in the various domains of environment.


1.8.1 Meteorology

The meteorological parameters were recorded on hourly basis during the study period and comprises of parameters like wind speed, wind direction (from 0 to 360 degrees), temperature, relative humidity, atmospheric pressure, rainfall and cloud cover. The meteorological parameters have been recorded and are presented in **Table-5**.

TABLE-5
SUMMARY OF THE METEOROLOGICAL DATA GENERATED AT SITE

Month	Temperature (°C)		Relative Humidity (%)		Atmospheric Pressure (hPa)		Rainfall (mm)	Wind Speed (m/s)
	Max	Min	Max	Min	Max	Min		
December 2020	29.5	6.7	79	55	981.9	920.5	6.5	3.0
January 2021	31.9	5.9	74	54	991.5	928.1	11.1	4.0
February 2021	33.1	7.1	73	53	959.4	936.0	8.0	2.8
Range	5.9-33.1		53-79		920.5-991.5		25.6	Avg: 3.26

The maximum and minimum temperatures recorded at site during study period were 33.1 °C and 5.9 °C. The relative humidity was observed to range from 53 % – 79 % during the study period. Predominant winds are mostly from NW followed by

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NE. Calm conditions prevailed for 28.5 % of the total time. Average wind speed is 3.26 m/s.

1.8.2 Ambient Air Quality

Ten ambient air quality locations were monitored in and around project site. The minimum and maximum concentrations for PM₁₀ were recorded as 27.1 µg/m³ and 61.6 µg/m³. The minimum and maximum concentrations for PM_{2.5} were recorded as 11.3 µg/m³ and 32.0 µg/m³. The minimum and maximum SO₂ concentrations were recorded as 9.1 µg/m³ and 16.6 µg/m³.

The minimum and maximum NO₂ concentrations were recorded as 10.0 µg/m³ and 21.0 µg/m³. The minimum and maximum CO concentrations were recorded as 151 µg/m³ and 334 µg/m³. The minimum and maximum O₃ concentrations were recorded as 3.2 µg/m³ and 9.9 µg/m³.

The concentrations of PM_{2.5}, PM₁₀, SO₂, NO₂, O₃, CO, NH₃, Pb, Hg, BaP, As, Ni and C₆H₆ are observed to be well within the NAAQ standards, 2009 for industrial and rural /residential zone.

1.8.3 Land Use

The land use pattern of the study area indicates that 40.1% of the study area is under agricultural lands followed by water bodies of about 31.5 %. Percentage of built-up area and forest area is about 5.6 % and 31.5 % respectively. Wastelands are about 12.9 % of study area.

1.8.4 Soil Characteristics


The pH of the soil in the study area ranged from 5.84 to 7.41. The electrical conductivity was observed to be in the range of 38.6 µmhos/cm to 124.5 µmhos/cm. The nitrogen values range between 37.6 to 73.8 kg/ha. The phosphorus values range between 52.6 to 132.6 kg/ha. The potassium values range between 253.6 –362.5 kg/ha. The chlorides were found to be in the range of 48.9–108.5 mg/kg of soil.

1.8.5 Water Quality

The baseline water quality status in the region is established by analysing samples at 12 locations consisting of six ground water samples and six surface water samples. The ground and surface water samples were analysed and found that ground water quality is well within the drinking water quality limits.

Surface Water Quality

The pH value was observed to be in the range of 6.7 to 7.68, which are well within the specified standards of 6.5 to 8.5. Electrical conductivity of surface water samples was observed to be in the range of 256 µS/cm to 730 µS/cm. The dissolved oxygen was observed in the range of 5.6 mg/l to 6.2 mg/l. The total hardness was found to be in the range of 71.6 mg/l to 229.3 mg/l. The chloride

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concentration was observed in the range of 29.6 mg/l to 84.2mg/l and the sulphates were found to be in the range of 16.5 mg/l to 58.6 mg/l. Fluoride content was found to be in the range of 0.5 mg/l to 0.7 mg/l. Cyanides and phenolic compounds found to be below detection limits. The total coliform counts are 620-1120 in all the samples against the standard limit of 10 MPN/100 ml.

Ground Water Quality

The pH in range of 6.85 -7.66 which are with the specified standard limits of 6.5 to 8.5. Color and turbidity of the samples ranged from 2-5 Hazens and 1-5 NTU. Electrical conductivity of the samples ranged from 258-1690 μ S/cm. The total hardness of the samples ranged from 79.7 -432.9 mg/l. Calcium and magnesium concentrations ranged from 16.4 -112.6 mg/l and 9.4-36.8 mg/l. The total dissolved solids of the samples ranged from 141.9 -1072.1 mg/l. Range of chlorides and sulphates concentrations at all the locations 34.9-298.6 mg/l and 18.2 -84.6 mg/l respectively. Fluoride concentration ranged from 0.5-0.72 mg/l and is found to be within the permissible limits. Similarly, nitrates are also found to be ranging in between 5.5- 9.2 mg/l. Iron concentrations in ground water varied from 0.07-0.16 mg/l. Zinc levels varied from 0.03 mg/l to 0.08 mg/l respectively. Aluminum concentration in ground water is <0.01 mg/l which are within the limits stipulated. All other metal concentrations are observed to be below detectable limits. The total coliform counts are absent in all the samples against the standard limit of 10 MPN/100 ml.

1.8.6 Noise Levels


The noise monitoring has been conducted for determination of noise levels at fifteen locations in the study area. The daytime noise levels were ranged in between 37.8 dB (A) to 44.6 dB (A). The nighttime noise levels were ranged in between 34.7 dB (A) to 41.5 dB (A).

Noise monitoring results reveal ambient noise levels in all the locations are well within the limits as per CPCB ambient noise standards except at village Jagaldaga at govt school during night time. This higher range can be attributed to mining activities at nearby Sikni coal mine.

1.8.7 Flora and Fauna

The mine lease area or its buffer zone are not ecologically sensitive. Sal is the dominant forest tree. Sisal hemp is cultivated in degraded forest areas. Mahua is the most widely cultivated tree in rural areas. Mango and Ber are the main fruit trees. There were no threatened plant species either in the core area or buffer zone. Sloth Bear (*Melursus ursinus*), Peacock (*Pavo cristatus*), Python (*Python molurus*) and Common monitor (*Varanus bengalensis*) are the four schedule I fauna reported from the forests of the buffer zone. Honeycombs were very abundant in the forest and non-forest including residential areas in the study area which are said to sustain Sloth bears.

There are no eco-sensitive areas such as the Biosphere Reserves, National Parks, Wildlife Sanctuaries, Ramsar Wetlands, Important Bird Areas (IBAs) or Nature

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Heritage sites within 10 km from the project site. There are no Tiger or Elephant corridors within the 10 km radius.

Detailed study of flora and fauna has been conducted by Dr. Shyama Prasad Mukherjee University, Ranchi.

1.9 Anticipated Environmental Impacts and Mitigation Measures

1.9.1 Impact on Soil Quality

The coal mine developmental activities will result in loss of topsoil to some extent. This topsoil requires proper handling like separate stacking so that, it can be used for green belt development. Apart from this, no significant adverse impact on soil in the surrounding area is anticipated during site preparation.

1.9.2 Impact on Topography and Drainage Pattern


The general topography of the block characterizes with rolling terrain with low ridges and depressions. Elevation level of boreholes reveals that the minimum of 423.17 m in borehole no 2 W and maximum of 459.90 m in borehole no 20 E. Around 25% of the block is covered with protected forest located in the western part. Partly the villages like Udayapura, Jagaldagga, Banhardih, and Sabanu are falling within the forest area. Rest of the area within the block is covered with cultivated land and residential hutments.

During mining and allied operations, some changes to the pre-mining land use will happen due to the following activities:

- Removal of topsoil;
- Removal of overburden (OB);
- Dumping of overburden (OB);
- Stockpile of coal;
- Construction of mine infrastructure facilities such as inclines, pit office, haul road etc., within the lease area;
- Formation of garland drain around the mine lease; and
- Subsidence of surface topography of the area.

However, by using scientific way of mining and better management technique, it is possible to reclaim the mined-out land by utilising OB dump and convert it into greenery.

The Bagdagga nala and Rajdaha nalas and their tributaries forms the main drainage system of the sector. The courses of nalas have been developed into cultivated lands and some gully head bandhs have been constructed across the nalas for storage of water for irrigation. A canal passes across the area from north to south at the Centre and parallel to main connecting road passes through Surli, Huchlu and Bari villages. Due to undulating nature of the land, a number of natural ponds have been formed and these ponds are aligned in a definite line indicating a possible presence of fault.

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1.9.3 Impact on Land use

➤ Pre-Mining Land Use

The ML area of Banhardih coal block is 1818.18 ha. Out of this, 31.99% is designated as forest land, tenancy land is 40.69 %, Government/Non- forest land is 27.32 %. Present and post mining land use is given in **Table-6** and **Table-7** respectively.

TABLE-6
PRESENT LAND USE OF MINE BLOCK AREA

Sr.No	Type		Area in ha
	Within ML Area		
1	Tenancy	Agricultural Settlements	739.89
2	Government	Water Bodies/Tanks Roads	496.60
3	Forest & open scrubs		581.61
Sub-Total			1818.10

Source: Pre-Feasibility Report of Project


TABLE-7
PRE-MINING LAND DISTRIBUTION

Pre-Mining Land Use "ha"		
Tenancy	Agricultural	324.45
	Township	0.00
	Grazing	0.00
	Barren	208.33
	Water Bodies	8.00
	Road	0.81
	Community	0.00
	Others	35.78
Govt. Non-Forest	Agricultural	132.70
	Township	0.00
	Grazing	0.00
	Barren	151.40
	Water Bodies	33.44
	Road	27.61
Forest	Reserve	0.00
	Protected	474.25
	CJB	43.70
Free-Hold		0.00
Total		1467.42

Source: Approved Mining Plan of Banhardih

➤ Mining Land Use

The average workable coal seam thickness are found to be 4.23 m (seam R2) to 37.86 m (Seam 1B), however the seam gradients are found to be on much higher

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side upto 45 deg. Considering the geo-mining parameters of the block, it has been planned to deploy Surface Miner as well as to adopt drilling and blasting for coal excavation in this project. There will be no drilling and blasting till 7th year of mining operation.

The proposed mechanised opencast mining of coal mine project mineable area is 1467.42 ha.

➤ *Post Mining Land Use*

After the proposed changes during mining, the changed land uses shall be subjected to reclamation, rehabilitation, during ongoing period and then in post mining period at final mine closure activities. The post-mining land-use at the end of mineralization at a production rate for 12 MTPA capacity of coal production, based on existing surface plan is presented below in **Table-8**.


TABLE- 8
POST MINING LAND USE OF MINE BLOCK AREA

Sr. No	Description	Land Use (Post Closure) (in ha)						Total
		Agricultural Land	Plantation	Water body	Public/Company Uses	Forest Land (Returned)	Undisturbed	
1	Excavation	-	-	-	-	-	-	
2	Backfilled area	74.90	545.35	-	-	106.99	-	727.24
3	Top soil dump	-	12.24	-	-	-	-	12.24
	External Dump/Surface Dump (Temporary)				91.35	349.35		440.70
4	Safety zone	-	7.85	-	-	-	-	7.85
5	Haul roads between quarries	-	9.22	-	-	0.99	-	10.21
6	Road diversion	-	-	-	5.58	-	-	5.58
7	Settling pond	-	-	-	-	0.64	-	0.64
8	Road and infrastructure area	-	-	-	33.24	2.46	-	35.70
9	Garland drains	-	-	-	4.83	2.75	-	7.58
10	Undisturbed /Mining Rights for UG	-	-	-	-	54.77	164.91	219.68
	Grand total	74.90	574.66	0.0	135.00	517.95	164.91	1467.42

Source: Approved Mining Plan of Banhardih

➤ *Mine Closure and Land Reclamation*

Land degradation is one of the major adverse outcomes of mining activities and any effort to control adverse impacts is considered incomplete when appropriate land reclamation strategy is not adopted. This is carried out in two phases:

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1. Physical /technical reclamation; and
2. Biological reclamation.

Physical/Technical Reclamation

During the process, the geometrical shape of the internal dumps is improved to make it amenable to effective biological reclamation and also to provide safety and stability.

Biological Reclamation

For successful biological reclamation of reclaimed area, preference will be given to native species (mango, neem, mahua, gauva, imli, teak, shivan, ghamer, sisham, saal, sirus, bamboo etc.) and mixed culture. The species will be selected from the following groups of quick reclamation.

- Nitrogen fixing tree species for fuel wood, timber and fodder;
- Fruit bearing tree species;
- Tree species with dense foliage for shade; and
- Flowering and ornamental tree species.

Land degradation, technical reclamation & Biological reclamation of mined out land are given in **Table-9 & Table-10**.

TABLE-9
LAND DEGRADATION AND TECHNICAL RECLAMATION OF MINED OUT LAND
(Area in ha)

Stage/ Year		Land Degraded (ha) - Cumulative				Technically Reclaimed Area (ha) - Cumulative			
		Excavation	Dump (Surface+ Topsoil)	Infra/ Others	Total	Backfill	Dump (Surface+ Topsoil)	Others	Total
Y-1	2024-25	142.93	22.62	67.56	233.11	-	-	-	-
Y-3	2026-27	201.61	85.40	67.56	354.57	-	-	-	-
Y-5	2028-29	295.7	164.31	67.56	527.57	-	-	-	-
Y-7	2030-31	361.99	391.53	67.56	821.08	145.95	-	-	145.95
Y-10	2033-34	423.55	452.94	67.56	944.05	201.00	-	-	201.00
Y-15	2038-39	509.04	452.94	67.56	1029.54	320.00	-	-	320.00
Y-20	2043-44	578.47	452.94	67.56	1098.97	390.00	-	-	390.00
Y-25	2048-49	727.24	452.94	67.56	1247.74	458.89	-	-	458.89
Y-30	2053-54	727.24	452.94	67.56	1247.74	598.00	-	-	598.00
Post Closure									
Y-33	2056-57	727.24	452.94	67.56	1247.74	727.24	452.94	67.56	1274.74

Source: Approved Mining Plan of Banhardih


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TABLE-10
STAGE WISE DETAILS OF TENTATIVE BIOLOGICAL RECLAMATION

Stage/ Year	Biologically Reclaimed Area (ha) - Cumulative					Forest Land (Return)		Undisturbed/ To be left for Public/ Community Use	Total	
	Agriculture	Plantation	Water Body	Public/ Company Use	Total	Utilised	Un disturbed			
Y-1	2024-25	-	-	-	-	-	-	-	-	
Y-3	2026-27	-	-	-	-	-	-	-	-	
Y-5	2028-29	-	-	-	-	-	-	-	-	
Y-7	2030-31	-	-	-	-	-	-	-	-	
Y-10	2033-34	-	-	-	-	-	-	-	-	
Y-15	2038-39	-	-	-	-	-	-	-	-	
Y-20	2043-44	-	55.75	-	-	-	-	-	-	
Y-25	2048-49	-	123.89	-	-	-	-	-	-	
Y-30	2053-54	-	239.27	-	-	-	-	-	-	
Post Closure										
Y-33	2056-57	74.90	574.66	0	135.0	784.56	463.18	54.77	164.91	1467.42

Source: Approved Mining Plan of Banhardih

➤ **Blocked Reserves for Safety Barriers**

Safety barrier of 7.5 m width along the block boundary and reserve locked up within the safety barrier has been estimated separately. However, provision of 50 meter safety barrier has been planned all along the surface dumps towards the block boundary.


1.9.4 Waste Handling, Disposal and Management

➤ **Topsoil Management**

The topsoil in the active mining area gets adversely affected. The topsoil is to be separately kept. The soil quality of the surrounding area is also likely to get affected due to siltation and run off from waste dumps. The mine drainage, if it is acidic and containing toxic constituents, not adequately treated when discharged to nearby land would affect the soil quality adversely; when discharged untreated into streams effects the quality of water and make it unfit for agricultural use.

There is also positive impact of mining on agriculture, as sufficient water is discharged from the mine, which can be utilized for irrigation, increasing the productivity. Mine drainage water, in many mines, are not contaminated except high-suspended solids, which can be removed by simple settling.

The process of mining starts from scrapping of topsoil. Average topsoil in the proposed area of excavation found to be around 3.1 m. Top soil will be scrapped and stored in the designated place as shown in the respective stage plans. Topsoil will be utilized in the embankment in the initial years, however, will be spread over the reclaimed area in later phases during the progressive and final closure of the mine.

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➤ *Over Burden Management Plan*

The overburden generated in the initial 5th years will be dumped on the surface in the central part of the Block. Concurrent backfilling will commence from the 6th year of production commencement. Re-handling of the surface dump will commence after final year of the production commencement and proposed to be completed by end of post closure period. The temporary surface dump will be utilized for active dumping till 10th Year of mining operation.

➤ *Mitigation Measures*

The following control measures to prevent soil erosion and wash off of fines from freshly excavated benches and dumps will be adopted:

- Garland drains will be provided around the mine to arrest any soil from the mine area being carried away by the rainwater.
- The bench levels will be provided with water gradient against the general pit slope to decrease the speed of storm water and prevent its uncontrolled descent.
- Special local stone paved chutes and channels will be provided to allow controlled descent of water, especially from external dumps.
- Gullies formed, if any, on side of the benches shall be provided with check dams of local stone or sand filled bags.
- The inactive dump slopes will be planned with bushes, grass, shrubs, and trees to prevent soil erosion after applying topsoil; and
- Retaining walls (with gabion, concrete, or local stone) will be provided to support the benches or any loose material and to arrest sliding of loose debris.
- After exhaustion of the total workable coal reserves, within the lease area, the changed land form will be subjected to post mining reclamation activities, for best possible land uses.

1.9.5 Impact on Air Quality

Opencast mining operations lead to increment of air pollutants and dust (PM₁₀ levels) levels due to mining activity. Major gaseous pollutant levels incremented due to mining activity include NO₂, SO₂ and CO are basically generated from the burning of fossil fuel in mobile and stationary sources. The dust levels are increased due to physical activities mechanization, movement of vehicles, handling of solids and fugitive emissions from storage areas.

Dust as PM₁₀ is the most important air pollutant to be generated in the core area of the mining activity. The coal will be transported from Banhardih to Patraru STPP by rail, which is at distance of approximate 95 km by rail. Hence, the modelling is done only for the trucks moving in the haul roads of inside the coal mine. The incremental concentrations for the proposed coal mine without and with control measures are given in **Table-11** & **Table-12**.


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TABLE-11
PREDICTED 24-HOURLY SHORT-TERM GROUND LEVEL INCREMENTAL CONCENTRATIONS FOR PARTICULATE MATTER-UNCONTROLLED MEASURES

Uncontrolled				
Sr.No	Parameters	Incremental GLC ($\mu\text{g}/\text{m}^3$)	Direction	Distance (km)
1	PM ₁₀	55.2	SE	0.5
2	PM _{2.5}	16.6	SE	0.5

TABLE-12
PREDICTED 24-HOURLY SHORT-TERM GROUND LEVEL INCREMENTAL CONCENTRATIONS FOR PARTICULATE MATTER-CONTROLLED MEASURES

Controlled				
Sr. No	Parameters	Incremental GLC ($\mu\text{g}/\text{m}^3$)	Direction	Distance (km)
1	PM ₁₀	11.0	SE	0.5
2	PM _{2.5}	3.31	SE	0.5

Coal from the CHP will be transported through a surface conveyor to the silos/load out point located at southern boundary of the block, loading into railway wagon through rapid loading system and to be dispatched through the railways. The coal will be transported from Banhardih to Patratu STPP by rail, which is at distance of approximate 95 km by rail.

Mitigation Measures for Impact due to Mining Activity


Mitigation measures suggested for air pollution controls are based on the baseline ambient air quality of the area. From the point of view of maintenance of an acceptable ambient air quality in the region, it is desirable that air quality is monitored on a regular basis to check compliance of standards as prescribed by regulatory authorities. Fugitive dust will be generated in open cast mine due to drilling, blasting, handling of overburden and coal. To control dust from various operations following measures will be restored.

The production of blast fumes containing noxious gases should be reduced by the following methods:

- Proper and proportionate mixing of fuel oil with ammonium nitrate to ensure complete detonation;
- Use of adequate booster/primer; and
- Proper stemming of the blast hole.

➤ Drilling Operations

The following steps will be taken to reduce dust generation due to drilling activities:

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- Dust produced during deep large blast hoe drilling will be controlled by maintaining the drilling speed as recommended by the manufactures.
- All the drills will be equipped with well-designed dust extractor arrangement.
- Wet drilling will be practised & drills fitted with dust control devices will be used.
- Proper maintenance and handling of drilling equipment shall be maintained for good operational efficiency reducing resource utilisation.

➤ *Blasting Operations*

The following practices will be maintained in order to reduce dust generation:

- Recommended design of the geometry of blast holes will be maintained for appropriate results;
- Use of proper amount of explosive taking into consideration the geo-mechanical conditions of the site are maintained and avoid excessive dust generation;
- Controlled blasting will usually be done in daytime during the shift change over period; and
- The operation shall be in conformity with the existing laws with closer control of blasting parameters including results of blasting like desired fragmentation, permitted vibration, etc.

➤ *Loading and Transport*


The following measures will be observed to reduce the increment of dust levels during operation of mine:

- Surfacing of all service roads/permanent roads by asphalt;
- The length of haul road will be reduced to the minimum possible. The permanent haul roads will be boulder pitched and maintained properly;
- The un-metalled roads will be kept free of ruts, potholes, etc;
- Regular maintenance of HEMM engines to limit emission of harmful exhaust fumes;
- Provision of gas filter for exhaust fumes from HEMM.
- Frequent and at regular intervals, water will be sprayed on haul roads, service roads. Mobile water sprinklers will be provided in the project;
- Provision of auto-start, time cycle controlled, fine nozzle mounted fixed sprinklers at siding and haul roads. " Physical removal of dust from the roads;
- Greenbelts around quarry, service building area besides avenue plantation along roads;
- PUC (Pollution under control) will be continuously monitored for trucks carrying coal to the end use plants and will always be environmentally compliant.

➤ *Coal Handling*

The following control measures will be adopted during coal handling:

- Suppression of coal dust during coal handling by fine nozzle mounted fixed sprinklers and covering of belt conveyors.

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- Minimization of the height of coal-fall at transfer points to reduce the dust generation. Improved maintenance of plant and machinery.

Controlling CO Levels

The concentration of CO in the ambient air is found to be below permissible levels at all the air quality monitoring locations. Expected increase in the CO concentration is very low as CO emissions from mining operations are less as compared to other pollutants. Heavy and light vehicles are the major sources of CO in the mine. All vehicles and their exhausts will be well maintained and regularly tested for pollutants concentration.

Controlling NO₂ Levels

NO₂ emissions in the mine mainly occur during blasting operations. The main reasons for NO₂ emissions are:

- Poor quality of explosives having large oxygen imbalance;
- Manufacturing defect;
- Use of expired explosives in which ingredients have disintegrated; and
- Incomplete detonation, which may be due to low Primer to Column ratio.

To ensure low NO₂ levels following control measures will be adopted:


- Use of good quality explosives having proper oxygen balance with regular monitoring;
- Regular updating of the date of manufacture/expiry to avoid confusions. A normal procedure should be formulated to check/visually inspect all explosives, and if disintegrated ingredients are spotted, the explosives won't be used, even if the date has not expired; and
- The primer to column ratio would be rationalized so as to produce minimum NO₂.

1.9.6 Impact on Water Resources

Total requirement of water is estimated as 11.25 MLD for the block (Potable – 2.3 MLD; Industrial – 8.95 MLD).

Water Source: Bore wells/Ground water/Rainfall has been assumed to be the source of potable water requirement. For all industrial usage of water, the treated mine water pumped out from the sumps will be used after treatment of suspended solids.

In usual condition of the mining, this mine will operate in a "Zero Discharge" Scenario. The mine pit accumulated water will be pumped and stored in the central sump for workshop, sprinkling and plantation use. Water discharge may happen only in the rainy season due to sudden inrush of storm water.

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Impact on Ground Water and Surface Water Resources

The likely sources of water pollution from Banhardih along with type of pollutants are as follows:

- Industrial wastewater from workshop: suspended solids, oil & grease.
- Wastewater from mine: suspended solids of coal, clay, and oil.
- Surface run off passing through coal stockpiles: suspended solids; and
- Storm water from lease hold area and built up area: suspended solids.

The impact of mining on both surface water source and ground water resource has been assessed as follows:

A. Surface water sources


- Disruption of natural drainage pattern in the core zone.
- Deterioration of water quality & pollution of water bodies; and
- Siltation and choking of water courses causing scarcity of surface water.

B. Ground water resources

- Affected due to mine workings.
- Affected due to mine water. Consequently, the water table of the peripheral villages/ Bastis may get lowered; and
- Disruption in ground water aquifers.

For complying with the statutory provisions of MoEF&CC and Pollution Control Board, water quality will be monitored and evaluated. Corrective measures will be taken on the basis of monitoring results. The following measures are suggested to control the water pollution:

- Sufficient safeguards during the planning stage to make the project eco-friendly from water pollution control point of view;
- Effluent from workshop will be treated in the effluent treatment plant with zero discharge;
- Sanitary wastewater will be treated mainly for total suspended solids (TSS) and bio-chemical oxygen demand (BOD) in septic tanks and soak pits;
- Drains will be provided around coal stacks to collect run-off water and diverting it into settling ponds before discharging it into natural water courses; and
- Sufficient standby capacity will be provided in the main/ intermediate sumps, so that the suspended solids generated due to mine workings settle down and comparatively cleaner water is discharged to the surface drainage system.

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Water Conservation Measures

The following measures will substantiate the water requirement of the project and enhance ground water recharge to reduce the impact of lowering of water table due to mine dewatering in the vicinity and downstream:

1. Rain water harvesting from infrastructure, dumps and backfilled area;
2. Settling-cum-harvesting ponds;
3. Recharge wells and Water collection sumps in mine pits.

1.9.7 Impact due to Noise and Vibration

Major sources of noises from mining activity are delineated below:


- Drilling operations in the coal seams;
- Blasting in coal & O.B;
- Operation in HEMM like shovels, dumpers, dozers, graders, front end loaders etc.; and
- Operation of equipment in workshop and mining activity etc.

Mitigation Measures

The ambient noise level of the project will be monitored regularly. Noise levels are likely to remain within the limits of the prescribed standard. So, the noise produced from this project will not have auditory, non-auditory, masking effects, etc. as suitable mitigation measures shall be taken in the project.

Controlled blasting technique will be adopted in the project. So, there will be no significant adverse effects on life, property and ambient noise. The following measures will be taken:

- Proper designing of plant & machinery by providing in-built mechanisms like silencers, mufflers and acoustic enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment;
- Routine maintenance of equipment. A rational deployment of noise generating plant and machinery;
- Greenbelt around the quarry, infrastructure sites and service building area besides avenue plantation on both sides of the roads;
- To maintain noise level at nighttime within the limit for the inhabited localities situated at a very close proximity;
- HEMMs with sound proof cabins;
- Personal protective devices to all the persons working in high noise areas; and
- Regular monitoring of noise levels at various points.

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1.9.8 Rainwater Harvesting

Roof top areas in infrastructure area covering approximately 8.93 ha which is proposed during the 1st year itself is found to be feasible for taking up roof top rain water harvesting and use for the project needs other than drinking. Rain water from rooftops is not safe for drinking since many particles and substances like fecal deposits from animals may be found on roof.

1.9.9 Impact on Ecology & Biodiversity

The ecology and biodiversity of the mining area is disturbed due to degradation of vegetation cover, especially due to loss of forest lands. About 463.18 ha biologically reclaimed land will be handed over to the Forest department. Thus, the total biologically reclaimed area will be 1247.74 ha for all considerations.

Flora and Fauna

There is no schedule I or RET species in the mine lease area of 1818.10 ha. But they have been reported from the buffer zone. List of Schedule I species reported from the buffer zone is given in **Table-13**. A detailed Wildlife Conservation Plan is prepared for Schedule-I species.

TABLE-13


LIST OF SCHEDULE I SPECIES REPORTED FROM THE BUFFER ZONE OF THE MINE LEASE. (VU MEANS VULNERABLE AND LC MEANS LEAST CONCERN)

Scientific Name	Common Name	IUCN/WPA
<i>Melursus ursinus</i>	Sloth Bear	VU /I
<i>Pavo cristatus</i>	Peacock	LC/I
<i>Python molurus</i>	Python	NT/I
<i>Varanus bengalensis</i>	Common monitor	LC /I

1.9.10 Impact on Socio-Economic Aspects

The Banhardih coal block project of PVUNL covers villages of Udayapura, Sabano, Jagaldaga, Banhardi, Surli, Rampur, Ete, Barwadih, Tota and Bari. The project will acquire 1818.10 ha acres of land from the ten villages. All households of the ten villages will be affected as either their lands or houses will be acquired for the coal mining project.

The villages in the periphery will also be affected as a result of the project. Some of the villages located in the periphery of the coal mining project have also been taken for study. These villages are Renchi, Darea, Tarhasi, Zalim Khurd, Latdag, Aragunde, Sasang, Serak, Ambatiker and Kaima. For this reason, a detailed socio-economic study and Social Impact Assessment of Project Affected Families has been done by Asian Institute of Sustainable Development, Ranchi and a Rehabilitation Action Plan has been prepared as per Jharkhand R & R Policy 2008 and the Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013.

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The mining project will affect the core villages directly, but will also indirectly affect the villages situated in the peripheral areas. Therefore, the peripheral villages situated in 10 km radius around the project sites, have also been studied.

There are 963 projects affected families (PAF) who will be losing land and home. The compensation package for land loosing families of Banhardih Coal Block Project area has been prepared in consonance with the JRRP, 2008 and RFCTLARR 2013.

The compensation package or the R&R Entitlement Matrix for PAFs of Banhardih coal block project area will be prepared in consonance with the JRRP 2008 and RFCTLARR 2013. The compensation package for PAFs will be worked out as per the provision of JRRP 2008 subject to the current CPI. The CPI of the current year for 963 PAFs will be taken into consideration while calculating compensation packages. Absentee PAFs should also be considered when they come forward for the claim.

1.10 Environmental Monitoring Program

Post project environmental monitoring is important in terms of evaluating the performance of pollution control equipment installed in the project. The sampling and analysis of the environmental attributes will be as per the guidelines of CPCB/ Jharkhand State Pollution Control Board (JSPCB). The frequency of air, noise, surface water and ground water sampling and location of sampling being as per the directives of JSPCB.

1.11 Environmental Cost Benefit Analysis


Economic evaluation for environmental cost benefit analysis is done for 30 years only as life of mine is 30 years. The Environmental Cost: Benefit Ratio (1:B/A) would be about 1:18.00. Thus, the project gives positive benefit/cost ratio. The monetary returns of the project are positive over the environmental losses.

1.12 Risk Assessment and Disaster Management Plan

Mining operations involves dangers/risks like fires, inundation and failure of machinery etc. which need to be investigated, addressed and mitigated. Disaster management plan is formulated with an aim to take necessary precautions to avert disaster and also to take corrective action after the disaster to limit the damage to the minimum.

Mining operations will be carried out with utmost safety but there is always some element of danger or risk involved in it. Mining and its allied activities are associated with several potential hazards to both the employees and the public at large. A worker in a mine should be able to work under conditions which are adequately safe and healthy. At the same time, the environmental conditions should be such as not to impair his working efficiency. This is possible only when there is adequate safety in the mine workings.

An effective Disaster Management Plan (DMP) to mitigate the risks involved will be implemented for the proposed project. This plan defines the responsibilities and

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resources available to respond to the different types of emergencies envisaged. Training exercises will be held to ensure that all personnel are familiar with their responsibilities and that communication links are functioning effectively.

1.13 Project Benefits

The proposed mine will result in improvement of infrastructure as well as overall socio-economic development in the area.


There are 963 project affected families (PAF) who will be losing land and home. The compensation package for land loosing families of Banhardih Coal Block Project area has been prepared in consonance with the JRRP, 2008 and RFCTLARR 2013.

PVUNL is committed to help the population displaced for execution of its projects and has been making efforts to improve the socio-economic status of Project Affected Families (PAFs). In line with its social objectives, the Company has focused on effective Rehabilitation and Resettlement (R&R) of PAFs and also on Community Development (CD) works, in and around its projects.

The Right to Fair Compensation and Transparency in Land Acquisition, Rehabilitation and Resettlement Act, 2013 (RFCT LARR Act, 2013) which is applicable since 01.01.2014. NTPC has revised its R&R Policy to incorporate R&R entitlements as per RFCT LARR Act, 2013 as also retained NTPC's good practices / guidelines on facilities to be extended for Project Affected Families (PAFs).

In addition to this, in line with parent company NTPC's Policy and practices, various Community Development activities in the areas of Health, Drinking Water, Sanitation, Skill Development, Training, Infrastructure etc., will be taken up. Till date PVUN has spent more than Rs. 6.85 crores towards community development nearby its Patratu STPP area. For Banhardih project about Rs. 7 lakhs has been incurred in Community Development. As the project development will start the similar welfare & development activities under Community development/Corporate Environmental Responsibility (CER) will be started.

The basic requirement of the community will be strengthened by extending health care, educational facilities in community, providing drinking water to the villages affected, building/strengthening of existing roads in the area. The preference will be given to the local population for direct and in-direct employment. The proposed project may create opportunities for indirect employment in the field of vehicle hiring, labours, trading of construction material, carpenters etc. This will help in improving the socio-economic status of the region. The photographs of Community development is shown in **Figure-2**.

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Blankets Distributed among PAP




Food Items donated by PVUNL



PVUNL Donated Rs.500000.00 to District Administration Latehar for Procurement of Medical Items for COVID Treatment

FIGURE-2
COMMUNITY DEVELOPMENT (CD) WORKS BY BANHARDIH PROJECT

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1.14 Environment Management Plan

PVUNL will implements effective environment management plan for bringing uniformity in planning, execution and monitoring systems thereby ensuring environmentally sustainable coal mining operations.

The tentative capital cost of EMP would be about Rs. 771.0 Crores. The tentative recurring cost would be about Rs. 5.0 Crores per annum. However, the actual estimated cost will be obtained after preparation of Detailed Project Report (DPR) and detailed engineering. The budget for environmental monitoring for development & operational phases of the proposed project has been estimated approximately Rs.1.0 Crores. An Environmental Management Group (EMG) will work at Banharh coal mining project of PVUNL headed by Senior Manager, EMG and will be assisted by a Manager (EMG). This group will be responsible for the performance of environmental management at the coal mine for the protection of environment and compliance of environmental norms.

Additional Studies

- Detailed study of flora and fauna has been conducted by Dr. Shyama Prasad Mukherjee University, Ranchi. Wildlife Conservation Plan is prepared by M/s. Vimta Labs Ltd, Hyderabad;
- Socio-economic study and social impact Assessment of Project Affected Families (PAF) of Banhardih coal block project was prepared by Asian Institute for sustainable development in February 2019; and
- Area drainage study is being taken up by PVUNL. A detailed hydrogeology study has been carried out by M/s. Vimta Labs Ltd, Hyderabad.

The recommendations of above studies have been incorporated in EMP.

1.15 Conclusions

The proposed opencast coal mine is planned with annual production capacity of 12 MTPA.

The baseline environmental studies have been carried out with respect to meteorological conditions, air quality water quality, soil quality, geology, vegetation pattern, ecology, land use and socio-economic profiles of people.

The baseline values for air, noise, surface water and ground water sampling are found to be within the prescribed limits. The impacts have been assessed for the proposed mining activity and effective mitigation measures will be implemented.

However, development of this project has certain beneficial impact in terms of providing the employment opportunities and improves the socio-economic conditions of the region. Thus, it can be concluded that with the judicious and proper implementation of the pollution control and mitigation measures, the project will be beneficial to the society and to the exchequers of government.