

EXECUTIVE SUMMARY

1. Introduction

Government of India, Ministry of Coal, New Delhi, vide letter No. 13016/54/2008-CA-1, dated 21st November, 2008, has allocated "**Bhaskarpara Coal Block**" (**BCB**), jointly to M/s Electrotherm (India) Ltd and M/s Grasim Industries Ltd for captive for mining of coal for consumption at their respective end use plants.

A joint venture company named "**Bhaskarpara Coal Company Ltd (BCCL)**" has been formed by both allottees as joint venture partners for development of said coal block, mining of coal and dispatching to end use plants of joint venture partners.

Based on CMPDI, RIV, and Bilaspur Geological Report (GR) of 1999, the Mining Plan for proposed **Bhaskarpara Coal Mine (BCM)** has been prepared for 1.00 M. Te. Rated capacity and approval has been accorded by Ministry Of Coal (MoC), Government Of India (GoT), vide letter No. 34011/ (48) 2008-CPAM.

1.1 Location

Bhaskarpara Coal Block is located at Post Badsara, Tehsil Bhaiyathan, District Surguja, Chhattisgarh State in Jhillimili Coalfields under South Eastern Coalfields command area. Bhaskarpara Coal Block constitutes the eastern most member of the Jhillimili Coalfield and total area of the allocated Bhaskarpara Coal Block is 9.2 sq Km. Bhaskarpara Block lies between Latitude 23°20'50" to 23°22'30" N & longitude 82°45'00" to 82°48'50" E in Survey of India Toposheet No. 64-I/15.

1.2 Coal Block Boundaries

The boundaries of coal block are adopted as per details given in GR and approved boundary plan issued by CMPDI.

1.3 Approach to the Lease Area

The Bhaskarpara Coal Block is approachable by black top road from Surajpur and Patna located on the NH 78 (connecting Ambikapur & Shahdol via Surajpur, Patna and Baikunthpur). The Bhaskarpara Coal block is located at a distance of about 14 km from Patna through SH 12 (passing through Bhaskarpara Coal Block) and about 24 Km from Surajpur from proposed mine site. The Shivprasad Nagar Railway Station on Ambikapur-Anuppur Railway line of the SE Railway is the nearest railway station which is located at a distance of about 7 km from the proposed coal mine. The Surajpur railway station is about 11 km on the same railway line.

1.4 Meteorology

The average rainfall is around 1456 mm of which 80% is during the monsoon months July to September. The climate of the region is hot. The highest temperature during May-June observed to be 44.8°C during the day time while in winter the temperature dips to 0.9°C during night.

1.5 Topography

The general elevation of the Bhaskarpara block (Core Zone) varies from 526m to 607 m above mean sea level. The average elevation of the block is around 567 m above MSL. The buffer zone is considered 10 Km from the boundary of the proposed mine. The highest and lowest altitudes of the buffer zone are 424 m and 854 m above MSL. The southern part of the block is mainly plain country comprising of paddy fields. The northern part is however undulating terrain occupied by sandstone ridges.

2. Proposed Mine

The proposed project is coal mining project which will be worked by Opencast and Underground Mining Methods in 920 Ha mine lease area of Bhaskarpara Coal Block. The opencast mine will have 8 quarries and underground mine will have two mines UG Mine 1 and UG Mine 2. The initial 3 year period is being utilized for preparation of reports, statutory clearances, land acquisition and construction. The operation life of mine will be 27 years.

2.1 Exploration

The Bhaskarpara Coal Block was extensively explored through 102 Borehole studies by NCDC, MECL and SECL and GR was prepared by CMPDI, RI V, Bilaspur in 1999.

2.2 Geology

Regional and local geology of has been taken from CMPDI 1999 GR which was purchased from CMPDI. Mining Plan was prepared based on approved CMPDI GR and approved by MoC.

2.2 Coal Reserves

Coal block has been divided into following five sectors between six faults in mine lease area as per approved mining plan for extraction of coal. The Geological, Extractable and Mineable coal reserves have been calculated and are given below

a) Geological Reserves

Seam	Proved		Indicated		Total	
	Area	Reserves	Area	Reserves	Area	Reserves
Seam V	1.47	7.49	-	-	1.47	7.49

Seam IVA	2.32	4.01	-	-	2.32	4.01	14.68
Seam IVB	2.14	3.18	-	-	2.14	3.18	
Seam III	5.98	8.70	0.08	0.07	6.06	8.77	
Seam II (T)	5.71	12.33	0.22	0.52	5.93	12.82	
Seam II (C)	2.40	8.63	0.61	1.98	3.01	10.61	
Total		44.34 (94.52%)		2.57(5.48%)		46.91 (100%)	

b) Geological, Minable & Extractable Reserves

S.No	Sea m	Reserves (MT)					Extractabl e Mineable Reserve (%)
		Geologi cal	Mineable	Extractable			
		>0.5m	OC>0.5m UG>1.5	OC≥0.5 m	UG≥1.5 m	Total	
1.	V	7.49	7.49	6.82	-	6.82	90.00
2.	IVA	4.01	3.86	3.51	-	3.51	90.00
3.	IVB	3.177	3.05	2.77	-	2.77	90.00
4.	III	8.764	3.00	-	1.64	1.64	54.67
5.	II(T)	12.855	9.11	1.35	3.33	4.68	51.37
6.	II(C)	10.609	7.11	4.22	0.42	4.64	65.26
	Total	46.91	33.62	18.67	5.39	24.06	71.56

The coal reserves will be worked and extracted by Underground (UG) and Opencast (OC) mining methods during mine operation life for 27 years as per approved mining plan.

2.3 Mining Methodology

2.3.1 Underground Mining

The UG Mine will have two mine (UG Mine 1 and UG Mine 2) and 5.36 M. Te. Coal reserves will be extracted in 26 years. The Mine 1 will start from 3rd mining year and will work till 26th year for extraction of 4.85 M. Te. Coal reserves where as UG Mine 2 will start from Mining year and will work till 26th year for extraction of 0.54 M. Te. Coal reserves.

Only seam III and seam II (T) which has developed into workable thickness ($\geq 1.5\text{m}$) in part of the area of Bhaskarpara Block will be worked by

underground method. It is proposed to work both seams III & II(T) of this block by Board & Pillar method with introduction of medium technology like loading of coal by low height Load Haul Dumper (L.H.D.'s/ S.D.L.'s) onto Light Duty Chain Conveyor(L.D.C.C.).

Coal from UG face will be loaded on belt conveyor for transportation to pit top for storage in overhead bunkers/coal stock yard and will be loaded in Tipping Trucks(30 Te) for transportation and unloading at railway siding stock yard.

2.3.2 Opencast Mining

The OC Mine will have 8 Quarries (2 quarries in Group A and 6 quarries in group B) and 18.67 M.Te. coal reserves will be extracted in 26 years. Group A will have quarry no Q-NE and Q-NW whereas Group B will have quarries Q-A, Q-B, Q-C, Q-D, Q-E and Q-F. At a time only two quarries (One each from group A and B) will be worked. Initially, Over Burden(OB) will be dumped on surface in OB Dumps D-1 and D-2 located in central and north eastern parts of mine lease area. Later, simultaneous back filling, internal dumping in excavated quarries will be done for land reclamation and plantation for future gainful utilization and improvement of environment and ecology in mining area.

As coal seams are thin & gradient of seams is generally flat, extraction of coal is proposed by using Surface Miner (Wind rowing technique) for overburden removal, Shovel-Dumper mining system is proposed for O.B. removal. In O.B. Bench height is proposed as 10m and bench width is 30m. In cone of coal extraction, bench width of 40m is proposed where as height of bench will be equivalent to seam thickness The calander production programme for mine is tabulated below

Mining Year	Production (MTe)				Remarks
	OC	UG Mine 1	UG Mine 2	Total	
1 st Year	0.07	-	-	0.07	OC production start from Quarry A
2 nd Year	0.20	-	-	0.20	OC production start from Quarry N-E
3 rd Year	0.40	0.09	-	0.49	UG production start
4 th -22 nd Year	0.76	0.24	-	1.00	Target production from Mine
23 rd Year	0.76	0.20	0.04	1.00	

24 th Year	0.76	-	0.24	1.00	
25 th Year	0.76	-	0.24	1.00	
26 th Year	0.76	-	0.02	0.78	UG reserves exhausted
27 th Year	0.52	-	-	0.52	OC reserves exhausted
Total	18.67	4.85	0.54	24.06	

The coal at OC Quarries coal face will be loaded in trucks for transportation to pit top for unloading in receiving pit/ pit top coal stock yard for loading in Tipping Trucks (30 Te) for transportation and unloading at railway siding stock yard.

2.3.3 Coal Dispatch

The coal from railway siding stock yard will be loaded by front end loaders in railway wagons and will be transported to end use plants of coal block allottees ie Electrotherm's Sponge Iron Plant at Kutch, Gujarat and Grasim's Cement Plant at Chittorgarh, Rajasthan.

3. Base Line Environment

The study has been conducted for assessing base line environment in study area of proposed mine which include core zone (mine lease area) and buffer zone (10 km area outside mine lease boundary around the periphery). The baseline environmental qualities have been assessed through field study for various component of Environment viz Air, Noise, Water, Land and Socio-economic during summer 2009 and 2010 in the study area.

3.1 Air Environment

The primary site specific Meteorological data was generated at site by installing microprocessor based automatic weather monitoring station and monitoring was done in summer 2009.

The concentrations of PM10, SO₂ and NO_x were monitored PM10 was collected as 24 hourly average by drawing air at the rate of 1.1 m³/min through glass fibers paper and analyzing by the Gravimetric Method. SO₂ and NO_x were analyzed by calorimetric method. The minimum and maximum concentrations for PM10 were recorded as 24 µg/m³ and 46 µg/m³ respectively. The maximum concentration was recorded at Project Site and the minimum concentration was recorded at Kholpara. The minimum and maximum SO₂ concentrations were recorded as 6 µg/m³ and 9 µg/m³ respectively. The average concentrations were ranged between 7 to 8 µg/m³. The minimum and maximum NO_x concentrations were recorded as 7 and 12

µg/m³. The average concentrations were ranged between 8 to 11 µg/m³. The concentration of CO was found below the detectable limit.

The ambient air quality for all the parameters in core zone and buffer zone were found to be below the standard specified as per MoEF.

3.2 Noise Environment

Noise levels were monitored using sound level meter in the study area for core zone and buffer zone. Noise monitoring locations, two in core zone and six in the buffer zone were selected. It was observed that noise equivalent levels of study area varied in the range 46.40 to 53.00 dB(A) in the day time and 39.00 to 44.60 dB (A) in the night time. These observations indicate that the ambient noise level is within the prescribed standards.

3.3 Water Environment

Based on the water source in the project area eight Ground Water (GW) and three Surface Water (SW) samples were collected and subjected to detailed physico chemical analysis. It was observed that all the parameters were within the permissible limits specified in relevant standards.

The groundwater resources of the entire study area have been estimated based on the norms laid down by Groundwater Estimation Committee (GEC) Govt. of India. It was found that Groundwater Recharge (Rainfall infiltration Method) was 55.85 MCM due to monsoon recharge. It was found that Groundwater Recharge (Water Table Fluctuation Method) was 52.48 MCM due to the ground water recharge. The area comes under safe category and NOC from Central Ground Water Authority has also been obtained.

3.4 Land Environment - Soil

The coal block prominently shows occurrence of Barakar sandstone in the form of bare exposures. The other rock types although reported; are not found exposed. The details of the thickness range of different formations as encountered in the boreholes drilled in Bhaskarpara Block are given below.

Formation	Minimum	Maximum
Soil	0.00/0.20	12.00 (JBSG – 18)
Weathered zone	0.91 (NCBP – 22)	42.98 (NCBP – 58)
Barakar	42.98 (NCBP – 68)	202.99 (NCBP – 71)
Talchir	--	--

The soil quality assessment of the mining lease area has been carried out. Nine locations were identified for soil characteristics. Variation in the pH of the soil in the study area is found to be neutral (6.70 to 7.06), thus conducive for growth of plant. Electrical conductivity, a measure of soluble salts in the soil is in the range of 0.309 to 0.533 mmhos/cm. Organic matter present in soil influences physical chemical properties and is responsible for stability of soil aggregates. Organic matter and nitrogen are found in the range of 0.67 to 2.15% and 106.5 to 124.3 kg/ha respectively.

3.5 Land Use

3.5.1 Pre-mining Land Use Land Use Pattern in Mine Lease Area(Based On Revenue Land Records)

The total ML area of proposed mine is 920 Ha which include private agriculture land, government land and forest land. The part agriculture land of seven villages (Bhaskarpara, Badsara, Danauli, Kuridih, Kewara, Kusmushi and Khandapara) falls within mine lease area. The breakup as per revenue land records is presented below.

3.5.2 Pre-mining Land Use in Study Area(Based on Satellite Imagery)

Land use map was prepared on the basis of the visual interpretation of the satellite data for the year 2009, where the study area spreading over 451.31 km² area (along with the Mining Lease covering 9.2 Km² Land). The land use percentage for the entire study area and ML area as follows)

S. No.	Land Use	Study Area		M.L. Area	
		Area (Km ²)	(%)	Area (Km ²)	(%)
1.	Settlement	25.98	5.75	0.08	0.88

S.No.	Type of Land	Mine Lease Area (Ha)		
		Mining Right	All Right (Mining Right + Surface Right)	Total
1	Government Forest Land			
	a) Protected Forest	29.82	80.05	109.87
	b) Undemarcated Forest	22.10	2.00	24.10
2	c) Revenue Forest	147.37	233.74	381.11
	Government Revenue Land	14.27	31.66	45.93
3	Private Agriculture Land	103.44	255.55	358.99
TOTAL		317.00	603.00	920.00

2.	Mining Area	0.01	0.002	0.00	0.00
3.	Vegetation Cover	130.15	28.84	2.37	25.74
4.	Agriculture Land	257.76	57.12	4.65	50.55
5.	Wasteland	30.38	6.73	2.09	22.72
6.	Water Bodies	7.03	1.55	0.01	0.11
Total		451.31	100.00	9.20	100.00

3.5.3 Mining Land Use during:

a) UG Mining: For underground mining The 317.00 mining right land will be required and will not be required. The subsidence study for UC mining area has been done through Mining Department, Banaras Hindu University, Varansi and as per prediction in the study report, there will not be any impact on ground.

b) OC Mining: The 603.00 Ha all right land will be used for OC quarries, OB Dumps and surface infrastructure for UG and OC mines. The land for quarries will be reclaimed progressively by internal dumping in quarry voids. The plantation will be done in reclaimed areas and OB Dumps progressively for biological rehabilitation. The balance quarry voids in Q-NW and Q-F will be converted water bodies for use of local community.

The land use during mine life is given below

- a) OC Quarries Area = 426.29 Ha, b) OB Dump Area = 72.81 Ha, c) Water Bodies/Nalla = 14.63,
d) Roads Area = 5.27 Ha, e) Infrastructure for UG & OC Mines = 37.38 Ha, f) Unbroken Area for Open Space, Circulation, Areas Between different land uses = 46.49 Ha

3.5.4 Post Mining Land Use

The mining area will protected from environmental degradation and pollution will be mitigated by progressive mine closure during operation life of mine. At the end of mine life, the mining area land and water bodies to be created in balance quarries voids will be converted in to safe, useful and environmentally improved area by implementing final mine closure for gainful future utilization which will start 2 year before end of mine life and will continue for 3 years after end of mine life. The final mine closure plan will be prepared as per guide lines duly approved by MoC.

The breakup of post mining land uses for mining area of 603 Ha are given below

- a) OC Mine Quarries Area = 398.66 Ha, b) OB Dump Area = 72.81 Ha, c) Water Bodies/ Nalla = 42.39 , d) Roads = 8.55 Ha e) Mine Surface Infra Structure for OC and UG Mine = 30.70
 f) Unbroken Area for Open Space, Circulation, Areas Between different land uses = 40.89 Ha

The comparative statement for pre-mining, mining and post mining land use is given in table below

Comparative Statement for Present Land Use, Mining Land Use and Post Mining Land Use

SN o	Pre-mining Land Use		Mining Land Use		Post Mining Land Use	
	Land Use	Area(Ha)	Land Use	Area(Ha)	Land Use	Area(Ha)
1	Private Land	255.55	OC Quarries	145.82	Afforestation	115.82
			OB Dumps	52.07	Afforestation	52.07
					Water Tank	30.00
			Drain & Nallah	5.50	Drain & Nallah	5.50
			Road & Culverts	2.50	Road & Culverts	2.50
			Mine Infrastructure	32.68	Mine Infrastructure	32.68
			Open Circulation & Common Areas	16.98	Open Circulation & Common Areas	14.66
			Sub Total 1	255.55		255.55
2	Government Revenue Land	31.66	OC Quarries	24.35	Afforestation	24.35
			OB Dumps	2.74	Afforestation	2.74
			Drain & Nallah	4.35	Drain & Nallah	4.35
			Road & Culverts	0.22	Road & Culverts	0.22
			Sub Total 2	31.66		31.66
3	Govt. Forest Land					
	a) Protected Forest	80.05	OC Quarries	80.05	Afforestation	80.05
	b) Un-demarcated Forest	2.00	Drain & Nallah	2.00	Drain & Nallah	2.00

	c) Revenue Forest	233.74	OC Quarries	176.20	Afforestation	176.20
			OB Dumps	18.00	Afforestation	18.00
			Drain & Nallah	2.78	Drain & Nallah	2.78
			Roads & Culverts	2.55	Road & Culverts	2.55
			Mine Buildings & Infrastructure	4.70	Mine Buildings & Infrastructure	4.70
			Open Circulation & Common Areas	29.51	Open Circulation & Common Areas	26.23
Sub Total (3)		315.79		315.79		315.79
Grand Total		603.00		603.00		603.00

3.6 Socio-Economic Environment

a) Demographic Pattern : There are 138 villages in the study area which total population of 155524. The core zone and buffer zone demographic pattern are summarized below.

S.No.	Demography	Core Zone	Buffer Zone	Total
1.0	Core Zone			
1.1	Total villages	7	131	138
1.2	Total No. of household	1983	29657	31640
1.3	Population	9612	145912	155524
1.4	Total S.C. population	971	10181	11152
1.5	Total S.T. population	4353	52386	56739
1.5	Literates	4492	72966	77458

b) Basic Amenities : The summary of basic and civic amenities of the core zone and buffer zone are as follows:

- Educational facilities exist in almost all the villages.
- Medical facilities are available in all the villages, primary Health Centres are available only in Odagi.
- Drinking water is available in every village sourced from Tap, Tubewell and Handpump etc.
- Communication services in the form of post office are present in villages except 14 villages; whereas in some villages 2 post offices are existing.
- Phone facilities are available in all the villages.
- There are only 5 Banking facility in the study area.

4. Anticipated Environmental Impact & Mitigation Measures

4.1 Environmental Impact due to Opencast Mining and Mitigation Measures

a) Impact on Topography

- The mining activity will modify the topography significantly by creating a loosely built, relatively flatter surface as compared with the original undisturbed settings. As a result there will be marginal change in the drainage and surface run off. During this activity soil is most susceptible for changes due to erosion, leaching phenomenon/process etc.
- Impact on Buffer Zone topography is anticipated as all the activities will be concentrated within the core zone (lease area)
- Impact on physical/ textural changes of the soil would occur due to mining activities such as drilling, blasting etc. This will enhance rainfall-infiltration rates.

Mitigation Measures

- Appropriate land reclamation measures would be adopted to normalize topography of the Mining area.

b) Impact on Noise

- All mining activities i.e. drilling, blasting, shoveling, dozing and dumping are associated with high noise level [about 100 dB (A)].
- Operation of most HEMMs produces high noise level. The noise levels are in range of 80-100 dB (A). Noise level has been found to be related to engine capacity.
- Shock absorbing pads will be fixed in the foundation of vibrating equipment/machines. In case of aerodynamic noise producing sources, mufflers will be provided with the machines.
- Planting of furrows of trees along the thick foliage around the compound and wall of Coal Handling Process, workshop and other industrial building. This will reduce the spread of noise.

Mitigation Measures

- It has been proposed to provide vibration isolators in the form of vibration absorbing pads
- Placed at the base of vibrating equipment.
- The workers exposed to high noise level are provided with earplugs.
- Provision of enclosed booths at the worksite to protect worker from noisy environment.

b) Impact on Water Environment

- The impact of opencast mining on drainage pattern and the water quality will be significant if proper mitigation measures are not followed strictly.

- The quality of the water bodies will be affected due to the discharge of mine effluent, if not treated.

Mitigation Measures

- Provision of garland drains on periphery to prevent surface runoff from entering into quarry.
- Catch drain around the dumps for avoiding siltation.
- Sedimentation ponds for reducing the pollution of surface water bodies.
- Adequate numbers of vegetation will be planted on the top surface and slopes of the dumps in order to arrest the erosion of soil, which will reduce surface runoff thereby averting siltation of natural water bodies.

c) Impact on Ground Water Resources

- The lease area identified is the dry where 60% of the M.L. area comes under this category. Thus the mining activities in this area will not have any insignificant effect on ground water regime.
- Alteration of ground water balance of the study area will be marginal.
- Impact on Rehar River will be insignificant which 7km away from the mining lease area.
- The mine effluent may contaminate water sources if discharged untreated.

Mitigation Measures

- Water level required to be reduced below the working seam, by pumping water. Thus mine effluent may contaminate water sources if discharge untreated.
- The mine effluent will be discharged through sedimentation tank, for green belt development. The effluent can also be discharged to earthen check dam at suitable locations so that the groundwater gets additional recharge point.

d) Impact on Air Environment

- During the operation phase activities necessary for mining of the coal, its handling and
- Transportation will have impact on ambient air quality. Due to the dust and noxious gases due
- to the movement of vehicles and HEMMs.
- The impact of mining activities on air quality will have harmful effect on human being such as irritation and inflammation of eyes congestion of throat oedema of lungs. Flora and fauna, soil quality and aesthetic value of surroundings environment, if following mitigation measures are not adopted properly.

Mitigation Measures

- Wet drilling will reduce air borne dust.
- To minimise generation of dust during blasting following measures will be taken;
- Adaptation of controlled blasting technique as permitted by DGMS.
- The spraying of the water on loosened overburden and coal before loading operation, in order to reduce dust during transportation activities.
- Dump slope will be stabilized by plantation of grass and trees.
- Enclosure of the crusher house. Installation of dust suppression system in the crusher house (specially above the hopper in such a way that air borne dust is suppressed without adding water to the coal.
- Enclosure of the belt conveyor to reduce the generation of dust due to blowing wind.

e) Impact on Land Environment**Solid Waste Management**

- The solid waste generated due to the opencast mining activities will be from OB and top soil, Sludge from domestic waste. The sludge generated from the domestic source will be used as fertilizer in green belt development. The impact due to the OB management will be insignificant as the OB generated will be backfilled. The detailed OB management is given below;
- The opencastable area will be worked by eight quarries (Q-NW, Q-NE, Q-A, Q-B, Q-C, Q-D, Q-E and Q-F). Sector-wise extraction of coal from different seams (having thickness of 0.50 m or more) will be 18.67, where life of the mine has been taken 27 years as per the approved Mining Plan. The average stripping ratio has been worked out to be 8.56 cum/Ton. This will result in the maximization of internal dump 84.6% of the total OB which will reduce the land requirement for external dump as well as reduction in the quantity of OB to be transported to adjacent quarry. The quantity of the OB will be 159.88 MCM of which 135.28 MCM (84.61 %) will be dumped to internal dumping site and 24.60 MCM (15.38 %) will be dumped to external dumping site.

Mitigation Measures

- Simultaneous dumping of OB in the quarries void and dump D1 and D2.
- The following mitigation measures will be taken for land reclamation;
- Levelling of the backfilled area and carpeting with the topsoil.
- Creation of garland drains in order to arrest the silt load, due to erosion, to enter into natural watercourses during surface run-off.
- Grass, legumes and different types of plants etc. will be planted on such reclaimed land in order to make it, as far as possible, conducive to agricultural growth.

- Technical and biological reclamation of external dump. The density of trees shall be 2000-2500 plants/Ha.
- Regular monitoring of land reclamation will be carried out through analyzing the satellite data.

f) Impact on Ecology

- The mining activities are likely to affect surrounding vegetation which results in the reduction of photo-synthetic activities due to the deposition of dust. The situation will be overcome by spraying of water on vegetation.
- The other major impacts on the terrestrial ecosystems from mining activities and waste storage are the loss of habitat for flora and fauna. The impacts will be however be minimised due to implementation of mitigative majors recommended in EMP.
- Migration of biotic species due to noise, vibrations and lights.

Mitigation Measures

No activity relating to the mining will be extended to the buffer zone except the transportation of Coal. Hence, very little adverse impact on flora/fauna of buffer zone is anticipated.

g) Impact on Socio-economic Environment

- Migration of population from nearby areas for jobs.
- Strain on the existing Infrastructure.

Positive Impact

- Increase in infrastructural resources due to propose mining activities, by way of transport and communication and other basic requirements.
- Faster mining development will improve economy, by way of direct and indirect employment opportunities.
- Improvement in living conditions through better communication, infrastructure, health, education, additional income etc.

Negative Impact

- The landowners will be deprived of their land and the non-landowners who depend upon agriculture will be deprived of their earnings.
- If proper sanitation facilities are not provided during mining activities it may cause unhealthy atmosphere in the area.
- No historical monuments are present in the study area. Hence question of impact on historical monuments.

Mitigation Measures

- The total 7 villages admeasuring 786.03 Ha. Of land have been identified for the proposed mining activities. The project affected households are 1983 with population 9612.
- The detailed R & R plan will be prepared for the project affected people.
- In order to prevent occupational and diseases and health hazards the following mitigation measures:
- Pre-employment, pre-placement and periodic medical examination of employees.
- Use of protective equipments, clothing, helmets, Gas mask, shoes, etc.
- Periodical medical examination of every worker is done once in five years to detect preventable and curable diseases at an early stage.

4.2 Environmental Impact due to Underground Mining and Mitigation Measures

The opencast and underground mining activities are proposed in an area of 603.91 Ha and 316.09 Ha respectively. The coal occurs in the Bhaskarpara coal block in the form of multiple seams at varying depths ranging from 12.12m to 188.75m below ground level. The impact due to the underground mining activities will be restricted in the area of underground mining operations.

a) Impact on Environmental Components

- The coal seams V and IV-Bottom shall be mined out through opencast whereas, the lower seams i.e. III and II-composite shall be worked out by underground mine. Hence, maximum inflow expected to enter the upper opencast working pit. Through leakage and secondary permeability developed as well as recharge from in-crop region in south, groundwater enters into the underground workings.
- The impact on changes in the aquifer geometry, water level in the vicinity of the mine and disturb groundwater flow direction. This may cause fractures and higher permeability zone within the aquifer.
- The impact due to underground mining on ecology is not likely to be disturbed directly and indirectly.

b) Impact due to Subsidence

The impact of subsidence will not have any adverse effect on floristic composition, due to the technology adopted for underground mining. The statutory preventive measures describe by DGMS which will be taken during the operation phase of underground mine to minimise subsidence effect. The control measures to be adopted for controlling the subsidence are as follows:

- Around the depillaring area, co-related on the surface, productive bunds and garland drains shall be laid so that no water from surface enters the subsidence area, and through the cracks to the working area.

- The surface cracks shall be sealed up by using shale, clay or other suitable material.
- Depressed portions shall be leveled up rising soil or clay or other suitable material.
- The subsidence will always be less than 0.25 m and tensile strain less than 2 mm/m. There will not be any crack on the surface. Resulting subsidence contours and surface profile are not being given for this project (as subsidence is insignificant).

Mitigation Measures

- It is proposed to depillar the alternate row of pillar leaving alternate rows of pillars intact (a system of partial extraction). The pillar size will be as per given by coal mines regulations. Subsequently alternate row of pillar will be kept intact. It is being suggested that upto depth of 100 m, the intact pillars should not be reduced in size.
- For conditions where intact pillars are at a depth 100 m or more, the widened galleries should be well supported.

5. Environmental Monitoring Programme

5.1 Environment Management Cell : The Environmental Management Cell (EMC) will be responsible for the following aspects of environmental management:

- Establishment of baseline status of environment in respect of air, water, noise, land and socio-economic environment.
- Analysis of the various parameters as per the guidelines of MoEF in collaboration with government approved laboratory/consultant.
- Implementation of pollution control and environment protective measure.
- To coordinate within the project as well as outside agency in order to ensure timely implementation of EMP and other project activities.
- Ensuring regular periodic medical examinations of mine workers.
- Development and monitoring of afforestation / plantation in mining area.
- Preparation of quarterly environment monitoring report and environment statement and regular to be submitted to MoEF, central/state pollution control board

5.2 Budgetary Provisions

Environmental Management Cell will be under the direct administration control of Project Officer and technical control of Manager (Environment). The qualified and experienced manpower will be deployed for implementation of approved EIA/EMP, Monitoring and corrective actions for mitigation of pollution and protection of Environment. Supportive infrastructure and financial

budgetary provisions has been made in project report under capital head and also will be made on year to year basis under revenue budget.

a) Capital Budget

Item No	Item Particulars	Provision (Rs in Lakhs)	Remark
1	Environment Protection & Pollution Control for Mines	193.00	
2	Environmental Protection and Pollution Control for Township Complex/ Railway Siding Outside Mine Lease Area	148.00	
3	Environmental Monitoring & Field Environment Testing Laboratory	29.00	
Total		370.00	

b) Revenue Budget

Item No	Item Particulars	Provision (Rs in Lakhs)	Remark
1	Pollution Control and Mitigation Measures – Operation and Maintenance of Pollution Control Systems	36.00	
2	Environmental Monitoring and Corrective Actions	12.00	
3	Occupational Health – Periodical Medical Examination	2.00	
4	Development Of Green Belt/ Afforestation	10.00	
5	Land Reclamation and Rehabilitation	25.00	
6	Consultancy For Environmental Planning, Design and Management	5.00	
7	Forest and Wild Life Conservation	10.00	
8	Eco Development for Villages Outside Mine Boundary for improvement of Environment and Welfare of Community	10.00	
Total		110.00	

The total investment on environment improvement works is envisaged as Rs.370.00 lakhs and recurring expenditure during the stage of production is Rs.

110.00 lakhs per year. The capital expenditure and revenue expenditure proposed for environmental protection and pollution control measures will be Rs. 1.53 per tonnes and recurring cost Rs. 11.00 per tonnes of coal produced respectively.

6. Disaster Management Plan

6.1 Open Cast Mine

Disaster management plan has been formulated keeping in view the steps to be taken to avert disaster and to prepare action plan after the disaster which limits the damage to the minimum.

The following problems may be encountered during the mining operations:

- Filling of the mine pit due to excessive rains.
- Slope failures at the mine faces.
- Accident due to blasting.
- Accident due to plying of heavy mining equipment.
- Sabotage in magazine area.
- In order to take care of above hazards/disasters, the followings will be strictly followed:
 - Working of mines as per approved plans.
 - All safety precautions and preventions of CMR, 1957 will be strictly followed during all mining operations.
 - Regular maintenance and testing of all mining equipment as per manufacturer's guidelines.
 - Provision of adequate capacity pumps for pumping out water from the mining pit with standby arrangements.
 - Checking and regular maintenance of garland drainage and earthen bunds.
 - Entry of unauthorized persons will be prohibited.
 - Periodic checking of worthiness of fire fighting and first aid provision in the mining area.
 - Training and refresher courses for all the employees.
 - Cleaning of mining faces regularly.
 - As a part of disaster management plan, a rescue team will be formed by imparting specialized training to the concerned mining staff.

6.2 Underground Mine

- The optimal blast design parameters will be used.
- All necessary precautions will be taken while blasting so that the underground workings of seam below present workings and in close proximity will remain safe.
- Before blasting is done, warning sound will be given so that people can move to safe places.

- Arrangement will be made to alert the people working underground for sudden inrush of
- water by accidental development of fracture connecting the working place to the water bodies/aquifer.
- All statutory safety provisions as stipulated by DGMS, Chief Controller of Explosives and others are being followed.
- Adequate fire fighting arrangement shall be made.
- Mining operation is required to follow statutory mine safety rules administered by the Directorate General of Mine Safety (DGMS), Chief Controller of Explosives and others.
- To create safety awareness and impart education on safe practices, the following steps shall be taken.
- Holding annual safety weeks
- Imparting basic and refresher training to new and old employees respectively.
- First Aid Medical facilities will be provided at work place. Dispensary with qualified doctors in addition to a first aid centre will be provided. These will meet the medical emergencies arising out of accident.

7.0 Social Impact Assessment and Mitigation

- Detailed R & R plan for the project affected people will be prepared.
- Every worker is to be periodically checked up once in every five years keeping proper record of their health profile including X-ray and laboratory tests by establishing and extending pathological facilities. The importance of such periodical medical examination is to detect and prevent occupational diseases like Pneumoconiosis and Tuberculosis. The mining activities expose workers to some injuries and health hazards. Incidence of occupational disease and injuries and health hazards has not been recorded in those health centers / hospitals.
- Regular monitoring of working environment and implementation of safety and control measures, to prevent hazards.
- Use of protective equipments, clothing, helmets, Gas mask, shoes, etc.
- Periodical medical examination of every worker is done once in five years to detect preventable and curable diseases at an early stage.
- Due to mining Industrial and economic activities, the trade, business and service establishment will increase.
- Government revenues like sales tax, royalty, income tax and other statutory levies collection on coal produced from proposed mine to be produce will go up substantially.

8. Environmental Management Plan

8.1 EMP for Opencast Mining

a) Air Environment

- Dust is a measure source of particulate matter in the mines during drilling, blasting, handling of coal and operation of dumper /trucks on the haul road. Heavy machineries should be regularly maintained for optimum operation and minimum dust emission. Monitoring gadgets to monitor the machine health will be provided.
- The exhaust fumes from diesel powered machines shall be controlled by strict adherence to maintenance schedule as per manufacture guidelines.
- All service roads/permanent roads will be surfaced by asphalt.
- Limiting the speed of vehicles to reduce the generation of dust. Regular maintenance of vehicle to limit emission of harmful exhaust fumes.
- At regular intervals, water will be sprayed on coal transportation road, other roads, service roads; Coal faces Coal Bunkers and stockpiles. Water sprinklers have been provided for this activity.
- Greenbelts development around mine, industrial sites, service building area and residential colony besides avenue plantation along roads will be raised to prevent dust pollution.
- Provision of covers on the conveyor belts, unloading/transfer points to prevent access of wind.
- Minimisation of the height of coal fall at transfer points to reduce the dust generation.
- Ambient Air Quality should be monitored regularly.

b) Noise Environment

- Proper designing of plant & machinery added or replaced by providing inbuilt mechanisms like silencers, mufflers and enclosures for noise generating parts and shock absorbing pads at the foundation of vibrating equipment.
- HEMMs with sound proof cabin.
- Chute linings in CHP.
- Silencers as and where necessary.
- Personal protective devices to all the persons who are working in noise environment exceeding 90 dB (A).
- Regular monitoring of noise levels at various points.

c) Blasting Vibration Control Measures

- All provisions of coal mines Regulations are followed.
- Over charging is avoided and quantity of explosive is decided as per conditions imposed by DGMS.
- Blasting is done during the shift charge over period in day time when minimum numbers of persons are present around the blast area and avoided during active hours.
- Before blasting, warning sound is given so that people can move to safe places.
- Blasting team shall be equipped with all the safety equipments.

d) Water Environment

- Management of Surface Water Drainage: Garland drains will be made around the periphery of mine entry. These garland drains will be connected to the local nallas which is not likely to be disturbed by mining operation.
- Mine Water Discharge: The mine effluents will need treatment before reuse. Settled mine water is sent to filter plant from where it is used for domestic & industrial use. Workshop effluents will be reused through oil and grease trap and sedimentation tank.
- Domestic Effluent Treatment: Domestic effluent from the colony will be treated in a conventional septic tank and soak pit. Such treatment system will be constructed for different groups of blocks.
- Water Conservation: The waste water recycling after due treatment for the purpose mentioned above will enable conservation of water. Storage of conserved water in mine pits will be given due emphasis to provide water round the year and quality of water will be maintained before and after storage.

e) Land Environment

- Overburden Generation and Dumping: The life of the OC mine is expected to be 27 years. OB shall be dump simultaneously in the quarries void and in two external dump viz main central dump D 1 and a small dump D 2.(lying in the NE of block between Q-NE & Q-B).
- Land Reclamation Plan: The opencast mining will be dump through 8 no. of quarries having total quarry area at surface = 426.04 Ha. Initially OB from Q-NE and Q-A, Q-C will be disposed in main dump-D1 and dump-D2. The internal dumping will start for Q-NE and Q-A from the last quarter of 5th mining year and 2nd quarter of 3rd mining year respectively. During the process, the geometrical shape of the dumps is altered to make it amenable to effective biological reclamation and also to provide safety and stability.
- The drainage pattern for precipitation run-off will be as follows:
- During working stage, the run-off are collected from internal dump by foot drain for diverting to sump on mine floor for pumping.
- In the post-mining period, the drainage pattern of the reclaimed area will be such that the run-off will be diverted to final void of the quarry.

f) Topsoil Management

- In the opencast mining operation removal of top soil is inevitable as a part of overburden excavation. Hence ample care should be taken for selective mining of top soil which is precious commodity from the environmental point of view.
- Top soil which cannot be used immediately, has to be initially removed separately and stacked properly for its reuse in the reclamation work.
- Top soil should be stabilized by growing grasses till it is used for reclamation work. The species of grasses which will be raised on soil dumps should be such that they not only bind the soil but also contribute towards its enrichment. Fodder grasses or leguminous plants are suitable for this purpose.
- Biological Reclamation : The species are selected carefully from the following groups for quick reclamation:
 - a) Nitrogen fixing tree species for fuel wood, timber and fodder Fruit bearing tree species

Tree species with dense foliage for shade

b) Flowering and ornamental tree species.

c) The heavy material should be soften/made lighter and enriched with nutrients for raising grass/shrubs /trees.

d) The fine materials which contribute to the surface (15-30 cm) of overburden could be

biological reclaimed with a suitable biofertilizer and organic manure and slips of appropriate

grass species to be planted across the slopes in the first year, with the vegetation traps raises

intermittently to check gully erosion.

e) The major drains down the overburden areas shall be bordered with 2-3 rows of trees.

During the second year, overburden dumps should be contour planted with leguminous shrubs and trees species.

g) Programme of Afforestation

- An extensive green belt will be developed to reclaim back filled areas, fugitive dust. The afforestation programme shall include year wise area (Hectare) for plantation and number of saplings to be planted on backfilled area safety zone and vacant area.
- The local plant species will be preferred with economic aesthetic and ecological value.

8.2 EMP for Underground Mining

The major EMP for underground mining will be focused on land subsidence and Hydrogeological aspects.

- Land Subsidence: To ensure that no damage is caused to surface features following management plan will be adopted.
- Around the depillaring area, related to surface, protective bunds and garland drains will be provided, so that no water from surface enters the subsidence area.
- Surface cracks will be sealed by using clay or any other suitable material.
- Development of seams below permanent structures will be as per the guidelines of CMR 1957 for underground mining so that the stability of the same is not endangered and also, the safety of workings and workers below ground are ensured.
- Financial provision has been made for crack filling, digging and levelling of subsidence area from the revenue account at the time of depillaring operation.

8.3 Occupational Safety and Health

The coal mines regulations 2006 by DGMS will be followed strictly. To avoid any adverse effects on the health of workers due to dust, noise and vibration sufficient measures will be taken as follows:

- Provision of rest shelters for mine workers with amenities like drinking water, fans etc.

- All safety measures like use of safety appliances, safety awards, posters, slogans related to safety etc.
- Training of employees for use of safety appliances and first aid.
- Provision of adequate capacity pumps for pumping out water from mining pits particularly during monsoon season.

9.0 Project Benefits

- The physical Infrastructure in an around the proposed mine will improve and strengthened due to development, establishment, operation of the mine and its associated activities. The physical infrastructure will be improved in the respect of following facilities.
 - a) Approach and internal roads network including culverts and cross drainage works.
 - b) Improvement in power and telecommunication facilities.
 - c) Improvement in trade, business, Infrastructure facilities, sources etc.
 - d) Improvement in housing, sanitation, water supply, communication, banking, Post office, education, health, other community infrastructure and other basic facilities etc.
- The Corporate Social Responsibility plan will be prepared on yearly basis which will include Multipurpose Community Hall, Internals roads, Sanitation and Drainage, Health Centre, Open wells, Hand Pumps, Tube Wells and Water Ponds, Playground etc.
- Literacy and Awareness Drive will be given priority by authorities of BPCCL for funding.
- There will be improved employment potential due to creation of direct and indirect employment opportunities for unskilled, semi skilled, skilled and supervisory staff at proposed mining project.

10.0 Project Cost

The capital cost of the proposed Bhaskarpara Coal Mine Project is Rs.175.00 crore and will be implemented as per outsourcing option.