CHAPTER - I

1.1 Introduction:

With the aim to achieve Power for all by the year 2012 and considering the high growth rate of economy, the Govt. of India has envisaged capacity addition of 1,00,000 MW in next 6 years. This translates to almost doubling the existing capacity. Considering the fact that at present there is around 13% overall deficit of power availability with the present installed capacity, there is an immediate need to install power projects to achieve the economic growth projection which has been planned to meet the supply and demand equilibrium.

The project is being set up by M/s. Adhunik Power and Natural Resources Ltd. (APNRL) (formerly known as Adhunik Thermal Energy Ltd.), an Adhunik Group Company. It proposes to set up a 2 x 660 MW Super Thermal Power Plant based on Super Critical Technology near Villages: Sakreli, Dumarpara & Deragarh, Tehsil: Sakti, District: Janjgir-Champa, State: Chhattisgarh. Accordingly, APNRL has signed an MOU with Govt of Chatisgarh and the Chatisgarh State Electricity Board on 01.02.2008 for the same.

1.2 Project Proponent:

Adhunik Group is a potential business house in eastern India in the Steel Sector having a turnover of Rs. 5500 Million in 2004-05. The group is in the business in Steel Sector with interest in both Infrastructure and Power Sectors. Adhunik Group companies are Adhunik Metaliks manufacturing Alloy Steel, Forge Steel, Pig Iron, Sponge Iron (DRI), Coal Washery and Captive Power Plant; Adhunik Ispat Limited manufacturing TMT Bar & Alloy, Carbon Steel Wire Rods & Rounds at Durgapur, Adhunik Corporation Limited manufacturing Sponge Iron (DRI), Adhunik Alloys & Power Limited manufacturing Sponge Iron (DRI), ERW & Galvanised Pipes at Kandra and Adhunik Steels Limited trading in Iron & Steel products and consignment agent of TISCO at Kandra. The group also has captive coal and iron mines in Orissa.

The Group has decided to focus extensively into power generation and become a large power generator in the country. Accordingly, APNRL has signed an MOU with Government of Chhattisgarh and the Chhattisgarh State Electricity Board on 01.02.2008 for the same. It has also applied to the Ministry of Coal for allotment of Captive Coal Block in Raigarh of Chhattisgarh.

1.3 Description of the Site:

The coal based 1320 MW (2 X 660 MW each) Thermal Power Project is proposed to be located around Villages Sakreli, Dumarpara & Deragarh in Tehsil: Sakti, District: Janjgir-Champa, State: Chhattisgarh. These villages are located on the south-side of Korba town at 46 km in the North-West. Raigarh is at a distance of 56 km towards east. The co-ordinates of the proposed site including the ash dyke and water intake pump house is given in the table below:

Table No. 1.1

Locational Details

Power Plant				
Point	**CGNW**	**CGNE**	**CGSW**	**CGSE**
Latitude	22^0 00'41" N	22^0 00'55" N	21^0 59'50" N	21^0 59'47" N
Longitude	82^0 51'28" E	82^0 52'34" E	82^0 50'28" E	82^0 51'28" E
Ash Dyke				
Point	**A1**	**A2**	**A3**	**A4**
Latitude	22^0 00'43" N	22^0 00'48" N	21^0 59'50" N	21^0 59'50" N
Longitude	82^0 51'50" E	82^0 52'53" E	82^o 51'55" E	82^0 52'31s" E
Intake Well				
Latitude	21^0 44'00" N			
Longitude	82^0 47'20" E			

1.4 Details of Proposed Project:

The proposed power plant will be operated on coal as main fuel to generate 1320 MW of power. Pulverized coal fired boilers with super critical technology will be installed in the project. The details of the proposed power project are given in **Table No. 1.1.**

Table No. 1.2
Details of Proposed Power Plant

Sl. No.	Features	Description
1.	Capacity	1320 MW.
2.	Configuration	2 X 660 MW.
3.	Type of boilers	Pulverized Coal Fired.
4.	Power evacuation	Power will be evacuated into PGCIL's grid at 400/765 KV voltage level.
5.	Fuel	Primary Fuel: Coal 6.9 MTPA. Secondary Fuel: • LDO: 3000KL/Annum • LSHS : 12000KL/Annum • From nearest IOCL / HPCL / BPCL Depot.
6.	Source of Coal	Expected coal linkage from Raigarh coal fields block. (at a distance of 65 Km) Coal transportation proposed by rail.
7.	Coal Requirement	6.9 MTPA
8.	Sulphur Content	0.5% Maximum
9.	Ash Content in Coal	39%
10.	Ash Generation:	
	• Bottom Ash	0.53 MTPA
	• Fly Ash	2.15 MTPA
11.	ESP Efficiency	99.9%
12.	Stack	Two Twin Flue Stacks of 275 m height.
13.	Water Requirement	3650 m^3/hr (32.0 MCM/Year)

CHAPTER – II

2.1 Project Description:

The power generating units will be with super-critical technology steam parameters. The primary fuel to be used for the power generation will be coal. It is proposed to construct a railway siding line for transporting coal to plant site.

Steam is generated in the boiler of the Thermal Power Plant using the combustion heat of the fuel (coal) burnt in the combustion chamber. The steam generated is passed through steam turbine where part of its thermal energy is converted in to mechanical energy. This mechanical energy is further used for generating electric power. The steam coming out of steam turbine is condensed in the water cooled condenser and condensate is supplied back to the boiler with the help of the boiler feed pumps and cycle is repeated.

The main steam parameters envisaged for the plant will be around 2225 TPH with super heater outlet temperature of 565±5 Deg C at 247 kg/cm^2(g) steam pressure to generate 660 MW. The steam generating units shall comprise of Boiler drum, water cooled furnace wall system, economizer, superheaters, air heater, ID, FD & PA fans, Milling & firing systems and start up fuel oil system. The Boilers will also be equipped with Electrostatic Precipitator (ESP) of high efficiency above 99.88%.

It is proposed to provide 2x60% capacity FD, ID and PA fans with each boiler. It is proposed to use LDO for start-up and LSHS for low load operation of the Boiler. The Electrostatic Precipitators will be designed for an outlet dust emission of <50 mg/Nm3 under MCR conditions. The Steam Generator would be of forced circulation, super-critical, once through type, single reheat arrangement for firing 100% domestic coal (pulverized firing). The Steam Generator would be of two pass, water tube, radiant super heater, single reheat, balanced draft, semi outdoor type with low NOx burners.

2.1.1 Power Evacuation:

765/400 kV lines are envisaged for evacuation of power. Power evacuation would be finalized after completion of power systems studies by PGCIL.

2.1.2 Fuel Requirement:

Maximum total annual coal consumption for the 2 X 660 MW power plant at 85% PLF will be about 6.9 MTPA. Apart from coal, LSHS/LDO will be used as auxiliary fuel. The estimated annual requirement of LSHS/LDO is about 15,000 KL.

2.1.3 Water Requirement:

The total water requirement of the plant will be 32.0 million cum per annum (3650 m^3/hr). This water shall be drawn from River Mahanadi at about 32kms distance from the project site. Permission to drawl of 32000000 cum/year, from River Mahanadi has been obtained from Government of Chhattisgarh.

2.1.4 Manpower:

The proposed power plant will require skilled and semi-skilled personnel during operation, maintenance and administration of the proposed plant of 2 X 660 MW. People from neighbouring villages, if found suitable, shall be employed during construction and operational phases. The total manpower of power plant during operational period is about 400 persons.

2.1.5 Township:

Township will be constructed for the employees of the power plant. The township will include the residential quarters for all the technical and non-technical personnel, guest house and recreational and facilities.

CHAPTER - III

3.1 Existing Environmental Scenario:

The 10 kms radial distance from the plant boundary has been considered as study area for Environmental Impact Assessment (EIA) baseline studies. Environmental monitoring for various attributes like meteorology, ambient air quality, surface and ground water quality, soil characteristics, noise levels and flora & fauna have been conducted at specified locations and the secondary data collected from various Government and Semi-Government organization.

3.1.1 Meteorology:

On-site monitoring was undertaken for various meteorological variables in order to generate the site-specific data. Data was collected every hour continuously from 1st November 2009 to 31st January 2010. The maximum and minimum temperatures recorded during the study period are 32.0^{0}Cand 9.0^{0}C. The relative humidity found varying from 71% to 39%. The predominant winds are mostly from N (42%) and NW(10%) direction. 25.0mm of rainfall was recorded during study period.

3.2 Ambient Air Quality (AAQ):

Ten numbers of sampling stations were selected depending on wind flow pattern and the monitoring was conducted for a period of three months with the frequency of 2 days per week at each sampling station. The summary of Ambient Air Quality monitored is given in **Table No. 3.1.**

Table No. 3.1

Ambient Air Quality

PM_{10}	$PM_{2.5}$	SO_2	NO_x
32.1 – 62.1	12.8 – 25.0	4.2 – 6.3	10.0 – 12.7

Minimum and maximum concentration expressed in microgram per m^3.

3.3 Water Quality:

To evaluate the physico-chemical characteristics of the water resources existing in the study area, water samples from surface and ground water sources were collected during the winter season. Eight samples from river water sources & ten from ground water sources were analyzed for physical and chemical parameters.

3.3.1 Surface Water Quality:

The pH of the surface water samples varied between 6.8 -7.4 indicating that water is neutral in nature. Dissolve Oxygen varied between 5 - 7mg/l and BOD level varied between 1 - 3 mg/l, TDS varied between 107 – 183mg/l and Chlorides varied between 11 – 17 mg/l. The water samples conform to IS 2296 1982. The water is not harmful for aquatic life.

3.3.2 Ground Water Quality:

The analysis results indicate that the pH ranges in between 6.9 to 7.3, which is well within specified standard of 6.5 to 8.5. The hardness was observed to be raging from 185mg/l to 960 mg/l. Chlorides were found to be in the range of 159mg/l to 190mg/l. Sulphates were found to be in the range of 5mg/l to 15mg/l. The Total Dissolved Solids concentrations (TDS) were found to be ranging in between 288mg/l to 395mg/l. Heavy metals were in very low concentration and were well within the prescribed limits.

3.4 Noise Level:

Ten noise level monitoring locations, expected to represent the different activities prevailing in the area, were selected so as to represent the entire study area.

3.4.1 Day Time Noise Level:

The day time noise levels at all the locations ranged between 42.5 and 48.8 dB (A). The maximum value was recorded at the core zone due to proximity of the railway line. The day time noise levels at all the commercial / Industrial locations and residential locations were observed to be within the prescribed limit of 75 dB (A) and 55 dB (A) respectively.

3.4.2 Night Time Noise Level:

The night time noise levels at all the locations ranged between 37.2 – 43.5 dB (A). The maximum value was recorded at the core zone due to proximity of the railway line. The night time noise levels at all the commercial locations / Industrial and residential locations were observed to be within the prescribed limit of 70 dB (A), and 45 dB (A) respectively.

3.5 Land Environment:

The total study area is about 396.81sq.kms. The land use pattern of the study area by satellite imagery method is summarized in the table below:

Table No. 3.2
Land use pattern of study area (as per census 2001)

Land Cover/ Land use Class	Area in Sq. Km.	% of Total Area
Agricultural Land	207.41	52.27
Barren/Rocky/Stony waste	4.55	1.15
Forest	68.27	17.20
Land with /without Scrub	97.10	24.47
River/ Waterbody	9.06	2.28
Settlement	9.83	2.48
Open Forest	0.59	0.15
Total	**396.81**	**100.00**

3.6 Soil Quality:

A total of ten samples within 10 km radius of the plant site were collected for the assessment of soil quality. The baseline environmental monitoring studies were carried out from 1st November 2009 to 31st January 2010. The sampling was carried out during study period from 11 locations including ash pond. The pH of the soil extracts varied from 6.9 to 7.7 indicating neutral to slightly alkaline character. The electrical conductivity was observed to be in the range of 74µS/cm to 232µS/cm. The Nitrogen values ranged between 175kg/ha to 532kg/ha. The nitrogen content in the study area falls in very less to medium category. The phosphorous values range between 18ka/ha to 42ka/ha, indicating that the phosphorus content in the study area falls in medium to high category. The potassium values range between 135kg/ha to 260kg/ha, which indicate that the soils of all locations have medium level of potassium. The chlorides were found to be in the range of 124mg/kg to 246mg/kg of soil.

3.7 Ecology:

Based on the primary data collected by field visits and based on the secondary data and literature survey there are no endangered, threatened and protected plants and animal species in the study area.

As per the site visit to the place it is found that there is no National Park/Wild Life sanctuary, Tiger Reserve and elephant corridor within 10 Kms radius of the proposed project. As per letter No. 2797, dated 20.05.2010 of DFO Champa, there is no Wild Life Sanctuary; National Park; Elephant Corridor; Tiger Reserve in the study area of 10 Kms. radius surrounding the project site.

3.8 Socio-Economic Condition:

As per 2001cencus the study area consists of 1, 29,221 persons inhabited in the study area of 10 km radial distance from the periphery of the proposed plant. The males and females constitute 64,215 and 65,006 of the study area population respectively. The average household size of the study area is 24, 830 persons. The density of population reveals that the study area has an overall density of 325.64 persons per km^2. In the study area 29,722 of the population belongs to scheduled castes (SC) and 23,224 of the population belong to scheduled Tribes (ST). The study area experiences average literacy rate of 59,285. as per 2001 census records, altogether the main workers works out to be 41,796 of the total population. The marginal workers and non-workers constitute to 20,166 and 67,259 of the total population respectively.

CHAPTER IV

4.1 Anticipated Environmental Impacts and Mitigation Measures:

The environmental impacts during construction and operation phases of the proposed project have been assessed and adequate management plan has been evolved to mitigate the impacts.

4.2 Impacts during Construction Phase:

4.2.1 Air Environment:

4.2.1.1 Impact Assessment:

- During construction phase the source of air pollution is fugitive emissions resulting from civil works and vehicular movements.
- The exhaust from vehicles

4.2.1.2 Mitigation Measures:

- The fugitive emissions are localized and will be controlled by water sprinkling both at site and on roads.
- The vehicles used will be environment compliant and conform to Euro – III Standards. Routine maintenance of the vehicles will be done to avoid emissions beyond permissible limit.

4.2.2 Noise Environ ment:

4.2.2.1 Impact Assessment:

The increase in Noise Level may be due to movement of vehicles and running of various construction equipments.

4.2.2.2 Mitigation Measures:

This impact will be mitigated by regulating the movement of the vehicles, proper maintenance of vehicles and by providing ear muffs/ plugs to the people involved to work near the machines.

4.2.3 Water Environment:

4.2.3.1 Impact Assessment:

- The run-off water from the construction site may contain sediments and oil and grease due to maintenance of vehicles.
- The sanitary wastes from labour colony.

4.2.3.2 Mitigation Measures:

- Sedimentation tank will be made to settle the sediments before discharging waste water for other uses.
- For separation of oil and grease, traps will be provided at suitable locatons.
- The labour colony sanitary waste water will be passed to septic tanks.

4.2.4 Land Environment:

4.2.4.1 Assessment of Impact:

The land identified for the proposed 2 X 660 MW Power Plant is about 1099 acres. About 381 acres of the land will be used for ash disposal. The proposed plant land is partly barren land and partly single crop agriculture land. Proposed plant site does not contain habitation, hence no displacement of residential areas.

Due to the construction activities for various plant facilities, the course of natural drainage may be disturbed / obstructed.

4.2.4.2 Mitigation Measures:

- The earth generated during excavation of water reservoir and ash pond within the project premises will be used for grading the plant area. Hence, no major impact is envisaged on land use pattern of the project site or buffer zone.
- In order to facilitate drainage of the project site storm water drain will be excavated.

4.2.5 Soil:

4.2.5.1 Assessment of Impact:

The construction activities will result in loss of vegetation cover, topsoil and earthen material to some extent in the plant area. Apart from localized construction impacts at the plant site, no adverse impact on soil in the surrounding area is anticipated.

4.2.5.2 Mitigation Measures:

The excavated soil and earthen material will be used for greenbelt development and leveling of project site. Greenbelt will be developed in phased manner from construction stage onwards.

4.3 Operation Phase:

During operation phase there may be substantial impact on air quality due to various emissions and on land environment due to solid waste disposal. As the proposed plant will operate on zero discharge concept there will be very less impact on water environment.

4.3.1 Air Environment:

4.3.1.1 Assessment of Impact:

The result of the modeling study indicates that the maximum incremental PM_{10} Conc. of 2.28585 µg/m^3 will be experienced at distance of 6 Kms South of project site at ground level. Similarly the maximum Incremental Conc. of 7.077µg/m^3SO2 will be experienced at distance of 6 Kms South of project site at ground level. The maximum Incremental Conc. of 4.57792 µg/m^3 NOx will be experienced at distance of 6 Kms Southern of project site at ground level.

With respect to the AAQ sampling locations in the study area, the result of the modeling study indicates that the maximum resultant GLC after the proposed operation of the plant would be 73.15710µg/m^3 with respect to PM_{10}, 11.28404µg/m^3 with respect to the SO_2 and 16.27806µg/m^3 with respect to the NOx. The Resultant GLC predicted at all receptor locations after the proposed expansion are well within the PM_{10}, SO_2 and NOx limit prescribed in NAAQS by MoEF.

4.3.1.2 Mitigation Measures:

The air pollution mitigative measures conceived for the project is summarized below:

- Tall stack of 275 m height as recommended by MoEF conceived for proper dispersion of pollutants through the stack. Low NO_X burner also conceived to restrict NO_X generation.

- High efficiency ESP also conceived for this particular project to restrict PM emission at chimney outlet limited to 50mg/Nm^3 to ensure conformity to the "*Charter of Corporate Responsibility for Environmental Protection* (CREP)" recommendation of the MOEF, Govt. of India.
- Space provision for FGD will also be there.
- Dust extraction and dust suppression system conceived for the suppression of fugitive dust during unloading and handling sections of coal.
- Water spraying also conceived in ash silo area for suppression of fugitive dust in ash silo area.
- A green belt of adequate width is also conceived around the air pollution sources and also along plant boundary to restrict air pollution

4.3.2 Noise Environment:

4.3.2.1 Assessment of Impact:

- During the normal operation of the plant equipments, the ambient noise levels are expected to increase significantly with the attributes of respective equipments, but these noise levels will be restricted to small area close to it.
- The running of pumps, compressors, blowers, DG Sets will increase the noise level of concerned area.
- The blowing of safety relief valves and venting of steam etc. also will increase the noise level.
- Movement of heavy duty vehicles also will increase the noise level.

4.3.2.2 Mitigation Measures:

- Normally the equipments are designed basing on the OSHA (Occupational Safety and Health Administration) Standard and the noise level seldom exceeds the OSHA standard. Therefore, all the equipments in the proposed expansion project will be designed / operated in such a way that the noise level will not exceed 85 dB (A) at a distance of 1 meter from the source of noise, which will also comply the Factory Rules.

- Silencers will be fixed to the relief valve vents to reduce the noise level.
- The rotating equipment will be properly lubricated.
- Noise generating equipments will be installed in suitable sound proof enclosures.
- The control rooms will be acoustically treated.
- Green belt will be developed along the plant boundary with sound attenuating trees.
- People working in noise prone areas will be routinely rotated.

4.3.3 Water Environment:

4.3.3.1 Assessment of Impact:

About 624m^3/hr of waste water will be generated. This will be reused for ash handling system, coal handling and horticulture after proper treatment. The plant will be operated on "Zero Discharge Concept". Hence, there will be no impact on water environment.

4.3.3.2 Mitigation Measures:

- Clariflocculator sludge & Filtration Back wash containing suspended solids (SS) at very high concentration which will be sent to a settling tank. Clear Water will be pumped back to Reservoir.
- De-mineralization (DM) Plant regeneration waste containing acidic and alkaline water after neutralization, will be sent for dust suppression and gardening.
- Oily effluents and oil handling area run-off water containing Oil & Grease will be sent to an oil/grease trap and the oil will be stored in barrels to be sold to authorized oil re-processors.
- Cooling Tower Blow-down (CTBD), which generally contains residual chlorine or other biocide, will be neutralized and after settling used for dust suppression.

- Service water waste from Boiler/TG area containing both Suspended Solids as well as Oil & Grease will be sent to an oil/ grease trap followed by settling. The clear treated water will be used for dust suppression/ gardening / ash moistening.
- Rainfall run-off from coal pile area will be sent to a settling pond. The clear water will be pumped to Raw Water Reservoir.
- The sewage waste water shall be about 9m^3/hr from plant area and township which shall be sent to a Sewage Treatment Plant.
- The storm water in the project area will be collected through storm water drains and collected in the storm water reservoir. The stored storm water will be utilized in the plant operation resulting in conservation of fresh water.
- The bottom and sides of ash pond will be adequately compacted to prevent leaching. The pond will be provided with garland drain to collect the run-off water.

4.3.4 Solid Waste:

4.3.4.1 Assessment of Impact:

The quantity of ash generated from the plant is estimated at about 2.69 million tonnes per annum. This will be the largest source of solid waste.

There will be domestic solid waste generated from the plant which will be predominantly organic and biodegradable in nature. In addition there will be sludge from Sewage Treatment Plant.

4.3.4.2 Mitigation Measures:

- The main solid waste management of this project includes ash management generated due to combustion of coal. Ash generated will be utilized for manufacture of fly ash bricks, cement, as concrete mix and other purposes as per the Notification of Government regarding fly ash utilization. The balance fly ash will be disposed off in ash pond.

  Main features of the solid waste management plan conceived for the project is as follows:

(i) Intermittent wet or dry removal and disposal of bottom ash
(ii) Intermittent dry evacuation of fly ash
(iii) Dry collection of fly ash in Silo
(iv) Disposal of ash slurry through HCSD System to Ash Pond.

- Domestic solid waste being biodegradable in nature will be converted into manure using vermi-composting. It will be roughly 30-40 kg/day.
- The sludge from the sewage treatment plant will be dried, vermin-composted and used as manure for greenbelt maintenance.

4.3.5 Ecology:

4.3.5.1 Assessment of Impact:

- The emission form the stacks of the plant, fugitive emissions, higher levels of noise and illumination of the area may drive the fauna away from the plant site and may affect the flora of the adjoining locality, protected and reserve forests.
- The aquatic ecology may get affected if the effluent water of plant operation mixes with the local natural streams.

4.3.5.2 Mitigation Measures:

- In order to protect the flora and fauna, green belt and shelter belt of adequate width and height will be developed. The trees selected will attenuate noise and air pollution.
- There will be no discharge from the plant as all waste generated will be re-used in the plant after proper treatment. The company will work on “Zero Discharge Concept”.

4.3.6 Socio-economic Condition:

There will be positive impact on the socio-economic condition of the people of the locality. Not only that the Industrial activity will bring in economic changes but also the planned implementation of CSR programmes of the company will change the education level, sanitation of the area etc. In addition to payment of additional royalty, sales tax and excise duty to the government, APNRL shall continue its efforts to

improve the socioeconomic status of the local habitants. It shall review various welfare schemes going on in the area from time to time and take appropriate decisions of modifications/additions of welfare schemes as per requirement of local habitants.

4.3.7 Occupational Health and Safety:

4.3.7.1 Assessment of Impact:

During operation phase, dust causes the main health hazard. Other health hazards are due to gas cutting, welding, noise and high temperature and micro ambient conditions especially near the boiler operating and platforms which may lead to adverse effects (Heat cramps, heat exhaustion and heat stress reaction) leading to local and systemic disorders . Injuries in industries are usually of minor nature like bruise, cuts, and abrasions because of manual handling. However, serious accidents due to common reasons like fall from height and entrapment of limbs in machinery are also possible.

4.3.7.2 Mitigation Measures:

- Adequate arrangements are made for preventing the generation of dust by modifying the chutes at transfer points for reducing the falling height of material, preventing spillage of material by maintaining the handling equipment, isolating the high dust generating areas by enclosing them in appropriate housing and appropriately de-dusting through high efficiency bag filters.
- Due care is taken to maintain continuous water supply in the water spraying system and all efforts would be made to suppress the dust generated by coal handling system by water spraying at appropriate points.
- Almost all material handling systems are automatic i.e. unmanned. The workers engaged in material handling system are provided with personal protective equipment like dust masks, respirators, helmets, face shields, etc.
- All workers engaged in material handling system are regularly examined for lung diseases.
- Any worker found to develop symptoms of dust related diseases is changed over to other jobs in cleaner areas.

CHAPTER - V

5.1 Environnemental Monitoring & Management Programme:

A full fledged Environment Management Cell (EMC) will function for monitoring different environmental parameters regularly. Monitoring of different Environmental Parameters will be done regularly as per the schedule and the activity will be coordinated by the Environmental Management Cell (EMC). Details of the proposed environmental monitoring are described below:

5.2 Environmental Monitoring Methodology:

Table No. 5.1

Environmental Monitoring Methodology

Sl. No.	Section	Location	Monitoring Parameter	Monitoring Frequency
1.	Meteorology	One Location inside the Plant Premises	Wind Speed, Wind Direction, Temperature Humidity, Rainfall.	Hourly, Continuous
2.	Stack Emissions Monitoring	All stacks (apart form on-line monitoring system)	PM, SO_2, NO_X, CO,	Monthly
3.	Ambient Air Quality (outside the plant)	At 3 locations depending on wind direction.	PM_{10}, $PM_{2.5}$, SO_2, NO_x, Hg & O_3	Twice a week
4.	Ambient Air Quality inside the Plant	At 3 locations in 120 degree to each other	PM_{10}, $PM_{2.5}$, SO_2, NO_x, Hg & O_3	Twice a week
5.	Fugitive Emission	At 10m distance away from source of fugitive emission	PM_{10}, $PM_{2.5}$	Fortnightly
4.	Noise Levels	Plant Boundary, Equipment & Work Place.	Average Leq values and Maximum value of Sound Pressure Level in dB (A)	Monthly (for day & night time)
6.	Solid Waste	All solid wastes generated from process.	As prescribed by SPCB.	Yearly
7.	Work Environment	At all places where there is presence of workers all the time	1. Respirable Dust. 2. Inhaled dust.	Monthly
8.	Surface & Ground water Quality around the plant	Observations wells near solid waste dump yard and nearby villages	As prescribed by SPCB.	Six monthly

9.	Ground water Quality inside the plant	Source of raw water.	As prescribed by SPCB	Once a month.
10.	Effluent water Quality inside the Plant	Plant process	As prescribed by SPCB	Once a month.
11.	Ecology	Surrounding villages	Soil flora, fauna, crop yield	Yearly

5.3 Budgetary Provision:

Table No. 5.2

Budgetary Provision

A. SETTING UP THE ENVIRONMENTAL LABORATORY:			
Sl. No.	**Heads of Expenditure.**	**Estimated Expenditure (Rs. in lakhs)**	**Total Expenditure For Setting Up Laboratory (Rs. in Lakhs)**
1.	Instrument / equipment.	365	400
2.	Infrastructural facilities and Consumables.	35	
Total Capital Cost		**400**	
3.	Recurring Cost for consumables per Annum.	20	
B. MANPOWER :			
Sl. No.	**Designations**	**No. of Manpower**	**Recurring Expenditure per Annum (Rs. in Lakhs)**
1.	General Manager (Environment)	01	50.0
2.	Manager Environment	02	
3.	Environmental Scientist	04	
4.	Scientific Assistant	04	
5.	Laboratory Assistant	04	
6.	Field/Laboratory Attendant	08	
Total Manpower Required		**23**	

TOTAL BUDGET: Capital Investment: Rs. 400 Lakhs
Recurring Expenses: 70.0 Lakhs (20.0 + 50.0)

CHAPTER - VI

6.1 Additional Studies - Risk Assessment & Disaster Management Plan

The plant handles a number of materials like Coal dust, LDO and LSHS which are hazardous /toxic in nature. Certain process intermediates may also be hazardous/toxic/hot. Electric power and supply may also cause accidents. Hence, risk assessment shall be done and disaster management plan will be developed.

6.2 Disaster Management Plan:

To tackle the consequences of a major emergency inside the plant or in the immediate vicinity of the plant, a Disaster Management Plan has to be formulated. The Disaster Management Plan is aimed to ensure safety of life, protection of environment, protection of installation, restoration of production and salvage operations in this same order of priorities. For effective implementation of the Disaster Management Plan, it should be widely circulated and personnel trained through rehearsals/drills.

The objective of the Industrial Disaster Management Plan is to make use of the combined resources of the plant and the outside services to achieve the following;

- Combat the eventuality.
- Optimize operational efficiency to rescue.
- Rehabilitate and render medical help and to restore normalcy.

The Disaster Management Plan makes specific mention of emergency command structure, silent hour command structure and clearly states the actions each member of the structure should take in case of an emergency. The company will develop such emergency command structures consisting of its own staff, rehearse the combat procedure for suitable implementation at emergency.

CHAPTER VII

7.1 Project Benefit

When the expansion project becomes operational, 400 nos. of persons will find employment. Number of skilled and unskilled workers from the locality will be engaged. Infrastructural facilities like communication, education and transportation will increase. The additional power generated due to operation of the TPP will augment the power requirement of the region and the country at large. Good number of ancillary facilities also will develop in the nearby area which will generate direct and indirect employment. Overall economy of the area will improve.

CHAPTER - VIII

8.1 Environ ment Management Plan (EMP):

8.2 Environmental Management Cell (EMC):

For administering the environment aspects, an EMC will be formed. The Cell will be headed by a General Manager and have 23 members in a team including an Environmental Manager. This team will be responsible for all environment management activities including environmental monitoring, developing greenbelt, ensuring good housekeeping, ensuring statutory compliance as well as creating environmentally aware work forces for proposed steel plant. To evaluate the effectiveness of environmental management program, regular monitoring of the important environmental parameters will be taken up. The schedule, duration and parameters will be as per the consent conditions of No Objection Certificate issued by the State Pollution Control Board for 100% compliance.

8.3 Laboratory Facilities:

A well equipped laboratory will be set up for analyzing Air, Water, Effluents, Solid wastes, Raw materials and other process intermediates.

8.4 Environmental Management Plan (EMP) - Monitoring Aspects

Air Environment -

- A meteorological station will be set up at a suitable location to monitor wind speed, wind direction, temperature and relative humidity on continuous basis.
- The Ambient Air Quality, Stack Emissions and Fugitive Emissions will be monitored and analyzed for PM_{10}, $PM_{2.5}$, SO_2, NOx, CO & CO_2 in a schedule manner as per directives of State Pollution Control Board and corrective measures shall be taken.

- On-line Stack Monitoring facility will be provided for continuous monitoring of exhaust gases.
- The efficiency of all pollution control devices like ESPs and bag filters will be checked and their operability will be ensured on day to day basis.

Water Environment -

- Zero discharge of effluents will be ensured.
- The drainage system will be checked regularly and clogging, accumulation of sludge and sediments will be removed.
- Performance of Oil & Grease traps, settling ponds, neutralization pits and ETPs will be examined on day to day basis.
- Quality of Raw water, Drinking water and Waste water will be monitored at least twice in a month.
- The Ground water monitoring will be done at least every 3 months in locations around the Plant.

Noise Environment -

- The Noise levels inside the plant will be monitored in noise prone areas both in day and night time.
- Noise Protective Appliance like Ear Muffs, Ear Plugs will be issued to workmen in noise prone areas and it will be ensured that, they use the same.
- Performance of silencers provided at various vent points will be periodically examined and corrective action taken.

Solid Waste -

- Quantity and Characteristics of Solid Wastes will be regularly analyzed and their disposal will be monitored.
- It will be ensured that, Fly Ash is used in company's own cement plant/fly ash brick plant or sold to cement and fly ash brick manufactures.

8.5 Environmental Audit:

Quarterly Environmental Audit will be carried out to check for compliance with standards. This will be carried out by in-house experts. Third Party Environmental Audits will be carried out once in every year.

The directives from the Statutory Authorities and prevailing regulations will govern the periodicity of monitoring.

The action plan of EMP will be updated every year with respect to the results achieved and to plan activities for the next year.

8.6 Green Belt:

The EMC will monitor the plantation and maintenance of the proposed green belt and also look after the aesthetic of the Proposed Plant.

8.7 Training of Man Power:

Training will be imparted for safe operation and maintenance of the Plant. Safe operating and Safe Maintenance manuals will be issued to concerned personnel.

8.8 Occupational Health:

To ensure proper health of the working personnel, regular health checkup will be carried out as per provision of Factories Act. Proper house keeping of the shop floors will be maintained. Fire fighting equipment and other safety appliances will be tested regularly to ensure full serviceability. Training of employees for use of safety appliances and First Aid will be imparted. Separate Wing with adequate knowledge of industrial hygiene will constantly check for any occupational disease.

CHAPTER - IX

9.1 Conclusion:

In view of the above it can be concluded that, the proposed project is in line with the principles of sustainable development. Due to the project there will be appreciable improvement in social as well as economical status of the area. The mitigation measures those will be adopted will restrict the adverse impacts well within the tolerable limit. Hence, it is logical that the above project should come up at the earliest along with implementation of the mitigation measures.

ABBREVIATIONS

TPM	Total Productivity Management.	PM_{10}	Particulate Matter-10.
ISO	International Organization for Standardization.	$PM_{2.5}$	Particulate Matter-2.5.
TPP	Thermal Power Plan	SO_2	Sulphur Dioxide.
MoEF	Ministry of Environment and Forest.	NOx	Nitrogen Oxides.
CPCB	Central Pollution Control Board.	CO	Carbon Monoxide.
CGWB	Central Ground Water Board.	AQI	Air Quality Index.
Nm^3	Normal Cubic Meter.	Hg.	Mercury
TPH	Ton Per Hour.	NTU	Nephelo Turbidity Units.
TPD	Ton Per Day.	BOD	Biochemical Oxygen Demand.
DM	De-mineralization.	COD	Chemical Oxygen Demand.
CHS	Coal Handling System.	DO	Dissolved Oxygen.
AAQ	Ambient Air Quality.	ND	Not Detectable.
PM	Particulate Matter.	DFO	Divisional Forest Office.
mg	Milligram.	COC	Cycles of Concentration.
µg	Microgram.	dB(A)	Decibel in 'A' Scale.
ESP	Electro Static Precipitator.	EIA	Environmental Impact Assessment.
MW	Mega Watt.	EMP	Environmental Management Plan.
ETP	Effluent Treatment Plant.	CREP	Corporate Responsibility for Environmental Protection.
MSL	Mean Sea Level.	EMS	Environmental Management System.
NH	National Highway.	IMD	India Meteorological Department.
LDO	Light Diesel Oil	LSHS	Low Sulphur Heavy Stock.
N	North	MCM	Million Cubic Meter
E	East.	BDL	Below Detectable Limit
^0C	Degree Centigrade.	GLC	General Level Concentration
S	South.	CHP	Coal Handling Plant
ID	Included Draft	SW	South-west.
FD	Forced Draft	EMC	Environment Management Cell