



CHAPTER – 10

ENVIRONMENTAL MANAGEMENT PLAN

10.0 INTRODUCTION

The major objective and benefit of utilizing Environmental Impact Assessment in project planning stage itself, is to prevent avoidable losses of environmental resources and values as a result of Environmental Management. Environmental Management includes protection / mitigation / enhancement measures as well as suggesting post project monitoring programme. Environmental management may suggest revision of project site or operation to avoid adverse impacts or more often additional project operations may have to be incorporated in the conventional operation.

The industrial development in the study area needs to be intertwined with judicious utilization of non-renewable resources of the study area and within the limits of permissible assimilative capacity. The assimilative capacity of the study area is the maximum amount of pollution load that can be discharged in the environment without affecting the designated use and is governed by dilution, dispersion, and removal due to physio-chemical and biological processes. The Environment Management Plant (EMP) is required to ensure sustainable development in the study area of the proposed plant site, hence it needs to be an all encompassing plan for which the proposed industry, Government, Regulating agencies like Pollution Control Board working in the region and more importantly the affected population of the study area need to extend their cooperation and contribution.

It has been evaluated that the study area has not been affected adversely and is likely to get new economical fillip.

The affected environmental attributes in the region are air quality, water quality, soil, land use, ecology and public health.

The Management Action Plan aims at controlling pollution at the source level to the possible extent with the available and affordable technology followed by treatment measures before they are discharged.



Environmental Management aims at the preservation of ecosystem by considering the pollution abatement facilities at the plant inception. In the upcoming modern Power plants, pollution abatement has become an integral part of planning and design along with Techno economic factors.

10.1 MANAGEMENT DURING CONSTRUCTION PHASE

Environmental pollution is inevitable during the construction phase. The project proponent should take appropriate steps to control pollution during construction phase. The following are the factors requiring control during construction phase.

10.1.1 SITE PREPARATION

At the time of construction there will be generation of soil and debris and produce unstable material. The disturbed slopes shall be well stabilized before the onset of the monsoon. The leveling operation will also involve piling up of backfill materials. Use of dust suppressant spraying to minimize fugitive dust during construction activities is recommended.

10.1.2 WATER SUPPLY AND SANITATION

The workers at the plant during construction shall be provided with water for their requirement and for the construction activities. The construction labour will be provided with sufficient and suitable toilet facilities to allow proper standards of hygiene. These facilities would preferably be connected to a septic tank and shall be maintained properly to have least environmental impact.

10.1.3 FUEL & REST ROOMS FACILITY

Fuel will be supplied to construction labour for cooking during construction period. This will prevent usage of fire wood for cooking. Rest rooms will be provided to construction labour during construction period and operational stage.

10.1.4 NOISE

Noise pollution is anticipated during the construction phase due to the usage of various construction equipment such as mechanical vibrator, mixers etc. The noise effect on the nearest inhabitations due to construction activity will be negligible. However, it is advisable



that onsite workers working near the noise generating equipment shall be provided with noise protection devices like earplugs.

10.1.5 MAINTENANCE OF VEHICLES

One should be very careful in selecting the site for vehicle maintenance, so as to prevent the ground water contamination due to the spillage of oil. Both diesel and petrol engine vehicles shall be maintained properly. Unauthorized dumping of waste oil should be prohibited. Wastes should be disposed off to the APPCB approved vendors.

10.1.6 WASTE

The solid waste shall be collected and disposed off as per norms.

10.1.7 STORAGE OF HAZARDOUS MATERIAL

The following hazardous materials need to be stored at the site during construction.

- a. Gas for welding purpose
- b. LDO
- c. Painting materials

All these materials would be stored as per international safety standards.

10.1.8 LAND ENVIRONMENT

The proposed project will not create any major impact on land environment. As soon as the construction activity is over the surplus earth will be utilized to fill up low lying areas, the rubbish will be cleared and all in built surfaces will be reinstated. Appropriate vegetation will be planned and all such areas shall be landscaped. 14.0 Acres of thick greenbelt will be developed within the premises.

10.2 POST CONSTRUCTION PHASE

10.2.1 AIR EMISSION MANAGEMENT

The boilers proposed in the plant are CFBC boilers. The efficiency of these boilers is higher than the AFBC boilers due to recycling of unburnt carbon particles in the exhaust flue gases into the boiler from the cyclones. The combustion temperature is around 850 deg C. This prevents the formation of Thermal NOx. Hence it is an environmentally better technology for power generation.



The main sources of particulate emissions are crushing operations of coal and their transfer points. A separate de dusting system will be provided to control the dust from crushing operations and various material transfer points by means of suitable ducting connected to an Induced Draught fan. Material unloading areas will be provided with dust suppression system. The dust that is drawn from various dust emanating points such as crusher, fuel transfer points, etc will pass through dust extraction system with bag filters.

The emissions of concern due to the proposed power plant are Particulate Matter (PM), Sulphur dioxide, Oxides of Nitrogen and Fugitive dust. One stack of 75 m for 36 MW plant unit will be provided for effective dispersion of SO₂ emissions into the atmosphere.

- Electro Static Precipitators (ESP) will be provided to bring down the Particulate emission in the exhaust gas to less than 50 mg/Nm³.
- Interlocking will be provided to ESP in such a way that whenever tripping of any ESP field or all fields with reduction in boiler load or boiler trip depending on ESP outage. The interlocking system will be based on PLC system. Consequently there will be no power generation in that unit till the emission control system is rectified.
- A flue gas velocity of 22 m/s will be maintained for effective dispersion of emissions.
- Low NO_x burners will be provided to restrict the NO_x emission to less than 500 mg/Nm³.
- All the conveyors will be covered with GI sheets to prevent the fugitive dust emission into the atmosphere.
- Adequate dust suppression system like fog type and water spray system will be installed in the material unloading areas.
- Extensive greenbelt will be taken up all around the plant area to further reduce the emissions.
- All the internal roads will be asphalted to reduce the fugitive dust emission due to the vehicular movement.
- Water spraying will be done frequently at coal stock yard to control the fugitive dust.
- Dust extraction system with bag filters will be provided at material transfer points and junction towers.
- The net resultant Ground Level Concentrations (baseline concentration + max. predicted incremental rise in Concentration) of PM, SO₂ and NO_x during the



operation of the power plant are within the National Ambient Air Quality Standards. Hence there will not be any impact on the air environment due to the proposed power plant.

- All the CREP recommendations will be implemented.

Stack attached to	Control Equipment	Stack Height (m)	No. of stack	Particulate emission at the outlet of Stack
160 TPH Boiler	ESP	75	1	<50 mg / Nm ³

Good Housekeeping: Good housekeeping practices will be maintained in all sections of the plant.

10.2.1.1 DUST SUPPRESSION SYSTEM

Water sprinklers will be provided at the unloading areas of the raw materials for dust suppression. Dust suppression system with plain water - comprising piping network, valves pumps, instrumentation & control, water tank etc. will be provided.

10.2.1.2 INTERNAL ROADS

Internal roads will be asphalted to prevent the fugitive dust emission due to vehicular movement.

10.2.1.3 COMPLIANCE ON CREP RECOMMENDATIONS

All the CREP recommendations for the new Thermal power plants will be implemented & followed strictly. The following will be the compliance of CREP recommendations.

S.No.	CREP recommendation	Compliance
1.	New / expansion power projects to be accorded environmental clearance on or after 1.4.1.2003 shall meet the limit of 100 mg/Nm ³ for particulate matter.	Particulate emission from the Plant will be below 50 mg/Nm ³
2.	New plants shall adopt dry fly ash extraction or dry disposal system or Medium (35-40%) ash concentration slurry disposal system or Lean phase with hundred percent ash water re-circulation system depending upon site specific environmental situation.	-Dense Phase System for Fly ash with Ash Silo and will be given to the nearby brick manufacturers / cement plants Bed Ash will also be handled by Dense Phase System and will be independently stored, crushed and will be given to the nearby brick manufacturers / cement plants



3.	Install opacity meters / continuous monitoring system.	Online stack monitor will be provided to the stack to monitor PM continuously
4.	New plants shall promote adoption of clean coal and clean power generation technologies	CFBC boiler is proposed which will emit lesser SO ₂ and NO _x emissions

Recommendations

- a) The proposed air pollution control equipment will be installed prior to commissioning the proposed plant.
- b) Pressure drop measure system will be installed to measure the pressure drop across the bag filters.
- c) All the internal roads shall be asphalted to reduce the fugitive dust due to truck movement.
- d) Online stack monitor will be provided to the stack to monitor PM continuously

10.2.2 WASTEWATER MANAGEMENT

The Net wastewater generated from the proposed Power Project will be 287 cum/day. . This includes Cooling tower Blowdown, Boiler Blowdown, RO rejects, Clarifier Blowdown & Sanitary waste water from the proposed power plant.

Effluent Treatment Plant

Boiler Blowdown & RO rejects will be treated in neutralization tank. Boiler Blowdown, RO rejects effluents after neutralization will be mixed with Cooling Tower Blow-down in a Central Monitoring Basin (CMB). After ensuring compliance with APPCB standards for onland for irrigation the treated effluent will be utilized for Dust suppression, Ash conditioning, for greenbelt development.

The following will be the treated effluent characteristics.

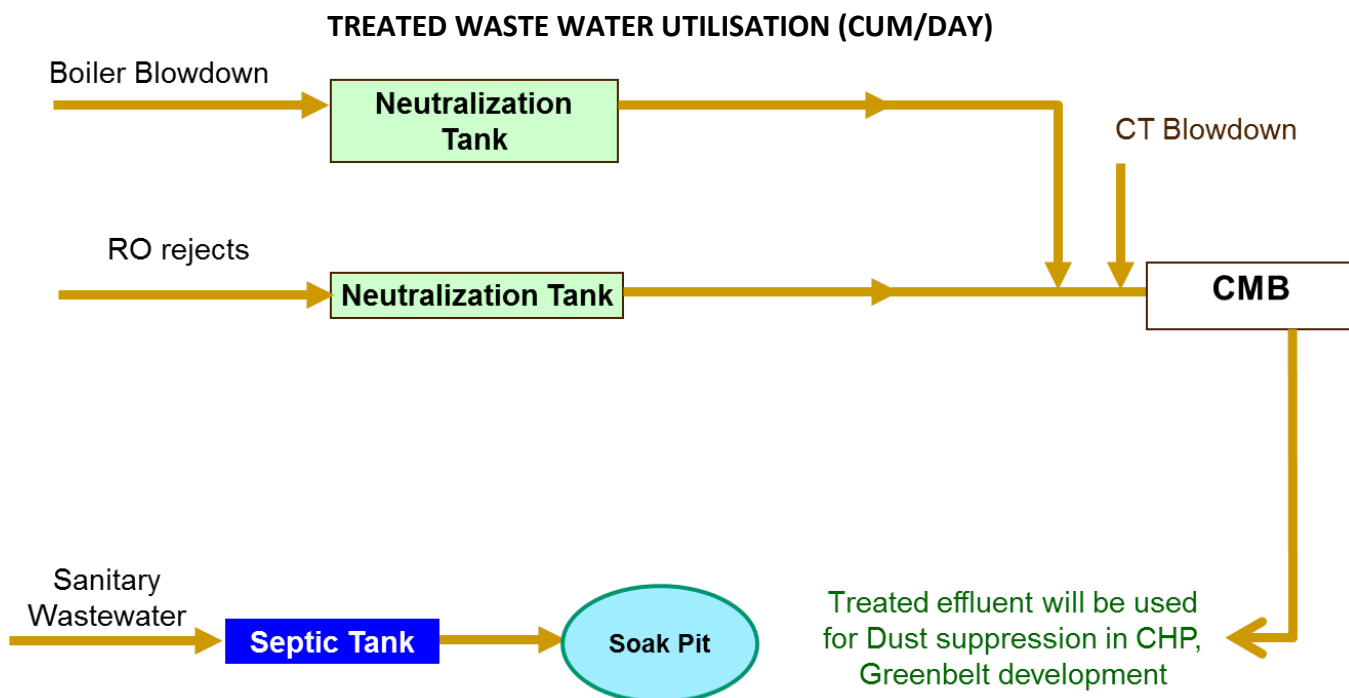
The following will be treated combined effluent characteristics.

pH	6.5 to 8.5
Free available chlorine	< 1.0 mg/l
Copper	< 1.0 mg/l
Zinc	< 1.0 mg/l
Chromium	< 0.2 mg/l
Iron	< 1.0 mg/l
Phosphorus	< 5.0 mg/l



The entire ETP will be operated efficiently to ensure that the quality of effluent at the Central Monitoring Basin confirms to the standards laid down by (APPCB). Totally zero discharge will be implemented in the proposed power plant.

Sanitary waste water which will be treated in septic tank followed by soak pit.



Net waste water generation (excluding sanitary waste): 271 cum/day. The following is the waste water utilization for various purposes.

- Effluent utilization for Ash conditioning : 50 cum/day
- Effluent utilization in dust suppression in CHP : 81 cum/day
- Effluent utilization for greenbelt development : 140 cum/day

Hence there will be no discharge of effluent outside the premises. Hence there will not be any adverse impact on water environment due to the proposed power plant.

10.2.3 ASH GENERATION & DISPOSAL

The ash generation from the proposed project and utilization will be as following:

Ash from	QUANTITY (TPD)	METHOD OF DISPOSAL
Imported coal (100 %)	52	The ash generated in the power plant will be utilized/disposed in accordance with the provisions of the ash utilization Notification issued by the Ministry of Environment & Forests, New Delhi and it's amendments.



The ash generation from the proposed project will be as following.

ASH HANDLING AND DISPOSAL SYSTEM

The major solid waste from this proposed coal based power plant will be fly ash & bottom ash. The daily coal requirement of the plant is 654 TPD. The maximum ash content in the coal is 8%, and the ash generated per day is 52 TPD. The ash handling/ disposal system will be designed to meet the above ash generation.

The ash handling will be designed and constructed for dust free operation. Ash handling will be fully automated.

Bottom Ash Handling

Bottom ash from the boiler is collected in the double ' V' water impounded hopper lined with refractory. The capacity of the hopper will be suitable for holding 8 hours collection of bottom ash. Hot bottom ash is quenched in the hopper. The bottom ash will be collected for 8 hours and cleared in 1.5 hour. Bed Ash will also be handled by Dense Phase System and will be independently stored, crushed and will be given to the nearby Cement plants / Brick manufacturers.

Fly Ash Handling

Fly ash will be separated from the flue gas and would be collected in ESP hoppers, APH, Economizer hoppers and chimney hopper. A pneumatic pressure conveying system is envisaged for each unit. The system will be provided with heaters, fluidizing air blowers, conveying air blowers/compressors, feed vessels, etc. for extraction of fly ash from hoppers and conveyance through pipeline. The pressurized conveying system will deliver the fly ash to intermediate surge hopper of 12 hours capacity located near ESP.

There will be alternate outlet from ash hoppers with ash wetting / hydro-sludging system and with high pressure water connected from the ash water pump house to convert the dry ash into slurry form and convey to the ash slurry sump. The water requirement for the plant would be made available from the wastewater from CMB. There will be two intermediate silos to hold 12 hrs of ash generation in total. From the intermediate silos the ash will be conveyed to the main ash silos. There will be two main silos each having a capacity to hold



16 hrs ash generation. The secondary conveying system will be a dense phase conveying system to convey ash from intermediate silo to final silos.

Intermediate Silos

The intermediate silos will be located nearby the units. The silos will be provided with dust collector, vent filter, level controller, fluidizing pads and two discharge outlets. One outlet will be connected to the dense phase conveying system to convey ash to main ash silos.

Main Ash Silos

The main ash silos are located within the plant boundaries to enable easy movement of trucks handling dry/conditioned ash. The silos will be of RCC construction. The silos will have fluidizing pads, vent filter, level control as required.

The Ministry of Environment Notification vide S.O 513 (E) dated 3-04-2007, will be followed.

FLY ASH UTILISATION

Policy on Fly Ash Utilization & it's Compliance

Dispose fly ash through competitive bids to the best advantage of the owners	Ash will transported to the nearby brick manufacturers / cement plants
Shall not store more than three months ash generation in their storage / ash ponds	No ash pond is envisaged
Maintain a record of all sale and disposal of fly ash	Records of quantity of ash disposed to cement plants / brick units will be maintained
Submit annual compliance report including record of sale / disposal	Annual compliance report will be submitted

10.2.4 NOISE LEVEL MANAGEMENT

The major noise generating sources in the plant will be STG, boiler, feed pumps, D.G. Sets. Acoustic enclosures will be provided to STG. All machinery will be manufactured as per MoEF/OSHA & other international standards on noise levels. The major noise levels will be confined to the working zones of the plant. The Leq of eight hours will be within the prescribed standards. Acoustic enclosures are provided to the STG. Community noise levels are not likely to be affected due to the proposed thick green belt and attenuation due to the physical barriers. The ambient noise levels will be less than 75 dBA during day time & less



than 70 dBA during night time. As the nearest habitation is about 0.9 Kms. from the plant, there will not be any adverse impact on habitation due to the proposed power plant.

Recommendations

- a) Acoustic enclosures will be provided to STG.
- b) The impact can reduce by adopting shock absorbing techniques.
- c) The Noise absorption will improve by using hollow concrete blocks in the construction of the proposed Plant.
- d) Ear plugs shall be provided to the workers and this shall be enforced strictly.
- e) Extensive greenbelt shall be developed for further attenuating the noise levels.

10.2.5 LAND ENVIRONMENT

All the required Air Pollution Control systems will be provided in the proposed project. The treated effluent will confirm to the Andhra Pradesh Pollution control Board's standards. Hence there will not be any impact on land environment due to the proposed project. The solid waste generated from the project utilized as per the Fly Ash utilization Notification issued by MOEF. Hence there will not be any adverse impact on land environment due to the solid waste generated from the proposed project activities. Extensive greenbelt development will have positive impact on land environment. Land prices in the area will increase due to the proposed project.

Recommendations

Land scaping can be done around the Administrative building, CHP, etc. This will help in preserving the ecological conditions.

10.2.5.1 MEASURES FOR IMPROVEMENT OF ECOLOGY

There are no Wild life sanctuaries, Bird sanctuaries, National Parks within 10 Km. radius of the plant. No significant vegetation occurs in and around the project site. No significant fauna exists in the area. Hence there will not be any adverse impact on flora & fauna due to the proposed project.



Recommendations

Plantation programme should be undertaken at several areas. They should include plantation, along the internal and external roads and along the administrative buildings and the stacking yards. Plantation along Village Roads has also been planned.

People should be educated and trained in social forestry activities by local governmental and non-governmental organizations.

10.2.5.2 GREEN BELT DEVELOPMENT

Extensive greenbelt will be developed within the plant premises. The greenbelt shall be developed simultaneously with the plant construction. This will further mitigate the pollution impacts. 15 m wide greenbelt will be developed all around the plant. A detailed greenbelt plan will be developed in as per CPCB guidelines in consultation with local DFO.

Greenbelt plantation

Greenbelt will be developed in a set of rows of trees planted in such a way that they form an effective barrier between the plant and the surroundings. The main purpose of greenbelt development is to contribute to the following factors.

- To maintain the ecological homeostatus.
- To attenuate the air emissions from the boiler and the fugitive dust emissions.
- To prevent the soil erosion.
- To attenuate the noise levels.

Plantation of grass, flowers, bushes and trees will be taken up to reduce the generation of dust from the bare earth and to enhance the aesthetic value.

Plantation species

Plantation species will be considered based on the following.

- Suitable to the Geo-climatic conditions of the area.
- Mix of round, spreading, oblong and conical canopies.
- Ever green trees.
- Different heights ranging from 4m to 20m.



Plantation for Arresting dust

Trees particularly having compact branching closely arranged leaves of simple elliptical and hairy structure, shiny or waxy leaves and hairy twigs are efficient filters of dust. The following species are suggested to arrest the dust

- *Alstonia Scholaris*
- *Bauhinia purpurea*
- *Cassia siamea*
- *Peltoferrum ferrugineum*
- *Butea monosperma*
- *Tamarindus indica*
- *Azadirachta indica*

Plantation to absorb SO₂ emissions

The following plants are suggested for plantation to absorb SO₂ in the air.

- *Azadirachta indica*
- *Albizia lebbeck*
- *Alstonia scholaris*
- *Lagerstroemia flosregineae*
- *Melia azedarach*
- *Minusops elangi*

Plantation to reduce noise pollution

Trees having thick and flushy leaves with petioles are suitable. Heavier branches and trunks of trees also deflect the sound waves. The following plant species are suggested to reduce noise pollution.

- *Alstonia scholaris*
- *Azadirachta indica*
- *Melia monosperma*
- *Grevillea peridifolia*
- *Tamarindus indica*
- *Greavillea robusta*



Plantation along the roads (Avenue plantation)

- Alstonia scholaris
- Cassia fistula
- Bauhinia purpurea
- Mimusops elangi
- Pongamia pinnata
- Polyalthia longifolia
- Poluferrum ferrugineum
- Lagerstroemia flosreginea
- Cassia siamea.

Greenbelt development plan

- Local DFO will be consulted in developing the green belt.
- Greenbelt of 14.0 Acres will be developed in the plant premises.
- 15 m wide greenbelt will be developed all around the plant.
- The tree species to be selected for the plantation are pollutant tolerant, fast growing, wind firm, deep rooted. A three tier plantation is proposed comprising of an outer most belt of taller trees which will act as barrier, middle core acting as air cleaner and the innermost core which may be termed as absorptive layer consisting of trees which are known to be particularly tolerant to pollutants.
- Greenbelt will be developed as per CPCB guidelines.
- 600 plants will be planted per acre.
- Greenbelt will be developed on along the internal roads.

10.2.6 WATERCONSERVATION MEASURES

10.2.6.1 RAINWATER HARVESTING

Rainwater harvesting structures will be constructed to harvest the run-off water from roof tops by laying a separate storm water drainage system for recharging of ground water. Rain harvesting will be taken-up in consultation with State Ground Water Board. The harvested water will be reused to meet plant water requirements.



Water recharge by RWH

Total roof top area that can contribute to Harvesting	: 7.0 acres
	: 28328 m ²
Annual Rainfall	: 1150 mm
	: 1.15 m
Total volume of Rain water	: 32577 m ³

This water conserved will be reused in the plant.

10.2.6.2 OTHER WATER CONSERVATION MEASURES [TOR # vi]

The quality of cooling water will be continuously monitored, chemical dosing will be carried out and COC of 5 will be maintained in the cooling tower. This will help in conserving the precious water.

10.3 POST PROJECT MONITORING STRATEGY

The monitoring of various environmental parameters is necessary, which is a part of the environmental protection measures. Monitoring is an important feature because the efficiency of control measures can only be determined by monitoring. A comprehensive monitoring programme is given under.

Locations and frequency of monitoring as per the CPCB stipulation are tabulated below:



MONITORING SCHEDULE FOR ENVIRONMENTAL PARAMETERS

S.No.	PARTICULARS	FREQUENCY OF MONITORING	DURATION OF SAMPLING	PARAMETERS REQUIRED TO BE MONITORED
1.	Water & Waste water quality			
A.	Water quality in the area	Once in a month except for heavy metals which will be monitored on quarterly basis.	Grab sampling	As per IS: 10500
B.	Waste water	Once in Month	composite sampling (24 hourly)	As per IS: 10500
2.	Air Quality			
A.	Stack Monitoring	Online monitoring Once in a month		PM SO ₂ & NO _x
B.	Ambient Air quality	Twice a week	24 hours continuously	PM _{2.5} , PM ₁₀ , Sox, NO _x & CO
C.	Fugitive emission monitoring	Once in a month		Particulate Matter
3.	Meteorological Data			
	Meteorological data to be monitored at the plant.	Daily	Continuous monitoring	Temperature, Relative Humidity, rainfall, wind direction & wind speed.

Infrastructure for Environmental Protection

Man Power

The project proponent shall provide a fully equipped laboratory to carry out the analysis. The following manpower shall be provided on regular basis.

Environmental Engineer / Safety Officer

He should be a graduate engineer with adequate experience. He will be responsible for implementing and monitoring the environmental impacts and all the safety aspects. He should be a liaisoning officer between the proposed plant and with regulatory agencies like MOEF, CPCB, APPCB etc.

Chemist

He should be a qualified chemist to carry out the analysis of various samples.



Monitoring equipment and Consumables

Environmental monitoring during the operation phase of the plant will be entrusted to a third party. Monitoring will be carried out as per CPCB/APPCB norms. A budgetary allocation of Rs 10 Lakhs will be earmarked for Environmental monitoring.

Noise levels

A sound level meter shall be purchased to record noise levels in different scales like A, B and C with slow and fast response options at various generating sources such as STG, Boiler, Boiler feed pumps, Compressors, etc.

10.4 COST OF THE PROJECT

The total cost of the proposed project will be Rs.191 Crores.

10.4.1 COST FOR ENVIRONMENTAL PROTECTION

The detailed break up for environmental protection is furnished below:

Cost Break-up for Environment Protection

S.No	Item	Cost (Rs.in Crores)
1.	Electrostatic Precipitators & Dust extraction systems with bagfilters	5.00
2.	Stacks	2.50
3.	Ash Handling & Management	2.00
4.	Effluent Treatment Plant	0.25
5.	Dust Suppression	0.25
6.	Fire fighting	0.50
7.	Environmental Lab Equipment & online Monitoring equipment	0.50
8.	Greenbelt Development	0.25
9.	Occupational Health & Safety	1.00
TOTAL		12.25