

ENVIRONMENTAL IMPACT ASSESSMENT

FOR
THE PROPOSED 6 MW CO-GENERATION POWER PLANT
AT THUVARASI VILLAGE, TIRUNELVELI DISTRICT, TAMILNADU

EXECUTIVE SUMMARY

Sponsor :



Arjun Pulp and Paper (India) Private Ltd
Thuvarasi Village, Tirunelveli District

Prepared by :



Vimta Labs Ltd.
8, Azad Road, R.S.Puram, Coimbatore – 641 002
&
142, IDA, Cherlapally, Hyderabad–500 051
www.vimta.com

*(QCI-NABET & NABL Accredited and ISO 17025 Certified Laboratory,
Recognized by MoEF, New Delhi)*

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1.0 PROJECT DESCRIPTION

Arjun Pulp and Paper India Private Limited (APPIL) proposes to set-up a 6 MW co-generation power plant at Thuvarasi Village, Tirunelveli District, Tamilnadu. APPIL belongs to "ARJUN GROUP" who is pioneer in making machines for paper industry. Their association with the paper industry spans over 25 years and the name ARJUN is an accredited name in the paper industry.

APPIL proposes a green field paper mill project, with a capacity of 29,500 TPA and they proposed to have its own captive power plant of 6 MW capacity for uninterrupted steam and power supply to the paper mill. The salient features of the proposed co-generation plant are given in **Table - 1**.

**TABLE - 1
SALIENT FEATURES OF PROPOSED CO-GENERATION PLANT**

| S. No. | Parameter | Description |
|---------------|-------------------------------|---|
| 1 | Plant Capacity | 6 MW |
| 2 | Total area of the plant | 2.023 ha (5.0 Acres) |
| 3 | Configuration | |
| A | No of Boilers | One |
| B | Capacity of SG | 40 TPH AFBC type boiler |
| C | Generator | 1 x 6 MW |
| 4 | Power Evacuation | Power will be evacuated to its in-house used after stepped down to 11 kV and 433 volts |
| 5 | Fuel | Imported Coal, lignite, Saw dust, DOB & Wood chips |
| A | Source of Fuel | Indonesia, Neyveli , Local sources |
| B | Fuel Transportation | By trucks from Tuticorin Port or Neyveli or local sources |
| C | Fuel Requirement | 11 TPH or 264 Tons/day |
| 6 | Ash Generation | |
| | Fly Ash | 17.88 TPD |
| | Bed Ash | 2.24 TPD |
| 7 | Water Requirement | |
| A | Requirement | Fresh water – 780 KLD |
| B | Source of water | Thamiraparani River |
| C | Cooling system | Water Cooled Condensers |
| 8 | Total wastewater generation | 239 KLD |
| 9 | Waste Water Treatment | Paper Mill ETP |
| 10 | Fire Fighting System | Adequate fire fighting systems as per Tariff Advisory Committee (TAC) and OISD guidelines will be provided. |
| 11 | Stack details | |
| A | No. of stacks | 1 |
| B | Stack height (m) | 65-m |
| C | Diameter of stacks at top (m) | 1.0-m |
| 12 | Noise Levels | Equipment are designed to conform to prescribed noise levels [(< 90 dB(A)] |

2.0 DESCRIPTION OF THE ENVIRONMENT

2.1 Location and Description of the Site

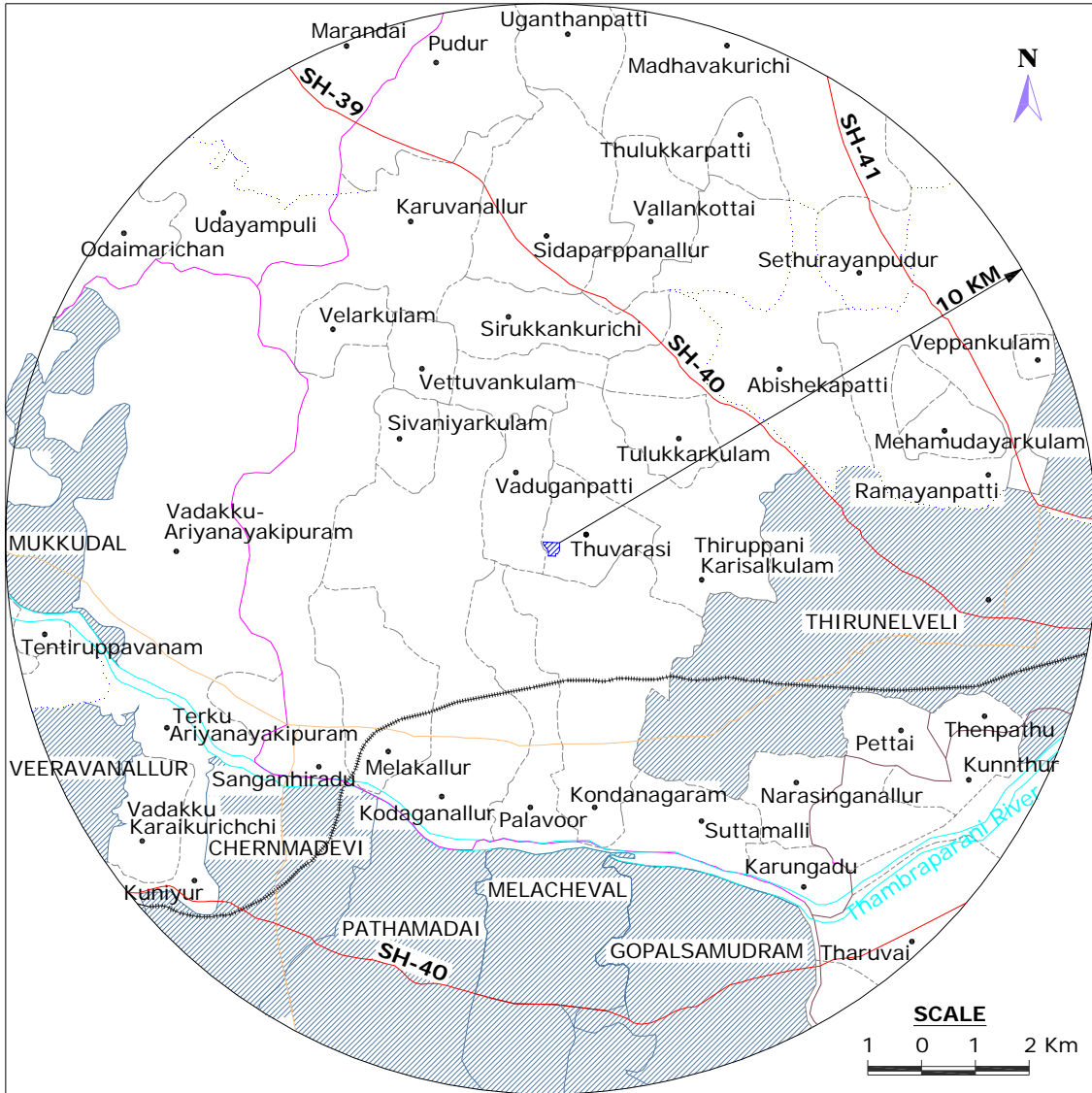
The terrain of the land in the plant site is plain with gentle slopes and no water streams present in the site area. The environmental setting of the proposed plant site is given in **Table-2**. Study area of 10-km radius around the proposed site is shown in **Figure-1**.

**TABLE-2
ENVIRONMENTAL SETTING OF THE SITE**

| Sr. No. | Particulars | Details |
|----------------|---|--|
| 1 | Location | |
| A | Village | Thuvarasi |
| B | Tehsil | Tirunelveli |
| C | District | Tirunelveli |
| D | State | Tamilnadu |
| E | Latitude | 08°44'32" N |
| F | Longitude | 77°36' 50" E |
| 2 | Elevation above MSL | 66-m |
| 3 | Seismicity | Zone-II as per IS 1893 (Part-1): 2002 |
| 4 | Present land use | Unclassified Land |
| 5 | Climate Condition | As per IMD, Thoothukkudi Annual Mean Max Temp : 38.3°C Annual Mean Min Temp : 19.4°C Average Annual Total Rainfall : 625.8-mm |
| 6 | Nearest Highway | State Highway 40 – 3.6 km, NE National Highway 7 – 13 km, NE |
| 7 | Nearest Railway Station | Tirunelveli R.S. – 10.5 km, ESE |
| 8 | Nearest Airport | Tuticorin – 45.0 km, ESE |
| 9 | Nearest Village | Vaduganpatti – 1.75 km, NW |
| 10 | Nearest Town | Cheranmadevi – 8.0 km, SW Tirunelveli – 10.5 km, ESE |
| 11 | Sanctuaries/National parks/biospheres etc | Nil within 10 - km radius |
| 12 | Reserved / Protected forests | Nil within 10 - km radius |
| 13 | Hills/valleys | Nil within 10 - km radius |
| 14 | Streams/Rivers | Thamiraparani River – 6.0 km, South |
| 15 | Topography | Plain land |
| 16 | Defence Installation | Nil within 10 - km radius |
| 17 | Historical places | Nil within 10 - km radius |
| 18 | Industries | Prathyusha Power Plant – 0.4 km, East Subam paper mills – 1.5 km, West Servalakshmi Paper Pvt. Ltd – 2.0 km, NW Subburaj Paper Mills – 7.0 km, NW Sun Paper Mills – 7.5 km, SW |

2.2 Baseline Study

Baseline environmental studies for the various environmental attributes were carried out during 1st December 2010 to 28th February 2011 covering the winter season. The details of the base line study are presented as follows:



LEGEND

- | | |
|----------------|--------------------|
| Project Site | Urban Area |
| Railway Line | Village Boundary |
| Imp.Metal Road | Panchayat Boundary |
| Taluk Boundary | Nala/River |

FIGURE-1
STUDY AREA MAP OF THE PROJECT SITE – 10 KM RADIUS

2.2.1 Meteorology

The climatic condition of this area is semi arid. During the study period (winter season 2010-2011) the maximum temperature goes upto 32.0°C and the minimum temperature goes down 21.0°C. The average humidity in the area ranges from 40.0% to 85.0%. The total rainfall of 126 mm is observed during the study period.

2.2.2 Ambient Air Quality

The prime objective of the baseline air quality study was to assess the existing air quality of the area. Ambient Air Quality Monitoring (AAQM) stations were set up at eight locations with due consideration to the above mentioned points. **Table-3** gives the details of environmental setting around each monitoring station and their distances with reference to the proposed co-generation plant.

TABLE - 3
DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

| Code | Name | Distance w.r.t. plant (km) | Direction w.r.t. plant | Environmental Setting |
|------|-------------------------|----------------------------|------------------------|-----------------------|
| AAQ1 | Plant site | --- | --- | Industrial area |
| AAQ2 | Thulukarkulam | 2.75 | NE | Rural & Resi. area |
| AAQ3 | Terku Ariyanayakipuram | 7.5 | SW | Rural & Resi. area |
| AAQ4 | Melakallur | 4.75 | SW | Rural & Resi. area |
| AAQ5 | Palavoor | 4.5 | SSW | Rural & Resi. area |
| AAQ6 | Vaduganpatti | 1.5 | NNW | Rural & Resi. area |
| AAQ7 | Thiruppani karisalkulam | 2.75 | ESE | Rural & Resi. area |
| AAQ8 | Vadaku Ariyanayakipuram | 6.75 | W | Rural & Resi. area |

The PM₁₀ and PM_{2.5} is observed as 20.0 to 33.8 µg/m³ and 4.8 to 9.7-µg/m³ respectively. Sulphur dioxide and Oxides of Nitrogen is observed to be 4.0 to 7.5-µg/m³ and 5.6 to 12.4-µg/m³ respectively. Carbon Monoxide (CO) is observed to vary from 173 to 248-µg/m³ and lead are observed below 0.1 µg/m³. All the above parameters are well within the CPCB standards for Industrial, rural, residential and other areas.

2.2.3 Water Quality

Selected water quality parameters of ground water and surface water resources within 10-km radius of the study area has been studied for assessing the water environment and evaluate anticipated impact of the proposed co-generation plant. Understanding the water quality is essential in preparation of Environmental Impact Assessment and to identify critical issues with a view to suggest appropriate mitigation measures for implementation.

Two surface water and Six ground water samples were collected as grab samples and were analyzed for various parameters to compare with the standards for drinking water as per IS: 2296 and IS: 10500. The details of the sampling locations are given in **Table-4**.

TABLE - 4
DETAILS OF WATER SAMPLING LOCATIONS

| Sr. No. | Code | Location | Distance w.r.t. Plant Boundary | Direction from the Plant Boundary |
|----------------------|------|------------------------------------|--------------------------------|-----------------------------------|
| Surface Water | | | | |
| 1 | SW1 | Up stream of Thamiraparani River | 6.5 km | SSW |
| 2 | SW2 | Down stream of Thamiraparani River | 6.5 km | South |
| Ground Water | | | | |
| 1 | GW1 | Project Site | --- | --- |
| 2 | GW2 | Vaduganpatti | 1.5-km | NNW |
| 3 | GW3 | Sivaniyarkulam | 3.5-km | NW |
| 4 | GW4 | Thiruppani Karisalkulam | 2.75-km | ESE |
| 5 | GW5 | Melakallur | 4.75-km | SW |
| 6 | GW6 | Vadaku Ariyanayagipuram | 6.75-km | W |

2.2.3.1 Surface water quality

The analysis results indicate that the pH ranges from 7.1 to 7.3 and TDS fall in the range of 36 to 41 mg/L which are in accordance with the standards. The DO values ranging from 5.0 to 6.0 mg/L were observed to well within the permissible limits. Other parameters like Chlorides, Sulphates and Nitrates are within the prescribed standards. The overall physico-chemical and biological analysis reveals that the quality of these waters conform the prescribed limits of IS: 2296.

2.2.3.2 Ground water quality

The analysis results indicate that the pH and conductivity of the ground waters was found to be in the range of 6.9 to 7.3 and 348 to 482 μ S/cm. The TDS were found to be well with in the limits ranging from 212 to 411 mg/l. The Chlorides and Sulphates were observed to be 45.4 to 62.1 mg/l and 9.2 to 14.1 mg/l, which are well with in the prescribed limits. By and large the physico chemical analysis divulges that all the parameters are well within the standards as per IS: 10500.

2.2.4 Soil Characteristics

Agriculture is the main occupation of people in the study area. Hence it is essential to identify the impacts in the study area on the soil characteristics, which would affect the agricultural and afforestation potential. Accordingly, an assessment of the baseline soil quality has been carried out to evaluate the base line status of the soil environment.

Six locations within 10-km radius of the proposed project site were selected for soil sampling. The details of the sampling locations are given in **Table-5**.

**TABLE - 5
DETAILS OF SOIL SAMPLING LOCATIONS**

| Code No | Location | Distance from Plant Boundary (km) | Direction from Plant Boundary |
|---------|-------------------------|-----------------------------------|-------------------------------|
| S1 | Project Site | --- | --- |
| S2 | Thulukarkulam | 2.75-km | NE |
| S3 | Thirupani Karisalkulam | 2.75-km | ESE |
| S4 | Melakallur | 4.75-km | SW |
| S5 | Vadaku Ariyanayakipuram | 6.75-km | W |
| S6 | Vettuvankulam | 4.0-km | NW |

It has been observed that the pH of the soil ranged from 7.1-7.8 indicating that the soils are neutral to moderately alkaline in nature. The soil in the study area is predominantly of sandy clay type. The bulk density of the soil ranges between 1.0-1.2 gm/cc. The Electrical Conductivity was observed to be in the range of 88-136 μ S/cm. The soils of the study area have 'very less' to 'medium' NPK ratio indicating average to good fertility value.

2.2.5 Noise Level Survey

The foremost objective of noise monitoring in the study area is to evaluate the baseline noise and assess the impact of the total noise expected to be generated by proposed project. Ten locations were monitored for assessing the existing noise levels in and around the project location. The noise monitoring locations are given in **Table-6**.

**TABLE-6
DETAILS OF NOISE MONITORING LOCATIONS**

| Code No | Location | Direction & Distance w.r.t. Plant site | Environmental Condition |
|---------|-------------------------|--|-------------------------|
| N1 | Project Site | ---- | Rural |
| N2 | Thuvarasi | NE, 0.5-km | Residential |
| N3 | Thulukarkulam | NE, 2.75-km | Residential |
| N4 | Thirupani Karisalkulam | ESE, 2.75-km | Residential |
| N5 | Kondanagaram | SSE, 5.0-km | Residential |
| N6 | Melakallur | SW, 4.75-km | Residential |
| N7 | Cheranmadevi | SW, 8.5-km | Commercial |
| N8 | Vadaku Ariyanayakipuram | W, 6.75-km | Residential |
| N9 | Vettuvankulam | NW, 4.0-km | Residential |
| N10 | Vaduganpatti | NW, 1.5-km | Residential |

The day and night time noise levels in all the residential locations were observed to be in the range of 39.6 dB(A) to 48.9 dB(A) and 35.7 dB(A) to 44.6 dB(A). The day and night time noise levels in the commercial area was observed as 60.0 dB(A) and 54.2 dB(A). It was observed that the prevailing noise levels in and around the proposed project location was found to be well with in the statutory limits prescribed by the regulatory authorities.

2.2.6 Ecological Environment

A detailed ecological survey covering an area of 10-km radius from the project site was conducted during study. No rare plants are found around project site. No endangered animal species are found around the project site and there are no National parks and wild life sanctuaries within the 10-km around the project site.

3.0 ANTICIPATED ENVIRONMENTAL IMPACTS AND MITIGATION MEASURES

3.1 Construction Phase

The environmental impacts during the construction stage will be short term, temporary in nature and will be confined very close to project sites. The manpower required for these activities should preferably be employed from nearby villages.

3.1.1 Land Environment

The present land use of the project site is under unclassified use. The land available for the proposed project is 2.023 ha (5.0 Acres). The greenbelt proposed will have a positive impact on land.

3.1.2 Water Resources

The water consumption during the construction period is estimated to be about 50-m³/day for a period of one year. This quantity of water will be supplied by the contractor. The overall impact on water environment during construction phase is likely to be short term and insignificant.

3.1.3 Demography and Socio-Economics

The project area is typical semi-arid region with vast agricultural fields surrounding the project site. The construction of the project shall also not entail any displacement of people and project facilities will be located in such a manner to avoid the settlements.

3.2 Operation Phase

3.2.1 Air Environment

- Air pollution modeling, carried out for proposed co-generation plant shows that resultant concentrations of SO₂ (11.8 µg/m³), NO_x (13.3 µg/m³) and PM₁₀ (34.0 µg/m³) for winter season will remain well within the National Ambient Air Quality Standards for rural residential and other areas.
- Limiting of pollutant discharge and minimizing its effect on air quality, within prescribed standards, will be achieved, consequent to selection eco-friendly AFBC technology and plant design for boilers and installation of stack of adequate height that provides better dispersion of pollutants.
- Consequently the proposal is unlikely to have any major impacts on local or regional air quality or to adversely affect human health or status of pollution-sensitive vegetation, either locally or on nearby terrain.

3.2.2 Air Dispersion Modeling

In the present case, **Industrial Source Complex [ISC3]** 1993 dispersion model based on steady state Gaussian plume dispersion, designed for multiple point sources for short term and developed by United States Environmental Protection Agency [USEPA] has been used for simulations from point sources. The modeling results are presented in **Table-8**.

TABLE-8
RESULTANT CONCENTRATIONS DUE TO INCREMENTAL GLC's

| Pollutant | Concentration ($\mu\text{g}/\text{m}^3$) | | | NAAQ Limits |
|------------------|--|-------------|-----------|-------------|
| | Baseline | Incremental | Resultant | |
| PM ₁₀ | 33.8 | 0.2 | 34.0 | 100 |
| SO ₂ | 7.5 | 4.3 | 11.8 | 80 |
| NO _x | 12.4 | 0.9 | 13.3 | 80 |

3.2.3 Water Environment

- The project will source its entire water requirement from Thamirabarani River. The total daily fresh water requirement of the proposed co-generation plant is about 780 KLD;
- The project will not extract groundwater and hence there will be no impact on ground water.

The wastewater generated in the plant area will be treated in the ETP plant and will be recycled / reused in the plant process.

Under normal operation of the plant, no wastewater will be discharged out side plant premises. The storm water in the project area will be collected through storm water drains and shall be suitably diverted to rainwater harvesting pits and the overflow from the RWH pits will be diverted to nearby nalla. Hence, impact on the water quality is not envisaged.

3.2.4 Solid Waste Management and Land Use

Ash will be utilised as per the "Fly Ash Utilization Notification 2007". The total fly ash generated will be sold to cement manufactures, fly ash bricks manufactures. The bottom ash shall be utilized for road laying flooring within the plant.

3.2.5 Noise Environment

The main noise generating sources are blowers from boilers and turbines. The impact of noise emission from boilers will be minimized by acoustic enclosures and the noise levels will be limited to 85 dB(A).

3.2.6 Greenbelt Development

APPIL proposes to develop wide greenbelt around the project premises. In the proposed greenbelt, trees will be planted in an area of 0.72-ha land with a density of 2000 trees/ha. Every year 500 number of trees will be planted and absolute greenbelt will be developed over a period 3 years.

3.2.7 Socio- Economics

The major economic impacts, which will accrue to the region, during the construction phase and operation of co-generation plant, will be an increased availability of direct and indirect employment. Local people will be benefited after commissioning of the proposed project in terms of petty to major contractual jobs and associated business establishments.

4.0 ENVIRONMENTAL MONITORING PROGRAMME

Post project environmental monitoring is important in terms of evaluating the performance of pollution control equipments installed in the project. The sampling and analysis of the environmental attributes will be as per the guidelines of CPCB/TNPCB. The frequency of sampling and location of sampling will be as per the directives of Tamilnadu Pollution Control Board. Following attributes will be covered in the post project environmental monitoring in and around the project site:

1. Ambient air quality monitoring on monthly basis in the plant area and in the surrounding villages with respect to PM₁₀, PM_{2.5}, SO₂ & NO₂;
2. Source emissions will be monitored on monthly basis. Automatic continuous online monitoring system shall be installed in the stacks;
3. Water quality monitoring at intake point, surface water bodies and ground water in the surrounding villages.
4. Treated wastewater before routing to clarifier will be analyzed on fortnightly basis. The pH, temperature, electric conductivity, TDS and flow will be monitored regularly;
5. The noise levels will be recorded in and around plant. The noise levels at boundary of the plant will be recorded on monthly basis;
6. All the results will be compiled and thoroughly analyzed to assess the performance of the power plant; and
7. The results will be reported on regular basis to the Tamilnadu Pollution Control Board and regional office of MoEF.

5.0 ENVIRONMENT MANAGEMENT PLAN

5.1 Environment Management Plan during Construction Phase

During construction phase, the construction activities like site levelling, grading, transportation of the construction material cause various impacts on the surroundings.

5.1.1 Air Quality Management

The activities like site development, grading and vehicular traffic contribute to increase in SPM and NO_x concentration. The mitigation measures recommended to minimize the impacts are:

- Water sprinkling in construction area;
- Asphaltting the main approach road;
- Proper maintenance of vehicles and construction equipment; and
- Tree plantation in the area earmarked for greenbelt development.

5.1.2 Water Quality Management

The wastewater from vehicle and construction equipment maintenance centre will contribute to oil and grease concentration. The wastewater from labour colony will contribute to higher BOD levels. The mitigation measures recommended to minimize the impacts are:

- Sedimentation tank to retain the solids from run-off water;
- Oil and grease trap at equipment maintenance centre;
- Septic tanks to treat sanitary waste at labour colony; and
- Utilizing the wastewater in greenbelt development.

5.1.3 Noise Level Management

Operation of construction equipment and vehicular traffic contribute to the increased noise level. Recommended mitigation measures are:

- Good maintenance of vehicles and construction equipment;
- Restriction of construction activities to day time only;
- Plantation of trees around the plant boundary to attenuate the noise; and
- Provision of earplugs and earmuffs to workers.

5.1.4 Ecological Management

During construction, vegetation in the plant premises is required to be cleared. The measures required to be undertaken to minimise the impact on the ecology are:

- The felling of trees will be kept at minimum;
- Transplantation of existing matured trees will be undertaken and transplanted in the area earmarked for greenbelt development; and
- The greenbelt having tree density of 2000 trees/ha will be developed.

5.2 **Environment Management Plan during Operation Phase**

During operation phase, the impacts on the various environmental attributes should be mitigated using appropriate pollution control equipment. The Environment Management Plan prepared for the proposed project aims at minimizing the pollution at source.

5.2.1 Air Pollution Management

Fugitive and stack emissions from the power plant will contribute to increase in concentrations of SPM, SO₂ and NO_x pollutants. The mitigative measures recommended in the plant are:

- Installation of ESP's of 99.9% efficiency to limit the SPM concentrations below 100 mg/Nm³;
- Provision of 65-m high stack for wider dispersion of gaseous emissions;
- Dust extraction system will be provided at transfer points of conveyor system;
- Conveyor belt will be closed to prevent dust generation;
- Provision of water sprinkling system at material handling and storage yard;
- The ash will be transported by closed bulkers;
- Asphalted of the roads within the plant area;
- Development of Greenbelt around the plant to arrest the fugitive emissions.

5.2.2 Water Pollution Management

The wastewater will be generated from DM plant and cooling towers in the power plant. Additionally, domestic wastewater from canteen and employees wash area will also be generated. The recommended measures to minimise the impacts and conservation of fresh water are:

- Recycling of complete wastewater generated in cooling tower into ash handling and disposal;
- Recycling the entire wastewater from DM plant and boiler after treat it in paper mill ETP;
- Provision of septic tank to treat domestic sewage from plant;
- Utilization of treated wastewater for greenbelt development;
- Suitable rainwater harvesting structures to be constructed.

5.2.3 Noise Pollution Management

In the process, various equipments like pumps, cooling tower, compressors etc generate the noise. The recommendations to mitigate higher noise levels are:

- Equipment will conform to noise levels prescribed by regulatory authorities;
- Provision of acoustic enclosures to noise generating equipments like pumps;
- Provision of thick greenbelt to attenuate the noise levels; and
- Provision of earplugs to the workers working in high noise level area.

5.2.4 Solid Waste Management

The total ash generation will be about 20.12 Tons per day (Fly ash–17.88 TPD & Bottom Ash-2.24 TPD). The total fly ash from the plant will be disposed to Cement Manufacturing units. The bottom ash shall be utilised for road laying works within the plant, utilized as bed material for boiler and shall also be given to local villages for road laying works, filling up of low lying areas, etc.