

ENVIRONMENTAL IMPACT ASSESSMENT

FOR

THE PROPOSED 15 MW CO-GENERATION POWER PLANT
AT KODAGANALLUR VILLAGE, TIRUNELVELI DISTRICT, TAMILNADU

EXECUTIVE SUMMARY

Sponsor :



SERVALAKSHMI PAPER PRIVATE LIMITED
KODAGANALLUR VILLAGE
TIRUNELVELI – 627 010

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1.0 PROJECT DESCRIPTION

Servalakshmi Paper Private Limited (SPPL) is proposes to set-up a 15 MW co-generation power plant at Kodaganallur Village, Tirunelveli District, Tamilnadu. SPPL belongs to "SERVALL GROUP" who is synonymous with Paper Industry. SERVALL group of companies are the pioneers in the Indian Paper Industry. Their association with the paper industry span over 35 years and the name SERVALL is an accredited name in the paper industry.

The Servall group has three other paper mills which are Danalakshmi Paper Mills Private Limited, Servalakshmi Paper and Boards (P) Limited, Vijayalakshmi Paper Mills, Vilampatti, Dindugal district on Vaigai River basin and have a combined paper manufacturing capacity of 45000 tones of paper per annum. In addition to the Paper mills, SLPB has a co generation Power plant of 5.5 MW capacity. 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	15 MW
2	Total area of the plant	5.85-ha (14.45 Acre)
3	Configuration	1 Boiler + 1 TG
A	No of Boilers	One
B	Capacity of SG	80 TPH AFBC type boiler
C	Generator	1 X 15 MW
4	Power Evacuation	Power will be evacuated to its in-house used after stepped down to 6.6 kV and 415 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	750 Tons/day
6	Ash Generation	Fly ash 64 TPD Bottom ash 16 TPD
7	Water Requirement	
A	Requirement	Fresh water make-up – 1500 KLD
B	Source of water	Thamiraparani river
E	Cooling system	Air Cooled Condensers
F	Auxiliary Cooling Water System	Induced draft cooling tower
8	Total wastewater generation	350 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 Emissions	
A	No. of stacks	1
B	Stack height (m)	66-m
C	Diameter of stacks at top (m)	2.0-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	Kodaganallur
B	Tehsil	Tirunelveli
C	District	Tirunelveli
D	State	Tamilnadu
E	Latitude	08°45'37" N
F	Longitude	77°35' 31" E
2	Elevation above MSL	240-m
3	Seismicity	Zone-II as per IS 1893 (Part-1): 2002
4	Present landuse	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 39 – 3.5 km, NE National Highway 7 – 12.5 km, East
7	Nearest Railway Station	Pettai R.S. – 8.0 km, SE Tirunelveli R.S. – 10.5 km, SE
8	Nearest Airport	Thoothukkudi
9	Nearest Village	Vaduganpatti – 1.5 km, NE
10	Nearest Town	Cheranmadevi – 8.5 km, SW Tirunelveli – 10.0 km, SE
11	Sanctuaries/National parks/biospheres etc	Nil
12	Reserved / Protected forests	Nil
13	Hills/valleys	Nil
14	Streams/Rivers	Thamiraparani River – 6.5 km, WSW
15	Topography	Plain land
16	Defence Installation	Nil
17	Historical places	Nil
18	Industries	Subam paper mills – 1.0 km, S Prathyusha Power Plant – 3.0 km, E Subburaj Paper Mills – 4.0 km, NW Sun paper mills – 6.0 km, SW

2.2 Baseline Study

Baseline environmental studies for the various environmental attributes were carried out during 1st December 2008 to 28th February 2009 covering the winter season. The details of the base line study are presented as follows:



Environmental Impact Assessment for the proposed 15 MW Co-generation power plant at Kodaganallur Village, Tirunelveli District, Tamilnadu

Executive Summary

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 2008-2009) the maximum temperature goes upto 31.0°C and the minimum temperature goes down 18.0°C. The average humidity in the area ranges from 45.0% to 82.0%. The average annual rainfall is observed to be 625.8 mm.

2.2.2 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 present study on the soil quality establishes the baseline characteristics and identifies the incremental concentrations if any, due to the proposed project. The details of the sampling locations are given in **Table-3**.

**TABLE-3
DETAILS OF SOIL SAMPLING LOCATIONS**

Code No	Location	Distance from Plant Boundary (km)	Direction from Plant Boundary
S1	Project Site	---	---
S2	Vaduganpatti	1.0	ENE
S3	Vettuvankulam	2.5	NNW
S4	Vadaku Ariyanayakipuram	5.5	WSW
S5	Melakallur	5.5	SSW
S6	Tavarasi	2.5	SE

It has been observed that the pH of the soil ranged from 7.2-8.1 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 88-245 µS/cm. The soils of the study area have 'medium' to 'better' NPK ratio indicating average to good fertility value.

2.2.3 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 seven locations with due consideration to the above mentioned points. **Table-4** gives the details of environmental setting around each monitoring station and their distances with reference to the proposed co-generation plant.

TABLE-4
DETAILS OF AMBIENT AIR QUALITY MONITORING LOCATIONS

Code	Location	Distance (km)	Direction	Remark
AAQ1	Plant site	---	---	Industrial area
AAQ2	Vaduganpatti	1.0	ENE	Rural & Resi. area
AAQ3	Vadaku Ariyanayakipuram	5.5	WSW	Rural & Resi. area
AAQ4	Sirukkankurichi	3.0	NNE	Rural & Resi. area
AAQ5	Melakallur	5.5	SSW	Rural & Resi. area
AAQ6	Sivaniyarkulam	1.5	NW	Rural & Resi. area
AAQ7	Tavarasi	2.5	SE	Rural & Resi. area

The TSPM and RPM is observed to vary from 65.8 to 119.5- $\mu\text{g}/\text{m}^3$ and 18.3 to 33.8- $\mu\text{g}/\text{m}^3$ respectively. Sulphur dioxide and Oxides of nitrogen is observed to be <4.0 to 6.9- $\mu\text{g}/\text{m}^3$ and 5.6 to 12.4- $\mu\text{g}/\text{m}^3$ respectively. All the above parameters are well within the CPCB standards for rural, residential and other areas.

2.2.4 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.

Three 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 10500. The details of the sampling locations are given in **Table-5**.

TABLE - 5
DETAILS OF WATER SAMPLING LOCATIONS

Location Code	Locations	Distance (km)	Direction
Surface Water			
SW1	Up stream of Thamiraparani River	6.5 km	WSW
SW2	Down stream of Thamiraparani River	6.5 km	WSW
SW3	Pirayamkulam	1.0 km	SW
Ground Water			
GW1	Project Site	---	---
GW2	Vaduganpatti	1.0 km	ENE
GW3	Vettuvankulam	2.5 km	NNW
GW4	Vadaku Ariyanayagipuram	5.5 km	WSW
GW5	Melakallur	5.5 km	SSW
GW6	Tavarasi	2.5 km	SE

2.2.4.1 Surface water quality

The analysis results indicate that the pH ranges from 6.8-7.2 and TDS fall in the range of 351-524 mg/L which are in accordance with the standards. The DO values ranging from 5.6-6.0 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.



2.2.4.2 Ground water quality

The analysis results indicate that the pH and conductivity of the ground waters was found to be in the range of 6.8-7.4 and 351-524 $\mu\text{S}/\text{cm}$. The TDS were found to be well within the limits ranging from 212-418 mg/l. The Chlorides and Sulphates were observed to be 45.4-65.6 mg/l and 8.5-17.1 mg/l, which are well within the prescribed limits. By and large the physico chemical analysis divulges that all the parameters are well within the standards as per IS: 10500.

2.2.5 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** and the results of noise monitoring are given in **Table-7**.

TABLE-6
DETAILS OF NOISE MONITORING LOCATIONS

Location Code	Locations	Direction & Distance w.r.t Project Site	Remarks
N1	Project Site – Near power plant	---	Rural
N2	Project Site – Near Paper Mill	---	Rural
N3	Vaduganpatti	ENE, 1.0-km	Residential
N4	Vettuvankulam	NNW, 2.5-km	Residential
N5	Sivaniyarkulam	NW, 1.5-km	Residential
N6	Vadaku Ariyanayakipuram	WSW, 5.5-km	Residential
N7	Cheranmadevi	SW, 8.5-km	Commercial
N8	Melakallur	SSW, 5.5-km	Residential
N9	Tavarasi	SE, 2.5-km	Residential
N10	Tulukkarkulam	NE, 4.0-km	Residential

TABLE - 7
NOISE LEVELS IN THE STUDY AREA [dB (A)]

S No	Location	L ₁₀	L ₅₀	L ₉₀	L _{eq}	L _{day}	L _{night}	L _{dn}
1	Project Site – Near power plant	41.1	37.0	28.1	39.8	38.6	31.5	39.8
2	Project Site – Near Paper Mill	42.3	39.1	30.5	41.4	41.3	32.4	41.7
3	Vaduganpatti	40.2	37.1	35.4	37.5	37.2	30.5	38.6
4	Vettuvankulam	40.6	37.4	35.0	37.9	37.7	31.2	39.2
5	Sivaniyarkulam	40.0	37.8	34.7	38.3	37.3	30.8	38.8
6	Vadaku Ariyanayakipuram	41.2	38.1	35.3	38.7	37.9	31.4	39.4
7	Cheranmadevi	62.3	58.6	53.6	59.9	57.8	49.5	58.4
8	Melakallur	40.7	38.8	36.8	39.1	38.6	32.8	40.5
9	Tavarasi	37.5	34.2	33.2	34.5	34.6	29.6	37.0
10	Tulukkarkulam	40.4	37.1	34.8	37.6	37.6	31.3	39.2

It was observed that the prevailing noise levels in and around the proposed project location was found to be well within 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. The flora found in this region is of common tree species and thorny bushes. 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 5.85-ha. After commissioning of proposed project, the land use will change to industry category. 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 (6.3 µg/m³), NO_x (1.9 µg/m³) and SPM (0.4 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	
SPM	118.9	0.4	119.3	200
SO ₂	6.9	6.3	13.1	80
NO _x	12.4	1.9	14.3	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 1500 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 is the main solid waste generated in the thermal power plant. The quantity of fly ash and bottom ash generated will be 64 TPD and 16 TPD respectively. 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. No land is earmarked for ash pond/ash dyke.

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 85dB [A].



3.2.6 Greenbelt Development

SPPL proposes to develop wide greenbelt around the project premises. In the proposed greenbelt, trees will be planted in an area of 1.8-ha land with a density of 2500 trees/ha. Every year 2500 number of trees will be planted and absolute greenbelt will be developed over a period 2 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 weekly basis in the plant area and in the surrounding villages with respect to SPM, RPM, SO₂ & NO_x;
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 75 mg/Nm³;
- Provision of 66-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;
- Asphaltting 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 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 80 Tons per day (Fly ash-64 TPD & Bottom Ash-16 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.