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# Environmental impact assessment of a 1600 MW thermal power plant project in Karimnagar district of Telangana

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***Abstract*— With rapid urbanization and population boom in India, the need for power has grown considerably over the past decade. And with more and more power plants being set up, it becomes essential to focus on the power generated but also on the impact it has on the environment. EIA is carried out at a 1600 MW thermal power plant located in the Karimnagar district of Telangana to help us estimate the effect the power station has on natural resources which in turn effects the population near it. The EIA requites the help of air quality models such as AERMOD in addition to other tools and methods. The project has significant impact on the air quality of the region and considerably less on the ground and surface water. The mitigation measures are also stated in addition to it.**

***IndexTerms*— Impact assessment, Air quality, Groundwater, Surface water** *(keywords)*

## I. Introduction

Due to the rapid growth of population, economy and industrialization change in the life style and advance technologies are causing harm to the environment and human [3]. The purpose of Environmental Impact Assessment (EIA) being used is to have information regarding proposed project before project and after project regarding every physical, environmental aspects as to make a decision whether proposed one have potential effect to the environment and human. It also provides information regarding reduction the impacts and mitigation measures. Overall EIA is a systematic process of examination, analysis and assessment of planned activities with a view to ensuring environmentally sound and sustainable development [2] and main objective is to design the activities considered in the any process of proposed projects considering environmentally [4].

Power development is one of the key infrastructural elements for the economic growth of the country. About 60% of electricity in India is generated by thermal power plants [5]. National Thermal Power Corporation Limited was set up in November 1975 with the objective of planning, promoting organizing and integrated accelerated development of thermal power in the country. As per A.P. Re-organization Act 2014, NTPC has been mandated to set up 4000 MW Coal fired thermal power plant for Telangana State. As per Environmental Impact Assessment (EIA) Notification dated 14.09.2006 and subsequent amendment dated 01.12.2009 of Ministry of Environment and Forests and Climate Change (MOEF & CC). The proposed project falls under category A of schedule 1(d) and requires environmental clearance from MOEF & CC. this paper provides the environmental impact assessment of proposed project and providing decision making regarding implementing of projects and also mitigation measures.

## II. METHODOLOGY

This Environmental Impact Assessment (EIA) study for the proposed power project considers a core study area covering a radius of 10 km around the proposed site. The scope of the study is based on the TOR prescribed by MoEF &CC. The six step approach is followed in order to do environmental risk assessment for proposed thermal project, the steps involved are-

**2.1. Identification of the possible impacts due to proposed projects**

In this step all possible impacts that can occur during the constructional phase, operational phases are listed and corresponding parameters that causes the environmental is mentioned.

**2. 2. Description of existing environmental conditions**

As name indicates this step includes the description of present environmental conditions in terms of effecting parameter like air quality data, existing surface and ground quality data, present noise levels etc.

**2.3. Procurement of relevant environmental quality standards and regulations**

In this step we will indicate all environmental quality standards issued by government authorities like for air -National Ambient Air quality Standards, for surface water- surface water discharge limits for non effecting water body etc.

**2.4. Impact prediction**

Impact prediction is done with all listed possible impacts mentioned in the step 1 using the models, instruments, frame works. In this stage we will able to get the numerical value of possible impacts after the project

**2.5. Impact assessment**

In this stage we will sum up existing value and calculated (predicted) value of a proposed project and compared to the quality standards mentioned in the step 3. And a rating is given for all baseline parameters according to their affected timeline using the leopard matrix in the form of intensity and context.

**2.5.1. Leopold Matrix**

It is generally used for environmental impact assessment, in this the rows cover the important or vital aspects of the environment and society, while the columns covers a project's activities during all stages prevalent in the project. Each box of interaction must help us come to the conclusion as whether the action in question will have an impact on the environmental factor. If it doesn't, an empty circle is put in its place. But if it does, a filled circle is placed and the impact is described as : (A) High (B) Moderate Or (C) Low.

There are three steps involved in building the matrix:
1. Mark a diagonal line on all boxes where the impacts of the action on the environment are considered significant.
2. Rate it from 1 to 10, 1 being lowest and 10 being highest, with the number placed in each box identified in Step 1 to indicate the magnitude of the specific action's impact on that aspect of the environment. This number is to be placed in the upper left hand corner.
3. Using the same rating system, a rating is made in the lower right hand corner of the defined boxes, representing the importance of the impact to the project.

**2.6. Mitigation measures**

The decision is made according to impact assessment whether project is to be constructed or not based on the step 5 and if it is constructed then measured to be taken to reduce the affected parameters which exceed the standard values is mentioned.

## III. LOCATION OF PROJECT AND DESCRIPTION

A coal based thermal power station of 1600 MW (2X800 MW) capacity with super critical technology is located in the Karimnagar district of Telangana, with the details as stated in Table 1.

**Table 1: Features of Power Plant**

| Sr. No. | Features | Description |
|---|---|---|
| 1 | Capacity | 1600 MW |
| 2 | Configuration | Stage-I ( 2*800) MW |
| 3 | Technology | Super critical technology |
| 4 | Construction power | Start-up power from NTPC Ramagundam |
| 5 | Source of coal | Indigenous coal from SCGL |
| 6 | Sulphur content | 0.5% |
| 7 | Ash content | 37-43 % |
| 8 | Total ash generation | 3.2 MPTA |

| | | |
|---|---|---|
| 9 | Coal requirement | 8.0 MTPA |
| 10 | Mode transportation | Rail and underground conveyor system |
| 12 | ESP efficiency | 99.90 |
| 13 | Stack | 275 m height |
| 14 | Water requirement | 5825 $m^3$/hr |
| 15 | Source of water | Yellampally barrage, 14 km from proposed plant |
| 16 | Project cost | 9954.20 Crores |
| 17 | Man power | 1500 persons |

## IV. RESULTS

### 4.1 Prediction and assessment of impacts of the air environment

**Step 1. Identification of the types and quantities of air pollutants and of their impacts**

This step consists of describing the given project, what types of air pollutants might be emitted during the construction and operational phases of proposed project activity, quantities to which such air pollutants are expected to occur.

The ambient air quality with respect to the study zone around the proposed plant area forms the baseline information. The various sources of air pollution in the region are industrial, traffic, urban and rural activities. This will also be useful for assessing the conformity to standards of the ambient air quality during plant operation.

**Table 2: Impacts during constructional activities**

| Construction Activities | Sector | Probable Impacts |
|---|---|---|
| Site clearing and Levelling (cutting, stripping, excavation, earth movement, compaction) | Air | • Fugitive Dust Emissions<br>• Noise/ Air Emissions from construction equipment & Machinery |
| Transportation and Storage of Construction Material/ Equipment | Air | • Noise and Air Emissions from Vehicles<br>• Fugitive Dust Emissions due to Traffic Movement<br>• Spillage and fugitive emissions of construction materials |
| Civil Construction Activities | Air | • Noise and Air Emissions from Construction Machinery<br>• Fugitive Dust Emissions due to Movement of Traffic |
| Mechanical and Electrical Erection | Air | • Noise & Air Emissions from |
| Transportation and Disposal of Construction Debris | Air | • Noise and Air Emissions from Transport Vehicles<br>• Fugitive Dust Emissions due to Movement of Traffic<br>• Spillage and fugitive emissions of debris materials |

The main sources of emission during the construction period are the movement of equipment at site and dust emitted during the leveling, grading, earthwork and foundation works. The dust emitted during the above mentioned activities depend upon the type of soil being excavated and the ambient humidity levels. The dust generated during the construction activities will however, settle quickly. Therefore, the impact will be for short duration and confined locally to the construction site. The composition of dust in this kind of operation is, however, mostly inorganic and non-toxic in nature. The impact will be confined within the project boundary and is expected to be negligible outside the plant boundaries. Exhaust emissions from vehicles and equipment deployed during the construction phase is also likely to result in marginal increase in the levels of NOx, PM and CO. The impact will be for short duration and confined within the project boundary and is expected to be negligible outside the plant boundaries. The impact will, however, be reversible, marginal and temporary.

**Table 1: Impacts during Operational Phase**

| Operation and Maintenance Activities | Sector | Probable Impacts |
|---|---|---|
| Transportation of Coal/ Oil | Air | • Noise and Air Emissions from Vehicles<br>• Fugitive Dust Emissions due to Traffic Movement<br>• Spillage and fugitive emissions of coal/ oil |
| Unloading, Crushing and Storage of Crushed Coal/ | Air | Fugitive Dust Emissions from Coal |
| Burning of Fuel | Air | Stack emissions (PM, $SO_2$, NOx) |
| Transportation and Disposal of Ash | Air | • Fugitive Emissions |

The impact on air quality is assessed based on emissions from the proposed power plant. Particulate Matter (PM), Sulphur dioxide ($SO_2$) and Nitrogen Dioxides (NOx) are the important pollutants emitting from the proposed project.

**Table 2: Details about proposed stack emissions**

| Parameters | Units | Value |
|---|---|---|
| Stack height | M | 275 |
| No of stacks | NO. | 1 |
| Flue diameter | M | 8.15 |
| Flue gas velocity | K | 22 |
| Flue gas temperature | m/sec | 398 |
| Volumetric flow rate | $Nm^3$/sec | 858.9 |
| Rate of coal combustion | TPH | 1010.10 |
| Sulphur | % | 0.5 |
| **Estimated emission rates** | | |
| Sulphur dioxide | g/s/unit | 1402.9 |
| Nitrogen oxides | g/s/unit | 534.5 |
| Particulate meter | g/s/unit | 21.4 |

**Step 2. Description of existing Air quality conditions**

Existing air quality conditions can be described in terms of ambient air quality data, emission inventories, and meteorological information which relates to atmospheric dispersion.

**Respirable Particulate Matter ($PM_{10}$):**

A maximum value of 68.5 $\mu g/m^3$ was observed at Mallialpalli (AAQ-2) and minimum value of 41.1 $\mu g/m^3$ was observed at Near FCI Gate (AAQ-4). The average values were observed to be in the range of 44.8 to 51.4 $\mu g/m^3$.

**Particulate Matter ($PM_{2.5}$):**

A maximum value of 40.2 µg/m$^3$ was observed at Mallialpalli (AAQ-2) and minimum value of 20.2 µg/m$^3$ was observed at Near FCI Gate (AAQ4). The average values were observed to be in the range of 22.4 to 30.2 µg/m$^3$.

**Nitrogen Dioxide ($NO_2$):**

Maximum concentration of $NO_2$ is observed to be 32.8 µg/m$^3$ at Mallialpalli (AAQ-2) and minimum value of 14.6 µg/m$^3$ observed at Near FCI Gate (AAQ4). The average values were observed to be in the range of 16.0 to 13.2 µg/m).

**Sulphur Dioxide ($SO_2$):**

Maximum concentration of $SO_2$ is observed to be 23.5 µg/m$^3$ at Mallialpalli (AAQ-2) and minimum value of 12.1 µg/m$^3$ observed at Near FCI Gate (AAQ4). The average values were observed to be in the range of 13.4 to 18.7 µg/m$^3$

**Meteorological information**

The meteorological parameters were recorded on hourly basis during the study period near proposed plant site and comprises of parameters like wind speed, wind direction (from 0 to 360 degrees), temperature, relative humidity, atmospheric pressure.

• Temperature - Min: 9.1C and Max: 36.4C

• Relative Humidity - Min: 20.6% and Max: 93.8%

• Wind speed - -0.2-19 kmph

• Predominant Wind Direction - NE, S and SE

**Step 3. Procurement of relevant air quality standards and regulations**

The primary sources of information on air quality standards, criteria, and policies will be the relevant local, state, and federal agencies which have mandate for overseeing the air resources of the study area.

**Table 3: National ambient air quality standards for concern pollutants**

| Pollutant | Time weighted mean | Concentrated in ambient air | |
|---|---|---|---|
| | | **Industrial zone** | **Sensitive zone** |
| Sulphur dioxide | Annual | 50 | 80 |
| | 24 hours | 80 | 80 |
| Nitrogen dioxide | Annual | 40 | 30 |
| | 24 hours | 80 | 80 |
| $PM_{10}$ | Annual | 60 | 60 |
| | 24 hours | 100 | 100 |
| $PM_{2.5}$ | Annual | 40 | 40 |
| | 24 hours | 60 | 60 |
| OZONE | 8 hour | 100 | 100 |
| | 1 hour | 180 | 180 |

**Step 4. Impact prediction**

Air quality impact prediction can be based on several approaches, including mass balance, mathematical models, and other considerations

The impact on air quality is assessed based on emissions from the proposed power plant. Particulate Matter (PM), Sulphur dioxide ($SO_2$) and Nitrogen oxides (NOx) are the important pollutants emitting from the proposed project.

**Details of Mathematical Modelling**

For prediction of maximum Ground Level Concentrations (GLC's), the air dispersion modelling software (AERMOD version 7.1.0) was used. AERMOD is steady state advanced Gaussian plume model that simulates air quality and deposition fields up to 50 km radius. AERMOD is approved by USEPA and is widely used software. It is an advanced version of Industrial Source Complex (ISCST3) model, utilizes similar input and output structure to ISCST3 sharing many of the same features, as well as offering additional features. The model is applicable to rural and urban areas, flat and complex terrain, surface and elevated releases and multiple sources including point, area, flare, line and volume sources.

The simulations have been carried out to evaluate $SO_2$, NOx and PM likely to be contributed by the proposed project. For the short-term simulations, the concentrations were estimated to obtain an optimum description of variations in concentrations over the site in 10 km radius covering 16 directions.

**Table 4: Predicted concentrations using model**

| Pollutant | Maximum incremental Levels (µg/m3 ) | Distance (km) | Direction |
|---|---|---|---|
| Particulate Matter | 0.52 | 2.2 | SW |
| Sulphur dioxide | 34.22 | 2.3 | SW |
| Nitrogen oxides | 13.04 | 2.2 | SW |

**Step 5. Assessment of impact significance**

Significance assessment refers to interpretation of significance of anticipated changes related to project .one basis for impact assessment is public input; input can be received through a continued scoping process or conduction of public meeting .

**Table 5: Resultant ground level concentrations (24-hourly)**

| Pollutant | Max baseline concentration | Incremental concentration | Resultant | NAAQS limits |
|---|---|---|---|---|
| PM | 68.5 | 69.02 | 69.02 | 100 |
| $SO_2$ | 23.5 | 34.22 | 57.72 | 80 |
| $NO_X$ | 32.8 | 13.04 | 45.84 | 80 |

The fugitive dust emissions expected are from coal storage yards, coal conveyor belt area, ash dumping areas, transportation of fuel and solid waste. In the proposed project coal handling plant will be properly operated with EMP suggested in this report, no major fugitive dust emissions are envisaged. Similarly, HCSD system of ash stacking will be practiced and hence, no dust emissions are envisaged from ash dump areas. The fuel will be received through rail line and the solid waste will be sent to dyke areas through pipeline. Hence, no dust emissions from transportation are envisaged. Further, internal roads are to be asphalted to further reduce fugitive dust emissions.

The dust emissions, if any, from the above areas will be fugitive in nature and maximum during summer season (when the wind velocities are likely to be high) and almost nil during the monsoon season. The dust emissions are likely to be confined to the place of generation only. The quantification of these fugitive emissions from the area sources is difficult as it depends on lot of factors such as dust particle size, specific gravity of dust particles, wind velocity, moisture content of the material and ambient temperatures etc. Also, there is a high level of variability in these factors. Hence, these are not amenable for mathematical dispersion modelling. However, by proper usage of dust suppression measures, dust generation and dispersions will be reduced.

**Step 6. Identification and incorporation of mitigation measures**

The mitigative measures recommended for control of air pollution in the plant are:

- Installation of ESP of efficiency more than 99.99% to limit the Particulate Matter (PM) concentrations below 50 mg/$Nm^3$.
- Provision of twin flue stack of 275 m height for wider dispersion of gaseous emissions.
- Combustion Control for NOx (Low NOx burner).
- Dust suppression and extraction system in Coal Handling Plant.
- Space for retrofitting FGD System in future, if required.
- Provision of water sprinkling system at raw material storage yard.
- Asphalting of the roads within the plant area.
- Online flue gas monitors as well as flue gas flow rates and temperature measurement shall be provided for all stacks.

**4.2 Prediction and assessment of impacts on groundwater**

**Step 1. Identification of ground water quality & quantity impacts of the proposed project**

No ground water source will be tapped for meeting the water requirements during operation of power plant. The entire water requirement of the project will be drawn from a water barrage on a river. Hence, no adverse impact on ground water sources is envisaged. Operation of the thermal power project will not have any long-term impact on water quality as it is proposed to be a minimum discharge plant. The water system of the proposed project has been developed with maximum recycle and reuse of water, so as to reduce the quantity of effluents generated from the plant. The project will have a closed cycle cooling system with cooling towers. Ground water will only be used during construction phase and not during the operational phase of the plant. There is a possibility of decrease in the ground water level during the construction phase. Also there could a contamination of ground water by various pollutants during this phase. Sewage from the labour colony can potentially contaminate the ground water.

**Step 2. Description of existing ground water conditions**

**Table 6: Existing groundwater conditions**

| Parameters | Units | Existing values |
|---|---|---|
| pH | -- | 6.98 |
| Turbidity | NTU | 16 |
| TDS | mg/l | 872 |
| Total hardness as $CaCO_3$ | mg/l | 445 |
| Total alkalinity | mg/l | 430 |
| Chlorides | mg/l | 126 |
| Total coliforms | MPN/100 | Nil |

**Step 3. Procurement of relevant groundwater standards**

**Table 7: General groundwater standards**

| Parameters | Units | Permissible standards |
|---|---|---|
| pH | -- | 6.5 – 8.5 |
| Turbidity | NTU | 5 |

| | | |
|---|---|---|
| TDS | mg/l | 500 |
| Total hardness as $CaCO_3$ | mg/l | 300 |
| Total alkalinity | mg/l | 200 |
| Chlorides | mg/l | 250 |
| Total coliforms | MPN/100 | 10 |

**Step 4. Impact prediction**

No adverse impact on the ground water was predicted as it was only to be used during the construction phase. Decrease in ground water level may be noted in the vicinity of the plant during the mentioned phase. As there are no inhabitants living there so its impact can be easily overlooked. Untreated sewage may contaminate the ground water which may originate from the labor colonies.

**Step 5. Assessment of impact significance**

For the assessment of impact significance we need to construct the Leopold matrix. It is a tool which can be used effectively to judge the significance of a proposed project on a particular environmental parameter or all the parameters at a once.

**Table 8: Leopold matrix for impact on ground water**

| Environmental items | Construction phase |
|---|---|
| Ground water | 2/10 / 2/10 |

Note – A scale of 1 to 10 was used in the above matrix. 1 was used to signify least negative impact whereas 10 signifies the highest negative impact of a project.

So from the above shown Leopold matrix we can conclude that the project is not having any significant impact on the ground water and thus the project could go on.

**Step 6. Incorporation of mitigation measures**

As the project is not having any significant impact on the ground water so the application of mitigation measures in not compulsory. But during the construction phase proper measures could be taken to minimize the usage of water so that there is a lesser drop in the ground water level. Sewage generated from the labor colonies should be treated by using soak pit or septic tanks. This will decrease the chances of the contamination of the ground water.

**4.3 Prediction and assessment of impacts on surface water**

**Step 1. Surface water impacts**

- Construction phase
  - Run-off from storage areas of construction material.
  - Run from construction debris.
  - Run-off from Storage Areas of Erection site – oil & paints.
  - Effluent from labour colonies.
- Operational phase
  - Effluent from oil and coal storage areas, coal dust suppression systems etc.
  - Reduced availability of water for downstream users.
  - Effluent from various processes containing heavy metals, oil and grease and nutrients (N,P).
  - Thermal Pollution in discharging stream.

**Step 2 and Step 3. Existing environment description and relevant standards**

**Table 9: Surface water permissible limits and measured value**

| Parameter | Units | Permissible limits | Measured value |
|---|---|---|---|
| pH | - | 6.5 – 8.5 | 8.34 |
| TDS | mg/l | 500 | 397 |
| DO | mg/l | 5 | 6.2 |
| BOD | mg/l | - | < 3.0 |
| Total Hardness as $CaCO_3$ | mg/l | 300 | 176 |
| Total alkalinity as $CaCO_3$ | mg/l | 200 | 168 |
| Nitrate as $NO_3^-$ | mg/l | 45 | 0.2 |
| phosphate | mg/l | - | 1.0 |
| Coliform | MPN/100 | 10 | 5 |
| Zinc | mg/l | 5 | 1.24 |
| Copper | mg/l | 0.05 | 0.18 |
| Iron | mg/l | 0.3 | 0.26 |
| Chromium as $Cr^{+6}$ | mg/l | 0.05 | < 0.05 |
| Chloride | mg/l | 250 | 45.7 |
| Oil & Grease | mg/l | 10 | < 1.0 |
| temperature | $^{o}$ C | 20 | 25 |

**Step 4. Impact Prediction**

**Table 10: Surface water permissible limits and discharge value**

| Parameter | Units | Permissible limits | Discharge value of mixed stream |
|---|---|---|---|
| pH | - | 6.5 – 8.5 | 4 |
| TDS | mg/l | 500 | 7000 |
| DO | mg/l | 5 | 1 |
| BOD | mg/l | - | 250 |
| Total Hardness as $CaCO_3$ | mg/l | 300 | 1600 |
| Nitrate as $NO_3^-$ | mg/l | 45 | 15 |
| Phosphate | mg/l | - | 5 |
| Coliform | MPN/100 | 10 | - |
| Zinc | mg/l | 5 | - |
| Copper | mg/l | 0.05 | - |
| Iron | mg/l | 0.3 | - |
| Chromium as $Cr^{+6}$ | mg/l | 0.05 | - |

| | | | |
|---|---|---|---|
| Chloride | mg/l | 250 | 300 |
| Oil & Grease | mg/l | 10 | 45 |
| Temperature | $^o$ C | 20 | 110 |

**Table 11: Parameter values in effluent**

| **Parameter** | **Units** | **Permissible limits for discharge to stream** | **Value in the effluent** |
|---|---|---|---|
| pH | - | 6.5 – 8.5 | 5.5 |
| temperature | $^o$ C | 20 | 30 – 35 |
| Suspended solids | mg/l | 30 | 150 |
| $BOD_5$ | mg/l | 30 | 200 |
| Nitrates as $NO_3^-$ | mg/l | 45 | 50 |
| Phosphates | mg/l | - | 8 |

- The construction phase water stream has a discharge rate of 0.002 cusec and flows into a stream of discharge 15 cusec
- Effect negligible.

**Table 12: Overall assessment of parameters in surface water**

| **Parameter** | **Units** | **Permissible limits for discharge to the stream** | **Expected values** | **Values in the river** | **Final concentration after mixing** |
|---|---|---|---|---|---|
| pH | - | 6.5 – 8.5 | 5.5 | 8.34 | 8.340 |
| Temperature | $^o$ C | 20 | 35 | 25 | 24.997 |
| Suspended solids | mg/l | 30 | 400 | 50 | 49.998 |
| $BOD_5$ | mg/l | 30 | 250 | 2 | 2.053 |
| Nitrates as $NO_3^-$ | mg/l | 45 | 55 | 0.2 | 0.233 |
| Phosphates | mg/l | - | 5 | 1 | 1.007 |
| Oil & grease | mg/l | 10 | 50 | 1 | 1.001 |
| Paints and thinners | mg/l | 1 | 36 | 0.2 | 0.207 |
| Spent automobile oils | mg/l | 1 | 45 | 0.05 | 0.055 |

**Step 5. Assessment of impact significance**

- Small populated town 50 km downstream
- Water drawn from the same stream
- Hence quality of water in this context – 5 out 10
- Leopold matrix for various components
- Marks allotted on a scale of 1 to 10 with 10 being for best quality.

**Table 13: Operational and Constructional phase details**

| **Surface water** | **Operational phase** | | **Construction phase** | |
|---|---|---|---|---|
| | **Context** | **Intensity** | **Context** | **Intensity** |
| pH | 5/10 | 3/10 | 5/10 | 6/10 |
| TDS | 5/10 | 1/10 | 5/10 | 8/10 |
| DO | 5/10 | 2/10 | 5/10 | 6/10 |
| BOD | 5/10 | 1/10 | 5/10 | 1/10 |
| Total Hardness as CaCO3 | 5/10 | 1/10 | 5/10 | 1/10 |
| Nitrate as NO3 - | 5/10 | 8/10 | 5/10 | 3/10 |
| Phosphate | 5/10 | 2/10 | 5/10 | 2/10 |
| Coliform | 5/10 | 9/10 | 5/10 | 2/10 |
| Chloride | 5/10 | 2/10 | NA | |
| Oil & Grease | 5/10 | 3/10 | 5/10 | 3/10 |
| Temperature | 5/10 | 1/10 | 5/10 | 8/10 |
| Suspended Solids | 5/10 | 1/10 | 5/10 | 2/10 |
| **Total Score awarded** | **5/10** | **3/10** | **5/10** | **4/10** |

**Step 6. Mitigation measures**

The following mitigation measures are to be adopted

- Separate sewage treatment scheme for the township
- Process alternatives
  - ash water recycling and
  - boiler water recirculation.
- Treatment plant for treating the plant effluent
- ESP and other air pollutant equipment wash water pre – treatment before discharge
- Alternative technology
  - reduce water usage such as preheating of coal with spent water recirculation.
  - recycle wash water.

## V. CONCLUSION

With rapid industrialization and urbanisation in India the need for power availability too drastically increased since the fall of the century. Thus, it has become unreasonable to allow blockade of industries and with the ever expanding stress on nature, impact prediction studies such as this and their application is the sole way forward in maintaining caution and protection of natural resources.

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