Middle-East Journal of Scientific Research
24 (Recent Innovations in Engineering, Technology, Management & Applications): 152-159, 2016
ISSN 1990-9233; © IDOSI Publications, 2016
DOI: 10.5829/idosi.mejsr.2016.24.RIETMA124

Case Study On Environmental Impact Due To Industrial Waste Water In Vellore District, Tamil Nadu, India Using Geospatial Techniques

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Abstract: The study area will be demarcated in Vellore district based on the drainage conditions to assess the quality of surface and subsurface water using geospatial technology. The study area will be falling in a part of Palar River basin. Survey of India Toposheets (SOI) and Satellite imageries will be used to demarcate the study area. Various thematic maps pertaining to the study such as topography, drainage, land use, geomorphology, lineament, soil, geology will be prepared using Remote Sensing and GIS techniques. Various secondary data such as borehole lithology, groundwater levels, groundwater quality, crop details etc will be collected from various government departments. Field visits will be carried out in the watershed during various monsoon seasons to collect well inventory details, surface water samples, groundwater samples, municipal solid wastes, leachate and effluents. All the samples will be tested for various major ions, minor ions and trace elements in the laboratory using standard procedure. The analytical data will be interpreted to know the level of pollution of surface and groundwater quality. Land use/Land cover change detection analysis will also be carried out using GIS. Finally suitable remedial measures will be suggested to control the pollution of surface and groundwater and also suitable sites will be identified to dispose the municipal solid waste.

Key words: Pollutions · Environmental Degradation · Surface · Subsurface Water · Remote Sensing · GIS

INTRODUCTION

In this project the Environmental Impact Due To Industrial Waste Water in the vellore will be identified [1]. All the samples will be tested for various major ions, minor ions and trace elements in the laboratory using standard procedure [2]. The analytical data will be interpreted to know the level of pollution of surface and groundwater quality [3]. Water samples were collected in two types. One water is from Industry waste water another water is from is form usage of ground water (bore well water). Land use/Land cover change detection analysis will also be carried out using GIS [4]. Finally suitable remedial measures will be suggested to control the pollution of surface and groundwater, and also suitable sites will be identified to dispose the municipal solid waste [5].

Aim and Objectives:

- To create spatial Digital database consisting of Landuse / Landcover, Topography, Drainage, Soil, Geomorphology, Lineament and Geology with the help of satellite imageries and ground data using GIS.
- To Create Digital Elevation model of the study area.
- To analyze the environment, health and economical trade of wastewater.

MATERIALS AND METHODS

Environmental Works
Need for the Study:

- The untreated industry wastes and effluent dumped into the nearby water bodies by the factories lead to water pollution.
- The industry polluting water are paper, chemical, textile and dyeing, oil refineries, electroplating and the tanneries.
- This polluted water becomes unfit for human use and also for irrigation. It also affects the marine life.
- This water when used by human beings leads to different water borne diseases and the harmful substances pass into the food products when used for irrigation.

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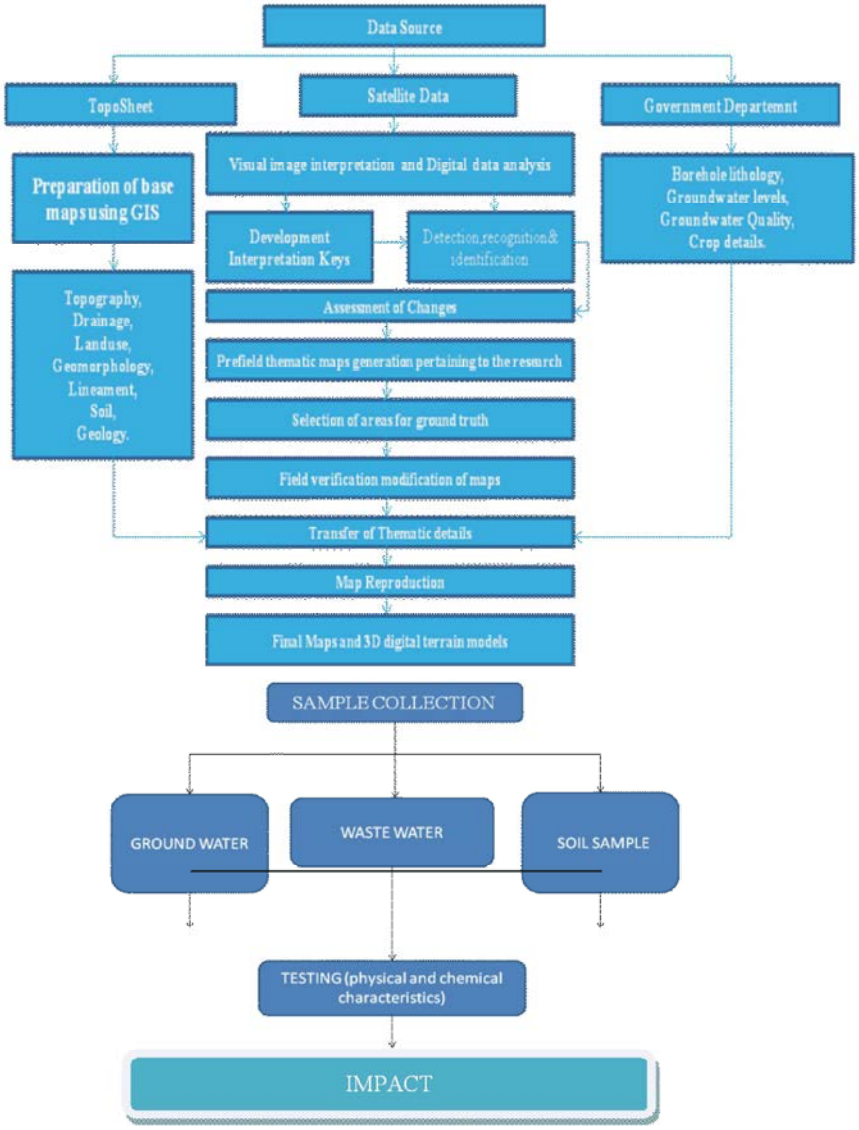

- Thermal pollution of water is the rise or fall in the temperature of a natural body of water caused by human influence. A common cause of thermal pollution is the use of water as a coolant by power plant and industrial manufactures.
- When water used as a coolant is returned to the natural environment at a higher temperature the change in temperature impacts organisms by
- Decreasing oxygen supply and
- Affecting ecosystem composition.
- This is caused by the presence of man-made chemicals or other alteration in the natural soil environment.
- This type of contamination typically arises from the rupture of underground storage tanks, application of pesticides, percolation of contaminated surface water to subsurface strate, oil and fuel dumping, leaching of wastes from landfills or direct discharge of industrial wastes to the soil.
- The most common chemicals involved are petroleum hydrocarbons, solvents, pesticides, lead and other heavy metals. This occurrence of this phenomenon is correlated with the degree of industrialization and intensity of chemical usage.
- The concern over soil contamination stems primarly from health risks, both of direct contact and from secondary contamination of water supplies.
- To increase the utilization of waste water.
- To increase the productivity of the crops using waste water.
- To reduce the usage of groundwater or other sources of water for irrigation purposes.

- Low cost source of water supply.
- Reliable, constant water source allows multiple cultivation cycles and flexibility of crops planted.
- Effective use of plant nutrient contained in the wastewater (such as nitrogen and phosphorus).
- Allow higher crop yields, a yearly production and increases the range of crops that can be irrigated, particularly in arid and semi-arid areas.
- Can also reduce the demand for fertilisers especially where the wastewater is not diluted, i.e. make crop nutrients more accessible to poor farmers.

Fig. 1.1: Supply of bore well water

Fig. 1.2: Formation of salts in the field due to the usage of industrial waste water

Fig. 1.3: Environmental Pollutions

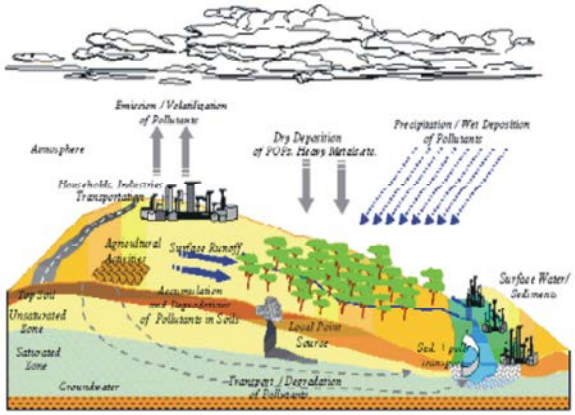

Fig. 1.4: Environmental Process with Industrial Pollutions

Details of Study Area:

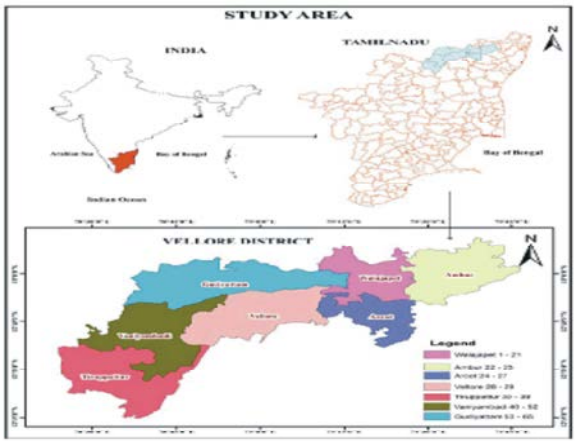

Fig. 1.5: Vellore District

- Name of the District : Vellore
- Geographical Position:

North Latitude Between 12 °15' and 13 °15 '
East Longitude Between 78°20' and 79°50'

- Total Geographical area : 5920.18 Sq.km
- Palar River:12.4678° N, 80.1544° E
- Palar is a river of southern India. It rises in Nandi Hills, India in Kolar district of Karnataka state and flows 93 km in Karnataka, 33 km in Andhra Pradesh and 222 km in Tamil Nadu before its confluence into the Bay of Bengal at Vayalur about 100 km south of Chennai.
- It flows as a Guptagamini (underground course) for a long distance only to emerge near Bethamangala town, from where, gathering water and speed, it flows eastward down the Deccan Plateau.

- The cities of Ramanaickenpet, Vaniyambadi, Ambur, Vellore, Melvisharam, Arcot, Walajapet (Anaicut), Kanchipuram and Chingleput are located on banks of Palar River. Of all the total of seven tributaries, the chief tributary is Cheyyar River.

Fig. 1.6: Palar River Flow from Vellore

Pictorial Representation of Parameters: The various parameter such Land use, Rainfall, Drainage, Geology, Geomorphology and Soil map of Vellore is shown in below figures were generate with the help of Remote Sensing and Geographical Information System analysis. The various image processing technique used in this analysis such as parallelepiped, Minimum Distance, Mahalanobis Distance, Maximum Likelihood, Spectral Angle Mapper, Spectral Information Divergence, Binary Encoding, Neural Net, ISO data and K-means with the help of ENVI and ERDAS image processing software.These factor should consider for the initial process for Industrial Pollution occur in Surface and sub surface water quality from vellore , these clearly shows the rain fall data, drainage possibilities and existing, land coverage details, structure and features of earth surface.

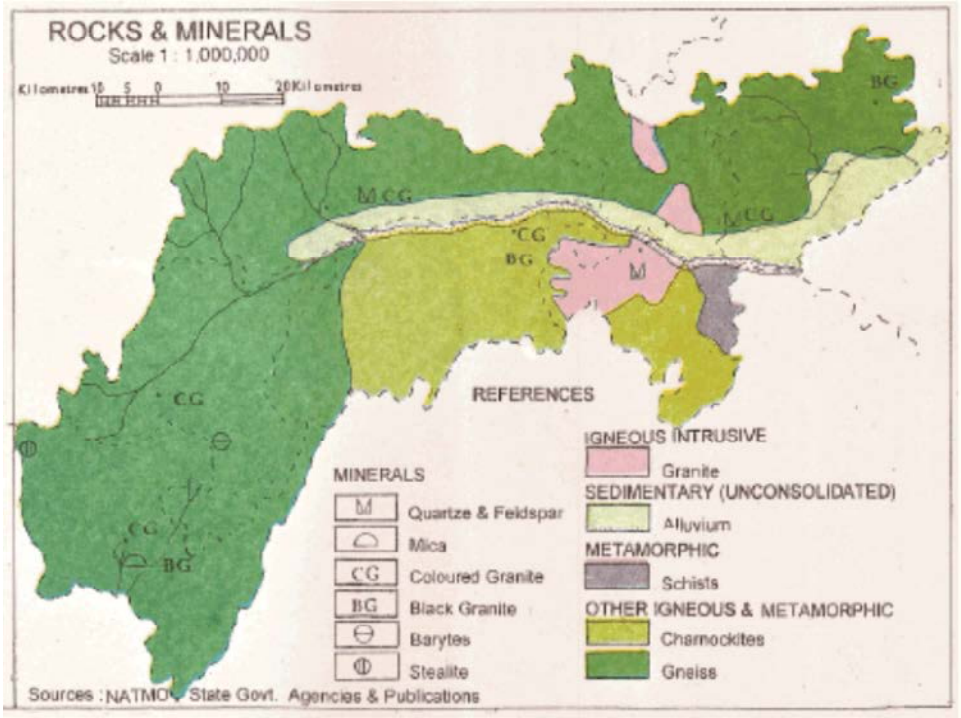

Fig. 1.7: Rocks and Minerals Content in Vellore

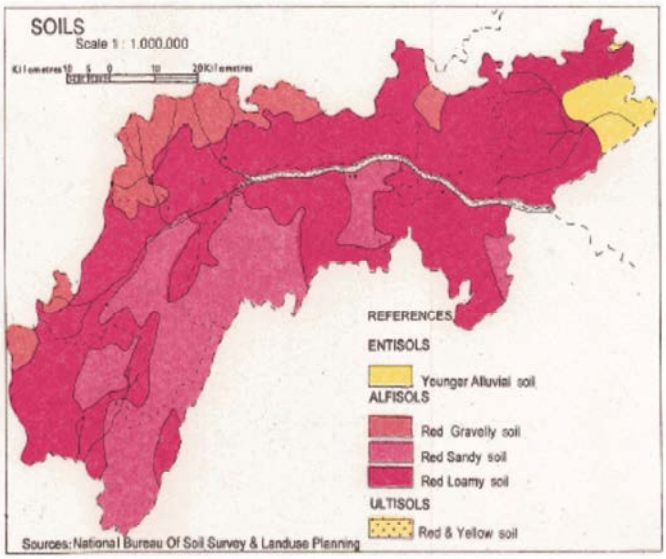

Fig. 1.8: Soils Classification in Vellore

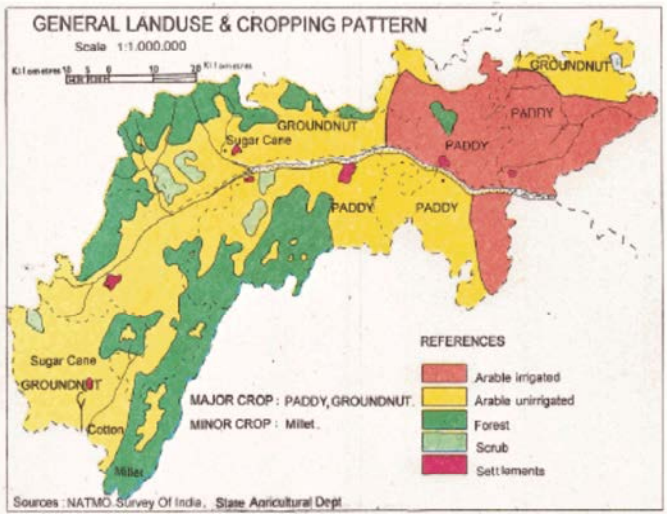

Fig. 1.9: Landuse & Cropping Pattern in Vellore

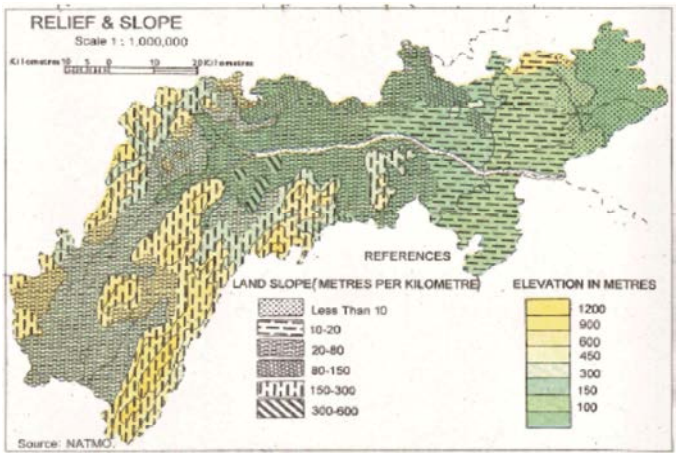

Fig. 1.10: Relief & Slope in Vellore

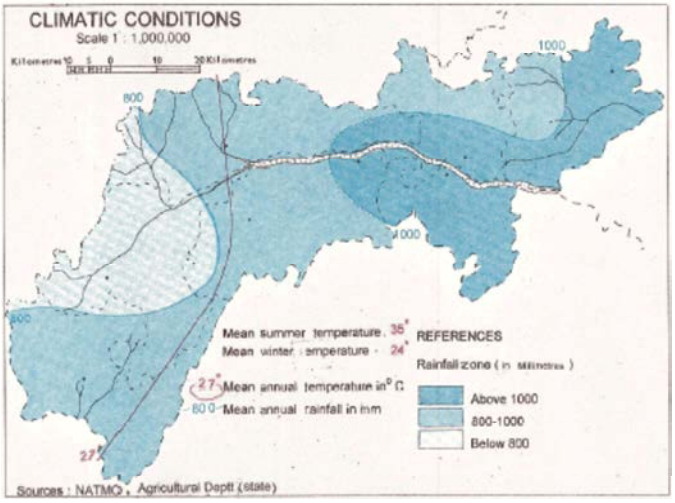

Fig. 1.11: Climatic Conditions inVellore

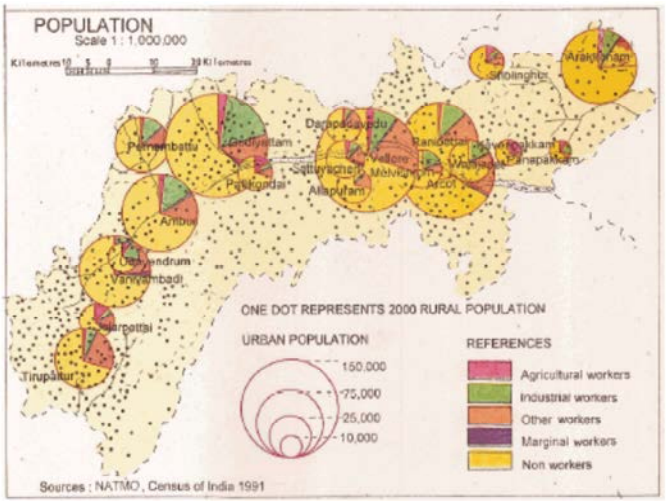

Fig. 1.12: Population working field in Vellore

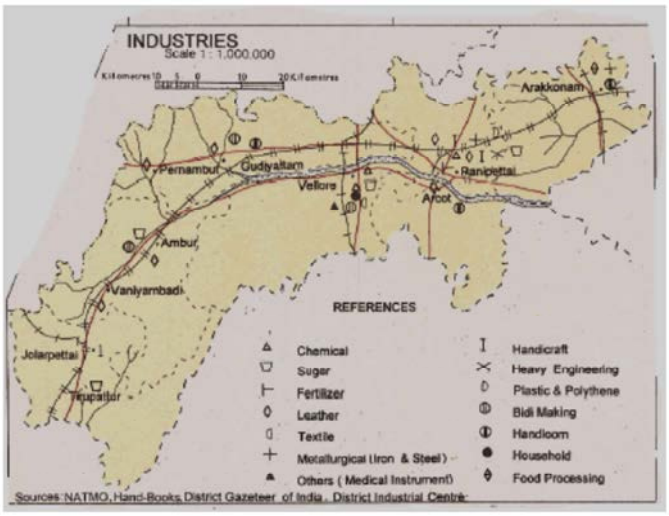

Fig. 1.13: Industrial Classification in Vellore

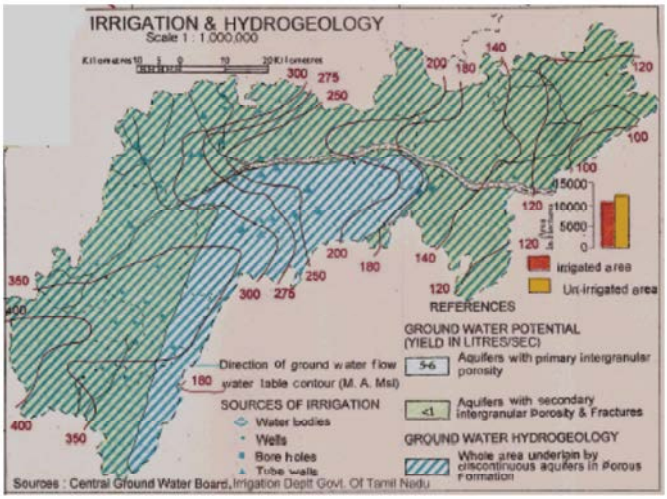

Fig. 1.14: Irrigation & Hydrogeology in Vellore

RESULTS AND DISCUSSIONS

Water samples were collected in two types. One water is from Industry waste water another water is from is form usage of ground water (bore well water).

The waste water sample is collected from sugar mill and ground water is collected from vaniyambadi, valayampet, perumalpet at near RS International. The physical and chemical tests have been carried out on the water samples and the following results were identified.

Table Results: Thephysico-chemical parameters were identified for the water sample which was collected in RS International and the results are shown in Table 1 & 2.

Table 1: INLET

Date	03/02/2016	10/02/2016
Appearance	Yellowish	Yellowish
Odour	Septic	Septic
Turbidity Nt Units	64	68
Total Solids	630	625
Total Dissolved Solids	560	570
Electrical Conductivity	800	815
Ph	8.13	8.2
Alkalinity Ph	0	0
Alkalinity Total	112	105
Total Hardness as Caco3	124	124
Calcium as ca	30	29
Sodium as Na	110	101
Potassium as K	28	28
Iron as Fe	1.5	1.5
Free Ammonia as Nh3	3	3.5
Nitrite as No2	1.5	1.7
Nitrate as No3	14	10
Chioride as Ci	100	100
Fluoride as F	0.4	0.36
Sulphate as So4	124	120
Phosphate as Po4	1.9	1.7

Table 2: Bore Water Results(02/02/2014)

Parameters/ Places.	Vaniyambadi	Valayampet	Perumalpet
Appearance	Colourless	Colourless	Colourless
Odour	None	None	None
Turbidity Nt Units	0	0	0
Total Solids	1291	1187	3549
Total Dissolved Solids	1291	1187	3549
Electrical Conductivity	1844	1696	5070
Ph	7.29	7.87	7.49

Table 3: Quality Classification of Irrigation Water (USDA)

Water class	EC in μ mhos/cm at 25°C	Sodium adsorption ratio (SAR)
Excellent	<250	Up to 10
Good	250-750	10-18
Medium	750-2250	18-26
Bad	2250-4000	>26
Very Bad	>4000	-

Soil Test Result: Soil samples were collected in two types, one soil is from waste water and another soil is from bore well usage. The various test have been carried out in PEC lab and the following results have been shown in Table 6.

Table 4:

Parameter	Industrial soil	Agricultural soil
P_H	8.29	7.86
EC (dsm^{-1})	0.42	0.38
Organic carbon (%)	0.402	0.32
Avail. Nitrogen (%)	182	165
Avail.phosphrous (%)	12	11.50
Avail. Potassium (%)	113	146
Exchangeable ca	8.43	5.67
Exchangeable mg	2.46	3.70

- In this table shows the test results of various parameter values of industrial and agricultural soil.
- By the usage of industrial waste water in agriculture the parameter values get vary due to some content are excess in industrial waste water.
- Due to over usage of irrigation waste water, the soil get affected.

Result Analysis: From the test results, it shows that the soil gets affected due to the over usage of industrial waste water. So that the biological treatment is necessary for industrial waste water to increase the productivity of crop yield and also primary treatment is needed for bore well water for avoiding the clogging of agricultural land area.

CONCLUSION

Based on the results obtained, the following conclusions are made. Sufficient treatment is needed for the usage of waste water in agriculture. Soil gets affected due to excess usage of industrial waste water and yield is very less when compared with bore well water. So, biological treatment is preferred for industrial waste water and primary treatment is needed for bore well water to use them for agricultural purposes effectively. We can assure a sustainable growth and development by this treatment.

This project provides information at a provincial level about the various parameters for Environmental Degradation Due to Industrial Pollution. The study shows the environmental and social factor are majorly affected by surface and subsurface water quality. The palar Rivers origin and settling area present inside the Tamilnadu, so there is no possibility of confliction among the states. While occur the pollution from this rivers, these rivers unquestionably the total Tamilnadu water scarcity will be reduced, majorly the following area Vaniyambadi, Ambur, will get benefit and possibility of increase the water storage capacity for the irrigation and drinking purpose. In other hand of Palar Rivers helps to control the floods in Tamilnadu and the surplus water flow may be used for diverse purpose such as Agriculture, Irrigation, Electric power generation and so on.

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