# PREDICTION OF FUTURE SURFACE WATER QUALITY IN TIRUCHIRAPPALLI DISTRICT USING SPSS SOFTWARE

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## ABSTRACT

**Climate change could have significant impacts on surface water resources around the world because of the connections between the climate and hydrological cycle. Rising temperatures will increase evaporation and lead to increase in precipitation through there will be regional variations in rainfall. Both drought and floods may become more frequent in different region at different times, and dramatic changes in snowfall and snow. In this present study the water quality index is calculated. Then the water quality index is predicted using regression model. Commonly used techniques for predictionare regression analysis, weka tool, and ANN (Artificial Neural Network). The regression model is drive for most correlate parameters. The water quality index is analyzed in six taluks of Tiruchirappalli district. The Water quality index in Tiruchirappalli is higher in Musiri and lower in manikandam. But Water quality index trend is decrease in future.**

**Keywords: Water quality parameter, Water Quality Index(WQI), Regression model, Predictor, SPSS Software.**

## 1. INTRODUCTION

Climate change also called global warming refers to the rise in average surface temperature on earth. The impacts of climate change currently predicted for India include rise up to 40°C in surface air temperature by 2100. This would cause decline in almost one third of the yields from rain fed grain crops, and a rising number of extreme weather events, such as droughts, floods and cyclones. A precious gift of nature to mankind is water and millions of other species living on the earth. The total water resources available in India are 1859 $km^3$, which is roughly 4% of the world's fresh water resources. It is becoming a scare commodity in most part of the world. Tamil Nadu accounts for 4 per cent of the land area and 6 percent of the population, but only 3 percent of the water resources of the country. Climate change mainly affects the water resource. Higher temperatures will also affect water quality and possible impacts include increased eutrophication. Climate change could also mean an increase in demand for farm irrigation, garden sprinklers, and perhaps even swimming pools. Change in climate has and will continue to have a profound impact on the water sector through the hydrologic cycle, water availability, water demand, and water allocation at the global, regional, basin, and local levels.

### 1.1 OBJECTIVE

To analyze the water quality parameter in Tiruchirappalli district.

- To calculate the Water Quality Index (WQI) up to 2015.
- To drive the REGRESSION model using Water Quality Index.

### 1.2 STUDY AREA

The study that is chosen in this studies is Tiruchirappalli which consists of 11 taluks and the coordinate of the district is 10º47'40.56"N and 78º41'6"E and it is located at 88mm above the MSL. The six main taluks are Lalgudi, Manaparai, Manikandam, Musuri, Thyraiyur and Thuvakudi were the temperature, surface water quality parameters readings were taken. The surface water quality parameter are given by state ground & surface water data center, Chennai. From the data it is come to know that during the summer months of March to May it is extremely hot and dry during day time in our study area. In summer season the temperature is exceed the 105° F. The Study area is shown in fig 1.

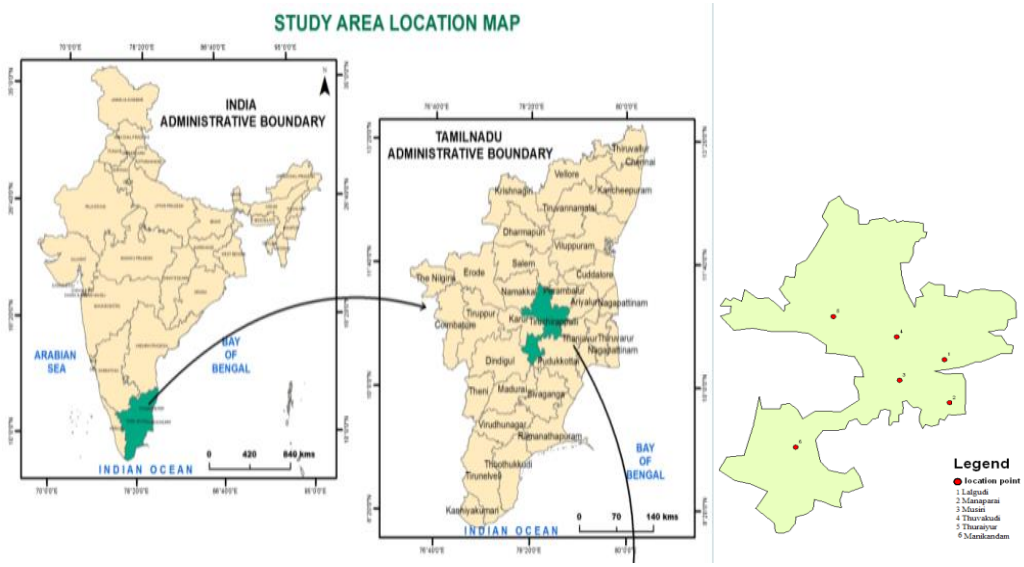


Fig.1.- Study Area Map

### 2.Materials and methods

The Surface water Quality parameters are collected for the past 25 years from state ground & surface water data center, Chennai. The temperature data are collected from Indian Meteorological Department. The WQI is calculated using collected Meteorological data and it used to drive the regression models.

### Water Quality Index

The water quality index is calculated by using VBEE (Virtual Board Environmental Education) method. The WQI means a single value is numerically summarizes from multiple water quality parameters.

$$\mathbf{WQI = \Sigma W_Y Q_Y / \Sigma W_Y}$$

Here,

Y = available Water Quality Parameters

$Q_Y$ = q- value of the parameters

$W_Y$ = weighting factors of available parameters.

**Q-Value** – Indication of water quality relative to 100 of 1 parameter.

**Weighting Factor** – sets the relative importance of the parameter to overall water quality.

Table. 1. Water Quality Index Range

| Water Quality Index Range | Condition |
|---|---|
| 90-100 | Excellent |
| 70-89 | Good |
| 50-69 | Medium |
| 25-49 | Bad |
| 0-24 | Very Bad |

## 3. Result and Discussion

The water quality index is calculated using surface water quality parameters. The six taluks water quality index is expressed in given figures. In Musiri water quality index is better compare to another selected 5 taluks. The water quality index in Manikandam is poor compared to other taluks. Then the WQI is downward trend in all six regions.

The Water Quality Index is predicted using model. The trend of WQI is in downward direction. In 2080 the surface water is no fit for any purpose due to temperature increases. The temperature increase affects the water quality parameters. So, the WQI is reduced. The major reason for temperature rise is urbanization, GHG emission rate increase, industrialization. The water quality parameters are affected by temperature.

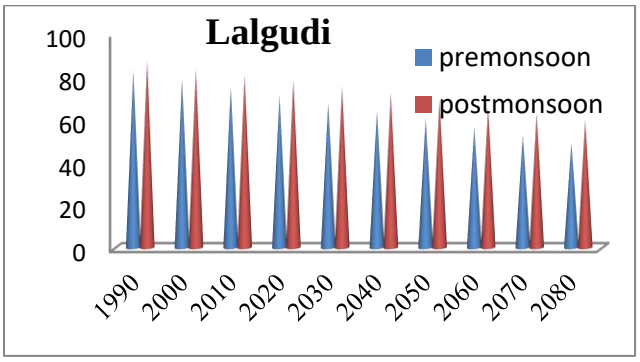


Figure 2.WQI for Lalgudi

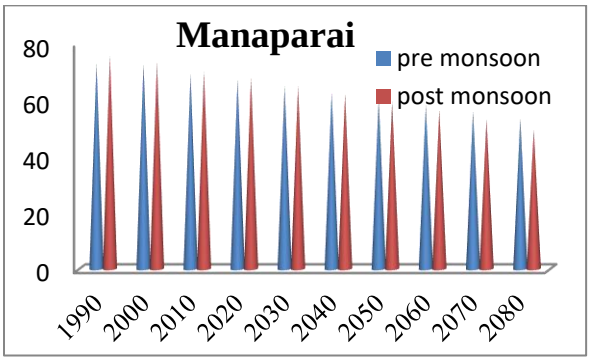


Figure 3.WQI for Manapparai

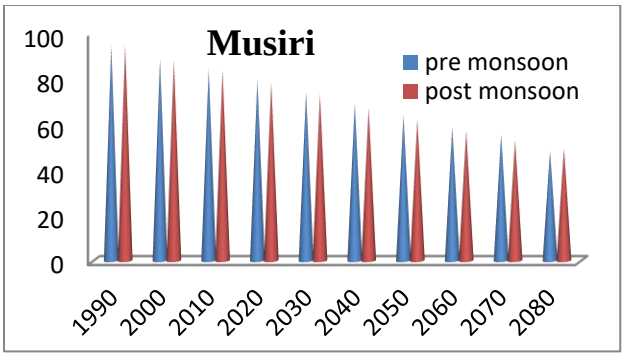


Figure 4. WQI for Musiri

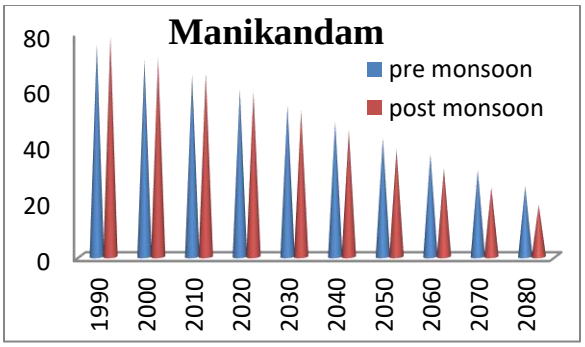


Figure .5. WQI for Manikandam

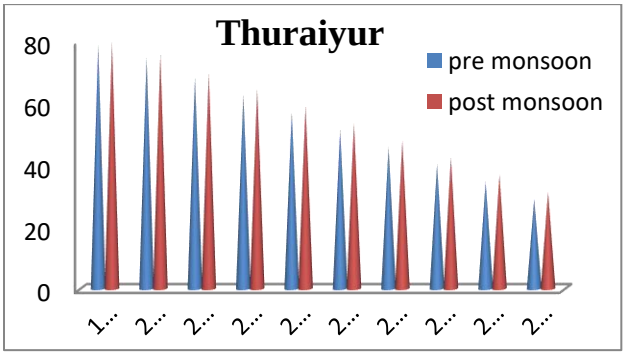


Figure 6. WQI for Thuraiyur

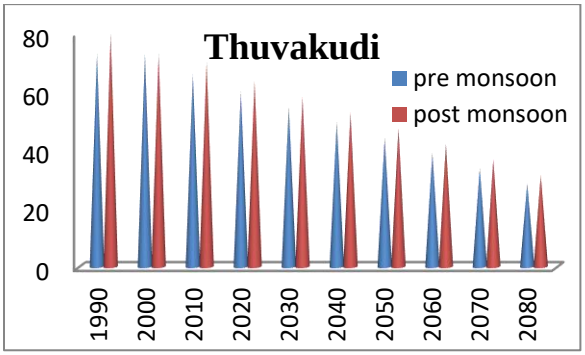


Figure 7. WQI for Thuvakudi

In simple regression there are only two variables where one is the dependent variable and other is the independent variable and relation among them is of kind as below. This is known as the deterministic model.

$$Y = A + BX$$

Here Y = Dependent variable

X = independent variable

A, B = Regression parameters

Tables 4.2 showing Water quality and temperature arein decreasing trend. Then the precipitation and Water quality is in increasing trend for Tiruchirappalli district. In pre monsoon the temperature is influenced the Water quality index in Manaparai. In post monsoon the temperature is influenced the Water quality index in Lalgudi. Then the precipitation is influenced the water quality index in lalgudi for pre monsoon and post monsoon.

Table: 4.2 Regression equation and $R^2$ value for WQI Vs Temperature

| | **Pre monsoon** | | **Post monsoon** | |
|---|---|---|---|---|
| | **Regression equation** | **$R^2$ value** | **Regression equation** | **$R^2$ value** |
| **Lalgudi** | y = 0.0831x + 26.038 | 0.0084 | y = 1.04x + 1.4578 | 0.1729 |
| **Manaparai** | y = 0.4557x + 12.201 | 0.5103 | y = 0.9966x - 0.4959 | 0.4598 |
| **Manikandam** | y = 0.0157x + 28.12 | 0.0005 | y = 0.4014x + 15.362 | 0.0699 |
| **Musiri** | y = 0.3806x + 13.319 | 0.3016 | y = 0.4549x + 13.057 | 0.0656 |
| **Thuraiyur** | y = 0.2406x + 22.065 | 0.1484 | y = 0.1133x + 25.533 | 0.0041 |

| | | | | |
|---|---|---|---|---|
| **Thuvakudi** | y = 0.1454x + 21.218 | 0.1018 | y = 0.1523x + 21.592 | 0.0064 |
| **Trichy average** | y = 0.1971x + 21.003 | 0.1999 | y = 0.642x + 9.862 | 0.0962 |

Table: 4.3 Regression equation and $R^2$ value for WQI Vs Precipitation

| | **Pre monsoon** | | **Post monsoon** | |
|---|---|---|---|---|
| | **Regression equation** | **$R^2$ value** | **Regression equation** | **$R^2$ value** |
| **Lalgudi** | y = -1.1406x + 30.352 | 0.3104 | y = -0.81x + 30.504 | 0.3131 |
| **Manaparai** | y = -0.4483x + 28.194 | 0.0415 | y = -0.164x + 28.159 | 0.0138 |
| **Manikandam** | y = -0.2903x + 29.077 | 0.0325 | y = -0.3463x + 27.972 | 0.2034 |
| **Musiri** | y = -0.2567x + 26.229 | 0.0129 | y = -0.3165x + 25.626 | 0.1825 |
| **Thuraiyur** | y = -0.5375x + 30.686 | 0.0858 | y = -0.1408x + 28.984 | 0.0779 |
| **Thuvakudi** | y = -0.6193x + 26.786 | 0.1882 | y = -0.1198x + 26.21 | 0.1023 |
| **Trichy average** | y = -0.1784x + 27.86 | 0.0152 | y = -0.2246x + 27.73 | 0.14 |

## 4. CONCLUSION

Climate change impacts within surface water systems include changes in runoff, river flow and groundwater storage. Inaddition to these quantitative aspects, some water quality parameters are also expected to change. With respect to biogeochemical water quality, most climate change impacts can be attributed to changes in temperature and precipitation. The impact of climate change on surface water quality is highly dependent on the future evolution of temperature, rainfall as well as on other meteorological and physical parameters. The present study showed that surface water quality index is 22.618 to 31.868 and 23.92 to 32.235 for pre monsoon and post monsoon respectively. In the post monsoon the water quality is good compare to pre monsoon. Because the temperature is high in pre monsoon as well as precipitation is less in our study area. So, the impurities present rate in water is higher than post monsoon. The study areas are Lalgudi, Manaparai, Manikandam, Musiri, Thuraiyur, and Thuvakudi. The water quality is Musiri > Thuvakudi > Manaparai > Manikandam > Lalgudi > Thuraiyur for pre monsoon and post monsoon.

The study concluded that the water quality in Musiri is good and Thuraiyur is least. However, climate change may results in these parameters changing by other processes that increased air temperature. For instance, if climate change increases runoff, it is very likely that some parameters, particular those related to soil erosion, will also change in the future. If the water quality was studied for other purposes, e.g. aquatic habitat conditions, the selected criteria as well as thresholds would be very different than the one used in the present study. For instance, a good body of research is showing that from an aquatic habitat perspective, some surface water bodies are currently experiencing close to lethal water temperatures (30˚C) in summer. Such

high temperatures may not have a great influence on drinking water quality, but may have a significant impact on aquatic organism population as well as for other cold water species.

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