

# MUTTUKADU LAKE WATER QUALITY IN TERMS OF WATER QUALITY INDEX AND WATER QUALITY PARAMETERS

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**Abstract:** *Lake is a region with water bordered by land. Lake is more contrasted to river. The main difference between rivers and lakes is the movement of water, in river the water moves along its, but the lakes are surround by the land. In maintaining ecological balance lakes play an important role in urban areas the water from the lake is used for many purposes and also for irrigation. Muttukadu Lake is a famous lake located on the east coast road (ECR) at muttukadu. In this work deals with the detection of water quality index value based upon Weighted Arithmetic key method by examining various characteristics such as pH value, conductivity of electricity data, Total stiffness value, amount of magnesium content and calcium contents, Total solids dissolved in water etc to analyze the quality level of water all the purposes. Here in this implemented paper the samples from the Muttakdu lake is collected and the parameters and checked with the collected samples.*

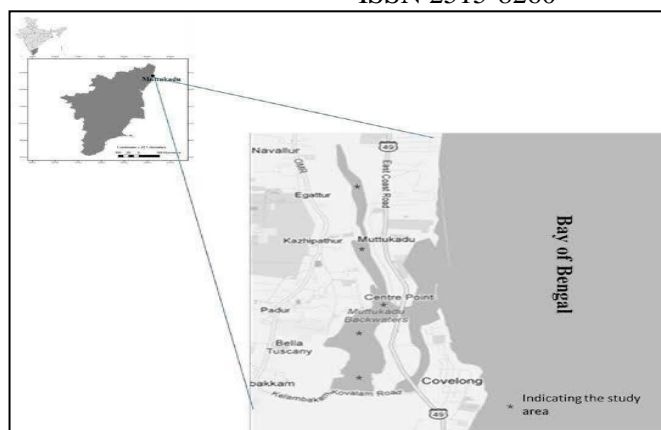
**Keywords:** *Water Quality, Weighted Arithmetic Index Method, Parameters, Ph Value.*

## 1. Introduction:

Water is the important resources received from nature. Without water the people cannot live in the world. Hence water is considered as an essential factor for human life. Water is used for several purposes. As population increases water pollution is also increased. Many water resources are engaged by common people. Due to this number of water resources are reduced. Theater which is polluted creates more diseases. To manage this problem analyzing the water quality is important. In urban India water pollution is one of the major issues. Now-a day the water is not in a good quality for utilizing it. The water is polluted because of industries, and the sewages which emerge in the lake water. Because of utilizing the water which is of less quality sometimes it leads to some critical situation at last, as this many disease. So, there is a need to provide a good quality of water, so in this proposed the water which is used for certain purposes can be analyzed. Here the water sample form the Muttukadu Lake is analyzed. Mutukadu is a famous lake located at Chennai. A bamboo boat house and a floating boat jetty are also present at Muttukadu. But now Mutukadu lake water is no more exceptions. The following amp shows the location of Muttukadu Lake located at ECR.

The balance part of the work is arranged as: section two explains the various associated works for analyzing water quality. Section 3 explains the method used to measure the water quality level Section 4 demonstrates the result part by using the collected samples set1 to set5. Section 5 provides the conclusion of the current work.

## 2. Study Area:



Muttukadu lake is a water sport office on the East Coast Road at Muttukadu, Chennai, India, offering paddling, wind surfing, water skiing, and speedboat riding. It is a backwater region of the Bay of Bengal found 36 km from the downtown area and 23 km from Adyar while in transit to Mamallapuram. The boat shelter was introduced in 1984 and has 15 rowboats, 27 speedboats and 9 pedal vessels, other than two fast water bikes. The water profundity changes between 3 ft and 6 ft. It is possessed and worked by the Tamil Nadu Tourism Development Corporation (TTDC). The sailing spot gets in excess of 4,000 every weekend.

## 2.1 Materials and Methods:

The water tests were gathered at various focuses in the lake for investigation, including at inflow and out stream purposes of the lake for various stations, Fig 1 shows the area of lake. Perfect and sanitized plastic jars of two-liter limit were utilized to gather the examples for examination and furthermore to decide broke down oxygen, the Sterilized glass bottles were utilized. The scientific and normal aftereffects of water tests are introduced in table for the two seasons. The outcomes were contrasted and Indian drinking water norms and furthermore the investigation was conveyed according to the system laid by standard strategy.

Here The 5 Station water samples collected form the Muttukadu Lake is analyzed. Shown in figure 1. \* star indicates the station of water samples. Temperature of the samples was recorded at their sample points. Standard methods are used for the determination of various parameters. For pH, electrical conductivity, total dissolved solids, alkalinity, calcium, magnesium.

## 3. Weighted arithmetic water quality index method:

Level of Quality Water is a way to denote the quality of water in an easiest way based on the amount of purity in the water. This method is designed by many physico – chemical parameters. The following formula used to compute the water quality level and mostly this method is used by the scientists.

$$WQI = \frac{\sum W_i Q_i}{\sum W_i}$$

Here,  $Q_i$  represents quality rating value and ,  $W_i$  represents Unit weight of the water. Quality level rating scale value ( $Q_i$ ) for each feature is determined by using following formula:

$$Q_i = \frac{(V_{\text{actual}} - V_{\text{ideal}})}{(V_{\text{standard}} - V_{\text{ideal}})} \times 100$$

Here,  $V_{\text{actual}}$  value measured as the  $i^{\text{th}}$  attributes in the water  $V_{\text{ideal}}$  means the ideal data value of attributes in clean water  $V_{\text{ideal}} = 0$ . The  $V_{\text{ideal}}$  value is 7.0 for pH.

$V_{\text{standard}}$  is the standard value of  $i^{\text{th}}$  arguments. Weight value of the unit level ( $W_i$ ) for each water quality attribute is measured by the given expression

$$W_i = \frac{K}{S_i}$$

Where,  $S_i$ , represents the Typical permissible value for  $n^{\text{th}}$  attribute  $K$  is the proportionality constant value, here  $K$  value is considered 1.

#### 4. Literature Survey:

M.MamathaKukkarahalli et al., studied about measuring the quality water using Weighted Arithmetic Index Method. The goal of the current study is to determine whether the water content is apt for drinking or not. Here the author uses eight parameters to find the quality level of water [1].

Vijay S. Kale et al., summarizes the usage of temperature measuring, pH value and oxygen value. These attributes are used to measure the quality level of the water. WHO provides the important attributes of drinking water [2].

R.M.Bhardwaj et al., conducted a study for water quality. The entire network consists of 870 locations in twenty six different and five Union Territories through all over the world. Water quality is monitored on monthly basis or quarterly basis [3].

Antara Bhattacharya et al. conducted a study to find the pollution level in upper lake. They used various attributes like pH, water color and number of various biological factors [4].

#### 5. Results and Discussions:

Water in the Muttukadu Lake is studied and examined for analyzing the quality of the water. Finally the output are evaluated with WHO standard value and the ISI standard values are tabularized below.

Table 1: Water Quality Attributes & WHO and ISI Standard Values

Parameters	Method	WHO standard	ISI standards
Temp	Thermometric	.....	.....
pH	pH meter	7.0 – 8.0	6.5 – 8.5
conductivity	Conductometry	1400	.....
Total dissolved solids ions	EDTA titration	1000	500
Calcium ions	EDTA titration	75	75
Magnesium ions	EDTA titration	150	30
Alkalinity	Titration method	120	200

### Temperature:

One of the important parameters of water is temperature as its affects the chemical and the bio- chemical reaction. If the water's temperature is increased the substance combinations in water decreases the solvable of gas level and increases the flavor and whiff. Samples are collected and recorded as 27°Celsius.

### pH:

The term pH value is refers as the negative log value of hydrogen level. The constant value is normally between 6 to 8 of drinking water. Difference in the pH level of the water is important because of the hydrolysis level of salt contents of week acids rate value and tough bases or vice versa. The gases carbon dioxide, Hydrogen, ammonia also determines the level of the pH value of the water content. The pH of the collected samples are measured to be 7.42 to 7.44 correspondingly. It is good with ISI standard data but somewhat less value compared with WHO normal data.

### Alkalinity:

The quantitative capacity to neutralize acids is defined as the Alkalinity. The gas which reduces the H<sup>+</sup> value and raise pH value of water content are bicarbonates, carbonates and hydroxides. The alkalinity of the samples are measured as 253 mg/L and 254 mg/L, which is very highest value based on WHO & ISI standard data which can be alert signal.

### Electrical Conductivity:

Measuring of current carrying capacity of the water refers to Electrical Conductivity. The level of solvable inorganic contents of solids such as chlorine level, nitrogen level, sulphur level, phosphate value, sodium data level, magnesium value, calcium level, ferric level and aluminum contents level in the water increases the conductivity value of electrical conductivity. From the sample the electrical conductivity is 16460 µs/cm and 16460 µs/cm.

### Total Dissolved Solids:

Soluble total solids are the aggregation of all the compound ions that are solved in water content. The amount of solids present in the samples is 221 mg/L and 500 mg/L Dissolved solid may be organic (animal or plants waste) or inorganic compounds (carbonate, sulfate, bicarbonate etc). These compounds give variety of effects like hardness, taste, odor etc depending on nature of dissolved solid.If water is filtered to remove suspended solid, the remaining solid in water indicates total dissolved solid.

Table 2: Water Quality Attributes of Muttukadu Lake

method	parameters	S1	S2	S3	S4	S5
temperature	-----	27°	27°	27°	27°	27°
ph meter	ph	7.42	7.43	7.43	7.42	7.44
conductometry	conductivity	16460	16460	16459	16460	16461
titration method	alkalinity	253	254	253	253	254
filtration method	total dissolved solids	221	220	220	222	222
edta titration	calcium	195.7	195.8	194.2	193.9	196.1
edta titration	magnesium	104.4	104.6	105.7	105.9	103.9

Table 3: Calculation of WQI for S1 sample

Parameters	Observed Value	Standard Value	Unit Weight (W <sub>i</sub> )	Quality rating (Q <sub>i</sub> )	Weighted values (W <sub>i</sub> Q <sub>i</sub> )
PH	7.42	8.5	0.1176	4.941176	0.5813
CONDUCTIVITY	16460	300	0.0033	5486.667	18.2889
ALKALINITY	253	120	0.0083	210.8333	1.7569
TOAL DISSOLVED SOLIDS	221	500	0.0020	44.2	0.0884
CALCIUM	195.7	75	0.0133	260.9333	3.4791
MAGNESIUM	104.4	30	0.0333	348	11.6000

From the table 3:

$$\sum W_i = 0.1780$$

$$\sum W_i Q_i = 35.7947$$

$$\text{Water Quality Index value (WQI)} = \frac{\sum W_i Q_i}{\sum W_i} = 201.1157$$

Table 4: Calculation of WQI for S2 sample

PARAMETERS	Observed Value	STANDARD VALUE	Unit Weight (Wi)	Quality rating (Qi)	Weighted values (WiQi)
PH	7.43	8.5	0.1176	5.0588	0.5952
CONDUCTIVITY	16460	300	0.0033	5486.6667	18.2889
ALKALINITY	254	120	0.0083	211.6667	1.7639
ORGANIC SOLIDS	220	500	0.0020	44.0000	0.0880
CALCIUM	195.8	75	0.0133	261.0667	3.4809
MAGNESIUM	105.5	30	0.0333	351.6667	11.7222

From the table 4:

$$\sum W_i = 0.1780$$

$$\sum W_i Q_i = 35.9390$$

$$\text{Water Index Quality value (WQI)} = (\sum W_i Q_i) / \sum W_i = 201.927$$

Table 5: Calculation of WQI for S3 sample

Parameters	Observed value	Standard values	Unit Weight(Wi)	Quality rating (Qi)	Weighted values(WiQi)
PH	7.43	8.5	0.1176	4.944727	0.5815
CONDUCTIVITY	16459	300	0.0033	5575.5151	18.3992
ALKALINITY	253	120	0.0083	196.6867	1.6325
TOTAL DISSOLVED SOLIDS	220	500	0.0020	36.9	0.0738
CALCIUM	194.2	75	0.0133	259.8721	3.4563
MAGNESIUM	105.7	30	0.0333	375.375	12.5000

From the table 5:

$$\sum W_i = 0.1778$$

$$\sum W_i Q_i = 36.6433$$

$$\text{Water Quality Index value (WQI)} = \sum W_i Q_i / \sum W_i = 206.092801$$

Table6: Calculation of WQI for S4 sample

Parameters	Observed value	Standard values	Unit Weight(Wi)	Quality rating (Qi)	Weighted values(WiQi)
PH	7.42	8.5	0.1176	4.876700	0.5735
CONDUCTIVITY	16460	300	0.0033	5666.4242	18.6992
ALKALINITY	253	120	0.0083	231.6265	1.9225

TOTAL DISSOLVED SOLIDS	222	500	0.0020	46.9	0.0938
CALCIUM	193.9	75	0.0133	294.4586	3.9163
MAGNESIUM	105.9	30	0.0333	345.3453	11.5000

From the table 6:

$$\sum W_i = 0.1778$$

$$\sum W_i Q_i = 36.7053$$

$$\text{Water Quality Index value (WQI)} = \frac{\sum W_i Q_i}{\sum W_i} = 206.441507$$

Table 7: Calculation of WQI for S5 sample

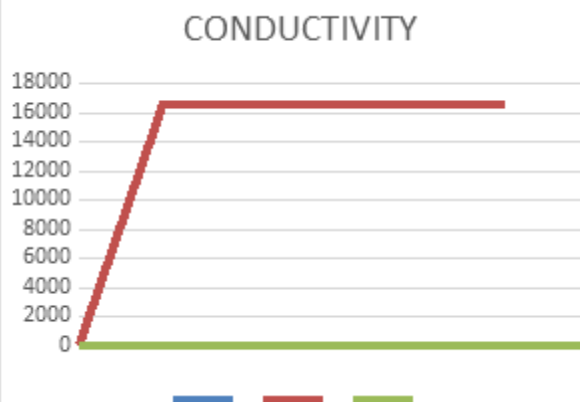
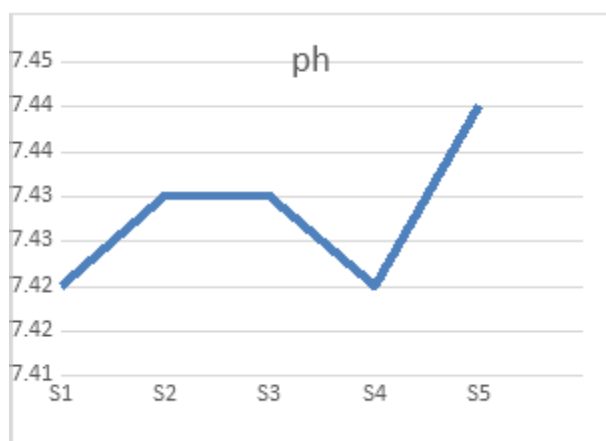
Parameters	Observed value	Standard values	Unit Weight( $W_i$ )	Quality rating ( $Q_i$ )	Weighted values( $W_i Q_i$ )
PH	7.44	8.5	0.1176	6.57738	0.7735
CONDUCTIVITY	16461	300	0.0033	5363.39	17.6992
ALKALINITY	254	120	0.0083	243.674	2.0225
TOTAL DISSOLVED SOLIDS	222	500	0.0020	36.9	0.0738
CALCIUM	196.1	75	0.0133	264.383	3.5163
MAGNESIUM	103.9	30	0.0333	315.3153	10.5000

From the table 7:

$$\sum W_i = 0.1778$$

$$\sum W_i Q_i = 34.5853$$

$$\text{Water Quality Index value (WQI)} = \frac{\sum W_i Q_i}{\sum W_i} = 194.51799$$



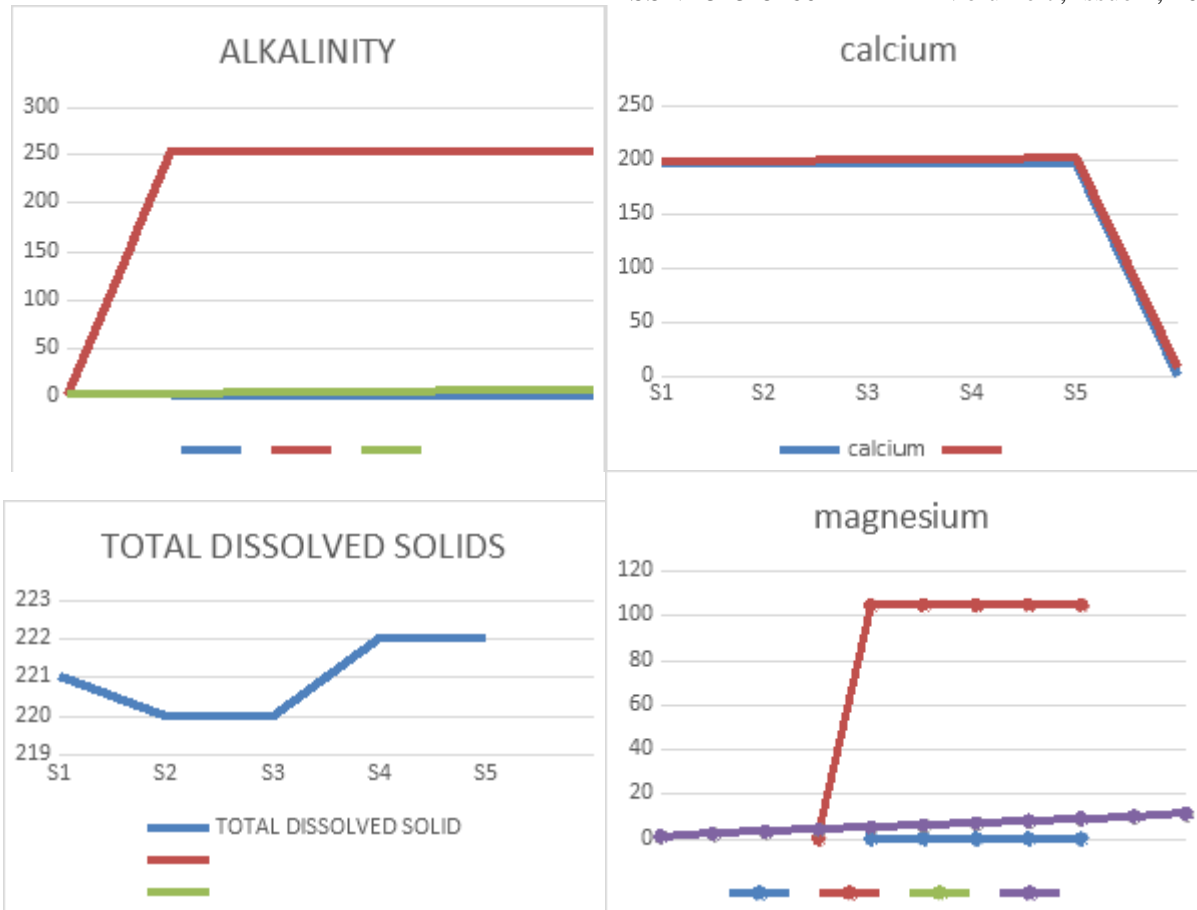
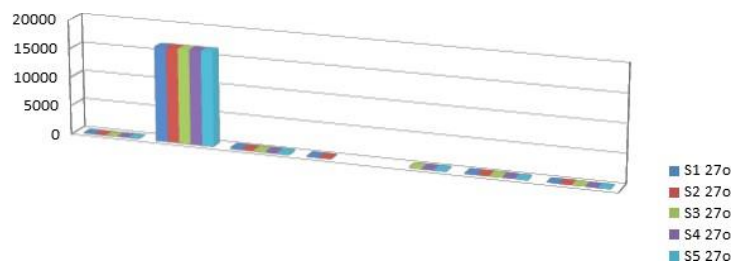


Table 8: Quality Index of Water (WQI) quality level of water

Water Quality Index Level	Water Quality Status
0 – 25	Excellent water quality
26 – 50	Good water quality
51 – 75	Poor water quality
76 – 100	Very poor water quality
> 100	Unsuitable for drinking

Figure 2: Graphical demonstration of chemical parameters of Muttukadu Lake water





## 6. CONCLUSION:

Now days there are various types of pollutions are is in the environment. Among this pollutions water pollution has a high impact towards our surroundings. Because of water pollution 40% of the deaths take place. The current study conducted on Muttukadu Lake for finding the quality of water. The quality level of the water index value is e calculated and found the value 201.1157 and 201.927 and 206.092801 and 206.441507 and 194.51799 for the collected samples s1 and s2, s3, s4 and s5. The major reason of lake water pollution is mixing industrial waste water and sewage water into the water. The major finding of this proposed study is the concern lake river is not suited for drinking purpose. The water which is above the normal level water quality index value is not suitable for any purposes.

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