

POLLUTION ABATEMENT OF MEENACHIL RIVER IN KOTTAYAM DISTRICT

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Abstract - The Meenachil river flows through the heart of the Kottayam district of Kerala state, India. The river which is 78 km long, flows through Poonjar, Teekoy, Erattupetta, Pala, Ettumanoor and Kottayam reaching itself into Vembanad lake at Kumarakom. It has four main tributaries. The river has a total annual yield of 2,394 million cubic meter. The river has 38 tributaries including major and minor ones. The river has 47 sub watersheds and 114 micro watersheds. This is a society based and environmental friendly project which aims to improve the water quality level of the Meenachil river to class B standard (IS 2296:1992) by analyzing the present pollution levels of the river. The main part of the project was the collection and testing of the water samples from the selected points and these test results indicated pollution levels at these points. Also, a survey was conducted to know the opinion of the public on the pollution level in Meenachil river and several suggestions were taken from them on improving the water quality level in the river. The main objectives of the project were to assess the water quality parameters of the Meenachil river in wet and dry periods, to provide suggestions on improving present water quality in Meenachil river, to improve the health of the people by reducing the water pollution effects caused, and to encourage and develop proper waste disposal practices. This project has good scope in future and will be very beneficial in assessing the pollution and water quality levels of Meenachil river in future by comparing with previously collected data and information. This project can also be extended as a multidimensional project. Pollution rate in the Meenachil river is observed and studied in this project and suggestions are provided to reduce the pollution rate and improve the water quality of the river.

Key Words: (Size 10 & Bold) Key word1, Key word2, Key word3, etc (Minimum 5 to 8 key words)...

1. INTRODUCTION

Water is a universal symbol of life and it covers 71% of the earth's surface. It is vital for all known forms of life. On earth 96.5% of the planet's water is found in seas and oceans, 1.7% in groundwater, 1.7% in glaciers and the ice

caps of Antarctica and Greenland, a small fraction in other large water bodies, and 0.001% in the air as vapor, clouds (formed of solid and liquid water particles suspended in air), and precipitation. Only 2.5% of the Earth's water is freshwater, and 98.8% of that water is in ice and groundwater. Less than 0.3% of all freshwater is in rivers, lakes and the atmosphere, and an even smaller amount of the Earth's freshwater (0.003%) is contained within biological manufactured products.

Meenachil river is the major river in Kottayam district and many major towns and cities like Erattupetta, Pala, Ettumannur, and Kottayam depend upon this river for drinking water and water for commercial activities. Thousands of farmers use water from the river for agriculture.

The river Meenachil is formed by several streams originating from the Western Ghats of India. One of the tributaries originates from the southern valley of the Kurishumala hills and flows through Adivaram, Peringalam, and Poonjar. Another tributary is formed by the stream originating at Illikkal kallu near Thalanadu and flowing through Mankombu and Vakakkadu. These two streams join together and flow south-eastwards and join with Teekoy river which further flows southward to enter the north side of Erattupetta. Since the river originates from the Western Ghats, considered to be a protected region under the Reserve Forest Area, the quality of water implies to be pristine in nature.

With exploding population, increasing industrialization and urbanization, water pollution by agriculture, municipal, domestic and industrial sources have become a major concern for the welfare of mankind. Surface waters are most vulnerable to pollution due to their accessibility for disposal of waste waters. Since rivers constitute the main inland water resource from domestic, industrial and irrigation purposes, the monitoring of toxic pollutants is necessary.

Water quality refers to the chemical, physical, biological, radiological characteristics of water. It is a measure of the condition of water relative to the requirements of one or

more biotic species and or to any human need or purpose. It is most frequently used by reference to a set of standards against which compliance can be assessed. The most common standards used to assess water quality relate to health of ecosystems, safety of human contact and drinking water.

The study involves determination of chemical parameters of surface water at 13 locations along the river. The locations are Moonnilaavu, Payyanithotta, Cherppunkal, Pala, Assissi, Mutholi, Poonjar, Almanar, Aruvithura, Edathilkavu, Panackappalam, Vattolikadavu, Tharappel. The objectives of the study are to assess the present water quality, through analysis of some selected water quality parameters like temperature, pH, total dissolved solids, acidity, alkalinity, turbidity and electrical conductivity, BOD, DO. The MPN method is a well-established and fully documented method of estimating the number of viable microorganisms in a product in which the microorganisms are randomly distributed. The test is a method to estimate the concentration of viable microorganisms.

1.1 Relevance of the topic

The human body contains 55-78% water, depending on body size. To function properly, the body requires between 1 and 7 liters of water per day to avoid dehydration; the precise amount depends on the level of activity, temperature, humidity and other factors. With an exploding population, increasing industrialization and urbanization, water pollution by agricultural, municipal, domestic and industrial sources has become a major concern for the welfare of mankind. Surface waters are most vulnerable to pollution due to their easy accessibility for disposal of waste waters. Rivers play a major role in imitating or carrying industrial and municipal wastewater, runoff from agricultural fields, roadways and streets which are major sources of pollution. Among various organic and inorganic water pollutants, metal ions are toxic, dangerous and harmful because of their carcinogenic nature.

Meenachil river is the main source of the water to meet the domestic and drinking purpose of the people in Meenachil Taluk. Hence it is important to test the water of the Meenachil river in order to find the degree of contamination.

1.2 Objectives

- **Water quality parameters of Meenachil river in 2 seasons (wet and dry seasons).**

The water quality tests are to be done for 13 locations. The tests that are to be conducted are pH, turbidity, Electrical conductivity, TDS, Hardness, Acidity, Alkalinity, MPN, BOD,

DO, COD. The results obtained are compared in order to find the variation in water quality in both seasons.

• Comparison of the result obtained with the previous result.

The results obtained from the 13 locations are compared with the results obtained two years back to find out the variation in the quality of water. The locations to be selected are the same as the locations where water analysis was done two years back.

1.3 Scope

- The study is envisaging an assessment of water quality of Meenachil river for different months including lean periods.
- The pollution abatement measures that can be followed to keep the water in Meenachil river good for domestic purposes is proposed to be an outcome.

2. Literature review

2.1 Water Quality Analysis of Narmada River with Reference to Physico-Chemical

Parameters at Hoshangabad City, M.P; India Dr. D. S. Saluja Professor of Chemistry, Govt.

M. V. M. College, Bhopal (M.P.), India, 2018

Rivers are a major source for drinking water supply. Narmada River is considered to be the lifeline and west flowing river of the state of Madhya Pradesh, which covers 98797 sq. km. of total water shed area in India. The water samples collected from four main sampling stations at downstream

Hoshangabad city was analyzed as per standard methods suggested by APHA (2012). The parameters as pH and Turbidity were determined in-situ. Statistical analysis is also carried out through correlation method and also evaluates Average Value (AV), Standard Deviation (SD),

Standard Variance (SV), Standard Error (SE) and 95% Confidence Limit (CL) to assess the pollution load. The results revealed that Narmada River water quality is suitable and safe for domestic and irrigation purposes but not for drinking purpose without proper treatment because of Turbidity and TDS are not in the range of permissible limit according to the WHO and BIS standard suggested.

2.2 Water quality assessment and apportionment of pollution sources of Gomti river (India) using multivariate statistical techniques—a case study, panelKunwar P.Singh,

AmritaMalik, SaritaSinha, 2018

This study presents usefulness of multivariate statistical techniques for evaluation and interpretation of large complex water quality data sets and apportionment of pollution sources/factors with a view to get better information about the water quality and design of monitoring network for effective management of water resources. These included the trace metals group (leaching from soil and industrial waste disposal sites), organic pollution group (municipal and industrial effluents), nutrients group (agricultural runoff), alkalinity, hardness, EC and solids (soil leaching and runoff process). DA showed the best results for data reduction and pattern recognition during both temporal and spatial analysis. It rendered five parameters (temperature, total alkalinity, Cl, Na and K) affording more than 94% right assignments in temporal analysis, while 10 parameters (river discharge, pH, BOD, Cl, F, PO4, NH4-N, NO3-N, TKN and Zn) to afford 97% right assignments in spatial analysis of three different regions in the basin.

3. METHODOLOGY

Planning and selection of suitable sites and suitable periods for the collection of samples is the first step.

- Parameters of assessing the water quality are selected. (Various physical- chemical parameters such as Ph, electrical conductivity, temperature, total hardness)

Study area:

i)Erattupetta(upstream and downstream of check dam)

ii)Bharananganam

iii)Pala

iv)Cherpunkal

v)Poonjar

vi)Kidangoor

- Methods of water quality analysis are selected according to the requirement.

i)Volume and number of samples to be analyzed

ii) Cost of analysis

iii) Precision required

iv) Promptness of the analysis as required

- Collected sample is tested by conducting suitable tests and results on various parameters

are obtained.

- Obtained results are monitored, compared and studied.

- Suggestions for adopting water conservation practices. Management of waste disposal is prepared based on study results.

4. COLLECTION OF WATER SAMPLES

Water samples are collected from Cherpunkal, Erattupetta, Bharanganam, Poonjar,

Aruvithura, Kidangoor and Pala of Meenachil river. It was collected in pre cleaned non- reactive plastic containers and were transported to the laboratory. The containers were transported to the laboratory. The containers must be cleaned periodically to prevent build- up of dirt. To do this:

- Rinse the he container well with tap water
- Rinse it with distilled water three times
- Allow it to dry
- Before collecting sample, the container must be thoroughly rinsed with the river water three times
- Allow it to dry

4.1 TEST RESULTS

	Station	Electrical conductivity	Turbidity (NTU)	pH	Temperature (°C)	CO D (mg /L)	BO D (mg/L)	DO (mg/L)
1	Erattupetta	38.5 /32°C	0.28	5.9	32°C	16	10.2	10.3
2	Poonjar	38.7 /32°C	0.29	6	32°C	16	10.2	10.2
3	Bharananganam	39/31°C	0.3	6.04	31°C	16.4	9.4	11.4

4	Pala	43.5 /31° C	0.4 8	6. 1 5	31° C	16. 4	9.3	10. 5
5	Cherpunkal	43.6 /32° C	0.5 9	5. 9	32° C	16	9.2	10. 4
6	Kidangoor	48/ 31°C	0.5 3	5. 9	31° C	16	9.2	10. 2

Table 1: Test results during wet season

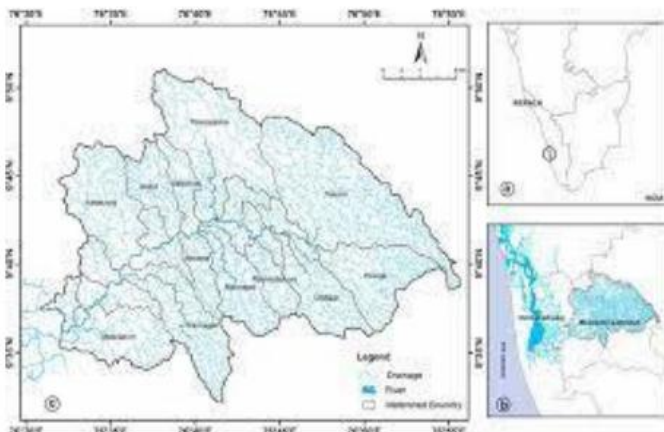


Fig 3.2.1 Geo- position of Meenachil river basin

4.2 SURVEY REPORT

Surveying is done to gather data or information from common people through direct communication. We conducted the survey in 6 major stations of the Meenachil river. The stations selected were Poonjar, Erattupetta, Bharananganam, Pala, Cherpunkal and Kidangoor. We visited 60 houses, 10 houses from each station. A questionnaire was prepared which included various questions regarding the water availability, water sources, waste disposal method, and awareness of the pollution in the river. Recommendation of the people for keeping the river cleaned etc. We received very much pleasing reviews from the households we visited.

5. CONCLUSIONS

The water samples collected from Meenachil river were analyzed for various water quality parameters like pH, temperature, electrical conductivity, COD, BOD, DO etc.

The class B criteria for bathing purposes defined by the central pollution control board are:

1. PH between 6.5 and 8.5
2. Dissolved oxygen 5 mg/L or more
3. Biochemical oxygen demand 5 days 20°C 3 mg/L or less
4. Total coliforms organism MPN/ 100ML shall be 500 or less

The following recommendations have been made for keeping Meenachil river water conforming to class B standards, throughout the year.

A. Short term methods include immediate, visible-impact activities such as river surface cleaning, rural sanitation to prevent pollution entering the river through rural sewage drains, renovation, and modernization. Among the above mentioned measures

01. fitting of cameras
02. awareness programmes falls under short term methods.

B. Medium term methods comprise activities that arrest municipal and industrial pollution entering the river. Among the above mentioned measures

01. Construction of bottle booths

02. proper monitoring and imposing of Punishments on violating the laws fall under medium term methods.

C. Long term methods consist of providing adequate flow to the river, enhancing usage efficiency and improving the efficiency of surface irrigation. Among the above mentioned measures

01. Fencing along bridges

02. Construction of sewage treatment plan

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