

# Assessment of Water Quality of Periyar River

Ajina Jose<sup>1</sup>, Akhilraj A<sup>2</sup>, Chinjumole P P<sup>3</sup>, Sreekutty Kunjappan<sup>4</sup>, Geethu Shanmugan<sup>5</sup>

UG Scholars, Department of Civil Engineering, Mar Baselios Institute of Technology and Science, Nellimattom,  
Ernakulam, Kerala, India<sup>1,2,3,4</sup>

Assistant Professor, Department of Civil Engineering, Mar Baselios Institute of Technology and Science, Nellimattom,  
Ernakulam, Kerala, India<sup>5</sup>

**ABSTRACT:** Water quality maps are effective for identifying locations that involve the threat of contamination. The study described here uses geographic information system (GIS) technology to map water quality for drinking and irrigation purposes, utilizing data generated from chemical analysis of water samples collected from the area under study. Spatial variations in water quality in the Periyar River of Ernakulam district in Kerala State, India, have been studied using geographic information system (GIS) technique.

**KEYWORDS:** Geographic information system

## I. INTRODUCTION

Water is one of the most essential natural resources for eco-sustainability and is likely to become critical scarce in the coming decades due to increasing demand, rapid growth of urban populations, development of agriculture and industrial activities especially in semi-arid regions. Variations in availability of water in time, quantity and quality can cause significant fluctuations in the economy of a country. A continuous monitoring of water quality is very essential to determine the state of pollution in River. Pollution of the environment can be estimated by the level of contamination in rivers. There will be sites of accumulation of polluting impurities which comes from human activity, due to dissolution, precipitation and adsorption. GIS is very helpful tool for developing solutions for water resources problems to assess in water quality, determining water availability and understanding the natural environment on a local and / or regional scale. From GIS, spatial distribution mapping for various pollutants can be done. The resulting information is very useful for policy makers to take remedial measures.

## II. RELATED WORK

The tests include various parameters to know the quality of the water of periyer river by the samples collected from Bhoothathankettu to Aluva. These various parameters are pH, acidity, hardness, chloride, turbidity, COD, DO and sulphate. Gis mapping with water quality parameters is also have to done to determine the variation more easily. GIS allow user to enter the data collected from the river and predicts the value of the pollution. Results displays the water quality map.

## III. METHODOLOGY

It is the systematic theoretical analysis of the methods applied to field of study. Even though much attention is given to the nature and kinds of processes to be followed in a particular procedure or to attain a objective as follows :-

- Datacollection
  - Samplecollection
  - GPSLocation.
  - Spatial datacollection
- Physico - Chemical analysis of sample.
- Generation of water qualitydata and thematic map.

**IV. EXPERIMENTAL RESULTS**

The test results of water quality parameters are given below.

**a) pH**

As per IS10500-2012, the desirable limit of pH is 6.5-8.5.

Sample No	Location	October	November	January
1	BHOODATHAN KETTU	6.3	6.4	7.17
2	PANIYELI PORU	6.27	6.7	6.41
3	ABHAYARANYAM	6.06	6.4	7.01
4	KODANAD	6.37	6.33	7.2
5	KOTTAMAM	6.4	6.8	6.51
6	MUTHALAKADAVU	6.13	6.36	6.4
7	THANIPUZHA	6.24	6.39	6.15
8	CHELAMATTOM	6.44	6.04	6.79
9	MANJAPETTY	6.97	5.81	7
10	MARAMPILLI	6.7	6.83	6.81
11	MAHILALAYAM	6.4	6.57	6.25
12	MANAPPURAM	6.65	6.6	6.58

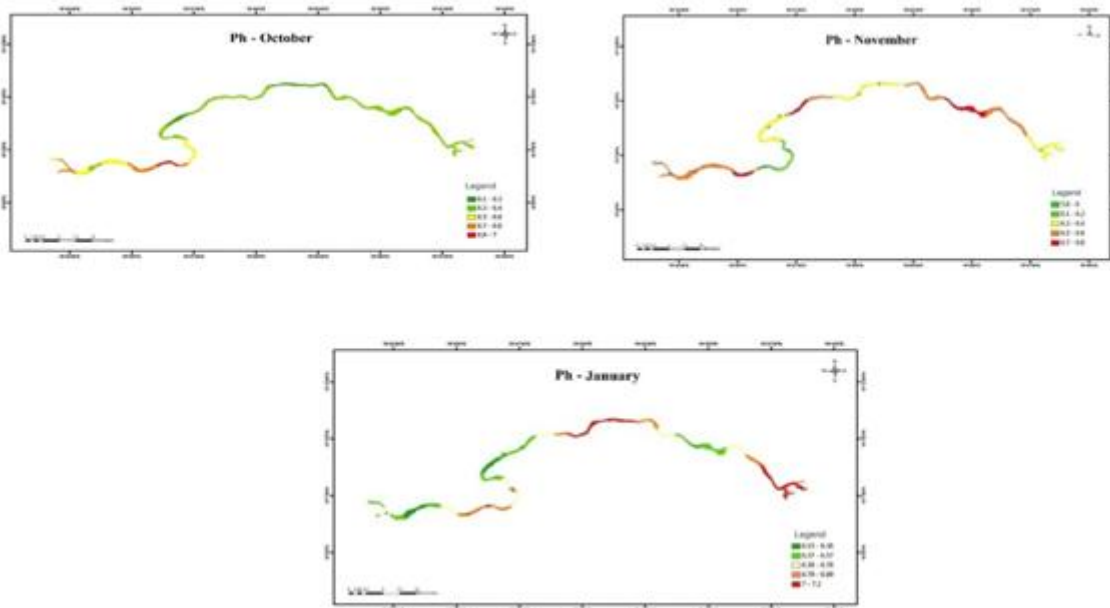


Fig 1. Gis maps for pH values

**a) ACIDITY (mg/l)**

Acidity is the sum of all titrable acid present in the water sample. Strong mineral acids, weak acids such as carbonic acid, acetic acid present in the water sample contributes to acidity of the water. The limit of acidity is 0.

Sample No	Location	October		November		January	
		MA	TA	MA	TA	MA	TA
1	BHOODATHAN KETTU	15	22	8	20	0	0
2	PANIYELI PORU	2	7	2	8	4	12
3	ABHAYARANYAM	2	31	6	16	0	0
4	KODANAD	6	17	10	14	0	0
5	KOTTAMAM	11	32	4	14	4	8
6	MUTHALAKADAVU	12	22	2	14	4	18
7	THANIPUZHA	7	20	2	10	4	10
8	CHELAMATTOM	15	27	8	34	4	12
9	MANJAPETTY	26	50	6	24	0	0
10	MARAMPILLI	4	12	2	12	2	8
11	MAHILALAYAM	16	18	4	12	2	10
12	MANAPPURAM	18	28	6	12	4	8

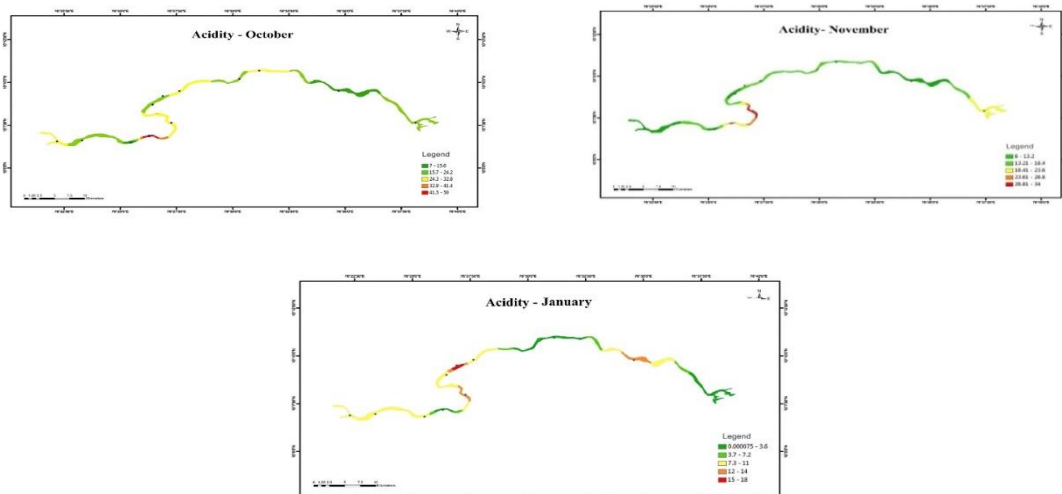


Fig 2. Gis maps for acidity values

b) **HARDNESS (mg/l)** - As per IS10500-2012, the limit of hardness is 200mg/l -600 mg/l.

Sample No	Location	October	November	January
1	BHOOTHATHAN KETTU	16	20	44
2	PANIYELI PORU	11	22	14
3	ABHAYARANYAM	18	42	16
4	KODANAD	12	48	14
5	KOTTAMAM	19	18	24
6	MUTHALAKADAVU	20	38	22
7	THANIPUZHA	16	20	18
8	CHELAMATTOM	16	30	16
9	MANJAPETTY	20	18	34
10	MARAMPILLI	24	18	32
11	MAHILALAYAM	40	20	20
12	MANAPPURAM	32	24	22

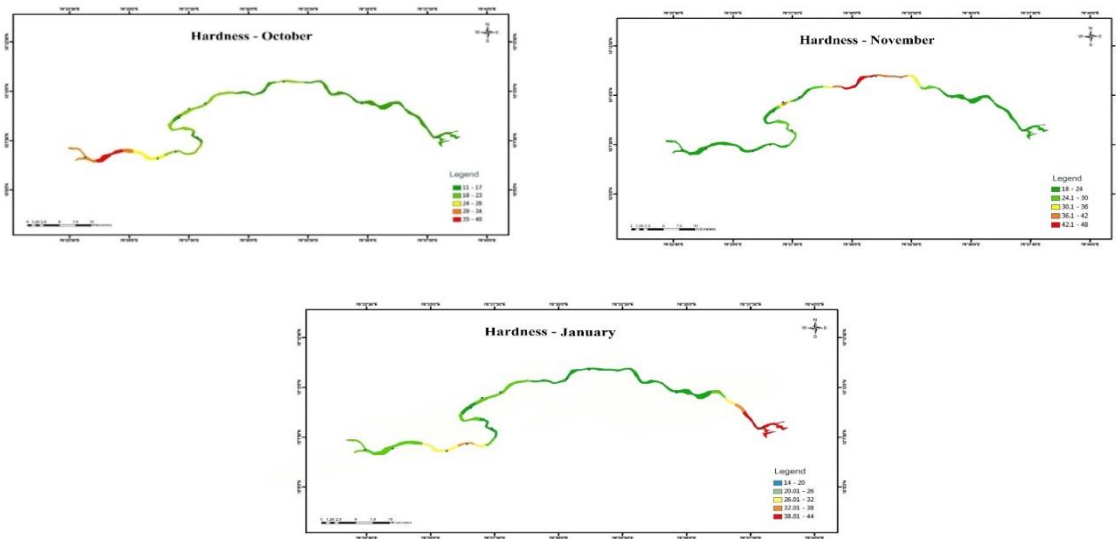


Fig 3. Gis maps for hardness values

c) **CHLORIDE (mg/l)** - The limit of chloride is 250 mg/l-1000 mg/l. Table 7 shows the test results of chloride.

Sample No	Location	October	November	January
1	BHOODATHAN KETTU	3.49	0	5.99
2	PANIYELI PORU	158.9	17.99	2.99
3	ABHAYARANYAM	7.99	1.49	1.499
4	KODANAD	2.99	1.99	4.498
5	KOTTAMAM	5.5	4.99	3.498
6	MUTHALAKADAVU	3.99	2.499	1.99
7	THANIPUZHA	4.99	3.498	0.499
8	CHELAMATTOM	1.5	7.497	7.99
9	MANJAPETTY	2.99	5.498	3.498
10	MARAMPILLI	3.99	4.998	7.99
11	MAHILALAYAM	4.99	3.49	4.49
12	MANAPPURAM	1.49	2.99	5.99

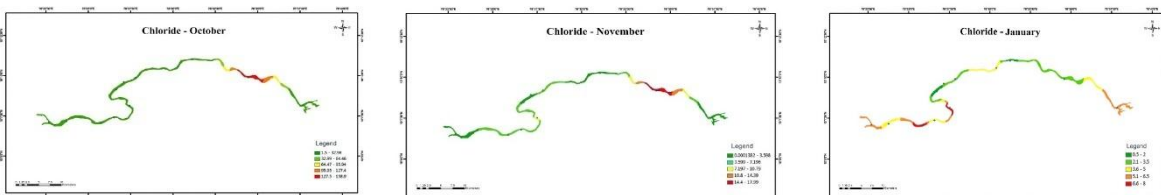


Fig 4. Gis maps for chloride values

d) **TURBIDITY (NTU)** - Turbidity is a measure of the amount of suspended material in the water. As per IS10500-2012, the limit of turbidity is 1 NTU to 5 NTU.

sample No	Location	October	November	January
1	BHOODATHAN KETTU	5.5	6.11	1.2
2	PANIYELI PORU	14.6	10.8	5
3	ABHAYARANYAM	1.9	6.8	6
4	KODANAD	3.1	9.8	0
5	KOTTAMAM	0.9	13.1	12.8
6	MUTHALAKADAVU	2.2	2.1	3.3
7	THANIPUZHA	4	2.3	1.6
8	CHELAMATTOM	0	4.1	3.2
9	MANJAPETTY	2.8	18.2	3.3
10	MARAMPILLI	2.7	7.6	9.3
11	MAHILALAYAM	2.4	3.5	5.9
12	MANAPPURAM	0.4	3.1	1.8

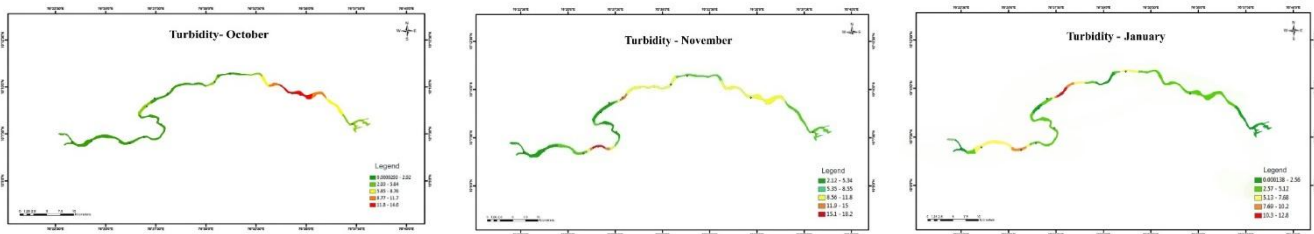


Fig 5. Gis maps for turbidity values

e) **DISSOLVED OXYGEN (mg/l)**

As per IS10500-2012, the limit of DO is not less than 7 mg/l.

Sample No	Location	October	November	January
1	BHOODATHAN KETTU	6.7	8.9	9.8
2	PANIYELI PORU	8.9	9.1	9.3
3	ABHAYARANYAM	6.9	12.3	7.6
4	KODANAD	9.6	7.1	5.6
5	KOTTAMAM	8.6	8.6	8.7
6	MUTHALAKADAVU	5.3	7.1	8.6
7	THANIPUZHA	8.9	10.3	5.6
8	CHELAMATTOM	6.6	9.2	9.1
9	MANJAPETTY	10	10.4	6.6
10	MARAMPILLI	8.2	7.8	8.2
11	MAHILALAYAM	5.7	8.4	5.9
12	MANAPPURAM	10.2	8	8.2

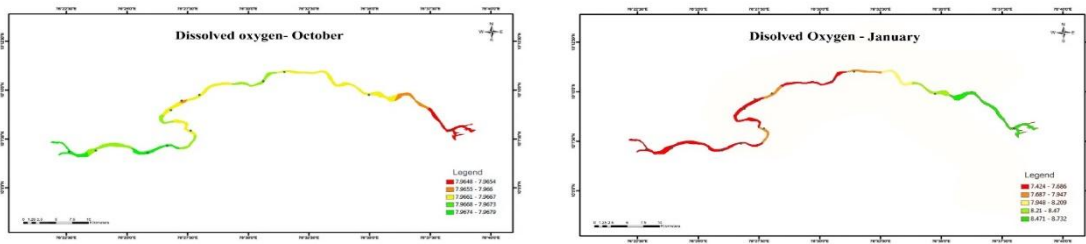


Fig 6. Gis maps for DO values

f) **CHEMICAL OXYGEN DEMAND (mg/l) - COD** is defined as the amount of total measurement of all chemicals present in the water. As per the IS10500-2012 guideline limit of COD for drinking water is 0.

Sample No	Location	October	November	January
1	BHOODATHAN KETTU	83.91	91.78	15.734
2	PANIYELI PORU	83.91	60.315	110.14
3	ABHAYARANYAM	104.89	104.896	7.86
4	KODANAD	86.54	91.78	62.93
5	KOTTAMAM	91.78	102.273	83.916
6	MUTHALAKADAVU	86.54	78.67	0
7	THANIPUZHA	86.54	70.804	86.54
8	CHELAMATTOM	91.78	65.56	97.028
9	MANJAPETTY	94.4	99.65	86.53
10	MARAMPILLI	83.91	62.57	97.028
11	MAHILALAYAM	89.16	44.58	47.2
12	MANAPPURAM	94.4	73.427	78.672

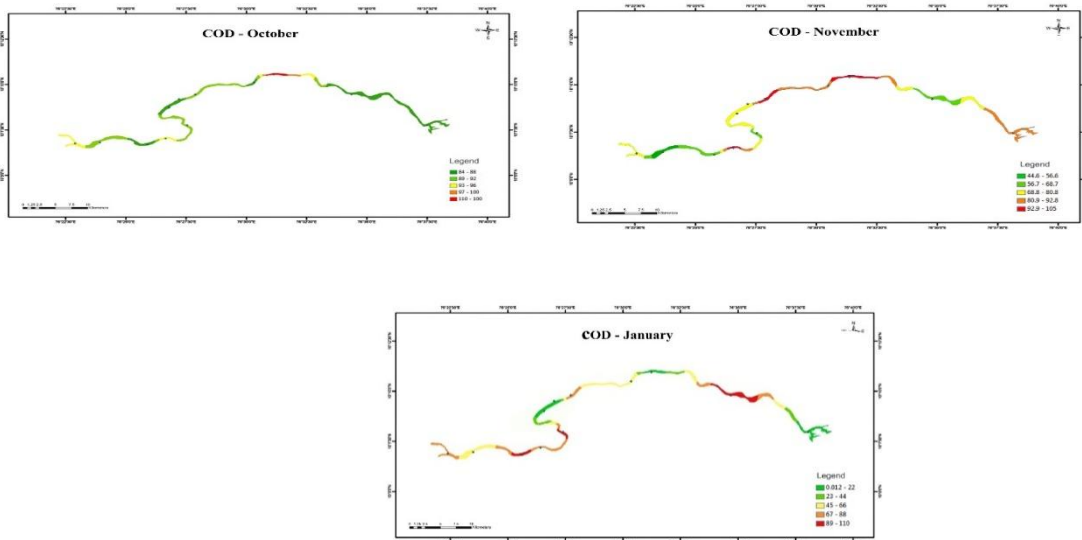


Fig 7. Gis maps for COD values

g) **SULPHATE (mg/l)** - As per IS10500-2012, the limit is 200 mg/l to 400 mg/l.

Sample No	Location	October	November	January
1	BHOODATHAN KETTU	3	7.6	3.9
2	PANIYELI PORU	1.5	5.8	3.3
3	ABHAYARANYAM	3	11.2	2.8
4	KODANAD	3	4.4	9.1
5	KOTTAMAM	1.8	3.4	4.8
6	MUTHALAKADAVU	0	4.6	0.01
7	THANIPUZHA	2	4.6	0.08
8	CHELAMATTOM	1.7	6.1	3.6
9	MANJAPETTY	4.3	8.9	6.1
10	MARAMPILLI	5.2	7.9	6.6
11	MAHILALAYAM	1	6.8	3.9
12	MANAPPURAM	0.8	6.6	3.7

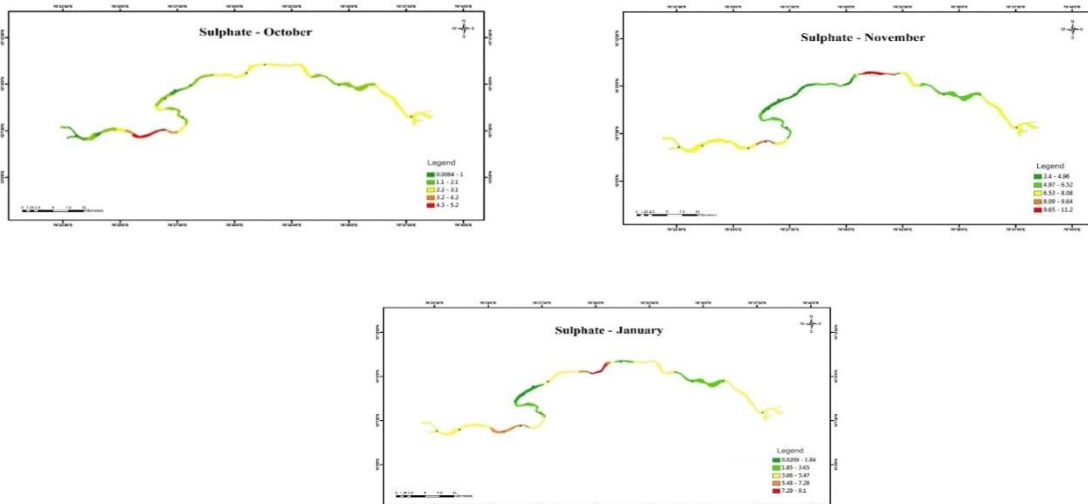


Fig 8. Gis maps for sulphate values

### V. CONCLUSIONS

In the study discussed here, we analyzed different water quality parameters such as pH, acidity, alkalinity, chloride, hardness, DO, BOD, COD and sulphate, along the length of periyer river by the samples collected from Bhoothathankettu to Aluva, noting spatial and temporal variations. We performed physical, chemical and biological analysis on water samples taken from various stations within the river at different times.

- ❖ Physicochemical analysis data revealed that the pH of the samples selected may vary from 6.04 to 7.2, which indicate that the water is slightly acidic in nature. pH of the samples satisfies the water quality standards.
- ❖ From chemical analysis results, the chloride content of the water is very less compared to the desirable limit of Indian standard.(IS10500-2012)
- ❖ Hardness of the water samples that were collected will also have less value compared to the desirable and permissible limit IS recommendations. From our results the higher value found at Kodanad with value of 48 mg/l within the limit of 0-60 mg/l indicates soft water.
- ❖ Some values obtained during turbidity test is higher due to climate change.
- ❖ BOD, COD values are much higher at all points due to the presence of industries, agricultural fields, construction sites, etc.



#### REFERENCES

1. Abbas J kadhem, (2013) "Assessment of Water quality in Tigris River-Iraq by Using GIS Mapping", Journal of Natural Resources, 2013, vol 4, pp.441-448
2. Aparna Pa, NigeeKa, Shimna Pa and Drissia T Kb, (2015) "Quantitative Analysis of Geomorphology and Flow Pattern Analysis of Muvattupuzha River Basin Using Geographic Information System", Journal on international conference on water resources, coastal and ocean engineering
3. K. S. Kannan and V. Ramasubramanian, (2011) "Assessment of Fluoride contamination in Ground Water Using GIS, Dharmapuri District, Tamilnadu, India," International journal of Engineering Science and Technology (IJEST), Vol. 3, No. 2, p.1077.
4. O. Altansukh and G. Davaa, (2011) "Application of Index Analysis to Evaluate the Water Quality of the Tuul River in Mongolia," Journal of Water Resources and Protection, Vol. 3, No. 6, pp.398-414
5. P. Balakrishnan, Abdul Saleem and N. D. Mallikarjun, (2011) "Groundwater quality mapping using geographic information system (GIS): A case study of Gulbarga City, Karnataka, India", Journal of Environmental Science and Technology, Vol. 5(12), pp. 1069-1084.
6. Shikha Sharma<sup>1</sup>, Pawan Kumar Jha, Manju Rawat Ranjan, Umesh Kumar Singh and Tanu Jindal, (2017), "Water Quality Monitoring of Yamuna River by Using GIS Based Water Quality Index in Delhi, India", International Journal of Current Microbiology and Applied Sciences (ISSN): 2319-7706 Volume 6 Number 2 (2017) pp.1249-1263