

ANALYSIS ON PHYSIC-CHEMICAL FEATURES OF NOYYAL RIVER AND MITIGATION MEASURES

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ABSTRACT

The Noyyal River is a tributary of the River Cauvery and originates from the Vellingiri Hills of the Western Ghats in the Coimbatore district of Tamil Nadu, South India. The Coimbatore district gets maximum rainfall from South-West monsoon followed by the North-East monsoon and is very close to Western Ghats. It is located 410 meters above sea level with moderate climate and average annual rainfall of 61.22 cms. The river has moderate to good flow for a short period during the North-East and South-West monsoons and flows over a distance of 180 km in an area of 3510 km². The river supplies water to several Tanks located in and around Coimbatore.

Keywords: Temperature, pH, Turbidity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Hardness, Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Residual Chlorine, Chloride, Alkalinity.

1. INTRODUCTION

Water is the elixir of life, a precious gift of nature to mankind and millions of other species living on the earth. It is fast becoming a scare commodity in most part of the world. Water resources comprising of surface water (river and lakes), ground water, and marine and coastal waters support all living thing including human beings. Most human activities involve the use of water in one way or other. It may be noted that man's early habitation and civilization sprang up along the banks of rivers. Although the surface of our planet is nearly 71% water, only 3% of it is fresh. Of these 3% about 75% is tied up in glaciers and polar icebergs, 24% in groundwater and 1% is

available in the form of fresh water in rivers, lakes and ponds suitable for human consumption (Dugan, 1972). Due to increasing industrialization on one hand and exploding population on the other, the demands of water supply have been increasing tremendously. Moreover considerable part of this limited quality of water is polluted by sewage, industrial waste and a wide range of synthetic chemicals. Fresh water which is a precious and limited vital resource needs to be protected, conserved and used wisely by man. But unfortunately such has not been the case, as the polluted lakes, rivers and streams throughout the world testify. Among the fresh waters, only about 5% of them or 0.15% of the total world waters are readily available for beneficial use. The total water resource available in India is 1850 km³, which is roughly 4% of the world's fresh water resources (EPA-PWD,2001).Tamil Nadu accounts for 4 % of the land area and 6% of the population, but only 3 % of the water resources of the country.

2. METHODOLOGY

The water samples were analyzed for various parameters in the laboratory of Environmental Engineering, Coimbatore Institute Technology Coimbatore. Various physical and chemical parameters like Temperature, pH, Turbidity, Total Dissolved Solids, Total Hardness, Acidity, Dissolved Oxygen (DO), Residual Chlorine, Chloride, Alkalinity have been monitored for the tap water of different locations. Plastic bottles of 2 liter capacity with stopper were used for collecting samples. Each bottle was washed with 2% Nitric acid and then rinsed three times with distilled water. The bottles were then preserved in a clean place. The bottles were filled leaving no air space, and then the bottle was sealed to prevent any

leakage. Each container was clearly marked with the name and date of sampling.

2.1 Water Sampling and Collection

Surface water samples from the Noyyal River were collected from 18 different sampling sites. The samples taken from each 5 km from Vellingiri hills to Tirupur. The river water samples (18) were collected in clean sterile plastic containers from the different sites at monthly intervals during the rainy season of the study period from September 2014 to February 2015. The samples were transported to the laboratory within 5 hrs for analysis of physico-chemical parameters.

Table 1. Drinking Water Standards (IS: 10500)

Sl. No.	Parameters	Permissible value	Standard
1.	Color	Unobjectionable	IS: 10500
2.	Taste	Agreeable	IS: 10500
3.	Ph	6.5-7.5	IS: 10500
4.	Turbidity (Max NTU)	5	IS: 10500
5.	TDS	500	IS: 10500
6.	TSS	5	USPHS
7.	Residual chlorine	0.2	IS: 10500
8.	DO	4.0 to 6.0	USPHS
9.	Total hardness	300	IS: 10500
10.	Chloride	250	IS: 10500
11.	Alkalinity	120	USPHS

2.2 Methods of Data Collection

There are two popular methods of analysed the noyyal river basin:

a) Questionnaire based: Questionnaires are the most commonly used tool in survey research. A questionnaire survey can be conducted for public

people domain and based on river basin. It is the first step to obtain and gather information to analyse and compare different people answer the suggestion of noyyal river basin.

b) Statistical based: A Statistical study (or case report) is a descriptive, exploratory or explanatory analysis the quality of water is characterized by various physico-chemical parameters. These parameters change widely due to many factors like source of water, type of pollution, seasonal fluctuations, etc. Statistical analysis viz., descriptive statistics, correlation and regression analysis of the physico-chemical properties of a river basin give a fairly good amount of information like their average values and possibly prediction of one variable (usually the one which is difficult to evaluate). Such studies have been carried out by many scholars in the past.

2.3 Study Area

The study area of Vellingiri hills is located in Coimbatore district of TamilNadu. The study area of the river was the starting place where the discharge of domestic sewage and washing of vehicles, bathing of animals, human activities, releasing of municipal wastes are the main sources of pollutants in the Noyyal River. Hence the study has been carried out to analyze the physico-chemical and mitigation measures of the Noyyal River.

Various venues of the samples collected along the river basin till now,

1. Vellingiri Hills – Sample 1
2. Irutupallam – Sample 2
3. Alandurai – Sample 3
4. Mathampatti – Sample 4
5. Perur – Sample 5
6. Athupalam – Sample 6
7. Vellalur – Sample 7
8. Sular – Sample 8
9. Kathir mills – Sample 9
10. Selvarajapuram – Sample 10
11. K.Madapur – Sample 11
12. Somanur – Sample 12
13. Pallapalayam – Sample 13
14. SulthanPettai – Sample 14
15. Alangadu – Sample 15
16. Vijayapuram – Sample 16
17. Kasipalayam – Sample 17
18. Mudhalipalayam (SIDCO)-Sample 18

The Noyyal sub-basin, which is 3510 sq km in area, is part of the Cauvery basin that lies in the state of Tamil Nadu. It is a rapidly urbanizing sub-basin that includes the Class I cities of Coimbatore and Tiruppur as well as 84 smaller urban settlements. Water issues in this basin have been the focus of much public debate and action over the last two decades. Most of the debate, triggered by farmer agitations and court cases, has focused on the question of water pollution; water scarcity and sustainability issues have received relatively little attention. Recent banison industrial effluent discharge into the Noyyal, as well as changes in water supply infrastructure, watershed development activities, urban demand and agricultural water use have dramatically altered the future of the Noyyal River and merit follow-up studies.

2.4 Noyyal Sub-Basin

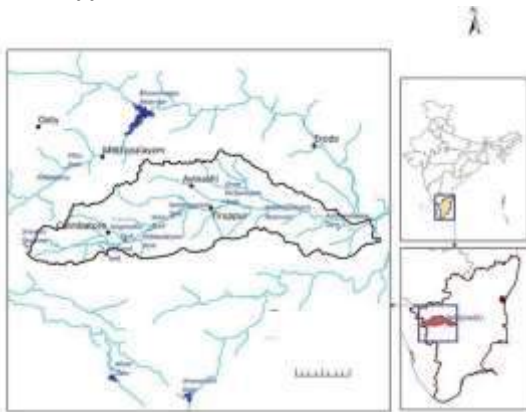


Figure 1: Schematic map of the Noyyal sub-basin

3.2 Physical Characteristics

Table 2 Physical Parameters

PARAMETER	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	Sample 8	Sample 9
Temp (°c)	31	29	31	29	29	27	28	29	29.5
EC (ms/cm)	0.07	0.07	0.09	0.34	0.35	1.80	1.82	1.18	1.42
Turbidity	5.7	7.3	8.6	8.9	11.9	25.5	102.2	110.4	147.2
Color	Color less	Light brown	Light brown	Light brown	Brown	Brown	Black	Light brown	Light brown
TDS (mg/l)	20	40	50	210	220	1120	1180	1140	1980
PARAMETER	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15	Sample 16	Sample 17	Sample 18
Temp (°c)	31	29	30	30	30	31	29	31	30
EC	2.12	3.81	2.98	2.54	4.80	4.89	1.12	4.95	4.92

2.5 Land Use For Noyyal River Basin

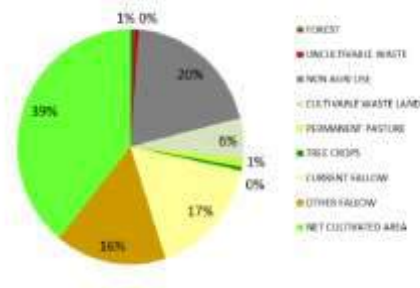


Fig.No 1 Land Use For Noyyal River Basin

3. RESULTS AND DISCUSSION

3.1 Work Done

The water samples were analyzed for various parameters in the laboratory of Environmental Engineering, Coimbatore Institute Technology Coimbatore. Various physical and chemical parameters like Temperature, pH, Turbidity, Total Dissolved Solids (TDS), Total Suspended Solids (TSS), Hardness, Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Residual Chlorine, Chloride, Alkalinity have been monitored for the tap water of different locations.

(ms/cm)									
Turbidity	98.4	39.8	42.4	48.9	59.8	33.1	72.4	80.8	62.4
Color	Brown	Light brown	Brown	Brown	Light Brown	Light Black	Light Black	Colorless	Light brown
TDS (mg/l)	2110	1320	1410	988	2100	1980	1990	1990	1995

3.3 Chemical Characteristics

Table 3 Chemical Parameter

PARAMETER	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5	Sample 6	Sample 7	sample 8	Sample 9
Ph	6.21	8.31	6.71	7.07	7.27	9.69	7.33	7.67	7.27
Acidity	6	8	10	22	16	0	96	92	84
Alkalinity	22	26	34	118	118	154	394	417	394
Chlorides	36	34	16	31	20	221	223	210	226
Total hardness	57	55	43	142	148	78	372	310	345
DO	6.6	5.3	5.2	3.9	6.2	4.2	5.8	4.8	5.4
Sulphates	0.032	0.009	0.007	0.004	0.008	0.016	0.846	0.612	0.916
Residual chlorine	0.42	0.49	0.42	0.77	1.27	1.20	1.27	1.44	1.74
PARAMETER	Sample 10	Sample 11	Sample 12	Sample 13	Sample 14	Sample 15	Sample 16	sample 17	Sample 18
pH	6.87	6.91	7.48	7.79	6.73	7.68	6.12	7.78	6.46
Acidity	72	164	158	168	124	140	112	165	182
Alkalinity	324	249	221	244	520	380	414	720	641
Chlorides	280	261	295	276	285	265	395	280	275
Total hardness	410	295	324	344	295	275	270	380	275
DO	0	3.9	2.78	4.14	6.8	5.4	6.14	0	0
Sulphates	0.712	0.123	0.482	0.341	0.088	0.197	1.121	0.075	0.688
Residual chlorine	1.46	1.48	1.29	1.07	1.24	0.72	2.12	1.34	1.42

4. MITIGATION MEASURES

Sustainable river water management requires proper study, sound understanding and effective management of water systems and their inter-relationship (groundwater, surface water and rain water; quantity and quality; biotic component). The aim of sustainable river water management is to ensure the sustained multi-functional use of the river water. Basic water needs of people and ecosystem should first be fulfilled.

Essential ecological and physical processes should be protected.

- Determine water quality status;
- Identify pollution sources;
- Generate awareness and motivate regulatory agencies and polluters);

- Adopt regulatory and incentive measures (treatment plant and recycling) to reduce pollution load;
- Conduct regular bio-monitoring along with physico-chemical monitoring
- Conduct compliance monitoring program for enforcement of regulating measures
- Removal of encroachments in and around river has to be done
- Alternative arrangements to be made to deposit debris
- Removal of all solid wastes from the river
- Waste water treatment plants with appropriate technology to be constructed at the water inlets
- Regular monitoring of physio-chemical properties of tank water has to be done
- Wherever necessary bund strengthening has to be done
- Planting of native trees on the bunds essential to stop
- soil erosion, to provide nesting opportunity to the water birds and shade to the walkers
- Small islands have to be created inside the wetlands with suitable tree saplings for foraging and nesting of water birds
- Unnecessary roads in and around river has to be closed and fenced
- Erect necessary signage at appropriate places around river.
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