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Water Quality Analysis & Comparative Study of Selected Rivers In Karnataka .

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ABSTRACT:

The Cauvery River, also known as Kaveri or Dakshina Ganga, is a sacred river of India that originates from Talakaveri in the Coorg district of Karnataka and flows through Karnataka, Tamil Nadu, Pondicherry, and Kerala, ultimately emptying into the Bay of Bengal. Along its journey, the river is joined by several tributaries, including Harangi, Hemavathi, Laxmanthirtha, Kabini, Suvarnavathi, Shimsha, and Arkavati. Flowing past significant landmarks like the Krishnarajasagar Dam and the Sivasamudram waterfalls, it forms a 64 km boundary between Karnataka and Tamil Nadu before entering Tamil Nadu. An analysis of a 40.5 km stretch of the river near Harihara town indicates an increase in physical and chemical variables, particularly during the pre-monsoon season, though they remain within drinking water standards. According to the Central Pollution Control Board (CPCB) guidelines, the upstream 12.08 km stretch from Ingalagondi is classified as Class C based on Biochemical Oxygen Demand (BOD), while the downstream segment (12.08 km to 40.5 km) near Harihara is classified as Class D. However, the river meets Class C standards for dissolved oxygen (DO), maintaining levels above 4 mg/L across all sampled locations and periods.

Keywords: Cauvery River, Water quality analysis, *Water quality classification*: Class C, Class D, *Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO)*

1.Introduction:

Water is a vital resource for all forms of life and plays a crucial role in the social, economic, and environmental well-being of a region. Karnataka, a state in southern India, is endowed with numerous rivers that sustain its agricultural activities, support industrial processes, and provide drinking water to millions of people. However, with increasing urbanization, industrialization, and agricultural practices, the water quality of these rivers has been subject to significant degradation.

This report aims to analyse the water quality of selected rivers in Karnataka, namely the Kaveri, Uttara Pinakini, Chitravathi, and Arkavathi by examining various physico-chemical parameters such as pH, turbidity, total dissolved solids (TDS), dissolved oxygen (DO), biological oxygen demand (BOD), and conductivity, alkalinity, chloride. A comparative study will be conducted to identify the primary pollutants and the factors contributing to water quality deterioration across different regions.

By understanding the current state of water quality in these rivers, the report seeks to highlight the pressing need for effective water management practices and pollution control measures. The findings will provide valuable insights into the sources of contamination and suggest sustainable strategies to improve and maintain the health of Karnataka's river ecosystems.

Sewage is a type of waste water that is produced by community of people, characterized by volume or rate of flow, physical condition, chemical and toxic constituents. The use of sewage water for irrigation is a positive way to dispose of sewage water for irrigation is a positive way to dispose of sewage. Such large volumes of water in a country with persistent droughts and can be of great agronomic and economic importance. It has been estimated that typical wastewater from domestic sources could supply all the nutrients that are normally required for agricultural crop production (FAO, 1992). In hyper-arid Fezzan region of Libya (UNESCO, 1997) in the central Sahara Desert where groundwater is the only natural water resource available, increasing water demand has necessitated reusing treated municipal waste water for irrigation of sandy soils.

1. **Kaveri River:** Originating from the Brahma Giri Hills, it is a major river that supports agricultural and drinking water needs in Karnataka and Tamil Nadu.
2. **Chitravathi River:** Flowing through Karnataka and Andhra Pradesh, it faces ecological issues such as illegal sand mining and pollution from agricultural activities.
3. **Uttara Pinakini River:** Also known as the Penna River, it originates from the Nandi Hills and flows through Karnataka and Andhra Pradesh, facing challenges related to pollution and seasonal flow.

2.Objectives of the study:

The scope of a Water Quality Analysis & Comparative Study of Selected Rivers in Karnataka would typically involve several key components Industrial Sources Effluents: Factories and industrial plants discharge wastewater containing chemicals, heavy metals, and other pollutants directly into rivers. Thermal Pollution: Industries that use water for cooling purposes may release heated water back into rivers, disrupting aquatic ecosystems. Agricultural Sources Runoff: Fertilizers, pesticides, and herbicides used in farming can be washed into rivers during rainfall, introducing nutrients like nitrates and phosphates that cause eutrophication.

To achieve the above objective following experimental program is planned:

- To assess the current water quality of selected rivers in Karnataka by analyzing the physical & chemical parameters.
- To compare the present analysis results with the data collected from concerned government authorities and represent the findings.
- Preventive measures to be adopted to improving water quality and ensuring sustainable river management.

Materials and methodology:

Materials used for test

SLNO	Parameters	Unit	Test Method
1	P^H	-	p^H meter
2	Dissolved Oxygen	mg/L	Winkler method
3	Bio chemical Oxygen demand	mg/L	volumetric analysis
4	Conductivity	Ms/cm	conductivity meter
5	Alkalinity	mg/L	Titration
6	Total dissolved solids	mg/L	Gravimetric method
7	Chloride	mg/L	volumetric analysis
8	Total hardness as CaCo3	mg/L	volumetric analysis
9	Calcium	mg/L	volumetric analysis
10	Magnesium	mg/L	volumetric analysis
11	Acidity	mg/L	Titration method
12	Phosphate	mg/L	
13	Turbidity	NTU	Nephlon turbidity meter
14	Nitrate	mg/L	Titration method

3.5 Methodology:

Selection of Rivers in Karnataka :- Karnataka has numerous riversthat play a vital role in economy, ecology and culture. While selectionOf the rivers we majorly concentrated on the rivers which originates inKarnataka and give lives to other state.

The selected Rivers are kaveri (Cauvery) ,Uttara Pinakini, Chintravathi, Arkavathi

- **Collection of water sample :-** The water sample has been collected from the selected rivers at two points based on the activities going on the particular river. One liter of water collected at every point carefullywith all necessary precautions regarding preservation. All water samples tested in the laboratory within 24 hrs of preservation.

- **Testing of water sample with different parameters :-** The following are the tests conducted in the environmental laboratory with all facilities.

  1) pH, dissolved oxygen, Bio chemical Oxygen Demand, Conductivity, Alkalinity, Total Dissolved Solids, Chloride, Total Hardness, Ca, Mg, Nitrate, Phosphate.

- **Analysis of test report :-** After the conduction of all tests, the results aretabulated in the above order.
- **Comparison study of present data with pre conducted data :-** The quality of water will be checked by comparing the test results with the data available from the government authorities.

Result and discussion :- By comparing the obtained data, we decide the quantity of the water for drinking purpose. We suggest water treatment if water quality parameters do not fall in the acceptable limits.

4. Experimental results:

This section deals with various test results Water Quality Analysis and Comparative Study of Selected Rivers in Karnataka

4.1 COMPARISION STUDY OF PRESENT DATA WITH PRE-CONDUCTED DATA

Table:1KAVERI / CAUVERY BEFORE SANGAM

SLNO	Parameters	Maximum Acceptable Limits (in mg/L)	Maximum Permissible Limits (in mg/L)	Result of pre-conducted data Before Sangam	Result of Present data Before Sangam
1	P^H	6.5-8.5	No Relaxation	7.6	8.2
2	Dissolved Oxygen	-	-	5.8	6.7
3	Bio chemical Oxygen demand	-	-	1.7	4
4	Conductivity	-	-	172	152
5	Alkalinity	200	600	20.6	184
6	Total dissolved solids	500	2000	156	220
7	Chloride	250	1000	9.9	45
8	Total hardness as CaCo3	200	600	450	152
9	Calcium	75	200	70	35
10	Magnesium	30	100	30	16
11	Acidity	-	-	18	16
12	Phosphate	-	-	0.03	1

13	Turbidity	1	5	1.2	1.4
14	Nitrate	45	No Relaxation	0.32	4.6

SLNO	Parameters	Result of Pre-conducted data Before Sangam	Result of Present data Before Sangam
1	P^H	7.6	8.2
2	Dissolved Oxygen	5.8	6.7
3	Bio chemical Oxygen demand	1.7	4
4	Conductivity	172	152
5	Alkalinity	20.6	184
6	Total dissolved solids	156	220
7	Chloride	9.9	45
8	Total hardness as CaCo3	450	152
9	Calcium	70	35
10	Magnesium	30	16
11	Acidity	18	16
12	Phosphate	0.03	1
13	Turbidity	1.2	1.4
14	Nitrate	0.32	4.6

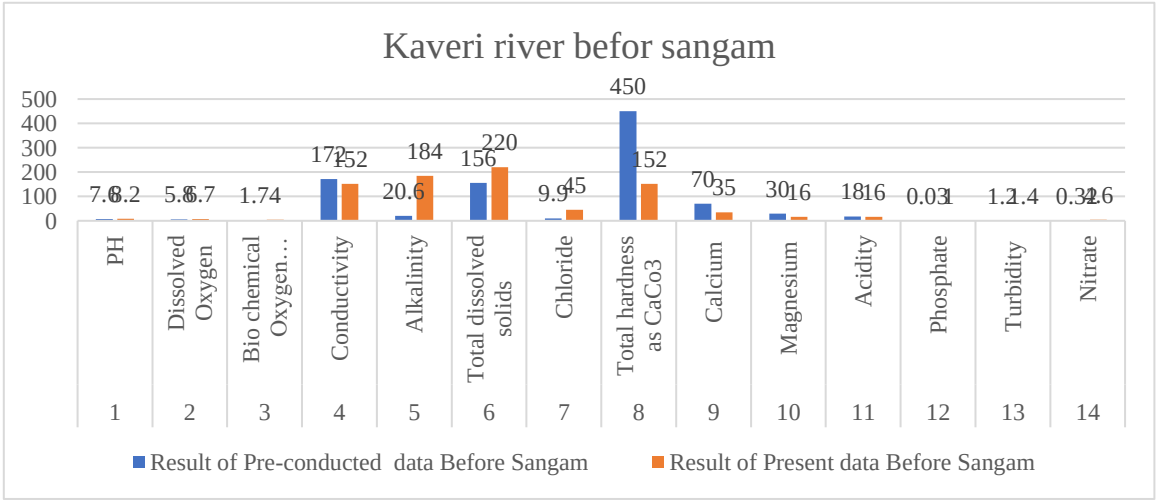


Fig:1Kaveri river before sangam chart

Table:2KAVERI / CAUVERY AFTER SANGAM

SLNO	Parameters	Maximum Acceptable Limits (in mg/L)	Maximum Permissible Limits (in mg/L)	Result of pre-conducted data After Sangam	Result of Present data After Sangam

1	P^H	6.5-8.5	No Relaxation	8.4	8.4
2	Dissolved Oxygen	-	-	5.8	6.7
3	Bio chemical Oxygen demand	-	-	1.7	4
4	Conductivity	-	-	718	636
5	Alkalinity	200	600	49.4	224
6	Total dissolved solids	500	2000	480	398
7	Chloride	250	1000	104	95
8	Total hardness as CaCo3	200	600	196	212
9	Calcium	75	200	53.4	48
10	Magnesium	30	100	15.3	22
11	Acidity	-	-	10	8
12	Phosphate	-	-	0.53	1.1
13	Turbidity	1	5	1.6	1.9
14	Nitrate	45	No Relaxation	1.9	11.1

SLNO	Parameters	Result of Pre-conducted data After Sangam	Result of Present data After Sangam
1	P^H	8.4	8.4
2	Dissolved Oxygen	5.8	6.7
3	Bio chemical Oxygen demand	1.7	4
4	Conductivity	718	636
5	Alkalinity	49.4	224
6	Total dissolved solids	480	398
7	Chloride	104	95
8	Total hardness as CaCo3	196	212
9	Calcium	53.4	48
10	Magnesium	15.3	22
11	Acidity	10	8
12	Phosphate	0.53	1.1
13	Turbidity	1.6	1.9
14	Nitrate	1.9	11.1

Fig:2 Kaveri river after sangam chart

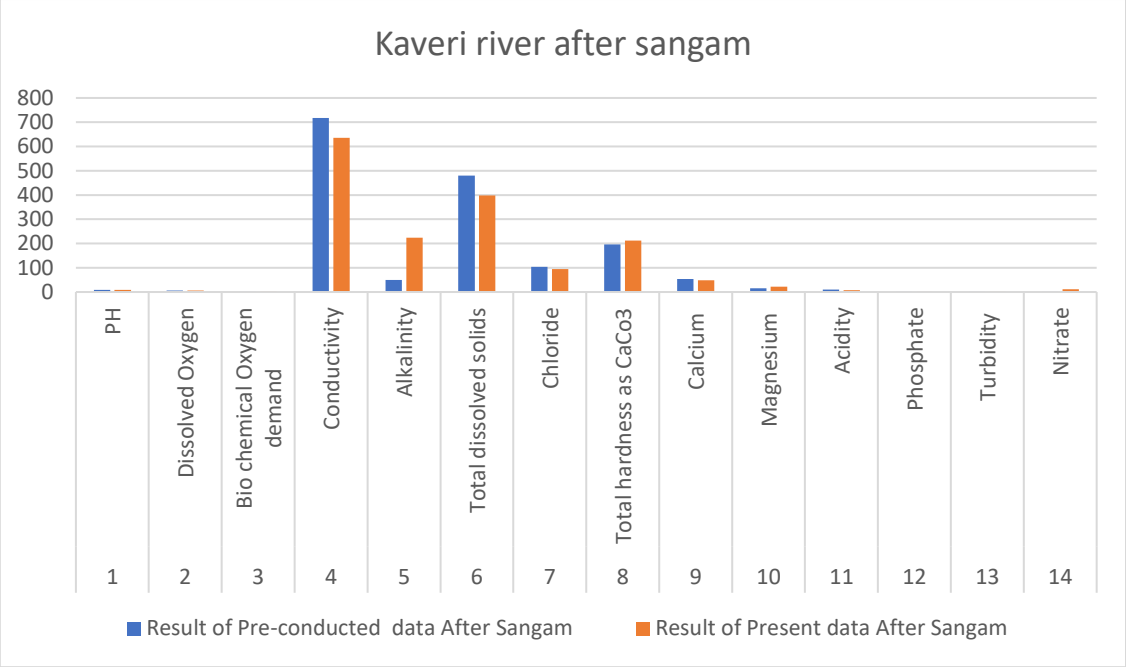


Table:3UTTARAPINAKINI / PENNAR RIVER

SLNO	Parameters	Maximum Acceptable Limits(in mg/L)	Maximum Permissible Limits(in mg/L)	Result of pre-conducted Data Gowribidanuru	Result of Present data Gowribidanuru
1	P^H	6.5-8.5	No Relaxation	7.8	7.9
2	Dissolved Oxygen	-	-	5.2	6.9
3	Bio chemical Oxygen demand	-	-	6	5
4	Conductivity	-	-	960	570
5	Alkalinity	200	600	150	168
6	Total dissolved solids	500	2000	520	356
7	Chloride	250	1000	75	115
8	Total hardness as CaCo3	200	600	200	132
9	Calcium	75	200	40	29
10	Magnesium	30	100	20	15
11	Acidity	-	-	10	20

12	Phosphate	-	-	1.2	1.4
13	Turbidity	1	5	32.5	4.4
14	Nitrate	45	No Relaxation	8.2	7.7

SLNO	Parameters	Result of Pre-conducted Data Gowribidanuru	Result of Present data G0wribidanuru
1	P^H	7.8	7.9
2	Dissolved Oxygen	5.2	6.9
3	Bio chemical Oxygen demand	6	5
4	Conductivity	960	570
5	Alkalinity	150	168
6	Total dissolved solids	520	356
7	Chloride	75	115
8	Total hardness as CaCo3	200	132
9	Calcium	40	29
10	Magnesium	20	15
11	Acidity	10	20
12	Phosphate	1.2	1.4
13	Turbidity	32.5	4.4
14	Nitrate	8.2	7.7

Fig:3Uttara Pinakini river chart

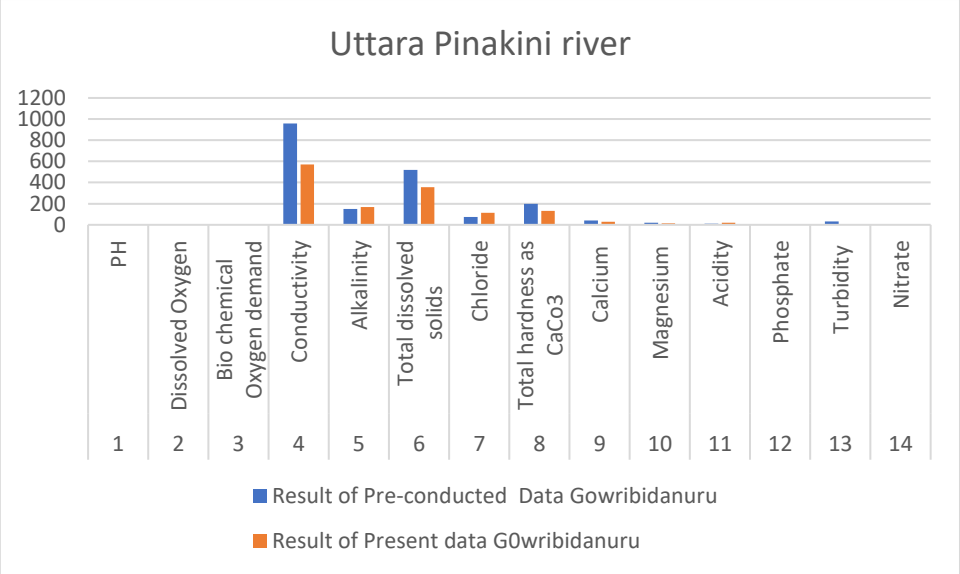


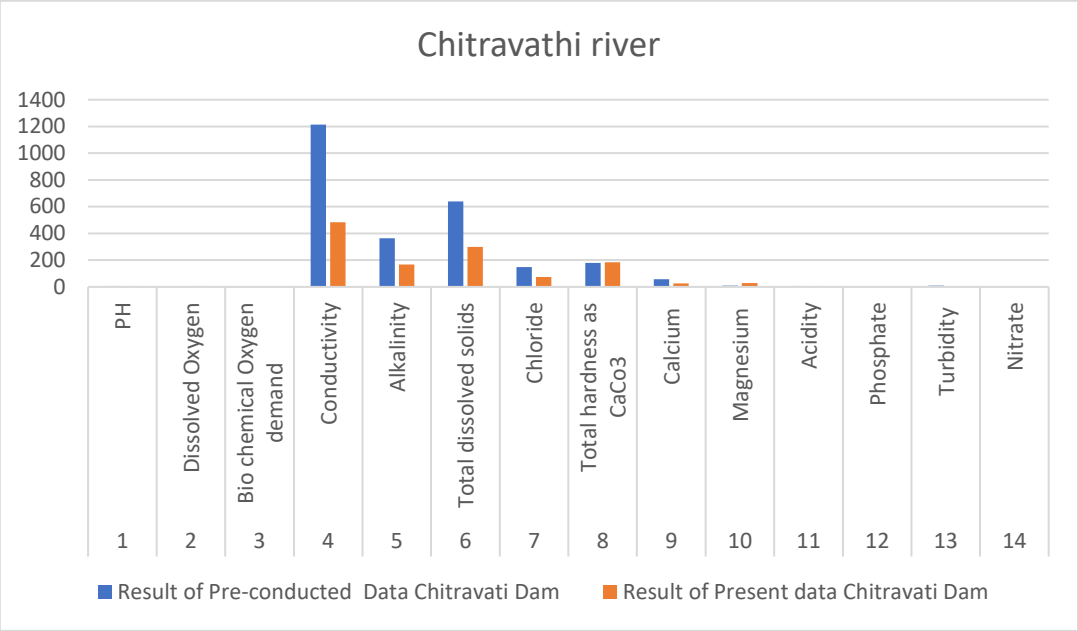
Table:4CHITRAVATHI RIVER

SLNO	Parameters	Maximum Acceptable Limits(in mg/L)	Maximum Permissible Limits(in mg/L)	Result of pre-conducted Data Chitravati Dam	Result of Present data Chitravati Dam

1	P^H	6.5-8.5	No Relaxation	7.2	8
2	Dissolved Oxygen	-	-	3.4	6.8
3	Bio chemical Oxygen demand	-	-	2.4	4
4	Conductivity	-	-	1213	484
5	Alkalinity	200	600	364	168
6	Total dissolved solids	500	2000	639	300
7	Chloride	250	1000	148.4	75
8	Total hardness as CaCo3	200	600	180	184
9	Calcium	75	200	56.1	27
10	Magnesium	30	100	9.7	28
11	Acidity	-	-	6.2	8
12	Phosphate	-	-	0.074	1
13	Turbidity	1	5	10.1	1.5
14	Nitrate	45	No Relaxation	0.23	4.5

SLNO	Parameters	Result of Pre-conducted Data Chitravati Dam	Result of Present data Chitravati Dam
1	P^H	7.2	8
2	Dissolved Oxygen	3.4	6.8
3	Bio chemical Oxygen demand	2.4	4
4	Conductivity	1213	484
5	Alkalinity	364	168
6	Total dissolved solids	639	300
7	Chloride	148.4	75
8	Total hardness as CaCo3	180	184
9	Calcium	56.1	27
10	Magnesium	9.7	28
11	Acidity	6.2	8
12	Phosphate	0.074	1
13	Turbidity	10.1	1.5
14	Nitrate	0.23	4.5

Fig:4 Chitravathi river chart



Analysis is done as per the standard procedure given in standard method. The data connected to the quantity of wastewater was personally analyzed the samples collected from various sampling stations in Environmental Engineering laboratory, Civil Engineering Department, SJCIT, Chickaballapur. It may be due to the joining of storm water drain and treated/untreated sewage and industrial waste water from part of Mysore city into the river Kaveri/Cauvery.

Due to the agricultural waste disposed to the water illegally the water is getting contaminated at that particular zone.

5.Observations and discussions

- .The collection of water sample plays an important role in the analysis of water quality, the water quality depends on the place of collection
- The collected water sample should be stored in a container and should be tested within 48hrs of collection
- The importance of collection is access to clean and safe water is essential for human health, economic development and environmental sustainability
- Water sources can be contaminated with various pollutants affecting water quality and posting risks to human's health and the environment
- Due to the industrial waste disposed to the water illegally the water is getting contaminated at that particular zone.
- At that particular Sangam place the public are allowable to swim and enjoy with families in the Kaveri water it also contaminates the water.
- The analysis of water quality of River Uttara Pinakini in Gowribidanur reveals significant pollution and contamination.
- The river's water is unfit for human consumption, irrigation, and aquatic life due to high levels of Total Dissolved Solids (TDS)- Electrical Conductivity (EC)- Fluoride- Nitrate- Bacterial contamination.

6. Conclusions

1. The water quality of the examined rivers and locations indicates significant contamination. Key parameters like nitrate, chloride, and total dissolved solids (TDS) often exceed acceptable limits, rendering the water unsuitable for human consumption, irrigation, and aquatic ecosystems.
2. Contamination is largely attributed to untreated industrial effluents, agricultural runoff, and sewage discharge. These pollutants severely impact the water quality in areas such as the Kaveri, Uttara Pinakini, and Chitravathi rivers.
3. Biochemical Oxygen Demand (BOD) and nitrate levels have significantly increased compared to earlier data. These changes highlight worsening pollution levels due to organic and nitrogenous waste inputs.
4. Recreational activities, including bathing and swimming at Sangam points, contribute to localized pollution, further degrading water quality in these areas.
5. The findings underscore the necessity for pollution control measures, improved waste management practices, and regular monitoring to restore and maintain acceptable water quality standards.0

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