Analysis of Water Pollution in Bhavani And Cauvery River Belt

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Abstract- *India is a fast growing economy moving towards development. The establishment of industries has lead to exploitation of the natural resources and the environment. Even though many environmental laws have been put forth by the government, it's been a challenge for the administrative authorities to check its effectiveness. The establishment of unauthorized dying and tanneries in and around the district of erode is mainly due to the availability of the Cauvery and Bhavani river water. The agricultural runoff, untreated effluents and sewage enter into the river and pollute the ecosystem. The quantization of the level of pollution inflicted on Cauvery and Bhavani River flowing through the Namakkal and Erode district will be studied. The impact on the eco-system, human health will be analyzed and necessary modifications in the existing systems of waste discharge will be done. Numbers of samples of drinking water and industrial effluents will be taken at appropriate points, tested for chemical threshold limits, analyzed for the toxic materials as per the Bureau of Indian Standards and Pollution Control Board.Cauvery rive, Bhavani River, water quality index, feacal coil forms.*

Keywords- Cauvery rive, Bhavani River, water quality index, feacal coil forms

I. INTRODUCTION

Bhavani, the second largest river in Tamil Nadu, begins from Kerala's Silent Valley and flows into western Tamil Nadu, covering a distance of 217 km before merging with the Cauvery. The basin drains an area of 0.62 million ha, spread over Kerala (9 per cent), Karnataka (4 per cent) and Tamil Nadu (87 per cent). The main river courses through Coimbatore and Erode districts of Tamil Nadu, before reaching the Cauvery at Bhavani town. About 90 per cent of the river’s water is used for agriculture, even as industries dot the sub basin at every point.

The river Cauvery River originates in the Brahmagiri hills of the Western Ghats near Coorg (Kodagu). The Cauvery basin enters over an area of 87,9000sq km in the states of Kerala, Karnataka and Tamil Nadu. The total length of the river from the head to its outfall into the sea is 800 km of which about 320 km are in Karnataka, 416km in Tamil Nadu and the remaining length of 64 km form’s the common boundary between the states of Karnataka and Tamil Nadu.

Figure - 1 Cauvery River System

The main polluters are agricultural, industrial and urban sectors. Huge quantities of fertilizers and pesticides are discharged into the river as agricultural runoff. Coffee plantation in the districts of Kodagu, Hassan and Chikmagalur contributes heavily to BOD level in the river water. A total of 61 industries in Karnataka and 1,139 in the Tamil Nadu contribute a heavy pollution load. These include water intensive textile and sugar units, paper mills, chemical units, engineering units and tanneries. The quantity of waste-water discharged directly into the river is approximately 87,600 cum/ day. The river has a total dissolved solid (TDS) level of 1,450 mg/l which is three times higher than the permissible limit of 500 mg/l prescribed by the W.H.O. (Anil Agrawal et al. 1999, p.90). The Water Quality of Cauvery river monitored by CPCB at twenty locations indicates that DO is in the range of Nil-14.0 mg/l and the minimum value is observed at Erode near Chirapalayam in Tamil Nadu. A number of dying units and tanneries are constantly monitored for breach of the environmental laws and several units discharging untreated water has been constantly closed by the SPCB authorities in and around Erode and Bhavani.

Figure - 2 The Flowing Filth in Cauvery

The main objective of the project is to analyze the level of water pollution the river is been experiencing. The water quality of the Namakkal & Erode districts are taken as subject of interest. The water flowing through Bhavani, Komarapalayam, Agraharam and Pallipalayam is taken into consideration for the assessment of the quantum of the pollution involved. Samples of river water and drinking water have to be collected at appropriate places and characteristics (physical, chemical and Biological) of the water have to be analysed. The source of pollution will be identified and analysis. Using water quality index the river water quality will be expressed and whether river water could be used for various purpose will be analysed.

II. LITERATUREREVIEW

Arivoli Appavu1, Sathiamoorthi Thangavelu et al., [2016]The present study is focused on the determination of physic-chemical parameters, such as temperature, pH, EC, hardness, chlorides, alkalinity, DO, BOD5, COD, phosphate and sulphate of water samples from different sampling points. Increase of pollution concentration indicate an increase in the pollution load due to domestic sewage and industrial effluents and anthropogenic activities and discharge of wastes to the discharge into river at Erode district. In the present study water samples were collected from the whole city was divided in four regions for well-organized sampling and interpretation. The results revealed that the average pH value was analyzed as 7.86, Electrical Conductivity was 920 µS/cm-1, parameters include Total Solids 1580 mg/l, Total Dissolved Solids 1004 mg/l, total suspended solids was 690 mg/l, total hardness was 340 mg/l, chloride was 380 mg/l, dissolved oxygen was 5.59 mg/l, BOD5 was 38 mg/l, COD was 304 mg/l, phosphate was 6.0 mg/l and sulphate was 60 mg/l of the river water sample. Therefore the study revealed that how the Cauvery river water is contaminated by effluents from small scale industries and dumping of wastages from markets and domestic use wastages. So water quality management is urgently required to achieve the water quality standards determined by WHO. Correlation coefficient showed highly significant positive and negative relationship

Paramasivan Sivakumar, Thangaraj Senthamizhchelvi etal.,[2017]Assessment of water pollution in the lower Cauvery was executed on the basis of water quality indices. WQI for nine sites were calculated using ten water quality variables (DO, TDS, EC, and pH, Alkalinity, Hardness, Calcium, Nitrate, Chloride, and Sulphate). WQI for the three stations, Kabisthalam, Hokenakkal and Moovalur were 40.322, 45.206 and 46.486 respectively, i.e., “Good” category of river water quality. The WQI from Kallanai, Mettur dam, Mukombu were below the level of 51 – 75 and these sites can be categorized as moderately polluted. Tiruchi, Kumbakonam and Melaiyur were below the level of 76 - 100 and these sites can be categorized as severely polluted. High values of WQI were observed to be predominantly from the lower estimations of DO, nitrate, calcium, and greater values of pH in the study sites. It was observed that the major cause of degradation in water quality was high anthropogenic practices, unlawful release of sewage, absence of appropriate sanitation, and urban spillover

Abida Begum Harikrishnaet al., [2007] The quality of water in four streams of Cauvery River in Mandya District, where many small scale sugar and brewery distilleries are located, was analysed. Sampling was carried out from four streams designated as station 1 (upstream of effluent discharge point), station 2 (effluent discharge point) and station 3 (downstream of effluent discharge) station 4 (fresh water stream) to assess the impact of effluent on the water quality. The river water composition is increasingly dominated by Na and Cl in the downstream region of the river, indicating the influence of airborne salts with oceanic affinities. Significant spatial variation was observed in water level, transparency, turbidity, depth, dissolved oxygen, colour, biochemical oxygen demand, nitrate, nitrite and total hydrocarbon among the physiochemical parameters of the study stations. A posteriori test revealed that station 2 & 3 were the cause of the significant difference. The dissolved oxygen level in stations 2 & 3 was lower than 5.0mg/L, which is recommended minimum allowable limit for aquatic life. About 7 rotifer species in large amount recorded in this study were encountered in station 1, 7 in station 2 & 3 while 12 species in station 4. The overall density of rotifers in the four stations was significantly different. A posteriori comparison revealed that station 2 & 3 are the cause of the significant difference. The Branchionus angular is rotifers, which dominated the community, were found to tolerate the effluent effect in station 2&3, and showed remarkable recovery in the downstream station 4. Low faunal diversity and negative impact on the biotic and abiotic environment was experienced in station 2 & 3 throughout the duration of sampling because of the brewery effluent discharged directly into these two Streams.

S.Hema, T.Subramanietal.,[2010]Cauvery River is one of the significant sources of water supply for domestic, agricultural and industrial usage in Tamil Nadu. In spite of large scale utilization of the river water, poor water management has resulted in large scale degradation of the quality of water. Hence a detailed study has been attempted in the Cauvery River between the latitudes 11 0 29' 35.1" N & 10 0 57' 24" N and the longitudes 77 0 42' 40.7" E and 78 0 14' 17.9" E. Four major tributaries such as Bhavani River, Noyal River, Amravati River and Thirumanimuthar River confluence with the Cauvery River in the study region. About fifty water samples were collected in the Cauvery River during February2009 and the samples were analyzed for the physical and chemical parameters such as pH, Electrical Conductivity, Total Dissolved Solids, alkalinity, hardness, Ca 2+ , Mg 2+ , Na+ , K + , Cl , SO4 2 , CO3 2 , HCO3 NO3 ,and F . The analytical results were compared with the Indian (BIS) and International (WHO) standards to assess the suitability of water for drinking and the extent of deterioration. Spatial variations of various surface water quality parameters were studied using the Geographical Information System (GIS). The study indicates that some of the samples of February2009 exceed the permissible limit for drinking. The study further reveals that the variation of water quality with respect to space and time is not uniform. Agricultural runoff, sewage and industrial effluents are the probable sources for the variation of water quality in the study region

S.Ranjith, Anand.V. Shivapur et al., [2019] The study reports the Weighted Arithmetic Water Quality Index (WQIa) value obtained for River Tungabhadra, a major tributary of Krishna River basin. A WQIa delivers a unique rating that gives whole water quality at a specific stretch and period depending upon some water quality constraints. The principle point of a WQIa is to give complex water quality insights into data that is clear and useable by the community. Some of most critical water quality parameters such as pH, Total dissolved solids (TDS), Total alkalinity, dissolved oxygen (DO), Biochemical oxygen demand (BOD), Total hardness (TH), calcium (Ca), magnesium (Mg), and electrical conductivity (EC) were Used for evaluating the WQIa. The WQIa esteems for the Tungabhadra River oscillate from 40 to 156. The estimations of WQIa exhibited that the stream water was free of any impurities at the examining sites aside from 2-3 months where its qualities were under good condtion. On every occasion there are anthropogenic influence viz industrial effluent, agricultural runoff and domestic sewage which is directly discharge into stream water gets contaminated to some level and hence of WQI declines. It is opinioned that WQIa can be used as a device in relating the water-quality of different sources. It delivers the community an over-all awareness of the thinkable glitches with water in a specific stretch. The WQI are among the best approaches to convey the data on water-quality pattern to the public community or to the water quality policy-makers and which is help full to drive suitable mitigative measure

Krishnappa Venkatesha Raju et al., [2018] Cauvery basin is one of the significant areas of rice and sugarcane production in India. A stretch of river Cauvery in Karnataka, receives mainly an agricultural run-off followed by domestic and industrial sewage, apart from this recreation, ritual, sand mining practices and hydro-electric power generation cause intensive pressure on flora and faunal affluence by deteriorating the water quality of the river system. Along the steady stretch of river Cauvery in Karnataka, eight major tributaries merge to contribute towards water flow and water quality fluctuations. In the present investigation, seven sampling stations were selected through a preliminary observations on anthropogenic interferences associated with river system. Sampling was performed for pre and post-monsoon seasons. Water, sediment and bank soil samples were collected twice in each season by following an advanced standard sampling and preservation procedures to study the spatio-temporal variation and fluctuations. Further fish, macrophytes and benthic organisms were also monitored for metal accumulation once during the study period. APHA Standard analytical methods were applied to estimate physico-chemical and metal characteristics of the river water. The analytical results have been applied for appropriate statistical techniques to delineate spatio-temporal variations. As per the study of physicochemical characteristics through factor analysis, it could be revealed that conductivity, organic load and dissolved oxygen were observed to be significant parameters in seasonal fluctuation of river water quality. It was observed that iron is the major and cadmium is least concentration in the river stretch. Principal Component Analysis outcome evidently indicated both innate and anthropogenic activities are contributing factors as source of metal profusion in river Cauvery basin. In case of biological samples, Vallisnariaspiralis, Catlacatla and Mollusca showed significant accumulation potency for the metals

D.Shiva Kumar S.Srikantaswamyet al., [2014] In the global context water pollution is considered as a major issues pertaining to its pollution level from the anthropogenic activities. In this scenario the conservation strategies plays an important role in the conservation of water bodies as well as water quality. The quality of natural water in rivers, lakes and reservoirs and below the ground surface depends on a number of interrelated factors. Water has the ability to react with the minerals that occur in the soil and rocks and to dissolve a wide range of materials, so that its natural state is never pure. It always contains a variety of soluble inorganic, soluble organic and organic compounds. In addition to these, water can carry large amounts of insoluble materials that are held in suspension. Both the amounts and type of impurities found in natural water vary from place to place and by time of year and depends on a number of factors. In order to examine and evaluate the quality of Cauvery River, water samples were collected from different locations of the river basin. The results showed that the Cauvery river still in the purest water quality condition. Many research studies shown the water quality of the Cauvery River have become pollute and near to pollute, but in the present study it clearly indicates that the Cauvery river water sustains the normal quality form in the sampling location during the study period. It was observed that the impact and entering of human activity was very less in the sampling location of Kodagu District, India.

Smita Rout, Asit Kumar Beheraet al., [2013] The study was conducted to assess and ascertain the physico-chemical properties of Mahanadi river water from five different locations of (Binakhandi, 500 m upstream of Binakhandi, 500 m downstream of Binakhandi, PC bridge and Dhanupali) Sambalpur city of Odisha during the month of March and August, 2014. The analysis was carried out by taking certain important parameters like pH, dissolved oxygen (DO), biological oxygen demand (BOD), chemical oxygen demand (COD), Chloride, total dissolved oxygen (TDS), Nitrate, Sulphates, total hardness (TH), electrical conductivity (EC) and Fluoride. Analyzed parameters like pH, DO, TH, Chloride, Sulphate, and TDS were found within permissible limit prescribed by IS 10500 except Nitrate and Fluoride content which exceeds at some sites. COD values were invariably higher than BOD indicating the presence of considerable amount of chemically oxidizable matter which were non-biodegradable. High COD values clearly indicates the status of the river water i.e. polluted. EC also considerably recorded high particularly in site – 2 in summer season. These physicochemical parameters indicates the deterioration of water quality which is the result of various anthropogenic disturbances like industrialization, construction activities, utilization of agricultural and forest land for other developmental purposes. Other sources which contributes more or less in water quality depletion are disposal of untreated domestic and sewage effluents and different types of solid wastes directly to river.

A. R. K. Kulandaivel, P. E. Kumaretal.,[2009] An attempt has been made to study the physico-chemical characteristics and biological investigations of Cauvery river at Erode region. The sampling points were selected on the basis of their importance. Industrial wastewater, dyeing effluents and sewage are allowed to mix with the Cauvery river water in this region. Water Quality Index (WQI) has been calculated based on National Sanitation Foundation (NSF) index system. Water Quality Index is an easy tool to assess the quality of surface waters and to control the pollution load of water bodies.

C.Gajendran and A.Jesumi[2013]Maintaining the quality of water is very essential in order to utilize the resource effectively. Rapid industrial and urban development's often witness deterioration of water quality. It is important to assess the baseline characteristics of river water quality so that, sustainable development can be pursued. This study emphasizes on Cauvery River Basin, Tamil Nadu, India. Data has been collected for twenty years for different physiochemical parameters of water quality for about seventy five villages in Tiruchchirappalli district. Water Quality Index is a means to summarize large amounts of water quality data into simple terms for reporting to management and the public in a consistent manner. The Water Quality Index has been evaluated using Microsoft Excel for the parameters considered. The variables of interest are Total Dissolved Solids, Chloride, Sulphate, Bicarbonates, Nitrates, Fluoride, pH, Total Hardness, Calcium and Magnesium. The WQI obtained from the result ranged from 34.47 to 730.96. The analysis reveals that none of the villages have excellent quality of water. About 20% of the villages have moderately polluted water. In about 28% of villages, water is very poor and 52% of the villages have water which is unsuitable for drinking in Tiruchchirappalli district, Tamil Nadu, India.

III. METHODOLOGY

The drinking water is collected at various locations and tested as per the Drinking water standard. The sampling technique, the parameters determined, the methodology followed to evaluate it are discussed in the following sections.

Characteristics of Water

The characteristics of water are physical, chemical and biological in nature. Each characteristic have its own importance and deviation from the normal values leads to undesirable results. The physical characteristics are taste, colour, odour, turbidity etc. The chemical characteristics are determined by chemicals such as chlorine, arsenide, mercury, sulphate, chloride, calcium, magnesium etc. Securing the microbial safety of drinking-water supplies is based on the use of multiple barriers, from catchment to consumer, to prevent the contamination of drinking-water or to reduce contamination to levels not injurious to health. Safety is increased if multiple barriers are in place, including protection of water resources, proper selection and operation of a series of treatment steps and management of distribution systems (piped or otherwise) to maintain and protect treated water quality. The preferred strategy is a management approach that places the primary emphasis on preventing or reducing the entry of pathogens into water sources and reducing reliance on treatment processes for removal of pathogens. In general terms, the greatest microbial risks are associated with ingestion of water that is contaminated with human or animal (including bird) faeces. Faeces can be a source of pathogenic bacteria, viruses, protozoa and helminthes. Faecally derived pathogens are the principal concerns in setting health-based targets for microbial safety Microbial water quality often varies rapidly and over a wide range. Short-term peaks pathogen concentration may increase disease risks considerably and may trigger Outbreaks of waterborne disease. Furthermore, by the time microbial contamination is detected, many people may have been exposed. The potential health consequences of microbial contamination are such that its control must always be of paramount importance and must never be compromised.

Sampling

In order to determine the characteristics of water, physical, chemical and biological sample must draw from appropriate places of interest. A representative sample is a small quantity of the water that is to be tested to determine of the characteristic of a whole water system. The quantity of the sample taken depends on the tests to be carried out.

Sampling Procedure-I

1. Water for chemical examination should be collected in a clean, white 2 liter polythenecontainer
2. The source from which water is collected should be in regular use. Otherwise the source should be adequately flushed before sampling. For hand pump sources, the water should be pumped and wasted for at least three to five minutes to clear all dirt, slime and turbidity. Water from wells should be taken in the middle at mid depth. For lakes, river sand dams, the water should be collected near the off-take point.
3. Before collection of sample, the container should be washed with the water to be sampled for at least 2 to 3 times.
4. The water should be then filled completely in the container without leaving any airspace.
5. Place the inner cap. Place a polythene sheet (10x10 cm) in-between the inner and outer caps. Screw the outer cap. Place another polythene sheet of same size over the outer cap and tie the neck with a rubber band or twine thread.
6. Label the container with all required source particulars.

Sampling Procedure – II

1. For bacteriological examination, the water should be collected only in a pre sterilized250 ml glass bottle which is supplied from the laboratory after remitting the testing charges
2. The sample collection procedures will be explained in the laboratory when the sampling bottles are delivered to the customer.
3. The sample should reach the laboratory within 6 hours from the time of collection. However when preserved in an icebox, the sample can be delivered within 24 hours.
4. The sample should be labeled properly before it is dispatched.

Water Quality Index

A water quality index provides a single number (like a grade) that expresses overall water quality at a certain location and time based on several water quality parameters. The objective of an index is to turn complex water quality data into information that is understandable and useable.

Water Quality Index = QiWi
Wi= K/Sn
Where,
Wi - Unit weight of chemical factor,
K-constant of proportionality and is given as:
Sn - standard value of ith parameter
Rating scale: Each chemical factor has been assigned a water quality rating to calculate
WQI.
Qi = 100 [(Va-Vi) / (Vs-Vi)]
Where,
Va - average of measured values in the water sample for three months at one place
Vs -standard value of ith parameter
Vi - ideal value for pure water (O for all parameters except pH and DO)
0 <WQI< 100 indicates that the water is fit for human use and 0 > WOI > 100 reflects its unsuitability for use.

Using the water quality index, all the samples were categorized into the following live classes: excellent (0 - 25), good (26 - 50). Moderately polluted (51 - 75), severely polluted (76 - 100)

IV. RESULTS ANDDISCUSSION

Drinking Water

The characteristics of all the samples are compared with the permissible limits of IS-10050, the Indian standard for Drinking Water Specifications.

Essential Characteristics

The highlighted values in the below table indicates that the value of the particular parameter exceeded the permissible value mentioned in the IS 10050. The values are compared and checked against the standard values.

The increase in the pH value can stomach irritation and inflammation of mucus membrane. The estimated levels of chlorine also have exceeded the standard value and the water is overdosed. Proper quantity of dosing agent must be used.

Table - 1 Essential Characteristics

S.No	Characteristics	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1.	Colour, (Hazen Units, Max)	Colour less	Colour less	Colour less	Colour less	Colour less
2.	Odour	Odour less	Odour less	Odour less	Odour less	Odour less
3.	Taste	Agreeable	Agreeable	Agreeable	Agreeable	Agreeable
4.	Turbidity (NTU, Max)	1.0	1.0	1.0	2.0	1.0
5.	pH Value	7.35	7.85	8.13	8.05	8.21
6.	Total hardness (ppm)	72	132	148	162	152
7.	Iron as Fe (ppm)	0.2	0.14	0.18	0.14	0.08
8.	Chlorides (as Cl) (ppm)	61.5	81.4	81.4	128	140.9
9.	Residual, free chlorine (ppm)	Nill	Nill	Nill	Nill	Nill

Desirable Characteristics

The desirable characteristics of water satisfies the standard values and are within limits.

Table - 2 Desirable Characteristics

S.No	Characteristics	Sample 1	Sample 2	Sample 3	Sample 4	Sample 5
1.	Conductivity	181.2	343.69	363.21	484.13	481.76
2.	TDS (ppm)	122	230	252	338	332
3.	Calcium (as Ca) mg/lit, Max	26	46	34	42	58
4.	Nitrate (as NO3) mg/lit, Max	0.3	0.49	0.66	0.61	0.46
5.	Fluoride (as F) mg/lit, Max	0.03	0.04	0.02	0.04	0.02
6.	Alkalinity mg/lit, Max	100	150	170	220	200
7.	Boron mg/lit, Max	<0.01	0.02	0.02	0.01	0.01
8.	Zinc mg/lit, Max	0.01	<0.01	<0.01	<0.01	<0.01
9.	Chromium mg/lit, Max	<0.01	<0.01	<0.01	<0.01	<0.01

Biological Characteristics

Examination of water samples revealed a significant amount of coliform bacteria. These bacterial colony, especially the fecal coliform have that ability to cause dysentery, throat infections and abdominal problems. Instead of using chlorine as a disinfectant, Ultraviolet rays can be used to kill the microbes present.

River Water

The samples are drawn at Mettur, Bhavani and erode for three consecutive months and tested in laboratories for the vital ten parameters and water quality index is been calculated. Using the water quality index, all the samples were categorized into the following five classes: excellent (0-25), good (26-50), moderately polluted (51-75), severely polluted (76-100).

WQI Calculation

The water quality index has been calculated for three locations namely Bhavanisagar Dam, Mettur Dam,Bhavani, Bhavani cauvery and Erode. The water quality have declined from mettur and it becomesunusable when it reaches Erode. The summation of QiWi gives the value of the waterquality index.

WQI of Bhavanisagar Dam = 19.248
WQI of Mettur Dam = 42.756
WQI of Bhavani River = 53.665
WQI of Bhavani cauvery = 52.230
WQI of Erode = 59.713

Table - 3 WQI at Bhavanisagar Dam

S.No	Parameters (mg/l except pH)	Va	Vi	Vs or Vp	Wi	Qi	QiWi
1	PH	7.35	7	8.5	0.6023	23.333	14.0548
2	TDS	122	0	500	0.0102	24.400	0.2499
3	Total Hardness	72	0	300	0.0171	24.000	0.4096
4	Total Alkalinity	100	0	200	0.0256	50.000	1.2800
5	Chloride	61.5	0	250	0.0205	24.600	0.5038
6	nitrate	0.3	0	20	0.2560	1.500	0.3840
7	calcium	26	0	75	0.0683	34.667	2.3666
			K	5.119968			

WQI IN BHAVANISAGAR DAM	19.24862

Table - 4 WQI at Mattur Dam

S.No	Parameters (mg/l except pH)	Va	Vi	Vs or Vp	Wi	Qi	QiWi
1	PH	7.85	7	8.5	0.6023	56.667	34.133
2	TDS	230	0	500	0.0102	46.000	0.471
3	Total Hardness	132	0	300	0.0171	44.000	0.751
4	Total Alkalinity	150	0	200	0.0256	75.000	1.920
5	Chloride	81.4	0	250	0.0205	32.560	0.667
6	nitrate	0.49	0	20	0.2560	2.450	0.627
7	calcium	46	0	75	0.0683	61.333	4.187
			K	5.119968			

WQI IN MATURE DAM	42.75609

Table - 5 WQI at Bhavani River

S.No	Parameters (mg/l except pH)	Va	Vi	Vs or Vp	Wi	Qi	QiWi
1	PH	8.13	7	8.5	0.6023	75.333	45.3770
2	TDS	252	0	500	0.0102	50.400	0.5161
3	Total Hardness	142	0	300	0.0171	47.333	0.8078
4	Total Alkalinity	170	0	200	0.0256	85.000	2.1760
5	Chloride	81.4	0	250	0.0205	32.560	0.6668
6	nitrate	0.66	0	20	0.2560	3.300	0.8448
7	calcium	36	0	75	0.0683	48.000	3.2768
			K	5.119968			

WQI IN BHAVANI RIVER	53.66527

Table - 6 WQI at Bhavani Cauvery River

S.No	Parameters (mg/l except pH)	Va	Vi	Vs or Vp	Wi	Qi	QiWi
1	PH	8.05	7	8.5	0.6023	70.000	42.1644
2	TDS	338	0	500	0.0102	67.600	0.6922
3	Total Hardness	162	0	300	0.0171	54.000	0.9216
4	Total Alkalinity	220	0	200	0.0256	110.000	2.8160
5	Chloride	126	0	250	0.0205	50.400	1.0322
6	nitrate	0.61	0	20	0.2560	3.050	0.7808
7	calcium	42	0	75	0.0683	56.000	3.8229
			K	5.119968			

WQI IN BHAVANI CAUVERY	52.23013

Table - 7 WQI at Erode Cauvery River

S.No	Parameters (mg/l except pH)	Va	Vi	Vs or Vp	Wi	Qi	QiWi
1	PH	8.21	7	8.5	0.6023	80.667	48.5895
2	TDS	332	0	500	0.0102	66.400	0.6799
3	Total Hardness	150	0	300	0.0171	50.000	0.8533
4	Total Alkalinity	200	0	200	0.0256	100.000	2.5600
5	Chloride	141.9	0	250	0.0205	56.760	1.1624
6	nitrate	0.46	0	20	0.2560	2.300	0.5888
7	calcium	58	0	75	0.0683	77.333	5.2793
			K	5.119968			

WQI IN ERODE CAUVERY	59.71323

According to the value of the water quality index, there are five classes

Excellent = (0 - 25)
Good = (26 - 50)
Moderately polluted = (51 - 75)
Severely polluted = (76 - 100)

So, it could be that the water from Bhavanisagar dam is excellent as it has a water quality index of 19.248, Mattur Dam water quality is good with a water quality index of 42.756,but it compare to the Bhavanisagar Dam there are some minimum amount of pollution contain the water.

After reaching Bhavani the water quality index of Bhavanisagar River is 53.665. It contain a larger pollution mainly due to the presence of many industries and human faeces let out in the open stream. When it reaches erode the dying industries let out effluent and it changes the colour of water leading to numerous problems to public and municipality. The water becomes difficult to be treated as the amount of chemicals in the water increases considerably and the plants present in water used those minerals to grow and causes eutrophication leading to death of fishes sometimes.

After reaching Erode the water quality index of Cauvery River is 59.713. It contain a larger pollution mainly du e to the many dying industry's and human faeces.

Core parameters:

The designated best use defined by the central pollution control boardis used to classify water for its use. It indicates a certain limit to be maintained for thelife of organisms to sustain.It also describes the criteria to bath and use water for industrial and cooling purposes.The water sample is collected from erode and tested for various parameters mentioned indesignated best use table.

The criteria for using river water for irrigation industrial cooling and controlled waste disposal is as follows

pH: 6.0 to 8,
Electrical Conductivity: 2250 mhos/ cm,

Sodium Absorption Ratio: 26
Boron: 2 mg/ l

Comparing these values with the values obtained and presented in the below table it can be concluded that the river water is suitable for irrigation and industrial cooling purpose. The criteria for Propagation of wild life and fisheries is as follows

pH: 6.5 to 8.5
Dissolved Oxygen: 4 mg/ l or more
Free Ammonia: 12 mg/ l

Comparing these values with the determined ones, the concentration of ammonia exceeds 13 mg/ l and it may cause harm to wildlife.

The criteria for Outdoor bathing is as follows

Ph: 6.5 to 8.5
Dissolved Oxygen: 5 mg/ l or more
Biochemical Oxygen Demand 5 days 20 ° C 3 mg/ l or less,

Fecal Coliform Organism MPN/ 100ml shall be 2500 (Imax permissible), or1000 (desirable)

It exceeds the value of 2500 and the calculated value is around 3200, so the water is declared unfit for bathing purpose as it may lead to infection and disease.

Table - 8 Core Parameters

S.no	Parameters	Estimated values
1	pH	8
2	DO (mg/l)	5.7
3	BOD (mg/l)	1.6
4	Total coliform (MPN/100ml)	3282
5	Free Ammonia (mg/l)	13
6	Conductivity (mho/cm)	2145
7	Sodium Absorption Ratio	22
8	Boron (mg/l)	1

V. CONCLUSIONS

The river water is highly polluted when it reaches erode and it is mainly due to the dying industries, Even though many dying industries have installed RO plants he hardly use them and their usage is limited to inspection purpose for the sake of pollution control boards The river water is highly contaminated with coliform bacteria because human feces is directly let put into the river making it unfit for bathing. Eutrophication is also possible due to presence of excess nutrients and it could be prevented once the treated effluents are let out into the river. Even though the sodium absorption ratio is lower than the permissible standard, still it is a high figure and can effect crop productivity in a significant way by logging the roots and preventing the plant roots to absorb nutrients because of the high salinity. Mixes with the river system, the river water could be used for irrigation but this is unsuitable for drinking.

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