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A Case Study on Sarabanga River Pollution in Salem District

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ABSTRACT: The Sarabanga river has become one of the most polluted rivers in Salem because of the high-density urbanisation growth and speedy industrialization. The Sarabanga river is severely polluted and needs urgent revival. The Sarabanga river in Salem is polluted due to poor sewage facilities, and insufficient wastewater management amenities. The measurement of the quality can be done by water quality assessment. In this study, the water quality index has been calculated for the Sarabanga river at Salem using monthly measurements of 12 physicochemical parameters. Trend forecasting for river water pollution has been performed using different parameters for the years 2020–2022 at Salem. The study shows that the values of four parameters namely TDS, and Hardness are increasing yearly, whereas the values of pH and DO are not rising heavily. The considered physicochemical parameters for the study are TDS, Chlorides, Alkalinity, DO, COD, BOD, pH, Magnesium, Hardness, and Calcium. As per the results and trend analysis, the value of total coliform, temperature, and hardness are rising year by year, which is a matter of concern.

I. INTRODUCTION

More than two third of the Earth's surface is covered by water. Water is essential for life. We have the rain as the ultimate source of water in the form of surface and underground water. The water bodies like ponds, lakes, wells, rivers etc. are directly affected and polluted by human activities including industrial and domestic. But the ground water is too deep in the earth to add some waste into it. Still, the ground water is also polluted in some areas where the surface is full of pollutants like the industrial areas where several industries discharge effluents in open tank and left for solar evaporation. The rain water percolates through the top soil and earth crust to underground water resources. We observe that the earth's surface is full of unwanted chemicals and pollutants. The ever increasing demand of the fertilizer for crop further increased the problem. In addition to the fertilizer various chemicals in the form of weedicides, pesticides and insecticides are also used in agriculture to increase the productivity to meet the growing demand of food product.

NEED OF STUDY

In present times, there is a huge shortage of water all over India, which is affecting us and our environment. Few concerns which should be looked into for remedial measures are Due to increasing dependency on ground water to fulfill the increased requirement of industries, agriculture; a large percentage of urban and rural population is deprived of safe, usable water. This condition is threatening and it worsens during severe summer months when even drinking water is not available in several parts of our country. Increase in the concentration of contaminants like fluoride, chloride, nitrate, iron, zinc, arsenic, lead, selenium, mercury, cadmium etc, in surface and ground water is a critical issue which needs urgent attention for a continuous supply of safe drinking water. Excess fluoride and arsenic have posed a serious health hazard to millions of people.

OBJECTIVE OF STUDY

Water pollution occurs when unwanted materials enter in to water (e.g. lakes, rivers, oceans, aquifers and contaminate the quality of water. This form of degradation occurs when pollutants are directly discharged into water bodies without adequate remove harmful compounds. This is harmful to environment and human health. Water pollution affects the biosphere of plants and organisms living in these as well as organisms and plants that might be exposed to the water. In almost all cases, the effect is damaging not only to individual species and populations, but also to the natural biological communities.

II. LITERATURE REVIEW

Many researchers have highlighted the causes and effects of water pollution.

Dhote et al. (2001) argue that the toxic chemicals used in making the idols tend to cause serious problems of water pollution and also pose a serious threat to the underwater ecological system. When immersed, these colors and chemical dissolve slowly leading to significant alteration in the water quality.

Zafar and Alappat (2004) indicate that the most landfills are located along the banks of rivers flowing through the cities in India. The quantity of waste generation is one of the biggest sources of environmental degradation in Delhi, India's capital. It contributes to river pollution in a significant way through landfill leachate and runoff, especially during the rainy season. All the landfill sites except Tilak Nagar, Hastal and Chattarpur are located close (0-6 km) to the river Yamuna. The leachate produced by landfills finally percolates to the porous ground surface at the landfills or finds its way to nearby drains. A large portion of landfill leachate and runoff produced by these landfill sites finally reaches the Yamuna through ground water flow or surface water flow through the drains. They indicate that river water quality is affected by the presence of landfill locations.

Yogendra et al. (2008) highlighted that freshwater is of vital concern for humans. The surface water bodies, which are the most important sources of water for humans and related activities are unfortunately under severe environmental stress and are being threatened as a consequence of developmental activities. The Pneumonia and Diarrhoea Progress Report (2016) published by John Hopkins in its report states that Pneumonia and Diarrhoea claimed lives of 1.5 million children under the age of five. This prevails disproportionately in a few countries as 72 percent of these two diseases among children deaths occur in just 15 countries.

Srinivasan et al (2009) in their paper examined the cost of illnesses for households living in areas irrigated with wastewater and comparing it to areas irrigated with normal quality of water along Musi River. The study found that nutrients present in wastewater are beneficial to agriculture but contaminants present in it hamper the environmental growth and poses health issues. Also it was found that higher morbidity rates existed in areas irrigated with wastewater that compared to areas irrigated with normal quality water.

III. MATERIAL PROPERTIES

pH

pH is the term used universally to express the intensity of the acid or alkaline condition of a solution. It is a measure of the concentration of free hydrogen ions (H^+) in water and expressed as $pH = -\log \{H^+\}$. The pH of an aqueous system is a measure of the acid-base equilibrium achieved by various dissolved compounds and, in most natural waters, is controlled by the $CO_2-HCO_3-CO_3$ equilibrium system. In most raw water sources pH lies within the range 6.5 - 8.5. The pH scale is usually represented as ranging from 0 to 14, with pH 7 representing absolute neutrality. Acid condition increase as pH values decrease and alkaline conditions increases as the pH values increase (Environmental Engineering, 1985; Davis, 1991). Although pH usually has no direct impact on consumers, it is one of the most important operational water quality parameters. Careful attention to pH control is necessary at all stages of water treatment to ensure satisfactory water clarification and disinfection.

Total Solids (TS)

Total solids (TS) is the term applied to the material residue left in the container after evaporation of the sample and its subsequent drying in an oven at a defined temperature. Solids can be dispersed in water in both suspended and dissolved forms. Water with a total solid content of less than 500 mg/l is most desirable. Total solids (TS) is the sum of Total Suspended Solids (TSS) and Total Dissolved Solids (TDS).

Total Suspended solids (TSS)

The material remaining in the filter after filtration for the solids in the water is the suspended solid. Suspended material may result from human use of the water. Domestic wastewater usually contains large quantities of suspended solids that are mostly organic in nature. Industrial use of water may result in a wide variety of suspended impurities of either organic or inorganic nature. Suspended material may be objectionable in water for several reasons. It is aesthetically displeasing and provides adsorption sites for chemical and biological agents. Suspended organic solids may be degraded biologically, resulting in objectionable by-products. Biologically active (live) suspended solids may include disease-causing organisms as well as organisms such as toxin-producing strains of algae. Suspended solids, where such material is likely to be organic and/or biological in nature, are an important parameter of water. The suspended-solids parameter is used to measure the quality of the drinking water, to monitor several treatment processes, and to measure the quality of the water used for daily household use.



Chlorides (Cl)

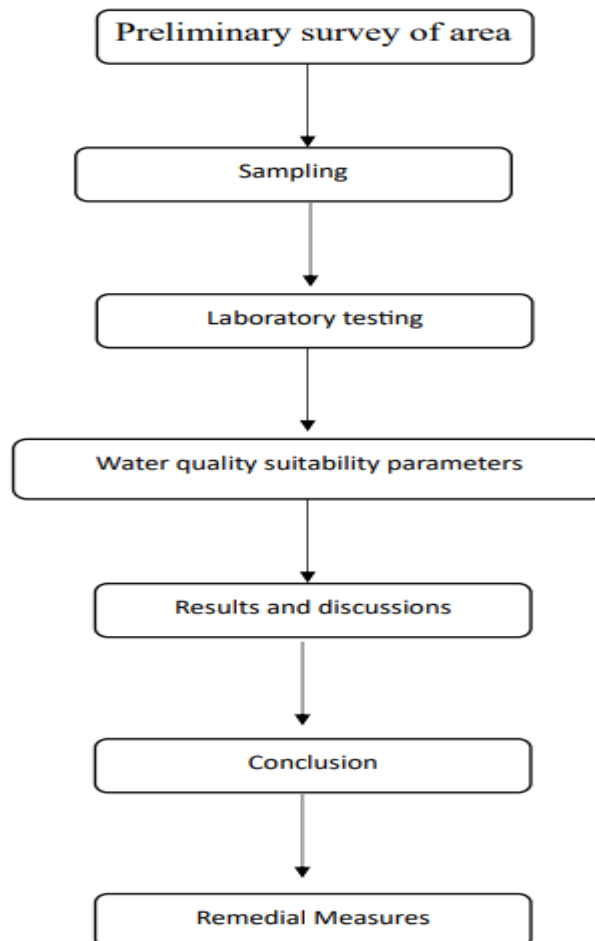
The attendance of chloride in usual waters can be credited to the suspension of salt deposit, Chloride anion is usually here in usual waters. Irrigation drainage and manure free. Person excreta, mostly urine also contribute to high amount of chlorides. High chloride satisfied also has a damaging consequence on agricultural crop.

Biochemical Oxygen Demand (BOD)

Biochemical Oxygen Demand (BOD) is usually defined as the amount of oxygen required by microorganisms while stabilizing decomposable organic matter under aerobic condition. BOD is a characteristic, not a constituent, of the water. So, BOD is the measurement of oxygen consumed by living organisms (mainly bacteria). BOD is the major criterion used in stream pollution control where organic loading must be restricted to maintain desired dissolved oxygen levels. The BOD test is widely used to determine the pollution strength of domestic water. Biochemical Oxygen Demand (BOD) determination is used to measure the purification capacity of streams and serves regulatory authorities checking the quality water source. Information regarding BOD of water is an important consideration in the design of treatment facilities. Unpolluted water should have less than 5 ppm of BOD (Environmental Engineering, 1985; Davis, 1991).

IV.METHODOLOGY

Methods used for this project are summarized under following headings:





V. LABORATORY ANALYSIS

In present study, Sarabanga River water sample were collected and analyzed for various physico-chemical parameters to find out the characteristics of the river water of Salem City, Tamilnadu. All the samples were analyzed to determine PH, TSS, DO, COD, BOD, TDS, Alkalinity, Phosphate, Sulphate, Turbidity, Calcium Hardness, Magnesium Hardness, Total Hardness, Nitrate, and Chloride using standard methods.

Parameters	Sample 1	Sample 2	Sample 3	Maximum permissible limit
pH	7.45	6.25	6.48	6.5 – 8.5
TSS(mg/l)	22.8	26	25.5	50
TDS(mg/l)	83	86.5	88	2000
Alkalinity(mg/l)	55.0	57.4	56.5	500
Chloride(mg/l)	53	54.8	53.20	500
Total Hardness(mg/l)	24.50	26.20	26.50	500
Phosphate(mg/l)	0.65	0.70	0.72	50
Sulphate(mg/l)	10.6	11.8	12.2	400
Nitrate(mg/l)	2.20	2.30	2.35	45
BOD(mg/l)	10.80	12.25	10.18	30
COD(mg/l)	15.50	18.20	16.25	100
DO(mg/l)	4.30	4.35	4.48	4
Turbidity(NTU)	17.50	24	23.2	15
Mg Hardness(mg/l)	9.75	10.25	10.40	100
Ca Hardness(mg/l)	14.65	15.4	16.20	100

VI. CONCLUSION

According to the identified sources of pollution, anthropogenic factors such as population growth, excessive consumption, overexploitation, chemical explosions, and subsurface mining are the main contributors to pollution in the catchment area. One of the main causes of this is a general lack of awareness among the general public. As a result, appropriate efforts must be done to restore the river ecology, which, if not preserved, will result in major environmental imbalances. In this study, characterization of the physicochemical parameters of Sarabanga River at 3 sample locations was carried. From the above results and discussion, it may be concluded that water quality of river in the investigation area is safe for domestic, irrigation, and industrial activities. Most of water samples were found to be within the permissible limits. It is clear from this initiative that pollution in the Sarabanga River may be substantially decreased. Since rivers are natural sources, appropriate steps should be taken to prevent pollution.

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