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Studies of Water Quality Analysis Due to Disposal of Domestic Sewage in Tapti River

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Abstract

In this project study of characteristics of Tapti River at Burhanpur has been done. The parameters studied were Colour, Odour, Taste, pH, Electrical conductivity, Total dissolved solids, Salinity, Turbidity, Total hardness. The values of these parameters were found in excessive amounts as prescribed by World Health Organization (WHO) &Bureau of Indian Standards. It can be concluded that the water parameters which were taken for the present study are above the pollution level for surface water which does not satisfy their requirement for the use of various purposes. A brief attempt has been made to study the extent of change in the quality of water in comparison to water quality standards of World Health Organization (WHO) and Bureau of Indian Standards.

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Keywords: *Tapti river , Burhanpur Sewage*

1. Introduction

1. Introduction:

India is a country having various land forms and rivers. There are 14 major rivers in India.Water, the universal solvent because of high dielectric constant has the property of dissolvingmost of the substances but the access of these substances leads to water pollution. The water bodies get polluted due to the discharge of effluents from the industries, domestic activities, and soil pollution from the nearby dumping sites and agriculturaldrainage. These factors result in the deterioration of water quality of the various waterbodies. Previous studyshows that the impact of theindustrial effluents and domestic sewage on river Ganga at Allahabad reported that all thepollution parameters are beyond the permissible limits and unfit for human consumption.Studyshows that the pollution potential of river Pandu contaminatedheavily by thedischarge of various industries. Untreated sewage discharge not only damage for aquatic lifebut also hazardous to human health used for drinking purpose in the downstream areas of theriver. Most of the cities and towns have developed along the banks of riversbecause of the multipurpose use of river water. But unfortunately, some rivers are beingpolluted by indiscriminate disposal of sewage and industrial wastes.Thepresent study is an attempt to make an assessment of the change in the physio chemicalproperties of Tapti River by the addition of sewage, domestic waste and garbage ofBurhanpur city.

1.1 Waste

Waste and wastes are unwanted or unusable materials. Waste is any substance which is discarded after primary use, or it is worthless, defective and of no use.

Examples include municipal solid waste (household trash/refuse), hazardous waste, wastewater (such as sewage, which contains bodily wastes (feces and urine) and surface runoff), radioactive waste, and others.

1.2 Types of Waste

In general, the wastes may be classified into the following categories:

i. Solid Wastes

These are the unwanted substances discarded by the human society. These include urban wastes, industrial wastes, agricultural wastes, biomedical wastes and radioactive wastes. It is also called as refuse.

ii. Liquid Wastes

Wastes generated from washing, flushing or manufacturing processes of industries are called liquid wastes. It is also called as sewage.

iii. Gaseous Wastes

These are the wastes that are released in the form of gases from automobiles, factories or burning of fossil fuels, like petroleum, and get mixed in the atmosphere.

1.3 Sources of Wastes

Generation of waste is a part and parcel of day-to-day human life. Wastes can be generated from various sources.

i. Municipal Sources of Wastes

This includes trash or garbage from households, schools, offices, market places, restaurants and other public places. Everyday items like food debris, used plastic bags, soda cans and plastic water bottles, broken furniture, broken home appliances, clothing, etc. comprise wastes generated from such sources.

ii. Medical or Clinical Sources of Wastes

Wastes produced from health care facilities, such as hospitals, clinics, surgical theaters, veterinary hospitals, and labs are referred to as medical/clinical waste. This includes surgical items, pharmaceuticals, blood, body parts, wound dressing materials, needles and syringes

iii. Agricultural Sources of Wastes

Waste generated by agricultural activities, including horticulture, livestock breeding, market gardens and seedling nurseries, are called agricultural wastes. Wastes generated from this source include empty pesticide containers, old silage wrap, out of date medicines and wormers, used tires, surplus milk, cocoa pods and corn husks.

iv. Industrial Sources of Wastes

These are the wastes released from manufacturing and processing industries like chemical plants, cement factories, power plants, textile industries, food processing industries, petroleum industries. These industries produce different types of waste products.

v. Wastes from Construction Or Demolition

Concrete debris, wood, huge package boxes and plastics from the building materials comprise construction waste, which is yielded as a result of the construction of roads and building. Demolition of old buildings and structures generate wastes, called demolition waste.

vi. Commercial Sources

As a result of the advancement of modem cities, industries and automobiles, wastes are generated daily on a large scale from commercial enterprises. These may include food items, disposable medical items, textiles and much more.

vii. Mining Sources

Mining activities also generate wastes that have the potential to disturb the physical, chemical and biological features of the land and atmosphere. The wastes include the overburden material, mine tailings (the waste left after extracting the ore from the rock), harmful gases released by blasting etc.

viii. Radioactive Sources

Radioactive sources of wastes include nuclear reactors, mining of radioactive substances and atomic explosions.

ix. Electronic Sources of Waste

The DVD and music players, TV, Telephones, computers, vacuum cleaners and all the other electrical stuff at your home, which are of no more use, are electronic wastes. These are also called e-waste, e-scrap, or waste electrical and electronic equipment (WEEE). Some e-waste (like TV) contains lead, mercury and cadmium, which are harmful to humans and the environment.

Waste nearby the Tapti River at Raj Ghat

2. **Waste Water**

2. Waste Water:

Wastewater is any water that has been adversely affected in quality by waste generated by human activity. Wastewater can originate from a combination of domestic, industrial, commercial or agricultural activities, surface runoff or stormwater, and from sewer inflow or infiltration.

Municipal wastewater (also called sewage) is usually conveyed in a combined sewer or sanitary sewer, and treated at a wastewater treatment plant. Treated

wastewater is discharged into receiving water via an effluent pipe. Wastewater generated in areas without access to centralized sewer systems rely on on-site wastewater systems. These typically comprise a septic tank, drain field, and optionally an on-site treatment unit. The management of wastewater belongs to the sanitation, just like the management of human excreta, solid waste and stormwater (drainage).

Sewage is a type of wastewater that comprises domestic wastewater and is therefore contaminated with feces or urine from people's toilets, but the term sewage is also used to mean any type of wastewater. Sewerage is the physical infrastructure, including pipes, pumps, screens, channels etc. used to convey sewage from its origin to the point of eventual treatment or disposal.

2.1 Origin of Waste Water

Waste water can be classified by their origin as domestic waste water and industrial waste water. Any combination of waste water that is collected in municipal sewers is termed as municipal sewage. Domestic waste water is that which is discharged from residential and commercial establishments, whereas industrial waste water is that which is discharged from manufacturing plants. The pollutant in domestic waste water arise from residential and commercial cleaning operation, laundry, food preparation, body cleaning function and body excretions. The composition of domestic waste water is relatively constant.

Industrial waste water is formed at industrial plants where water is used for various processes, and also for washing and rinsing of equipments, rooms etc. these operations result in the pollution of nearby aquatic systems because some of the products and byproducts are discharged, either deliberately or unintentionally in to them.

Figure 2.1 Waste Water coming out of pipe at Raj Ghat, Tapti River

Normally waste water is conducted to treatment plant for removing undesirable components which include both organic and inorganic matter as well as soluble and insoluble material. These pollutants, if discharged directly or with improper treatment, can interface with the self-cleaning mechanism of water bodies. The capacity for self-cleaning is due to the presence of relatively small number of different types of micro-organisms in the water bodies. This micro-organism use a food much of the organic pollutants and break down into simple compounds such as methane, and the micro-organisms produce new cells also. But often either a pollutant does not degrade naturally or the whole volume of the pollutant discharged is sufficient to the self-cleaning process

Various constituents of waste water are potentially harmful to environment and to human health. In the environment, the pollutant may cause destruction of animal and plant life, aesthetic life nuisance. Drinking water sources are often contaminate by increase concentration of pathogenic organisms as well as by many of the new toxic chemicals disposed by industry and agriculture. Thus, the treatment of these wastes is of importance.

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Figure 2.2 Waste water coming out of pipe at SatyaraGhat, Tapti River on 08-04-2017

Figure 3.1 Map of Madhya Pradesh

3. Sampling and Measurement

3. Sampling and Measurement

The complexity of water quality as a subject is reflected in the many types of measurements of water quality indicators. The most accurate measurements of water quality are made on-site, because water exists in equilibrium with its surroundings. Measurements commonly made on-site and in direct contact with the water source in question include temperature, pH, dissolved oxygen, electrical conductivity, turbidity.

3.1 Study Area:

Geographically, Burhanpur city is located on southern part of the Madhya Pradesh. The average elevation at theBurhanpur city is 267 m above Mean Sea Level (MSL). As of 2011, India census Burhanpur city has a population of 210,891. The map of study area is presented in Figure. TaptiRiver flows from east to west. TaptiRiver alsoprovides the necessary water requirements for few blocks of Burhanpur city.

3.2 Sample Collection:

More complex measurements are often made in a laboratory requiring a water sample to be collected, preserved, transported, and analyzed at another location. The process of water sampling introduces two significant problems.

The first problem is the extent to which the sample may be representative of the water source of interest. Many water sources vary with time and with location. The measurement of interest may vary seasonally or from day to night or in response to some activity of man or natural populations of aquatic plants and animals. The measurement of interest may vary with distances from the water boundary with overlying atmosphere and underlying or confining soil. The sampler must determine if a single time and location meets the needs of the investigation, or if the water use of interest can be satisfactorily assessed by averaged values with time and/or location, or if critical maxima and minima require individual measurements over a range of times, locations and/or events. The sample collection procedure must assure correct weighting of individual sampling times and locations where averaging is appropriate. Where critical maximum or minimum values exist, statistical methods must be applied to observed variation to determine an adequate number of samples to assess probability of exceeding those critical values.

Figure 3.2 The Sewage disposing in Tapti river

Figure 3.3 Waste Water disposal into Tapti River at Raj ghat

The second problem occurs as the sample is removed from the water source and begins to establish chemical equilibrium with its new surroundings – the sample container. Sample containers must be made of materials with minimal reactivity with substances to be measured; and pre-cleaning of sample containers is important. The water sample may dissolve part of the sample container and any residue on that container, or chemicals dissolved in the water sample may sorb onto the sample container and remain there when the water is poured out for analysis. Similar physical and chemical interactions may take place with any pumps, piping, or intermediate devices used to transfer the water sample into the sample container. Water collected from depths below the surface will normally be held at the reduced pressure of the atmosphere; so gas dissolved in the water may escape into unfilled space at the top of the container. Atmospheric gas present in that air space may also dissolve into the water sample. Other chemical reaction equilibria may change if the water sample changes temperature. Finely divided solid particles formerly suspended by water turbulence may settle to the bottom of the sample container, or a solid phase may form from biological growth or chemical precipitation. Microorganisms within the water sample may biochemically alter concentrations of oxygen, carbon dioxide, and organic compounds. Changing carbon dioxide concentrations may alter pH and change solubility of chemicals of interest. These problems are of special concern during measurement of chemicals assumed to be significant at very low concentrations.

Sample preservation may partially resolve the second problem. A common procedure is keeping samples cold to slow the rate of chemical reactions and phase change, and analyzing the sample as soon as possible; but this merely minimizes the changes rather than preventing them. A useful procedure for determining influence of sample containers during delay between sample collection and analysis involves preparation for two artificial samples in advance of the sampling event. One sample container is filled with water known from previous analysis to contain no detectable amount of the chemical of interest. This sample, called a "blank", is opened for exposure to the atmosphere when the sample of interest is collected, then resealed and transported to the laboratory with the sample for analysis to determine if sample holding procedures introduced any measurable amount of the chemical of interest. The second artificial sample is collected with the sample of interest, but then "spiked" with a measured additional amount of the chemical of interest at the time of collection. The blank and spiked samples are carried with the sample of interest and analyzed by the same methods at the same times to determine any changes indicating gains or losses during the elapsed time between collection and analysis.

Brief Detail of Sampling Sites

S. No.	***Site Code***	***Site Location***
1	*Site I*	*RAJ GHAT*
2	*Site II*	*SATIYARAGHAT*
3	*Site III*	*NAGZHIRIGHAT*
4	*Site IV*	*MOHANA SANGAM GHAT*

5. Result and Discussions:

Table 5.1 Physio- Chemical Characteristics of Water Samples of Tapti River, Burhanpur (Comparison with IS Standard)

S.No	Parameters	IS 10500:2012	Site I	Site II	Site III	Site IV
1	Colour	Colourless	Colourless	Colourless	Colourless	Colourless
2	Odour	Agreeable	Bad smell	Soil Smell	Soil Smell	Bad smell
3	Taste	Agreeable	Urine Type	Soil Type	Soil Type	Urine Type
4	pH	6.5 -8.5	7.12	7.81	8.03	7.72
5	Total Dissolved Solids	500 mg/l	437 mg/l	2090 mg/l	678 mg/l	665 mg/l
6	Electrical Conductivity	< 1 µmhos/ cm	0.67 µmhos/ cm	3.22 µmhos/ cm	1.04 µmhos/ cm	1.02 µmhos/ cm
7	Salinity	500 – 1500 ppm	504.00 ppm	2042.00 ppm	782.00 ppm	766.00 ppm
8	Turbidity	1 NTU	< 1 NTU	< 2 NTU	< 2 NTU	< 1 NTU
9	Total Hardness	500 ppm	380.00 ppm	1350.00 ppm	520.00 ppm	470.00 ppm

6. Conclusion

- The study reveals that the water of the river Tapti is deteriorated very badly as a result of addition of urban waste, domestic sewage, which enters the river from the banks during its course through the heart of Burhanpur city.
- Direct discharge of human and animal waste not only imparts the quality of water but also affects the health of the people down stream of Burhanpur city where if the same water is used for washing, bathing and sometimes for drinking purposes.
- The urban runoff and continuous dumping of waste materials especially sanitary waste are affecting the water quality of river Tapti.
- There is considerable need for better understanding of these small rivers so that they can be managed effectively.
- It is concluded that the water of SatiyaraGhat is very polluted as compared to other ghats like Raj Ghat, NagziriGhat, Mohana Sangam Ghat.

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