

Surface Water Quality Assessment of Hasdeo River Water Around Satranga Dam, Chhattisgarh, India

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Abstract

To meet the increasing demand for water, reliance on groundwater has been growing rapidly. However, the overexploitation of groundwater resources can lead to deterioration in water quality. The present study was undertaken to assess the quality of groundwater in relation to its potability. Groundwater samples were collected from the catchment area of the Satranga Dam and analyzed for selected physico-chemical parameters such as pH, Total Dissolved Solids (TDS), Dissolved Oxygen (DO), calcium and magnesium hardness, total alkalinity, and others. The analysis revealed that all the collected samples were within the desirable limits for drinking water quality.

Keywords: Surface water quality, Hasdeo River, Satranga dam, Chhattisgarh, physicochemical parameters, water quality assessment.

INTRODUCTION

Hasdeo River is under environment stress due to siltation, human encroachment and sewage input from various resources. There are a number of discharging loads of sewage, domestic wastewater and industrial effluents directly into the river. Almost every river system in India is polluted now at several points to a considerable extent (Chaudhuri, 1977). This dam has influenced various anthropogenic activities and rapid pace of industrialization in the catchment areas upstream. Therefore, the river has received silt-containing fertilizers, insecticides, pesticides that are used for agriculture resulting in a variety of changes in the hydrology and water quality of the river. Water from surface provides sustenance to plants & animals constitutes the habitat for aquatic organisms & meets importance of agricultural & industrial needs (Prasad, 1992). The water qualities of the reservoir have a negative impact due to discharge of sewage and municipal wastes into water bodies. Some loads of waste from industries, domestic sewage and agricultural practices find their way into rivers resulting in large-scale. In the present study, surface water quality assessment of Hasdeo River around Satranga Dam has been carried out in order to determine the sources responsible for deterioration of water quality for various uses. Knowledge on physico chemical environment of water functions in many ways and influences the biotic components (Kumar, 1995). It gives a picture of environmental suitability of water for maintaining normal life.

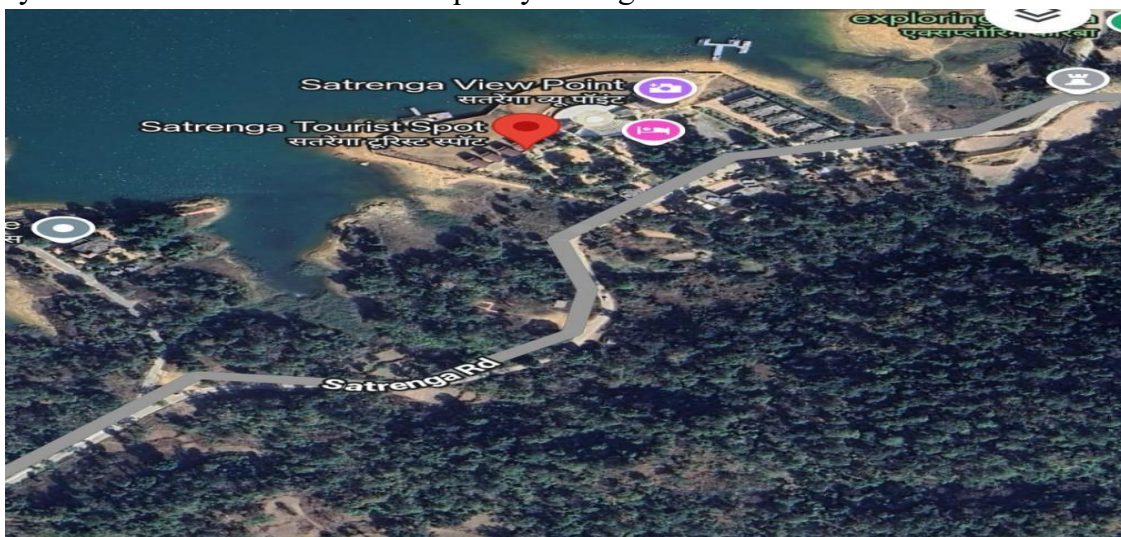
Study Area

Korba district in Chhattisgarh, India is characterized by its large area of 7,145.44 square km and a population of 1,206,640.9t is divided into 5 administrative blocks and 717 villages the district in known for its coal mining activities and is considered the “Bourn Hub” of Chhattisgarh, Korba’s climate is dry to most tropical with distinct seasons. The districts landscape includes plains, hills and Hasdeo River which influence the coalfield.

Korba district in the industrial hub of Chhattisgarh state and situated between $22^{\circ}0'50''$ and $23^{\circ}0'20''$ N latitude and between $82^{\circ}07'20''$ and $83^{\circ}07'50''$ E longitude.

Geographical location and map

The present study is focused on the Satranga dam of Korba city, Chhattisgarh, India. Korba city is situated in the fertile plains of the Hasdeo River basin in Chhattisgarh state. Industrial waste was observed in dam water from last few years. There is a problem such as swallowing of dam water was also faced in past few years in addition to increased in improper sanitation. In the present paper, city dams were selected for water quality testing.



Sampling and preservation

Water samples from February to March in the afternoon were collected from six different points for water quality assessment. White plastic bottles of five-liter capacity were used for collecting the samples and labeled as sample 1, 2, 3,--6. Assessment of the water sample has done by according to the standard analytical procedure. Samples collected were analyzed within a few days go in order to avoid special preservation required. However, samples in the bottles were kept in the refrigerator.

Material and method

The pH of the surface water was estimated by pH meter. The conductivity of the surface water was estimated by conductivity meter. Temperature of the samples measured by thermometer. Total hardness of surface water was calculated by EDTA titration method. It was calculated by adding calcium and magnesium hardness derived by EDTA titration method. The chloride was estimated by silver nitrate titration method. The total alkalinity of surface water was calculated by standard

titration method. The total solid (TS) of sample water was at 103⁰ to 105⁰ C to dryness in drying oven. Cooling is done desiccators sand then weight. The total dissolved solids (TDS) term is used to describe inorganic salts and small amounts of organic matter present in solution.

SN	PARAMETER	APPARATUS	MODELNO.
1.	pH	Digital pH meter	Sytronic-335
2.	Conductivity	Conductivity meter	Sytronic-304
3.	Temperature	Thermometer	

Results & Discussion

Based on the analysis of the physico-chemical parameters of water samples collected from the Hasdeo River near the Satranga Dam (as shown in Table-1), the following conclusions have been drawn:

pH Range:

The pH of the collected water samples ranges between 6.5 and 8.5. Although there is slight variation near the dam site, the pH values fall within the standard permissible limits. Therefore, the water quality is considered safe and suitable for drinking purposes.

Electrical Conductivity:

Electrical conductivity at 25°C is recorded as 0.1 ms/cm, indicating the presence of dissolved ions in the water. The observed variation may be attributed to minor contamination in certain samples.

Hardness:

The total hardness of water, primarily due to the presence of calcium and magnesium ions (with a lesser contribution from iron), is found to be 18 mg/L near the dam. This value lies well within the acceptable limit, indicating that the water is soft and safe for domestic use.

Calcium Content:

The calcium concentration is measured at 4.008 mg/L, which is significantly below the acceptable limit. Thus, the water is suitable for drinking, washing, and cleaning purposes.

Magnesium Content:

Magnesium salts, which contribute to water hardness, are also present in concentrations below the permissible limit, indicating no significant concern regarding water quality in this aspect.

Chloride Concentration:

The chloride ion concentration is found to be 19.88 mg/L, which is well within the acceptable limit of 250 mg/L. Chloride levels at this concentration do not pose any health risks.

Alkalinity:

The alkalinity of the sample is 200 mg/L. Moderate alkalinity is beneficial as it helps buffer against the corrosive effects of acidity. The observed value is below the permissible limit of 600 mg/L and is considered desirable.

Dissolved Oxygen:

The level of oxygen in water is an indicator of healthy state of water & values below 3mg/l are hazardous to human body. The dissolved oxygen in samples collected near Satranga dam has value of 4.82mg/l which is considered safe.

TDS:

Total dissolved solids values were 100mg/l in the collected water sample is considered safe for drinking as per BIS standards.

Table -1

S No	Parameters	Units	IS:10500		SW-1
			Desirable	Permissible	
1.	Temperature	⁰ C	---	---	23 ⁰ C – 26 ⁰ C
2.	Colour	Hazen	5	25	CL
3.	Turbidity	N.T.U.	5	10	
4.	pH	pH scale	6.5-8.5	NR	9.14
5.	Conductivity	Micro Mohs /cm	---	---	0.1
6.	Chlorides	mg/l	250	1000	19.88
7.	Total hardness	mg/l	200	600	18
8.	Hardness Calcium (as Ca)	mg/l	75	200	4.008
9.	Hardness Magnesium (as Mg)	mg/l	30	100	5.27
10.	Total Alkalinity	mg/l	200	600	230
11.	T.S.	mg/l	500	1500	200
12.	T.D.S.	mg/l	500	1500	100
13.	T.S.S.	mg/l	500	1500	100
14.	D.O.	mg/l	6.5-8	---	4.824

Conclusion

We conclude that analysis of the water sample collected near Satranga dam shows that it is fit for drinking and other domestic purpose with respect to most physico chemical parameters. pH, alkalinity, DO all lies within limits prescribed by WHO & BIS. Calcium & Magnesium hardness is very low that may be due to sample collected at the catchment area near to the dam.

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