

Assessment of Water Quality Index (WQI) for Drinking Purposes in Case of Baitarani River in Odisha in the Light of National Sanitation (NSF) Standards

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Abstract: Water quality of the river Baitarani, the third largest river of Odisha is evaluated by WQI technique. The study on water quality provides a single number indicating the quality of water at a particular location and time depending on several water quality parameters. There are several ways to evaluate the quality of water suitable for its portability. WQI expressing its quality in terms of index number provides a useful guidance on overall quality of water for the specific purpose. Nine numbers of parameters were chosen for the calculation of WQI following Indian standard drinking water specification IS1050:2012. The present investigation is aimed at assessing the current water quality standard along the Baitarani river in Odisha. This technique is very useful tool for quick assessment of any water system. Nine parameters namely pH, change in temperature, DO, BOD, Turbidity, Total Phosphorus, Nitrate Nitrogen, E. Coliform, Faecal Coliform were considered to compute Water Quality Index (WQI) based on National Sanitation Foundation studies. On the whole these indices are effective indicators of water quality at different places of the river to generate public awareness and better sanitation.

Keywords: Water Quality Index (WQI), Baitarani river, pH, change in temperature, DO, BOD, Turbidity, Total Phosphorus, Nitrate Nitrogen, E. Coliform, Faecal Coliform, National Sanitation Foundation(NSF)

1. Introduction

Water is not only an essential element for our survival but is also an important vehicle for economic development of the nation. Although water is a renewable resource, its reserve

in nature is limited and therefore, we have to plan for its sustainable development and efficient management so that the growing demands of a rising population, expanding industries and rapid urbanisation are adequately met.

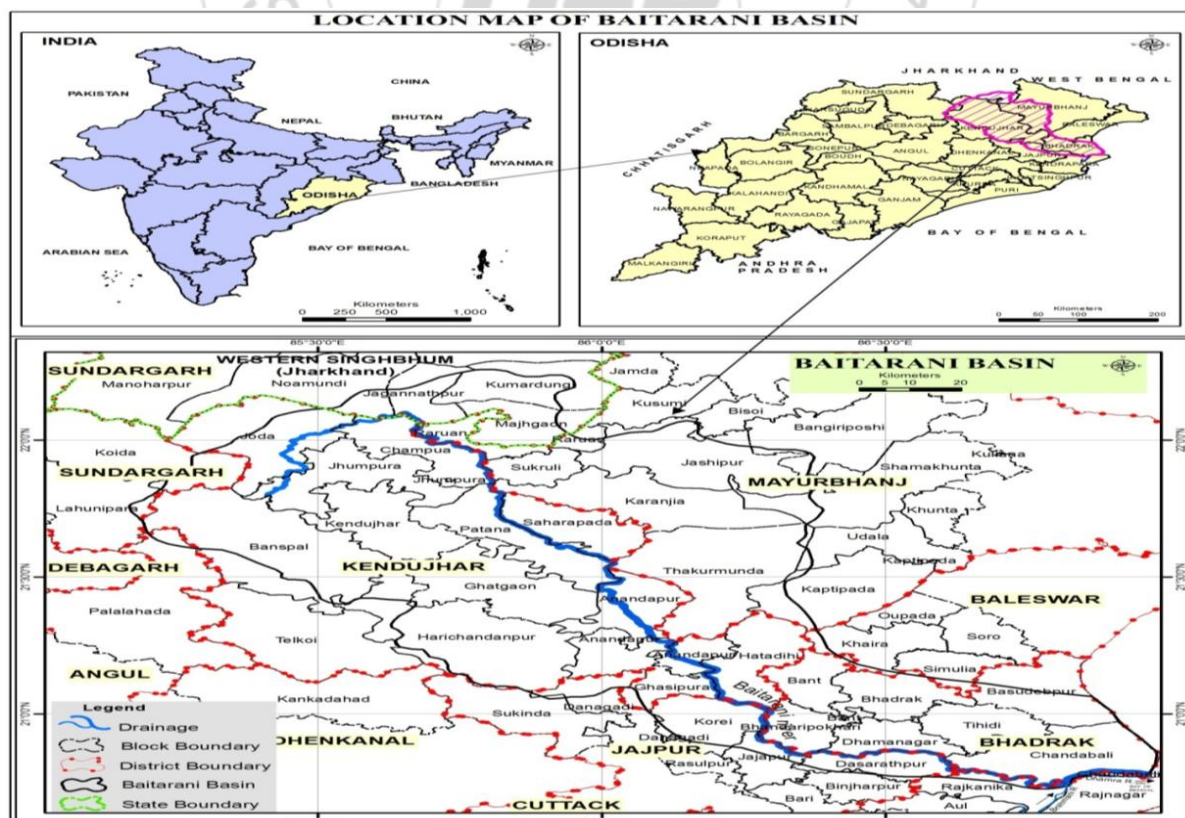


Figure 1

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The term water quality was developed to give an indication of how suitable the water is for human consumption and is widely used in multiple scientific publications related to the necessities of sustainable management. Water quality in an aquatic ecosystem is determined by many physical, chemical and biological factors. Therefore, particular problem in the case of water quality monitoring is the complexity associated with analyzing the large number of measured variables and high variability due to anthropogenic and natural influences.

2. Materials and Method

Study Area

The river Baitarani plays a pivotal role in the peninsular river system in India. The river Baitarani is a rainfed river originated from the Gupta Ganga of the Gonasika hill of the Eastern Ghats located at an elevation of about 981 mt. above the mean sea level in the Kendujhar district, flows through several towns such as Champua, Swampatna, Anandapur, Jajpur etc a distance of about 365 km before meeting the river Brahmani at Bajarpur village of Rajnagar block of Kendrapara district about 8 km from the Dhamra river mouth of the Bay of Bengal. Before falling into the Bay of Bengal the river flows through Kendujhar, W. Singhbhum, Mayurbhanj, Jajpur, Bhadrak and Kendrapara. The present study reports on the potable quality of river at Anandapur station in Kendujhar district of Odisha.

The water samples were collected from the Central Water Commission, Bhubaneswar over period of 25 years from 1990 to 2014, Baitarani river at Anandapur of Kendujhar district using standard methods (APHA 2005). Water temperature is measured using Mercury thermometer. The Winkler's alkali iodide-azide method was followed for the estimation of DO and BOD. Nitrate was determined colorimetric procedure (APHA 2005). Total Coliform & Faecal Coliform population was analysed by MPN/100 ml method by growing on M-FC medium at temperature 44.5^o C and counted after 48 hours. E- Coliform is simply subtraction of the Faecal Coliform from Total Coliform. pH is measured using pH meter. Turbidity is measured by Nephelometer. The turbidity of a sample is measured from the amount of light scattered by the sample taking a reference with standard turbidity suspension. Total Phosphorus is by Ascorbic acid Spectrophotometry. Nitrate nitrogen is measured by acid treatment followed by spectrophotometry at 220 nm & 275 nm (UV-visible).

National Sanitation Foundation Water Quality Index (NSFWQI)

In order to summarize water quality data different type of WQ indices have been developed. One such index was developed by Brown et al which was later referred as NSFWQI. As many as 142 WQ experts of USA were contacted and important parameters affecting water quality were assessed along with their respective weightages. Nine parameters were finally accepted to

Table 1

Sl. No.	Parameter	WQI Weight
1	pH	8
2	Change in temp	14
3	DO	88
4	BOD	1
5	Turbidity	0.8
6	Total Phosphorus	0
7	Nitrate Nitrogen	1
8	E. Coliforms	17
9	Faecal Coliforms	45

Water Quality Index (WQI) = 74.46

Water Quality Rating = Good

Table 2

Classification	WQI Range
Very Bad	0-25
Bad	26-50
Medium	51-70
Good	71-90
Excellent	91-100

summarize the composite effect on water quality using a single numerical expression. The single numerical index helps to classify the water into five different classes. Such classification helps to identify river water requiring immediate action on a priority basis. The parameters, their weighting, their classification and the corresponding numerical ranges are given in Tables 1 and 2 respectively.

3. Discussion and Conclusion

As per the requirements of NSFWQI, nine parameters were measured for each sample following

The standard procedures of APHA every year. All the measured values were used in the online calculation to get their respective index values. The overall WQI is an online calculation, which is done by putting the index values against the respective weights. The present study reveals that the water quality of Baitarani river is quite safe as all the physical and chemical properties of the river were within desirable limit and the river water shall be useful in future management. The water quality of the river suggests that there is no harmful to pisciculture, irrigation and drinking water.

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