

## **LENTIC WATER QUALITY OF BHUBANESWAR, THE TEMPLE CITY OF ORISSA**

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### **ABSTRACT**

Bhubaneswar, the temple city of Orissa, has about 500 and odd temples confined mostly to old town areas. For different rituals to be performed daily each temples has one or more water tanks nearby. Some are quite small but others represent huge expanse of fresh water. These lakes and water bodies are related to religious sentiments. The water samples were collected from seven important lakes or water bodies of Bhubaneswar and were analyzed. From the data of analysis it is concluded that the water quality of all these ponds are nearer to class B water quality as per IS: 2296-1982.

### **INTRODUCTION**

Bhubaneswar the capital city of Orissa is also known as the temple city of India. More than 500 magnificent temples including the miniatures are present mostly in the old town areas. So the city occupies a remarkable place in the religious –cultural scenario of the state. The famous Kalinga Style of art and architecture are epitomized in the most of temple and monuments.

Bhubaneswar is situated in the Khurda district of Orissa between 20° 12' N to 20° 25' N latitude and 85° 44' E to 85° 55' E longitude on the western fringe of the coastal plain across the main axis of the Eastern Ghats. It is on the South Eastern railway line joining Howrah and Madras at a distance of 435 km south of Kolkata. The National Highway No - 5 connecting Kolkata and Madras passes through Bhubaneswar. The city lies to the Western side of the Mahanadi Delta on the bank of Kuakhai, a distributary of Mahanadi River. The river Daya branched off from Kathojadi flows along the south eastern part of the city. The basement rocks of Bhubaneswar and its surroundings belong to Gondwana, one of the stable landmass of world. Bhubaneswar forms an undulating hilly terrain. The average height of the town is 43.5 m above mean sea level. The soil in and around the city is mostly hard laterite in the north and western part. But the eastern and southern part consists of alluvial soil. The city enjoys a salubrious and moderately equable humid tropical climate. The city experiences three distinct seasons the summer, rainy and winter. It receives about 120 cm of rainfall during south west monsoon usually from June to September which contributes to about 75% of annual rainfall. The average maximum temperature is around 38°C with highest maximum temperature of 46.3° and minimum of 8.6° C.

## **MATERIALS AND METHODS**

There are so many temples in the city which are mostly confined in the old city area. Each temple in this part of the city has one or more water tanks nearby, some are quite small while others represent huge expanse of freshwater. It is believed that during the construction of Temple vast depressions were created in the nearby soil to built earthen ramps which were used for dragging huge block of stone to the temple top. In order to assess the water quality of the ponds and lakes in and around Bhubaneswar, seven water bodies were selected which are represented below:

- 1) Bindusagar Pond (S<sub>1</sub>)
- 2) Kedargauri Tank (S<sub>2</sub>)
- 3) Mausima Temple Tank (S<sub>3</sub>)
- 4) Brahmeswar Temple Pond (S<sub>4</sub>)
- 5) Vanivihar Lake (S<sub>5</sub>)
- 6) Ponds near Baramunda Bus Stand (S<sub>6</sub>)
- 7) Unit IV Lake (S<sub>7</sub>)

These ponds are selected because some of great religious importance and others are well known for the other use. The water collected on monthly basis for a period of one year from June, 2004 to May, 2005 and analyzed for different water quality parameters. The average value of the analyzed parameters is presented in Table -1.

### **Bindusagar Pond**

It is located near the famous Lingaraj Temple. The religious merit of the water is lauded in the highest terms in Hindu scriptures such as Padma Purana, the Siva Purana, the Brahmanda Purana and the Ekamra Puran. The pond is extensively used by the devotees who flock the area throughout the year from all parts of country. A deep in the pond before entering into the temple is associated with religious sentiments.

It is a spring fed rectangular tank of 450 m length and 320 m breadth. The average depth varies from 2-5 m in summer to 4-5 m in monsoon. The bottom is flat, smooth and laterite bed and is free of any macrophytic vegetation except for isolated patches of Eichhormia Crassipes and Nymphaea Stellata. The inlet from which sewage and other waters were inserting was sealed by municipality. The municipality has been flushing the pond water regularly with fresh town water supply. The tank has remained practically unmanaged till recently but few years back, municipality has a right step by draining the water completely. The tank was mechanically dredged to level the bottom evenly by latrite slabs with the purpose of increasing the aesthetic value, decreasing the eutrophication and increasing fish production. In spite all that because of various reason such as dumping of cooked and uncooked food from the nearby famous Ananta Vasudeva temple, the water belongs to class B category.

### **Kedar Gauri Tank**

It is located inside the premises of Kedar Gauri temple which is believed to be about 1000 years old and a great religious sanctity is associated with it. This is a small tank of the size 21.3 m long and 8.3 m broad with an average depth of about 4.9 m. The tank is lined with stone

revetments and the bottom is formed of small boulders. The water is fairly transparent and the bottom is visible throughout. This water body commands highest veneration from the people. According to legends the tank was endowed with most heavenly virtues. But the results indicate the water is not free from pollution.

### **Mausima Temple Tank**

It is also called the Rameswar Tank. The length and breadth of the tank are 130 m and 45 m respectively with a depth varies in between 3-6 m. the tank is solely fed by rain water. This tank is gaining importance for being one of the recreational spot in Bhubaneswar. Because of unsystematic and unscientific use of the water bodies, the water are becoming more and more unsuitable for public use.

### **Vanivihar Lake**

It is a wet land habitat located inside the campus of Utkal University by the side of National Highway -5. It is a neutral and permanent shallow fresh water body with a water spread area of 27,000 sq m. The depth of water varies from 1.2 – 1.8 m which reaches 3-4 m in rainy season. It is constantly fed by springs in the up stream Jayadev Vihar and the domestic waste water from Jayadev Vihar, Acharya Vihar, Unit -IX, Regional Research Laboratory, Utkal University, Salia Sahi etc. the water bodies are practically unmanaged. No effective measures are taken to make the water pollution which is reflected in the analytical data.

### **Pond near Baramunda Bus Stand and Unit – IV Lake**

These ponds are of less importance so far as mythological views are concerned. They are usually used by the local people for bathing purposes. How ever, the water is not fit for even bathing.

## **RESULTS AND DISCUSSION**

The analytical data of few physico-chemical parameters were represented in Table – 1 and the maximum tolerance limits for inland surface water subject to pollution are represented in Table – 2. The comparison of the prevailing water quality with the best designed water quality of class – B shows that the water quality in almost all these ponds are not suitable for bathing. These ponds have different shape and size and have also situated in different environment. The population using these ponds is also varying in their characteristics.

### ***Classification of Water (Designated Best Use)***

Class A: Drinking water source without conventional treatment but after disinfection

Class B: Outdoor bathing

Class C: Drinking water source with conventional treatment but after disinfection

Class D: Fish culture and wild life propagation disposal

Class E: Irrigation, Industrial cooling or controlled waste disposal.

Table 1. Analysis of results of lentic waters of Bhubaneswar city

Parameters	S <sub>1</sub>	S <sub>2</sub>	S <sub>3</sub>	S <sub>4</sub>	S <sub>5</sub>	S <sub>6</sub>	S <sub>7</sub>
pH	7.4	7.2	7.1	7.2	7.2	7.0	6.6
DO	5.3	5.6	4.3	7.2	6.4	6.2	4.5
BOD	12	12	25	12	2.5	6.5	2.9
Sulphate	165	54	64	72	25	57	22
Chloride	35	67	60	65	90	63	66
Phosphate	0.115	0.034	0.50	0.223	0.022	0.112	0.022
TDS	235	255	320	243	250	346	402
Nitrate	5.3	12.3	25.9	2.02	8.0	4.5	23.8
Total Coliform	1700	760	900	750	300	8950	490
Fecal Coliform	1500	260	250	195	159	1300	130

Except pH, all the parameters are in mg/l, Total coli and fecal coli are in MPN/100 ml.

Table – 2 Tolerance limits for inland surface waters subject top pollution (IS: 2296-1982)

Parameters	Class- A	Class- B	Class- C	Class- D	Class- E
pH	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5	6.5 – 8.5
DO (mg/l) Min.	6	5	4	4	-
BOD (5 days at 20°C) mg/l Max	2	3	3	-	-
TDS (mg/l) Max	500	-	1500	-	2100
Total Hardness (as mg/l of CaCO <sub>3</sub> ) Max	300	-	-	-	-
Chloride (mg/l) Max	400	-	400	-	1000
Total Coliform	50	500	5000	-	-

## CONCLUSION AND RECOMMENDATIONS

From the mythological point of view the ponds are related to religious sentiments, but from the scientific point of view the pond water is not suitable for human uses. As large number of pilgrims comes to Bhubaneswar and many of them take holy bath in these ponds, it is very difficult to always maintain the desirable water quality of these ponds. By considering the mythological, geological and meteorological stand, the following suggestions are proposed to reduce the pollution load of these sacred temple ponds.

- i) Strict control on throwing of ritual offerings which includes rice, milk, sugar and flowers etc. into the ponds.
- ii) Complete check of municipal sewage entry into the ponds and lakes.
- iii) Wherever possible, complete drainage of existing water, desilting and cleaning of bottom debris and filling the tanks with fresh water.
- iv) Arrangement for regular flushing of fresh water in temple ponds with provision for outlet.

- v) Attempt should be made to clear the algal blooms preferably by mechanical means, by use of suitable algacide and by introducing suitable fish varieties who are capable of scavenging biological, organic and inorganic load of the ponds.
- vi) Public awareness should be created about the potential hazards of using polluted water and citizen's role in maintaining the water bodies so that the desired uses can be sustained inexpensively.
- vii) Water of these ponds can be pumped out and the mud and clay deposited at the bottom of the pond should be cleaned during summer season. This process can be repeated at regular intervals of two to five years.
- viii) Regular monitoring and cleaning process be continued to make the water fit for human use.

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