REJUVENATION OF URBAN LAKES OF BHUBANESHWAR CITY AND THEIR ROLE IN RECHARGE TO GROUND WATER

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ABSTRACT

Bhubaneshwar the capital city of Orissa is generally known as the *"City of Temples and Tanks"* and the *"Cathedral City of India"* .In ancient times lakes were very common in any king's capital. In Bhubaneshwar city there are about 500 and odd temples which are having one or more temple tank nearby. Any waterbody needs constant management in contrary to the ill conceived notion that water bodies are natural sinks and could be utilized as the cheapest waste disposal system. Bindusagar is a spring fed rectangular tank of 450m length and 320m breadth and a deep in the pond before entering into the temple complex is associated with religious sentiments. With increase in urbanization there is increase in runoff and there is less scope for ground water recharge. Also research study has revealed that removal of bottom mud from tanks shows upto ten times increase in infiltration rate downward. The high levels of bod, chloride, nitrate, total and fecal coliform counts recorded in all these water bodies indicate their polluted nature and the water quality in almost all these ponds was not suitable for bathing.

INTRODUCTION

There is no specific definition for lakes in India. The word "Lake" is used loosely to describe many types of water bodies – natural, manmade and ephemeral including wetlands. Bhubaneshwar the capital of Orissa , generally known as "Temple City" has about 500 and odd temples which are having one or more water tank / lake nearby. Some are quite small while others represent huge expanse of fresh water. As regard to the origin, temple ponds are believed to have originated initially as vast depressions created by removing enormous amount of soil needed to built earthen ramps that were used for dragging the huge blocks of stone to heights corresponding to the rising height of the temple under construction. After the completion of the temples, these depressions were sized and lined with surplus stone available and were converted into temple ponds for use during daily rituals and festive occasions.

METHODOLOGY

1. Geological studies were carried around the city to know the status of the lakes.
2. The chemical quality study carried out by different organizations were also collected.
3. Literature survey was carried out to know the status of lakes of Bhubaneshwar city and their rejuvenation.

RESULTS AND DISCUSSION

In general water bodies need constant management. Closed water bodies still need more care. It is more so in the context of the ill conceived notion that water bodies are natural sinks and could be utilized as the cheapest waste disposal system. As a result of this misconception, human intervention in the form of waste disposal, fishing, bathing, swimming and other recreational pass time has been mounted up resulting in fast deterioration in water quality of this fragile ecosystem.

Status of Lakes of Bhubaneshwar City

In order to assess the status of ponds and lakes in and around Bhubaneshwar, a study was carried out in the following water bodies:

Bindusagar Pond: Bindusagar , literally means " the water body with fine suspension of silt" that shine brilliantly the sun rays imparting grey colour to the ripples of waters, is located near the famous Lingaraj Temple. As such, the pond is extensively used by devotees who flock the area in thousands from all corners of the country throughout the year.A deep in the pond before entering into the temple complex is associated with religious sentiments.

Bindusagar is a spring fed rectangular tank of 450m. length and 320m. breadth. The average depth varies between 2.5 m. in premonsoon to 4.5 m. in post monsoon. The bottom is flat, smooth with laterite bed and is free of any macrophytic vegetation except for the isolated patches of Eichhornia crassipes and Nypmphaea stellate. Through a small inlet at the north western end , the pond was receiving sewage, water and run off from nearby paddy fields throughout the year.This inlet has recently been sealed. Instead the Muncipality has been flushing the pond water regularly with fresh town water supply. A small outlet at the south allows a limited quantity of tank water to flow out.

Besides the religious significance, the pond serves as the dumping site for left overs of variety of cooked and uncooked food from the nearby temples. The waste water from the nearby locality do enter into the pond. Local residents regularly bath in it and also depend on it for their personal hygiene, recreation and washing clothes.

Until recently, the tank has remained practically unmanaged. However, with the direct initiative of the Municipality, the tank was completely drained up and mechanically dredged to level the bottom evenly by laterite slabs in 1979 with the purpose of increasing the aesthetic value, decreasing the eutrophication and increasing fish production.

Kedar Gouri Tank: The Kedargouri tank is located inside the premises of Kedargouri Temple. The tank is believed to be about 1000 year old and a great religious sanctitiy is associated with it. The tank is 213.3m long and 8.3m. broad with an average depth of about 4.9m.

The water body is lined with stone revetments. The bottom is formed of small boulders. The water is fairly transparent and the bottom is visible throughout. The tank is spring fed. To the west of Kedareswar temple, there is a perennial spring called "Dudha Kunda", meaning "milk

tank". Its water is prized for medicinal properties. In the temple premises is located the Kedar Kunda also.

Kanjia lake at Nandankanan : About 12 km. north of Bhubaneshwar lies one of the beautiful picnic spots Nandankanan , a sprawling wild life park with rare white tigers and crocodiles and botanical gardens with a natural lake interveining. It is used for boating. Presently there is siltation problem in the lakes and covered with different water weeds.

Other major lakes present in the city are: Mausima Temple Tank, Brahmeswar Temple pond, Vanivihar Lake , Pond near Baramunda Bus Stand , Unit – IV lake etc.

CHEMICAL QUALITY

The lentic water quality of Bhubaneshwar city is given in Table-1 and tolerance limits for inland surface waters* subject to pollution (IS:2296-1982) is given in Table-2.

Table 1. Analysis results of lentic water of Bhubaneshwar City

S. N.	Location of lakes	pH	DO mg/l	BOD mg/l	T.C. MPN/ 100ml	F.C. MPN/ 100ml	SO_4^{-2} mg/l	Cl mg/l	PO_4^{2} mg/l	NO_3 mg/l
1	Vanivihar	7.5	5.4	14	1900	1650	164.09	37	.118	4.31
2	Barmunda	7.4	5.7	13	700	260	56.63	66	.035	11.18
3	Unit - IV	7.2	4.2	24	900	260	60.46	63	.480	28.9
4	Brahmes war Temple	7.1	7.1	14	700	190	71.7	63	.223	2.24
5	Mausima Temple	7.1	6.4	2	290	145	24.4	92	.027	8.71
6	Bindusaga r	7	6.3	6	9000	1200	57.3	64	.119	4.37
7	Kedargou ri	6.5	4.9	2.7	500	100	17.25	61	.028	25.08

(Source: Enviornmental Status of Bhubaneshwar , Orissa Pollution Control Board)

Table 2. Tolerance limits for inland surface waters* subject to pollution (IS:2296-1982)

Parameter	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
Dissolved Oxygen mg/l Min	6	5	4	4	-
BOD(5 days at 20^0 c) mg/l Max	2	3	3	-	-
Total Coliform (MPN/100ml)Max	50	500	5000	-	-
Total dissolved solids(mg/l) Max	500	-	1500	-	2100
Total Hardness(as mg/l of $CaCO_2$) Max	300	-	-	-	-
Chloride(mg/l) Max	400	-	400	-	1000

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 without Conventional Treatment but after Disinfection.
Class D: Fish Culture and Wild Life Propagation Disposal.
Class E: Irrigation, Industrial Cooling or Controlled Waste Disposal.

A comparison of the prevailing surface water quality with that of the best designated water quality of Class-B shows that the water quality in almost all these ponds was not suitable for bathing. The high levels of BOD, chloride, nitrate, total and fecal coliform counts recorded in all these water bodies indicate their polluted nature. The water quality of urban lakes has deteriorated so much as to cause serious disturbance to the bio-diversity of the lake environment.

DESILTING AND INCREASE IN INFILTRATION RATE IN TANKS

A research study has been carried out (Muralidharan,2005) to evaluate the economically viable depth of desiltation in old tanks to achieve a substantial increase in percolation and storage. The study at percolation tank indicated that the infiltration rate of 10-20 mm/h has increased to a maximum of 310 mm/h with removal of 40 cm silt. The tritium tracer migration study supported a faster movement of percolated water at desilted sites by showing a greater dilution of tracer concentration and deeper penetration. The research study strongly supports a necessity of carrying out infiltration studies at different places within the tank bed area with removal of varying thickness of silt to decide the optimal level of desiltation especially in old tanks before commencing the revival of tank system.

DECLINING TREND OF WATER LEVEL AND ROLE OF ARTIFICIAL RECHARGE

In Bhubaneshwar city the population has crossed 10 lakhs. Due to increase in utilization of ground water and decrease in recharge there is declining trend of water level. For this roof top rainwater harvesting is suitable methods and also we cannot neglect the traditional water bodies which acts as good recharge structure.

CONCLUSIONS

1. Desilting of these lakes are necessary which will improve the percolation of water and water holding capacity of these tanks. Test has revealed that removal of silt from the bottom of the lakes has showed upto ten times increase in infiltration rate of water and increase in recharge to ground water.
2. Complete check of municipal sewage entry into the ponds and lakes.
3. Wherever possible, complete drainage of existing water and cleaning of bottom debris and filling the tanks with fresh water.
4. Arrangement for regular flushing of fresh water in temple ponds with provision for outlet.
5. Arrangement should be made to provide Sulabha Souchalaya in the vicinity of these ponds preferably on all sides and connecting those with main city sewer but not the water bodies in question.

6. Strict control on throwing of idol and ritual offerings which include rice, sugar, milk and candy, flowers etc. into the ponds.
7. Growth of water hyacinth has been prolific in many lakes resulting in breeding of vectors and consequently causing endemic diseases. Attempts should be made to clear the algal blooms preferably by mechanical means, by use of suitable algicide and by introducing suitable fish varieties who are capable of scavenging both biological, organic and inorganic load of the ponds.
8. 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.

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