Water Quality Changes during a Decade: A Case Study of Upper Lake, Bhopal

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ABSTRACT

Aquatic resources are considered to be the heritage of Nation, but as we are exploiting our water resources for our benefits, they are day by day deteriorating & loosing their importance. Same is the case of Upper Lake, Bhopal. The Upper lake was constructed by Raja Bhoj in 11th Century. As the population increases with time, the water quality deteriorated a lot. To conserve the lake a project named “Bhoj Wetland Project” (funded by JBIC) was implemented. Lot of work for the conservation & management of Bhopal lakes were taken like desilting & dredging, restoration of Takia Island, catchment area treatment, lake view promenade, fringe area protection, solid waste management, installation of floating fountains, removal of weed sewerage system etc. After the successful implementation of the project, it was clearly observed that the water quality of the lake improved considerably, at the same time carrying capacity also enhanced. This increases Eco-tourism.

If we take certain water quality parameters like pH, DO, BOD, COD, total nitrogen, and total phosphorous. This clearly shows that dissolved Oxygen concentration was increased considerably during the decade, while BOD, COD & other nutrient input decreases considerably during the decade.

Keywords: Bhoj Wetland, Idol Immersion, Lake, Physico-Chemical Characteristics.

INTRODUCTION

It is now generally accepted that life made it’s first appearance in the warm shallow coastal water and that life cannot exist without it. In the process of evolution man appeared on land but water has been so important for human life that we cannot think of our existence without water.

The serious aspect of water pollution is caused by human activity, urbanization and industrialization. The source of pollution being (a) Sewage, which contains decomposable organic matter & pathogenic agents, (b) Industrial & trade waste, which contain toxic agents, (c) agricultural pollutants, which comprise fertilizers & pesticides and (d) Physical pollutants viz. heat (thermal pollution) and radioactive substance (WHO Tech. Report, 1968).

Before the completion of Bhoj Wetland Project the Upper lake, Bhopal is mainly affected with the inflow of untreated sewage water and accumulation of silt & dead organic matter. The latter problem is more intensified as the catchment area is vast & silt, dead organic matter joins into the lake with the runoff of the rainy water during monsoon. The catchment area of upper lake is mainly occupied by agriculture field where fertilizers, pesticides, insecticides are extensively used & the loose soil flow with the rainy water accumulates in the lake.

The assessment of water quality changes during a decade is based on physico-chemical & biological analysis & the change in physico-chemical constituents of water can be reflected directly on the biotic community of the lake.

Upper lake of Bhopal is an important water body being one of the old ecosystem and source of potable water for the town. Till 1947 the quality of lake water was so good that lake water was used as potable water without ant treatment. With increasing population load & explosion of the city quality of lake water deteriorated to an extent that even after the conventional treatment. Water supply faces problem in maintaining potable water quality standard.

MATERIAL AND METHODS

Study Area: The Upper lake was identified for the study, as it is one of the established ecosystems for last 900 years and important source of potable water. Upper lake of Bhopal is situated between longitude 77° 18’ to 77° 24’E and latitude 23° 13’ to 23° 16’N, having submergence area of about 31 sq. km at FTL and catchment area of 361 sq. km. Mean depth of the water body is 6.0 m with maximum depth of 9.2 m. The catchment area is mainly occupied by agricultural fields.

The present study was conducted to assess the water quality changes after the completion of a major Conservation and Management Programme “Bhoj Wetland Project”, which was funded by JBIC, Japan.
Sampling stations: Sampling stations were identified so as to cover the complete water body.

Sheetal Das ki Bagiya (S-1): This sampling station is situated near the Kamla Park. Bathing and religious activities (old immersion ghat for Ganesh and Durga Idols) are the major pollution sources at this sampling site.

Bairagarh (S-2): This station is located behind the Sadhu Vaswani Collage Bairagarh. Agricultural activities are the major source of pollution at this site.

Medical Collage (S-3): This station is located behind the Hamidia Hospital, which is in between Kamla Park and Koh-e-Fiza. The station receives surface water from the adjoining areas and untreated sewage water.

Khanoogaon (S-4): This site is a habitat area near the lake. This site is representing the effect of activities, inflow of sewage water from the surrounding human settlements, agricultural activities and cattle population effects.

Bisenkhedi (S-5): At this site the lake receives agro-chemicals, fertilizers through surface run off from agricultural land.

The parameters taken were pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), Chemical Oxygen Demand (COD), total nitrogen and total Phosphorus. Samples were collected from the identified sampling points as per defined methods and brought to the laboratory for analysis of different parameters. The samples were processed and analyzed as per standard methods prescribe in “APHA 1976 & 1995”.

RESULTS AND DISCUSSION

The present study is based on the comparison of certain parameter like pH, DO, BOD, COD, total Nitrogen and total Phosphorus which are important to assess the water quality of any water body. An attempt was made in the study to assess the water quality changes during a decade i.e. 1994 and 2004. The results obtained are shown in Figure.1 to Figure 6.

Sheetal Das ki Bagiya (S-1): Over all water quality of this station has improved considerably as evident from the parameters analyzed. Dissolved oxygen concentration increases in 2004 as compared to 1994. Similarly BOD, COD values decreases considerably. Total nitrogen and total phosphorus concentration also decreases. This is due to installation of floating fountain near this site at the same time during the implementation of Bhoj Wetland Project. The idol immersion ghat has been shifted. These activities are mainly responsible for the water quality improvement at this station.

Figure 1 Graph showing pH variation of five stations during a decade.

Figure 2 Graph showing DO variation of five stations during a decade.

Figure 3 Graph showing BOD variation of five stations during a decade.
Variation in COD during a decade - 1994-2004 (on annual average basis)

Figure 4 Graph showing COD variation of five stations during a decade.

Variation in Total Nitrogen during a decade- 1994-2004 (on annual average basis)

Figure 5 Graph showing Total nitrogen variation of five stations during a decade.

Variation in Total Phosphorus during a decade- 1994-2004 (on annual average basis)

Figure 6 Graph showing Total Phosphorus variation of five stations during a decade.

Bairagarh (S-2): This station is situated in the northern side of the lake. Water quality of this station is also improved a lot. BOD, COD valued shows decreasing trend, similarly total nitrogen and total phosphorus value also decreases during the decade.

Medical Collage (S-3): This station is behind Hamidia Hospital. Remarkable improvement in water quality at this station was observed during the decade. BOD, COD, total nitrogen and total phosphorus values shows a decreasing trend and at the same time DO value shows a increasing trend during the decade. This water quality improvement is due to the installation of floating fountain, sewage diversion and construction of Retghat-Lalghati link road. This link road acts as a buffer between habitation water body.

Khanoogaon (S-4): Water quality improvement is also observed as this station. DO concentration shows a increasing trend during the decade while BOD, COD, total nitrogen and total phosphorus shows a decreasing trend. This is mainly due to installation to floating fountain at this station and promotion of organic farming in the catchment area of Upper lake.

Bisenkhedi (S-5): This sampling station is situated in a rural area. DO concentration shows a increasing trend during the decade at the same time BOD, COD, total nitrogen and total phosphorus values shows a decreasing trend during the decade. This water quality improvement is due to the promotion of organic farming activity.

CONCLUSION

This water quality improvement is due to less input of domestic sewage, which is directly joining the lake and promotion of organic farming activity in the area because catchment area near this station is mainly occupied by agricultural practices.

The present study clearly reveals that water quality has improved considerably during the decade (i.e. 1994-2004). This is due to the conservation and management activities performed under the Bhoj Wetland Project. The overall impact of all these activities can be very much seen from the water quality improvement of the lake. The main activities which are directly responsible for the water quality improvement are catchment area treatment, installation of floating fountains, construction of Retghat-Lalghati link road, creation of buffer zone, solid waste management and removal of weeds, biological control to weed through aquaculture and public participation and awareness.

The present assessment study is also very much helpful for the evaluation of Bhoj Wetland Project, which was successfully implemented.

REFERENCES