

# **Nutrient Budgeting of Incoming Waters of a Tropical Wetland (Bhoj Wetland) with reference to its Conservation and Management**

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## **ABSTRACT**

Upper lake of Bhopal is a major source of potable water supply providing 35 % of the total water supply to the city dwellers. The demographic alteration in last two decades coupled with changes in the land use along the fringe areas of the lake resulted in substantial increase in pollution load. Majority of the pollutants are brought into the lake through 3 major inlets. The study shows that inflow of nutrients i.e. of Nitrate-Nitrogen (0.322298 Metric tons) and of phosphorus (1.267432 Metric tons), are the major contributing factors for pollution of the lake.

## **INTRODUCTION**

Upper (Long 77°18' - 77°24'E, Lat 23° 13' - 23° 16' N.) is known as the lifeline of Bhopal. The Lake has been a source of potable water for the residents of the city since the time it was constructed in the 11th century. But as the population grew & the city of Bhopal expanded, the residential dwellings cropped up all around the catchment area of the lake. This unplanned growth of the habitation around the lake without a proper sewerage system finally resulted in culmination of sewage in the lake. The inflow of sewage with high organic matter caused significant deterioration in the water quality (Pani & Misra, 2001). Therefore, the present work was envisaged to assess the quantum of nutrient load through different channels in to the lake so as to formulate strategies for appropriate mitigative measures.

## **MATERIALS AND METHODS**

For the present study, the three major perennial inlets viz. Medical college inlet, Ahmedabad inlet and Kotra Sewage inlet of Upper were chosen. The details of the inlets are shown in Fig.1. Three samples i.e. A, B & C from each inlet was collected.

The first sample i.e. sample: A was collected from the inlet 50 meters upstream from the confluence point of the inlet with the lake, while the second sample (sample: B) was collected from the confluence point of the inlet and the lake. The third sample (Sample: C) was collected from 50 meters inside the lake. The samples collected from these sampling stations were then analyzed for different Physico – chemical parameters following the standard methods as mentioned in APHA (1995).

## **RESULTS**

### **Medical College**

Among major nutrients the maximum value of Nitrate was observed in the month of Apr. as 6.17 mg/l, which showed a major reduction & become 0.49 mg/l at station B & further reduced to 0.36 mg/l at station C.

The maximum value of Orthophosphate was observed in the month of Nov., as 5.36 at station A, which reduced to 2.89 mg/l at station B, which finally reduced to 0.85 mg/l at station C.

### **Ahmedabad**

The maximum value of Nitrate was recorded in the month of April at station A as 2.53 mg/l, which reduced to 2.26 mg/l at station B & got further reduced to 0.49 mg/l at station C.

Similarly the value of phosphate also showed a trend of reduction in three stations. The maximum value of phosphate was observed at station A in the month of July, which got reduced to 3.06 mg/l at station B & to 0.18 mg/l at station C.

### **Kotra Sewage Inlet**

The value of major nutrients also showed a similar trend. The maximum value of Nitrate was observed at station A in the month of Apr. as 7.9 mg/l, which is the highest reading of Nitrate during the course of the study. It got reduced to 2.26 mg/l at station B & at the station C it got reduced to 0.29 mg/l.

Similarly the maximum value of phosphate was observed at station A as 16.8 mg/l in the month of July, which is the highest value of phosphate throughout the study. The phosphate concentration reduced to 4.67 mg/l at station B & 4.27 mg/l at station C.

## **DISCUSSION**

The station A is the sample of raw sewage & therefore the concentration of pollutants in terms of nutrients were very high. The maximum concentrations of all the nutrient parameters therefore were observed at this station only. At station B, the concentration of all the pollutants is reduced significantly as compared to the station A since the sewage entering the lake through the inlet, get diluted.

The nutrients are other major pollutants from the sewage. Nitrate the most stable form of nitrogen is an indicator of pollution caused by nitrogenous waste. Nitrogenous compounds are excretory by products of all the animals and therefore the high concentration of Nitrate can be directly correlated to the pollution through excretory mater. The highest value of Nitrate was observed at Medical College that shows that

the inlet is grossly polluted in terms of human and animal excretory waste.

At Ahmedabad & Kotra inlets high concentration of Nitrate and Phosphate were also observed. Kotra sewage inlet is the major sewage inlet of the Upper Lake & it is also responsible for adding maximum nutrient load in the lake.

The pollution caused by the nutrients like Phosphate showed higher concentration at this inlet. Therefore Kotra sewage inlet is a major source of pollution in the Upper Lake. A total of 0.172187 Metric tones of Nitrate and 0.580578 Metric Tones of

**Table 1: Budgeting of nutrients inflow through major inlets of the lake**

Inlet	Flow lt./sec	Annual Flow (Liter)	Nitrate (Mt/annum)	Total Phosphorus (Mt/annum)
Ahmedabad	34.1	1075377600	0.049196	0.492908
Kotra	34	1072224000	0.172187	0.580578
Medical College	9.02592	284641413	0.100915	0.193946
Total	77.12592	2432243013	0.322298	1.267432

Phosphorus are added in the lake every year through this inlet.

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