



## Comparative Analysis of Physico-Chemical Properties of Water of Upper and Lower Lake of Bhopal, India

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### ABSTRACT;

Availability of clean and potable water has become a key issue in several developing countries. Burgeoning population and water scarcity is affecting the quality of life significantly, India is no exception to this. Providing water in adequate quantity and quality for domestic water supply, irrigation and industrial requirements in all parts of the country is a tremendous challenge from several angleseconomic, technical management and social.

Key Words ; Physio Chemical Parametes, Lower Lake ,Upper Lake

### INTRODUCTION:

Water is one of the most important natural resource available to mankind. Knowing importance of water for sustenance of life, the need for conservation of water bodies espacially the fresh water bodies is being realised everywhere in the world. Our planet is sometimes known as water planet as 2/3rd of earths surface is covered by water. However only 1% of the water resource is available as fresh water i.e surface water, rivers, lakes, streams, ground water for human consumption and other useful activities. Lakes also prove a useful source of fresh water in various parts of the world and hence it becomes necessary to check and maintain their water quality for a healthy survival. Lakes have been at the center of human attention. Several cities, industrial infrastucture and other complexes have been built in the vicinity of lakes, rivers and other water bodies. Development of human communities has deteriorated lake and river water qualities. Bearing the idea in mind it is inevitable to analyse and understand quality of surface water for various purposes such as for drinking, agriculture and industries. In the current study, some of the important physico-chemical characteristics of Upper Lake and lower lake of Bhopal were analysed and studied inorder to have an idea about its water quality as it is an important source of water espacially for drinking purpose to the urban population of Bhopal city.

The physico-chemical parameters of water provide the present information about the solute concentration at a given time (Singh and Shrivastava (2016). Imbalance in Physico-chemical properties of the water may adversely affect many species of aquatic flora and fauna that are dependent on both abiotic and biotic conditions (Santhosh and Singh, 2007). In India five water quality classes have been designated (A-E) on the basis of the water quality requirements for a particular use (UNECE 1993). Class A waters recommended as drinking water source straight without treatment but after disinfection. Class B waters categorize for outdoor bathing. Class C waters considered as drinking water source with conventional treatment followed by disinfection. Class D waters to maintain aquatic life (i.e. propagation of wildlife and fisheries) and class E waters for use for irrigation, industrial cooling and controlled waste disposal.

### STUDY AREA

Bhopal, the picturesque capital of the state of Madhya Pradesh, is also known as "City of Lakes" on account of a large number of water bodies present in and around Bhopal. The upper lake is the source of drinking water to urban populations, and is also known as "Badahtalab". Upper lake is surrounded by Van Vihar National Park on the south, human settlements on the east and north, and agricultural fields on the west. The water of the Upper Lake was used for drinking purposes up to year 1947 without any treatment, which proves that the water quality was very good. After Bhopal become the capital of Madhya Pradesh in 1956, it noticed tremendous population inflow and consequent rapid urban development which adversely affected the lake. Upper lake in Bhopal is arguably the oldest man-made lake in India, and was created by Raja Bhoj in the 11th century by constructing an earthen dam across the Kolans River. The Upper Lake is a major source of portable water for the people of the city of Bhopal, Madhya Pradesh, India. Upper Lake is situated at 23.25°N 77.34°E; this sampling site receives domestic wastes. Lower Lake is located at 23°16'0"N and 77°25'0"E. This lake receives the waste from the temple including polythene bags and the flowers and other solid waste at some point.

## MATERIAL AND METHODOLOGY

The samples were collected in uncontaminated sampling bottles of 1 liter capacity. For unsteady parameters such as temperature, electrical conductivity (EC), pH, were measured at the sampling site. Samples were brought to the laboratory for analysis of other physico-chemical parameters like Conductivity, pH, Total Dissolved Solids (TDS), Turbidity, Dissolved Oxygen, Hardness, Chloride content, free CO<sub>2</sub> and Total Alkalinity.

The samples were analyzed for different chemical, physical and biological parameters. Post-field interpretation includes compilation of data collected and generated after the testing of samples. The results were carefully studied and analyzed. The information and data generated from fieldwork throws light on various aspects.

- The pH of the samples was determined using digital pH meter.
- Turbidity was determined by Nephelo – turbidity meter.
- Total Hardness was determined titrimetric all using EDTA method (APHA 1985).
- Total Alkalinity was determined by titrimetric method.
- BOD was determined as per standard method (NEERI 1991).
- COD was determined by potassium dichromate open reflex method (NEERI 1991).
- Chlorides were determined by Mohr's argentometry method (APHA 1985).
- Nitrate and Phosphate content was determined as per standard method (APHA 1985).

## RESULT AND DISCUSSION

### Physio chemical properties of upper and lower lake Bhopal;

SNo.	Physio Chemical Parameters	Lower lake	Upper lake
1	Temperature	27 <sup>o</sup> c	28 <sup>o</sup> C
2	Color	Light yellow	----
3	Odour	Agreeable	Agreeable
4	DO	6.1mg/l	7mg/l
5	p <sup>H</sup>	7.3mg/l	8.5mg/l
6	Alkalinity	91.2mg/l	126mg/l
7	Hardness	112.6mg/l	157mg/l

**Conductivity:** Conductance was measured by conductometer (215K, Elite Scientific Co. India). The electrode of the conductivity meter is dipped into the sample, and the readings are noted for stable value shown as ms/cm.

**pH:** pH value of water sample was determined by pH meter (LT-PH57, Elite Scientific Co. India) using standard buffer solutions

**Turbidity:** Turbidity was determined by Turbidity meter (CL 880, Accumax India). The electrode was dipped into the sample, and the reading noted.

**Dissolved Oxygen (DO):** It was measured by dissolved oxygen meter (CL 930, Accumax India). The electrode was dipped into the sample, and the reading noted.

**Total Hardness:** The hardness of water body was determined by titration. Exactly 50ml of the well-mixed sample is pipetted into a conical flask, to which 1ml of ammonium buffer and 2-3 drops of Eriochrome black -T indicator is added. The mixture is titrated against standard 0.01M EDTA until the wine red colour of the solution turns pale blue at the end point.

**Chloride:** Chloride measured by Argentometric titration method with standard silver nitrate using potassium chromate as an indicator. A known volume of filtered sample (50ml) is taken in a conical flask, to which about 0.5ml of potassium chromate indicator is added and titrated against standard silver nitrate till silver dichromate (AgCrO<sub>4</sub>) starts precipitating.

**Alkalinity:** Total alkalinity was determined with titration with standard H<sub>2</sub>SO<sub>4</sub> or HCl solution. Titration to pH 8.3 or decolourisation of phenolphthalein indicator will indicate complete neutralization of OH<sup>-</sup> and 1/2 of CO<sub>3</sub><sup>2-</sup>, while to pH 4.5 or sharp change from yellow to orange of

methyl orange indicator will indicate total alkalinity.

## DISCUSSION ;

The water quality analysis of different locations of Lake water samples have been carried out for Total alkalinity, Carbonate alkalinity, Bi-Carbonate alkalinity, Total hardness, Ca hardness, Mg hardness, Ca content, Mg content, Chloride, Phosphate, Total Phosphorus, Org. Phosphorus, Nitrate, BOD and COD. The status of water quality of Two lakes of Bhopal.

The BOD exceed 3 mg/l, it affects coagulation and rapid sand-filtration processes conventional water treatment plants, requiring expensive advanced water treatment. COD contents are very high. High COD interferes with oxygen transfer to the soil, resulting death of rice plants.

The present study reveals that the assessment of water quality deterioration is due to various reasons. The water quality of Upper Lake is evaluated which is one of the major potable water source of Bhopal city during winter and summer. Better water quality was found in winter season than summer. Extent of pollution that has occurred due to urbanization, anthropogenic activities; increased human interventions in the water bodies have been ascertained.

Overall, the physico-chemical parameters of water studied from different water bodies showed minor variations and were within the desirable limit for the survival of fishes indicating healthy status of lakes of Bhopal region.

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