

Limnological Studies on a lake-A Case Study

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ABSTRACT

Water pollution has been one of the major topics in the environmental issue of urban India. This study was conducted to find out the pollution situation of Madiwala Lake. Source of surface water and ground water have become increasingly contaminated due to increased industrial and agricultural activities. The quality of surface water is largely affected by natural processes. For example, weathering and soil erosion. This paper observes the negative and harmful effects of lake water pollution on the environment and the surrounding community as well as the quality of water after its treatment. The most common form of water pollution has been waste disposal via human activities. The study conducts tests on water samples from the Madiwala Lake. Recorded values of pH, color, turbidity, hardness, total dissolved solids (TDS), chloride (Cl), total acidity, total alkalinity, the temperature measured during the time of sampling varied from 26 – 28 °C and presence of heavy metals such as lead and cadmium for before and after the water treatment have thus compared to analyze the extent of water hygiene delivered.

Keywords – Madiwala Lake, Environmental issue

I. INTRODUCTION

Madiwala lake is one of the biggest lakes in Bangalore. Legend has it that the lake was built by the Cholas in a day. The water in the lake was fit for drinking till the early 1990s. Since then it has become unfit for drinking due to industrial waste and sewage entering the waterbody. It has gradually become polluted.

It is situated in the BTM Layout at 12° 54' 28" North, 77° 37' 0" East in Bangalore city. It is a home to many migratory birds. The lake comes under the administration of Karnataka State Forest Department which carries out the routine maintenance of this lake. There is a children's park as well. The lake received a Rs 25 Crore grant in 2016 from the Lake Development Authority of Bangalore.

This waterbody is nearly 300 years old. It was built by the Cholas, one of the longest ruling dynasties in South India. It is believed that the lake was built overnight.

Table 1: MADIWALA LAKE

Location	Begur hobli, Bangalore south
Extent	272 acres (110.07 ha)
Water spread area	200 acres (80.93 ha)
Wetland area	72 acres (29.13 ha)
STP capacity	4 mld
Total sewage inflow	Approx 12 mld
Main inflows (south and southwestern sides)	Hulimavu, Sarakki and Jarganahalli
Outflows (north and north eastern side)	Agaram lake and Bellandur lake
Catchment areas	Rupena agrahara, bommanahalli, J.P.Nagar, Jayanagar, bilakahalli, hulimavu, madiwala, kodi chikkanahalli, devarchikkanahalli, dorasamipalya

LAKE HABITAT : The Madiwala lake sees a huge number of Spot-billed Pelican migration in the winter (November–December). These Spot-billed Pelicans live in groups. Their main food is fish. Egrets can also be sighted along with these birds.

II. LITERATURE REVIEW

Among the biggest lakes of Karnataka, Madiwala Lake is also one of them and it locates in Banaglore, India. It contains an area of 114.3 hectare and is also one of the oldest lakes in Bangalore. The water in the lake was fit for drinking till the early 1990s. Since then it has become unfit for drinking due to industrial waste and sewage entering into the water body. Because of entering those wastes into the water body the lake has gradually become polluted. The lake received a Rs. 25 Crore grant in 2016 from the Lake Development Authority of Bangalore. In 2018 of October thousands of dead snails and fish were found floating on the banks of Madiwala Lake due to pollution. On February 6 of 2019, a cattle egret was found unconscious on the lake's bank. Residents blame that the rising pollution in Madiwala Lake seems to be because of sewage entering the water body from the nearby storm water drains. But forest department officials, who manage the lake, call it as a natural phenomenon.

III. LABORATORY WORK & ANALYSIS

3.1 Preliminary Analysis of Wastewater Sample

The collected water samples, tested initially to know its concentration, was found to be highly turbid and alkaline, also showing the presence of heavy metals like arsenic, nickel...etc. in it. Preliminary water sample testing helps in determining the type and extent of treatment to be given to the wastewater, in order to make it consumable for domestic purposes. The below table shows the results of the water sample collected from the lake discharge.

Table 2 :Result chart of the conducted laboratory analysis.

PARAMETER	ZONE 1	ZONE 2	ZONE 3	ZONE 4	ZONE 5	ZONE 6
Chlorides(mg/l)	72.87	70.87	74.87	67.88	69.8	72.87
Partial Alkanity(mg/l)	44	16	8	28	12	12
Total Alkanity (mg/l)	460	240	176	224	242	216
Total Hardness (mg/l)	96	112	120	100	140	104
Calcium Hardness(mg/l)	80	84	120	80	112	108
Calcium (mg/l)	32.064	33.67	48.09	32.064	44.89	43.29
DO (mg/l)	6.2	3.79	4.45	4.53	4.93	4.26
Turbidity (mg/l)	115	160	190	140	160	180
TDS(ppm)	257	241	239	242	242	244
COD(mg/l)	16	15	14.26	16.5	16.8	17.06

Table 2 shows that our waste water can not be directly disposed without conducting treatment.

3.2 Graphs representing the quantity of Wastewater Sample

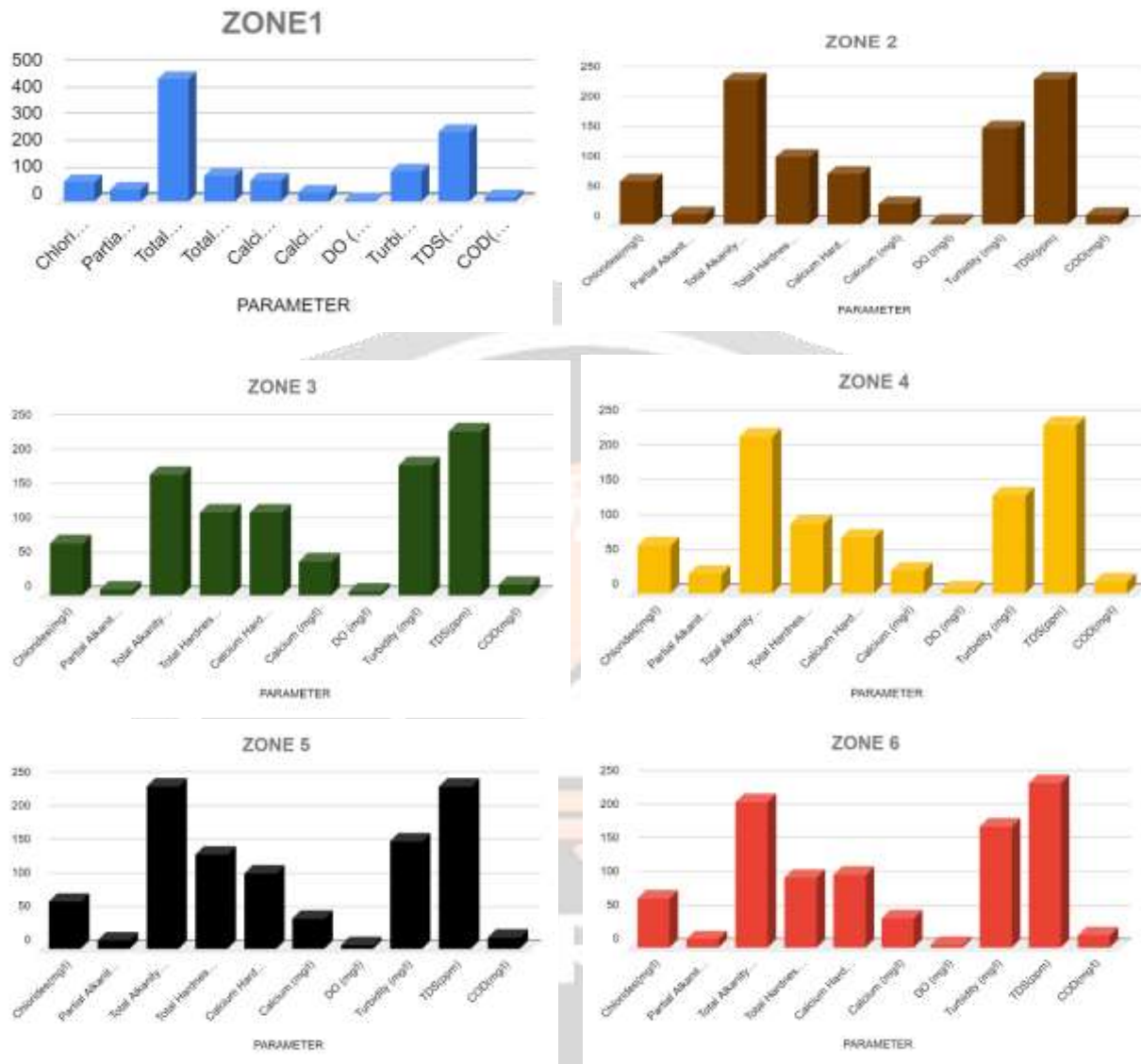


Figure:1 :Shows the graphical representation of the parameters of lake

IV.DISCUSSION

The Water temperature was taken as a routine measure and varied 23.5 to 28.60C depending on the time of sampling. Temperature influences the process behavior in lakes and its measurement was necessary to get overall view of temperature regime during the sampling period.

Table 3 Summarizes the range of values determined for 4 important parameters and compares this against the most stringent drinking water standards available. The factors of concern here were the pH, dissolved oxygen (DO), biological oxygen demand (BOD) and Total Dissolved Oxygen(TDS).

The pH measurements were done during the day. The photosynthesis and respiration of algae in eutrophic waters are known to influence the pH . Dissolved oxygen (DO) is not specified in drinking water standards since it influences all biological and chemical processes, it must be measured during water quality assessments . Although there is no specific water quality standards set for biological oxygen demand (BOD), it has been traditionally used as an indicator

providing an approximate measure of degradable organic matter present in the water. Unpolluted water usually have BOD of 2 mg/l or less and WHO standard indicated as 6 mg/l, although Madiwala lake exceeded this limit, the lake also exceeded permissible limit of 6 mg/ l said by the WHO standards. The levels determined for both parameters indicated the Madiwala Lake was eutrophic . Phosphate is largely responsible for eutrophic condition and if it is not limiting. Cyanobacteria can fix nitrogen from the atmosphere and develop algal blooms . During the study period, Madiwala and around villagers were seen washing clothes in the lake and the detergents used were promoting algal blooms.

Table 4, presents the range of eight common parameters used for assessing water quality. There are no guidelines for alkalinity in standard compared, but these are good indicators of productivity all other parameters were all well within permissible limits. The aquatic macrophytes was not cleared at all from the Madiwala lake, tend to accumulate vast quality of organic matter and this could account for the differences in sulphate.

While the water is safe based on most of the chemical parameters examined, the water may be unsafe due to poor microbial quality. Considering the significant contamination of lake by animal feces and unacceptable levels of DO and BOD seems in the lake, this explanation seem plausible. The aesthetic quality water, especially its green colour and the undesirable odour associated with algae is a strong deterrent for drinking, although the water quality managers parameters. This lake mainly used for watering animals and domestic purposes other than drinking

Table 3. Important Water Quality Parameters of Madiwala Lake

PARAMETERS	LAB TESTING PARAMETERS	PERMISSIBLE LIMIT	SOURCE
TDS (mg/l)	220-274	500	WHO
PH	6.5- 7	6.5-9.2	WHO
DO(mg/l)	6.2-6.9	5.0-10.0	WHO
BOD(mg/l)	14.26-17.4	6.0	WHO

Table 4. Common Water Quality Parameters of Madiwala Lake

PARAMETERS	LAB TESTING PARAMETERS	PERMISSIBLE LIMIT	SOURCE
Total Alkalinity (mg/l)	216-460	120	WHO
Total Hardness(mg/l)	96-128	500	WHO
Temperature (oC)	22.4-28.6	-----	WHO
Turbidity(FAU)	106-193	<5 FAU	WHO
Calcium Hardness	80-164	200	IS:10500:2012
Calcium	32-66	200	WHO
Chlorides	60-75	250	IS:10500:2012
Partial alkalinity	8-44	200	IS:10500:2012

V.CONCLUSION

The pH level were within limits prescribed by all drinking water standards.

BOD exceeded permissible limit of 6 mg/l said by the WHO standards. The TDS value were within limits prescribed by all drinking water standards. All other parameters were all well within permissible limits. The water is safe based on most of the chemical parameters examined, the water may be unsafe due to poor microbial quality. The aesthetic quality water, especially its green colour and the undesirable odour associated with algae is a strong deterrent for drinking, although the water quality managers parameters. This lake mainly used for watering animals and domestic purposes other than drinking.

Remedial Measures: Avoid releasing untreated sewage into madiwala lake. Don't throw any solid waste into the water as it clogs the flow of water thereby leading to pollution.Avoid releasing harmful chemicals and oils into storm drains or rivers.

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