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Physico – Chemical Analysis of Gotri Lake, Vadodara

Manmay Koli[1], Anjali Thakur[2], Indrani Bhattacharya[2], Dhwani Upadhyay[2], Prasad Andhare[3] , Juhi Ramrakhiyani[2]
1,2Department of Environmental Science, Parul Institute of Applied Science, Parul University, Vadodara, Gujarat -391760, (India)
3:Biological Sciences, PDPIAS, Charotar University of Science and Technology, Changa, Anand, Gujarat.
*Corresponding author: Ms Juhi Ramrakhiyani ,Email Id: juhi.ramrakhiyani20795@paruluniversity.ac.in

ABSTRACT
Water pollution has become an unavoidable menace as it directly affects the freshwater stockpiles present on the planet. The 'stockpiles' of freshwater are the glaciers, aquifers, lakes, rivers and streams in which major infiltration of pollution is observed affecting the viability of the water contained within these sources. Lakes and Reservoirs are the majority of sources from where small cities to huge metropolises acquire their municipal water supply, making them valuable assets and deterioration in them of major concern. And one such commodity was seen in Gorti, Vadodara. The aim of this study is to assess the present quality of the water present in the lake and also provides a brief insight regarding the different sources deteriorating the quality of the lake.
Keywords: *Lake deterioration, water pollution, Water quality, Physical parameters, Chemical parameters.*

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INTRODUCTION

Water, a liquid seen everywhere, used and consumed by every living species on this rock. Amongst its plethora of uses, washing and drinking are the most common. We often consider water as a single, pure element, but if you consider its makeup scientifically it's a chemical compound. And one of the chemical characteristics of water is that it is a universal solvent, which is what makes it a go to liquid for washing and cleaning.

Having a universal liquid for cleaning is a very positive factor, but the problem arises after the use. When water is used for washing it takes away all the contaminants with it but later separating them takes reasonable amount of efforts. And that is why there are campaigns all around about conservation of water.

Earth is known to have an unparalleled abundance of flowing water which makes it an ideal planet to host life. But even that amount of water is not sufficient to sustain humans. The earth is 71% water from which only 2.5% is freshwater and further only about 0.4% of this water is potable which needs to be shared with around 7 billion people [1]. This situation causes a problem because these numbers suggest that the availability of water for consumption is minute compared to the vast expanse we observe. This is the reason why water pollution is a major topic in present times as this depleting resource need conservation. A human body can go upto 21 days without sustenance and about two months only on water [2]. But the human body needs water and can only function 3 days without it [3]. Considering this importance of water in present times, it has become one of the most sought after and valuable resource after oil.

The properties of a lake like water level, recharge, chemical properties, etc can be affected by many factors such as Climate, Atmospheric inputs, underwater rock strata, lake morphology, etc.The study carried out for three months from 1st December 2021 to 28th of February 2022, was a comprehensive study for the identification of nearly all sources of water pollution that affect the environmental condition of the lake. A survey for gauging the awareness of the pollution present in the lake and their interest in the matter and Identification of the sources of pollution.

MATERIAL AND METHODS

The site selected for this study was *Gotri Lake,* which is a public access lake located in the Gotri area of the city of Vadodara, WNW of the geographic city centre, the Lakshmi Vilas Palace.

To carry out the water quality analysis a sample of the given lake was taken. A 'sample' is a smaller, manageable quantity representing the water present in the lake.

During the survey, it was observed that the whole lake has been divided into two parts due to heavy silt deposition. And because of this, the lake was assessed in two parts and the sections were labelled as Portion 1 and Portion 2. Discrete sampling was done for the lake throughout the two months of analysis, periodically as and when required by the procedure. The water was analysed for its present quality so that it can be compared to the standards set by the Bureau of Indian Standards (BIS). Further the parameters were also compared to a study done in the year 2019-20 by Gujarat Environment Management Institute (GEMI) titled 'Environmental Monitoring of Major Lakes of Gujarat'.

The procedure of analysis for this project was referred from either the standards set by BIS in the subset **IS 3025** or from the book Standard Methods for the Examination of Water and Wastewater, 23rd Edition published by American Public Health Association (**APHA**).

RESULTS AND DISCUSSION

During the survey it was observed that there was presence of high amounts of algae in the water, suggesting high amounts of nutrient availability. The water might contain chemicals like soaps and detergents in a considerable amount as people were seen washing their clothes on the bank of the lake. Furthermore, there was also observed a sewer output that flowed from the neighbouring residence, and the wastewater flowing through this input was white in colour.

For gauging the awareness of people, discussions were carried out at random with the local residents that visited the garden and the temple overlooking the lake. There were mixed opinions from people. Some were reacting with positive oversights towards the anthropogenic activities deteriorating the quality of the lake. And the rest were bound by their religious beliefs which lead to garlands and various religious materials being immersed in water, which further leads to pollution if not managed properly. Relating to these beliefs, periodic immersion activities are also carried out in the lake during festival events which might be the reason for the amount of silt deposition observed.

Also, a later visit to the site revealed that there might have been a presence of an invasive floating aquatic plant species earlier which had proliferated at an unprecedented amount at the time. Further confirming the overwhelming presence of nutrients in the water.

Table 1: Results of the Water analysis performed

Parameter	Record		GEMI results
	Portion 1	Portion 2	
pH	8.66	8.10	9.27
Conductivity	1043	1216	1161
Total Hardness	318.67	350.67	350
Ca Hardness	128.00	132.00	80
Mg Hardness	190.67	218.67	270
Calcium	53.83	55.51	-
Turbidity	0.06	0.02	26.4
Total Alkalinity	630.00	780.00	-
Carbonate	56.00	42.00	-
Bicarbonate	574.00	738.00	-
TS	700.00	636.00	-
TDS	476.00	544.00	592
TSS	224.00	92.00	-
COD	46.00	62.00	-
BOD	41.47	85.04	1.24
DO	4.75	9.58	7.56
Sulphate	10.27	12.46	94.18

Sodium	134.50	158.70	-
Residual CL	-	-	
Fluoride	0.05	0.33	-
Nitrate	6.84	6.90	7.73
Nitrite	0.18	0.30	-

CONCLUSION

The lake's water quality suggests that the parameters like Total Alkalinity, Dissolved Sodium, TS, and BOD are observed to be substantially over the limit. Comparison of the current observation with the previously recorded data suggest variable changes in the parameters but there is a lack of consistency, which might be a result of various intangible factors like negligence and poor management.

On a positive side, the public talks show that people are aware of the issue and are committed to the lake's repair. The use of pollution-specific methods and conservation measures, as well as effective environmental management and maintenance, can help to enhance the lake's water quality, possibly to the point where aquatic life can flourish.

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