

## Impact of Wastewater on Urban Lakes: A Case Study of Aurangabad City (MH) India

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**Abstract:** *One of the most critical problems of developing countries is improper management of vast amount of wastes generated by various anthropogenic activities. More challenging is the unsafe disposal of these wastes into the ambient environment. Water bodies especially freshwater reservoirs are the most affected. This has often rendered these natural resources unsuitable for both primary and/or secondary usage. Aurangabad is a fastest growing city in Asia, which is the district of Maharashtra State. In Aurangabad industrialization and urbanization has taken place very rapidly. The present study is focused on impact of wastewater on water quality of four different lakes of Aurangabad city, Gajgaon Lake, Harsul Lake, Salim Ali Lake and Nehru Lake. In present research work the water quality of all the Four lakes were analyzed and results were compared with the standards provided by different organizations. It is observed that, the lake water was getting polluted by depositing of domestic waste material, by the run off in the catchment area and during monsoon large amount of organic matter is brought through the runoff and the lakes itself subjected to human activity, like bathing, cloths washing, vehicle and another utensil washing and also the disposal of Nirmalya and idol immersion. Gajgaon Lake is highly polluted as compared to the other three lakes. Maximum parameters were found above their acceptable limits. This indicates there is an urgent need to generate the public awareness on the sources, extent and prevention of water pollution and also the impacts of pollution on the human health and environment.*

**Key Words:** *Wastewater, urbanization, organic matter, water quality, lake.*

### Introduction:

Contamination is a serious problem as 70% of India's surface water resources and as a growing number of its ground water reserves have been contaminated by biological, organic and inorganic pollutants<sup>10, 14, 5</sup>. The freshwater bodies, viz., ponds, lakes, wells and hand pumps are the principal sources of drinking water in urban areas. In India, around 80% of the surface water bodies are exposed to pollution due to of raw sewage<sup>24, 12, 9</sup>. The lentic water bodies, i.e. the lakes and the ponds are not free from defilement<sup>6, 7, 1, 22, 23, 13, 17, 18</sup>. The strong development experienced in many areas of the world in the 20<sup>th</sup> century has resulted in increasing wastewater disposal almost everywhere that has increasingly threatened freshwater ecosystems receiving these loadings<sup>2</sup>. In historical city Aurangabad, Gajgaon Lake, Harsul Lake, Salim Ali Lake and Nehru Lake are the oldest lakes, but due to religious customs, the lake water was getting polluted by depositing of domestic waste material, by the run off in the catchment area. In present research work the water quality of all the Four lakes were analyzed and results were compared with the standards provided by different organizations.

### Study Area:

Gajgaon Lake in Aurangabad, near the Waluj industrial area is built naturally Nehru Lake is situated in Nehru Udyan of N-8 CIDCO area, which is one of the oldest lakes in this historical city. A small garden is situated by the side of this lake such as Nehru Udyan. The Harsul Lake is located North-East of the Aurangabad city. It is 2 km away from Harsul jail. The area is intensively developed with high level of agricultural, industrial, as well as educational activity. Catchment area of Harsul lake is 16054 Acers. It was constructed in 1954 and inaugurated on 5<sup>th</sup> June 1956. A small garden is situated by the side of this lake. Water supply by Harsul Lake to Aurangabad city is about 1,00,000 MCD. Salim Ali Lake priorly known as "Khizir Talab" is situated near Delhi Gate, opposite to Himayat Bagh on Aurangabad-Jalgaon-Agra highway in Aurangabad city. Earlier it was supplied water under the ancient water supply scheme of "Nahar-E-Ambari" All the three lakes consist of rich flora and fauna. The soil along the lake is muddy and rich in algal biomass and microorganisms. These lakes are ecologically important as they provide a suitable habitat for birds.

**Material and Methods:**

Water samples were collected from Gajgaon Lake (Site A), Nehru Lake (Site B), Harsul Lake (Site C) and Salim Ali Lake (Site D). Water samples of all four lakes were collected and the physico-chemical parameters were analyzed by Standard methods prescribed by Trivedy and Goel (1984), and APHA (1998).

**Results and Discussion:**

**Table No. 1: Physico-chemical analysis of Site A, Site B and Site C.**

Sr. no.	Parameters	Site A	Site B	Site C	Site D
1	Temp	30.23	28.19	29.97	28.84
2	Turbidity (NTU)	76.5	60.18	56.98	41.70
3	TS (mg/l)	2186.4	315	476.22	339.302
4	TDS (mg/l)	1781.47	232.75	983.75	241.35
5	TSS (mg/l)	394.18	87	180.74	84.09
6	Electrical Conductivity ( $\mu\text{mhos}^{-1}$ )	542.89	344.22	514.41	374.97
7	pH	8.0	7.8	8.0	7.6
8	DO (ppm)	2.62	5.7	6.10	5.7
9	BOD (ppm)	63.29	14.94	32.23	15
10	COD (ppm)	347.97	145.43	162.1	31.46
11	Alkalinity (mg/l)	407	396.53	310.41	369.91
12	TotalHardness (mg/l)	344.1	220.85	239.51	243.4583
13	Nitrate (mg/l)	3.387	3.991	3.6001	3.58333
14	Phosphate (mg/l)	1.29	1.57	1.34	1.623
15	Sulphate (mg/l)	111.0	59.45	115.89	59.460
16	Chlorides (mg/l)	423.33	194.22	257.80	184.99

**Table No. 2: Standards for physico-chemical quality of surface water:**

Sr. No.	Parameters	USPH Standards	ISI Standards	WHO Standards	BIS Standards
1.	pH	6.0-8.5	6.0-9.0	6.5-9.2	-
2.	Conductivity ( $\mu\text{mhos cm}^{-1}$ )	300	-	-	-
3.	Turbidity NTU	< 5	-	-	-
4.	TDS mg/lit	500	-	500	-
5.	Alkalinity mg/ lit	-	200	-	-
6.	Total Hardness mg/ lit	-	300	-	-
7.	Chlorides mg/lit	250	600	500	600
8.	Sulphates mg/lit	<0.3	-	200-400	1000
9.	DO ppm	4-6	3.0	-	-
10.	BOD ppm	4.0	-	-	-
11.	COD ppm	4.0	10.0	-	-
12.	Phosphate mg/lit	-	-	-	-
13.	Nitrate mg/lit	-	45-100	-	-

**Discussion:**

In present investigation, All the sites water samples had moderate temperature and Turbidity was found above the permissible limit of BIS, IS and WHO. The maximum value of turbidity was found at the site A as compared to the site B, C and D. Higher electrical conductivity  $542.89 \mu\text{mhos}^{-1}$  and TDS  $1781.47 \text{ mg/l}$  were found in Gajgaon Lake (site A). It may be due to the discharge of domestic and industrial sewage. Electrical conductivity and TDS were found highly correlated with each other <sup>4, 15,8,19</sup>. All the sites water samples had more electrical conductivity as compared to permissible limit prescribed by different organization. Dissolved Oxygen was observed  $2.62 \text{ ppm}$ , very less than the permissible limit of BIS, IS and WHO in Gajgaon Lake (site A) water sample. This indicates less oxygen availability in the water. It may due to organic pollution, by waste water discharge into the water reservoir. Site A shows the least dissolved oxygen content as compared to the other sites. While at the site B, site C and site D it is found more than their permissible limits, which

indicate good quality of water. High BOD 63.29 ppm and COD 347.97 ppm were observed at the site A. This indicates polluted water due to the mixing of domestic high organic load<sup>17</sup>. The total alkalinity were observed more in all the water samples as compared to the WHO and IS standards, but as compared to the BIS standards all were within permissible limit. The highest value of alkalinity 407 mg/l was observed at Site A as compared to the other sites. It indicates the mixing of untreated sewage into it. The hardness was observed high Site A containing more hardness as compared with IS and acceptable limit of BIS than other sites. Nitrate, Phosphate and Sulphate at high concentration was observed in Site A water sample, due to influx of domestic sewage, detergents, agricultural effluents and industrial effluent. Site A contain chlorides more than its acceptable limit of BIS, IS and WHO. It indicates there was discharge of domestic and industrial sewage.

### Conclusion:

The present study reveals that the sites such as Harsul Lake (Site B), Salim Ali Lake (Site C) and Nehru Lake (Site D) are less contaminated. Maximum parameters were present within the acceptable limits prescribed by BIS, IS and WHO and CPCB, which were not much affected by the anthropogenic activities till today. But the Gajgaon Lake (Site A) was more polluted than the other sites. Maximum parameters were found above their acceptable limits. It is observed that, the lake water was getting polluted by depositing of domestic waste material, by the run off in the catchment area and during monsoon large amount of organic matter is brought through the runoff and the lakes itself subjected to human activity, like bathing, cloths washing, vehicle and another utensil washing and also the disposal of Nirmalya and idol immersion. This indicates there is an urgent need to generate the public awareness on the sources, extent and prevention of water pollution and also the impacts of pollution on the human health and environment.

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