

EVALUATION OF WATER QUALITY PARAMETERS OF SIX SELECTED LAKES IN DHAKA CITY

Md. Masud Alom

Department of Civil Engineering, Daffodil International University

E-mail: masud.ce@diu.edu.bd

Abstract: Dhaka, the capital city of Bangladesh is located in the geographic center of the country. Lots of lakes are situated in this city for balancing the environmental condition. But at present, almost all lakes are lost their beauty for various reasons such as continuous discharge of domestic and industrial effluents, sediments from under-construction buildings and liquid sewage through WASA drains etc. It is time to take initiatives for saving the lakes in Dhaka city. In this study an attempt was made to determine some vital water quality parameters of the selected lakes and to find out the most vulnerable location from Uttara Lake, Dhanmondi Lake, Banani Lake, Gulshan Lake, Ramna Lake and Hatirjheel Lake. Also tried to find out the remedial measures to minimize the pollution of lake

water and create a safe breeding zone for fish. A strong survey has been done to identify the main reasons behind the water pollution. From the study it is seen that, the physiochemical parameters of selected lakes water are not in suitable condition. Especially Turbidity and BOD₅ are in the worst condition of all the six selected lakes. The water quality status of Uttara Lake is in the best position and 68 percent people are satisfied with the present condition. But the water condition of Gulshan Lake is in the worst position. Also BOD values for fisheries are not satisfied with standard range which is very vital issue for breeding fish properly.

Keyword: Lake water, Physiochemical parameters, Pollution, Remedial measures

1. INTRODUCTION

Dhaka, the capital city of Bangladesh is located in the geographic center of the country. Lots of lakes are situated in this city for balancing the environmental condition. In the past, people enjoy natural beauty beside the lake. But at present, almost all lakes are lost their beauty for various reasons. According to general Concept of Lake is smaller than canal or river which may use as a store house of drain water in a city. A lake may play an important role to serve as various purposes like breeding fish, irrigation, aquaculture and livestock usage. The concerning issue is that, the lake water quality of Dhaka city is deteriorated day by day due to numerous biological, physical and chemical variables causing water toxicity [5;11]. When concentrations of any ingredients or components go beyond the tolerance limit for organisms that element is treated as pollutants. This research work has been carried out to determine some vital water quality parameters of the selected lakes and to find out the most vulnerable location from Uttara Lake, Dhanmondi Lake, Banani

Lake, Gulshan Lake, Ramna Lake and Hatirjheel Lake. Also try to find out the remedial measures to minimize the pollution of lake water and create a safe breeding zone for fish. A strong survey has been done to identify the major reasons behind the water pollution.

Gulshan Lake is one of the eight ECA's declared by Department of Environment [6; 8]. An "Ecologically Critical Area (ECA)" is ecologically defined areas or ecosystem, affected adversely by the changes brought through human activities. Tannery and other industrial wastes, unplanned sewage system, medical wastes, nuclear and toxic materials mixing with drain water passes to lakes and thus polluting lake waters, threatening people's liver with health hazards related to toxicity [1; 14]. At present, the menace of water borne diseases and epidemics still loom large on the horizons of developing countries [7]. The increasing urbanization and industrialization of Bangladesh have negative implications for surface water quality. The pollution from industrial and urban waste effluents and from agrochemicals in some water bodies and

rivers has reached alarming levels [2; 10]. It cannot be denial that good water quality in lakes is essential for maintaining recreation and fisheries and for the provision of municipal drinking water. As Fish is an

inexpensive source of protein and water is the physical support in which they carry out their life functions such as feeding, swimming, breeding, digestion and excretion [9].

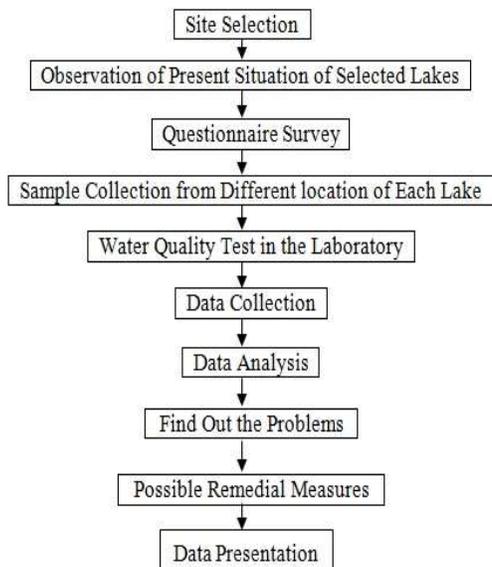


Figure 1.1: Picture of selected lakes in Dhaka city, Bangladesh.

2. METHODOLOGY

Methodology is the systematic, theoretical analysis of the methods applied to a field of study. A methodology does not set out to provide solution.

Instead, it offers the theoretical underpinning for understanding which method, set of methods or so called “best practices” can be applied pacific case. The flow chart for methodology is given below:



Although there are lots of lake in Dhaka city, total six lakes were selected for conducting this study which are Uttara Lake, Dhanmondi Lake, Banani Lake, Gulshan Lake, Ramna Lake and Hatirjheel Lake. Water samples were collected from three different points of each lake in the rainy season or wet season (15th May- 30th November, 2017). The sampling points are given below in the table 2.1.

Figure 2.1: Flowchart of key steps of the study

Table 2.1: Name and location of Sampling Sites

Lake Name	Sample	Sample Collection Zone Names
Uttara Lake	01	Road-02, Sector-05, Uttara Model Town, Dhaka-1230
	02	Rabindro Sarani, Sector-07, Uttara Model Town, Dhaka-1230
	03	Road-01, Sector-09, Uttara Model Town, Dhaka-1230
Dhanmondi Lake	01	Road-2/A, Dhanmondi, Dhaka
	02	Road-10/A, Dhanmondi, Dhaka
	03	Road-15/A, Dhanmondi, Dhaka
Banani Lake	01	Block-E, Banani, Dhaka
	02	Road-6/A, Kamal Ataturk Avenue, Banani, Dhaka
	03	Road-18/A, Banani, Dhaka
Gulshan Lake	01	Road-130, Gulshan-01, Dhaka
	02	Road-106, Beside Manarat International University, Gulshan, Dhaka
	03	Road-40/2, Madani Avenue, Gulshan, Dhaka
Ramna Lake	01	RamnaBotmul south point
	02	RamnaBotmul north point
	03	Ramna Lake's North point
Hatirjheel Lake	01	East West University Point, East Merul Badda, Dhaka
	02	Bridge number-02, West Rampura, Dhaka
	03	Hatirjheel link road, Mirbag,Rampura, Dhaka

3. DATA COLLECTION METHODS

This study is based on the critical analysis and evaluation of some selected lakes water of Dhaka city. The researchers have collected both primary and

secondary data in order to explore and critically analysis and evaluate the present water condition of these lakes and the sources of pollution. There are

different methods for data collection, but in this study two most common and popular methods were used e.g. questionnaire survey and testing samples in the laboratory. Different methods and/or instruments

were used for the determination of different physio-chemical properties of water samples. The methods and/or instruments are given in the Table 3.1.

Table 3.1: Methods and/or Instruments Used for the Analysis of Different Parameters.

Parameters	Methods/Instruments (APHA) ^[3]
pH	pH meter
Conductivity	Conductivity meter
Turbidity	Titrimetric method
Dissolve Oxygen (DO)	Titrimetric method
Iron (Fe)	Titrimetric method
Temperature	Thermometer
Alkalinity	Titrimetric method
Color and odor	Eye observation and feeling smell.
Biochemical Oxygen Demand (BOD)	Titrimetric method
Salinity	Salinity meter
CO ₂	Titrimetric method

N.B: American Public Health Association (APHA)

4. RESULTS AND DISCUSSION

A. Water Quality Taste Results

Table 4.1: Comparison of laboratory test results of selected lakes with standard values.

Water Quality Parameters	Uttara Lake	Dhanmondi Lake	Banani Lake	Gulshan Lake	Ramna Lake	Hatirjheel Lake	BS (ECR 97)	WHO (1993)
pH	8.33	7.63	7.4	7.76	6.63	6.63	6.5-8.5	6.5-8.5
Conductivity (mS)	419	283.67	261.67	778	265.67	804.67	-	-
DO (mg/l)	5.41	5.55	3.56	3.45	4.35	3.35	4.0	4.0
Iron (<mg/l)	0.3	0.17	0.5	0.5	0.3	1.0	0.3-1.0	0.3
Temperature (°C)	24	24	25	25	26	24	20-30	-
Color (Pt-Co)	29.67	22.67	35.33	34	27	30.33	15	15
Alkalinity (mg/l)	156.67	117.33	261.33	255	96.33	268.67	200	200
CO ₂ (mg/l)	10.33	11.67	30	22.67	24.33	92	15	15
Salinity	0.17	0.13	0.23	0.27	0.1	0.23	0	0
Turbidity (JTU)	16	12	18.33	19.33	13.33	19.67	10	5
BOD ₅ (mg/l)	17.33	21.33	23.33	26.67	24.67	24	2	-

N.B: Bangladesh Standards (BS) for Drinking Water (ECR 97) [4]; WHO Guideline Values, 1993 [12]

From the table it is seen that although most of the water quality parameter satisfy the standard range but the condition of BOD and Turbidity are different.

Especially the value of BOD is too much from the standard value.

Table 4.2: Comparison laboratory test results of selected lakes and standard values for fisheries

Water Quality Parameters	Bangladesh Standard for Fisheries (EQS,1997) ^[13]	Laboratory Test Report of Selected Lakes					
		Uttara Lake	Dhanmondi Lake	Banani Lake	Gulshan Lake	Ramna Lake	Hatirjheel Lake
pH	6.5-8.5	8.33	7.63	7.4	7.76	6.63	6.63
DO (mg/l)	4.0-6.0	5.41	5.55	3.56	3.45	4.35	3.35
Temperature(°C)	25	24	24	25	25	26	24
BOD ₅	(-) or below 2	17.33	21.33	23.33	26.67	24.67	24

5. QUESTIONNAIRE SURVEY

Questionnaire survey is a very common and systematic method for gathering information that is utilized to collect, analyze and interpret the views of a group of people from a target population. In this

study total 300 interviews were taken from 300 general people of various locations of 6 (six) selected lakes. For every lake 50 people were selected. Full report of questioner survey is attached in google site [15]. Every people faced total 9 (nine) questions which are shows in the table 5.1.

Table 5.1: Questions for conducting questioner survey in the study area

S.L	Question Types
1.	Are you satisfied with the present situation of water of this Lake?
2.	Do you find any smell or taste problem in the water of this Lake?
3.	In summer season do you notice any problem in the water of this Lake?
4.	In rainy season do you notice any problem in the water of this Lake?
5.	What are the sources of water of this lake?
6.	Are you using Lake Water for any purpose? If yes, which purpose?
7.	Have you faced any health related problems (last 6 months)?
8.	Have any suggestion for improving water condition of this Lake?
9.	What do you think about the major sources of Pollution of this Lake?

6. CONCLUSIONS

From the laboratory test result, it is seen that the physiochemical parameters of selected lake water are not in suitable condition. Especially Turbidity and BOD₅ are in the worst condition of all the six selected lakes. For identifying the major sources of pollution of lake water, questionnaire survey was conducted and result shows that the connected sewage lines and human unawareness are mainly responsible for lake water pollution. To find out the possible solution for improving the water quality of these selected lakes, people express their opinion that, increasing public and government awareness, disconnecting sewage

line connections, removing industries which are situated besides the lakes. Moreover, Government and NGO’s should come forward for changing the water condition of these lakes.

Although the water condition of lakes in Dhaka city are not in suitable condition, questionnaire survey and water test results shows that Uttara lake’s water status is in the best position and 68 percent people are satisfied with the present condition. But the water condition of Gulshan Lake is in the worst position. Also BOD values for fisheries are not satisfied with standard range which is very vital issue for breeding fish properly.

7. RECOMMENDATIONS

There are so many ways to prevent the pollution of Lake Water. From the study it can be point out some steps which can be taken into consideration for preventing the pollution of Dhaka city lakes which are as follows:

- Household effluents should not be connected with the lake. RAJUK authority can play a vital role in free up the lake from the encroachers.
- A public awareness program can be initiated to save the lakes from pollution.
- Water quality monitoring team can be developed.
- Implementation of original Master Plan of Dhaka city by proper authority.
- Different NGOs should come forward with government to improve the present situation of lakes.

References

- [1] M. J. Abadeen. Industrial waste give earth a chance. World Environment Day, 5 June 2002. Report Dept. Env. The Government of Bangladesh. 2002.
- [2] A. U. Ahmed, Reazuddin. Industrial pollution of water systems in Bangladesh, University Press Limited, Dhaka. 2000.
- [3] APHA. Standard Methods for the Examination of Water and Wastewater. 1996.
- [4] DoE (Department of Environment). Environmental Water Quality Standard for Bangladesh. Ministry of Environment and Forest, Government of the People's Republic of Bangladesh. 1997.
- [5] M. S. Islam. Bioengineering techniques for slope protection, land reclamation and water purification in Bangladesh, Proceedings of Conference on *Development and Democracy in Bangladesh: Problems and Prospects*, November 6-8, 2015, UC Berkeley, USA, 2015. Paper No. 36.
- [6] T. U. Islam. Third Bangladesh National Report Submitted to Secretariat of Convention on Biological Diversity, Ministry of Environment and Forest, Bangladesh Secretariat, Dhaka. 2005. pp. 153.
- [7] S. Jain. Assessment of water quality at the three stations of Chambal River. *International Journal of Environmental Sciences*. 3 (2): 881-884. 2012.
- [8] A. Kothari, N. Pathak and F. Vania. Where Communities Care: community-based wildlife and ecosystem management in South Asia. *Kalpavriksh, Pune and International Institute of Environment and Development (IIED)*, London. 2000. pp. 17-23
- [9] M. Mohinuzzaman and M. Kamrujjaman. "Quality Assessment of Water and Sediment of Gulshan Lake by Using Neutron Activation Analysis", Jahanginagar University. Bangladesh. 2013.
- [10] M. I. Sarwar, A. K. Majumder and M. N. Islam. Water quality parameters: A case study of Karnafully River Chittagong, Bangladesh. *Bangladesh Journal of Scientific and Industrial Research*. 45 (2): 177-181. 2010.
- [11] D. Sikder. Stability analysis of the Buriganga river bank. Undergraduate Thesis, Department of Civil Engineering, BUET, Dhaka-1000, Bangladesh. 2016.
- [12] WHO. Guidelines for drinking water quality. 2nd edn. Geneva 1: 25-100. 1993.
- [13] DoF, (Department of Fisheries). Saranica, Matsya Pakhya Sankalan, Annual Report, Ministry of Fisheries and Livestock. The Government of Peoples republic of Bangladesh, Dhaka, 2015 (In Bengali).
- [14] M. A. Satter and M. S. Islam. Quality Assessment of River Water around Dhaka City, *Bangladesh Journal of Environmental Sciences*, 10. 326-329. 2005.
- [15] Daffodil International University, Bangladesh. Survey report on: *Evaluation of Water Quality Parameters of Six Selected Lakes in Dhaka City*, 2017. Available: https://sites.google.com/s/1N4KTt7mWPAPqxsCiKRg1CBtvo0PFpCj/p/1z_UELz70xnf3YdWKM85P8qRvqQ2hPmTX/edit