

# ASSESSMENT OF SURFACE WATER QUALITY PARAMETER OF HATIRJHEEL LAKE IN DHAKA CITY

By

Student Name	Student ID
1. SOURAV KANTI PAUL	BCE1802014065
2. JUBER AHMED SAHEL	BCE1802014141
3. MD. SAIFUL ISLAM	BCE1802014009
4. YEAKUB ALI	BCE1802014142
5. MD. MOSIUR RAHMAN	BCE1802014091

A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor Of Science in Civil Engineering



Department of Civil Engineering  
Sonargaon University  
147/I, Green Road, Dhaka-1215, Bangladesh  
Section: 14C  
Semester: Spring  
Year: 2022

# ASSESSMENT OF SURFACE WATER QUALITY PARAMETER OF HATIRJHEEL LAKE IN DHAKA CITY

By

Student Name	Student ID
1. SOURAV KANTI PAUL	BCE1802014065
2. JUBER AHMED SAHEL	BCE1802014141
3. MD. SAIFUL ISLAM	BCE1802014009
4. YEAKUB ALI	BCE1802014142
5. MD. MOSIUR RAHMAN	BCE1802014091

## Supervisor

Md Lutfor Rahman  
Assistant Professor  
Department of Civil Engineering  
Sonargaon University

A thesis submitted to the Department of Civil Engineering in partial fulfillment for the degree of Bachelor of Science in Civil Engineering



Department of Civil Engineering

Sonargaon University

147/I, Green Road, Dhaka-1215, Bangladesh

Section: 14C

Semester: Spring

Year: 2022

## BOARD OF EXAMINERS

The thesis titled “**Assessment of Surface Water Quality Parameter of Hatirjheel Lake In Dhaka City**” submitted by Sourav Kanti Paul, Student ID: BCE-1802014065, Juber Ahmed Sahel, Student ID: BCE1802014141, Md. Saiful Islam, Student ID: BCE1802014009, Yeakub Ali, Student ID: BCE1802014142, Md. Mosiur Rahman, Student ID: BCE1802014091, has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering on May 21, 2022.

---

**1. Md. Lutfor Rahman**

**Supervisor**

Assistant Professor  
Department of Civil Engineering  
Sonargaon University (SU)

---

**2. Name of the Internal Member**

**Member**

Designation

**3. Name of the Internal Member**

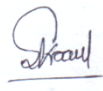

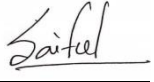


**Member**

Designation

## DECLARATION

We hereby declare that this thesis represents our own work done after registration for a Bachelor's degree in Civil Engineering at the University of Sonargaon, and was not previously included in a thesis or dissertation submitted to this or any other degree, diploma or other degree institution.

We guarantee that the current work does not infringe any copyright.

<u>STUDENT NAME</u>	<u>STUDENT ID.</u>	<u>SIGNATURE</u>
Sourav Kanti Paul	BCE-1802014065	 _____
Juber Ahmed Sahel	BCE1802014141	 _____
Md. Saiful Islam	BCE1802014009	 _____
Yeakub Ali	BCE1802014142	 _____
Md. Mosiur Rahman	BCE1802014091	 _____

***Dedicated***

*to*

***“Our Parents,***

*for filling our head with endless dreams,*

*our hands with endless books,*

*and our hearts with endless love and*

***Our Honorable Teachers***

*for encourage minds to think,*

*hands to create and hearts to love.”*

## **ACKNOWLEDGEMENTS**

The preparation of the thesis was undertaken to meet the need for the partial fulfillment of the Bachelor of Science Degree in Civil Engineering from Sonargaon University. Regardless of our efforts, the success of this thesis depends largely on the encouragement and guidance of many others. We take this opportunity to thank all those who contributed to the success of this thesis.

First and foremost, we would like to praise and thank GOD, the Almighty, for bestowing countless blessings, knowledge, and opportunities on the author, allowing us to finally complete the thesis, without which we would not have been able to complete this work on time.

We would like to express my sincere gratitude to Sonargaon University supervisor, Md Lutfor Rahman, Assistant Professor and Head, Department of Civil Engineering, Sonargaon University for the continuous support unwavering guidance throughout the course of this work. We greatly appreciate all the support that he has been given to us, both on this thesis and during the entire period. We have learned a lot from him. The whole work definitely needed the application of engineering judgment and thoughtful logic along with information from textbooks or previous relevant publications. Without his guidance and persistent help this thesis would not have been possible.

We wish to express our profound gratitude to Md. Alamgir Hossain, Dean & Professor and S.M. Yashin, Co-coordinator, Department of Civil Engineering, Sonargaon University, they are also support us and encouragement during this study.

And finally, our special tribute goes to our parents, for their love and encouragement.

## ABSTRACT

The study was conducted in the Department of Civil Engineering at Sonargaon University with the objectives to prepare a project and thesis with a view to partial fulfillment of the requirements for the degree of Bachelor of Science (B.Sc.) in Civil Engineering. The specific objective of the study was to study the surrounding environment at a few selected sites around Hatirjheel Lake, to assess the lake's water quality in terms of very important water quality parameters, to investigate the causes leading to it. This serious water pollution and finally to provide some suggestions to improve the existing condition. To determine the suitable locations of water collection, the whole area in and around the lake was preliminarily surveyed and necessary photographs were taken. Then water samples were collected such that the samples represent the characteristics of lake water. With a view to finding out the water quality some parameters water samples were tested at field and several data was tested DPHE central laboratory. We get pH scale varied from 7.5 to 8.0. with a weighted average of 7.75 that's samples 100% maintain the quality (ECR.97) and World Health Organization guideline. The Dissolve Oxygen of the Lake water has shown a variation from 4.75 to 6.05 mg/l. with a weighted average of 4.06 the study value not exceeded the minimum requirement so the water was not good for drinking. BOD varied from 15mg/l to 32 mg/l with a weighted average of 23.33 mg/l, 100% samples showed deviation from the standard. COD varied from 60 to 120 mg/l with a weighted average of 88.67 mg/l, which is so far from the BECR standard and WHO guideline. Electrical Conductivity of water of the Hatirjeel lake was found to vary from 550 to 740 (micro mhos/cm) and the average value was 616.33 (micro mhos/cm). According to WHO guideline and BECR standard electrical conductivity value should not exceeded 1000  $\mu$ s/cm so the water 100% maintain the quality. The Total Dissolved Solid of water of the Hatirjheel lake was found in a range of 275 mg/l to 370 mg/l with a weighted average of 308.50 mg/l. Hence, the range was acceptable and concentration of TDS is not harmful. And Hardness varied from 153 to 171 mg/l as  $\text{CaCO}_3$  and a weighted average 163.00 mg/l. Hence WHO guideline and BECR standards the hardness value was low. This helps to assess the need to prevent water and pollution of Hatirjheel Lake.

## TABLE OF CONTENT

ABSTRACT.....	vi
LIST OF FIGURES .....	ix
LIST OF TABLES .....	x
CHAPTER 1 .....	1
INTRODUCTION .....	1
1.1 Background and Motivations .....	1
1.2 Research Objectives and Overview .....	2
1.3 Organization of the thesis .....	2
CHAPTER 2 .....	3
LITERATURE REVIEW .....	3
2.1 Introduction .....	3
2.2 Previous Work .....	3
2.3 Hatirjheel Lake .....	4
2.4 Determination of different parameter of Hatirjheel Lake water .....	4
2.4.1 Temperature .....	5
2.4.2 pH .....	5
2.4.3 Electrical Conductivity (EC) .....	6
2.4.4 Total Dissolved Solid (TDS) .....	7
2.4.5 Dissolved Oxygen (DO) .....	7
2.4.6 Biochemical oxygen demand (BOD).....	8
2.4.7 Chemical Oxygen Demand(COD).....	8
2.4.8 Hardness .....	9
CHAPTER 3 .....	10
METHODOLOGY .....	10
3.1 Study Area .....	10
3.2 Sample Collection Method .....	11
3.2.1 Sample collection area .....	11
3.2.2 Followed Procedure: .....	12
3.3 Method of Testing .....	13
3.3.1 Type of Test.....	13
3.4 Drinking Water Quality Standard:.....	14
CHAPTER 4 .....	15
RESULTS AND DISCUSSION .....	15
4.1 Graphical Comparison and discussion between WHO guideline, BECR Standard & Hatirjeel lake Water Samples .....	16
4.1.1 Temperature .....	16
4.1.2 pH: .....	17
4.1.3 Dissolved oxygen (DO): .....	18
4.1.4 Biological Oxygen Demand (BOD): .....	19
4.1.5 Chemical Oxygen Demand (COD):.....	20
4.1.6 Electrical Conductivity (EC): .....	21
4.1.7 Total dissolved solids (TDS): .....	22
4.1.8 Hardness: .....	23



CHAPTER 5 .....	24
CONCLUSIONS AND FUTURE WORKS .....	24
5.1 Conclusions .....	24
5.2 Recommendations of Future Works .....	25
REFERENCES .....	26
APPENDIX A .....	29
APPENDIX B .....	31

## LIST OF FIGURES

<b>Figure 2.1: Temperature scales (Wikipedia, 2021).</b> .....	5
<b>Figure 2.2: pH Scale</b> .....	5
<b>Figure 2.3: Electrical Conductivity Meter</b> .....	6
<b>Figure 2.4: TDS Standard Range</b> .....	7
<b>Figure 2.5: DO Standard Value Range (Textile Learner, 2015).</b> .....	7
<b>Figure 2.6: BOD Level (Wikipedia, 2022)</b> .....	8
<b>Figure 2.7: Hardness Scale (McGowan, 2000)</b> .....	9
<b>Figure 3.1: Hatirjheel Lake</b> .....	10
<b>Figure 3.2: Study Area Base Map Hatirjheel Lake, Dhaka</b> .....	12
<b>Figure 3.3: Industry area location map of Hatirjheel Lake, Dhaka</b> .....	13
<b>Figure 3.4: Sample Collection Point 01</b> .....	11
<b>Figure 3.5: Sample Collection Point 02</b> .....	11
<b>Figure 3.6: Sample Collection Point 03</b> .....	12
<b>Figure 4.1: Compare the temperature with BECR standard and WHO guideline</b> .....	16
<b>Figure 4.2: Compare the pH with BECR standard and WHO guideline</b> .....	17
<b>Figure 4.3: Compare the DO with BECR standard and WHO guideline</b> .....	18
<b>Figure 4.4: Compare the BOD with BECR standard and WHO guideline</b> .....	19
<b>Figure 4.5: Compare the COD with BECR standard and WHO guideline</b> .....	20
<b>Figure 4.6: Compare the EC with BECR standard and WHO guideline</b> .....	21
<b>Figure 4.7: Compare the TDS with BECR standard and WHO guideline</b> .....	22
<b>Figure 4.8: Compare the Hardness with BECR standard and WHO guideline</b> .....	23

## LIST OF TABLES

<b>Table 3.1: GPS location of sampling points</b> .....	11
<b>Table 3.2: Laboratory test parameters</b> .....	13
<b>Table 4.1: Data summary of water quality variables</b> .....	15

# CHAPTER 1

## INTRODUCTION

---

### 1.1 Background and Motivations

Environmental pollutants have dramatic effects on the quality of water (e.g. rivers, lakes). Numerous biological, physical, and chemical factors are contributing to the deterioration of water quality, making it exceedingly hazardous. Freshwater conservation has become a global problem; so, surface water is an essential resource for treatment as drinking water. Whereas Bangladesh has sufficient freshwater reserves, only a few of its lakes and streams preserve proper quality of the water and biodiversity due to overcrowding, ignorance, and a lack of law enforcement. Globally, water quality and availability are decreasing. Nearly 75% of the world's indigenous populace and 20% of its urban populace lack convenient access to drinking freshwater (Miah, Majumder and Latifa, 2017).

In addition to surface and groundwater, Bangladesh relies on a variety of water sources including rivers, lakes, reservoirs, canals and ponds. Bangladesh's ecology, economic growth, and development are all likely to rely on water and its local and seasonal availability, as well as the standard of surface and groundwater. Numerous biological, physical, and chemical volatiles are to blame for the current decline in water quality. There is clear and convincing evidence, however, that the status of its availability and the current patterns of water use and demand are not evaluated and cannot be sustained in the Asian region. As Dhaka developed into a megacity, we acknowledged nature of green spaces, natural wetlands, lakes, and open spaces. Dhaka's surface water area is approximately 10-15% of the overall land area. Lakes and waterways are one of the most potential water resources for meeting the increasing demand for water in Dhaka before and after the dry season. (Haq, 2021) & (Rahman & Quayyum, 2008)

Haitirjheel is a well-known lake in the greater Dhaka area. The Reservoir accounts for roughly 302 acres in the Tejgaon, Moghbazar, and Rampura regions and vital in managing the region's major drainage system. Waste water among several neighbor nodes is transferred into the Hatirjheel lake and blends with the rain water, making it extremely difficult to conserve clean water. These lakes' water is exploited by throwing solid wastes, discharging waste water, and sewages, to the point where this water cannot meet nearly any emergency water requirement.

Wastewater from different adjoining areas is discharged into Hatirjheel's canals and mixes with rainwater, making it difficult to keep the water clean. In the study, water quality parameters were studied from Hatirjheel lakes and compared with relevant standard levels to know the current status of water quality of the lakes and have discussed about causes of pollution of lakes water.

## 1.2 Research Objectives and Overview

The main objectives are to:-

- Find out the present water quality of different location in Hatirjheel lake of selected water quality parameters
- Compare the result with the guideline of World Health Organization-(WHO) & standard of Bangladesh Environmental Conservation Rule 1997 (BECR).
- Identify sources discharging pollution in Hatirjheel lake.

## 1.3 Organization of the thesis

This thesis comprises of five chapters. The contents of each chapter are summarized below:

**Chapter 1:** This introduction chapter discusses the study's context and aims. Additionally, it provides a concise explanation of the methods used in this study.

**Chapter 2:** The Hatirjheel lake is the subject of a literature review in this chapter. This chapter also contains information on lake and river water quality management.

**Chapter 3:** Briefly, this chapter explains the process. Procedure for conducting a sample test, as well as the place where samples are collected

**Chapter 4:** The water quality of Hatirjheel is forecasted in this chapter after the project is completed. In addition to presenting the data in a graphical format, this chapter compares the WHO and BECR standard values for Hatirjheel's water quality.

**Chapter 5:** The findings of this investigation are summarized in this concluding chapter. The Hatirjheel project is also recommended for further research in this document.

## CHAPTER 2

# LITERATURE REVIEW

---

### 2.1 Introduction

One of the most essential elements of nature is water that acts as a sole medium of aquaculture, irrigation and much more. Nevertheless, the foremost utility of water is drinking upon which all of the living creatures depend. Research shows that there are numerous sources of both surface and groundwater in Bangladesh that can provide for the large population of this country. The matter of greater importance is whether this whole population is getting the safe water quality for drinking and livelihood purposes as well because it is very obvious that lack of safe drinking water can be threatening to various diseases, even death (Sarkar Faroque, 2021). Studies demonstrate that the water quality of city areas is much better than the urban areas (J. Levy, 2017). Insufficient source of safe drinking water supply system in urban areas has now become a paramount issue in the socio-economic context of Bangladesh (Md. Arman Arefin, 2017). There are certain chemical contaminants mixed in drinking water which can cause immediate and also rapid health consequences that put public health at high risk (Md. Khalid Hasan, 2019). Drinking water contamination is basically the result of a number of reasons such as geological conditions, industrial exploitation, agricultural and other man-made activities. People from these urban poor areas highly depend on unregulated activities and mostly on agriculture (Sarkar, 2019).

### 2.2 Previous Work

Research has been done on Hatirjhil situated in Tejgao to analyze the water quality of the surface source using NSF-WQI method. Total suspended solids, total dissolved solids, pH, dissolved oxygen, biological oxygen demand, ammonia, nitrates, nitrites, total phosphates, fecal coliform, chemical oxygen demand, and temperature (P. Dandge & S. Patil, 2021) were all assessed throughout the study period (Dewata, 2019). Another research has been done on analyzing the quality of surface water resource using WQI method in. The analysis has been done on physico-chemical parameters of water such as pH, alkalinity, electrical conductivity, fluoride, chloride, nitrate, sulphate, potassium, total hardness, E. Coli, turbidity, total dissolved solids, dissolved oxygen and biochemical oxygen demand (K. P. Dandge, 2021). There has been research done on the water quality of areas in Bangladesh as well. A research has focused

on the current status of the water quality of the lake by analyzing water quality parameters such that pH, turbidity, total dissolved solids (TDS), temperature change, total phosphate, total nitrates, dissolve oxygen (DO), biological oxygen demand for 5 days (BOD) and fecal coliform and the results showed that the water quality of the site was medium (Shahriar, 2021). Also, in 2016, another research was done on the Old Brahmaputra River, Mymensingh district on the water quality using WQI method while three different locations were selected within the study area and the research clearly showed that the water in that area is not suitable for public water supply (Z Muyen, 2016). There has been no specific analysis done on the water quality of urban poor community of, Bangladesh. This is the main reason behind choosing the urban poor community of as our study area.

### **2.3 Hatirjheel Lake**

Hatirjheel Lake is a vital part of the city's drainage system and is situated in the heart of Dhaka. Hatirjheel Lake is situated at 23°48' N & 90°25' E of Dhaka city, with a length of 4.1 kilometers and a surface area of 0.79 square kilometers. It's 2.6 m deep on average. The lake's widest point is 0.46 kilometers. Gulshan-Banani is on the northern side, Banglamotor is on the southern side, Rampura is on the eastern side, and Tejgaon is on the western side. (Tariquzzaman et al. 2016)

### **2.4 Determination of different parameter of Hatirjheel Lake water**

The Temperature, pH, Electrical Conductivity (EC), Total Dissolved Solid (TDS), Dissolved Oxygen (DO), Hardness, BOD, and COD of the sample were measured between 30<sup>th</sup> September 2021 and 7<sup>th</sup> February 2022.

### 2.4.1 Temperature

Temperature is a physical quantity that expresses hot and cold or a measure of the average kinetic energy of the atoms or molecules in the system. It is the manifestation of thermal energy, present in all matter, which is the source of the occurrence of heat, a flow of energy, when a body is in contact with another that is colder or hotter. (Wikipedia, 2021).

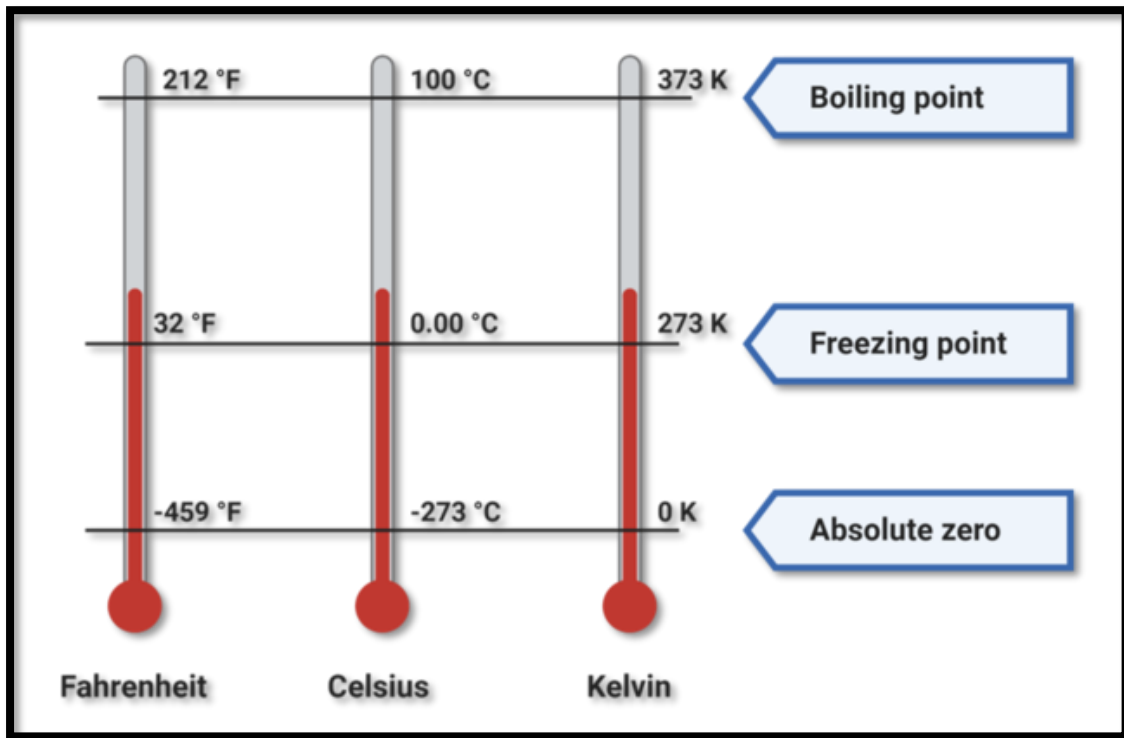


Figure 2.1: Temperature scales (Wikipedia, 2021).

### 2.4.2 pH

In an aqueous solution, pH is a measurement of acidity or alkalinity. The negative logarithm to base 10 of hydrogen ion concentration is pH. It is measured on a scale of 1 to 14, with 7 being neutral, <7 being acidic, and >7 being basic.

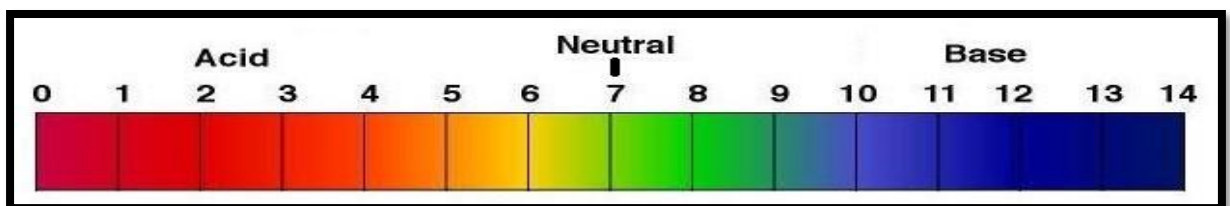


Figure 2.2: pH Scale



### 2.4.3 Electrical Conductivity (EC)

The capacity of water to conduct electric current is measured by its E.C. The concentration of ions in water causes this. It is measured in microsiemens per cm (S/cm or  $\mu\text{S}/\text{cm}$ ) or millisiemens per cm (mS/cm).



Figure 2.3: Electrical Conductivity Meter

#### 2.4.4 Total Dissolved Solid (TDS)

Total dissolved solids (TDS) refers to organic and inorganic dissolved substances present in water, such as metals, minerals, and salts. It also suggests salinity. It's measured in milligrams per liter (mg/L) or parts per million (ppm).

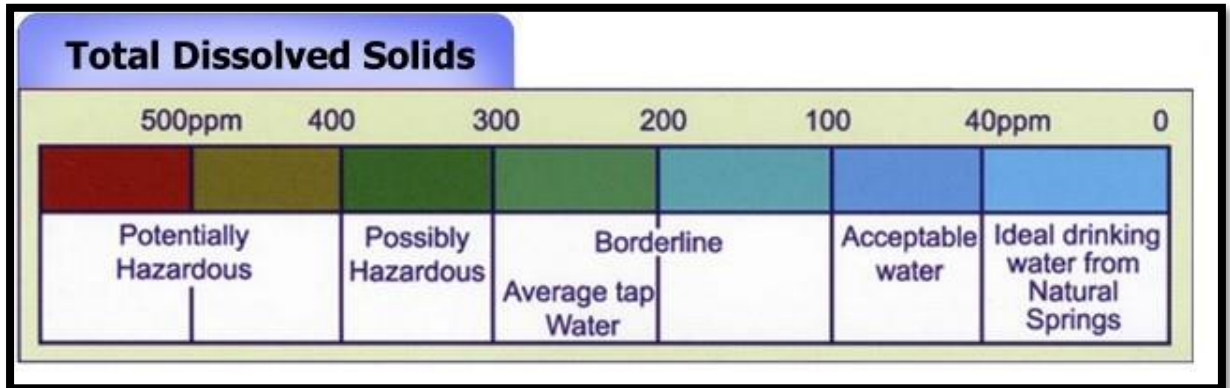


Figure 2.4: TDS Standard Range

#### 2.4.5 Dissolved Oxygen (DO)

The quantity of gaseous oxygen dissolved in water that enters the water by diffusion is measured by dissolved oxygen. It is necessary to assess the existence and circumstances of aquatic life. It is measured in milligrams per liter (mg/L) or parts per million (ppm) (ppm) (Textile Learner, 2015).

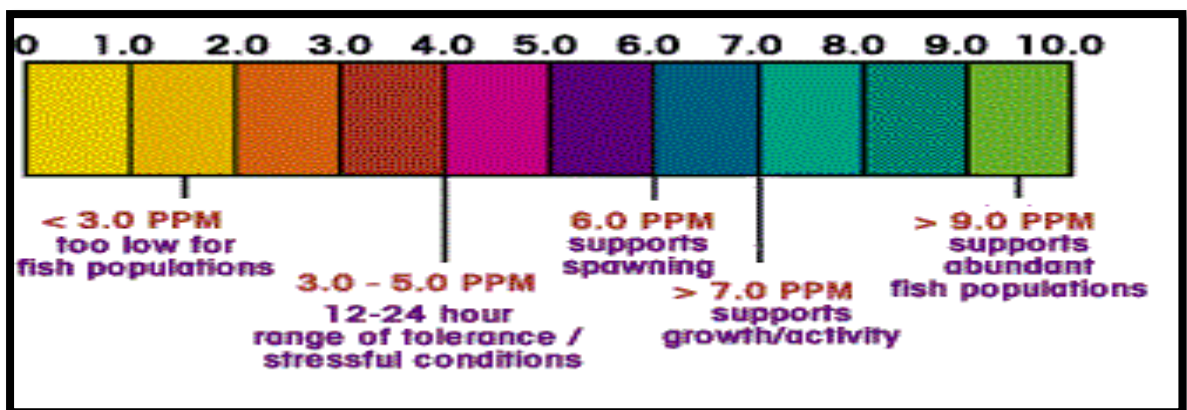


Figure 2.5: DO Standard Value Range (Textile Learner, 2015)

#### 2.4.6 Biochemical oxygen demand (BOD)

The quantity of dissolved oxygen (DO) required (i.e. requested) by aerobic biological organisms to break down organic material present in a given water sample at a particular temperature during a certain time period is known as biochemical oxygen demand (BOD). The BOD value is usually given in milligrams of oxygen used per litre of sample after 5 days at 20°C incubation (Wikipedia, 2022).

BOD Level in mg/liter	Water Quality
1 - 2	<b>Very Good:</b> There will not be much organic matter present in the water supply.
3 - 5	<b>Fair:</b> Moderately Clean
6 - 9	<b>Poor:</b> Somewhat Polluted - Usually indicates that organic matter present and microorganisms are decomposing that waste.
100 or more	<b>Very Poor:</b> Very Polluted - Contains organic matter.

Figure 2.6: BOD Level (Wikipedia, 2022)

#### 2.4.7 Chemical Oxygen Demand(COD)

The quantity of dissolved oxygen required to oxidize chemical organic compounds such as petroleum is known as chemical oxygen demand (COD). COD is a metric for determining the short-term influence of wastewater effluents on oxygen levels in receiving waterways.

## 2.4.8 Hardness

The most common unit of measurement for hardness is milligrams of calcium carbonate equivalent per litre. Calcium carbonate concentrations of less than 60 mg/l are considered soft; 60–120 mg/l are moderately hard; 120–180 mg/l are hard; and more than 180 mg/l are extremely hard. (McGowan, 2000).

<b>Water Hardness Scale</b>		
Grains/Gallon	mg/L & ppm	Classification
Less than 1	Less than 17.1	Soft
1 to 3.5	17.1 to 60	Slightly hard
3.5 to 7.0	60 to 120	Moderately hard
7.0 to 10.5	120 to 180	Hard
10.5 and over	180 and over	Like a stone
Note - one grain per gallon = 17.1 parts per million (ppm)		

Figure 2.7: Hardness Scale (McGowan, 2000)

## CHAPTER 3

# METHODOLOGY

---

Water samples were taken from several locations around Hatirjheel, and chosen imported parameters were examined in the lab. Then, in Hatirjheel Lake, we selected 07 parameters in three separate locations.

### 3.1 Study Area

Hatirjheel Lake is situated between 23°44' N and 90°23' W of Dhaka city, with a length of 4.1 kilometers and a surface area of 0.79 square kilometers (collected from google earth). Tejgaon, Gulshan, Badda, Rampura, Niketon, Maghbazar, and other neighborhoods surround the area (Mokaddes et al., 2013). It is 2.6 meters deep on average. The lake is 0.46 kilometers across at its widest point. The northern side is Gulshan-Banani, the southern side is Banglamotor, the eastern side is Rampura, and the western side is Tejgaon industrial area (Tariquzzaman et al., 2016).



**Figure 3.1: Hatirjheel Lake**

## 3.2 Sample Collection Method

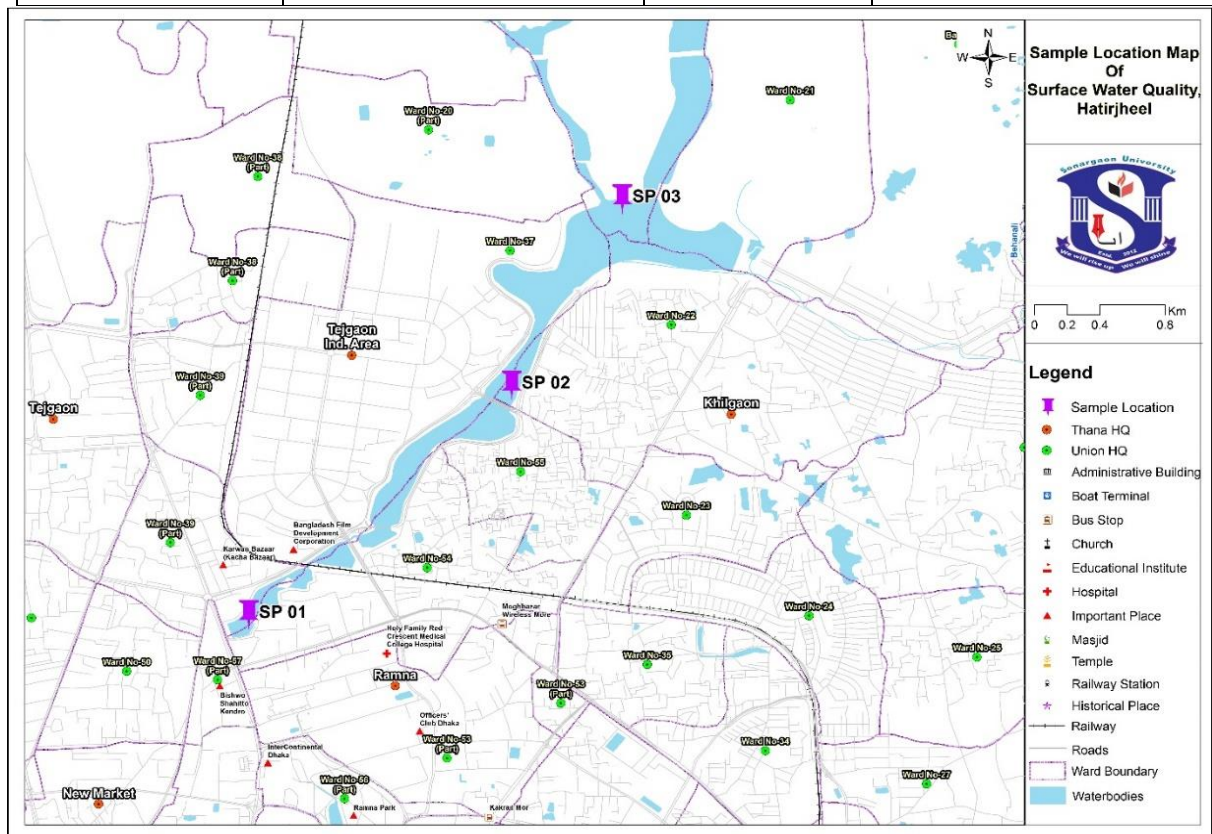
Water samples were collected from three different points of Hatirjheel lake during 30<sup>th</sup> September 2021 and 7<sup>th</sup> February 2022. The first samples were collected on September 2021 and the second sample was collected on February 2022. To determine the suitable locations of the water collection entire lake areas have been visited. Water samples have been collected such that the samples represent the characteristics of whole lake.

### 3.2.1 Sample collection area

The study area point is located at Hatirjheel Lake, Dhaka. GPS location of sampling points are:

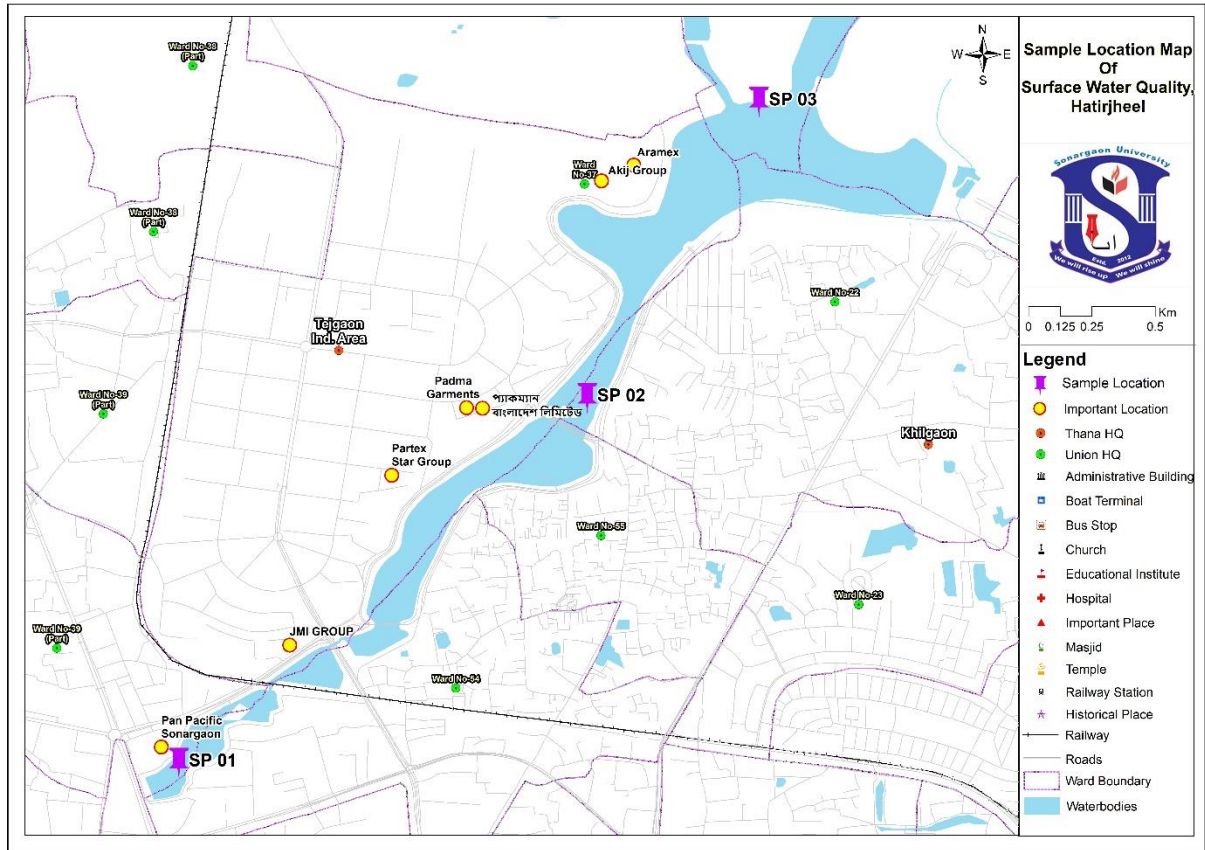
**Table 3.1: GPS location of sampling points**

LOCATION & SAMPLE DETAILS			
LOCATION ID	LOCATION NAME	SAMPLE ID	COORDINATE
Location 01	Sonargaon Hotel	SP 01	23.748700, 90.395796
Location 02	Madhubagh	SP 02	23.761804, 90.410630
Location 03	Police Plaza	SP 03	23.772332, 90.416110





**Figure 3.2: Study Area Base Map Hatirjheel Lake, Dhaka**



**Figure 3.3: Industry area location map of Hatirjheel Lake, Dhaka**



The sample location point are:

- (i) Sonargaon Hotel point 01

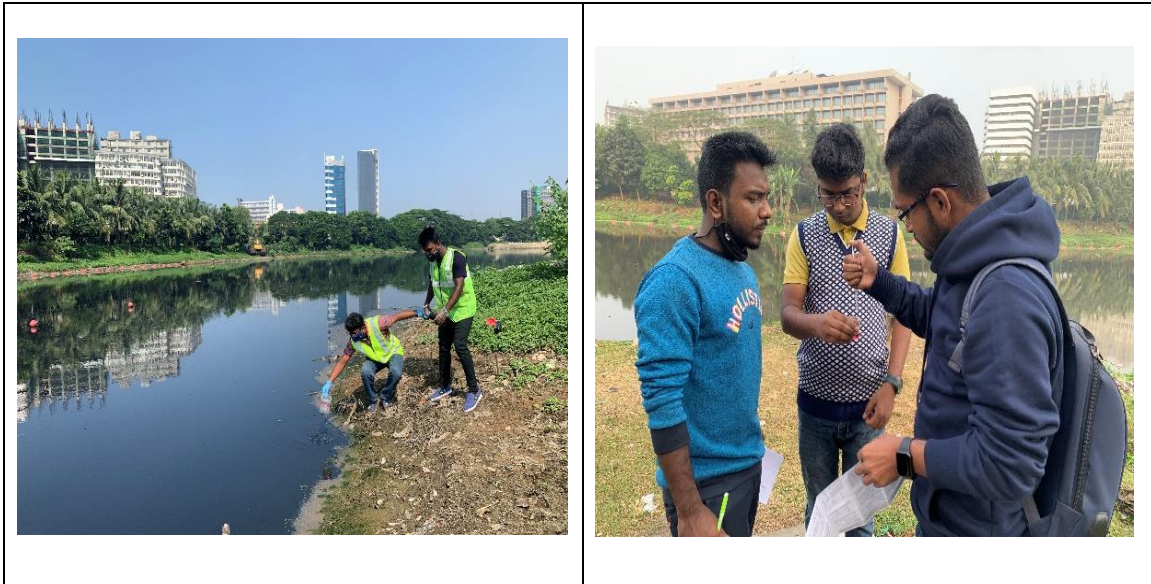


Figure 3.4: Sample Collection Point 01

- (ii) Madhu Bagh point 02

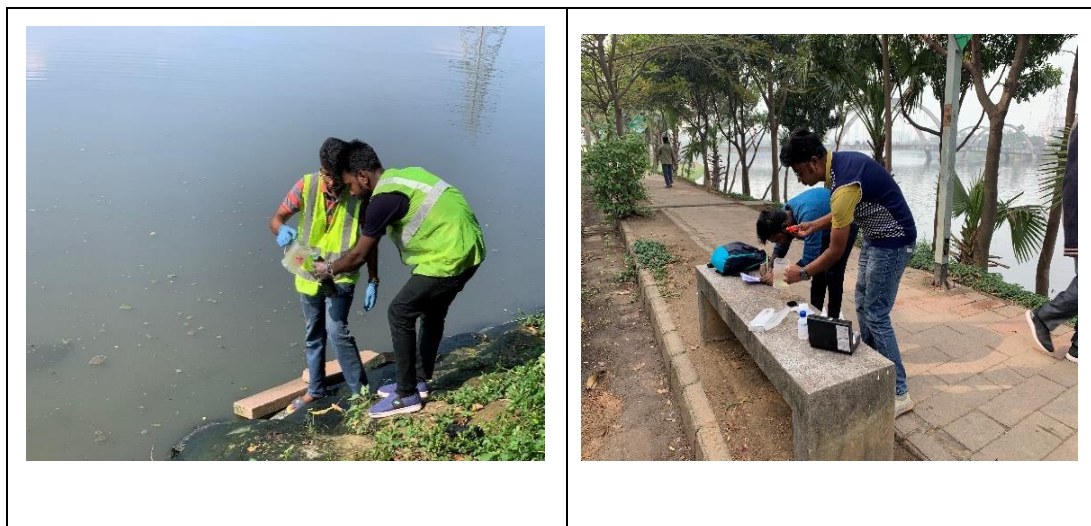


Figure 3.5: Sample Collection Point 02

(iii) Police Plaza point 03



**Figure 3.6: Sample Collection Point 03**

**3.2.2 Followed Procedure:**

Total Three Plastic bottles having a volume of 500 ml each and marked with sampling point name were used for collection of water samples. Samples were collected from 2m away from edge of the lake & 0.5m meter depth from surface. Before collection of water samples bottles were cleaned and washed with detergent solution. Then the sampling bottles rinsed with deionized water and dried. After sampling, bottles were screwed carefully and marked with the respective identification number. Necessary information for each sample such as date of collection, location, time of collection was recorded in note book. Simple random sampling was used for the primary data collection.

### 3.3 Method of Testing

Some parameter was tested on field and several parameter was tested by DPHE central lab.

#### 3.3.1 Type of Test

**A. Field Test:** pH, Temperature, EC, TDS, DO, Hardness was tested on field.

##### Field test method:

- (i) 1st water sample should be collected from a depth of 0.5meter every time. Measure some physicochemical parameters (Temperature, pH, Conductivity, Dissolved Oxygen, TDS) at the field and record properly.
- (ii) Total 03 surface water samples were collected aseptically in pre-sterilized screw caped bottles.
- (iii) pH were determined by the thermometer and digital pH meter (Hanna)
- (iv) The electrical conductivity (EC) and total dissolved solid (TDS) was measured by digital EC meter (model-HM digital, Germany) and digital TDS meter, respectively.
- (v) Dissolved oxygen was determined by digital DO meter.

**B. Lab Test:** Laboratory test including the name of the parameter, the total number of samples was 15, type of sample, and name of the lab are as below:

**Table 3.2: Laboratory test parameters**

Sample Id	Parameter	Total Sample	Name of the Lab
Sample 01, 02, 03	Biological Oxygen Demand (BOD)	5*3=15	DPHE Central Lab, Mohakhali
	Chemical Oxygen Demand (COD)		
	Dissolved Oxygen (DO)		
	EC		
	Total Dissolved solid (TDS)		

### **3.4 Drinking Water Quality Standard:**

Bangladesh Drinking Water Quality standards [ENVIRONMENT CONSERVATION RULES 1997, Published: 28th August 1997, Government of the People's Republic of Bangladesh; Ministry of Environment] are shown in Annexure Section.

## CHAPTER 4

### RESULTS AND DISCUSSION

Total 07 different quality parameters of Hatirjheel Lake water were measured at different point. In Table 02, Sample points 1, 2 and 3 of Hatirjheel Lake represent respectively. The first sample was collected September 2021 and the second samples was collected February 2022. We selected three different location point in Hatirjheel lake.

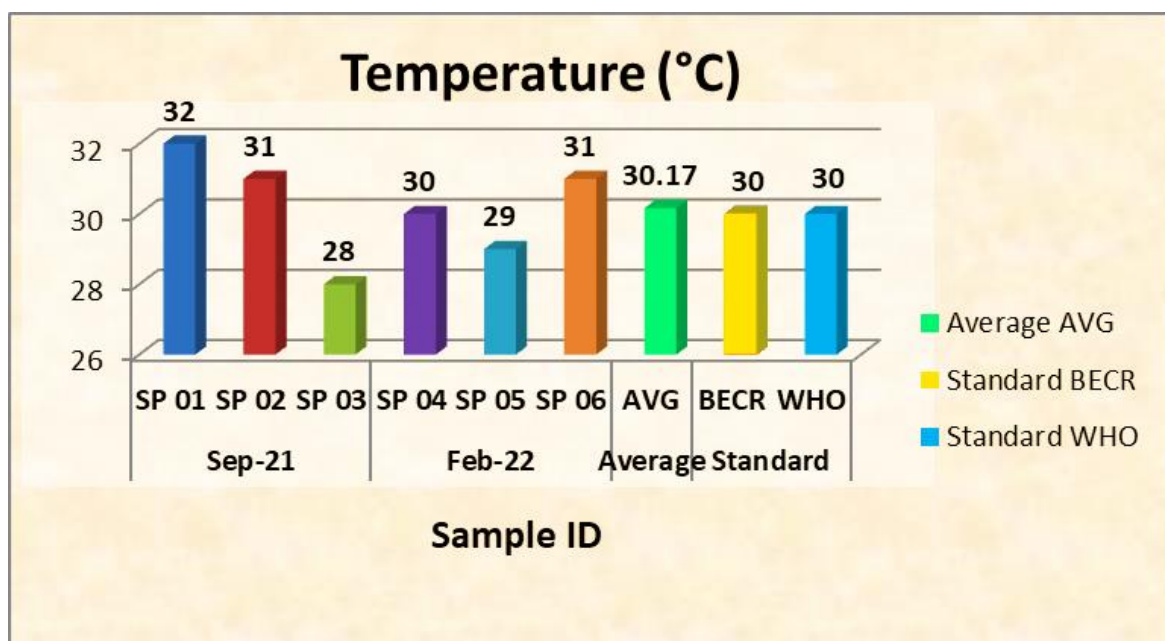
**Table 4.1: Data summary of water quality variables**

Parameters	Unit	Sep-21			Feb-22			Average
		SP 01	SP 02	SP 03	SP 01	SP 02	SP 03	
Temperature	(°C)	32	31	28	30	29	31	30.17
PH		7.5	8	7.8	8	7.7	7.5	7.75
Dissolved oxygen (DO)	(mg/l)	4.75	3.25	6.05	3.48	4.1	2.72	4.06
BOD	(mg/l)	18	30	25	20	15	32	23.33
COD	(mg/l)	72	116	88	76	60	120	88.67
EC	(µs/cm)	620	570	550	740	573	645	616.33
Total dissolved solids (TDS)	(mg/l)	310	285	275	370	286	325	308.50
Hardness	(mg/l)	165	171	153	165	171	153	163.00

## 4.1 Graphical Comparison and discussion between WHO guideline, BECR Standard & Hatirjeel lake Water Samples

### 4.1.1 Temperature

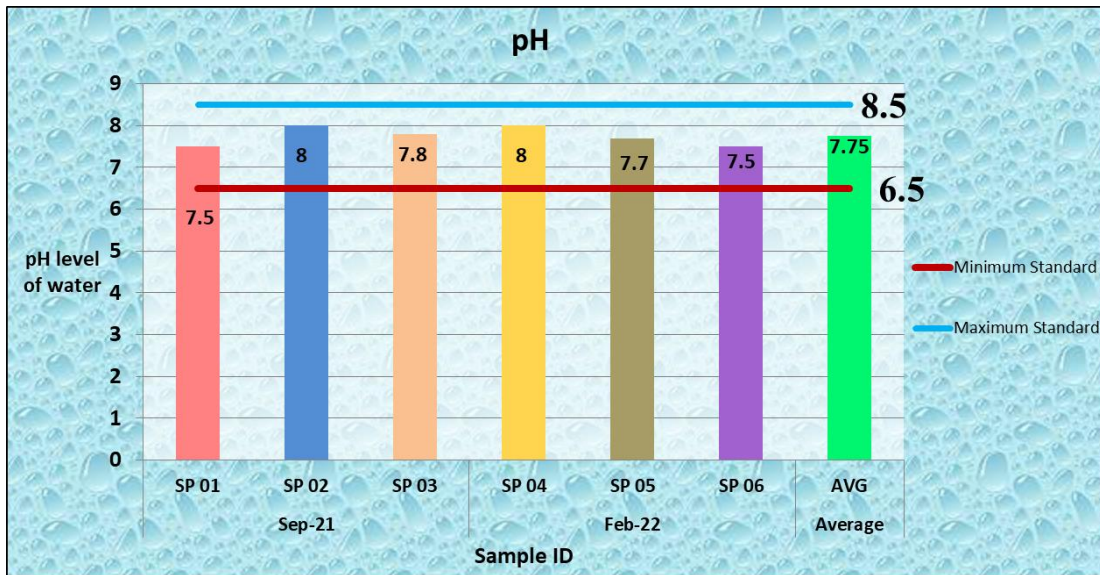
Temperature is an important physical parameter for determining the quality of water. The different value of temperature levels taken in the month of 30<sup>th</sup> September 2021 and 7<sup>th</sup> February 2022.



**Figure 4.1: Compare the temperature with BECR standard and WHO guideline**

The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjeel area. Some sample of temperature here just above the standard and the proportion of temperature is higher in sample 1 which is 32 highest in the peak and sample 2 and 6 similarly 31. The average value of temperature is 30.17, which is above the WHO and BECR standards anywhere is similarly 30, to prove that temperature of this area is vary point to point and some below the standards and some are above the standards

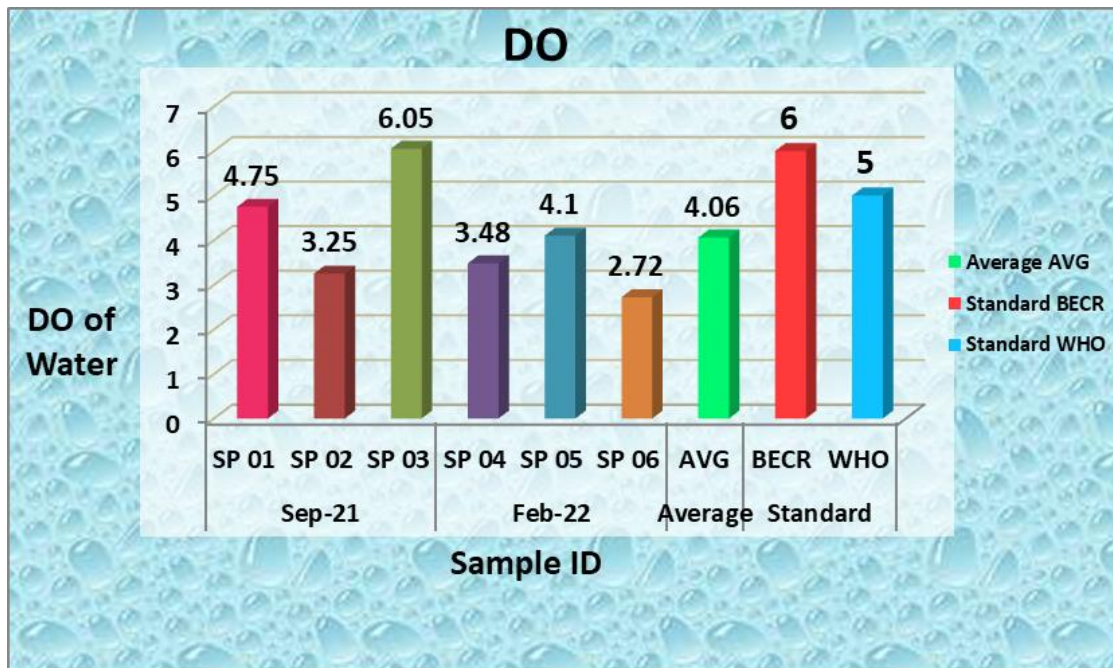
#### 4.1.2 pH:



**Figure 4.2: Compare the pH with BECR standard and WHO guideline**

The bar chart shows that various samples value of pH level was taken. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. None of the sample touched the maximum standard and the proportion of pH is higher in sample 2 and 4 similarly 8. This is because of high algae production used up the dissolved  $\text{CO}_2$ , which causes the  $\text{CO}_3^{2-}$  to react with  $\text{Ca}^{2+}$  and  $\text{Mg}^{2+}$ , forming bases and increasing the pH. The pH also indicates that the sample only contains  $\text{HCO}_3^-$  ions. The average value of pH is 7.75 and WHO guideline and BECR standard range 6.5-8.5, which is sufficient to prove that pH of this area is acceptable.

### 4.1.3 Dissolved oxygen (DO):

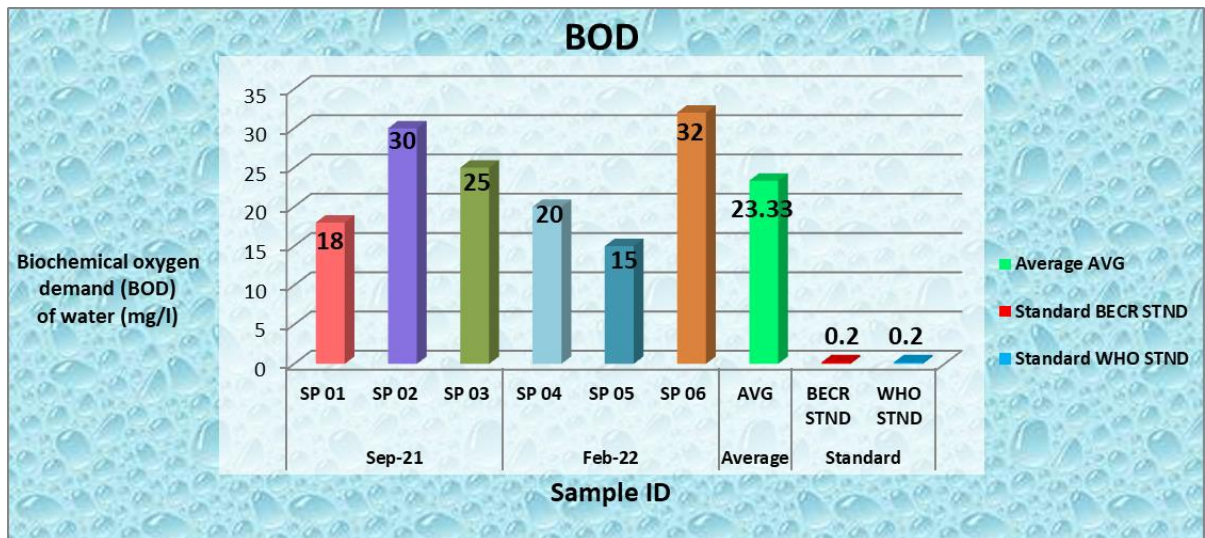


**Figure 4.3: Compare the DO with BECR standard and WHO guideline**

Dissolved oxygen (DO) is an important drinking water quality parameter. The bar chart shows that various samples value of Dissolved oxygen level in the month of September 2021 and February 2022. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. Only one of the sample is above the standard which is 6.05, and the proportion of DO is lowest in sample 6 which is taken in February 2022. The average value of DO is 4.06. According to WHO guideline and BECR standards DO concentration should not below 5 mg/l and 6 mg/l respectively. Since the study value not exceeded the minimum requirement so the water was not good for drinking.



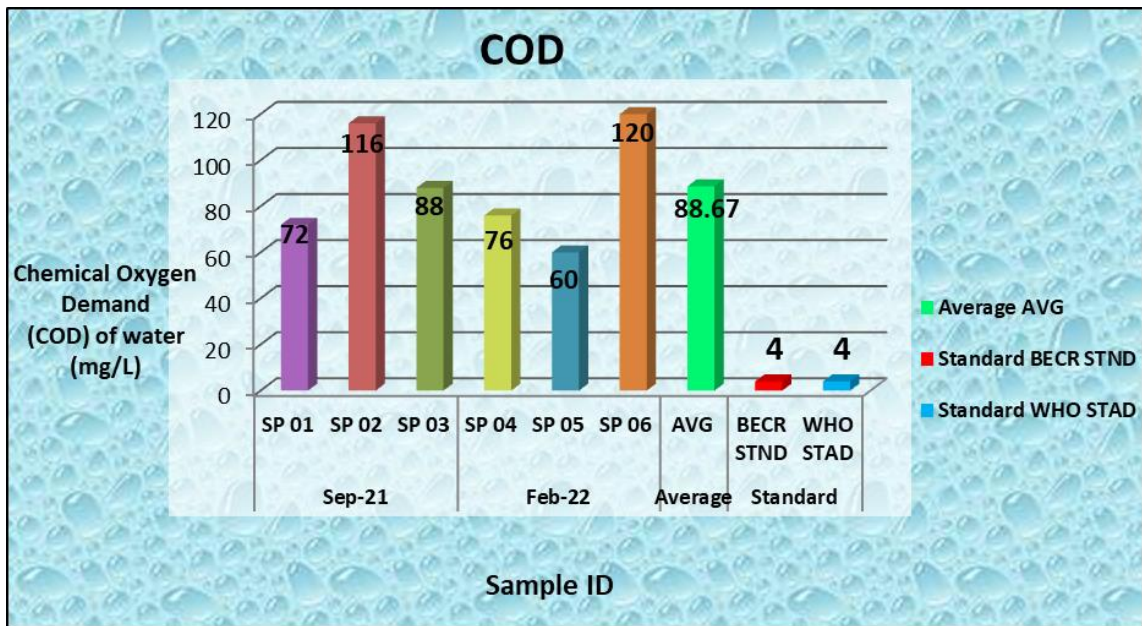
#### 4.1.4 Biological Oxygen Demand (BOD):



**Figure 4.4: Compare the BOD with BECR standard and WHO guideline**

The bar chart demonstrates that the different value of Biochemical oxygen levels in the month of September 2021 and February 2022. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. Dramatically every samples of BOD here touched the standard and the proportion of BOD is maximum in sample 2 and 6 nearly 30 and 32. The average value of BOD is 23.33, which is so far from the BECR standard and WHO guideline everywhere is 0.2 so it's enough to prove that BOD of this area is intolerable.

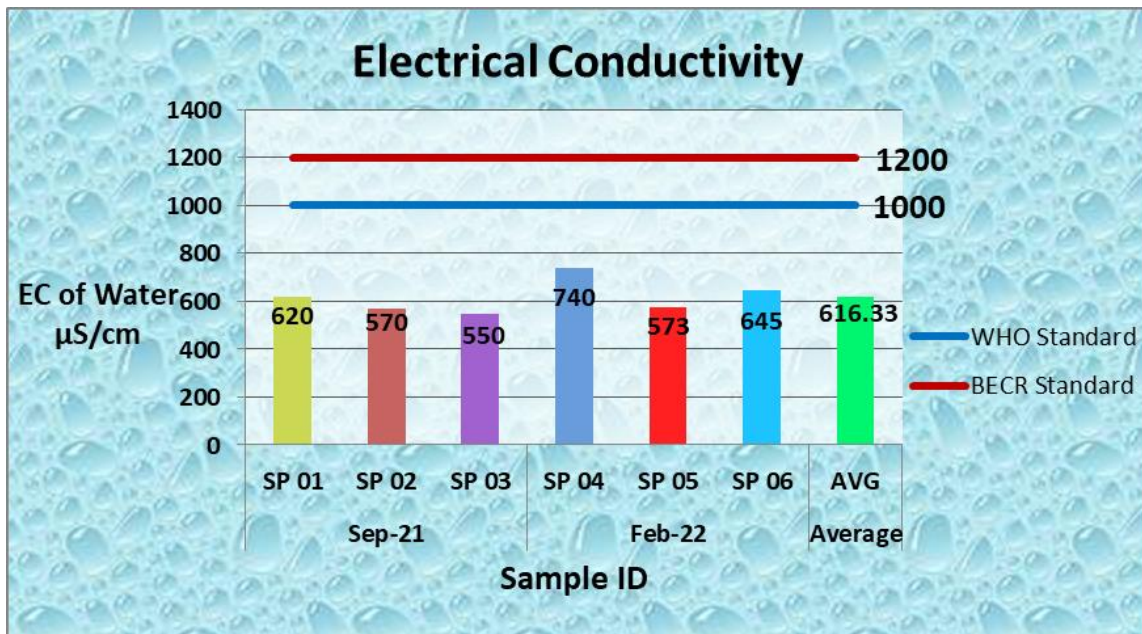
#### 4.1.5 Chemical Oxygen Demand (COD):



**Figure 4.5: Compare the COD with BECR standard and WHO guideline**

The bar chart illustrates the several samples value of Chemical oxygen demands levels. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. The maximum value found on last sample of in the month of February which is sample 6 and the value is 120. The average value of COD is 88.67, which is so far from the BECR standard and WHO guideline whereabouts similarly 4, to prove that COD of this area is totally imperfect.

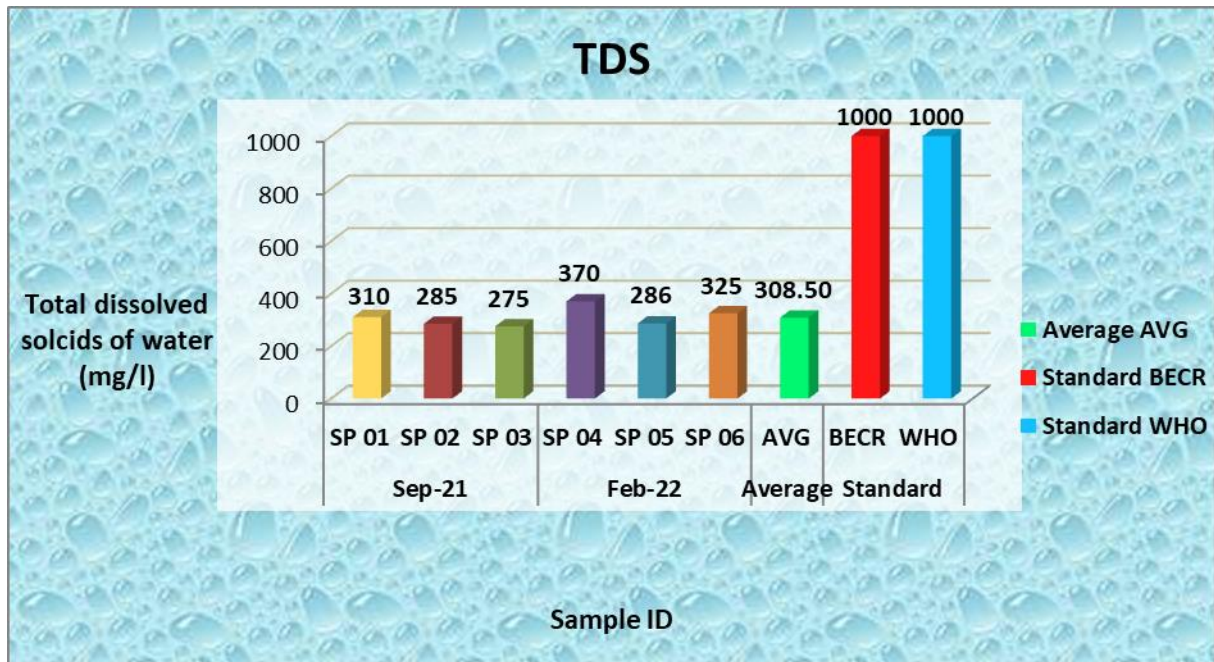
#### 4.1.6 Electrical Conductivity (EC):



**Figure 4.6: Compare the EC with BECR standard and WHO guideline**

Pure water is an excellent insulator rather than a strong conductor of electric current. The electrical conductivity of water improves as ions concentration rises. The bar chart given information that the various value of Electrical Conductivity level in the month of September 2021 and February 2022. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. All of the 6 sample below the standard and the proportion of EC is higher in sample 4 and 6 nearly 740 and 645 which is taken on in the month of February 2022. The average value of EC is 616.33, According to WHO guideline and BECR standard electrical conductivity value should not exceeded 1000  $\mu\text{S}/\text{cm}$  so the water was good for drinking purpose on the basis of electrical conductivity.

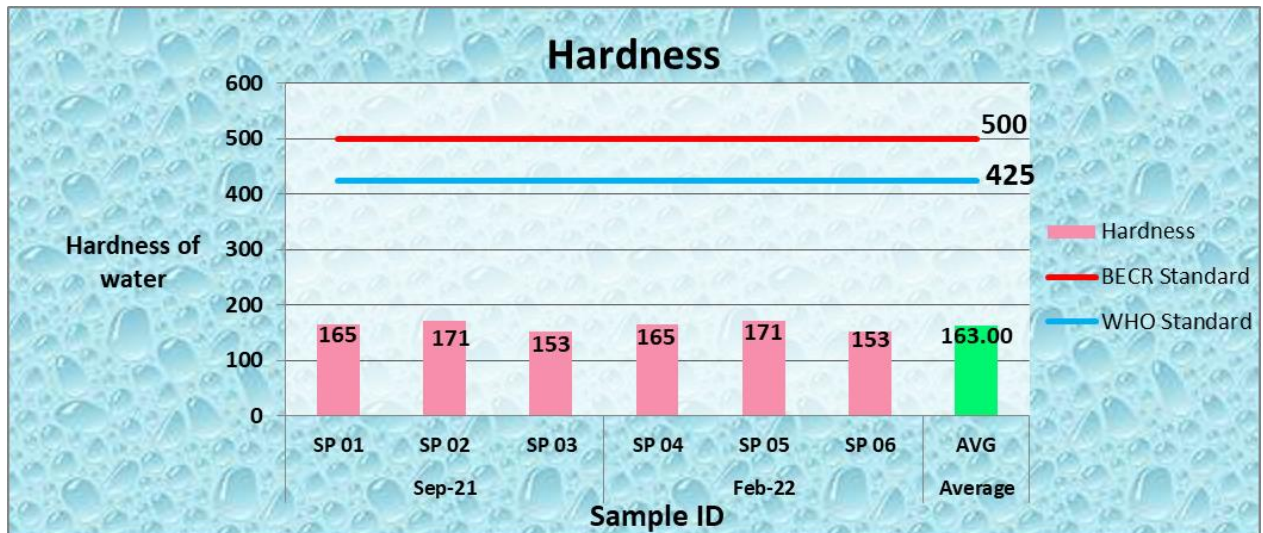
#### 4.1.7 Total dissolved solids (TDS):



**Figure 4.7: Compare the TDS with BECR standard and WHO guideline**

Potassium, calcium, sodium, bicarbonates, chlorides, magnesium, sulfates, and other inorganic and organic minerals or salts may all be dissolved in water. These minerals gave the water an unpleasant flavor and a diluted tint (Meride and Ayenew, 2016). The figure bar chart demonstrates the different value of TDS oxygen levels taken in the month of September 2021 and February 2022. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. Every sample of TDS here bellowed the standard and the proportion of TDS is higher in sample 4 which is taken in February 2022. The average value of TDS is 308.50, Hence, the range was acceptable and concentration of TDS is not harmful.

#### 4.1.8 Hardness:



**Figure 4.8: Compare the Hardness with BECR standard and WHO guideline**

The bar chart shows the different value of Hardness levels taken in the month of September 2021 and February 2022. The chart shows the value of six samples, taking sample from 3 individual locations of Hatirjheel area. The average value of Hardness is 163, According to WHO guideline and BECR standards anywhere is respectively 425 and 500 so the hardness value is very low.

## CHAPTER 5

### CONCLUSIONS AND FUTURE WORKS

---

#### 5.1 Conclusions

The physicochemical properties of surface water from six samples collected at various locations in the Hatirjheel lake region were characterized in this research. To measure the quality of surface water, each parameter was compared to the World Health Organization's (WHO) and Environment Conservation Rules' standard recommended levels (ECR, 1997).

In our assessment we found that water qualities parameters are in very fragile conditions and most of our samples are below the standards of WHO and BECR and in serious matter of issues for the lake ecology and biodiversity criteria. The pH of Hatirjheel Lake water varied from 8 to 7.5; pH remained slightly alkaline most of the time. The Lake water is characterized by very low Dissolved Oxygen (DO), mostly below 2.72 to 6.05 mg/l, relatively high BOD 15 to 30 mg/l. There is a trend of decreasing DO and increasing BOD. Among the parameters, COD concentration varies from 60 to 116. And its higher then standard value. EC varies from 550 to 740. TDS and Hardness varies from 275 to 370 and 153 to 171. We found that our BOD average data was 23.33 and COD average data was 88.67. So see here is a relations with this two parameters.  $COD/BOD: 88.67/23.33 = 3.80$ . The result shows that it is more than 3. So we can say that here is industrial waste water discharge. Industrial waste water discharging in the Hatirjheel Lake. Lake water utilization and deterioration of lake water quality is increasing fast in Dhaka city as a result of unplanned and unsustainable development and industrial pollution, resulting to major environmental degradation. Which result of Hatirjheel lake's water significant pollution. Inside Hatirjheel, the mixing of sewage pipes with rainwater is a major source of pollution. Wastewater from several nearby regions is released into Hatirjheel canal, where it combines with rainwater, making it difficult to keep the canal clean. When it rains, the solid waste that is mixed in washes into Lake Hatirjheel, contaminating the lake's water. Another major source of water pollution is residential trash that flows into the lake via the sewer system. The Hatirjheel lowlands are hydraulically connected to Gulshan Lake. If no action is taken, the polluted water of Gulshan Lake would become another source of pollution in Hatirjheel. We evaluated the water quality of Hatirjheel Lake and discovered that the water could be utilized provided a proper treatment plant was built and pollution sources around the water region were eliminated. Due to time constraints and discomfort, we are unable to assess

the entire surface water of the lakes. We agree on one point: if the government and the lake authority enact appropriate regulations, the water can be rescued from contamination and utilised in various ways. We also have some recommendations for restoring the quality of the lakes' aquatic environment, including preventing degradation by establishing individual zones for storm water, sanitary water, construction debris, and solid waste, halting unauthorized and illegal construction on the lake's edge, and increasing monitoring, maintenance, and, last but not least, public awareness.

Dredging of the existing Lake and regular removal of non-degradable materials from the Lakebed, demolition of unauthorized structures on the Lake bank, maintaining a regular monitoring system against land grabbers, providing Effluent Treatment Plants for each and every industrial unit to reduce pollutant load on the Lake, law enforcement and public awareness.

## **5.2 Recommendations of Future Works**

- An all-stakeholder lake management body can be established for lake conservation.
- Determining the boundary of Hatirjheel lake to save it from encroachment (Ali, 2007).
- Manage household discharge identification of pollution sources quantification and selection of treatment options.
- Manage solid waste in the area to reduce pollution load through surface runoff.
- Ensure free movement of Lake waters.
- Stop industrial wastewater discharge into the Lake.
- Identify new hazardous substances and implement pollution prevention and control strategies.
- Prevent and control harmful releases.
- Need to reuse surface water for sustainable development..
- Stop environmental threats before they become a real problem.
- Develop goals for water quality and ecosystem health.
- Raise awareness about the importance and fragility of freshwater resources.

## REFERENCES

1. Chowdhury, S. and Chowdhury, R. (2018). Water quality and EIA of simple Hatirjheel Lake Engineering and Technology (A High Impact Factor. International Journal of Innovative Research in Science, Vol. 7, Issue 7, July 2018  
[http://www.ijirset.com/upload/2018/july/90\\_22\\_Assessment.pdf](http://www.ijirset.com/upload/2018/july/90_22_Assessment.pdf)
2. Razzak, N.R.B. (2013). Evaluation of Water Quality of Ramna and Gulshan Lakes. International Journal of Environmental Monitoring and Analysis, 1(6), p.273.
3. Mohuya, F.A., Bhuiyan, R.H. and Hoque, S. (1970). Heavy metal contamination in Gulshan-Baridhara lake, Dhaka. Dhaka University Journal of Biological Sciences, 19(1), pp.53–61.
4. Wikipedia. (2022). Biochemical oxygen demand.  
<https://en.wikipedia.org/wiki?curid=420598>.
5. Miah, M.B., Majumder, A.K. and Latifa, G.A. (2017). Evaluation of microbial quality of the surface water of Hatirjheel in Dhaka City. Stamford Journal of Microbiology, 6(1), pp.30–33.
6. Anon, (n.d.). Environmental Study of the River Buriganga - Assignment Point.  
<https://www.assignmentpoint.com/arts/social-science/environmental-study-of-the-river-buriganga.html>.
7. Meride, Y. and Ayenew, B. (2016). Drinking water quality assessment and its effects on residents health in Wondo genet campus, Ethiopia. Environmental Systems Research, 5(1).
8. Ali, D.M.S. (2007). Gulshan Lake: An ecologically critical area. The Daily Star.  
<https://www.thedailystar.net/news-detail-7950>.
9. Tariquzzaman, S., Nishu, S., Saeed, T. and Reday, R. (2016). WATER QUALITY AND EIA OF SIMPLE HATIRJHEEL LAKE. [online] p.125.  
[http://www.iccesd.com/proc\\_2016/Papers/ICCESD-2016-401.pdf](http://www.iccesd.com/proc_2016/Papers/ICCESD-2016-401.pdf).
10. Textile Learner. (2015). Green Apparel Product Development: Research on Environmental Issues. [online] Available at: <https://textilelearner.net/practices-towards-green-apparel-product/>.
11. www.environmentportal.in. (n.d.). New Nation (Bangladesh) - India Environment Portal | News, reports, documents, blogs, data, analysis on environment & development | India, South Asia. [online] Available at: [http://www.environmentportal.in/category/10565/name\\_of\\_the\\_newspaper/new-nation-bangladesh/?page=66](http://www.environmentportal.in/category/10565/name_of_the_newspaper/new-nation-bangladesh/?page=66).
12. P. Dandge, K., & S. Patil, S. (2021). Drinking Water Quality Assessment Using WQI in Bhokardan Area of Jalna District, Maharashtra State. Applied Ecology and Environmental Sciences, 9(9), 800–805. <https://doi.org/10.12691/aees-9-9-3>
13. Dewata, I. (2019). Water Quality Assessment of Rivers in Padang Using Water Pollution Index and NSF-WQI Method. International Journal of GEOMATE, [online] Vol.17, pp.192–200. Available at: <http://repository.unp.ac.id/23589/>.
14. wordassociations.net. (n.d.). Associations to the word 'Ph' - Word Associations Network.  
<https://wordassociations.net/en/words-associated-with/Ph>.
15. Owens, P.R., Rutledge, E.M., Osier, S.C. and Gross, M.A. (2001). The relationship of soils containing liquefaction features and redoximorphic features to perched seasonal water tables in the Lower Mississippi River Valley. Quaternary International, 78(1), pp.45–51.
16. Tripathi, N. K., & Singh, P. (2000). Integrated GIS and Remote Sensing Approach to Map Pollution in Upper Lake, Bhopal, India. Geocarto International, 15(4), 51–58.  
<https://doi.org/10.1080/10106040008542172>
17. Rafiqueel, I., Jannat, A.F., Hasanuzzaman, Musrat, R., Laisa, A.L. and Dipak, K.P. (2016). Pollution assessment and heavy metal determination by AAS in waste water collected from Kushtia industrial zone in Bangladesh. African Journal of Environmental Science and Technology, 10(1), pp.9–17.
18. Saha, S., Habib, A.S., Rahman, M.A. and Saha, M. (2021). Assessment of Water Quality of a Transboundary River at Brahmanbaria. Bangladesh Journal of Zoology, 49(1), pp.137–146. Available at: <https://www.banglajol.info/index.php/BJZ/article/view/53689>.
19. Alam, Md.S. (n.d.). Assessment Of Water Quality Of Hatirjheel Lake In Dhaka City. ResearchGate, 2(6), pp.97–100.  
[https://www.researchgate.net/publication/313672562\\_Assessment\\_Of\\_Water\\_Quality\\_Of\\_Hatirjheel\\_Lake\\_In\\_Dhaka\\_City](https://www.researchgate.net/publication/313672562_Assessment_Of_Water_Quality_Of_Hatirjheel_Lake_In_Dhaka_City).



20. Scirp.org. (2018). ECR (1997) Ministry of Environment and Forest, Government of the People's Republic of Bangladesh. The Environment Conservation Rules, 205-207. - References - Scientific Research Publishing.  
<https://www.scirp.org/%28S%28lz5mqp453edsnp55rrgjt55%29%29/reference/referencespapers.aspx?referenceid=2383133>.
21. M, M. and M, K. (n.d.). Quali-ty Assessment of Water and Sediment of Gulshan Lake by Using Neutron Activation Analysis. 19(13).
22. old.dphe.gov.bd. (n.d.). Department of Public Health Engineering (DPHE).  
[http://old.dphe.gov.bd/index.php?option=com\\_content&view=article&id=125&Itemid=133](http://old.dphe.gov.bd/index.php?option=com_content&view=article&id=125&Itemid=133).
23. Ackerman, D.J. (1996). Hydrology of the Mississippi River valley alluvial aquifer, south-central United States. Professional Paper.  
<https://pubs.er.usgs.gov/publication/pp1416D>
24. Rahman, Md & Quayyum, Shahriar. (2008). Sustainable Water Supply In Dhaka City: Present And Future.,Conference: Conference of The Japan Science And Technology.,  
[https://www.researchgate.net/publication/279851202\\_Sustainable\\_Water\\_Supply\\_In\\_Dhaka\\_City\\_Present\\_And\\_Future](https://www.researchgate.net/publication/279851202_Sustainable_Water_Supply_In_Dhaka_City_Present_And_Future)

## **APPENDIX**

## APPENDIX A

### BANGLADESH DRINKING WATER QUALITY STANDARDS

#### ENVIRONMENT CONSERVATION RULES 1997

Published: 28th August 1997

Government of the Peoples' Republic of Bangladesh

Ministry of Environment



SL	Parameter	Unit	Standard
1	Aluminum	mg/L	0.2
2	Ammonia	„	0.5
3	Arsenic	„	0.05
4	Barium	„	0.01
5	Benzene	„	0.01
6	BODS 20 °C	„	0.2
7	Boron	„	1.0
8	Cadmium	„	0.005
9	Calcium	„	75
10	Chloride	„	150-600*
11	Chlorinated alkenes carbon	„	0.01
	1.1Dichloroethylene	„	0.001
	1.2Dichloroethylene	„	0.03
	Tetrachloroethylene	„	0.03
	Trichloroethylene	„	0.09
12	Chlorinated phenols	„	0.03
	2.4.6 Trichlorophenol	„	0.03
13	Chlorine(residual)	„	0.2
14	Chloroform	„	0.09
15	Chromium (Hexavalent)	„	0.05
16	Chromium (Total)	„	0.05
17	COD	„	4
18	Coliform (Fecal)	n/ 100ml	0
19	Coliform (total)	n/ 100ml	0
	* At sea beach 1000		
20	Color	Hazen Unit	15
21	Copper	mg/L	1.0
22	Cyanide	„	0.1
23	Detergent	„	0.2
24	D.O	„	6.0
25	Fluoride	„	1.0
26	Hardness (as CaCO <sub>3</sub> )	„	200- 500
27	Iron	mg/L	0.3-1.0
28	Kjeldahl nitrogen (Total)	„	1.0
29	Lead	„	0.05
30	Magnesium	„	30-35
31	Manganese	„	0.1

SL	Parameter	Unit	Standard
32	Mercury	"	001
33	Nickel	"	01
34	Nitrate	"	10
35	Nitrite	"	<1.0
36	Odor	"	Odorless
37	Oil and Grease	"	001
38	pH	"	6.5-8.5
39	Phenol compounds	"	002
40	Phosphate	"	6
41	Phosphorus	"	0
42	Potassium	"	12
43	Radioactive substances (Total- radiation)	Bq/l	001
44	Total B B-radiation		01
45	Selenium	mg/l	001
46	Silver	"	002
47	Sodium	"	200
48	S. S	"	10
49	Sulfide	"	0
50	Sulfate	"	400
51	Total dissolved solids	"	1000
52	Temperature	°C	20-30
53	Tin	mg/l	2
54	Turbidity	JTU/NTU	10
55	Zinc	mg/l	5

\*Chloride= 1000mg/l (for coastal Area)

# APPENDIX B

## LAB TEST RESULT SCAN COPY

	<p><b>Government of the People's Republic of Bangladesh</b>  <b>Office of the Chief Chemist</b>  <b>Department of Public Health Engineering</b>  <b>Central Lab, 38-39, Mohakhali C/A, Dhaka-1212</b>          Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc_central_lab@yahoo.com</p>	
---	---	---

Lab Memo: 347/ CC, DPHE, CL, Dhaka

Date: 10-11-2021

### Physical /Chemical/ Bacteriological Analysis of Water Sample

Sample ID: CEN2021110118	Sample Receiving date: 30-09-2021
Ref. Memo No: MSI/2021/NIII & Dated: 30-09-2021	Sample Source: Surface Water
Sent by: Md. Saiful Islam, Civil Department, Sonargaon University.	Dist: Dhaka, Upa:
Care Taker: Md. Saiful Islam (Sample ID :01)	Union:, Vill.: Hatirjheel
Sample Collection date: 30-09-2021	Date of Testing: 30-09-2021-08/10/2021

### LABORATORY TEST RESULTS:

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	18	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	72	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	4.70	mg/L	Multimeter	-
4	EC	-	620	μS/cm	Multimeter	-
5	Total Dissolved Solid (TDS)	1000	310	mg/L	Multimeter	-

Comments: Sample was collected & supplied by client.

N.B: CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

<p><b>Test Performed by:</b></p> <p>1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer <i>Signature</i> 10.10.2021</p> <p>2.) Name: Taslima Akhter Designation: Sample Analyzer <i>Signature</i> 10-10-21</p>	<p><b>Countersigned/Approved by:</b></p> <p>1.) Name: Mita Sarker Designation: Senior Chemist <i>Signature</i> 15/10/2021</p> <p>2.) Name: Md. Biplab Hossain Designation: Chief Chemist <i>Signature</i> 10/10/2021</p>
--	--

**Md. Biplab Hossain**  
 Chief Chemist  
 Department of Public Health Engineering  
 Central Laboratory Mohakhali, Dhaka



Government of the People's Republic of Bangladesh  
Office of the Chief Chemist  
Department of Public Health Engineering  
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212  
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc\_central\_lab@yahoo.com



Lab Memo: 347/ CC, DPHE, CL, Dhaka

Date: 10-11-2021

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2021110119	Sample Receiving date: 30-09-2021
Ref. Memo No: MSI/2021/Nilil & Dated: 30-09-2021	Sample Source: Surface Water
Sent by: Md. Saiful Islam, Civil Department, Sonargaon University.	Dist: Dhaka, Upa:
Care Taker: Md. Saiful Islam (Sample ID :02)	Union:, Vill.: Hatirjheel
Sample Collection date: 30-09-2021	Date of Testing: 30-09-2021-08/10/2021

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	30	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	116	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	3.25	mg/L	Multimeter	-
4	EC	-	570	µS/cm	Multimeter	-
5	Total Dissolved Solid (TDS)	1000	285	mg/L	Multimeter	-

Comments: Sample was collected & supplied by client.

N.B: CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 10-10-2021	1.) Name: Mita Sarker Designation: Senior Chemist	 10/10/2021
2.) Name: Taslima Akhter Designation: Sample Analyzer	 10-10-21	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 10/10/2021 <b>Md. Biplab Hossain</b> Chief Chemist

Department of Public Health Engineering  
Central Laboratory Mohakhali, Dhaka



Government of the People's Republic of Bangladesh  
Office of the Chief Chemist  
Department of Public Health Engineering  
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212  
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc\_central\_lab@yahoo.com



Lab Memo: 347/ CC, DPHE, CL, Dhaka

Date: 10-11-2021

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2021110120	Sample Receiving date: 30-09-2021
Ref. Memo No: MSI/2021/Nill & Dated: 30-09-2021	Sample Source: Surface Water
Sent by: Md. Saiful Islam, Civil Department, Sonargaon University.	Dist: Dhaka, Upa:
Care Taker: Md. Saiful Islam (Sample ID :03)	Union:, Vill.: Hatirjheel
Sample Collection date: 30-09-2021	Date of Testing: 30-09-2021-08/10/2021

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	20	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	88	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	6.05	mg/L	Multimeter	-
4	EC	-	550	μS/cm	Multimeter	-
5	Total Dissolved Solid (TDS)	1000	275	mg/L	Multimeter	-

Comments: Sample was collected & supplied by client.  
N.B: CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

<p><b>Test Performed by:</b></p> <p>1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer</p> <p>2.) Name: Taslima Akhter Designation: Sample Analyzer</p>	<p>Signature</p> <p><i>[Signature]</i> 10.10.2021</p> <p><i>[Signature]</i> 10-10-21</p>	<p><b>Countersigned/Approved by:</b></p> <p>1.) Name: Mita Sarker Designation: Senior Chemist</p> <p>2.) Name: Md. Biplab Hossain Designation: Chief Chemist</p>	<p>Signature</p> <p><i>[Signature]</i> 10/10/2021</p> <p><i>[Signature]</i> 10/10/2021</p> <p><b>Md. Biplab Hossain</b> Chief Chemist</p>
--	--	--	---

Department of Public Health Engineering  
Central Laboratory Mohakhali, Dhaka



Government of the People's Republic of Bangladesh  
Office of the Chief Chemist  
Department of Public Health Engineering  
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212  
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc\_central\_lab@yahoo.com



Lab Memo: 622/ CC, DPHE, CL, Dhaka

Date: 03-02-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022010313	Sample Receiving date: 07-02-2022
Ref. Memo No: SU/2022/Nilil & Dated: 07-02-2022	Sample Source: Surface Water
Sent by: Md. Saiful Islam, Student, Civil Department, Sonargaon University, Dhaka.	Dist: Dhaka, Upa:
Care Taker: Md. Saiful Islam (Sample ID :SW-01)	Union:, Vill.: Hatirjheel Lake
Sample Collection date: 07-02-2022	Date of Testing: 07-02-2022 -15/02/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	20	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	76	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	3.48	mg/L	Multimeter	-
4	EC	-	740	µS/cm	Multimeter	-
5	Total Dissolved Solid (TDS)	1000	370	mg/L	Multimeter	-

Comments: Sample was collected & supplied by client.  
N.B: CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.02.2022	1.) Name: Mita Sarker Designation: Senior Chemist	 20.02.2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.02.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.02.2022 <b>Md. Biplab Hossain</b> Chief Chemist

Department of Public Health Engineering  
Central Laboratory Mohakhali, Dhaka





Government of the People's Republic of Bangladesh  
Office of the Chief Chemist  
Department of Public Health Engineering  
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212  
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc\_central\_lab@yahoo.com



Lab Memo: 622/ CC, DPHE, CL, Dhaka

Date: 03-02-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022010314	Sample Receiving date: 07-02-2022
Ref. Memo No: SU/2022/Nill & Dated: 07-02-2022	Sample Source: Surface Water
Sent by: Md. Saiful Islam, Student, Civil Department, Sonargaon University, Dhaka.	Dist: Dhaka, Upa:
Care Taker: Md. Saiful Islam (Sample ID :SW-02)	Union:, Vill.: Hatirjheel Lake
Sample Collection date: 07-02-2022	Date of Testing: 07-02-2022-15/02/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	15	mg/L	5 days Incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	60	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	4.10	mg/L	Multimeter	-
4	EC	-	573	µS/cm	Multimeter	-
5	Total Dissolved Solid (TDS)	1000	286	mg/L	Multimeter	-

Comments: Sample was collected & supplied by client.  
N.B: CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.02.2022	1.) Name: Mita Sarker Designation: Senior Chemist	 20.02.2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.02.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.02.2022 <b>Md. Biplab Hossain</b> Chief Chemist

Department of Public Health Engineering  
Central Laboratory Mohakhali, Dhaka



Government of the People's Republic of Bangladesh  
Office of the Chief Chemist  
Department of Public Health Engineering  
Central Lab, 38-39, Mohakhali C/A, Dhaka-1212  
Phone: 88-02-9881927, Fax: 88-02-9882003, Email: wqmsc\_central\_lab@yahoo.com



Lab Memo: 622/ CC, DPHE, CL, Dhaka

Date: 03-02-2022

**Physical /Chemical/ Bacteriological Analysis of Water Sample**

Sample ID: CEN2022010315	Sample Receiving date: 07-02-2022
Ref. Memo No: SU/2022/Nilil & Dated: 07-02-2022	Sample Source: Surface Water
Sent by: Md. Saiful Islam, Student, Civil Department, Sonargaon University, Dhaka.	Dist: Dhaka, Upa:
Care Taker: Md. Saiful Islam (Sample ID :SW-03)	Union:, Vill.: Hatirjheel Lake
Sample Collection date: 07-02-2022	Date of Testing: 07-02-2022-15/02/2022

**LABORATORY TEST RESULTS:**

Sl.#	Water quality parameters	Bangladesh Standard	Concentration present	Unit	Analysis Method	LOQ
1	Biochemical Oxygen Demand (BOD)	0.2	32	mg/L	5 days incubation	0.1
2	Chemical Oxygen Demand (COD)	4.0	120	mg/L	CRM	-
3	Dissolved Oxygen (DO)	6.0	2.72	mg/L	Multimeter	-
4	EC	-	645	µS/cm	Multimeter	-
5	Total Dissolved Solid (TDS)	1000	325	mg/L	Multimeter	-

Comments: Sample was collected & supplied by client.  
N.B: CRM-Closed Reflex Methods, LOQ- Limit of Quantitation.

Test Performed by:	Signature	Countersigned/Approved by:	Signature
1.) Name: Md. Saiful Alam Khosru Designation: Sample Analyzer	 20.02.2022	1.) Name: Mita Sarker Designation: Senior Chemist	 20.02.2022
2.) Name: Taslima Akhter Designation: Sample Analyzer	 20.02.2022	2.) Name: Md. Biplab Hossain Designation: Chief Chemist	 20.02.2022

**Md. Biplab Hossain**  
Chief Chemist  
Department of Public Health Engineering  
Central Laboratory Mohakhali, Dhaka

