ASSESSMENT ON BURIGANGA RIVER WATER QUALITY AT SELECTED LOCATIONS

Submitted by

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A Thesis Submitted to the Department of Civil Engineering, Daffodil International University in Partial Fulfilment of the Requirements for the Degree of
Bachelor of Science in Civil Engineering

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Certification

This is to certify that this thesis entitled "**ASSESSMENT ON BURIGANGA RIVER WATER QUALITY AT SELECTED LOCATIONS**" is done by the following students under my direct supervision and this work has been carried out by them in the laboratory of the Department of Civil Engineering of Daffodil International University in partial fulfillment of the requirements for the degree of Bachelor of Science in Civil Engineering. The presentation of the work was held on February 2022.

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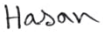

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This thesis paper titled "ASSESSMENT ON BURIGANGA RIVER WATER QUALITY AT SELECTED LOCATIONS" submitted by **Md. Rashedujjaman (Student ID: 182-47-124), Md. Mahmudul Hasan (Student ID: 182-47-131) and Md. Rana Feroz (Student ID: 182-47-141)** has been accepted as satisfactory in partial fulfillment of the requirement for the degree of Bachelor of Science in Civil Engineering at February 2022.

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Dedicated

To

Our Beloved Parents

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All praise is for almighty Allah who graced us to complete this thesis paper properly.

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ABSTRACT

This assessment has been performed to investigate the present water quality of Buriganga river at selected locations and to find possible solutions to prevent the degradation of the Buriganga river water quality. The present water quality parameters have been compared with the irrigation standard of Bangladesh (ECR, 1997) and also to investigate the trend of changing of the water quality parameters with respect to time. To ensure better and healthy environment to the riverine areas of Buriganga river and to protect the river water from pollution several steps must have been taken.

From three stations (Babubazar Bridge ghat, Badamtoli ghat and Wise ghat), nine samples have been collected. The selected parameters are pH, DO, BOD, EC, TDS and Turbidity. From the laboratory test it has been noted that the DO value of sample-6 is 2.9 mg/L under Badamtoli ghat which is the biggest threat to the aquatic organism. The EC, TDS and Turbidity value Badamtoli ghat is comparatively higher than the other stations. The overall average DO and BOD value of three stations are not satisfactory. The Water Quality Index developed from the weighted arithmetic index method which represents that the index value of the three stations that are respectively 151, 134 and 136 which indicate that the water is unfit for irrigation according to ECR, 1997. Since 2011 to 2021 the pH value trends to rises up. The TDS value also trends to rises up. On the other hand, the DO value is significantly decreasing. From this observation the indication is clear that the water quality of Buriganga river is degrading with an alarming rate which unfolds a huge environment and health risk.

Keyword: Buriganga river, Water quality, Irrigation, Aquatic organism

CHAPTER 01

INTRODUCTION

1.1 GENERAL

Water is absolutely essential not only for survival of human beings, but also for animals, plants and other living things (Razo et al.,2004). The same water that is used for crop and animal production can also be share with the public and the aquatic and terrestrial ecosystem (Cooper et al.,1998). Rivers constitute the main inland water body for domestic, industrial, and agricultural activities and often carry large municipal sewage, industrial wastewater discharges, and seasonal runoff from an agricultural field (Singh et al., 2004; Pradhan et al., 2009). Pollution of river water can be occurred in many ways like contamination of untreated water from industries, transportation wastes, different types of municipal wastes etc. Now-a-days water pollution has proven to be a very serious and very visible form of environment contamination as water bodies are indiscriminately as dumps (Francis, 1994). The sources of surface water pollution are mainly from agricultural, industrial and domestic wastes (De, 2000; Dara, 2002).

1.2 STATEMENT OF THE PROBLEM

Assessment of water resource quality of any region is an important aspect of developmental activities, because rivers, lakes and manmade reservoirs are used for water supply to domestic, industrial, agricultural and fish culture (Jackher and Rawat, 2003). River basin has been a major source of water supply for many purposes and provides fertile lands, which support the development of highly populated residential areas due to its favorable conditions (Mouri et al., 2011). Buriganga is one of the notable rivers among Bangladesh due to its geological position. The river Buriganga is a tide-influenced river which is originated from the river Dhaleswari near Kalatia and flows past the southwest ambit of the capital city of Bangladesh (Dhaka). This river had been used since centuries for communication, goods transportation and trading purpose. Buriganga has been a great habitat for the aquatic organism. From the last 20 years, the water quality of Buriganga is degrading with an alarming rate due to unplanned urbanization and industrialization. The problems related to Buriganga can be categorized as natural, climate change-related, external to the country, and human made (Alam, 1995). Thousands of industrial units and sewerage lines dumping huge volumes

of toxic wastes into Buriganga river increasingly polluting the water (Islam et al.,2006). The disposal of untreated waste water of various industries, urban wastes and agrochemical wastes in the low land, open water bodies and rivers has reached an alarming situation in Bangladesh which is increasing day by day (Islam et al., 2015, Ali et al., 2016 Mottalib et al., 2016 and Al-Razee et al., 2016).

The city Dhaka, capital of Bangladesh, is in the problem of shortage of domestic and industrial water supply. The present water supply system in majorly dependent on ground water source. According to the annual report of Dhaka Water and Sewerage Authority (WASA) from 2018-2019, Dhaka has a daily water demand of 2.45 billion litter and 78 percent of the water demand is met by exerting ground water. This is one of the biggest issues for the future of Dhaka city because the layer of ground water of Dhaka city is going downward day by day with an alarming rate.

The dependency on ground water has been increased because of the lack of pollution free surface water source. Various types of pollutant decreasing the water quality of Buriganga which become the biggest threat to the aquatic organism as well as the irrigation sector.

1.3 OBJECTIVE OF THE STUDY

The followings are the major objectives of this research work:

i) To observe the water quality parameters in selected areas of Buriganga river.
ii) To find possible solution of how to minimize the water pollution of the Buriganga river.

1.4 ORGANIZATION OF THE THESIS

The thesis paper contains five chapters, the first of it is introduction. Second chapter contains a brief and selective review of the relevant literature which provides history of water quality assessment, Bangladesh water quality standard etc. In third chapter, sampling area and methodologies adopted in the research work is illustrated. Fourth chapter is arranged with results and discussion provides the field observation, variation in physicochemical Parameters, Comparison with Standard, WQI computation equation, water quality assessment, and a review on previous years water quality etc. The fifth chapter is conclusion and recommendation.

CHAPTER 02

LITERATURE REVIEW

2.1 INTRODUCTION

The river Buriganga is a major river in respect of transmission, transportation, source of drinking and irrigation water which flows beside Dhaka, capital of Bangladesh. But now-a-days the water body of Buriganga river is one of the most polluted one. The reason behind this is contamination of industrial and municipal wastes (solids & liquid) to the water body of Buriganga river. This is rising the risks to human health as well as ecological health. The problems related to Buriganga can be categorized as natural, climate change-related, external to the country, and human made (Alam, 1995). Pollution from human and industrial sources is the main water quality problem in the river systems near urban areas because they are one of the largest water users and polluters (Nemerow, 1978). The careless disposal of industrial effluents and other wastes may contribute greatly to the poor quality of the water (Chindah et al., 2004). Anthropogenic activities, as well as the variation in river water flow during different seasons were the main reasons for this high degree of water pollution (Islam et al., 2015).

The regional people are very much supported by the Buriganga river water for their livelihood and they are not aware about the pollution of Buriganga river water. As a result, they suffer in many ways. Basically this assessment is conducted to put a focus on the water quality parameters at several points of Buriganga river and develop public awareness which will help to understand the characteristics of water body of Buriganga river.

2.2 HISTORY OF BURIGANGA RIVER WATER QUALITY

Since the beginning of the civilization water quality was a matter of concern. The remains of lake Moeris in Egypt indicates its construction about 2000 S.C It was the largest of the reservoirs of the Nile Valley, which is believed to supply water for 20,000,000 people (Aziz, 1975). River water is the greatest source of sweet water which is still being used for various purposes. Among them the chief purposes are drinking

and irrigation. In the ancient days, irrigation work was totally dependent on surface water.

The history of water supply of Dhaka City back to 1878 which consisted of a 0.2 MGD capacity water treatment plant treating water from the Buriganga river at Chandnighat and having a 4.5 miles' network of distribution mains.

Figure 2.1: Ancient picture of Buriganga River

The system was expanded later increasing the capacity to 2.4 MGD and the distribution mains to 57 miles by 1939 (Islam, 1977). Deep wells were introduced at the early of 1950's. The demand of ground water was increasing day by day due to the city expansion and urbanization. To keep pace with the urbanization of the city the numbers of deep wells were increasing with no limit. Now-a-days this is affecting the ground water stability of Dhaka city. At present only 4% of city water is coming from surface water source. And the surface water quality is decreasing with an alarming rate. This is one of the greatest threat to the coastal people of Buriganga River.

Recent pictures of Buriganga river water pollution are attached below. The present condition of Buriganga River is severe.

Figure 2.2: Present picture of pollution at Buriganga River

Figure 2.3: Municipal drainage is directly linked with Buriganga River.

2.3 BANGLADESH WATER QUALITY STANDARD

2.3.1 Surface water

The water from surface can be classified majorly in two ways that is sweet water and salt water. The water of Buriganga is sweet water which is a great resource for the demand of irrigation water. The Buriganga river water was also used as drinking purpose once. But the present water quality has significantly degraded. The water quality standard of Bangladesh for different parameters for irrigation purpose is shown below with tabular representation.

Table 2.1: Bangladesh Water Quality Standard for Irrigation (EQS, 1997)

Water Quality Parameters	Unit	Bangladesh Standard for Irrigation (EQS, 1997)
pH	…	6.5-8.5
DO	mg/L	4.5-8.0
BOD	mg/L	0 to 10
EC	µmho/cm	1200
TDS	mg/l	450 to 2000
Turbidity	FTU	35

The water quality standard of Bangladesh for different parameters for drinking purpose is given below.

Table 2.2: Bangladesh Water Quality Standard for Drinking (EQS, 1997)

Water Quality Parameters	Unit	Bangladesh Standard for Drinking (EQS, 1997)
pH	...	6.5 to 8.5
DO	mg/L	6
BOD	mg/L	0.2
EC	µmho/cm	700
TDS	mg/L	1000
Turbidity	FTU	10

The water quality standard of Bangladesh for different parameters for fisheries purpose is given below.

Table 2.3: Bangladesh Water Quality Standard for Fisheries (EQS, 1997)

Water Quality Parameters	Unit	Bangladesh Standard for fisheries (EQS, 1997)
pH	…	6.5 to 8.5
DO	mg/l	5 or more
BOD	mg/l	greater than 6
EC	µmho/cm	800 to 1000
TDS	mg/l	0 to 1000
Turbidity	FTU	40

pH, DO (Dissolved Oxygen), BOD (Biological Oxygen Demand), EC (Electric Conductivity), TDS (Total Dissolved Solid), Turbidity these are the common parameters to measure the water quality for drinking, irrigation and fisheries purposes. To prevent massive health risks and the ensure safer environment for the aquatic animal the experimental value should not differ much from the standard values for different purposes.

2.4 WATER QUALITY PARAMETERS

2.4.1 pH

It is an important parameter for the water quality determination. pH indicates the acidity or basicity of a liquid. It is ranged from 0 to 14. When the pH value is 7 it is called neutral. If the pH is below 7 then the liquid is acidic and when the value is above 7 then the liquid is alkaline.

2.4.2 Dissolved Oxygen (DO)

The amount of oxygen that is dissolved in the water body is called DO (Dissolved Oxygen). Adequate quantity of Dissolved Oxygen is very much essential for the aquatic animal, aquatic plants and microorganism for survival. Low DO value indicates the poor water quality. The ideal value of Dissolved Oxygen is 14.6 mg/L. (Tripaty and Sahu, 2005).

2.4.3 Biological Oxygen Demand (BOD)

The quantity of Dissolved Oxygen that are utilized by the pathogens and microorganism is Biological Oxygen Demand (BOD). This parameter can provide an actual concept about the quantity of bacteria and microorganisms present in the water body. Excessive value of BOD indicates poor water quality.

2.4.4 Electric Conductivity (EC)

Electric Conductivity is a parameter which determines how well the electricity can pass through the water. Pure water doesn't pass any electricity. Generally, this is caused by dissolved metal and salt present in the water.

2.4.5 Total Dissolved Solid (TDS)

There are some solid particles which dissolved in the water. The amount of solid particles dissolved in the water body is known as TDS (Total Dissolved Solid). In the wet season at rivers of Bangladesh the value of TDS remains respectively higher than the dry season. TDS (Total Dissolved Solid) can easily be determined from the EC (Electric (Conductivity) value.

$TDS = 0.75 \times EC$

2.4.6 Turbidity

The cloudiness of water is known as turbidity. It generally dependent on the amount of total dissolved solids in the water body and chemical contents in the water body. The appearance of higher turbidity water body is quite ugly and also indicates poor water quality.

2.5 SUMMARY ON PREVIOUS WATER QUALLITY ASSESSMENTS ON BURIGANGA RIVER

Several assessments were conducted to highlight the Buriganga River water quality in front.

Kalam investigated the water quality of the river Buriganga near Chadnighat in the year 1967 to 1968. Kalam observed that the Buriganga river water is required to be treated for the removal of turbidity, hardness, alkalinity, soluble iron, manganese etc. to make it potable.

Das investigated the water quality of the river Buriganga in the year 1967. Based on the test results, the investigator also concluded that treatment for controlling the water quality parameters like color, turbidity, pH, hardness is required to make the water potable.

Islam (1977) investigated the water quality of various waters in and around Dhaka City. He concluded that the surface waters are being increasingly polluted with the passage of time. He also recommended that water from both Buriganga and Sitalakhya could be treated effectively and economically for Dhaka water supply. Water from other minor sources required elaborate treatment to make them suitable for public water supply.

It is clear that the water quality of Buriganga is degrading day by day. Due to the pollution of water the most of the living organisms of the river has either migrated or dead. The water of Buriganga is almost unsuitable for any purpose use.

CHAPTER-03

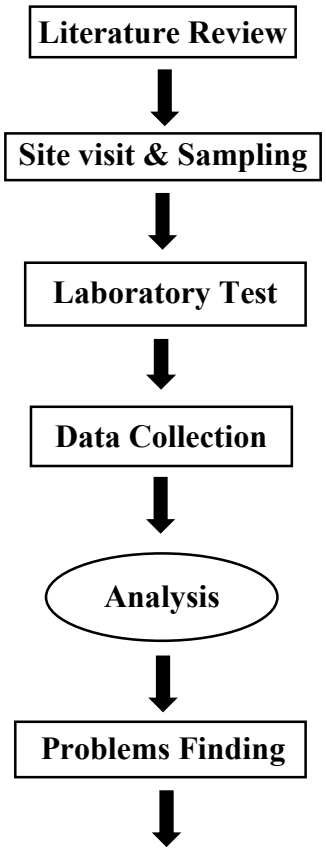
METHODOLOGY

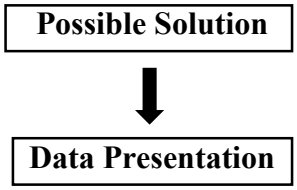
3.1 INTRODUCTION

In this assessment, samples of water have been collected from selected locations of Buriganga river for laboratory test to determine the water quality of the Buriganga river at selected locations and specify the degree of pollution with possible solutions. The selected parameters are pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Electric Conductivity (EC), Total Dissolved Solid (TDS), Turbidity and Temperature.

3.2 WORKFLOW

The methodology of this thesis paper has been oriented with a certain work plan which is shown below with a workflow diagram.





3.3 STUDY AREA

The study area is a pre-selected section of Buriganga River. Buriganga River flows through west and south of Dhaka which is one of the largest rivers in Bangladesh (Ahmed et al., 2001). The pre-selected section is from Babubazar bridge ghat to Wise ghat.

Figure 3.1: Buriganga river at Babubazar bridge ghat

The Buriganga river is originated from Daleswari river and meets with Turag river. The alignment of the Buriganga River is shown below with a picture attached below where the study area is marked individually. The marked area is an approximate section of 700 meters which contains Babubazar bridge ghat, Badamtoli ghat and wise ghat. The surrounding area of that selected section is significantly populated. And many of the people depend on the river for their livelihood or daily uses.

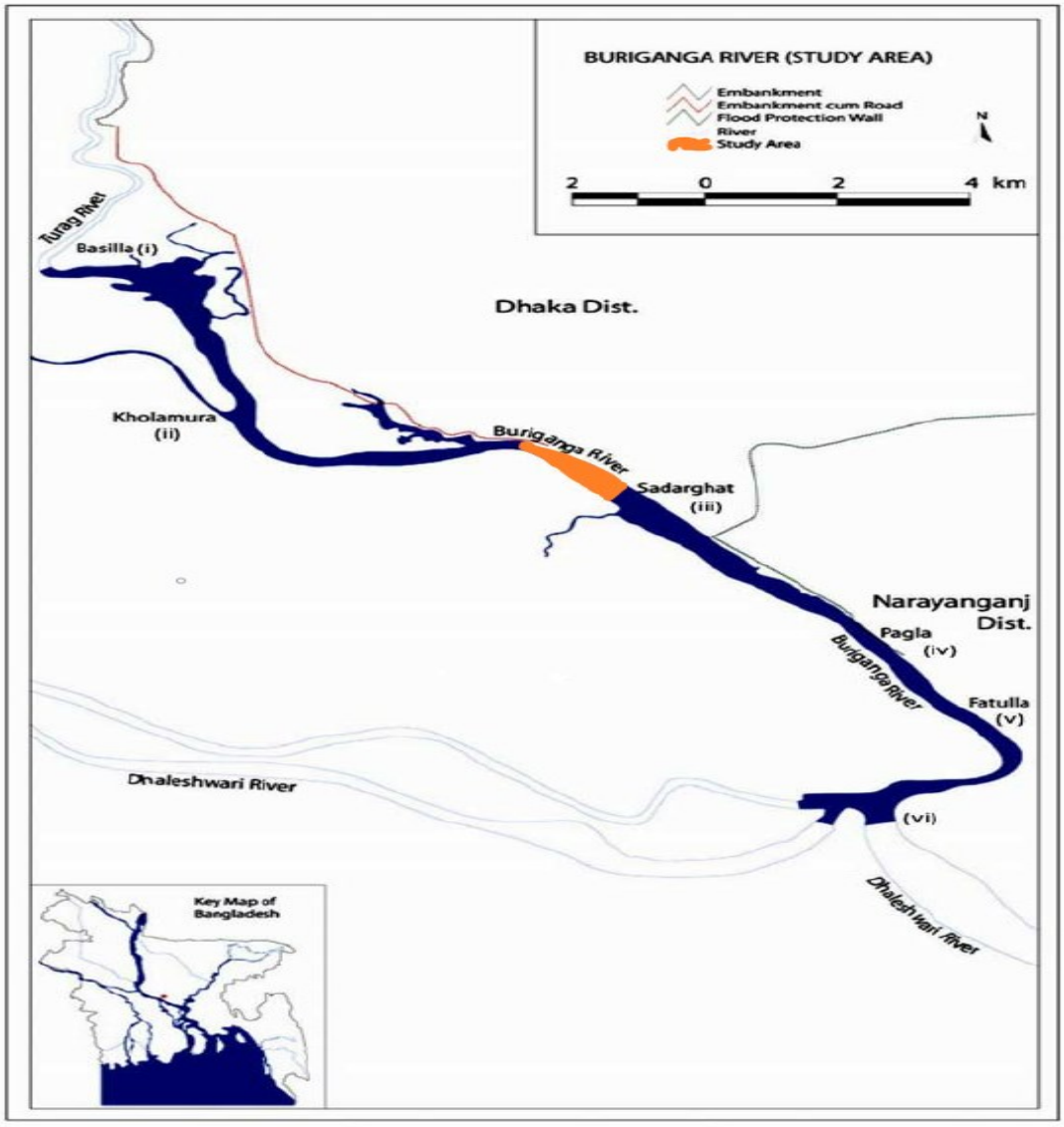


Figure 3.2: Buriganga river (Study Area)

3.4 SAMPLING

Samples of water had been collected in 27th September 2021 respectively from three stations upstream to downstream named Babubazar Bridge ghat (23°42'35" N, 90°24'07" E), Badamtoli ghat (23°42'29" N, 90°24'19" E), and Wise ghat (23°42'26" N, 90°24'23" E). The approximate distance between 1st and 2nd station is 350 meter and between 2nd and 3rd station is 150 meters. Samples were collected from three points of the river under one station. Approximately 2 meter away from the both edges of river and the approximate middle point of the river, these are the three points of every station from where the samples were collected. Each samples are collected from 1.5 feet below the surface water. Before collecting the samples, the jars were washed properly with

the water of specific point. While collecting samples the river water was moving from upstream to downstream with an approximate velocity of 0.5 meter/second.

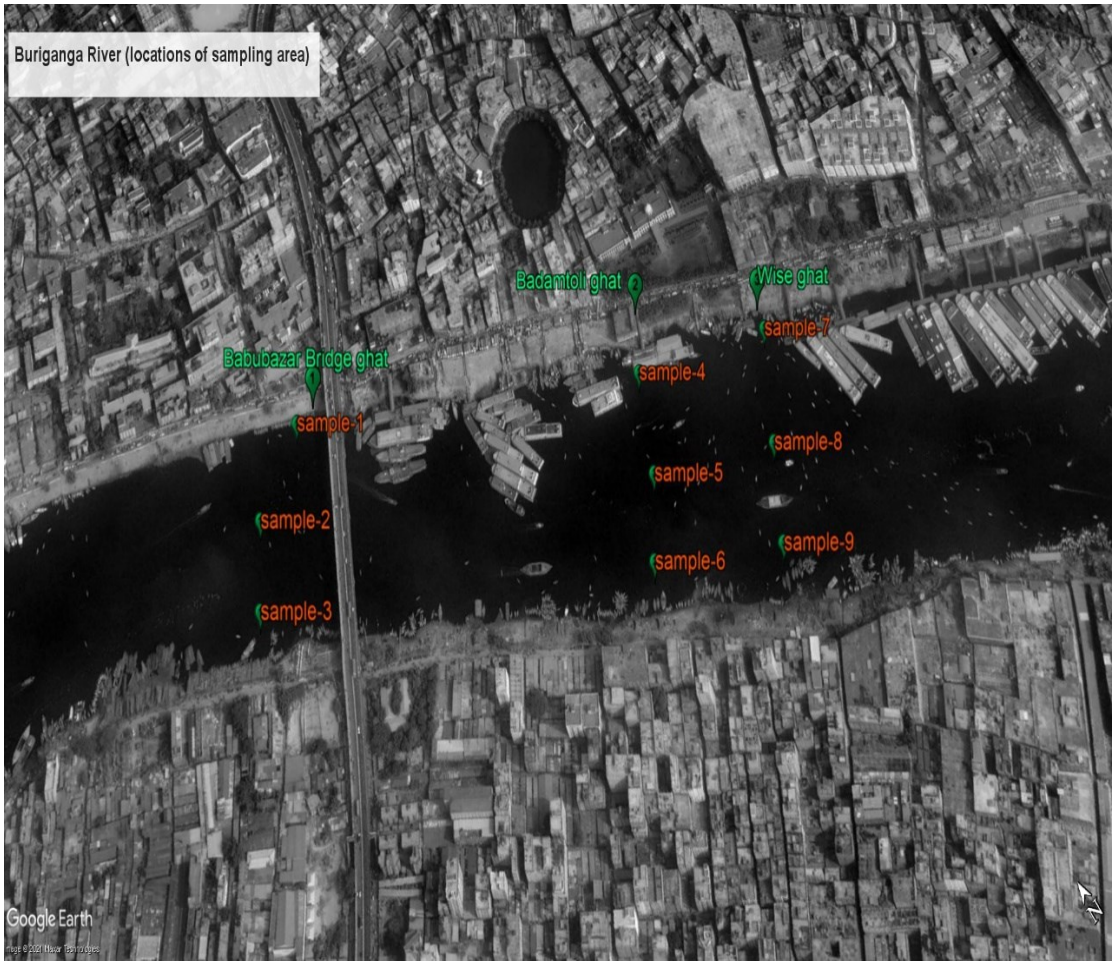


Figure 3.3: Buriganga River (locations of sampling area)

3.5 PROCESS OF ANALYSIS

3.5.1 Laboratory Test

Different physicochemical parameters of the Buriganga river water were inspected by laboratory test from specific stations to observe the present water quality of Buriganga river. Hydrogen ion concentration (pH), Dissolve Oxygen (DO), Biochemical Oxygen Demand (BOD) Total Dissolve Solid (TDS), Electric Conductivity (EC), Turbidity and Temperature were determined by using digital calibrated multi-meters. Biological Oxygen Demand (BOD) inspection was done by 5-days incubation, 20ºC method

(APHA 1995), Electric Conductivity was measured at 25°C in µmho/cm, Turbidity was measured in FTU and TDS was measured in mg/l.

Figure 3.4: Picture of laboratory test

Figure 3.5: laboratory test of Dissolved Oxygen

3.5.2 Variation of the Water quality parameters at selected locations

From the laboratory test, data of all selected parameters of each station have been collected appropriately. The collected data have been represented graphically. From the graphical representation, the variation of water quality parameters among each sampling station has been analyzed.

3.5.3 Relative comparison of the parameters with standard value

Mean values of the three stations of Buriganga river is determined for all the parameters (pH, DO, BOD, EC, TDS, Turbidity). These mean values have been comprised with the standard values for irrigation of Bangladesh (ECR 1997). From this comparison the picture of present water quality of the Buriganga river at selected location has been come in front.

3.5.4 Computation of Water Quality Index

Water Quality Index (WQI) is a representation of an isolated number which can be computed with several methods. This number is generally used for overall interpretation of the water quality of water bodies. WQI supplies short and simple approach to specify the quality of water by only inspection at the single index value and the corresponding scale.

Following the method of Brown et all., an index has been prepared. The ECR 1997 Standard value for irrigation is used as standard value. The selected parameters are pH, Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Electric Conductivity (EC), Total Dissolved Solid (TDS), and Turbidity. All the ideal values for the parameters are taken as zero except pH and DO. Ideal values for pH and DO are taken respectively 7 and 14.5 (Tripaty and Sahu, 2005).

From the prepared Water Quality Index, the assessment of water quality would be easier.

3.5.5 Data accumulation of the selected years

Data of water quality parameters of the selected years (2011 & 2017) from same stations has been collected. This has been done to observe the variation of water quality parameters with respect to time. The parameters are pH Dissolved Oxygen (DO), Biological Oxygen Demand (BOD), Electric Conductivity (EC), Total Dissolved Solid (TDS), and Turbidity. From the graphical representation of these data, the trend line of the water quality parameters has visualized.

CHAPTER-04

RESULT & DISCUSSION

4.1 LAB TEST RESULTS OF THE SELECTED PARAMETERS

After completing the laboratory experiment, the values of the selected parameters have been collected. The values are briefly arranged in table (4.1) shown below.

Table 4.1: Results from the laboratory test

Stations	Sample no.	Pick point	pH	EC (µmho /cm)	Tem (°C)	Turbidity (FTU)	TDS mg/l	DO mg/l	BOD mg/l
Babubazar Bridge ghat	Sample:1	Starting	7.8	450	29.3	19.73	337.5	5.9	25.67
	Sample:2	Middle	7.8	400	29.9	19.68	300.0	3.97	20.77
	Sample:3	End	7.8	520	30.1	22.52	390.0	4.1	23.00
	Average value		7.8	457	29.8	20.64	342.5	4.67	23.15
Badamtoli ghat	Sample:4	Starting	7.7	570	30.1	21.06	427.5	3.5	20.00
	Sample:5	Middle	7.7	420	30.0	18.54	315.0	3.3	20.33
	Sample:6	End	7.5	1300	29.9	46.33	975.0	2.9	08.67
	Average value		7.6	763	30	28.64	572.5	3.2	16.33
Coconut ghat(wise ghat)	Sample:7	Starting	7.7	510	30.0	17.41	382.5	3.5	16.00
	Sample:8	Middle	7.8	430	30.2	16.01	322.5	3.7	17.00
	Sample:9	End	7.8	410	29.8	20.32	307.5	4.1	18.33
	Average value		7.7	450	30	17.91	337.5	3.8	17.11

4.2 VARIATION OF THE WATER QUALITY PARAMETERS AT SELECTED LOCATIONS

Some variations are noticed during collecting the data of the three stations from the table. Hydrogen ion (pH) do not vary significantly and the observed value is pretty much satisfying. But the observed Dissolved Oxygen (DO) value is too poor as well as the Biological Oxygen Demand (BOD). Electric Conductivity (EC) value is nearly close at all points except the “sample:6” which is collected from Badamtoli ghat. The average value of Electric Conductivity (EC), Biological Oxygen Demand (BOD), Turbidity and Total Dissolve Solid (TDS) is significantly high at Badamtoli ghat than the other two stations. Average temperatures value of the three stations are close with each other.

The variations of parameters among the three stations with average values have been shown below by graphical representation.

pH

pH is a parameter which indicates that the water body (sample) is acidic or alkaline. A mediocre variation is noticed from the graph. Obtained values from the field observation is healthy and acceptable.

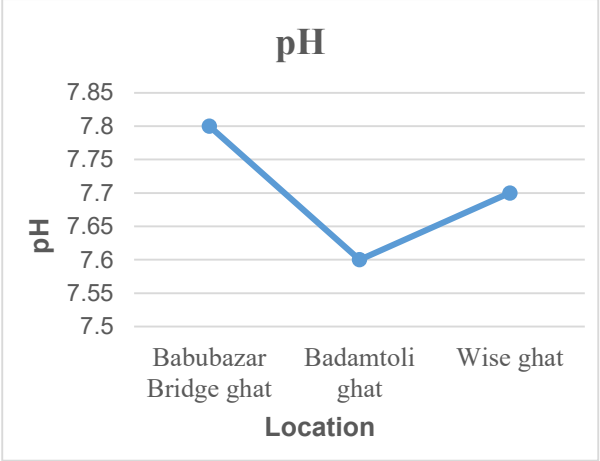


Fig 4.1: pH value of the different stations

DO

Concentration of oxygen that is dissolved in the water is known as DO. The concentration of DO is unhealthy at every stations among them the Badamtoli ghat is very poor. This can be a greater threat for the aquatic organism.

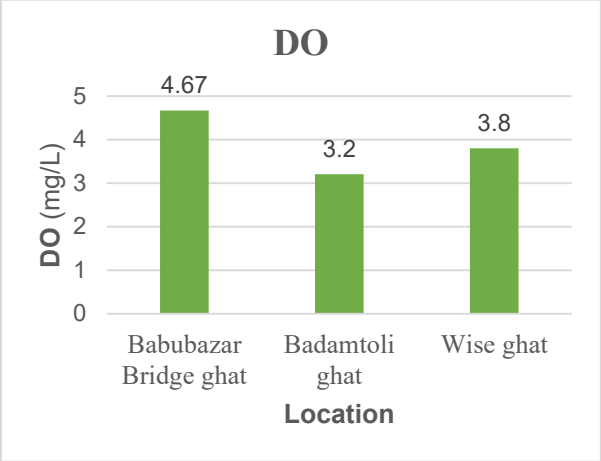


Fig 4.2: DO value of the different stations

BOD

The quantity of Oxygen absorbed by the bacteria and other aquatic microorganism is Biological Oxygen Demand (BOD). The observed values of the three stations are not satisfactory according to the irrigation standard of Bangladesh.

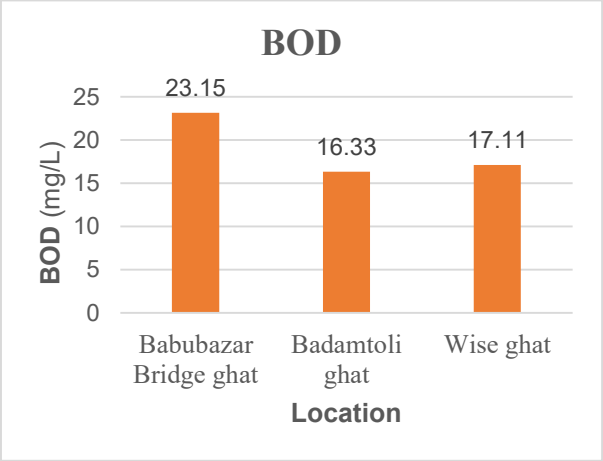


Fig 4.3: BOD value of the different stations

EC

EC (Electric Conductivity) is the estimation of the ability to conduct electricity through substances (samples). From the observation it has been noted that the value of EC at Badamtoli ghat is relatively higher than the other two stations.

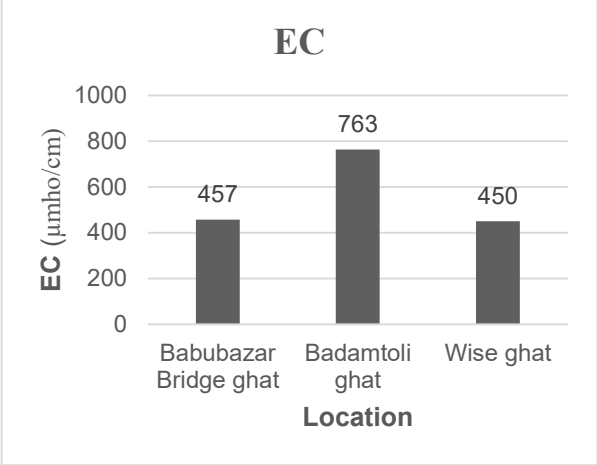


Fig 4.4: EC value of the different stations

TDS

The amount of solids that are dissolved in the water is Total Dissolved Solid (TDS). The observed TDS value at Badamtoli ghat is relatively high than the other two stations.

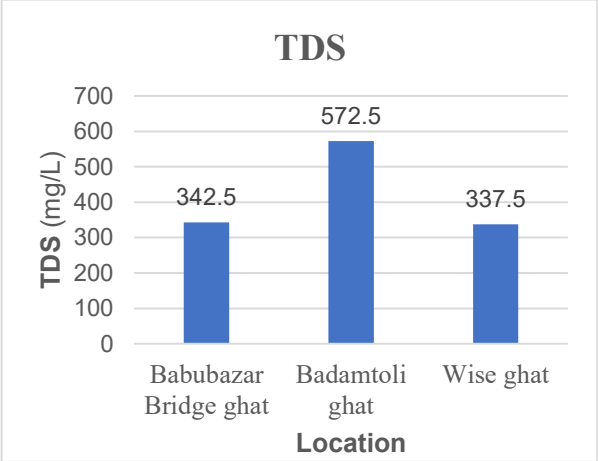


Fig 4.5: TDS value of the different stations

Turbidity

Turbidity is the cloudiness of water. Turbidity of Badamtoli ghat is excessive as like as the EC and TDS values at Badamtoli ghat. Observed values of all stations are acceptable.

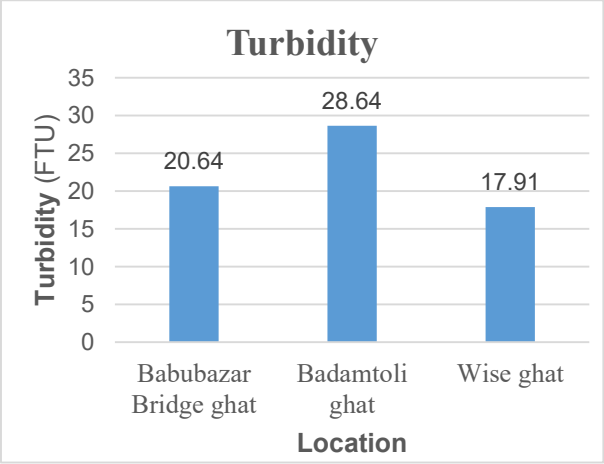


Fig 4.6: Turbidity value of the different stations

4.3 COMPARISON WITH STANDARD

The obtained value from the three stations of each parameter are being averaged and compared with the Bangladesh Standard for Irrigation (ECR, 1997). The comparison is presented with table:

Table 4.2: Comparison of investigated water quality parameters with standard values

Parameters	**Lab Teas Results** (mean values)	**Bangladesh Standard for Irrigation (ECR, 1997)**
pH	7.7	6.5-8.5
DO (mg/l)	3.89	4.5-8.0
BOD (mg/l)	18.86	0 to 10
EC (µmho/cm)	417.5	1200
TDS (mg/l)	556.67	450 to 2000
Turbidity (FTU)	22.04	35

4.4 WQI COMPUTATION EQUATION

A water quality index (WQI) is developed to simplify the observed investigation with the weighted arithmetic index method (Brown et al.,1972). Six physicochemical parameters have been used that are pH, DO, BOD, EC, TDS and Turbidity.

4.4.1 Calculation of the unit weight (Wn) factors

$$Wn = K/Sn$$

Where,

$$K = \frac{1}{\frac{1}{S1}+\frac{1}{S2}+ \ldots..\frac{1}{Sn}} = \frac{1}{\sum Sn}$$

And Sn= standard desirable value of nth parameter

On simulation of all selected parameters unit weight factors Wn=1(unity)

4.4.2 Calculation of Sub Index (Qn)

$$Qn = \frac{Vn-Vo}{Sn-Vo} \times 100$$

Where,

Vn = mean concentration of nth parameter

Vo = ideal values of the parameters

Sn = standard desirable value of the nth parameter

All the ideal values (Vo) are taken as zero except for pH = 7 and Dissolved Oxygen DO =14.6 mg/L. (Tripaty and Sahu, 2005).

4.4.3 Calculation of WQI

Water Table Index (WQI) is formed by the equation given below:

$$WQI = \frac{\sum WnQn}{\sum Wn}$$

Table 4.3: Different parameters used in WQI computation as its maximum permissible limit.

Parameters	pH	DO (mg/L)	BOD (mg/L)	EC (µmho/cm)	TDS (mg/L)	Turbidity (FTU)
Irrigation Standard (ECR,1997)	7.5	5	10	1000	1000	35

Table 4.4: Calculation of WQI for Babubazar Bridge ghat

Parameters	Sn	1/Sn	∑(1/Sn)	K=1/∑(1/Sn)	Wn=K/Sn	Vo	Vn	Vn/Sn	Qn=Vn/Sn*100	WnQn
pH	7.5	0.133333	0.463905	2.15561486	0.287415	7	7.8	1.6	160	45.98645
DO (mg/l)	5	0.2	0.463905	2.15561486	0.431123	14.6	4.67	1.18922	118.922	51.27001
BOD (mg/l)	10	0.1	0.463905	2.15561486	0.215561	0	23.15	2.315	231.5	49.90248
EC (µmho/cm)	1000	0.001	0.463905	2.15561486	0.002156	0	457	0.457	45.7	0.098512
TDS (mg/l)	1000	0.001	0.463905	2.15561486	0.002156	0	342.5	0.3425	34.25	0.07383
Turbidity (FTU)	35	0.028571	0.463905	2.15561486	0.061589	0	20.64	0.589714	58.97142857	3.631991
		0.463905			1					**150.9633**

Table 4.5: Calculation of WQI for Badamtoli Bridge ghat

Parameters	Sn	1/Sn	∑(1/Sn)	K=1/∑(1/Sn)	Wn=K/Sn	Vo	Vn	Vn/Sn	Qn=Vn/Sn*100	WnQn
pH	7.5	0.133333	0.463905	2.15561486	0.287415	7	7.6	1.2	120	34.48984
DO (mg/l)	5	0.2	0.463905	2.15561486	0.431123	14.6	3.2	1.36527	136.527	58.85993
BOD (mg/l)	10	0.1	0.463905	2.15561486	0.215561	0	16.33	1.633	163.3	35.20119
EC (µmho/cm)	1000	0.001	0.463905	2.15561486	0.002156	0	763	0.763	76.3	0.164473
TDS (mg/l)	1000	0.001	0.463905	2.15561486	0.002156	0	572.5	0.5725	57.25	0.123409
Turbidity (FTU)	35	0.028571	0.463905	2.15561486	0.061589	0	28.64	0.818286	81.82857143	5.03974
		0.463905			1					**133.8786**

Table 4.6: Calculation of WQI for Wise ghat

Parameters	Sn	1/Sn	∑(1/Sn)	K=1/∑(1/Sn)	Wn=K/Sn	Vo	V	Vn/Sn	Qn=Vn/Sn*100	WnQn
pH	7.5	0.133333	0.463905	2.15561486	0.287415	7	7.7	1.4	140	40.23814
DO (mg/l)	5	0.2	0.463905	2.15561486	0.431123	14.6	3.8	1.29341	129.341	55.76188
BOD (mg/l)	10	0.1	0.463905	2.15561486	0.215561	0	17.11	1.711	171.1	36.88257
EC (µmho/cm)	1000	0.001	0.463905	2.15561486	0.002156	0	450	0.45	45	0.097003
TDS (mg/l)	1000	0.001	0.463905	2.15561486	0.002156	0	337.5	0.3375	33.75	0.072752
Turbidity (FTU)	35	0.028571	0.463905	2.15561486	0.061589	0	17.91	0.511714	51.17142857	3.151597
		0.463905			1					**136.2039**

4.5 ASSESSMENT OF WATER QUALITY

According to the weighted arithmetic index method (Brown et al.,1972) WQI has been classified into five classes.

Table 4.7: WQI (Brown et al.,1972)

Water Quality Index	Water Quality Status
0-25	Excellent
26-50	Good
51-75	Poor
76-100	Very Poor
>100	Unfit for Irrigation

According to this classification and the previous calculation the Water Quality Index (WQI) has been prepared.

Table 4.8: Summary of WQI values of selected locations

Stations	Index Value	Water Quality status
Babubazar Bridge Ghat	**151**	Unfit for Irrigation
Badamtoli Ghat	**134**	Unfit for Irrigation
Wise Ghat	**136**	Unfit for Irrigation

As claimed by this Water Table Index it is crystal clear that water from each station is unsuitable for irrigation purpose use.

4.6 A REVIEW ON PREVIOUS YEARS WATER QUALITY PARAMETERS

Some historic data of Buriganga river water quality of the year 2011 and 2017 were being collected for same parameters that are investigated. A comparison on the water quality parameters of the year 2011, 2017 and 2021 of Buriganga river at specific location is shown with table 4.10 attested below.

Table 4.9: Data Table on Water Quality Parameters of 2011, 2017 and 2021

Parameters	**2011** (average value)	**2017** (average value)	**2021** (average value)
pH	6.7	7.5	7.7
DO (mg/L)	5.2	4.97	3.89
BOD (mg/L)	25.5	15.42	18.86
EC (µmho/cm)	1763	1179	417.5
TDS (mg/L)	279	581	556.67
Turbidity (FTU)	27	30.2	22.04

In this table six different parameters (pH, DO, BOD, EC, TDS and Turbidity) were presented from different years. Some variations are being noticed among the data of the year 2011, 2017 and 2021. The differences among them has been shown by graphical representation attested below.

4.7 RELATIVE COMPARISON OF THE SELECTED PARAMETERS AMONG YEAR 2011, 2017 & 2021

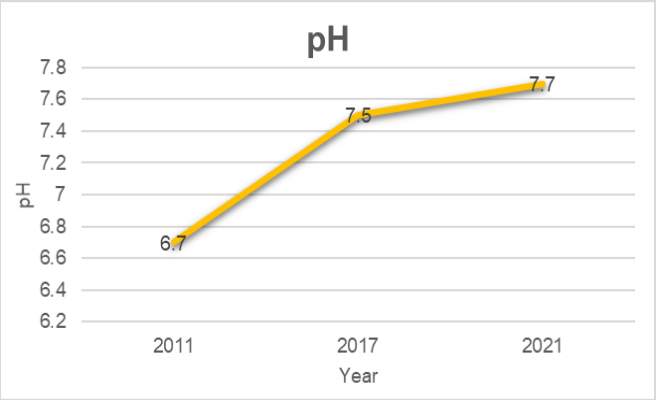


Fig 4.7: Variation of pH value in different years

pH

From this observation it is noticed that the pH has a trend to rise up with the time passes. But still the pH value is close to the standard value.

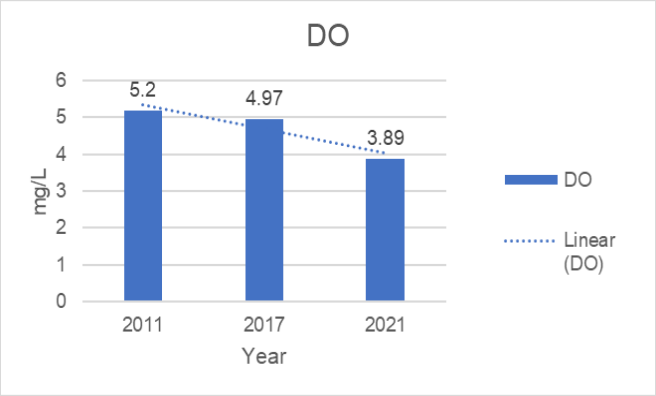


Fig 4.8: Variation of DO value in different years

DO

The trend line of the DO (Dissolved Oxygen) graph is going downward which indicates the water quality is decreasing day by day. It is one of the greatest threat to the living organism of Buriganga river.

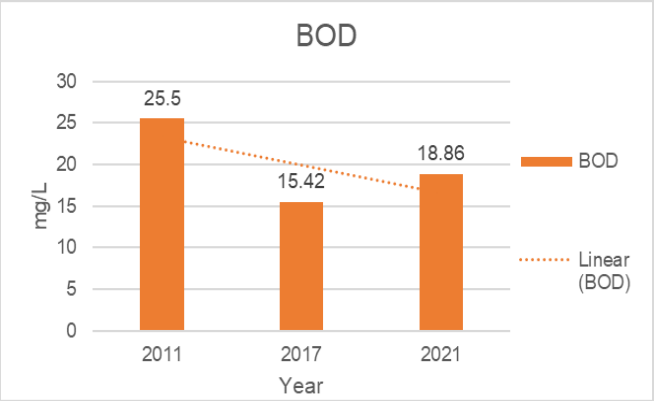
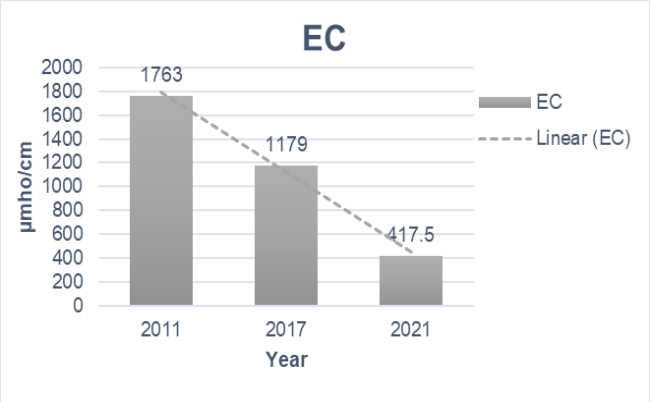


Fig 4.9: Variation of BOD value in different years

BOD

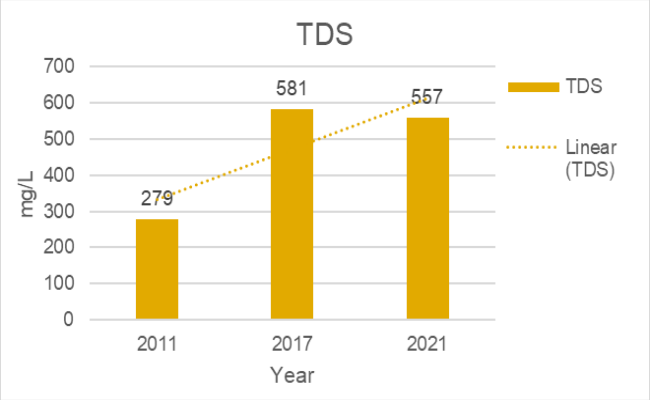
In 2011 the BOD (Biological Oxygen Demand) was significantly high. Then it drops down at 2017. Finally, it rises up a little bit in 2021.



EC

According to the graph of EC (Electric Conductivity) it is noticed that the EC value is remarkably decreasing from 2011 to 2021.

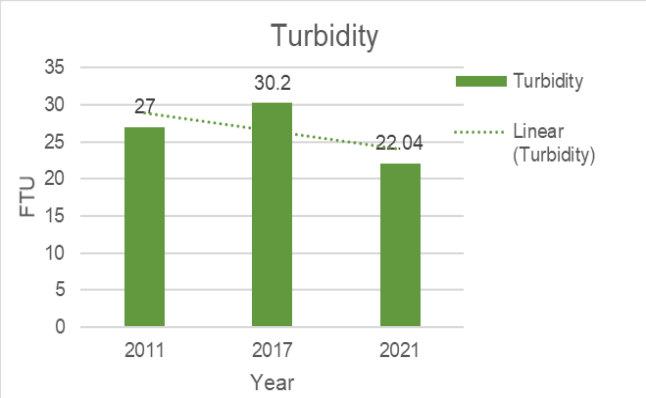
Fig 4.10: Variation of EC value in different years



TDS

At 2011 the TDS (Total Dissolved Solid) value was reasonable. From then the TDS value trend to rise up.

Fig 4.11: Variation of TDS value in different years



Turbidity

Turbidity value doesn't up and down too much. The trend line of Turbidity graph is more likely horizontal.

Fig 4.12: Variation of Turbidity value in different years

CHAPTER-05
CONCLUSION & RECOMMENDATION

5.1 CONCLUSION

The standard grade of drinking and irrigation water is an elementary demand for a blooming society. It is very much related with the national health and economy. Intense disposal of different kind of wastes from municipalities and industries are degrading the water quality of Buriganga severely. This study presents that DO level is too low at each stations specially at Badamtoli ghat. The BOD level is significantly high with respect to the Bangladesh Standard for Irrigation (ECR, 1997). From the WQI index it has been confirmed that water of each station is unfit for irrigation purpose use. Low DO level unfolds an extreme danger on environmental health and feasible ecological interference. Regarding all the values of the parameters, it is transparent that the quality of Burignga river water is in a complicated situation.

This issue can't be mitigated in short-term period. Continuous monitoring on waste disposal at Buriganga and proper water treatment is needed to get rid over the issue. Different approaches can be adopted to increase the Dissolved Oxygen level of the river water like regulating the temperature of river water as colder water can hold more oxygen and also simple aeration can also be done. Organic pollutants are responsible for the high BOD (Biological Oxygen Demand) in river water. Direct release of organic pollutants to the river water should be prevented.

Overall, mass consciousness is very much needed to protect the Buriganga River due to the sake of better environment, better quality of agriculture and fisheries and for quality life.

5.2 RECOMMENDATION

For the further study on Buriganga river water quality there are few key recommendations that are enlisted below.

i) The number of water quality monitoring stations could be increased to get more accurate result.
ii) Some parameters could be added like, Chemical Oxygen Demand (COD), Fecal Coliform, Nitrate, lead etc.

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