

Water Quality And Risk Assesment Of Goalichara In The Vicinity Of Sylhet City

M. A. Zafor*, Abdur Rahman** and M. Ahmed***

*(Lecturer, Department of Civil Engineering, Leading University, Sylhet)

** (Lecturer, Department of Civil Engineering, Stamford University Bangladesh, Dhaka)

*** (Professor, Department of Civil and Environmental Engineering, Shahjalal University of Science and Technology, Sylhet)

ABSTRACT

The quality of water is of vital concern for mankind since it is directly linked with human welfare. But majority of people is still not aware of it. Surface water is often physically contaminated due to unhygienic practices. Discharges from various contaminated sources are a very common thing in city life which deteriorates the water quality of any main water source and necessary treatment is required to make water potable. Sylhet, one of the six divisional cities of Bangladesh is suffering from shortage of domestic water supply & adequate sewerage lines, drainage & solid waste disposal problems. The selected parameters for assessing the water quality are pH, Total Dissolved Solid (TDS), Biochemical Oxygen Demand (BOD), Dissolved Oxygen (DO), Ammonia Nitrogen, Nitrate, Turbidity of Goalichara in the vicinity of sylhet city. The investigation continues from the month January 2008 to January 2009. The obtained values for pH ranges from 7.18 to 6.6, for total dissolved solids ranges from 162.75 to 328.75 mg/l, for dissolved oxygen from 6.24 to 5.28 mg/l, for Ammonia ranges from 0.155 to 0.3333 mg/l, Fecal coliform ranges from 15.5 to 48.91N/100ml.. Natural water reservoirs like ponds and lakes are being decreased due to the unplanned development of the city. Legal action should be taken to prevent the environmental degradation and to preserve the natural water bodies in the vicinity of Sylhet city.

Keywords - Ammonia, BOD, Coliform, Dissolved Oxygen, Goalichara, pH.

1. Introduction

Water is one of the vial components of the physical environment. Because of the growing global awareness in the maintenance of a “clean world”, public and private agencies have come to realize the importance of surface water to a national economy. Knowledge of water quality thus plays a significant role in the development of water quality control and management (Lohani & Todino, 1984). Sylhet city, one of the rapidly developing urban areas is located in the north—east region of Bangladesh and situated at 28.85° latitude and 98.80° longitude. The region is in the hilly portion of the country. The city occupies a total area of 26.5 sq.km with a population of around .5 million (S.C.C, 2005). A total of nine natural drainage channels (locally called chara)

are responsible for draining storm water from city area to the Surma river. The study area Goalichara lower part is situated in the SCC area. Originated from Lakkatura tea graden, it passes over Baluchar ,Shibgang, Sobhani Ghat, Chalibondar, Chararpar. At Masimpur the chara falls in the Surma River. As the quality of waste water is not satisfactory, problems like pollution to Surma River and the streams, deterioration of the environment and health sanitation have become serious. The water quality criteria are developed on the basis of pollutants upon a specific use of water. The criteria, therefore, are defined as the acceptable levels of concentration of pollutants for a particular use and describe the water quality requirements for protecting aquatic life .Therefore the present study has been undertaken to assess water quality parameters to evaluate the potential risks, as well as to suggest measures for the prevention of the water pollution.

2. Materials and Methods

During the study of the water quality of Goalichara a laboratory test program was under taken to monitor the different parameters which were the main causes of water pollution.

2.1 Sample Collection

The most important task of water quality analysis is sampling. In order to get the information about the water quality of Goalichara, grab sampling procedure is applied. Water samples were collected in plastic containers with stopper from surface and from two feet below the top of water surface from different sampling points. Plastic containers of capacity greater than 2 liters were used for sampling, and 2 liters of each sample in each location was collected for the study. Water samples are collected from seven locations namely Baluchar, Shibgonj, Uposhahar, Chalibondar, Masimpur, Surma River (U/S), Surma River (D/S).

2.2 Water Quality Testing

The water collected from different point of goalichara was tested at regular interval (throughout the year). The sample was tested for the parameters like pH, ammonia, Dissolved oxygen, BOD₅, and fecal coliform. For fecal coliform testing, Membrane filter technique was used. The potable pH meter HI 8014 by HANNA Instruments was used to test pH. For turbidity testing, Microprocessor Turbidity Meter HI 93703 by HANNA Instruments was used. Iron and Manganese were tested using HACH UV

Spectrophotometer DR/4000U. Suspended Solids, Dissolved Solids, Dissolved Oxygen were tested by standard Methods developed by APHA, AWWA, WPCF (1998).

2.3 Field Visit and Questionnaire Survey

All the sampling points were visited by walking and by Rickshaw and photograph taken with camera. The questionnaire survey was done by group discussion with the people living along the chara.

3. Results

DO, BOD₅, pH, Fecal coli form, Ammonia, are analyzed and their values are abstracted in tables 1 and 2 and relevant figures below (Jafor and Chowdhury, 2009).

3.1 pH

The standard pH value of surface water is 6.5-8.5, in that respect, pH at all the points are within the range. The average highest value of Goalichara is 7.18 & Surma River is 7.2. The following fig shows the pH data of different points.

The highest pH was found at Baluchar and the lowest at Uposhahor. From figure 1 we see that Goalichara downstream and Surma downstream pH is decreases. pH decrease at downstream due to acidic waste which are produced from different sources. For these reason we get pH lower at downstream than upstream.

3.2 Fecal coliform

Avg. Fecal coliform at Baluchar is 15.5/100ml, at Shibgonj 26.03/100ml, at Uposhahor 30.5/100ml, at Chalibonbar 36.25/100ml, at Masimpur 48.91/100ml, at Surma u/s 29.66/100ml, and at Surma d/s 36.66/100ml. Highest no of fecal are present in Masimpur at Goalichara d/s and lowest are present at baluchar at Goalichara u/s. Highest fecal coliform at Goalichara due to domestic sewage discharged

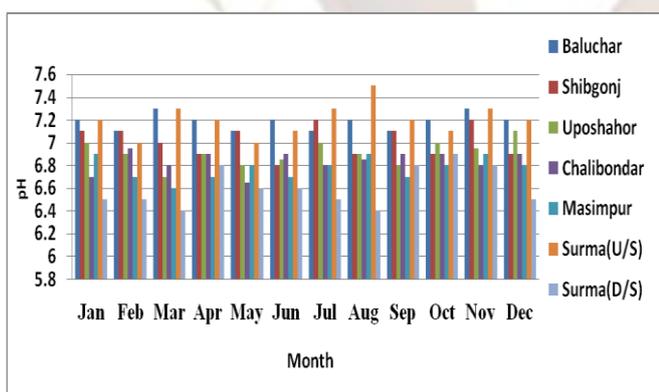


Fig -1: Variation of pH at different location

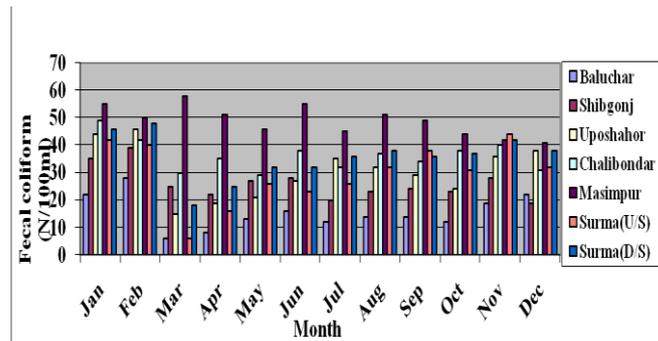


Fig -2: Variation of fecal coliform at different location

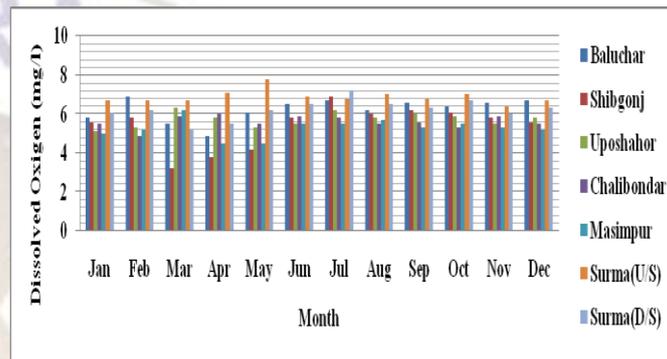


Fig -3: Variation of Dissolved Oxygen at different location

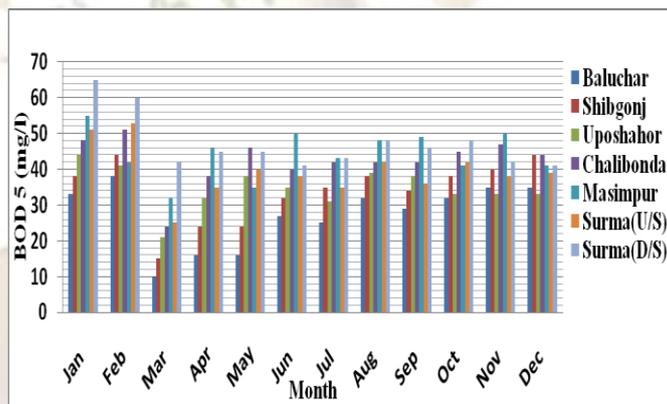


Fig -4: Variation of BOD5 at different Location

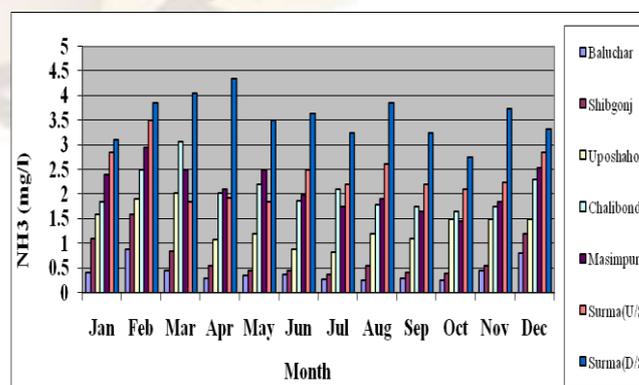


Fig -5: Variation of NH₃ at different location

to the channel directly polluting water continuously. Figure 2 shows the fecal coliform at seven points. Open defecation, sanitary sewage and domestic sullage water is the main causes of fecal coliform of this point. Fecal coliform at Goalichara D/S are higher than Goalichara U/S, when the channel flows through Sylhet city. Sanitary wastes are disposed into the channel which carry high amount of fecal coliform, fecal coliform to Surma river increases when Goalichara channel fall into it. should be zero. At every sampling location, fecal coliform exceed the limit of ECR (1997). Because of urbanization impact fecal coliform of Goalichara d/s is greater than Goalichara u/s.

3.4 Dissolved Oxygen

The main reason DO levels might fall is the presence of organic waste. Organic waste comes from something living or that was once living. It comes from raw or poorly treated sewage; runoff from farms and animal feedlots; and natural sources like decaying aquatic plants and animals and fallen leaves in water.

Warmer water holds less oxygen than cold water. Also, the time of yearly and many other factors affect the amount of DO in water. DO levels can also fall to any human activity that heats the water.

Average Dissolved Oxygen at Baluchar is 6.24mg/l, at Shibgonj 5.41mg/l, at Uposhahor 5.71 mg/l, at Chalibonbar 5.61 mg/l, at Masimpur 5.28 mg/l, at Surma u/s 6.88 mg/l, at Surma d/s 6.22 mg/l. Dissolved Oxygen is highest at Baluchar of Goalichara u/s and lowest at Masimpur of Goalichara d/s. Highest Dissolved Oxygen is reduced because of oxygen is consumed by bacteria to degrade waste. Figure 3 shows the Dissolved Oxygen at seven points. DO at Goalichara u/s is high but it is gradually decreases when Goalichara channel flow through the Sylhet city. Flowing to the downstream, at Masimpur it becomes low because of high amount of waste at Goalichara are being degraded with the passage of time at different locations.

3.5 Biochemical Oxygen demand

The water of Surma River is not suitable for drinking purpose. Average BOD at Baluchar is 27.33mg/l, at Shibgonj 33.83mg/l, at Uposhahor 34.83 mg/l, at Chalibonbar 42.42mg/l, at Masimpur 44.33 mg/l, at Surma u/s 39.5 mg/l, at Surma d/s 47.17 mg/l. BOD at Goalichara channel and Surma river is higher than 2 mg/l permissible value of ECR (1997) due to high concentration of sewage discharged directly to the water. Figure 4 shows the BOD at seven points. BOD at Goalichara u/s is comparatively low but it becomes high at Goalichara d/s may result from domestic or industrial waste water discharge. BOD at Surma river is also high because of various pollution sources are connected with the river. Because of urbanization impact BOD of Goalichara d/s is much greater than Goalichara u/s.

3.6 Ammonia

The water of Surma River is not suitable for drinking purpose. Average ammonia at Baluchar is 0.512mg/l, at Shibgonj 1.025mg/l, at Uposhahor 1.652 mg/l, at Chalibonbar 2.365mg/l, at Masimpur 2.49 mg/l, at Surma u/s 2.53 mg/l, at Surma d/s 3.84 mg/l. At every points except Goalichara u/s, ammonia contents are higher than expected. Following 5 graphically shows the ammonia content at seven sampling points. Ammonia at Goalichara d/s is higher than Goalichara u/s due to animal waste, open defecation, chemical (particularly chemical fertilizer) and domestic waste water discharged from household and hospital waste water discharge. At rainy season, concentration of ammonia decreases than the dry season. Desired value of ammonia according to ECR (1997) is 0.5 mg/l. At Goalichara u/s ammonia value is within the desired value but Goalichara d/s this value are higher than desired value because of urbanization impact.

3.7 Encroachment

Encroachment of Goalichara is the main cause of reducing the width of the chara. Encroachment has occurred in the urban catchment of the chara. Local peoples are also reducing the channel width by filling the side of the channel by soil to meet the accommodation needs or for other purposes. In Baluchar, Shibgang, Uposhahor, Chalibandar, Masimpur encroachment have been found at the time of survey work.

3.8 Sewage & Waste Water Disposal

As the sewerage system has not been established in the city, on site septic tank has been used for sewage treatment. However along the Goalichara, middle class, low income and temporary householders have been found to discharge sewage directly to the chara. In Baluchar and Uposhahor, waste water of TB Hospital and other private clinic is discharged directly to Goalichara deteriorating the quality of receiving waters.

3.9 Open Defecation

Lack of proper maintenance and awareness people are not using the channel properly in many region of the channel; people are using channel as a place of defecation. They think it is less harmful and they also habituated to this action. Children's open defecation in the chara is a common scenario along the long way of chara throughout the city. Lack of proper knowledge open defecation practices is very common to the children that can be easily reduced if parents of children are well aware of. Poor people of Chalibandar and Masimpur are evenly habituated with the open defecation in the channel.

4. Conclusion

The main waste water quality parameters such as DO, BOD₅, Fecal coliform, Ammonia etc. have greatly exceeded the acceptable level of a good water source for water supply. The obtained values for pH ranges from 7.18 to 6.6, for total dissolved solids ranges from 162.75 to 328.75 mg/l, for dissolved oxygen from 6.24 to 5.28 mg/l, for Ammonia from .155 to .3333 mg/l, and Fecal coliform from 15.50 to 48.91N/100ml The results

from data analysis show that, the water is certainly unfit for drinking purposes without any form of treatment.

References

- [1]. Lohani, B.N & Todino, N. (1984), *Water quality index for Chao Praya River*. J. Environ. Eng., ASCE 110(6), 1163 pp.
- [2]. SCC (2005), *Annual report*, Sylhet City Corporation.
- [3]. APHA, AWWA, WPCF (1998), *Standard Methods for the examination of water and wastewater*. 19th Edition.
- [4]. Zafor, M. A. and Chowdhury M.M.H (2009); *“Environmental condition and water quality of Goalichara in the vicinity of Sylhet city”* B.Sc. Engineering Thesis, Department of Civil and Engineering, SUST, Sylhet.
- [5]. ECR (1997); *Environmental Conservation Rules (ECR)*, Department of Environment, Government of Bangladesh.

