WATER QUALITY ASSESSMENT OF "KARNAFULLY" RIVER FROM SHIKALBAHA POWER STATION TO THAI FOOD KHAL DURING FLOOD TIDE AND EBB TIDE

T. Zannat*, B. Rokeya, M. Mostafa & S. M. E. Arafat

Department of Civil Engineering, Southern University Bangladesh, Chittagong, Bangladesh
**Corresponding Author: tasnima09@ gmail.com*

ABSTRACT
Water quality testing is an important part of environmental monitoring. When water quality is poor, it affects not only aquatic life but the surrounding ecosystem as well. Water quality is the key of environmental concern because of its important provision of water for drinking and domestic purpose, irrigation and aquatic life including fish and fisheries. In the Chittagong city and surrounding area of the Karnafully River are polluted by faecal contamination, saline instruction, as well as by agro – chemical, industrial waste and large amount of suspended sediment carried out by upstream flow to the Bay of Bengal through the Karnafully river. Surface water quality is likely to be deteriorated further in future industrial activity intensifies, disperses and agricultural extend abundantly with the increase of population. To investigate water quality of Karnafully river which is locate in Chittagong district, samples are collected about from 200 m up stream and 200 m downstream from the connecting cannel of the Karnafully river in both condition (flood and ebb tide) and tested by standard methods analysed subsequently. From the analysis of water quality parameters a conclusion can be added either the water can be used for drinking, domestic and irrigation purpose or not.

Keywords: Karnafully river; industrial activity; surface water quality; water quality parameters; upstream; downstream

INTRODUCTION
Water pollution is a phenomenon that is characterized by the deterioration of the quality of water as a result of various human activity1. There are other minor sources that contaminate surface water extensively2.
The Karnafully, Halda and other rivers of Chittagong division are showing gradual decline in water quality. The water quality of Karnafully river is degrading day by day as industrial wastes are dumped directly without going through any purification process. According to Ahmed 3, Sylhet pulp and paper mills at Chhatak, Karnafully paper mills at Chandragona, Fertilizer factory at Fenchugonj and Ghorashal, Hazaribag tanneries in Dhaka contributed to the depletion of fisheries resources of Surma, Karnafully, Kushiara, Sitalakhya and Buriganga Rivers, respectively. The USA National Water Commission stated that water gets polluted if it has been not of sufficiently high quality to be suitable for the highest uses people wish to make of it at present or in the future4. Usually these waters do not remain fit for human consumption and for the life of plants and animals5. There are many waste products of industries which is potentially dangerous to the enviromnent. In Bangladesh a few of the different industries treat their effluent before discharging it in the environment. Any stream has its own self-purification process. But if the pollutant is more enough then stream self-purification system will not work. These types of polluted water cannot be used for drinking, domestic and irrigation purposes. So it is required to assess the quality of Karnafully river water either it is up to the mark for using those purposes.

The objectives of this study are:
1) To determine the causes that how Karnafully river is getting polluted day by day.
2) To determine the various essential physical and chemical parameters to assess the water quality of Karnafully river from Shikalbaha Power Station to Thai Food Khal during flood tide and ebb tide.

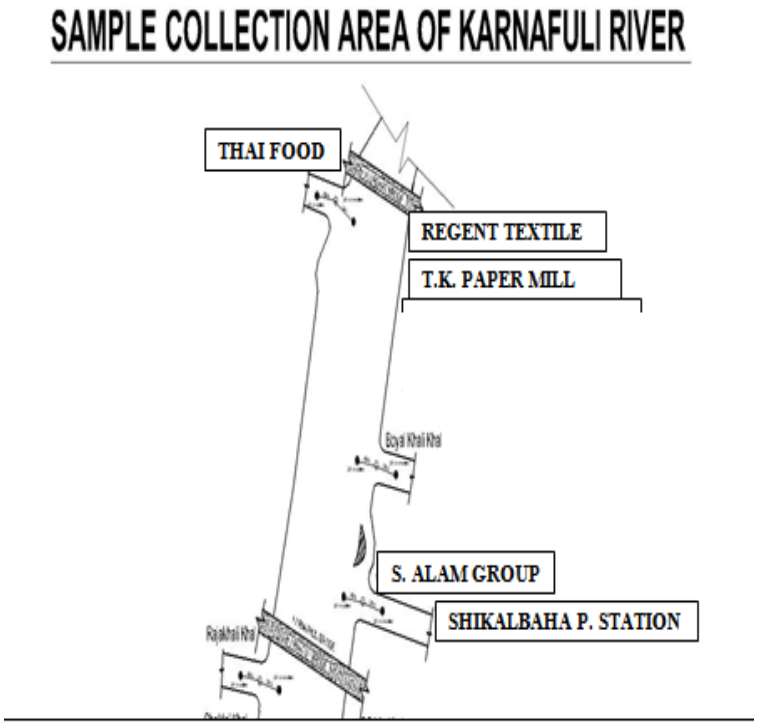
3) To compare the results with the Bangladeshi standards.
4) To predict the environmental effects of emerging man-made contamination.

METHODOLOGY

- The whole study area (from Shikalbaha Power Station to Thai Food Khal) is surveyed. How the water gets polluted is analyzed firstly. The industries located beside the river are identified.
- In this study the samples are collected from 05 stations (from intake point to 200m up and 200m down) at Karnafully river during flood tide and ebb tide.
- Among the various parameters 10 water quality parameters are tested.

Collection of samples

Surface water samples from different places of karnafully river were collected for study. A cross sectional descriptive study was conducted in karnafully river. Data collected from towards of bay of bangle to captain lake by cluster sampling in this area we have collected the samples from 05 stations. Samples were collected in amber color 1.5L plastic bottle cleaned by rinsing thoroughly with 8M HNO3,followed by repeated washing with distilled water. the surface water samples were collected under one meter below from the water surface. Before and after the sample collection, the cap was locked sufficiently so that no air space can be remained inside. Proper labeling was made in each sample by monitoring the name and the location of sampling side, date, and time of collection. Samples were collected early in the morning and in the afternoon in high tide and low tide. The collected water samples were immediately to the laboratory of the Mohara Water Treatment plant for the analysis.



RESULTS AND DISCUSSIONS

Table 1: Water quality of the Karnafully River at different locations

	Water Quality Parameters(Concentration Present)									
Name of the station	pH	Iron (mg/l)	Electrical Conductivity (EC) at 25^0 C(µS/cm)	DO (mg/l)	Total Hardness (as $CaCO_3$) (mg/l)	BOD (mg/l)	Salinity (mg/l)	TDS (mg/l)	Temperature (˚C)	Alkalinity (mg/l)
1.1Shikalbaha Power Station ;(Flood Tide-200 m Up-Stream)	6.25	0.43	17936	3.95	768	121	7.2	9075	26	10
1.2 Shikalbaha Power Station;(Flood Tide-200 m Down Stream)	7.33	0.75	17725	3.86	689	128	6.8	8986	26	31.90
1.3 Shikalbaha Power Station ;(Ebb Tide-200 m Up-Stream)	6.75	0.40	17690	3.92	794	134	6.9	9121	26	12
1.4 Shikalbaha Power Station;(Ebb Tide-200m Down Stream)	6.29	0.49	17886	3.98	698	138	6.7	9052	24	38.90
2.1 S.Alam Khal ;(Flood Tide-200m Up-Stream)	6.30	0.52	18570	2.98	580	212	6.8	9386	26	12
2.2 S.Alam Khal ;(Flood Tide-200 m Down-Stream)	7.39	0.77	18486	2.87	654	198	6.5	9475	26	29.4
2.3 S.Alam Khal ;(Ebb Tide-200 m Up-Stream)	7	0.43	18181	2.92	545	218	6.7	9275	26	12.7
2.4 S.Alam Khal ;(Ebb Tide-200 m Down-Stream)	6.15	0.37	17995	2.89	570	216	6.6	8891	24.6	38.90
3.1 T.K.Paper Mill Khal;(Flood Tide-200 m Up-Stream)	6.35	0.28	19220	1.59	675	348	6.8	10510	26	14
3.2 T.K.Paper Mill Khal ;(Flood Tide-200 m Down Stream)	7.19	0.69	19650	1.45	693	356	6.8	9831	26	37.2
3.3 T.K.Paper Mill Khal ;(Ebb Tide-200 m Up-Stream)	7	0.34	19524	1.42	690	352	6.7	9512	26	15.6
3.4 T.K.Paper Mill Khal ;(Ebb Tide-200 m Down-Stream)	7.25	0.72	19675	1.56	702	349	6.5	10317	24	33.9
4.1 Regent Textile Khal ;(Flood Tide-200 m Up-Stream)	7.08	0.67	19171	1.02	745	393	6.7	10491	26	122.8
4.2 Regent Textile Khal ;(Flood Tide-200 m Down-Stream)	7.12	0.48	19386	1.12	695	389	6.6	10120	26	27.2
4.3 Regent Textile Khal ;(Ebb Tide-200 m Up-Stream)	8.2	0.56	19532	1.08	768	387	6.7	10328	26	124.2
4.4 Regent Textile Khal ;(Ebb Tide-200 m Down-Stream)	7.10	0.45	19612	1.11	688	391	6.6	9895	24	26.8
5.1 Thia Food Khal ;(Flood Tide-200 m Up-Stream)	6.15	0.60	17890	2.59	759	256	6.7	9185	26	123
5.2 Thia Food Khal ;(Flood Tide-200 m Down-Stream)	7.16	0.49	17786	2.63	779	262	6.6	8372	26	8.67
5.3 Thia Food Khal ;(Ebb Tide-200 m Up Stream)	6.72	0.46	17699	2.57	802	266	6.8	8511	26	125
5.4 Thia Food Khal ;(Ebb Tide-200 M Down Stream)	7.59	0.58	17886	2.61	845	259	6.7	8431	24	9.76

GRAPHICAL REPRESENTATION

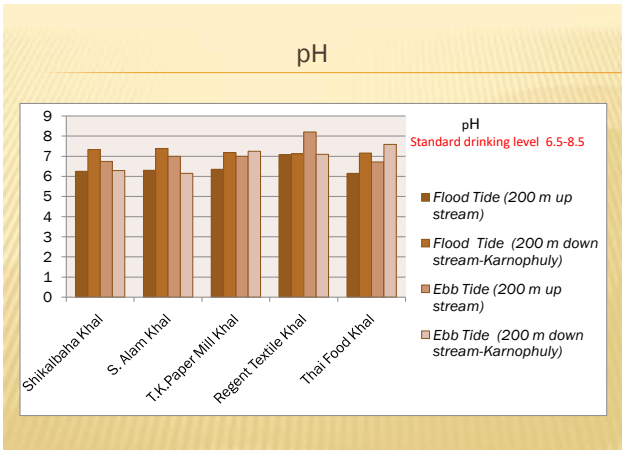


Fig.1: Variation of pH at different stations

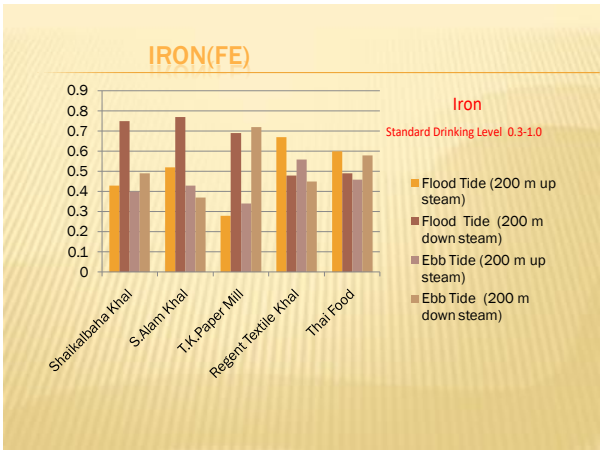


Fig.2: Variation of Iron at different stations

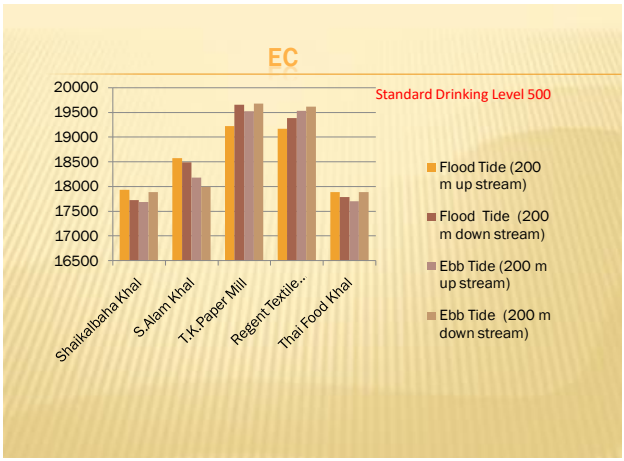


Fig.3: Variation of EC at different stations

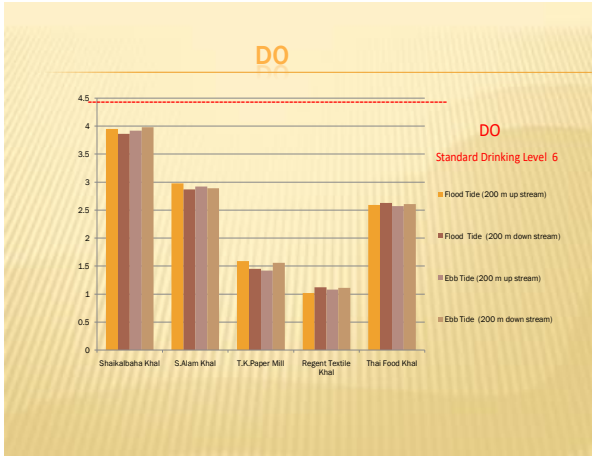


Fig.4: Variation of DO at different stations

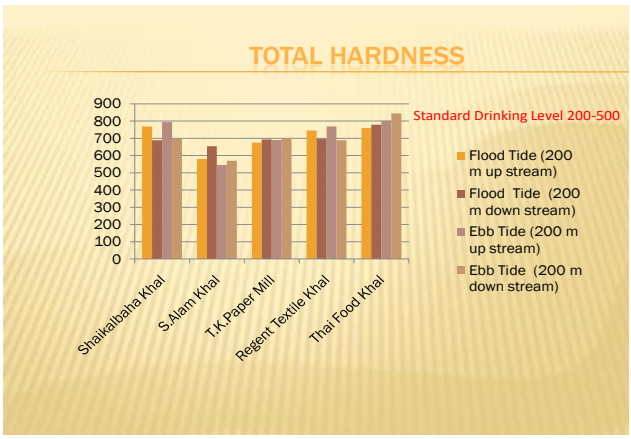


Fig.5: Variation of Total Hardness at Different Stations

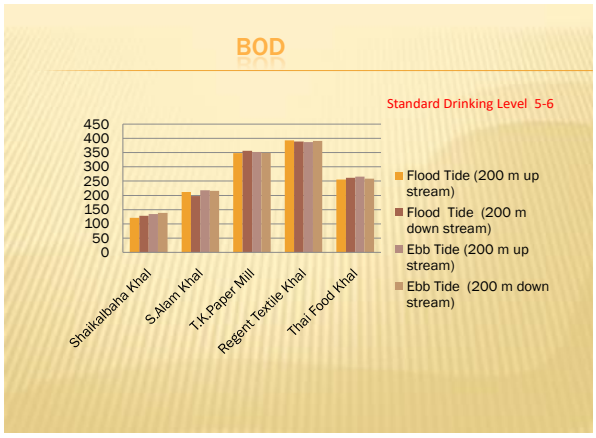


Fig.6: Variation of BOD at Different Stations

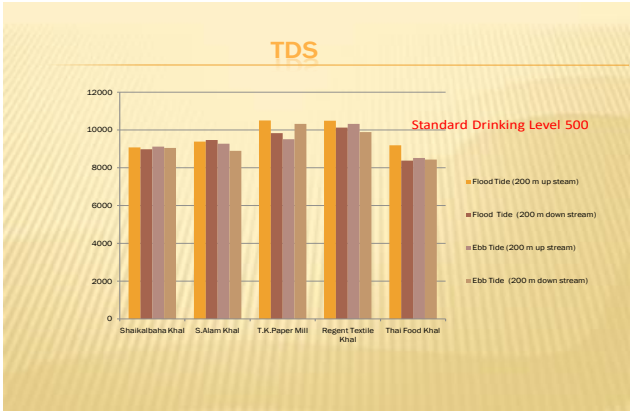


Fig.7: Variation of TDS at Different Stations

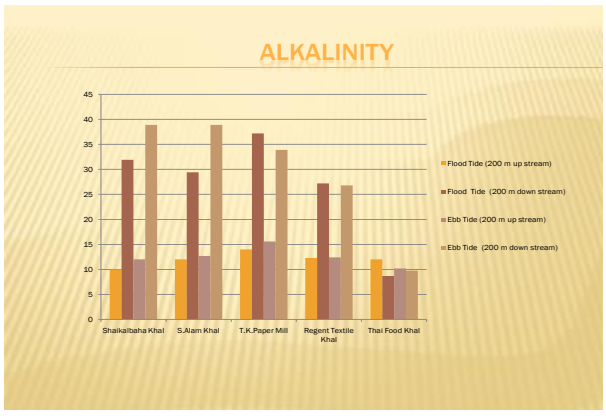


Fig.8: Variation of Alkalinity at Different Stations

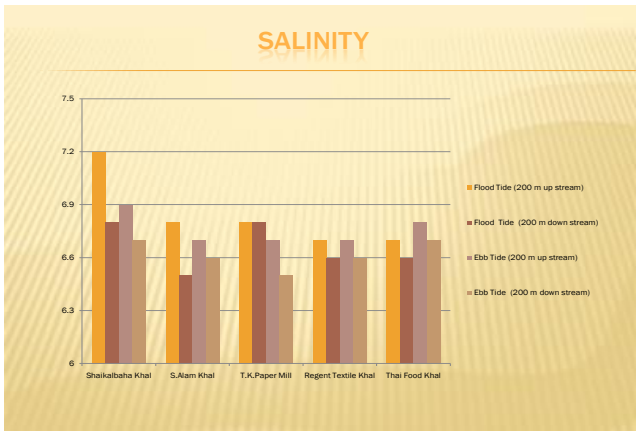


Fig.9: Variation of Salinity Different Stations

DISCUSSION

Temperature: Ambient temperature (AT) of the KARNAFULLY River water Table 1 shows that at most sampling time ambient temperature was found between 250C - 260C. Highest temperature (260C) was found at low tide.

pH: The descriptive statistics of the surface water pH value (Table 1) shows that most of the samples were found in the alkaline pH range i.e. within the CCC limit. Highest value (8-2) was found at ebb tide at Regent Textile point and lowest value (6.15) was found at flood tide at Thai Food point.

Electrical conductivity: Highest value (19675 µS cm-1) was found at T.K.Paper Mill point at low tide and lowest value (17690µS cm-1) was found ebb tide at Shikalbaha point.

Total dissolved solids (TDS): Highest value (10510 mg L-1) was found at flood tide at T.K.Paper Mill point and lowest value (8372 mg L-1) was found flood tide at Thai Food point.

Dissolved Oxygen (DO): Lowest value of DO 1.02mg/L-1 was found at flood tide at Regent Textile point and highest value of DO 3.98 mg/L-1 was found at ebb tide at Shikalbaha point.

Total Alkalinity: Highest value (38.90 mg/L-1) was found at ebb tide in at Shikalbaha point and lowest value (8.67 mg/L-1) was found at flood tide at Thai Food point.

Total Hardness: Highest value (845 mg/L-1) was found at ebb tide at Thai Food point and lowest value (545 mg/L-1) was found at ebb tide at S.Alam point.

Biochemical Oxygen Demand (BOD): This is a water quality parameter for organic mater in water, which is empirical in nature. Highest value (393 mg/L-1) was found at flood tide at Regent Textile point and lowest value (212 mg/L-1) was found at flood tide at S.Alam point. Higher values are found for most of the points except River mouth and Kaptai.

Iron: Highest value (0.77mg/L-1) was found at flood tide in the at S.Alam point and the lowest value (0.34 mg/L-1) was found at ebb tide at T.K.Paper Mill point.

Salinity: Highest value (7.2 mg/l^{-1}) was found at flood tide in at shikalbaha point and the lowest value (6.5 mg/l^{-1}) was found at flood tide at s.alam point.

CONCLUSIONS

The present physicochemical study of surface water resources of Chittagong division discloses the status of water quality of this division. It also identifies the sources and intensity of pollution load on surface water resources of this region. Karnafully, the principal river of this division is severely polluted from anthropogenic sources. From the present physicochemical study of surface water resources of the Chittagong region, it can be concluded that the condition of the Karnafully River is critical and Halda River may be affected by the polluted Karnafully River water. The Karnafully River water quality significantly varied with seasons, tide conditions and locations. From the location dependent variation it can be concluded that effect of sea water reaches up to the Kalurghat point. So there is possibility of destroying biodiversity of the Halda River by the intrusion of polluted Karnafully River water in the pre-monsoon period at high tides. Due to this, spawning of carps are decreasing gradually and lesser quantities of fish eggs are being harvested nowadays. Decreasing trend of DO of the Karnafully River water was observed. Minimum DO value found for the Karnafully River water indicates the critical condition of this river. Only tidal cycle keep the KARNAFULLY River alive. If there were no tidal cycle, the Karnafully would have been turned into a dead river like Buriganga and Turag of Dhaka. Higher BOD values found at regent textile & T.K. Paper Mill points of the Karnafully River and wastes and effluents of the industries and Chittagong City Corporation area, respectively. Higher values may be due to the washing out of fertilizer from agricultural fields and detergents used in household purposes which ultimately disposed off into the river water.

REFERENCES

Ahmed, A. 1999. *Safe water supply: Environmental problems and Strategies*.
Chhatwal, GR. 1998. *Encyclopedia of environmental Management*", Anmol Publications Pvt. Ltd., New Delhi, India, 67.
Islam, MZ; Azim, MA; Islam, R and Quraishi, SB. 2008. *Journal of Bangladesh Academy of Sciences*, 32(1):13.
Pande, GC and Pandy, DC. 1999. *Environmental Development and Management*. Anmol publication Pvt. Ltd. India.
Rag, G and Trivedi, PR. 2002. *Water pollution*, 5.
Majid, MA. 2002. *Development of fisheries in Bangladesh*, 2002, 80.