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Researches in Effluence and Environmental flow of Turag River – a review

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***Abstract*-** Articles regarding water contamination of Turag river have been reviewed. As an investigation article from various printed articles of worldwide reputed journals reports of renowned association and e-books is assembled. Besides, this work finds the interpretation of data and discussions published in different research papers. The water of Turag river is inappropriate for washing, underwater life and domestic supply because of the severe effect of the discharge of raw industrial and local wastes. Turag river and its virulent is an issue of growing import for environmental, evolutionary, and environmental reasons as wide range of contaminants are continuously introduced into the river. The fundamental situation of the river is of serious perturb, and there is an crucial need to take firm actions to confirm cleaning of the river and stop further contamination. This review work provides views and proposals to explain the assessment of water contamination of river water.

***Keywords*-** Turag River, Water quality parameter, Heavy metal Contamination, Environmental Flow

I. INTRODUCTION

Advanced as well as evolving countries for both water contamination problems are common [1]. Activities like industrialization, extracting, urban expansion and cultivation also affect water quality. Nutrients, deposits and poisonous pollutants are in non-point source contamination [2].

While worldwide care has concentrating mainly on water amount, water-use efficacy and distribution matters, the poor organization of wastewater, industrial and agricultural drainage has made severe water quality difficulties in many portions of the sphere, worsening the water disaster (Biswas et al., 2012).

Turag River of Bangladesh is a tide-influenced River flowing through west-north and north of Dhaka City [8] [Fig. 1]. Three fourth water of Turag is used in domestic and industrial purpose but in return the domestic sewage and industrial wastes those are throne significantly hamper the water quality[4]. About 15,000 m^3 of raw substance trashes are settled to the low-lying areas and usual waterways of Turag rivers [5]. Due to the heavy discharge of pollutant by the industries situated sideways of the banks of the river which causes a dangerous level of water abysmal, is declared to be in an ecologically critical state by the department of environment in September 2009. The majority of the manufacturing don't have waste administration arrangement and have made slight struggle to monitor conservational rule, which causes the water evidently faded [6]. Simultaneously metropolitan and manufacturing raw pollutants are also deposited on the sideways of the Turag River as an exposed space, which is linked with the river and releases toxic smell. Throughout rainy season, raw pollutants are ran through the river and entirely disrupt the water quality of the river. In this consideration, the damaging effects of manufacturing sewages and raw pollutant on the quality of water need to be examined to confirm water quality, community healthiness and their well-being. Pollutant stages crossing allowable standards can cause long-lasting affects—indistinct but prevalent changes that ultimately degrade the health of separate organisms and inhabitants. Certain long-lasting effects consequence from bioaccumulation, as an organism collects pollutants within its skins over the sequence of its life, and bio-manipulation, as viruses pass on their accumulated amounts to predators [24].

Present works delivers dispersed evidence on water contamination from home sewage and industrial wastes, but does not include a complete assessment, which is what this writing articles to deliver. The report pursues to accumulate and assimilate the best available evidence and statistics. It covers different papers, including data and inspects deviations in water bodies and the atmosphere and the reactions desirable to stop contamination and alleviate risks.

This article delivers an examination of problems and decisions for development.

II. WATER QUALITY CONSTRAINTS AND HEAVY METAL CONTAMINATION

Effluence can happen in numerous means in a river like Turag such as chemically, substantially and organically. Deficiency happens when the rate at which contaminant resources arrive water bodies surpasses their usual volume to adapt them.

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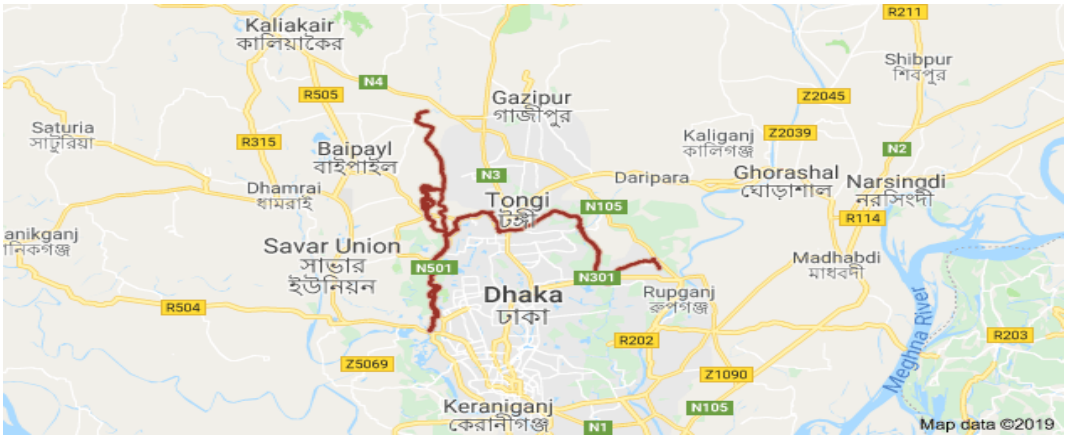

Fig 1. Turag river from Google map

Aktar, and Moonajilin (2017) assess the status of water quality of Turag River by reason of heavy metallic constraints like ,Zn, Cu, Cr, Cd, Pd, pH level, Biochemical Oxygen Demand (BOD5), Dissolved Oxygen (DO), Electrical conductivity (EC), Total Solids (TS), Total Dissolved Solids (TDS), and Industrial waste and it is concluded that most of the industries release pollutants directly or indirectly to the Turag River (Fig. 2).

Hafizur et al. (2017) investigated physicochemical parameter, heavy metal in Turag river water and adjacent industrial effluent in Bangladesh. Writers presented a cyclic design of alteration. Values of nearly all the constraints persisted high throughout the dry season with a minor river flow as related to the wet season. Results of the study display that the inclusive levels of contamination in Turag River are beyond the onset limits Fig. 3.

TABLE I
PERMISSIBLE LIMITS OF HEAVY METALS IN DRINKING WATER [27]

Heavy metal	Permissible limit				
	WHO	USEPA	ISI	CPCB	ICMR
Iron(mg/l)	0.1	-	0.3	1.0	1.0
Cupper (mg/l)	1.0	1.3	0.05	1.5	1.5
Mercury (mg/l)	0.001	0.002	0.001	No relaxation	0.001
Cadmium (mg/l)	0.005	.005	0.01	No relaxation	0.01
Arsenic (mg/l)	0.05	0.05	0.05	No relaxation	0.05
Lead (mg/l)	0.05	-	0.10	No relaxation	0.05
Zinc (mg/l)	5.0	-	5.0	15.0	0.10
Chromium (mg/l)	0.1	-	0.05	0.05	No relaxation

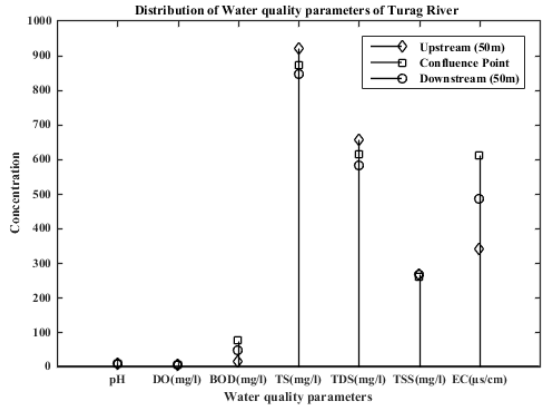

Fig 2. Distribution of Water quality constraints of Turag River. (Note: Source: Aktar, and Moonajilin (2017))

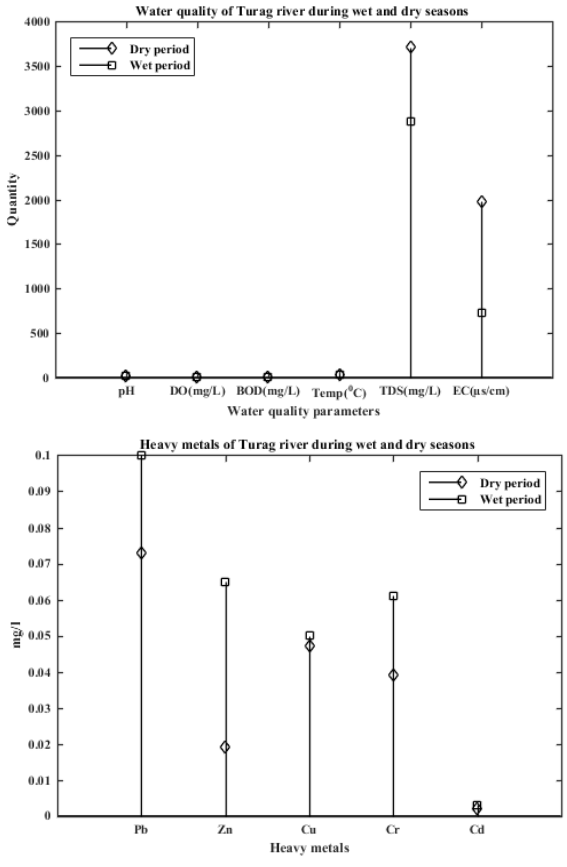

Fig **3.** General water quality of Turag river during wet and dry seasons (Note: Source: Hafizur et al. (2017).

Halder and Islam (2015) presented water contamination and its influence on the human health. Authors determined that due to the less melted oxygen (DO) stages and other measured constraints in the river the water quality of Turag river may not be in appropriate condition for using domestic purposes and for the aquatic life. Absorption of these components found in the Turag river is much higher than the usual allowable limit (Fig. 4)[10].

TABLE II .
THE MAXIMUM VERIFIED VALUES WERE

pH	7.1 mg/L
Color	625 ptcu
Turbidity	97.2
BOD5	4.65 mg/L
Hardness	1816 mg/L
TDS	676mg/L
Cl.	5 mg/L
CO_2	15.5
COD	78 mg/L

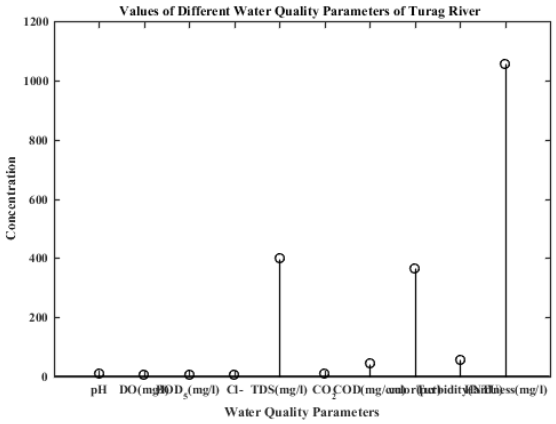

Fig 4. The analysis of the samples collected from Turag River (Note:Source: Halder and Islam (2015))

Islam et al. (2012) deliberated effects of raw waste and manufacturing wastes on water quality of Turag River at Konabari industrial area, Gazipur, Bangladesh (Fig. 5).

The upstream and downstream sample water from the Turag river have examined, The continuous putting of leftover supplies caused in order of decrease in the accumulation of metals in the river water varied in the order of Cd < Cu < Pb < Zn< Fe. Authors concluded that the downstream water in the river is nearly contaminated and inappropriate for human ingestion and aqua-farming grounds.

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TABLE III
THE EXTREME VALUES WRITTEN BELOW

pH	EC	TDS	DO	BOD
7.24-7.61	425-2277 µS/cm	239-1349 ppm	1.22-3.66 ppm	-2.44-0.86 ppm

Islam and Azam (2015) worked periodic distinction of physicochemical and poisonous attributes in three main rivers; Shitalakhya, Buriganga and Turag nearby Dhaka city, Bangladesh.

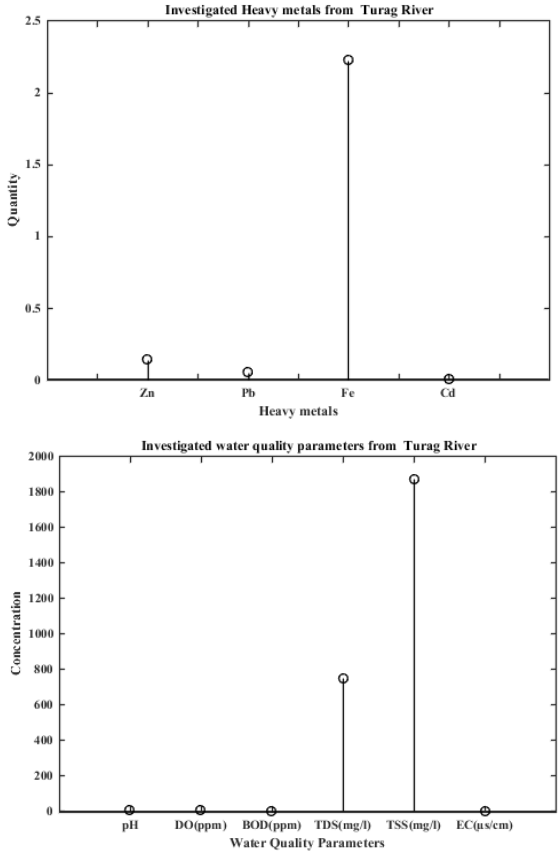


Fig 5. Investigated water quality constraints of the Turag River (Note: Source: Islam et al. (2012))

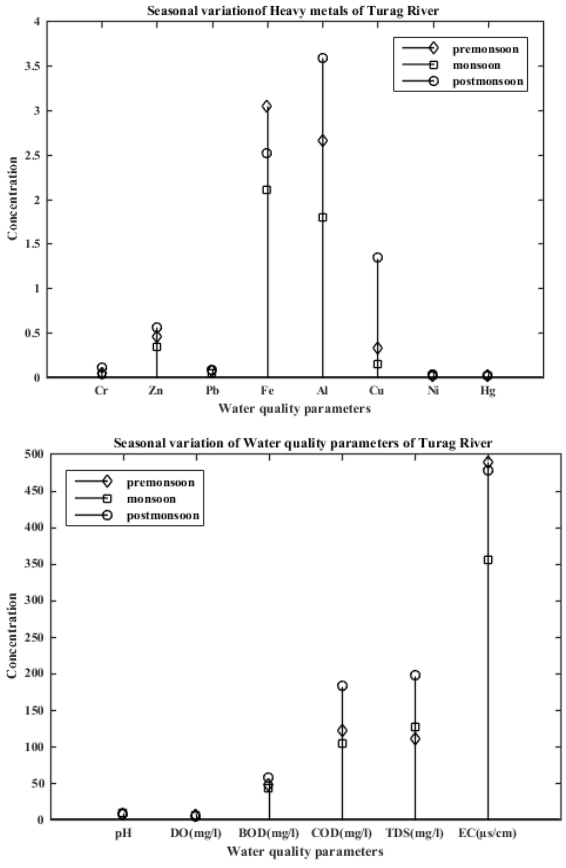


Fig 6. Seasonal dissimilarity of water quality constraints and heavy metals of Turag River (Source: Islam and Azam (2015)).

Comparatively good water quality was discovered in rainy season and the cyclical direction of contamination sequence is monsoon < pre-monsoon < post-monsoon. Water quality situations were dangerous throughout post-monsoon, due to upsurge of anthropogenic intrusions, low precipitation and river current (Fig.6).

The sequence of total cyclical average metal concentration of Turag river is Al>Fe>Cu>Zn>Pb>Cr>Ni>Hg.

Islam et al. (2018) examined hydro-environmental contamination of Turag river in Bangladesh, Higher absorption of potassium and phosphate ion in surface water and similar overthrow on deposit has been documented. The preoccupation of minerals and ions is arbitrarily high in the surface water and surface deposit in the Turag river (Fig. 7).

TABLE IV
THE OBSERVED VALUES OF HEAVY METALS ARE WRITTEN BELOW

Heavy metal / Site	Na	K	Cl-	PO4 3-
In water	22.10 mg/L	13.20 mg/L	108.50 mg/L	17.80 mg/L
Deposited	1359.07 mg/kg	2526.10 mg/kg	37.50 mg/kg	31.76 mg/kg

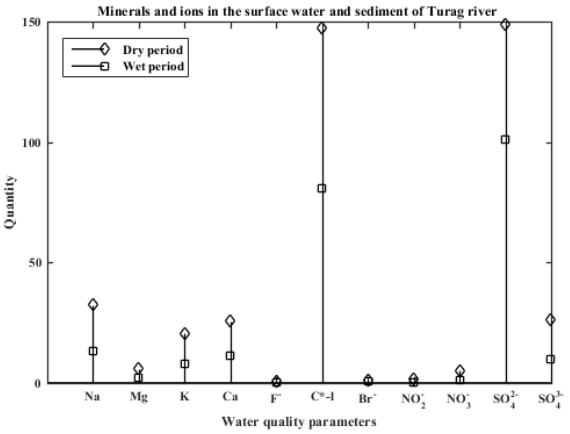


Fig 7. Minerals and ions in the surface water and sediment of Turag river (Note:Source : Islam et al. (2018))

Meghla et al. (2013) scrutinized assessment of physicoorganic characteristics of water from the Turag River in Dhaka City, Bangladesh, Turag River showed high pH, EC, TDS, BOD, hardness and Cd absorption, while it had less DO values which are susceptible for aquatic beings and their locale (Fig. 8).

Mobin et al. (2014) reviewed investigation of physic-organic characteristics of the Turag River water, (Fig.9). Authors suggested that the water quality of the Turag River is beyond the appropriate limit.

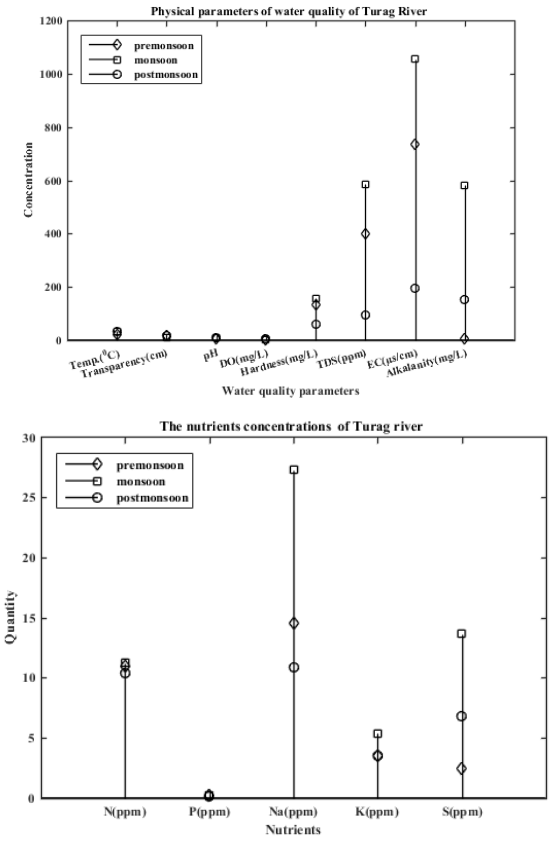


Fig 8. The nutrients and organic constraints of water quality of the Turag River throughout post-monsoon, Pre-monsoon and monsoon seasons (Source: Meghla et al. (2013)).

TABLE V
CHARACTERISTICS OF TURAG RIVER ARE GIVEN BELOW:

Constraints	Range	Average
Temperature	20º to 30ºC	28.39ºC
pH	-	6.83
DO	0.6 to 3.9 ppm	2.25 ppm
BOD	-	1015
TDS	-	340.86 ppm
EC	35 to150 µS/cm	-
Transparency	-	28.39 cm
Hardness	-	106.79 ppm
Alkalinity	-	237.66 ppm

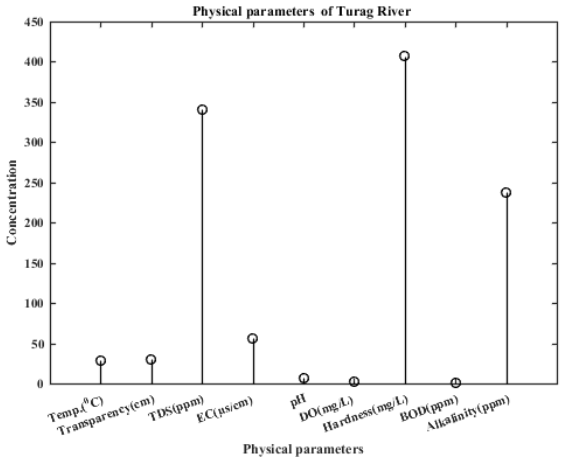


Fig 9. Physical constraints of the Turag River water (Source: Mobin et al. (2014))

Rabbani and Sarker (2017) inspected contamination sources assesment of Turag River, Bangladesh, Authors visited sites of Turag since 2014 till 2015, settled that both point sources and non-point sources of contamination exist around the river. Vast loads of raw surplus are also found on the bank of Turag river, several manufacturing waste water drops straight into the river through pipes, canals, open drains etc. pollute the river water and certain storm drain pipes, open drains, various small and big private channels have been also situated.

Rabbi et al. (2016) surveyed contamination status of Turag River spatial and chronological distinction of water quality.

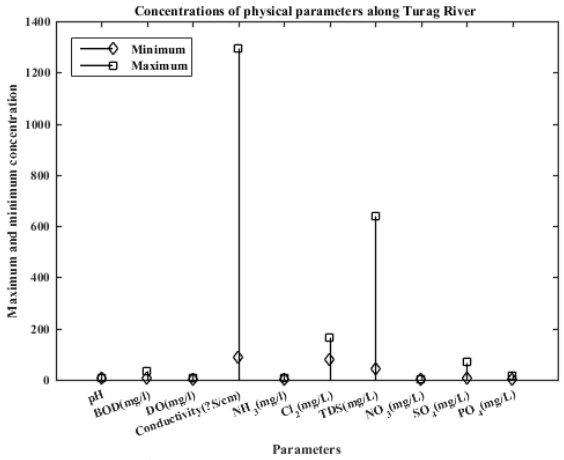
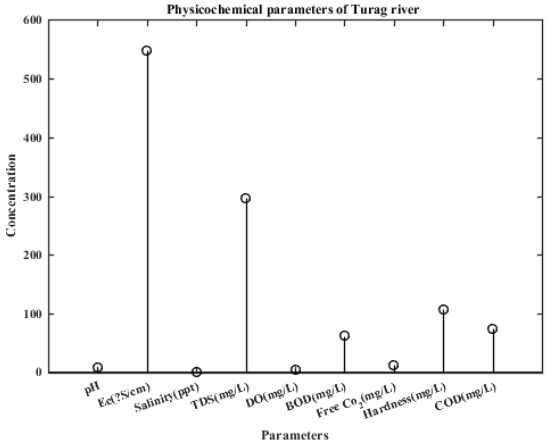


Fig 10. Ranges of concentrations of physical constraints along Turag river (Source : Rabbi et al. (2016)).

The investigated pH values, Bio-organic oxygen demand are progressive, melted oxygen is lesser, Electrical conductivity and total melted solids were above the DoE standard during dry season. Phosphate and ammonia levels were mostly higher from the DoE standard [19] , (Fig. 10).

Rahman et al. (2012) evaluated article of the cyclical dissimilarities in Turag river water quality constraints.

Due to the enlarged values of the constraints pH, DO, BOD, COD and free CO2 the water of Turag was not appropriate for human ingesting without appropriate action (Fig. 11).



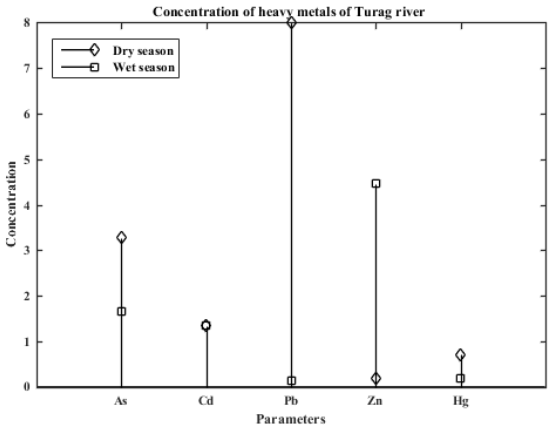


Fig 11. Concentration of heavy metals and Physicoorganic constraints of Turag river water (Source : Rahman et al. (2012))

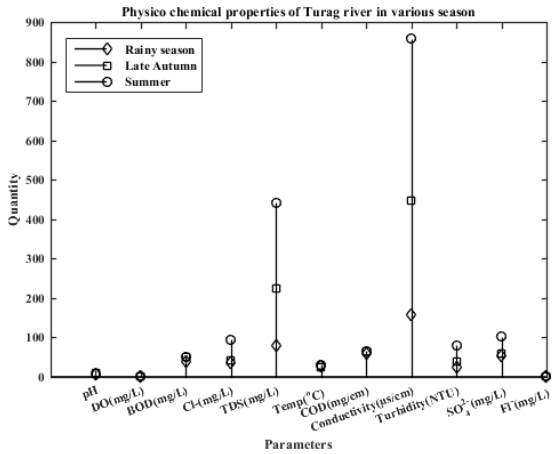


Fig 12. Physico organic characteristics of Turag River (Source: Saha et al. (2017)

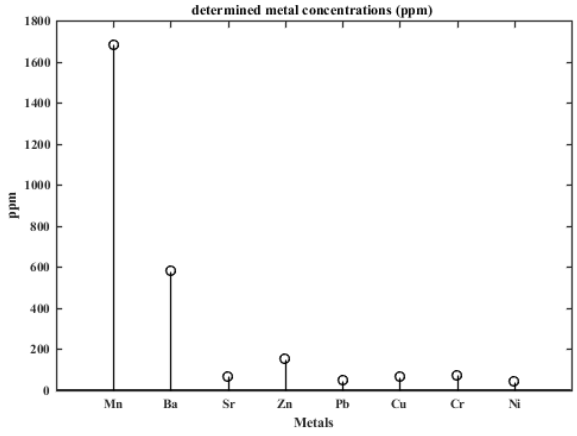


Fig 13. Determined metal concentrations (ppm) (Source : Zakir and Shikazono, (2008))

Saha et al. (2017) inquired bacterial and organic contaminationlevel of the river Turag, Gazipur, Bangladesh.

The capacity of aerobic heterotrophic bacteria and the presence and abundance of enteric and related bacteria such as Plesiomonas, Alcaligenes, Escherichia, Proteus etc. are in significant level of microbial contamination in the river. In terms of DO, BOD and COD values, the river Turag water was found to be contaminated (Fig. 12).

Zakir and Shikazono, (2008) studied valuation of metal contamination in lower Turag River in Bangladesh.

TABLE V
CHARACTERISTICS OF TURAG RIVER ARE GIVEN BELOW

CONST-RAINTS	RANGE	HEAVY METALS	RANGE
PH	6.6 - 7.98	Zn	0.04 - 0.4
EC	160 - 1107 µs/cm	Cd	0.043 - 2
DO	0.11 - 6.8 mg/L	As	1.15 - 4.8
BOD	10 - 180 mg/L	Pb	2.29- 18.62
CO_2	5 to 22 mg/L	Hg	0.12- 1.45

The values of the I_{geo} defined as follows:

$I_{geo} = \log_2 = \frac{Cu}{1.5 \times Bn}$

where, *Cu* is the calculated absorption of component n in the deposit and *Bn* is the geo-organic background for the component n which is either directly measure in sediments of the area or taken from the works [23]. The factor 1.5 is presented to contain likely differences of the background values that are due to lithological dissimilarities.

According to I_{geo} index, the distribution pattern of heavy metals in the lower Turag River indicates that the river studied has not so far polluted yet but if it is continued, the magnitude of the metal contamination in the river will increase to intolerable limits (Fig. 13)[22],

III. ENVIRONMENTAL FLOW

Rahman et al. (2013) studied environmental flow constraint and comparative study of the Turag River, Bangladesh, From all situations the Turag suffers from substantial hydrologic alteration that reveals decrease of flow in recent time (Fig. 14).

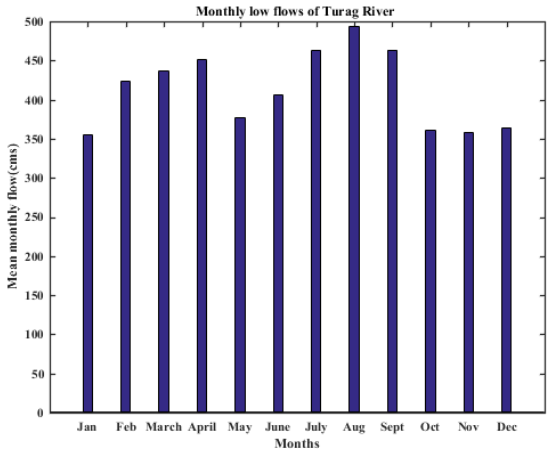


Fig 14 Environmental Flow Components (Source: Rahman et al. (2013))

Hafiz et al. (2017) studied simulation of hydrodynamic constraints of Dhaka outlying River scheme of Bangladesh,

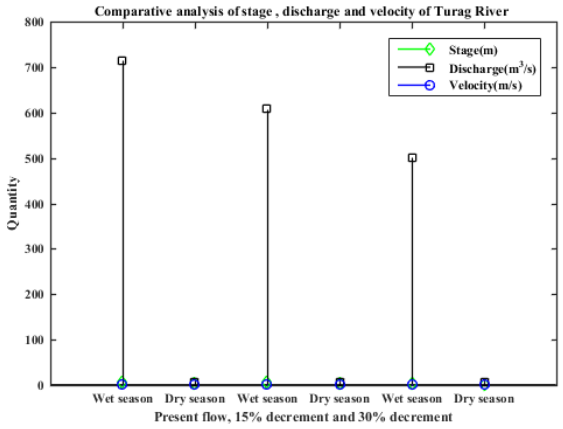


Fig 15. Comparative analysis on hydrodynamic constraints (a) Stage (b) Discharge (c) Velocity (Source : Hafiz et al. (2017))

Velocity distribution showed that, the velocity of the rivers in the wet season is satisfactory to maintain the ecological balance, but in dry season it becomes 0. Thus the river is declining day by day in a devastating manner. Over the years, The Daily Star has been often elevated its speech against the slow but assured death of the rivers around Dhaka due to violation, putting of pollutants and lack of dredging [25].

IV. CONCLUSION

Zakir and Shikazono, (2008) concluded that the Turag river has not so far polluted in 2008 but at present after 2008 to 2018 all the authors analyzed that the river is over polluted. So growing development and associated challenges affecting our aquatic atmosphere. The metals go in the atmosphere through aquatic life systems and plants and animals nearby the river. The risk of bio-accumulation and bio-magnification of the pollutant make a big threat to human health and welfare. Hence, it is required that steps should be taken to reduce the effluent load deposited into the river and also dredging is also essential for environmental flow of the river. This review proposed that various sources of heavy metals in the water and deposits of the river should be closely observed; development of circumstances and industrial pollutant and domestic sewage release should be sustained.

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