NNPublication Journal of Advance Research in Food, Agriculture and Environmental Science ISSN: 2208-2417

DOI: https://doi.org/10.53555/nnfaes.v9i8.1766 Publication URL: https://nnpub.org/index.php/FAES/article/view/1766

ADDRESSING THE IMPACTS OF TEXTILE INDUSTRIES ON ENVIRONMENT AND SOCIO- ECONOMIC CONDITION OF BANK TOWN AND BARAIGRAM AREA: A MANAGEMENT PERSPECTIVE

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Abstract

Textile industry is a well-established industrial sector in Bangladesh and ranked top in terms of export earnings. Because of its high value addition and huge growth and employment opportunities, textiles a thrust sector of the country. Textile industry of Bangladesh includes yarn and fabric manufacturing, dyeing and printing, making ready-made garment products and exporting them. A huge quantity of solid and liquid wastes is dumped out of the textile industries in Bank Town and Baraigram Area. The toxic effluents and solid waste of the textile industries contaminate soil, air and the water of the adjacent Karnatali river and leads to severe ailments such as eye diseases, skin irritations, kidney failure and gastrointestinal problems. Besides the ETP of these industries are not used properly. The industries in this area are adjacent to the locality. So, the government needs to be conscious about the externalities of the project. Because these unplanned industries could cause severe damages to agricultural land and species of Karnatali River. Not only the adverse environmental impact but also the socio-economic issues such as availability of inputs, skilled workers and markets, provision of adequate accommodation for the workers and standard of living condition. To make it fruitful, environment friendly, long according the detailed feasibility and EIA study of the project. There also needs address the probable risks of the project on the surrounding agricultural lands, river human health, surrounding environment and socio-economic condition of the people After addressing those problems necessary and fruitful initiatives the planning perspectives should have to be taken to make this contemporary policy fruitful for the environment, surrounding areas, people and finally for the economic structure of the country.

Keywords: *Textile Industry, Toxic Effluents, Diseases, Sustainable Urban Growth, Bank Town and Baraigram Area.*

1. INTRODUCTION

1.1. Background of the study

Industrial pollution is one of the major problems that Bangladesh facing to a greater extent. They are one of the largest water users and polluters. The careless disposal of industrial effluents and other wastes may contribute greatly to the poor quality of the water. The quality of water interferes with the aesthetic and economic pursuits of water bodies by affecting fish and other aquatic life (Tareq et al., 2013). The effluent when released into the environment, more precisely into the water pollutes the surface and ground water. Industrial effluents discharged into the water bodies or the natural hydrological system is the number one threat by far to the environment. Industrial development has always been developed close to a river system so that the effluents that are generated in the process can be easily discharged into the river. As a result of the waste industrial or household discharged into the river systems, for the last few decades the rivers that are close to any industrial sector are showing effects of it. These pollutions are more severe around the Dhaka city and its surrounding areas. The pollution in these rivers is so severe that even the wet period cannot flush them out. And during the dry period the entire river is full of industrial effluent.

1.2. Objective of the Study

- To determine the impacts of textile industries on the environmental condition of the study area.
- To address the impacts of textile industries on the socio-economic condition of the study area.
- To provide some recommendation regarding industrial development of the study area for sustainable urban growth.

2. Literature Review

Present study required a detail study regarding impacts of textile industry and steel casting industry effluents on the environment, human health, socio-economic condition and the government policy. Books, journals, newspapers and magazines had been consulted to gather a clear knowledge about the study. Basically, textile industry and steel casting effluents and solid waste impacts and proper maintenance and management related books, journals, newspapers, legislations, policies & plans and Statistical Year Books etc. had been consulted to receive clear idea and knowledge to carry out the study. Every year millions of synthetic fiber and tons of dyes are produced worldwide. Salvador Cesa et al., in 2017 described in Synthetic fibers as microplastics in the marine environment: A review from textile perspective with a focus on domestic washings that in 2016, over 5.4 million synthetic fibers were produced worldwide. According to Global fiber figure from Lenzing (2017), Global Fiber Market (2016) and Statista (2021) global synthetic fiber production in 2016 was estimated at around 64.8 million tons. By 2025 this volume is expected to reach 134.5 million tons of synthetic materials produced annually. Dyeing is a textile wet processing in which colour is incorporated into fibrous products in different forms such as loose fiber, yarn, fabric, and nonwoven in a suitable dyeing machine. Before dyeing, preparatory processes are required to remove natural as well as added impurities present in the fiber (Amanya et. al, 2016). Dyeing is done in many stages. According to Madrshet. al in1983 the main objective of the preparatory process is to make the textile substrate ready for subsequent processing. It might be either an additive process by giving additional functionality to the fiber or a subtractive process by removing the unnecessary impurities. Desizing removes the added sizing material either by acid- or enzyme- assisted hydrolysis. Presence of any sizing materials such as starch, polyvinyl alcohol, and guar gum, could hinder the penetration of dyes and chemicals inside the fiber. Desizing is carried out by hydrolysing the sizing material by any one of the following chemicals: amylase enzyme, sodium persulphate, oxidizing agents, and hydrochloric acid (Cavaco-Paulo &Gubitz2003). Scouring removes the adhered as well as added fatty matter present in the textile material by a saponification process. Natural fibers have impurities including pectin, fat, hemicelluloses, oil, minerals, natural colouring matter, and wax. These impurities are mainly acidic in nature and can be easily removed by a hot alkaline condition (Amapyan et al., 2015). These dyeing and pre-treatment processes use huge quantity of water. Wastewater pollutants arise both from raw fabrics and a wide range of additives used to produce the finished product. In textile wastewater treatment, one therefore has to deal with pollutants spanning a wide range including nonbiodegradable highly persistent organics and pesticides used in speciality textiles such as insect-proof fabrics. Textile and Garments' washing & dyeing sections have been condemned as being one of the world's most offenders in terms of pollution (Islam et al., 2021). The dye is usually used as an aqueous solution and may require a mordant to improve the fastness of the dye on the fiber. The dyes were obtained from animal, vegetable or mineral origin with no or very little processing. So, dyes are mainly organic and inorganic chemical substances. And if these substances spread out in the environment, they may cause huge adverse impact on the environment (Islam et al., 2011; "Dye definition for the clothing and fabric industry", 2011). Textile industries are major sources of pollution and contributors of metal contaminants to the environment (Sarker et al., 2021). When dyeing/printing textiles, water serves two purposes: First, it ensures the transmission of the colour onto the fibre; second, it washes out excess amounts of dyes from the treated fabrics. Of all dyed/printed textile fibres, cellulose fibres stand out as the most prominent, and more than 50% of production is dyed/printed with a special class of dyes, the so-called reactive dyes. Over 80,000 tons of reactive dyes are produced and consumed each year, which makes it possible to estimate the total pollution caused by their use (Allegrie et al., 2021). The effluents discharged from textile factories are a mixture of dyes, metals and other pollutants (Yaseen&Scholz, 2018). The dye effluents are high in colour, pH, suspended solids (SS), chemical oxygen demand (COD), biochemical oxygen demand (BOD) (Yaseen and Scholz 2016), metals (Sharma et al. 2007; Sekomo et al. 2012), temperature (Dos Santos et al. 2007) and salts (Yaseen&Scholz, 2018). In Bangladesh recently, the Government has identified a large number of knit and textile industries that have no effluent treatment plants. Thus, this indiscriminate discharge of untreated effluent to river deteriorates river water quality to unacceptable level and heavily impacts on water supply, human health, fisheries and agriculture (Sultana et al., 2013). Environmental pollution is a burning issue for most developing nations in the world. The environmental degradation, such

as air, water, land, and noise pollution, is a danger to human health, ecosystems, and financial development (Nahar et al., 2021). Also, Heavy metals particularly, lead (Pb), chromium (Cr), cadmium (Cd) and copper (Cu) are widely used for the production of colour pigments of textile dyes. Such heavy metals can exist in naturally in the structures of textile or they can penetrate into fibres of textile during production, dyeing process or through protective agents used during storage. These heavy metals which has transferred to the environment are highly toxic and can bioaccumulate in the human body aquatic life, natural water-bodies and also possibly trapped in the soil. (Mathur, 2005). Textile effluent comprise of large quantity of salt along with wastewater as dissolved solid. This salinity of the effluent is not removed by the conventional treatment of the effluent. So, with or without treatment, this wastewater disposed to the water system leads to increase the salinity of water severely (Sultana et al., 2013). Conventional water quality parameters such as chemical oxygen demand and suspended solids may not detect toxic compounds present in a variety of industrial wastewaters and treated wastes, and chemical procedures alone cannot provide sufficient information on the potential harmful effects of chemicals on the environment (TürkerSaçan&AkmehmetBalcıoğlu, 2006). Due to the strict implementation of environmental standards, it is important to adopt an eco-friendly model of textile industry that overcomes all flaws from its start to end product (Siddique et al., 2017). The existing tendency of industrialization and urbanization contribute significantly to the poor quality of water through the indiscriminate disposal of solid waste, industrial effluents and other toxic wastes, which are the major environmental issues, posing threats to the existence of human being (Akhie&Dipta, 2018). Contamination from these industrial and sewerage waste deteriorates the water quality parameters and alters natural processes. Due to having no central ETP plants or unit individual ETP plants, pollution concentration is increasing hazardously, and threats for environment is also increasing day by day (Roy et al., 2014). Akhie and Dipta (2018) described that Karnatali, Bangshi, Shitalakshya Rivers had been heavily polluted by the discharge of industrial effluents from garment estates. Alam and Akhie (2018) stated that severe degradation of water quality has taken place in the recent years in Bangladesh.

3. Study Area

The study area is located in Bank town and Baraigram of Savar Pourashava and in the district of Dhaka. The coordinates of the area are 23.8218° N, 90.2602° E. The Dhaka – Aricha highway flows through the middle of the town. It is about 25 kilometers away from the Dhaka city and about 3 kilometers away from the Savar upazila. The river Karnatali flows next to the Bank town and Barigram area. There are 4 textile industrial clusters in the area. The industries started establishing from the year 2010. The total industrial area is 15 acres. The total population of the area is 12583 (Savar Pourashava, 2021).

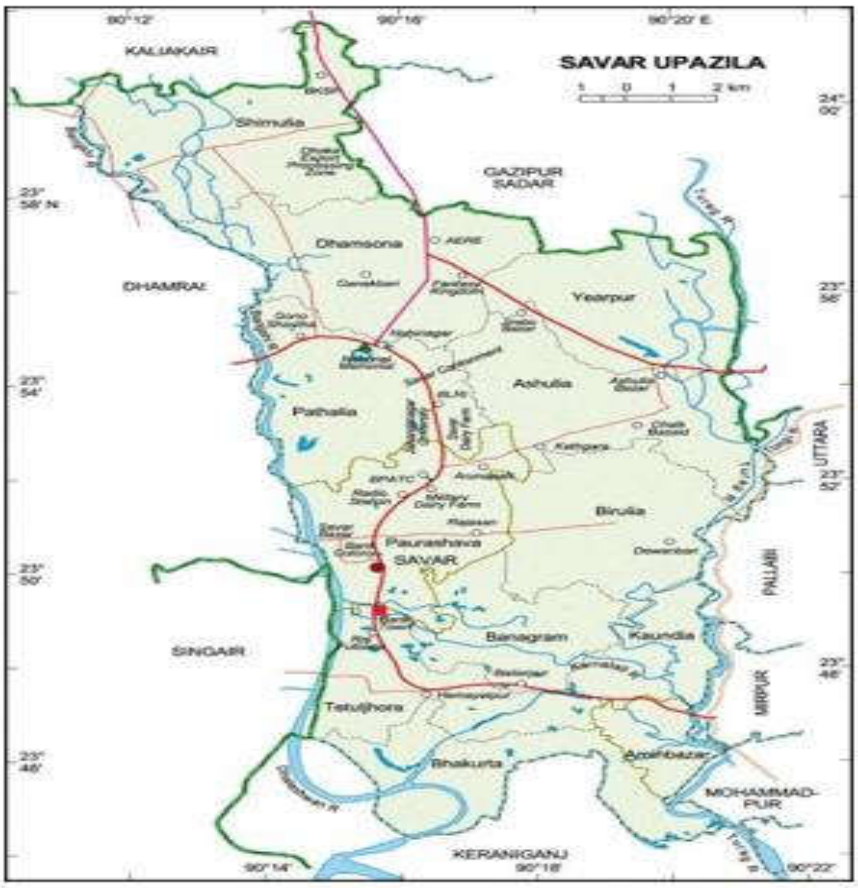

Figure 1 Bank Town and Baraigram Area

4. Methodology

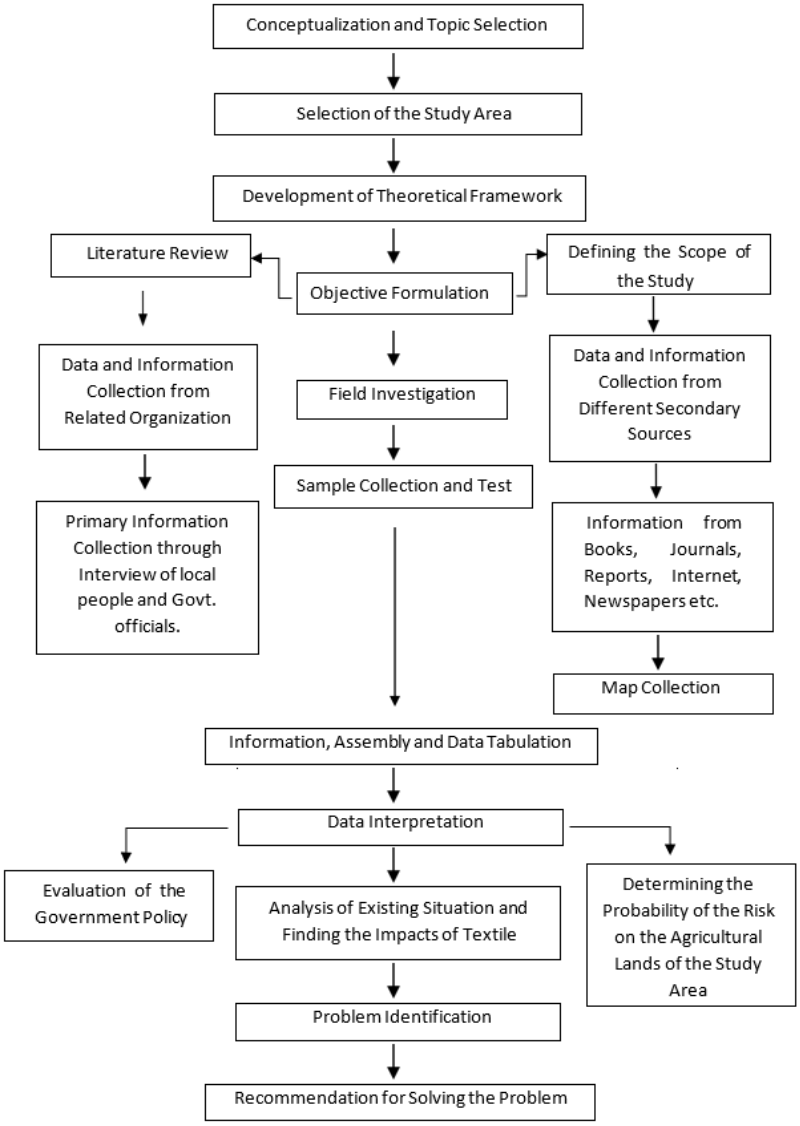

Figure 2 Flow Chart

5. Analysis

5.1. Existing Water Quality of Karnatali River

Table 5.1: Water Quality of the Dumping Zone and River Water

Parameter	DoE Standard (Drinking Water)	DoE Standard (Inlandsurface water for industrial unit)	2014[1]	2021			% Change over the years in river water
				Textile Water (Dum-ping zone)	River Water (50 m awayfrom water dumping zone)	River water (1km away from thedumping zone in downstream)	
Alkalinity (mg/l)	150	-	153	1700	1100	45	29.60%
BOD (mg/l)	0.2	50	12	130	108	15	25%
COD (mg/l)	4	200	22	550	450	35	59.10%
DO (mg/l)	6	4.5 –8	-	.25	.38	3.90	
pH	6.5–8.5	6 –9	6.60	7.8	7.4	6.7	0.15%
TDS (mg/l)	1500	2,100	150	4500	2550	270	80%
TSS (mg/l)	150	150	200	395	290	35	17.50%
Turbidity (NTU)	10	-	5.50	890	545	70	1272%

Situations	Legends	% Change	Legends
Critical		Increase	
Alarming		Static	
Safe		Decrease	

Table 5.2: Water Quality of the Dumping Zone and River Water

Parameter	DoE Standard (Drinking Water)	DoE Standard (InlandSurface Water for Industrial unit)	2011[1]	2021			% Change Over the years inriver water
				Textile Water (Dumping Zone)	River Water (50 m awayfrom Water dumping zone)	River water (1km away from thedumping zone inDownstream)	
Cadmium (ppm)	0.0005	0.50	0.0006	0.60	0.40	0.005	733.33%
Lead (ppm)	0.05	0.10	0.00135	0.35	0.32	0.002	48.15%
Nitrate (mg/l)	10	10	.00585	430	295	.25	4173.5%
Chromium (ppm)	0.05	0.50	.00385	58.60	12.79	0.001	74.03%

Situations	Legends	% Change	Legends
Critical		Increase	
Alarming		Static	
Safe		Decrease	

5.2. Existing Socio-economic Condition

Table 5.3: Population Profile of Bank Town and Baraigram

Area	2011	2021
Total population	5370	12583
Male	2868	6956
Female	2502	5627

Table 5.4: Years of Living in the Area

Number of years	Number of people	% Of people
1-3 years	43	20.48
4-6 years	64	30.48
7-9 years	49	23.33
10-12 years	34	16.19
12+ years	20	9.52

Table 5.5: House Tenancy of Banktown and Baraigram Area

Tenancy type	2011	2021
Rented (%)	83.2	88.57
Owned (%)	15.5	11.43
Rent free	1.3	0.0

Table 5.6: Utility Services of Bank Town and Baraigram Area

Utility Services	2011	2021
Electricity Connection (%)	99.8	100
Water Supply (%)	-	-
Tap	94.2	99.05
Tube well	5.8	0.95
Other	0.2	0.0

Table 5.7: House Rent of Bank Town and Baraigram Area

House Types	House Rent (2011)	House Rent (2021)
3 beds flat (pucca)	5000-6000	9500-15000
2 rooms flat (pucca)	2500-3000	5500-9000
1 room (pucca)	800-900	3000-4000
1 room (tin shade)	400-500	1500-2500

5.3. Land Price and Land Use

Table 5.8: Land Price of the Area

Year	Land Price (Near Road)	Land Price (Agriculture Land)
2001	80000-1000000	25000-30000
2011	3000000-700000	200000-250000
2021	1500000-2000000	800000-1000000

Land Use:

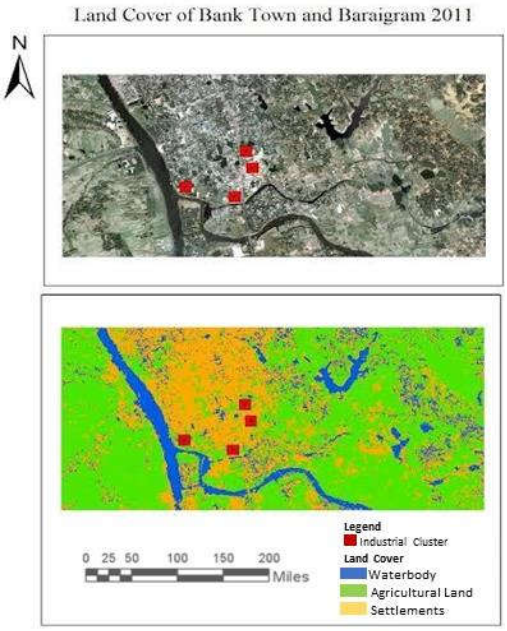

Figure 3 Land Use Map, 2011

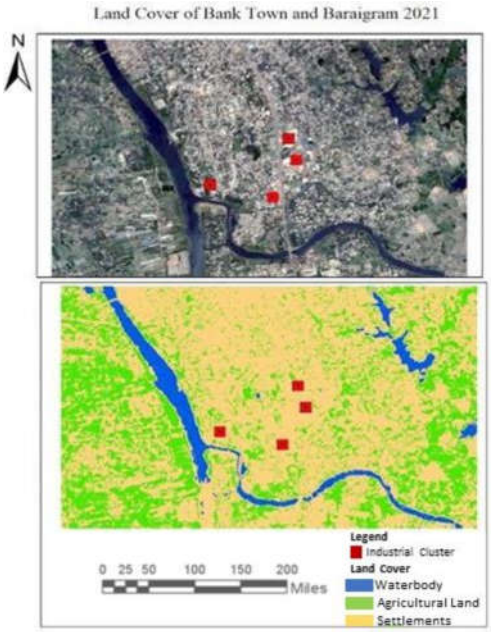

Figure 4 Land Use Map, 2021

6. Findings and Recommendations

The industries in the area have been established in non-industrial areas. All the four clusters of the industries that are situated in the area is established in close proximity to the residential households. The textile industries discharge serious toxic wastes into the environment. Primarily the discharges are in liquid forms as in liquid effluents and in solid forms as in solid wastes. The toxic effluents and solid wastes in the environment contaminate the soil, air and water of the area mainly Karnatali River which led to severe problems such as skin irritations, asthma, waterborne diseases such as diarrhea, dysentery etc. The effluent treatment plants of the industries are not being used. Which has led to the direct discharge of the effluents into the Karntali River. The liquid effluent discharged by the industries exceeds the Standards for Waste from Industrial Units or Projects waste set out by the Environmental Conservation Rules, 1997. The direct discharge of the effluents into the river has caused the pollution of the river water. The pollution has been slow but it has been increasing significant rate. There's unbearable bad odor coming out from the surrounding area of the industries, which has been creating more nuisance in the area. Solid wastes dumped into the environment can be seen all over the streets of the area. Wetlands of the surrounding area has become polluted. People simply started building houses in agricultural land and renting them to the industrial workers. The surrounding agricultural land has significantly lessened over the past years. Agricultural lands have been turned into residential plot in order to support the growing need for the residential households of the people of the area. There has been a significant decrease of employment in the agricultural sector among the people of the area over the past years. The house rent of the area has increased 3 to 5 times higher than the year 2011. Like the house rent, the land price has also increased 3 to 5 times higher than the year 2011. Roads are in dilapidated conditions and most of the roads are covered by wastes. It needs to be ensured that the effluent treatment plant (ETP) of the industries will be working properly for the proper treatment of toxic and harmful for environment and for human and animal health textile effluents. Skilled workers must be employed in order to run the operations smoothly and to reduce the textile effluents. Safety of the workers and the surrounding people from the environmental pollution needs to be ensured. Continuous H2O2/UV advanced oxidative process can be applied to treat the textile effluents. This process can help to reduce the consumption of inputs of water, costs of treatment and environmental impacts of textile effluents. The process can significantly decrease the amount of water needed in the process which is by 92.86%. At the same time consumption of Na2CO3 and NaOH will also be decreased in this process (Siddique et al., 2017). Regular monitoring system should be developed to restrict the in-discriminant discharge of waste into the Karnatali River and on the agricultural land. Protection of the reducing agricultural land according to the "Land use Policy, 2001".

7. Conclusions

The impact of these industries on the local environment is a matter of huge concern as these industries are built in residential areas and the effluents are directly discharged into the river without any treatment. Industries are important source of economy in the area. However, it is not desirable to pollute the Karnatali River for the sake of industrial development. Now we have seen how Buriganga River was polluted by unplanned industries. So, it is important to conduct an EIA and proper feasibility study of the industries in that area addressing the agricultural land, human health surrounding environment and the socio-economic condition. After addressing those problems necessary and fruitful initiatives the planning perspectives should have to be taken to make this contemporary policy fruitful for the environment, surrounding areas, people and finally for the economic structure of the country.

8. References

[1]. Tareq, Shafi M., et al. "Seasonal Variations in Water Quality of the Ganges and Brahmaputra River, Bangladesh." Jahangirnagar University Environmental Bulletin, vol. 2, Sept. 2013, pp. 71–82, https://doi.org/10.3329/jueb.v2i0.16332.

[2]. Salvador Cesa, Flavia, et al. "Synthetic Fibers as Microplastics in the Marine Environment: A Review from Textile Perspective with a Focus on Domestic Washings." Science of the Total Environment, vol. 598, Nov. 2017, pp. 1116–29, https://doi.org/10.1016/j.scitotenv.2017.04.172.

[3]. "Chemical and Textile Fibers Production Worldwide 2019." Statista, 2021, www.statista.com/statistics/263154/worldwide-production-volume-of-textile-fibers-since-1975/.

[4]. Ammayappan, L., et al. "Sustainable Production Processes in Textile Dyeing." Green Fashion, Dec. 2015, pp. 185–216, https://doi.org/10.1007/978-981-10-0111-6_8.

[5]. eBook, Textile. "Batchwise Dyeing of Woven Cellulosic Fabrics: A Practical Guide | G. J. Parish, G. W. Madaras, and J. Shore." Textile EBook, 22 Sept. 2019, www.textileebook.com/2019/09/batchwise-dyeing-of-woven-cellulosic-fabrics-a-practical-guide-g-j-parish-g-w-madaras-and-j-shore.html.

[6]. Artur Cavaco-Paulo, et al. Textile Processing with Enzymes. Crc; Cambridge, 2003.

[7]. Islam, M. M., et al. "Textile Dyeing Industries in Bangladesh for Sustainable Development." International Journal of Environmental Science and Development, vol. 2, 2011, pp. 428–36, https://doi.org/10.7763/ijesd.2011.v2.164.

[8]. Deepali, K. K., and Gangwar. "Metals Concentration in Textile and Tannery Effluents, Associated Soils and Ground Water." New York Science Journal, 2009.

[9]. Yaseen, D. A., and M. Scholz. "Textile Dye Wastewater Characteristics and Constituents of Synthetic Effluents: A Critical Review." International Journal of Environmental Science and Technology, vol. 16, no. 2, Nov. 2018, pp. 1193–226, https://doi.org/10.1007/s13762-018-2130-z.

[10]. Sultana, Zakia, et al. "Implementation of Effluent Treatment Plants for Waste Water Treatment." Journal of Environmental Protection, vol. 04, no. 03, 2013, pp. 301–8, https://doi.org/10.4236/jep.2013.43035.

[11]. Nahar, Najmun, et al. "The Severity of Environmental Pollution in the Developing Countries and Its Remedial Measures." Earth, vol. 2, no. 1, Feb. 2021, pp. 124–39, https://doi.org/10.3390/earth2010008.

[12]. Mathur, N., et al. "Assesing Mutagenicity of Textile Dyes from Pali (Rajasthan) Using AMES Bioassay." Applied Ecology and Environmental Research, vol. 4, Jan. 2006.

[13]. Türker Saçan, Melek, and Işıl Akmehmet Balcıoğlu. "A Case Study on Algal Response to Raw and Treated Effluents from an Aluminum Plating Plant and a Pharmaceutical Plant." Ecotoxicology and Environmental Safety, vol. 64, no. 2, June 2006, pp. 234–43, https://doi.org/10.1016/j.ecoenv.2005.03.017.

[14]. Siddique, Khadija, et al. "Textile Wastewater Treatment Options: A Critical Review." Enhancing Cleanup of Environmental Pollutants, 2017, pp. 183–207, https://doi.org/10.1007/978-3-319-55423-5_6.

[15]. Alam Akhie, Afsana, and Iftekhar Alam Dipta. "Effects of Water Pollution in Surrounding Rivers of Dhaka City." 1st International Conference on Research and Innovation in Civil Engineering (ICRICE 2018), 2018.

[16]. Roy, S., et al. "Water Quality of Narai Canal and Balu River of Dhaka City: An Impact of Industrialization." Journal of the Bangladesh Agricultural University, vol. 12, no. 2, 2014, pp. 285–90, www.banglajol.info/index.php/JBAU/article/view/28686.