

Assessing the Impact of Industrial Waste on Pasur River Water Quality

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ABSTRACT

This study explored the impact of industrial effluent discharge on the water quality of the Pasur River. Water samples were systematically collected from nine different strategic locations along the river. Laboratory analyses are conducted to determine various parameters, including pH, EC, turbidity, total dissolved solids (TDS), suspended solids (SS), dissolved oxygen (DO), biochemical oxygen demand (BOD) and metal concentrations (Na⁺, Ca²⁺, Mg²⁺, Pb⁴⁺, Al³⁺, Fe²⁺, As³⁺). To quantify pollution levels and assess water suitability for domestic and agricultural use, several water quality indices are computed: metal index (MI), comprehensive pollution index (CPI), weighted arithmetic water quality index (WQI) for domestic use, and sodium absorption ratio (SAR), magnesium hazard (MH), Kelly's ratio (KR), and total hardness (TH) for irrigation purposes. The results reveal significant pollution, particularly near industrial zones, where untreated or inadequately treated wastewater discharges into the river. The average concentration of total dissolved solid (TDS), electric conductivity (EC) and magnesium (Mg) are 1976.4, 1816.7 and 63.3 mg/L, respectively, significantly exceeding the health-based guideline of WHO and Bangladesh standards. The computed indices, including WQI (ranging from 69.9 to 127.4), CIP (1.9 to 2.2), MI (7.09 to 9.68), SAR (27.2 to 34.6), MH (52% to 70%), KR (1.7 to 2.5) and TH (308.67 to 428.74) also surpass standard limits, indicating both geogenic and anthropogenic sources of contamination. The findings underscore the urgent need for sustainable industrial practices and robust monitoring systems to improve water quality in the Pasur River.

Keywords: River Water Quality, Water Quality Indices, Irrigation indices, Environmental Monitoring, Industrial Pollution

INTRODUCTION

Water resources are crucial for maintaining environmental sustainability, supporting economic development, and safeguarding public health. Industrial waste contamination is a significant environmental issue, particularly in developing regions with often inadequate regulatory frameworks. As Bangladesh is an agrarian country, river water is mostly used for home and agricultural reasons. Surface water pollution is on the rise as industrial activity accelerates. To better understand surface water quality in specific places, hazardous metal concentrations in environmental samples should be analyzed (A et al., 2021). Rivers, commonly used as primary waste disposal pathways, are especially susceptible to pollution from industrial effluents. Such pollutants can degrade water quality, disrupt aquatic ecosystems, and pose risks to both biodiversity and human health (Rahman, M.M., Mahmud, A., Amin, n.d.). The Pasur River in Khulna, Bangladesh, is a vital waterway supporting ecological diversity and local livelihoods. Its proximity to major industrial activities, including shipbuilding, shrimp farming, and textile production, raises significant concerns about water quality. The nearby rural people use river water for a variety of purposes, including industrial use, home activities, bathing, agricultural irrigation, and food preparation. In some circumstances, during the dry season, when drinking water is scarce, local rural residents boil river water and drink it. The river was originally an important source of fresh water for drinking and residential usage, as well as fishing and agricultural irrigation. The river is still utilized for fishing, and fishermen use boats of various sizes. Polluted fish are another important cause to analyze and monitor the surface water of this river.

The industrial waste in this area typically contains a complex mix of chemical and organic pollutants, including heavy metals like lead, cadmium, and mercury, as well as hydrocarbons and nutrients such as nitrates and phosphates.

These contaminants have extensive consequences; for instance, heavy metals accumulate in sediments and enter the food chain, posing long-term health risks to humans and wildlife (Hossain et al., 2019). Nutrient overloads can lead to eutrophication, marked by algal blooms that reduce oxygen levels and disrupt aquatic life. Additionally, untreated effluents from shrimp farms add organic waste and chemicals to the water, further reducing oxygen levels and harming aquatic habitats. The textile industry's discharge also contributes by introducing dyes and metals that increase sediment toxicity and render the river unsuitable for critical uses such as drinking, irrigation, and recreation.

This study examines the impact of industrial waste on the Pasur River's water quality and evaluates its ecological and socio-economic effects. This research focuses on Pasur River water quality using criteria including the Water Quality Index (WQI) (Chowdhury et al., 2007) (Shams Tabrez, Torki A. Zughaibi, 2022), Comprehensive Pollution Index (CPI) (Yan et al., 2015) and the Metal Index (El-Sawy et al., 2023). The sodium absorption ratio (SAR), magnesium hazard (MH), Kelly's ratio (KR), and total hardness (TH) were identified (Mohammed & Hassan, 2015). Therefore, the objectives of this study were (i) to determine the water quality parameters of the Pasur River using physicochemical and toxicological parameters, (ii) to determine water quality indices such as WQI, CPI, and MI (iii) to determine irrigation indices such as SAR, TH, MH and KR and (iv) to identify the source of pollutants, including metal contamination in water. The findings aim to help develop targeted strategies for managing industrial waste and protecting river ecosystems, thereby supporting sustainable resource management in the region.

MATERIALS AND METHODS

STUDY AREA

The Pasur is the largest river in the Sundarban (Mangrove Forest) region at 89°30' E and 21°45' N. This river is known as Rupsha in Khulna. To the north of Khulna in the Jashore region, the river is known as Bhairab River, and to the south of Khulna, from the Chalna area, it is named Pasur River, and this location is known as Mongla Upazila. Mongla Port Municipality is the second largest seaport in the country, export processing zone, and fishing industry area on the shore of the Pasur River. The study was conducted in the Pasur River at Mongla Port Municipality area in Mongla Upazila of Bagherhat District in Khulna, Bangladesh. It is about 55 km south of Khulna City and 131 km north of the Bay of Bengal. Land use is concentrated in manufacturing industries, forests, upland fields, and urban areas. Tidal deltaic deposits mainly constitute the geology, but the northern and western areas are covered by marsh clay and peat deposits. The southern region also contains mangrove swamp deposits and deltaic silt deposits in the northeastern area. The western and central parts of the eastern region of the study area are agricultural areas, and the eastern and northern areas are industrial areas mixed with urban areas (Islam et al., 2022).

On October 27, 2024, water samples were collected from the Pasur River in Mongla, Bagerhat district, focusing on nine locations near the industrial wastewater discharge points of major establishments, including Mongla Cement Mills Ltd., Petromax LPG Ltd., Five Rings Cement Ltd., Holcim Cement Ltd., Jamuna LPG Ltd., Sena Cement Ltd., Dubai-Bangla LPG Ltd., Dubai-Bangla Cement Ltd., and Ali Ceramics Ltd. These sampling stations were selected through a detailed reconnaissance survey to capture the impact of industrial effluents on the river. Samples were collected midstream using an engine boat, following standard guidelines. Separate 1000 ml PET bottles were used for cationic and anionic analyses, and the samples were immediately transported to the laboratory for testing to ensure reliable and accurate results.

Table 1 Location of study area with geographical map.

Location	Site Name	Longitude	Latitude
Site 1	Mongla Cement Mills.	89°35'02.3"E	22°31'02.5"N
Site 2	Petromax LPG Ltd.	89°35'13.1"E	22°30'28.6"N
Site 3	Five Rings Cement Ltd.	89°35'00.6"E	22°31'03.5"N
Site 4	Holcim Cement Ltd.	89°35'02.4"E	22°31'00.2"N
Site 5	Jamuna LPG Ltd.	89°35'03.2"E	22°30'58.1"N
Site 6	Sena Cement Ltd.	89°35'03.6"E	22°30'56.5"N
Site 7	Dubai-BanglaLPG Ltd.	89°35'18.9"E	22°30'07.8"N
Site 8	Dubai-Bangla Cement Ltd.	89°35'17.6"E	22°30'13.7"N
Site 9	Ali Ceramics Ltd.	89°35'20.7"E	22°29'55.3"N

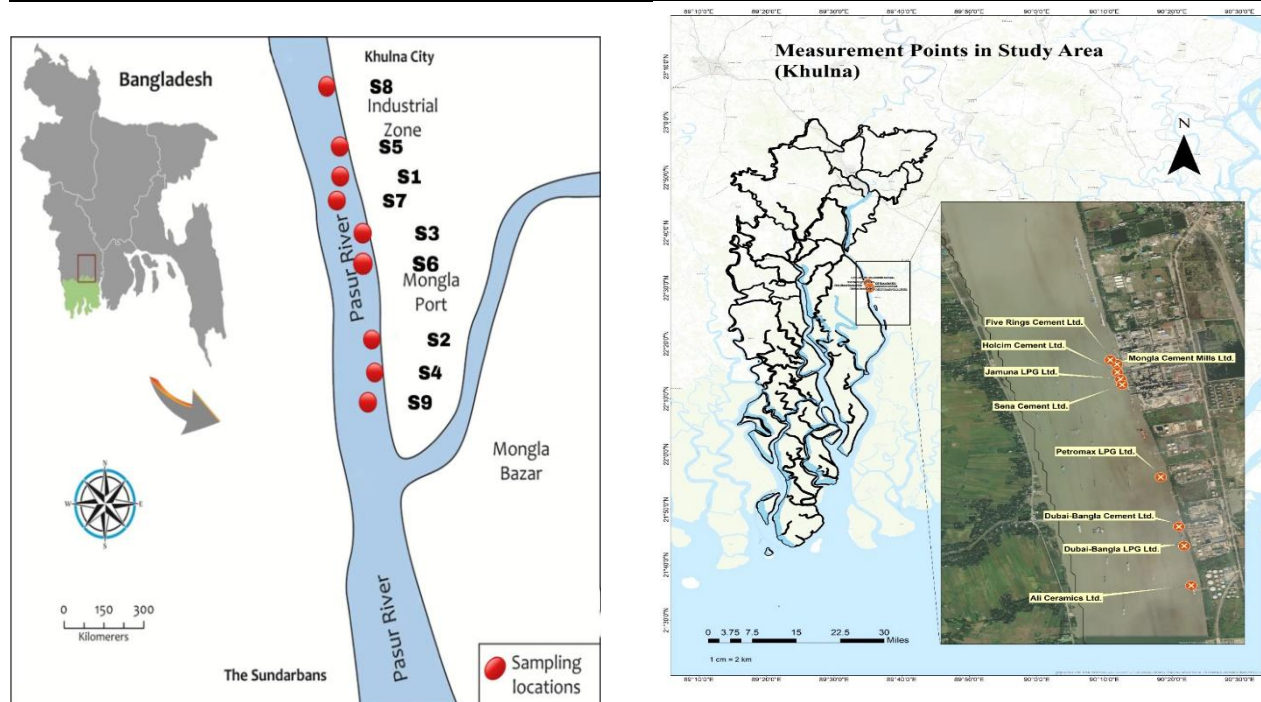


Figure 1 Location showing the study area and sampling points.

WATER PARAMETER TESTING

Three water samples were randomly collected from each site, thoroughly mixed to create a composite sample of 1.0–1.5 L, and then divided into clean polyethene bottles of 500 mL and 100 mL for subsequent analysis. This approach was implemented to ensure representative sampling from each location.

Simultaneously, survey work was conducted at each sampling station to gather background information about the sampling areas. The 500 mL samples were preserved with 5 mL of 55% HNO₃ per litre of water and stored at 4 °C for physical and chemical parameter analysis. The 100 mL samples were preserved with 2 mL of 6 N nitric acid for metal analysis. Before sample collection, all bottles were thoroughly cleaned with 10% nitric acid and rinsed with de-ionized water. The 100 mL water samples were transferred to a beaker for metal analysis, and 5 mL of concentrated HNO₃ was added. The samples were then heated to 130 °C on a hot plate until the volume was reduced to approximately 25–30 mL. The addition of HNO₃ was repeated until the solution became clear. After cooling, the solution was filtered through a 25 µm filter paper using de-ionized water. (Bhuyan et al., 2019)

WATER QUALITY INDEX (WQI)

The Water Quality Index (WQI) is a widely recognized and effective tool for evaluating the overall quality of water resources and determining the extent of pollution in groundwater and surface water systems. It simplifies complex water quality data by aggregating various parameters into a single numerical value. It provides a clear and concise representation of water quality that is easy to interpret for policymakers, researchers, and the general public. The WQI is a critical indicator in water quality monitoring programs, aiding in assessing pollution sources, prioritizing remediation efforts, and developing sustainable water management strategies. In this study, the weighted arithmetic method was employed to calculate the WQI (equation 4), as initially proposed by Brown et al. (1972). The calculations of unit weight (W_n) for each parameter and the quality rating of the n th parameter (Q_n) were performed using the equations (1-3).

$$W_n = \frac{K}{S_n}, \quad (1)$$

$$K = \frac{1}{\frac{1}{S_1} + \frac{1}{S_2} + \frac{1}{S_3} + \dots + \frac{1}{S_n}}, \quad (2)$$

$$Q_n = \frac{(V_n - V_0)}{(S_n - V_0)} \times 100, \quad (3)$$

$$WQI = \frac{W_n \times Q_n}{W_n}, \quad (4)$$

where K denotes the proportionality constant, S_n resembles the standard desired value of the n -th parameter, V_n denotes the concentration of the n th parameters, S_n represents the standard desirable value of the n th parameters, and V_0 resembles the actual values of the parameters in pure water (generally $V_0=0$, for most parameters except for pH). The summation of all unit weight factors should satisfy the condition of $\sum W_n = 1$ (*unity*), ensuring that the relative importance of all selected parameters is appropriately balanced (Bora & Goswami, 2017).

Table 2 WQI range, status and possible usage of the water sample (brown et al. 1972)

WQI	Water Quality Status	Possible Usage	Health Implications	Common Pollutants	Recommended Actions
0-25	Excellent	Drinking, irrigation, and industrial	No significant health risks	None or minimal pollutants	Regular monitoring and protection
26-50	Good	Drinking, irrigation, and industrial	Minor risks. It may contain trace pollutants	Trace nitrates and phosphates	Routine treatment and monitoring
51-75	Poor	Irrigation and industrial	Potential for gastrointestinal issues	Nitrates, phosphates, and organics	Basic filtration and chemical treatment
76-100	Very Poor	Irrigation	High risk of adverse health effects	Heavy metals, pathogens	Advanced treatment and restricted usage
>100	Unusable for drinking and fish culture	Proper treatment is required before use	Severe health risks (toxicity, disease)	Pathogens, heavy metals, pesticides	Comprehensive treatment before usage

COMPREHENSIVE POLLUTION INDEX (CPI)

A comprehensive pollution index (CPI) is a grading system that evaluates water quality and compares the quality of different bodies of water. It can be used to identify the main pollution parameters in a body of water and to analyze trends in water quality. The Comprehensive Pollution Index (CPI) identifies the overall water quality status as expressed in equation (5-6)(Bi et al., 2021).

$$PI = \frac{C_i}{S_i}, \quad (5)$$

$$CPI = \frac{1}{n} \sum_{i=0}^n PI, \quad (6)$$

where PI is the pollution index of the i-th parameter, C_n is the measured concentration of the i-th parameter, S_i is the standard permissible concentration of the i-th parameter in the water, and n is the total number of parameters. We used health-based guidelines from the WHO and the Department of Environment (DoE), Bangladesh, standards for maximum permissible concentrations. According to Mekuria (Mekuria et al., 2021), the PI is a Single Factor Evaluation Index (SFEI) for each water quality parameter. When the value of PI < 1, the water quality meets surface water quality standards. PI > 1 indicates that the water quality exceeds the standards. Hence, the water is polluted. The water quality can be classified into five categories based on the calculated value of CPI such as CPI: 0–0.20, Category 1, Clean; 0.21–0.40, Category 2, Sub clean; 0.41–1.00, Category 3, Slightly polluted; 1.01–2.00, Category 4, Medium polluted, and ≥2.01, Category 5, Heavily polluted. (Son et al., 2020).

METAL INDEX (MI)

The metal index (MI) is a water quality index that estimates the overall quality of drinking water by evaluating the potential health risks of heavy metals, as expressed in equation (7) (Ojekunle et al., 2016).

$$MI = \sum \frac{C_i}{(MAC)_i}, \quad (7)$$

where C_i is the mean concentration of i-th metal, and MAC is the maximum allowable concentration of each metal. The maximum limit of MI is 1, and MI > 1 is a warning threshold. The classification of water quality based on MI is < 0.3, class-I very pure; 0.3–1.0, class-II pure; 1.0–2.0, class-III, slightly affected; 2.0–4.0, class-IV, moderately affected; 4.0–6.0, class-V, and >6.0, class-VI, seriously affected. (Withanachchi et al., 2018)

IRRIGATION WATER INDICES

The total hardness of irrigation water is the sum of the calcium and magnesium concentrations in the water, expressed in parts per million (ppm) of calcium carbonate (CaCO₃). Equation (8) is used to compute Total Hardness (TH) (Hossain et al., 2024).

$$TH = 2.497 Ca^{2+} + 4.115 Mg^{2+}, \quad (8)$$

The Magnesium Hazard (MH) is determined using Equation (9).

$$MH = \frac{Mg^{2+}}{(Mg^{2+} + Ca^{2+})} \times 100, \quad (9)$$

The Kelley's ratio (KR) is calculated using Equation (10).

$$KR = \frac{Na^+}{(Mg^{2+} + Ca^{2+})} \times 100, \quad (10)$$

The sodium adsorption ratio (SAR) of irrigation water measures the amount of sodium relative to calcium and magnesium in the water. It's a water quality parameter that indicates how suitable the water is for irrigation. The SAR value was calculated using Equation (11).

$$SAR = \frac{Na^+}{\sqrt{\frac{(Mg^{2+} + Ca^{2+})}{2}}}, \quad (11)$$

The sustainability of the water samples in the selected area was evaluated by comparing their physiochemical properties to WHO and BDWS criteria. This comparison offers insights into surface water's long-term viability and suitability for various applications by examining its adherence to established rules and regulations.

RESULT AND DISCUSSION

WATER QUALITY GUIDELINES

The water samples were analysed, and their concentrations were contrasted with WHO and Bangladesh drinking water standards, as shown in Table 3. The pH value is a physical water quality characteristic critical to aquatic life. Water pH impacts metal toxicity, chemical reactions, and appropriateness for various uses (Mekuria et al., 2021). The recommended pH by WHO and Bangladesh drinking water guidelines varies from 6.50 to 8.50. The maximum and minimum pH values in the study area were 7.9 and 7.2 in the sampling stations S-2 and S-3, respectively. The pH values of all the samples were within the standard guideline (Rahman et al., 2023).

Table 3 Comparative study of physicochemical parameters of Pasur River water with WHO and BDWS Standards.

Sam ple No.	pH	EC (μ s /c m)	TD S (m g/ L)	D O (m g/ L)	Na + (m g/ L)	Ca 2+ (m g/ L)	M g2 + (m g/ L)	Pb 4+ (m g/ L)	Al 3+ (m g/ L)	As 3- (m g/ L)	Fe 2+ (m g/ L)	B O D5 (m g/ L)
1	7.6	187 5	18 47	5.9	20 2	43. 52 7	62	0.0 5	0.0 08	0.0 3	1.1 3	2.6
2	7.9	240 0	19 14	6.6	22 9	51. 34 1	73	0.0 4	0.0 07	0.0 4	1.1 3	2.6
3	7.2	172 9	19 41	6.3	22 1	34. 10 1	64	0.0 5	0.0 08	0.0 5	0.9 1	2.2
4	7.4	162 7	19 09	5.6	20 4	30. 12	71	0.0 4	0.0 09	0.0 3	1.1 2	2.8
5	7.6	167 2	19 42	5.9	23 4	32. 18	59	0.0 4	0.0 1	0.0 5	0.6 3	2.1
6	7.5	172 5	19 23	5.4	23 5	56. 23	61	0.0 5	0.0 09	0.0 4	0.4 5	2.4
7	7.6	189 0	19 21	5.5	19 3	45. 25	55	0.0 4	0.0 08	0.0 5	0.7 1	2.8
8	7.3	168 0	18 63	5.2	20 5	28	58	0.0 4	0.0 05	0.0 3	0.5	2.7
9	7.8	175 2	25 28	5.9	21 0	52	67	0.0 5	0.0 09	0.0 1	1.1	2.5
WH O STD	6.5 - 8.5 6.5	750	10 00	-	20 0	75	50	0.0 1 0.0 5	-	0.0 1	0.3	
BDW S	- 8.5	200 0	10 00	-	20 0	75	35		0.2	0.0 5	- 1.0	0.2

Electrical conductivity (EC) is another significant parameter in drinking water. It shows the amount of dissolved particles and the ionic strength of the source water. (Ahmed et al., 2020) WHO and Bangladesh drinking water guidelines recommend an EC of 750 to 2000. The maximum and minimum EC values in the study area were 2400 and 1627 μ s/cm, respectively, found in the sampling stations S-2 and S-4.

Total dissolved solids (TDS) are organic and inorganic substances in sample water. The recommended maximum concentration for TDS is 1000 mg/L in both WHO and Bangladesh drinking water standards. The maximum and minimum TDS values in the study area were 2528 and 1847 mg/L, respectively, found in the sampling stations S-9 and S-1.

Dissolved oxygen (DO) levels in water reflect the amount of oxygen gas in the water. They are an essential parameter of water quality. The maximum and minimum DO levels in the study area were 6.6 and 5.2 mg/L, respectively, found in the sampling stations S-2 and S-8.

Biochemical oxygen demand (BOD) is the quantity of oxygen required to break down organic materials in water. A greater BOD implies bad water quality, whereas a lower BOD suggests good water quality. In the study area, the maximum and minimum BOD levels were 2.8 and 2.1 mg/L, respectively, found in the sampling stations S-4 and S-5.

The concentration of dissolved cations such as Na⁺, Ca²⁺, Mg²⁺, Pb⁴⁺, Al³⁺, and Fe²⁺ varied from 193 to 235, 28 to 56.23, 55 to 73, 0.04 to 0.05, 0.005 to 0.01, 0.45 to 1.13 mg/L, respectively, and the concentration of anion like As³⁻ varied from 0.01 to 0.05 mg/L. The average concentration of total dissolved solid (TDS), electric conductivity (EC) and magnesium (Mg) were 1976.4, 1816.7 and 63.3 mg/L, respectively, significantly exceeding the health-based guideline of WHO and Bangladesh standards because of the addition of effluents from the surrounding industries.

WATER QUALITY INDICES

The water quality indices in the studied water are represented in Table 4, where three water quality indices essential for domestic water use are plotted. The WQI ranged from 69.9 to 127.4; the average value was 102.842. It exceeded the maximum limit of 100, which denotes a grade 5 pollution status. All areas have very poor water quality or are likely unsuitable for drinking. The station no 3 has the highest value WQI (Figure 2). Metal pollution in this site is a significant problem. The study region has a high WQI due to pollutants from geogenic sources, municipal wastewater, industrial effluents, fishing boats, agricultural runoff, loading and unloading, and construction.

Table 4 Water quality index (WQI), Comprehensive Pollution Index (CPI), Metal Index (MI) and pollution status.

Station ID	WQI	CPI	MI	Pollution Level
S-1	104.579	2.004	7.960	High
S-2	121.427	2.299	9.680	High
S-3	127.417	2.023	8.653	High
S-4	104.122	2.106	9.387	High
S-5	114.626	2.084	7.908	High
S-6	89.687	1.975	8.191	High
S-7	118.548	2.179	7.775	High
S-8	75.265	1.933	7.095	High
S-9	69.911	2.041	8.117	High
Average	102.842	2.071	8.307	High

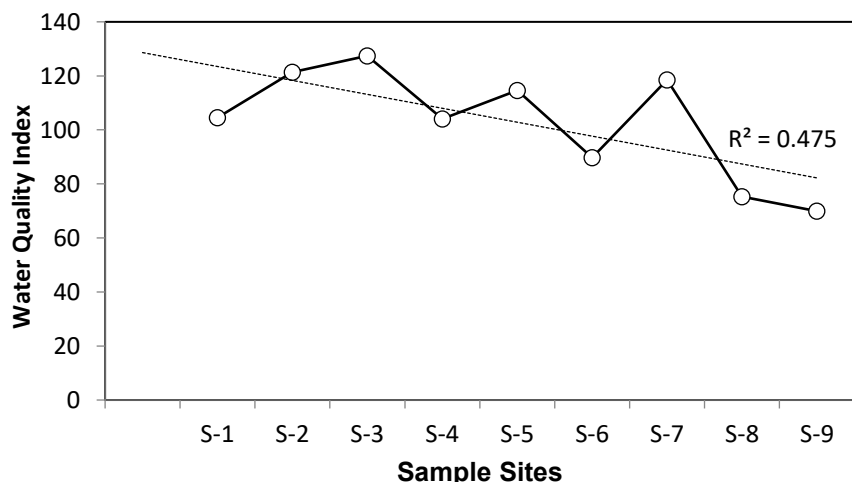


Figure 2 Water Quality Index (WQI) values for nine stations.

The CPI was used to assess the total level of water pollution in the Pasur River. This ranged from 1.9 to 2.2, with an average of 2.071 (Table 4), which indicates elevated pollution levels. Most of the stations exceeded the maximum limit of ≥ 2.0 , indicating Category 5 and serious pollution levels. Station no. 2 has the highest recorded CPI. The reason is the discharge of household, sewage, and septic waste. Metals are produced from garages, vehicle battery maintenance businesses, and related enterprises.

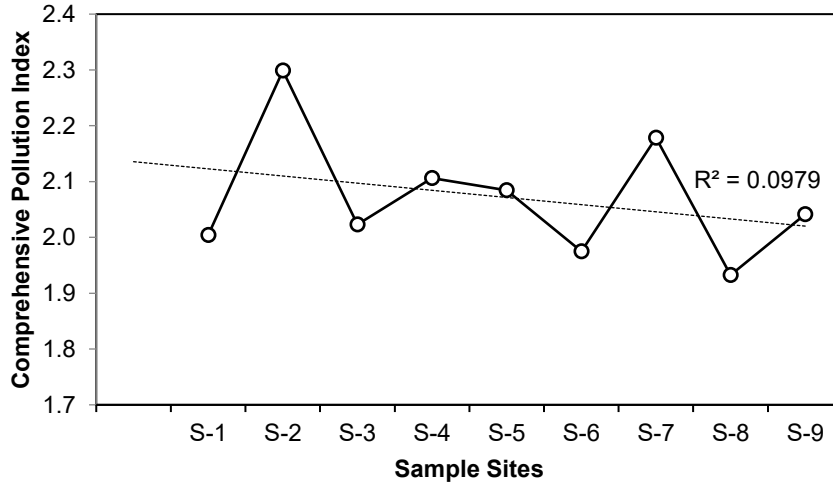


Figure 3 Comprehensive Pollution Index (CPI) values for nine stations.

Metal Index (MI) was identified to examine the cumulative impacts of metals. The MI ranged from 7.09 to 9.68, with an average of 8.307 (Table 4). All sampling locations exceeded the maximum limit of >6.0 (class VI, severely damaged). The highest MI was reported at station no 2 (Figure 4). Metals can come from either anthropogenic or geological sources. Anthropogenic causes of metal contamination include industrial wastewater from workshops and garages, automobile batteries, paints and pigments, fishing boats, fuel stations, and agrochemicals (Islam et al., 2022).

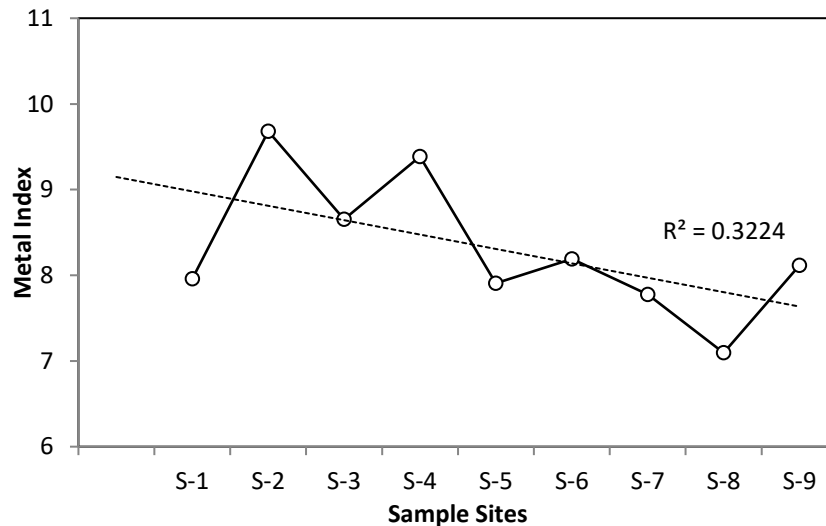


Figure 4 Metal Index (MI) values for nine stations.

IRRIGATION INDICES

The presence of minerals in water and soil impacts suitability for irrigation purposes. Plant growth depends on irrigation water quality, and soil drainage is a key aspect of this connection. Table 5 lists the irrigation indices (MH, TH, KR, and SAR) and their classifications. These indices can assist farmers in determining the appropriate management methods to prevent potential dangers.

Table 5 Sodium Adsorption Ratio (SAR), Total Hardness (TH), Magnesium Hazard (MH) and Kelley's ratio (KR).

Station ID	SAR	TH	MH	KR
S-1	27.809	363.948	58.7527	1.914
S-2	29.043	428.748	58.7095	1.842
S-3	31.555	348.613	65.2389	2.253
S-4	28.690	367.465	70.2136	2.017
S-5	34.656	323.235	64.7072	2.566
S-6	30.695	391.590	52.0345	2.005
S-7	27.260	339.450	54.8628	1.925
S-8	31.262	308.670	67.4419	2.384
S-9	27.225	405.705	56.3025	1.765
Average	29.799	364.158	60.9182	2.075
Water Class	Very High Sodium	Very Hard	High Magnesium	Unsuitable

The sodium adsorption ratio (SAR) is significant in irrigation because it evaluates the amount of sodium in the water and the soil's capacity to absorb it. This ranged from 27.2 to 34.6, with an average of 29.799 (Table 5), indicating a very high sodium level. Most stations exceeded the maximum limit of ≥ 26 , indicating a serious hazard. The station no 5 has the highest recorded SAR (Figure 5).

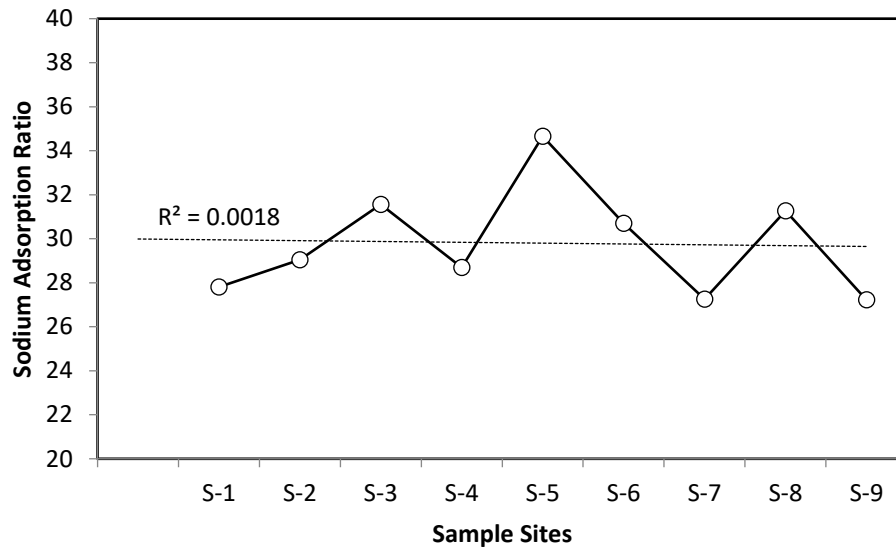


Figure 5 Sodium Adsorption Ratio (SAR) values for nine stations.

The total hardness of water is important in irrigation as it affects the quality of the water and the irrigation system's efficiency. This ranged from 308.67 to 428.74, with an average of 364.158 (Table 5). All the stations exceeded the maximum limit of ≥ 300 , indicating a serious hardness level. Station 2 has the highest recorded TH (Figure 6).

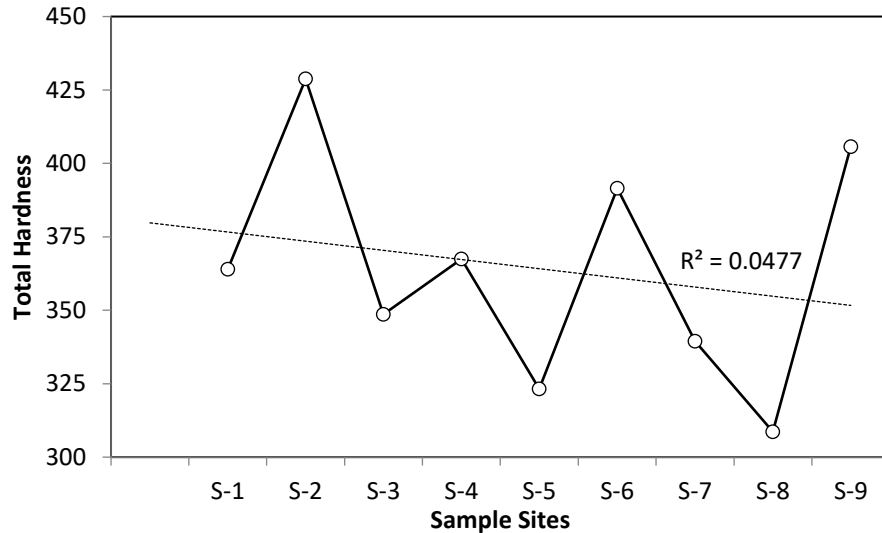


Figure 6 Total Hardness (TH) values for nine stations.

Magnesium hazard (MH) is a significant value in irrigation as it indicates how much suitable water is for agriculture. This ranged from 52% to 70%, with an average of 60.9182% (Table 5) indicating a high magnesium level. All the stations exceeded the maximum limit of $\geq 50\%$, indicating a serious hazard level. The station no 4 has the highest recorded MH (Figure 7).

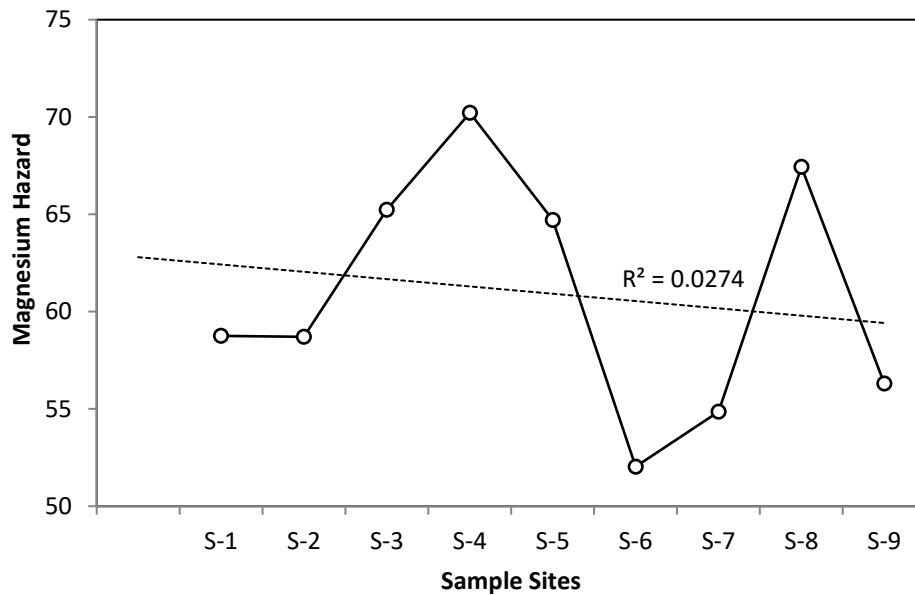


Figure 7 Magnesium hazard (MH) values for nine stations.

In irrigation class, Kelley's ratio is significant because it measures the concentration of various salts in the water to determine irrigation water quality. This ranged from 1.7 to 2.5, with an average of 2.075 (Table 5), indicating a high salt level. All the stations exceeded the maximum limit of ≥ 1 , indicating a serious salt presence. The station no 5 has the highest recorded KR (Figure 8).

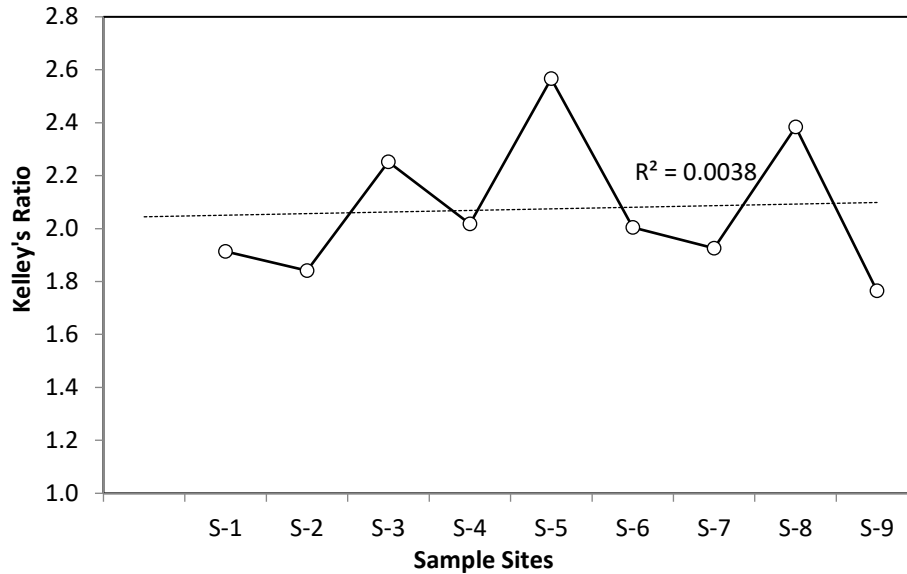


Figure 8 Kelley's ratio (KR) values for nine stations.

CONCLUSIONS

Rivers are vital sources of water for domestic and irrigation purposes, and they are now being greatly affected by industrial effluents. The findings of this study reveal that the concentration of total dissolved solids (TDS), electric conductivity (EC), and magnesium (Mg) has exceeded the standard guideline, which indicates that water in that area carries a huge amount of metal ions. The water quality indices like WQI, CPI, and MI show a high pollution level as the values exceeded the standard guideline. The result obtained from the research indicates that water in that area contains a colossal number of pollutants from industrial effluents. Irrigation indices like SAR, TH, MH, and KR were determined to investigate the suitability of water for irrigation purposes. The results exceeded standard limits, showing the presence of different kinds of metal ions in the water of that zone coming from the effluents of various industries. Considering the water quality indices and irrigation indices values, this study suggested that water in the Pasur River was not suitable for domestic purposes and to some sort for irrigation purposes. The significant concentration of pollutants in this area is mostly the result of anthropogenic causes such as industrial, agricultural, urbanization, and fishing activities. As a result, this study suggests that the pollution level of the Pasur River and surrounding agricultural areas should be continuously monitored to determine the risk to human health and ecosystems in the river's vicinity. To minimize and mitigate environmental contamination, effective methods for extracting dangerous heavy metals from sewage and industrial effluents are urgently required before the effluent is released into the environment. Domestic water must also be treated using traditional methods. Public understanding of the effects and solutions to pollution should be increased so that they can play an important part in pollution reduction.

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