The Socio-economic Impact of Buriganga River Contamination: A Sociological Analysis

Shumayia Shiddiqa[1], Abu Saleh Mohammad Noman[2]

Abstract: The Buriganga river, once the economic and cultural artery of Dhaka, Bangladesh, has undergone severe ecological degradation due to accelerated industrialization and inadequate waste management. Although the environmental degradation of the Buriganga river has received growing academic attention, its broader socio-economic effects on the communities that depend on the river remain insufficiently understood. This study examines at the community level how river contamination is reshaping livelihoods, health conditions, and everyday life among riverine populations. Using primary data collected through structured interviews and questionnaires with purposively selected community members, the study demonstrates that contamination of the Buriganga river has created a deeply layered socio-economic crisis for those most directly exposed to its decline. Industrial effluent discharge emerges as the primary driver of declining water quality, making the river increasingly unusable for communities that once relied on it for their livelihoods and routine needs. Its impacts extend well beyond the river itself: fishing and agricultural activities have been severely disrupted, household incomes have declined, and communities already constrained by limited education and informal employment face diminishing opportunities to adapt. Importantly, the study also reveals a pronounced willingness among local residents to participate in contamination governance. These findings are relevant to a wide range of stakeholders, including environmental regulators, urban planners, industrial groups, NGOs and municipal authorities, each of whom has both responsibility for and interest in mitigating the crisis.

Keywords: Buriganga River, River Contamination, Socio-economic Impact, Livelihood Vulnerability, Community Participation.

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1. Introduction

1.1 Statement of the Problem

Bangladesh is one of the world's most densely populated countries, with a population density of approximately 1,179 people per km² (Noman, 2025)[1]. In such a densely populated setting, rivers play a central role in sustaining socio-economic development, ecological balance, drainage, transportation, and river-dependent livelihoods (Afrin et al., 2023; Qayyum et al., 2021)[2,3]. The Buriganga, Turag, Shitalakshya, and Balu rivers have historically supported Dhaka's economic activities, including trade, navigation, and resource extraction (Banu, 2013)[4]. Among these rivers, the Buriganga has been especially important because of its historical role in Dhaka's economy, lifestyle, river connectivity, and transport system, including launches and country boats (Banglapedia, 2021; Bashar et al., 2023)[5,6]. However, the Buriganga River is now widely acknowledged as one of Bangladesh's most contaminated urban rivers. Rapid urbanization, uncontrolled industrial growth, inadequate waste management and limited public awareness have contributed to untreated industrial and municipal wastewater discharge, solid-waste dumping, and severe water quality deterioration (Fatema et al., 2018; Uddin & Jeong, 2021)[7,8]. Industrial facilities located along the riverbanks, particularly the former Hazaribagh tannery cluster and nearby textile and dyeing industries, have historically discharged untreated or inadequately treated wastewater containing chromium, heavy metals, processing chemicals, and high-oxygen-demand organic pollutants (Human Rights Watch, 2012)[9]. These activities have accelerated ecological degradation and reduced the river's capacity to support aquatic life, domestic use, and river-based livelihoods.

Several studies have assessed the physicochemical condition of the Buriganga River and reported alarming levels of contamination. Key water quality parameters such as dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), and heavy metal concentration indicate severe contamination, particularly during the dry season when river flow and dilution capacity are reduced (Islam et al., 2015; Riad Khan et al., 2023)[10,11]. Low DO levels reflect intense organic contamination and create inhospitable conditions for aquatic organisms, while elevated BOD and COD values indicate substantial organic and chemical contamination from untreated industrial effluents and municipal wastewater (Riad Khan et al., 2023)[12]. In addition, heavy metals such as chromium, lead, and cadmium have been detected in river sediments, mainly associated with tannery, textile, and other industrial activities near the river corridor (Akbor et al., 2020)[13]. Comparative studies further indicate that the Buriganga is more contaminated than other major peripheral rivers around Dhaka, including the Turag, Shitalakshya, and Balu rivers (Afrin et al., 2023)[14].

The consequences of Buriganga River contamination extend beyond environmental degradation. Contamination has significant social, economic, and health-related impacts on communities living along the river (Afrin, 2022; Kormoker et al., 2023; Uddin & Jeong, 2021)[15,16,17]. Numerous riverside residents depend directly or indirectly on the river through fishing, boating, small trade, informal labor, and other river-linked activities (Deb et al., 2021)[18]. When the river becomes contaminated, these livelihood activities are disrupted, creating economic strain for low-income households and increasing socio-economic vulnerability (Hoque et al., 2021)[19]. Severe contamination also reduces fish stocks and damages aquatic ecosystems, which negatively affects fishing-dependent households, food security, and employment opportunities (Senapati & Gupta, 2017)[20]. As a result, declining river-based income, reduced labor productivity, and increasing household expenses combine to worsen the economic condition of economically disadvantaged riverside communities (Baki et al., 2015)[21]. Health risks are another significant concern for communities living near the Buriganga River. Long-term exposure to contaminated river water is associated with skin infections, waterborne diseases, respiratory complications, and gastrointestinal illness (Hasan et al., 2019)[22]. Informal workers such as fishermen, boatmen, and riverside residents are particularly vulnerable because they frequently come into contact with contaminated water during their daily activities, which may reduce their workability and increase health-related expenses (Islam & Islam, 2020)[23]. In numerous cases, households face the double burden of higher medical costs and reduced income due to illness or missed workdays (World Health Organization, 2023)[24]. Some residents attempt to purify water using alum or solar heat; however, such methods may not fully eliminate disease-causing microorganisms, leaving continued health risks for users (Noman, 2024)[25].

From a sociological perspective, Buriganga River contamination is not only an environmental issue but also a question of social inequality and environmental justice (Kumar & Mizunoya, 2022)[26]. Poorer and socially marginalized communities often experience the most severe consequences of contamination, although they contribute least to the industrial and municipal sources of contamination (Hoque et al., 2021)[27]. These communities face multiple forms of vulnerability, including unsafe living conditions, livelihood insecurity, limited access to clean water, and increased exposure to environmental hazards. Therefore, the problem reflects broader social and economic inequalities associated with urban environmental degradation. Similar concerns have also been raised in broader discussions of river contamination, where environmental damage is closely linked with public health, livelihood disruption, and community-level economic stress (Tim Indonesia Asri, 2025)[28].

Although previous studies have made important contributions to understanding the environmental condition of the Buriganga River, comparatively few studies have examined how river contamination affects the overall quality of life of riverside communities. This gap is important because environmental degradation does not affect all groups equally; rather, its impacts are shaped by occupation, income level, social position, and degree of dependence on the river. The present study therefore, examines the socio-economic effects of Buriganga River contamination on riverside residents, with particular attention to health risks, livelihood disruption, household income, daily activities, and community perceptions. Such an approach can facilitate people-centered environmental policies that address both contamination mitigation and the social consequences of environmental degradation.

1.2 Rationale of the Study

The Buriganga River has historically supported Dhaka's urban and peri-urban communities by sustaining livelihoods, local ecosystems, transportation, and economic activities. However, uncontrolled industrial discharge, inadequate waste management, and insufficient public engagement have severely degraded the river environment and created significant challenges for communities living along its banks.

Although numerous studies have examined the environmental and technical aspects of Buriganga River contamination, fewer have explored its community-level socio-economic effects. This gap is important because numerous riverside residents depend on informal and low-income livelihoods and are highly vulnerable to health-related expenses, income loss, and reduced access to safe environmental resources. The present study addresses this gap by investigating how local communities perceive, experience, and respond to river contamination.

The study is also justified by the empirical findings that nearly two-thirds of respondents, 66.66%, described the river water quality as poor or very poor, while a substantial proportion identified untreated industrial discharge as a principal cause of contamination. These findings highlight the need for evidence-based policies, stronger industrial regulation, improved waste management, and community-based contamination mitigation. By examining the socio-economic dimensions of Buriganga River contamination, this research contributes to discussions on environmental justice, sustainable urban water management, and people-centered development in the Global South.

1.3 Limitations of Research

1. Sample size and representativeness: The study was conducted with a relatively modest sample of 45 respondents,97.78% of whom were male. This significant gender imbalance limits the study's ability to reflect women's views and experiences, although women may be more heavily affected by water contamination because of their involvement in household water use and caregiving responsibilities. Consequently, the findings may not comprehensively capture the diversity of the affected population.
2. Self-reported data: This study is based on self-reported perceptions and recall-based responses, both of which may introduce social desirability bias, imperfect recall, and individual interpretation. Respondents' perceptions of water quality, income levels, and contamination impacts may therefore not accurately reflect objective measurements.
3. Geographical scope: The research was limited to a particular section of the Buriganga River corridor and its immediately surrounding communities. These results may not fully represent conditions in other parts of the river or in other contaminated urban waterways in Bangladesh and comparable contexts without further investigation.

2. Objectives of the Study

This study is grounded in the understanding that environmental degradation is not only an ecological problem but also a social, economic, and political crisis that requires careful investigation and an evidence-based response. The decline of the Buriganga River reflects this reality. While its environmental damage is widely visible, the full human cost of this degradation has not yet been systematically examined or translated into practical policy measures. Against this context, the study sets out the following specific objectives:

1. To examine the socio-economic conditions of communities living along the Buriganga River and assess how river contamination has affected their livelihoods, income, and everyday life, thereby providing evidence that can support more targeted policy and development interventions.
2. To identify the principal causes of Buriganga River contamination as perceived by affected community members, to inform the regulatory priorities of environmental authorities and industrial monitoring agencies.
3. To analyze the socio-demographic characteristics of riverside communities,

including education, occupation, and income, to understand how these factors shape vulnerability to environmental degradation.

4. To explore community awareness of, and attitudes toward, participatory approaches to contamination mitigation, and to examine how local engagement can be meaningfully incorporated into environmental governance and river management frameworks.
5. To develop evidence-based policy recommendations for relevant stakeholders, including national environmental agencies, municipal authorities, industrial regulators, civil society organizations, and international development partners.

3. Methodology of the Study

3.1 Research Design

This study adopts a descriptive and exploratory research design to assess the socio-economic impacts of Buriganga River contamination on riverside communities in Dhaka, Bangladesh. A mixed-methods approach was employed, combining quantitative data collected through a structured questionnaire with qualitative insights gathered through face-to-face structured interviews. The questionnaires were used to collect socio-economic and perception-based information, while the interviews provided a deeper understanding of respondents' experiences, views, and concerns regarding river contamination and its impact. Given the practical nature of the research objectives, this design was considered appropriate for systematically capturing respondents' socio-economic characteristics, perceptions of water quality, sources of contamination, and attitudes toward community involvement in contamination mitigation.

The research adopted a cross-sectional design, in which data were collected at a single point in time from a specific group of respondents. This approach aligns with the study's objective of capturing current conditions and community experiences along the Buriganga River corridor.

3.2 Study Area

The study was conducted along a specific section of the Buriganga River corridor in Dhaka, Bangladesh. The Buriganga River is one of Dhaka's principal waterways and has long been essential to the city's economy and the livelihoods of nearby residents. However, decades of uncontrolled industrial growth, inadequate waste management, and low levels of public awareness have caused severe water contamination, leaving large portions of the river ecologically degraded and economically harmful to the

communities that depend on it. S The study area was intentionally selected because it includes a high concentration of low-income, river-dependent communities whose livelihoods and daily lives are most directly affected by deteriorating water quality.

3.3 Sampling Strategy

A purposive, non-probability sampling method was used to select participants for this study. This sampling method was adopted to ensure that the respondents were people who live or work near the Buriganga River and are directly affected by its contamination. The target population consisted of residents and workers living within the river corridor who engaged in river-dependent activities, such as fishing, boating, small-scale trading, and day labor, as well as other community members whose livelihoods and well-being were influenced by the condition of the river. A total of 45 respondents participated in the study. While the sample size is relatively small and limits statistical generalizability, it reflects the fieldwork challenges typical of densely populated informal settlements and remains appropriate for the exploratory aim of the research. At the time of data collection, all participants were adults who either lived or worked within the study area.

3.4 Data Collection Instrument

The data were collected through a structured questionnaire organized around four thematic domains in line with the research objectives:

1. Socio-demographic characteristics: including gender, age group, marital status, and occupation.
2. Economic characteristics: including monthly income and monthly expenditure brackets.
3. Perceptions of river water quality and contamination: including respondents' assessments of water quality and their identification of the primary causes of contamination.
4. Awareness and attitudes: including respondents' views on the environmental impacts of contamination and the perceived importance of community participation in contamination mitigation efforts.

The questionnaire included closed-ended questions with Likert-scale and categorical response formats. Questions were formulated in simple, accessible language and administered by enumerators in the local language (Bengali) to ensure that respondents understood them properly and could provide accurate responses. Before the full data

collection began, the questionnaire was pre-tested with a small group of respondents to identify and resolve any ambiguities.

3.5 Data Collection Procedure

Primary data were collected through face-to-face interviews conducted at or near respondents' homes or workplaces along the Buriganga River corridor. The study adopted a mixed-methods approach, integrating qualitative and quantitative techniques to examine both community perceptions and measurable patterns of river contamination impacts. Interviews were scheduled during regular daytime hours to enhance the availability of community members. Prior to each interview, all participants provided informed verbal consent and were assured that their participation was entirely voluntary and that their responses would be kept confidential and used solely for academic purposes. No personally identifiable information was recorded.

Before conducting the interviews, the enumerators were briefed on the questionnaire structure and data collection protocols to minimize interviewer bias and ensure consistency in responses.

3.6 Data Analysis

The collected data were systematically coded, cleaned, and analyzed using descriptive statistical techniques. All categorical and ordinal variables were analyzed using frequency distributions and percentages to present respondents' characteristics and perceptions. Findings are reported through a combination of tables (Tables 1, 2, and 3) and figures (Figures 1–7), collectively illustrating response patterns for key variables, including gender, age, marital status, occupation, income, expenditure, perceptions of water quality, sources of contamination, environmental impacts, and attitudes toward community involvement.

4. Findings of the Study

4.1 Demographic Characteristics of Respondents

4.1.1 Gender and marital status

Table 1 presents the gender and marital status distribution of the respondents. The gender distribution demonstrates that the respondents were overwhelmingly male. Out of the total 45 respondents, 44 were male, representing 97.78% of the sample, while only 1 respondent was female, accounting for 2.22%. This indicates that female participation in the survey was minimal compared with male participation.

Category	Percentage	Category	Percentage
Male	97.78%	Married	95.56%
Female	2.22%	Unmarried	4.44%
Total	100.00%		100%

Table-1: Respondents' Gender and Marital Status (in percentage)

The marital status distribution also demonstrates a pronounced predominance of married respondents. Among the 45 respondents, 95.56% were married, while only 4.44% were unmarried. This suggests that most participants belonged to a married population group, with unmarried respondents representing only a very minor proportion of the sample.

4.1.2 Respondents' age

Fig. 1 demonstrates that the largest proportion of respondents falls within the 30–41 age range (35.56%), whereas the smallest proportion is in the 42–53 group (8.89%). The 18–29 age category includes 14 respondents (31.11%), and the 54–65 group includes 11 respondents (24.44%).

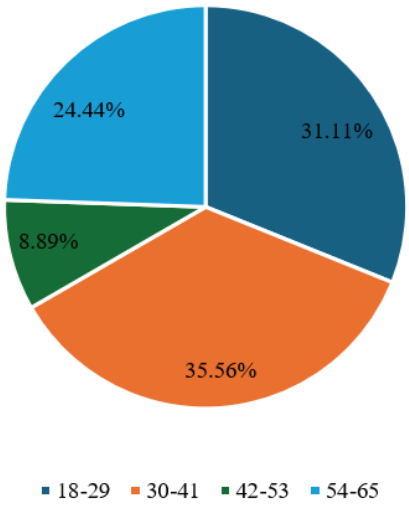


Fig-1: Respondents' Age (in percentage)

The 54–65 years group accounts for 24.44%, while the 42–53 years group has the lowest representation at 8.89%. Overall, the figure indicates that the majority of respondents were aged 18–41 years, with comparatively fewer participants from the 42–53 age group.

4.1.3 Respondents' occupation

Fig. 2 presents the occupational distribution of the respondents. The predominant group is laborers, representing about 42.22% of the respondents, indicating that a substantial proportion of the surveyed population depends on daily wage-based or manual work. The second-largest cohort is rickshaw drivers, accounting for approximately 31.11%, which also reflects a substantial dependence on informal urban livelihoods.

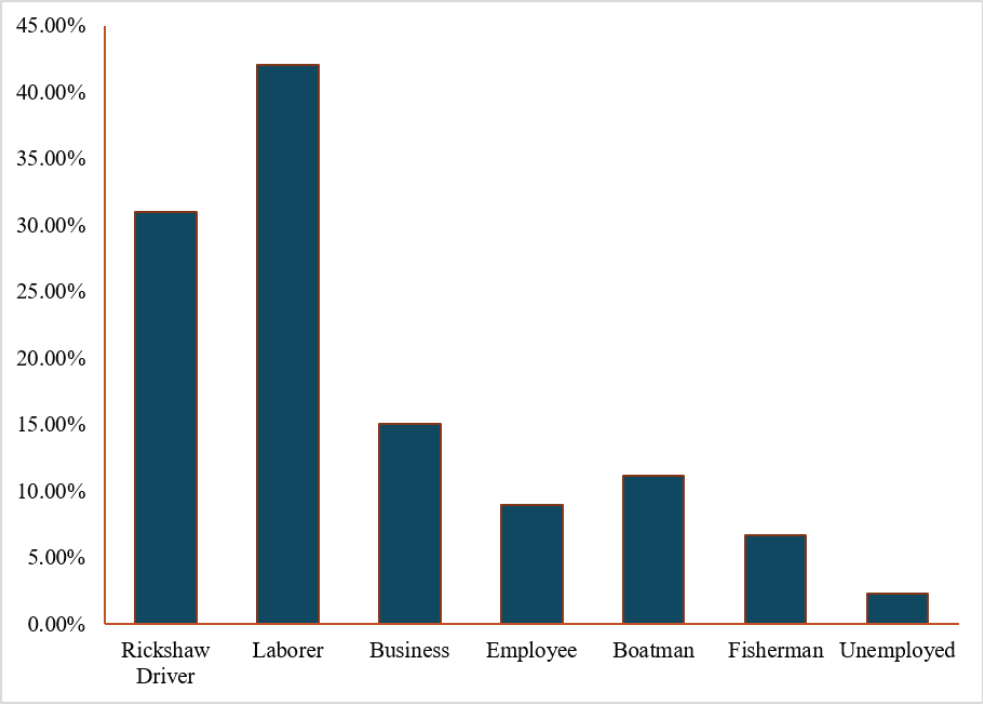


Fig-2: Respondents' Occupation (in percentage)

Other occupations are represented in lower proportions. Around 15.00% of respondents are involved in business, while boatmen account for about 11.11%. Employees represent approximately 8.89%, and fishermen constitute approximately 6.67% of the respondents. The smallest group is the unemployed, at only about 2.22%. Overall, the figure demonstrates that most respondents are engaged in low-income, informal, or physically demanding occupations, suggesting that the community is economically dependent on vulnerable livelihood activities.

4.1.4 Educational qualification

Fig. 3 presents the educational qualifications of the respondents. It demonstrates that the majority of respondents are illiterate, accounting for approximately 53.33% of the total sample.

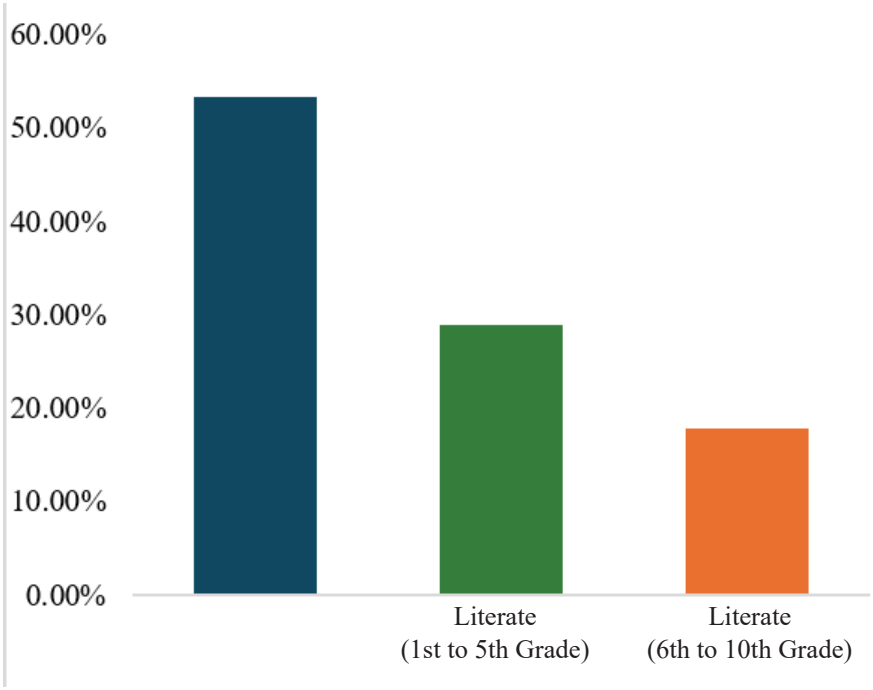


Fig-3: Respondents' Educational Qualifications (in percentage)

In comparison, 28.89% had education from Grade 1 to Grade 5, while only 17.78% had education between Grade 5 and Grade 10. Overall, the graph indicates a comparatively limited level of educational attainment among the respondents. The high percentage of illiterate respondents and the limited proportion of respondents with education up to Grade 10 suggest that access to or continuation of formal education may be limited within the surveyed community.

4.1.5 Monthly income and expenses

Fig. 4 presents the monthly income and expense distribution of the respondents. The highest proportion of respondents was found in the 4000–5000 range, where monthly income was about 37.78% and monthly expense was 33.33%. This indicates that most respondents belonged to a lower-middle-income group. In the 5000–6000 range, income accounted for about 29.44%, while expense was 25.56%, showing that a

substantial proportion of respondents also spent within this range. For the 3000–4000 range, income was 20.00%, and expense was 19.44%, suggesting that respondents in this group had minimal financial flexibility because their income and

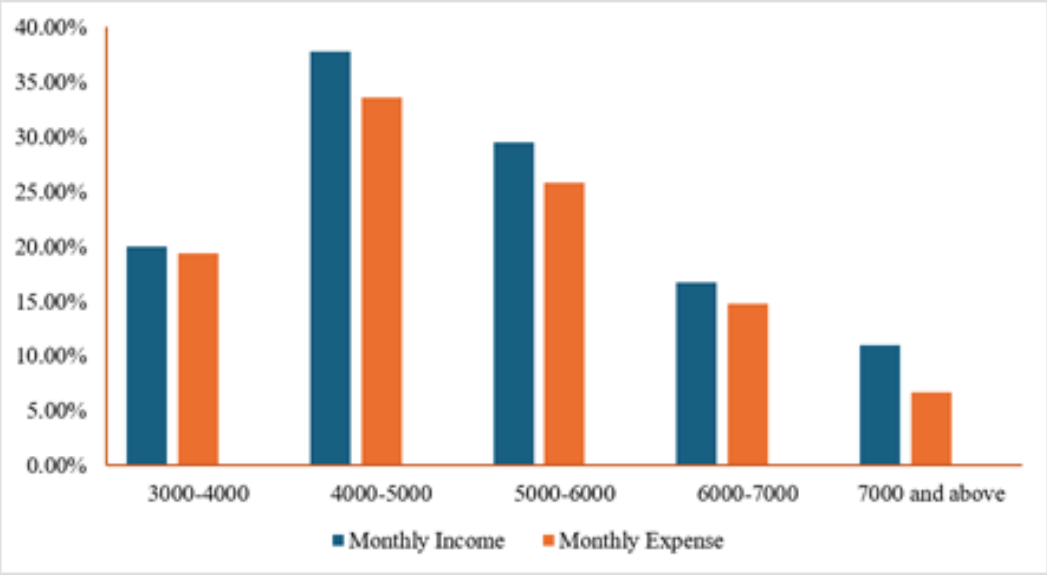


Fig-4: Respondents' Monthly Income and Expense (in percentage)

expenses were almost similar. In the higher ranges, 6000–7000 and 7000 and above, income levels were 16.67% and 11.11%, while expenses were 14.78% and 6.67%, respectively. Overall, the figure indicates that respondents are mostly concentrated in the lower-to-middle income and expense ranges, particularly between 4000 and 6000. In every category, monthly income is slightly higher than monthly expense, suggesting that respondents generally spend less than they earn.

4.2 Deterioration of Water Quality

4.2.1 Respondents' determination about the water quality

Building on the respondent characteristics presented in Table 1 and Fig. 1, the findings in Fig. 5 suggest that respondents generally view the quality of river water unfavorably. A considerable proportion of respondents, 44.44%, identified the water quality as very bad, suggesting that numerous participants perceive the river as highly contaminated

and unsuitable for regular use. In addition, 22.22% of respondents categorized the water quality as bad, further reinforcing the view that the river is experiencing significant degradation.

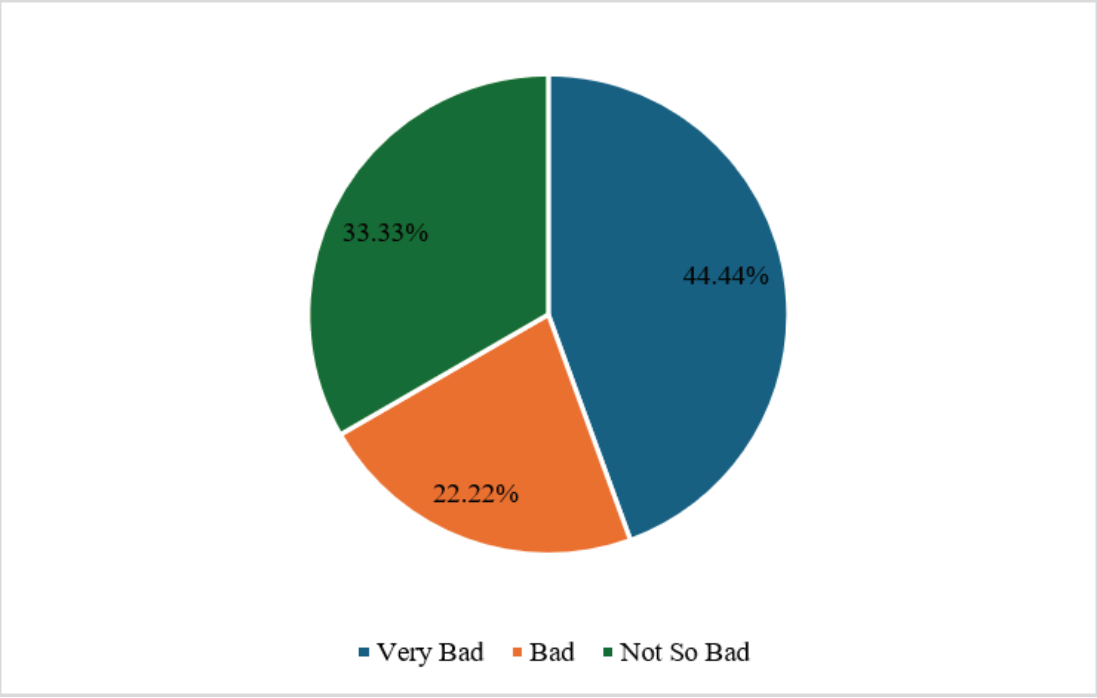


Fig-5: Respondents' Determination about the Water Quality (in percentage)

By comparison, 33.33% of respondents described the water quality as not so bad. Although this category reflects a relatively less negative perception, it does not necessarily indicate that the water is considered clean or safe. Rather, it may suggest variation in respondents' experiences, locations, or levels of exposure to river contamination. Overall, the figure demonstrates that 66.66% of respondents evaluated the Buriganga River water quality negatively, either as "very bad" or "bad."

4.2.2 Reasons for deterioration of water quality

Fig. 6 demonstrates the respondents' opinions regarding the principal reasons for the deterioration of river water quality. The chart demonstrates that untreated industrial waste discharge is viewed as the most significant contributor, accounting for 57.78%

of responses. This means that more than half of the respondents believe industrial effluents are the primary factor responsible for the declining water quality.

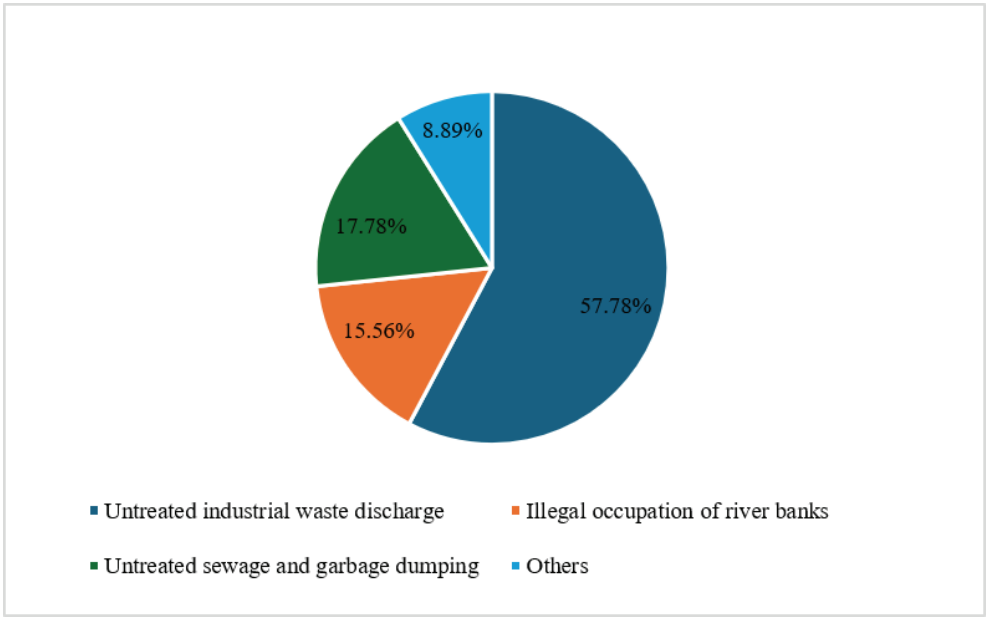


Fig-6: Reasons for Deterioration of Water Quality (in percentage)

The second most frequently cited factor is untreated sewage and garbage dumping, representing 17.78% of responses. This suggests that domestic waste, solid garbage, and municipal sewage also contribute notably to river contamination. Illegal occupation of riverbanks accounts for 15.56%, showing that encroachment and unplanned activities along the riverbanks are also perceived as significant contributors to environmental degradation. A smaller share, 8.89%, selected others, which may include factors such as lack of regulation, weak monitoring, inadequate waste management systems, and public negligence. Overall, the figure clearly indicates that respondents mainly associate the deterioration of water quality with anthropogenic activities, especially untreated industrial discharge.

4.3 Impact of Water Contamination

4.3.1 Impact of industrial waste disposal on the river

Table 2 presents respondents' perceptions of the impact of industrial waste disposal on the river. A total of 45 respondents participated in this question, and their responses demonstrate a pronounced concern about the direct degradation of river water quality. The most frequently reported impact was that the river water became unusable. This

option was selected by 40 respondents, representing 88.89% of the total sample. This indicates that the overwhelming majority of respondents believe industrial waste disposal has severely affected the practical use of river water.

Impact Type	Respondent Count	Percentage
Water became unusable	40	88.89%
Increase in mosquito nuisance	0	0.00%
Environmental damage	5	11.11%
Decreased river depth	0	0.00%
Total	45	100.00%

Table-2: Impact of Industrial Waste Disposal on the River (in percentage)

The second reported impact was environmental damage, selected by 5 respondents, or 11.11% of the total. Although this percentage is much lower than the response for unusable water, it still reflects awareness that industrial waste affects the wider river environment. No respondents reported mosquito nuisance or decreased river depth, as both categories received 0.00%. Overall, the table clearly demonstrates that respondents perceive industrial waste disposal as a principal cause of river deterioration.

4.3.2 Impact of contamination on fisheries and agriculture

Response Type	Respondent Count	Percentage
Yes	36	80.00%
No	9	20.00%
Total	45	100.00%

Table-3: Impact of Pollution on Fisheries and Agriculture (in percentage)

Table 3 demonstrates that most respondents reported a negative impact of contamination on fisheries and agriculture. Among the 45 respondents, 36 respondents, representing 80.00%, answered “Yes,” while only 9 respondents, or 20.00%, answered “No.” This indicates that contamination has a substantial effect on river-dependent economic activities, particularly fishing and agricultural practices.

4.4 Community participation in contamination mitigation

4.4.1 Importance of community participation in contamination mitigation

Fig. 7 illustrates respondents' perceptions regarding the importance of community participation in contamination mitigation. The results indicate a generally favorable attitude toward public involvement in environmental management. A substantial proportion of respondents, 64.44%, identified community participation as extremely important, suggesting that numerous participants recognize the role of local communities in supporting contamination prevention, monitoring, and mitigation efforts.

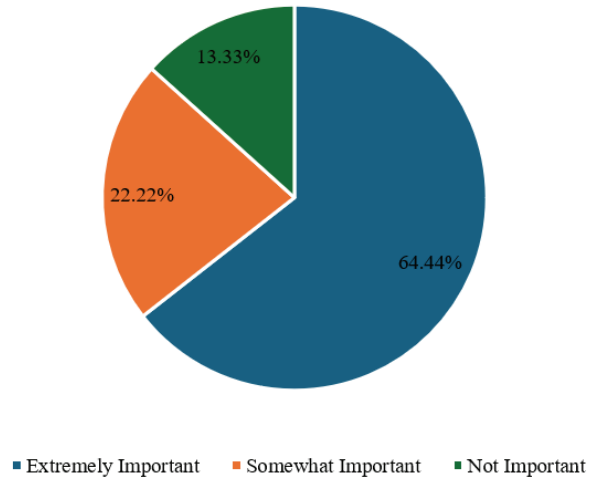


Fig-7: Importance of Local Community Participation in Pollution Control (in percentage)

In addition, 22.22% of respondents considered community participation to be somewhat important, indicating that this group acknowledges the relevance of community involvement, although perhaps with a more moderate level of emphasis. In contrast, 13.33% of respondents reported that community participation was not important, reflecting a relatively limited perception of the community's role in contamination mitigation. Overall, the findings demonstrate that 86.66% of respondents regarded community participation as either extremely important or somewhat important. This pattern suggests broad public recognition of the need for community engagement in contamination mitigation initiatives.

4.4.2 Socio-economic drivers of the Buriganga river

The conceptual framework presented in Fig. 8 illustrates the relationship between capitalism, urbanization, industrialization, and contamination in the context of the Buriganga river. The figure indicates that river contamination is not an isolated environmental problem; rather, it is shaped by broader socio-economic and

developmental processes. These three factors are shown as principal driving forces that contribute directly to contamination, while their interconnections further intensify environmental degradation.

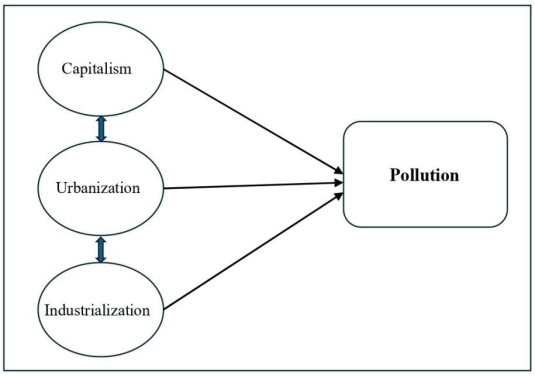


Fig. 8: Socio-economic drivers of the Buriganga river pollution

From a Marxian perspective, capitalist development is driven by continuous production, accumulation, and commercial expansion (Marx, 1867/1976)29. In the Buriganga River corridor, this development pattern can be linked to intensive land use and industrial expansion, which, under weak environmental regulation and inadequate waste-management systems, has contributed to river contamination. This process is further intensified by rapid and unplanned urbanization, which increases pressure on housing, drainage, sanitation, and waste management systems. As a result, sewage, domestic wastewater, solid waste, and surface runoff frequently enter the river. Industrial activities also contribute substantially to river degradation, as factories and processing units discharge untreated effluents, chemicals, and solid waste into the water. Together, these interconnected processes have degraded water quality, damaged aquatic ecosystems, and affected communities whose livelihoods and daily activities depend on the river.

5. Discussion

The findings demonstrate that the degradation of the Buriganga River has serious social, economic, and environmental effects on riverside communities. The age distribution demonstrates that most respondents were within the active working-age group, with 35.56% aged 30–41 years and 31.11% aged 18–29 years. Respondents aged 54–65 years represented 24.44%, while 8.89% were aged 42–53 years. This indicates that river contamination is affecting people who are economically active and often responsible for household income. Occupationally, the respondents were mainly

low-income and informal-sector workers. Laborers accounted for 42.22%, followed by rickshaw drivers at 31.11%, while other groups included business owners, employees, boatmen, fishermen, and unemployed respondents. This pattern is consistent with previous studies showing that riverside communities often depend on informal and river-linked livelihoods such as fishing, boating, small trade, and daily labor, making them highly vulnerable to environmental disruption (Deb et al., 2021; Hoque et al., 2021)30,31. The educational profile also supports this vulnerability, as 53.33% of respondents were illiterate, while 28.89% had education from Class 1 to Class 5 and 17.78% had education from Class 5 to Class 10. The income and expense data demonstrate that most respondents belonged to low-income groups, with a substantial proportion concentrated in the 4,000–5,000 range. Therefore, the contamination of the Buriganga is not only an environmental issue but also a livelihood and poverty issue, which reflects broader concerns of environmental inequality among poorer and marginalized riverbank populations (Kumar & Mizunoya, 2022; Hoque et al., 2021)32,33. The water-quality findings reveal a clear perception of river deterioration. About 44.44% of respondents described the water quality as very bad, while 22.22% described it as bad, and 33.33% considered it fairly good. Respondents identified untreated industrial waste discharge as the primary cause of deterioration, reported by 57.78%. Other causes included untreated sewage and garbage dumping at 17.78%, illegal occupation of riverbanks at 15.56%, and other causes at 8.89%. These findings agree with earlier studies that identified untreated industrial effluents, municipal wastewater, solid-waste dumping, and weak waste management as principal causes of Buriganga River contamination (Fatema et al., 2018; Uddin & Jeong, 2021; Riad Khan et al., 2023)34,35,36. The role of industrial discharge is also aligned to the previous evidence on tannery, textile, and dyeing industries along the riverbank, which released chromium, heavy metals, processing chemicals, and high-oxygen-demand pollutants into the river system (Human Rights Watch, 2012; Akbor et al., 2020)37,38. These findings suggest that the crisis is mainly anthropogenic and linked to industrial contamination, deficient urban governance, and inadequate regulation. The impact data further demonstrates the severity of the problem. An overwhelming majority, 88.89%, reported that the river water has become unusable, while 11.11% mentioned environmental damage. In addition, 80.00% of respondents reported that contamination affected fisheries and agriculture, compared with only 20.00% who reported no such impact. The loss of river usability also has direct implications for daily activities, income, and household security. Earlier studies similarly reported that poor water quality increases health risks, reduces workability, and raises medical

expenses among exposed riverside communities (Hasan et al., 2019; Islam & Islam, 2020; World Health Organization, 2023)39,40,41. Similar socio-economic vulnerability has been documented among marginalized riverine and coastal communities in Bangladesh, where environmental stresses interact with poverty, limited access to safe drinking water and health services, and dependence on climate-sensitive livelihoods, further reducing household resilience (Noman, 2020; Noman, 2025)42,43. Finally, the study demonstrates strong public support for community participation in contamination mitigation. Around 64.44% of respondents considered community participation extremely important, 22.22% considered it somewhat important, and only 13.33% considered it not important. This suggests that affected people are not passive victims; rather, they are willing to contribute to river restoration if proper institutional support is provided.

Overall, the results indicate that the Buriganga River crisis is both an environmental and socio-economic problem. Contamination has reduced water usability, threatened livelihoods, increased vulnerability among low-income communities, and exposed weaknesses in industrial and urban governance. Effective restoration, therefore, requires stringent regulation of industrial discharge, enhanced waste management, livelihood support, public awareness, and meaningful participation of local communities in contamination-mitigation initiatives.

6. Conclusion

This study began with a fundamental yet urgent question: what happens to people when a river dies? The findings demonstrate that the decline of the Buriganga river is not only an ecological crisis but also a social, economic, and human one. Contamination has directly affected riverside communities by weakening livelihoods, reducing economic opportunities, and threatening the social foundations on which numerous families depend.

The study demonstrates that the degradation of the Buriganga is largely the result of human and institutional failures. Untreated industrial effluent, inadequate regulatory enforcement, deficient urban planning, riverbank encroachment, and inadequate governance have turned the river into a waste channel rather than a shared ecological resource. The burden of this degradation falls most heavily on day laborers, rickshaw pullers, fishermen, small farmers, and low-income households, who contribute least to the contamination but suffer most from its consequences. This makes the Buriganga crisis a clear issue of environmental justice. For policymakers, the findings highlight the need for coordinated and practical action. Industrial discharge standards must be

enforced through regular inspections, transparent monitoring, and effective sanctions. At the same time, affected communities need targeted livelihood support, including skills training, microcredit, and alternative income opportunities. Industries operating around the Buriganga must also take responsibility by investing in wastewater treatment, allowing independent audits, and engaging transparently with affected communities.

Most importantly, the study demonstrates that riverside communities are willing to participate in contamination mitigation. Their lived experience and local knowledge should be included in future governance. Restoring the Buriganga is therefore not only an environmental necessity but also a socio-economic and governance priority. Meaningful recovery requires coordinated regulation, accountable industries, social support, and genuine community participation.

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