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Impact of Major Pollution Sources on the Water Quality of the Yamuna River: An Assessment of Remediation Strategies and Public Perception

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ABSTRACT

The Yamuna River is one of the most polluted rivers of India. It is facing severe environmental degradation due to rapid urbanization, industrialization, and population growth. Levels of pollution continue to rise despite substantial financial investments and initiatives like the Yamuna Action Plan, posing a significant threat to human health, biodiversity, and water security.

This study reviews the major sources of pollution affecting the quality of Yamuna water. Along with that, it also addresses both current remediation strategies and public perceptions towards the crisis. Additionally, it tracks decadal water quality trends and community awareness using secondary environmental data and a survey of 55 respondents.

The analysis has used secondary data from various environmental reports and websites, government publications, and other research studies. However, the data are correlated with people's perception. It demonstrates severe environmental failure between 2015 and 2025, in which Dissolved Oxygen (DO) decreased to 0.0 mg/L, Biochemical Oxygen Demand (BOD) increased from 35 mg/L to 70 mg/L, and Chemical Oxygen Demand (COD) increased by more than 123%, indicating severe deterioration in water quality and oxygen depletion in the studied river stretch. Survey results strongly reflect these scientific trends, with the public perceiving the river as very polluted, therefore lacking confidence in government efforts due to poor enforcement and monitoring of infrastructure.

Ultimately, these findings have highlighted that the recovery of the Yamuna relies heavily on reconciling the gap between best practices and policy. It can be achieved through strict disciplinary enforcement, improved sewage infrastructure, and collective community awareness and participation.

Keywords: Yamuna River; Water Pollution; Water Quality Assessment; Remediation Strategies; Public Perception; River Pollution

1. INTRODUCTION

The Yamuna River is the largest tributary of the Ganga River in North India (Kale, 2014). Its total length is around 1370 kilometers (National Mission for Clean Ganga [NMCG], 2021). Yamuna originates from the Yamunotri Glacier of Uttar Kashi in Uttarakhand. It flows through the states of Delhi, Haryana, and Uttar Pradesh before merging with the Ganges at Allahabad. Across generations, the Yamuna River has stood as a silent guardian of human life by ensuring excess water for agriculture, industries, and domestic use while also possessing immense religious and historical significance.

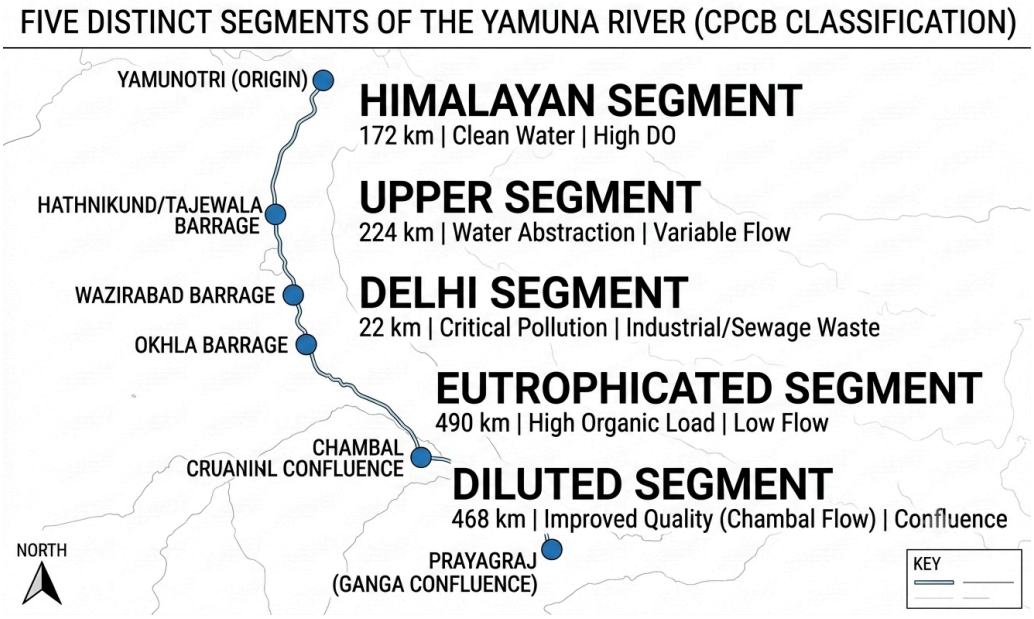

Figure 1. Segments of the Yamuna River (CPCB, 2006).

Cities like Delhi have expanded and developed on its banks. Thus, the river has become a lifeline of economic and social life**.** However, the conditions of the Yamuna River have worsened due to growing urbanization, industrial expansion, and population pressure. Large amounts of untreated sewage, industrial waste, agricultural runoff, solid waste, and religious activities of wastage are continuously discharged into the river (Upadhyay et al., 2011). These factors have contributed to the deterioration of the river's water quality. Increasing pollution in the Yamuna River has become a matter of great concern since it degrades human health, increases the loss of biodiversity, reduces drinking water, and affects the agricultural system (Sharma et al., 2021).Because of this, the overall sustainability of water resources is being destroyed. Nevertheless, despite its significance, many stretches of the river are extremely polluted today (Central Pollution Control Board [CPCB], 2020). Because of this, the overall sustainability of

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2. METHODOLOGY

2.1. Study Design

This study employed a mixed-method research design integrating secondary water-quality analysis with a primary questionnaire survey to examine pollution in the Yamuna River. Secondary data were analysed to assess changes in key water-quality parameters, while the questionnaire survey evaluated public awareness and perceptions of the river's pollution.The findings from both approaches were subsequently compared to examine the relationship between public perceptions and the observed water-quality conditions.

2.2. Secondary Water-Quality Data

Secondary water-quality data were obtained from official reports published by the Central Pollution Control Board (CPCB). The analysis focused on the Okhla monitoring station in the Delhi stretch of the Yamuna River, as it represents one of the most polluted sections of the river. Four key water-quality

parameters—dissolved oxygen (DO), biochemical oxygen demand (BOD), chemical oxygen demand (COD), and pH—were selected because they are widely used to assess river health.

The values analysed for 2015 and 2025 were extracted from CPCB reports for the Okhla monitoring station in the Delhi stretch of the Yamuna River. These years were selected to compare two comparable official observations separated by approximately a decade, using the earliest and most recent datasets available for the study. The reported values represent selected observations rather than continuous annual averages or seasonal mean values. These comparable observations were used to assess changes in water quality between the selected years.

2.3. Survey Methodology

To assess public perceptions of Yamuna River pollution, a cross-sectional online survey was conducted using Google Forms. A total of 55 respondents voluntarily participated in the survey. Respondents were recruited through the researcher's personal and school networks, including friends, classmates, teachers, and family members. Participation was voluntary, no incentives were provided, and no personally identifiable information was collected, ensuring respondent anonymity. The questionnaire collected demographic information, including age, gender, occupation, and location. Most respondents were from Delhi and the National Capital Region (NCR), while the remainder were from other parts of India. The survey employed convenience sampling, resulting in a sample predominantly comprising students and young adults.Therefore, the findings should be interpreted as reflecting the perceptions of this demographic rather than those of the broader Indian population.

3. DIFFERENT SOURCES OF POLLUTION IN THE YAMUNA RIVER

Approximately 75 percent of urban waste in India ends up in the country's rivers (Misra, 2010). Uncontrolled urban growth across the country, combined with poor government regulation, has resulted in the problem only getting worse.This situation has occurred despite the massive investment of successive governments and the efforts of various organizations in cleaning them up. 75 to 80 percent of the pollution in the river is raw sewage, industrial runoff, and the garbage dumped into the river (CPCB, 2020). It totals over 3 billion liters of waste a day. Around 20 billion rupees have already been spent on various clean-up projects (Ministry of Environment, Forest and Climate Change [MoEFCC], 2006). However, there is no effect on the pollution levels. So, the river water is not healthy for any use by humans or animals. There are many serious water quality problems in the cities, towns, and villages using the Yamuna River as a source of their water. Also, the Yamuna is under serious threat from relentless modernization and industrialization. There are a few major sources that cause pollution in the Yamuna River. These are as follows: -

3.1. Industrial Effluents

Yamuna River is also known as a drainage, useless river and river of sorrow to Delhi, Mathura and Agra. The river water is extremely black and muddy. It appears like an industrial drain in Delhi, as the majority of the industries are on its bank and used to dump the untreated effluents into the river. The water in the Yamuna remains stagnant for approximately nine months in a year. There are an unlimited number of industrial units draining immense amounts of untreated water into the Yamuna in Delhi, Faridabad, Mathura and Agra. There were approximately 359 industrial units, which directly or indirectly discharge their effluents in the Yamuna (CPCB, 2020). Moreover, there were about 42 industrial units in Delhi directly polluting the Yamuna (CPCB, 2020).

3.2. Domestic Wastewater

Yamuna is considered one of the most polluted rivers of the world, especially around Delhi, because of the large amount of wastewater discharge. According to a survey, Delhi contributes 23 percent of the total wastewater generated by Class I cities (cities with more than 100,000 people) (CPCB, 2006). More surprisingly, this is 47 per cent of the waste generated by 101 Class I cities and 122 Class II cities (Population: 50,000-99,999) in the Ganga basin. The untreated domestic wastewater is dumped in the Yamuna, which has ammonia in it, increasing its concentration. The water becomes untreatable when the ammonia concentration reaches 0.4 mg/L or more. In Delhi, predominantly ammonia in the Yamuna River has been found to be more than 0.4 mg/L, especially during the summer season. The river has turned grossly polluted due to continuous discharge of domestic wastewater from the Palla region to the Etawah region.

3.3. Pollution from Agriculture

Agriculture heavily impacts the water quality of the Yamuna River, particularly because farming is widespread across its catchment areas and banks (Misra, 2010). Runoff from ground and surface water affects the quality of river water directly or indirectly. During both monsoon and non-monsoon periods, precipitation and irrigation seepage transport critical contaminants including synthetic fertilizers, pesticides, herbicides, and livestock waste. Local people, who live along the bank of the Yamuna River, are usually very much involved in agriculture. Despite growing crops in their own fields, they also grow crops where river streams are shrunk, including catchment areas. Thus, such activities are directly contributing to pesticide residues in the water.

3.4. Solid Wastes

The unwanted and discarded solid products refer to solid wastes. Their proper management is essential for maintaining healthy ecosystems. Unfortunately, inappropriate garbage dumping has become one of the most critical threats to the Yamuna River (Pooja & Kumari, 2026). According to the different environmental reports of the Yamuna Action Plan and CPCB, it is proven that the permissible content of suspended solids in the Yamuna River should be less than 100 mg/L.

But after experimenting with the water of the Yamuna River, it has been found that the water has already exceeded its permissible limit of 100 mg/L, ranging from 1000 to 1000-10,000 mg/L. This extreme pollution is primarily driven by the rapidly growing and unaware population of Delhi, who are dumping solid waste directly into the river. Waste should be released only when it is properly treated. These pollutants are discharged untreated into the river from numerous authorized and unauthorized dairy colonies operating across major urban and industrial hubs, including Sonipat, Panipat, Delhi, Noida, Mathura, Agra, and Etawah. Because these pollutants enter the waterway from countless scattered locations rather than a single, easily controlled pipe, they are classified as a major non-point source of pollution, making environmental regulation and cleanup efforts exceptionally difficult.

3.5. Socio-Economic Challenges and Cultural Practices

The degradation of the Yamuna River is also caused by cultural practices, socio-economic challenges, and the absence of basic civic infrastructure in surrounding areas. Every year on holy and religious occasions, thousands of people take a dip in the Yamuna and leave behind worship materials, polythene bags, clay idols, human excreta, account books, and floral offerings in the river water. While these practices hold immense spiritual significance, these activities inadvertently increase the suspended materials iTn the water. The following superstitious mindset of the people is badly contributing to and escalating the Yamuna River Pollution. Furthermore, a large number of cities and small towns are located all along the Yamuna River.

The majority of these small cities and towns still lack the proper infrastructure for sanitation.

So, people use catchment areas and land along the river, resulting in open defecation. Further causes include pathogenic and organic contamination in the river. Mainly in India, either people follow the tradition of burning dead bodies and then releasing the leftovers in rivers, or the bodies are directly thrown into the river. According to superstition, people who die from certain diseases like asthma, tuberculosis, and snake biting, the death of newborn babies, and holy men are all considered to be consigned to the river. Additionally, the helpless situation of poor people forced them to dump bodies into the rivers to save on costly wood cremation.

4. IMPACT ON WATER QUALITY

The decadal evaluation of the River Yamuna (Delhi stretch) between 2015 and 2025 reveals profound, destructive impact on the river's aquatic chemistry, ecological stability, and overall environmental health. This section presents the primary physicochemical data compiled from published government reports and research literature. It illustrates the shifting multi-parameter trends and cascading ecological consequences of these variations.

4.1. Physicochemical Data and Trend Analysis

To evaluate the extent of the impact over the ten-year study period, the primary water quality parameters—including pH, Dissolved Oxygen (DO), Biochemical Oxygen Demand (BOD), and Chemical Oxygen Demand (COD)—were analyzed. The quantitative variations and their corresponding deviations from the CPCB standards are consolidated in Table 1.

Table 1. Decadal variation and multi-parameter scaling comparison of the Yamuna River (2015 vs. 2025)

Parameters	Unit	Year 2015	Year 2025	% Change	CPCB Standard Limit	Status (2025)
pH	-	7.6	7.1	-6.58%	6.5- 8.5	Within Limits
Dissolved Oxygen (DO)	mg/L	1.2	0.0	-100.00%	>=5.0	Critical Failure
Biochemical Oxygen Demand (BOD)	mg/L	35.0	70.0	+100.00%	<=3.0	Severe Organic Load
Chemical Oxygen Demand	mg/L	85.0	190.0	+123.53%	<=250.0	High Chemical Load

4.2. Discussion of Ecological and Chemical Impacts

4.2.1. Loss of Aquatic Life

One of the most significant findings of this study is the decline in Dissolved Oxygen (DO) from 1.2 mg/L in 2015 to 0.0 mg/L in 2025 at the selected monitoring location. It dropped from a very low 1.2 mg/L in 2015 down to absolute zero, 0.0 mg/L in 2025. Fish and other river creatures need at least 4.0 mg/L of oxygen in the water just to breathe. Such conditions are likely to severely reduce fish diversity and adversely affect aquatic life in this stretch of the river.

4.2.2. Foul Odor and Black Water

Tabular data shows that both BOD (organic waste) and COD (chemical waste) have doubled over the decade. Normally, a river uses oxygen to clean itself and break down waste naturally.

However, because there is no oxygen left, the waste is now decomposing without oxygen. This process relies on anaerobic bacteria. As these bacteria break down the heavy sewage, they release toxic gases like hydrogen sulfide, ammonia, and methane. These gases are the direct reason why the Yamuna water looks completely black and smells foul.

4.2.3. Heavy Sewage Load and Algae Growth

The massive rise in BOD (+100%) and COD (+123.53%) proves that a huge amount of untreated household sewage and factory waste is being dumped into the river. This waste acts like a powerful fertilizer, filling the water with excessive nutrients like nitrogen and phosphorus. Even though the pH looks normal (changing slightly from 7.6 to 7.1), this should not be interpreted as evidence of good water quality. Elevated BOD and COD concentrations indicate that the river remained heavily polluted despite relatively stable pH values. This toxic mix of stagnant water, zero oxygen, and heavy nutrients creates a perfect breeding ground for dangerous bacteria (like fecal coliform from sewage) and harmful algae, which threatens the safety of nearby groundwater (Upadhyay et al., 2011).

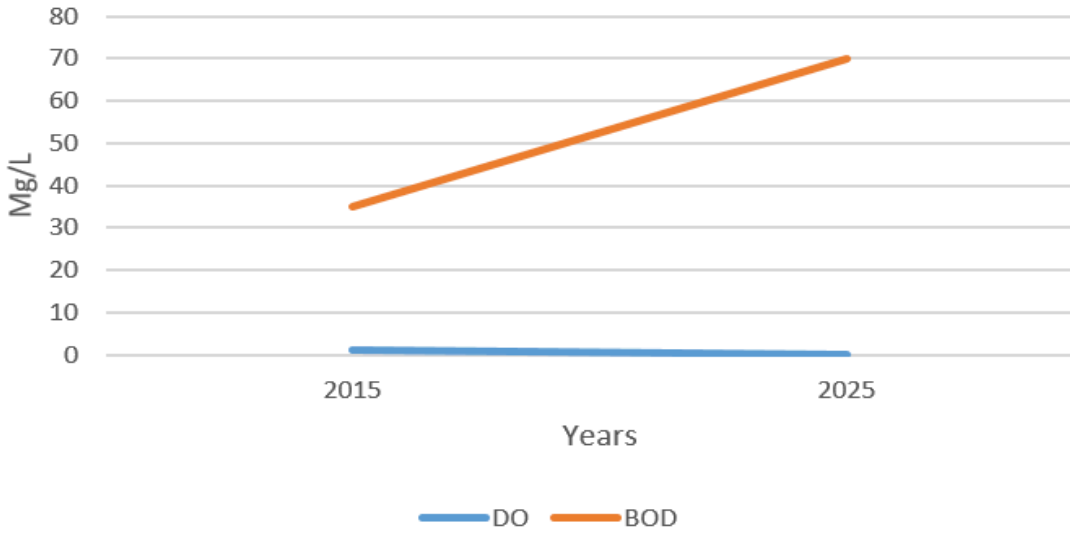

Figure 2. Comparison of BOD and DO between 2015 and 2025

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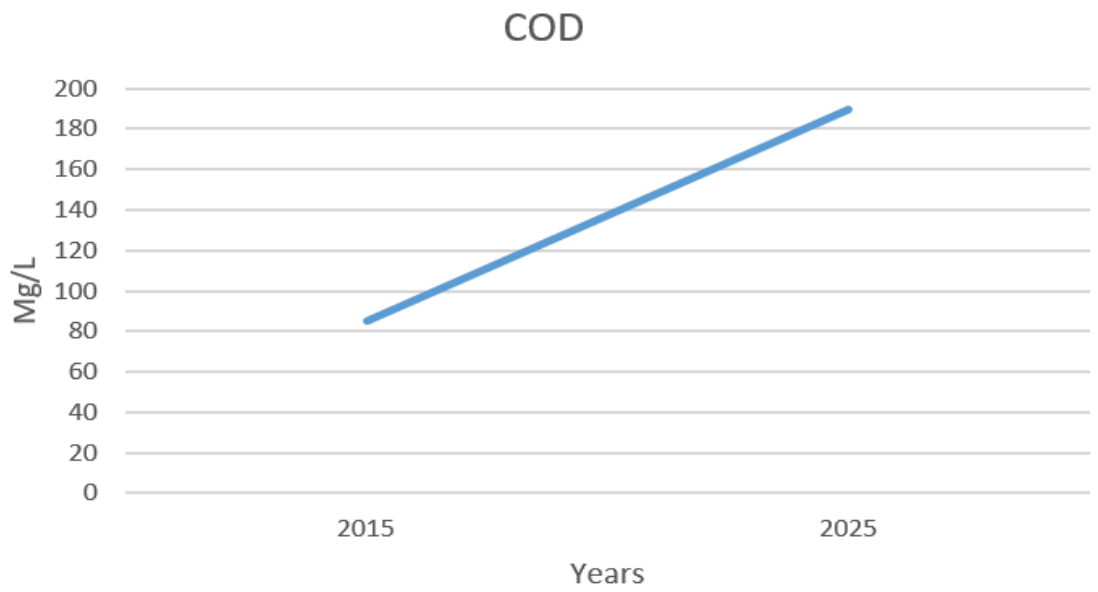

Figure 3. Comparison of COD Levels between 2015 and 2025

5. PUBLIC PERCEPTION

5.1. Demographic Profile of Respondents

This survey had a balanced sample of male and female respondents. Among the respondents, 54.5% were female, and 45.5% were male, indicating a balanced gender representation. The majority of respondents, 54.5%, belonged to the age group below 18 years, followed by 34.5% in the 18–50 years category and 10.9% above the age of 50 years. In terms of occupation, students formed the largest group of respondents, accounting for 61.8% of the sample, while 36.4% were working professionals. This diverse demographic profile provides a broad perspective on public awareness regarding Yamuna River pollution.

5.2. Awareness of the Yamuna River and Its Condition

The survey findings indicated that people have good awareness of the Yamuna River. Interestingly, all respondents said that they had seen the Yamuna River in real life, indicating that their understanding of the river is based on their personal experience, and not just social media findings. When asked about the current water quality of the river, most of the respondents described the Yamuna as "highly polluted" and the rest of them as moderately polluted. None of the respondents reported a clean or unpolluted river. This

shows a high level of people's awareness of the issue that pollution is a serious problem for the river, which is summarized in Figure 4.

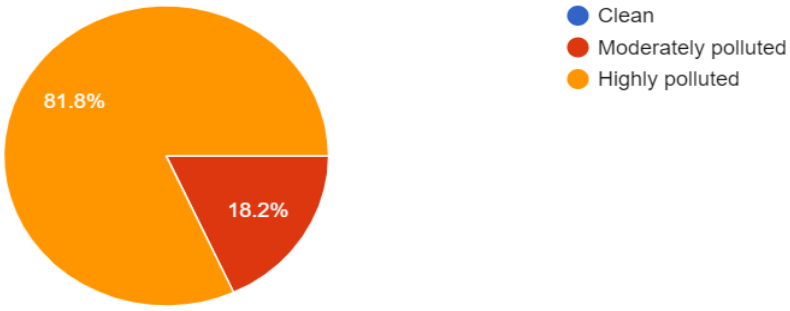

Figure 4. Public perception of the current water quality and pollution severity of the Yamuna River.

5.3. Perceived Sources of Pollution

Public opinion regarding the major causes of Yamuna pollution suggested that respondents recognize several human activities that contribute to the pollution of the river. Industrial waste was the major source of pollution for the largest number of respondents. Untreated sewage was the next most popular option, reflecting the broad worry about poor wastewater treatment and discharge practices. The second most mentioned concern was solid waste disposal, including plastic dumping, and religious activities were mentioned a number of times. This indicates that pollution is largely seen as a problem caused by industrial and infrastructural failures rather than solely cultural and religious practices.

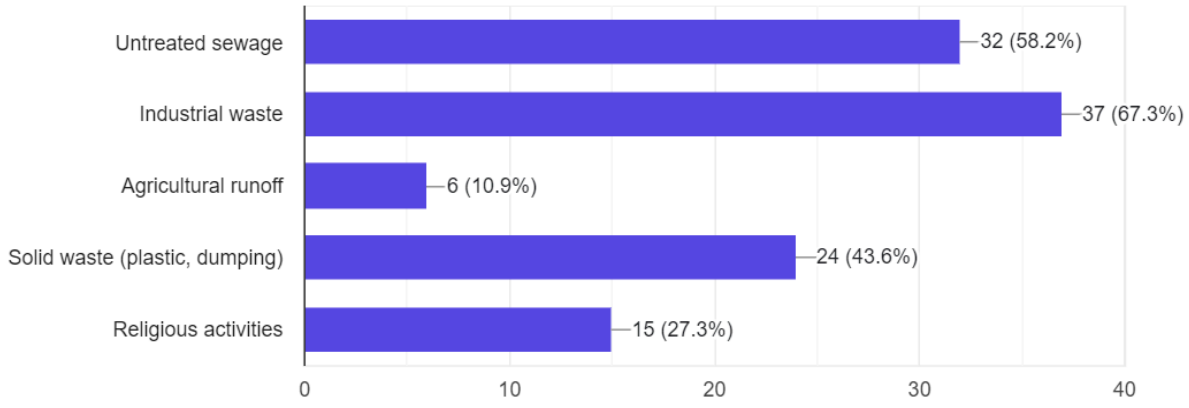

Figure 5. Public perception regarding the primary sources of pollution in the Yamuna River.

5.4. Public Concerns Regarding the Impact of Pollution

The survey also covered the issue of which aspects of pollution people are most worried about. Pollution damage to the environment, in the form of loss of biodiversity(39.3%), was the most commonly selected concern, reflecting awareness of environmental damage due to pollution. The degradation of aquatic life seems to be understood by the respondents to be a threat to the marine population, plant life, and overall ecological balance. At the same time, concerns about drinking water contamination (28.6%) and human health issues (28.6%) were also strong. This indicates that respondents not only consider the Yamuna pollution as an environmental problem, but also as a direct threat to public health and water security. Agricultural impacts were mentioned by only a few (3.6%) respondents.

5.5. Perceptions of Effective Solutions

Respondents had different views when asked what would be the best way to cut pollution. Strict industrial control was the most preferred solution, as large numbers believe that industries are a major source of pollution in the river and need more regulation. Sewage treatment improvements and public awareness campaigns were also deemed very important. The answer shows that the respondents feel that the way to tackle pollution control is through improving the infrastructure and changing citizens' behaviors. A few respondents considered best waste management practices to be the most effective solution.

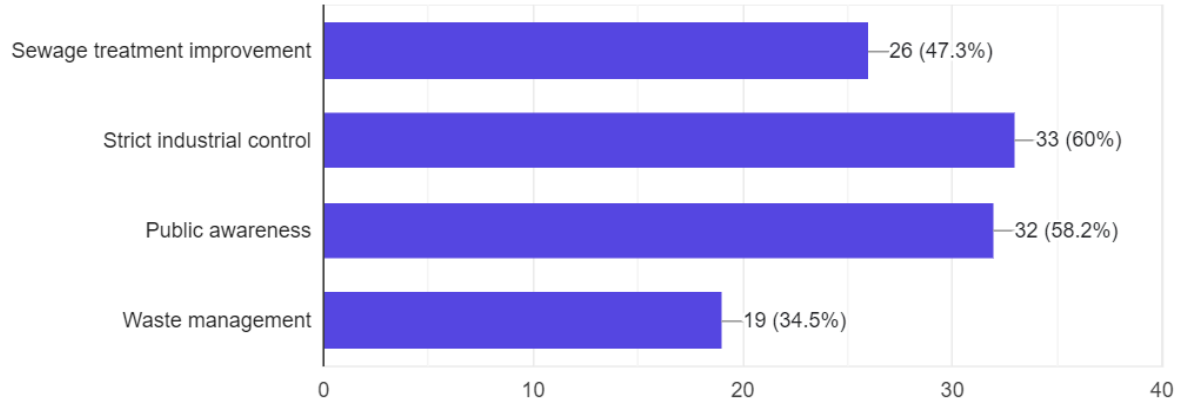

Figure 6. Public perception regarding the effective solutions of pollution in the Yamuna River.

5.6. Perception of Pollution Trends

The results of the survey are very discouraging about the condition of the Yamuna River. The majority view (69.1%) believed that the pollution situation was getting worse, while only 14.5% found the pollution situation improving. Very few respondents(10.9%) felt that there was no change, or (5.5%) were not sure about the trend. This feeling implies that, although there are different government measures and environmental programs, the public as a whole is not feeling that pollution is being controlled and is increasing over time.

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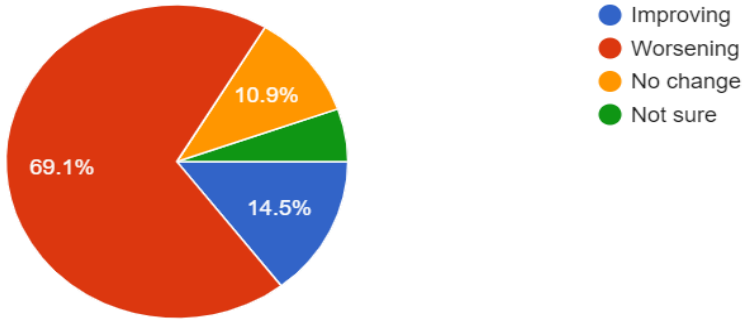

Figure 7. Distribution of respondent opinions regarding pollution trends in the Yamuna River

5.7. Assessment of Government Efforts

The Respondents were also asked to assess the effectiveness of government activities in reducing pollutants. Just under half, 50.9% of respondents felt that the government's efforts are not effective, while 41.8% of respondents felt that the government's efforts are partially effective. Only 7.3% of respondents felt that government initiatives are effective. These findings suggest that there is low confidence in current policies and implementation processes, while people have knowledge of government interventions; their perception of the impact of these efforts on river quality is not visible enough.

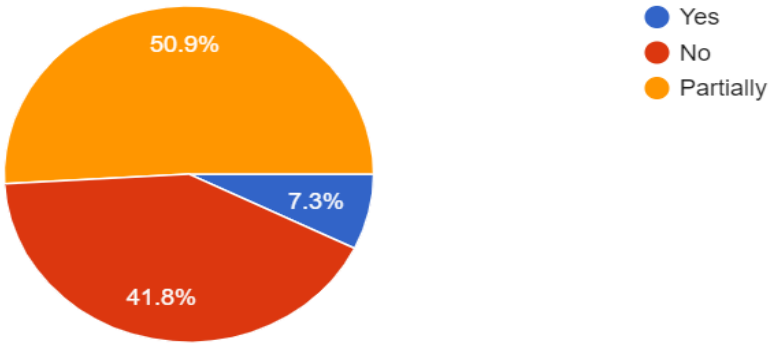

Figure 8. Participant evaluation of the effectiveness of government remediation programs and initiatives

5.8. Visible Signs of Pollution

The pollution observed by people was similar to the pollution issues reported in the Yamuna River. The most common symptom was the foam formation observed by 54.5% of participants. Foam is seen as the most visible sign of pollution in the river and is commonly linked with untreated sewage and industrial effluents.Also, 25.5% said that they saw dark or black water, and a smaller number, 16.4%, said it smells bad, and 1.8% reported seeing dead fish in the water.

These observations suggest that the pollution can be seen and is easily noticeable to the public, further compounding concerns regarding the river's poor conditions.

5.9. Responsibility for Pollution

One of the interesting findings of the survey is the view of responsibility. A very high percentage of respondents thought everyone was equally responsible for the pollution of Yamuna, including industries, government agencies, and the general public. Only a few respondents specifically blamed the public or industries. This implies that people view river pollution as a multi-faceted problem that cannot be blamed on any one person, but must be taken up in the spirit of collective responsibility and cooperation.

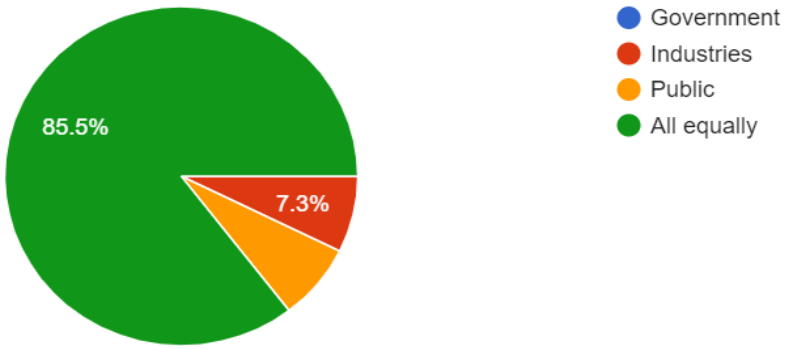

Figure 9. Perceived accountability for Yamuna River pollution

5.10. Awareness of Pollution Control Measures

Attitude towards existing pollution control initiatives was also measured. Around half of the respondents had heard of Sewage Treatment Plant (STP) and of the Yamuna Action Plan. Fewer knew about pollution control industrial regulations. Awareness is moderate for government programs and pollution management strategies, though this seems to be the case for treatment infrastructure rather than pollution management regulations.

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5.11. Perceived Effectiveness of Sewage Treatment Plants

Generally, respondents viewed sewage plants as moderately useful. The majority of them considered STPs as somewhat effective, while the rest of them saw them as either very effective or not effective. This shows that while people acknowledge the importance of sewage treatment infrastructure, there is still uncertainty regarding its actual performance and implementation. The public appears to believe that STPs contribute to pollution reduction but are insufficient on their own to solve the problem completely.

5.12. Challenges in Reducing Pollution

When asked about the biggest obstacle that comes while reducing Yamuna pollution, the most common response was lack of enforcement. This tells us that respondents believe laws and regulations exist, but their implementation, as usual, remains weak. Other challenges identified during surveying included public behavior, industrial non-compliance, and poor infrastructure. These key findings suggest that respondents see pollution as a mainly governance issue requiring stronger monitoring, enforcement, and accountability mechanisms.

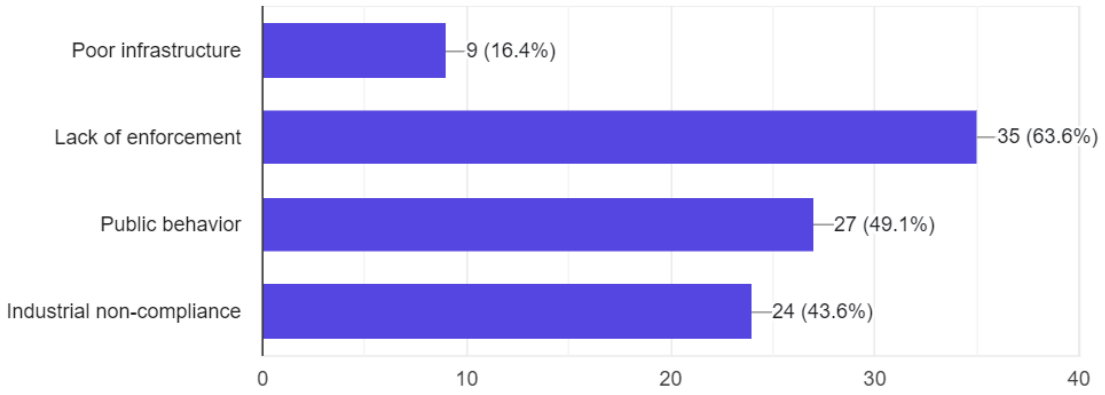

Figure 10. Survey results indicating the primary challenges in reducing Yamuna pollution

5.13. Individual Actions and Environmental Responsibility

The survey also explored personal environmental behavior. More than half of the respondents reported that they actively avoid dumping waste into water bodies. Others stated that they reduce plastic use or participate in clean-up activities. These responses show willingness among individuals to contribute to pollution reduction through responsible behavior. However, the findings also suggest that greater public participation and awareness efforts could further strengthen community involvement in river conservation.

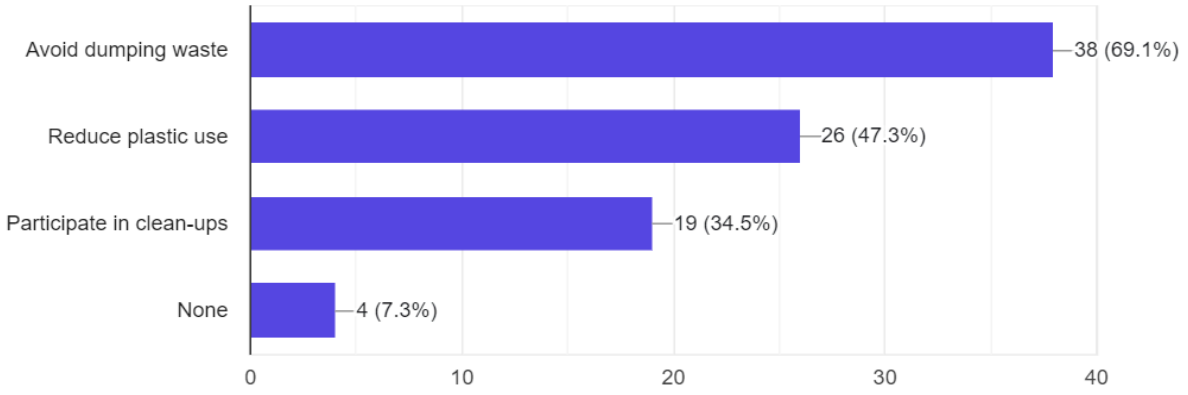

Figure 11. Distribution of respondent opinions regarding individual actions taken to reduce Yamuna River pollution.

Overall Interpretation

In conclusion, the results of the survey reveal a high level of public awareness regarding the pollution of the Yamuna River. Most respondents perceive the river as highly polluted, believe that pollution levels are continuing to worsen, and express concerns about environmental degradation, water contamination, and public health risks. Industrial waste and untreated sewage are widely viewed as the primary causes of pollution, while strict industrial regulation, improved sewage treatment, and public awareness are considered essential solutions. The findings further highlight a lack of public confidence in the effectiveness of current government efforts and emphasize the need for stronger enforcement of environmental regulations. Importantly, respondents recognize that responsibility for pollution is shared among industries, government authorities, and citizens, indicating support for a collective and integrated approach to restoring the health of the Yamuna River.

6. REMEDIATION STRATEGIES AND YAMUNA ACTION PLAN ANALYSIS

The restoration of the Yamuna River requires an integrated approach combining technical, administrative, and community-based interventions. The Yamuna Action Plan (YAP) has been the primary programme for reducing river pollution through the expansion of sewage treatment plants (STPs), improvement of sewerage networks, industrial pollution control, solid waste management, and public awareness initiatives.Despite these interventions, improvements in the Delhi stretch of the Yamuna have remained limited. The secondary water-quality analysis conducted in this study shows continued deterioration in DO, BOD, and COD between 2015 and 2025, indicating that pollution persists despite decades of restoration efforts.

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Although Delhi has an installed sewage treatment capacity of approximately 3,474 MLD, the city generates around 3,596 MLD of sewage. Furthermore, only about 2,955 MLD is treated, of which approximately 2,014 MLD complies with the prescribed discharge standards. Consequently, a substantial volume of untreated or inadequately treated wastewater continues to enter the Yamuna, limiting the effectiveness of the programme. The effectiveness of the Yamuna Action Plan has also been constrained by implementation and enforcement challenges. Several sewage treatment plants operate below their designed capacity because of inadequate sewer connectivity, operational inefficiencies, and maintenance issues. In addition, continued discharge of untreated domestic sewage, industrial effluents, poor solid waste management, agricultural runoff, and weak regulatory enforcement have further reduced the programme's impact. These findings suggest that expanding treatment infrastructure alone is insufficient unless wastewater is effectively collected, treated to the required standards, and prevented from entering the river.

Overall, the Yamuna Action Plan has strengthened wastewater treatment infrastructure and increased institutional capacity for pollution control; however, the continued deterioration of key water-quality indicators demonstrates that its overall impact on river restoration has been limited. Future efforts should therefore prioritize improving the operational efficiency of STPs, strengthening enforcement of environmental regulations, expanding real-time water-quality monitoring, and enhancing inter-agency coordination and community participation to achieve sustainable improvements in the ecological health of the Yamuna River.

7. LIMITATIONS

This study compares secondary water-quality data from two comparable time points (2015 and 2025). A continuous annual dataset for DO, BOD, COD, and pH at the selected monitoring location was not available in the public domain from official sources, thereby preventing a detailed assessment of year-to-year variations in water quality. Therefore, the results show differences among the selected years but no temporal trend. Future studies could incorporate continuous monitoring data over several years (when available) to more comprehensively assess long-term changes in water quality.

8. CONCLUSION

This study demonstrates the major sources of pollution in the Yamuna River, their impact on water quality, the effectiveness of remediation strategies, and the public's view regarding the pollution crisis. The findings demonstrated broad agreement between the secondary water-quality analysis and public perceptions of pollution. The comparison of the available secondary water-quality data from 2015 and 2025 indicated substantial deterioration in the ecological condition of the Delhi stretch of the Yamuna

River. The analysed data indicated a decline in Dissolved Oxygen (DO) to 0.0 mg/L at the selected monitoring location, reflecting severe oxygen depletion and degraded water quality.

At the same time, Biochemical Oxygen Demand (BOD) doubled, while Chemical Oxygen Demand (COD) increased significantly from 85 mg/L to 190 mg/L, reflecting serious organic and chemical pollution.These findings indicate a deterioration in water quality between the selected years despite various government interventions. The survey results aligned with the given scientific observations. According to the survey, most respondents perceived the Yamuna River to be highly polluted. They also believe that pollution levels are increasing and identified industrial waste and untreated sewage as the primary causes of pollution. Respondents also expressed low confidence in the remediation strategies of the current government. To effectively mitigate these challenges, we need a solution mix of several actions such as stronger enforcement, long-term monitoring, improved sewage treatment, and widespread public awareness.

Overall, public perceptions were broadly consistent with the scientific evidence presented in this study. However, the survey reflects public awareness rather than independently verifying water-quality conditions. While remediation initiatives such as the Yamuna Action Plan have created important infrastructure, their impact has been limited due to implementation challenges and lack of long periods of monitoring. Therefore, stronger enforcement, improved waste management, and widespread public participation are essential for restoring the health and sustainability of the Yamuna River.

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