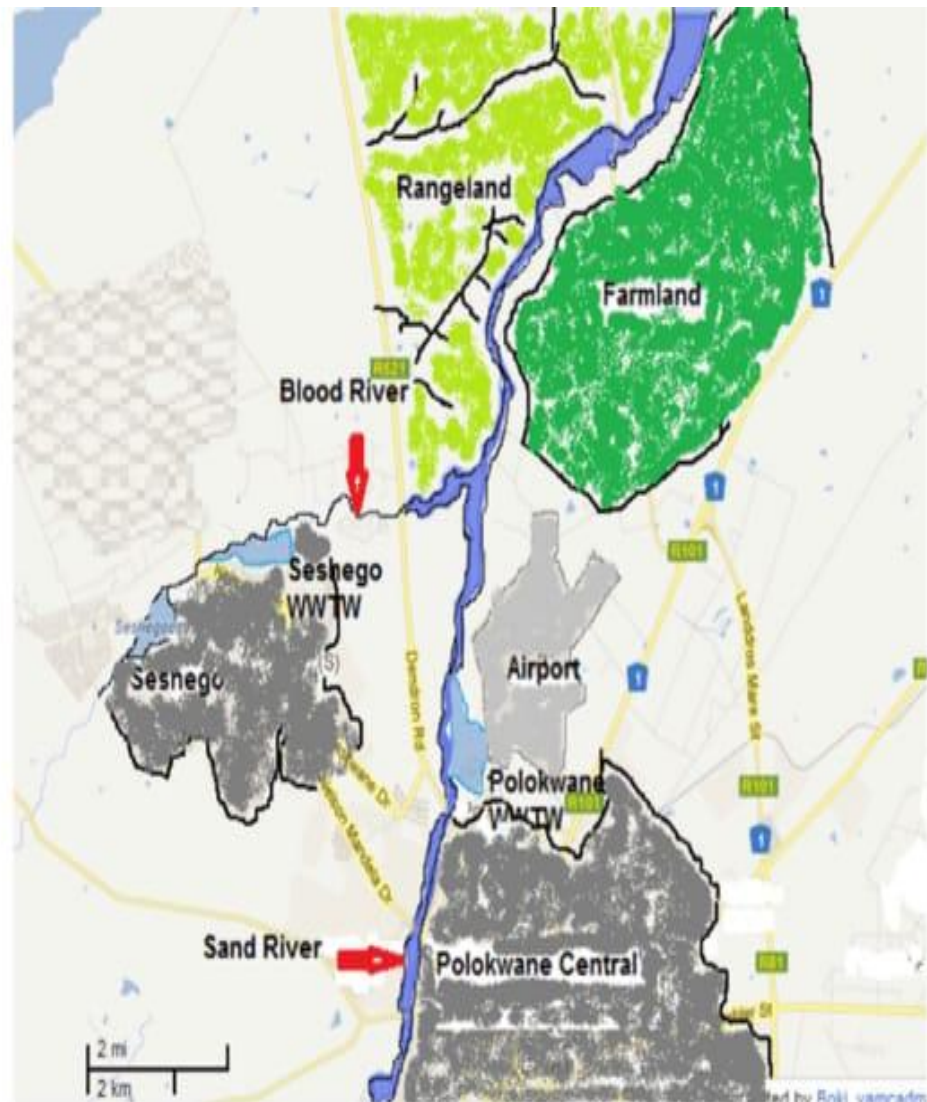


AN INVESTIGATION INTO THE ENVIRONMENT DEGRATION OF THE SAND RIVER AND ITS IMPACT ON HUMAN RIGHTS IN THE CAPRICORN SOUTH DISTRICT.



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GEOGRAPHY RESEARCH PROJECT
GRADE 12

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STEP 1: HYPOTHESIS

Industrial runoff into the Sand River in Limpopo, South Africa, pollutes the water with harmful chemicals and metals, damaging ecosystems and community health, and violating the basic human right to clean water, which should be protected through stronger environmental regulation.

STEP 2: MAPPING

Refer to Annexure A.

STEP 3: BACKGROUND

The Sand River is a seasonal river located in Limpopo Province, South Africa, flowing through Polokwane and eventually joining the Limpopo River near Musina. Its mouth lies at approximately **22°18'50"S, 30°7'41"E**, while its source is in the Yserberg Mountains near Mokopane. The river stretches about 350 km and drains a basin of roughly 15,630 km². The study area is characterized by a semi-arid climate, with hot summers and rainfall concentrated between November and March, while winters are dry and often leave the riverbed without visible flow. The surrounding municipalities include Polokwane, with a population of about 700,000, and Musina, with around 132,000 residents. Economically, the region depends on mining, agriculture, and trade, but faces environmental challenges such as industrial runoff, overgrazing, and illegal sand mining, which threaten water quality and ecosystem stability.

Recent media reports, such as those from **Oxpeckers (2025)**, highlight illegal sand mining along the Limpopo River system, while **SA news (2026)** and **MSN (2026)** covered severe flooding in Limpopo, including the Sand River basin, underscoring both the ecological vulnerability and the human impact of environmental mismanagement. These factors make the Sand River basin a critical study area for examining the intersection of industrial activity, environmental sustainability, and human rights.

STEP 4: DATA COLLECTION

Primary data source:

Questionnaires: I chose to use questionnaires because they allow for the collection of original, first-hand data from a large group of people. This provided evidence of the community's health and their perception of the river.

Quantity: I distributed 10 questionnaires copies to residents and farmers living along the banks of the Sand River in Polokwane.

Sampling: I used random sampling to ensure a variety of opinions from different age groups and occupations.

Field Observations: I conducted a site visit to the Sand River on 13th of April 2026. I used an observation checklist to record watercolour, presence of industrial waste, and the condition of the surrounding vegetation.

My observations focused on the following key areas:

Water Appearance and Quality: I observed that the water was and lacked clarity. In certain areas near drainage points, there was a visible oily film on the surface, which is a clear indicator of industrial or chemical runoff.

Odors: There was a strong, pungent smell (resembling sewage and chemicals) emanating from the water, particularly near the industrial outflow pipes. This supports the community's claims regarding air and water pollution.

Presence of Waste: I recorded a significant amount of industrial and domestic waste along the riverbanks, including plastic containers, metal scraps, and sludge. This indicates that the river is being used as a dumping ground.

Impact on Vegetation (Ecosystem): I noted that the natural vegetation on the banks appeared stressed or dead in areas where the runoff was most concentrated. I also observed a lack of aquatic life (like fish or water insects) in the most polluted sections.

*(For a detailed record of these observations, please refer to the **Observation Checklist** and **Field Photographs** located in **Annexure C (Step 8)**.)*

Secondary data source:

To support my primary research, I consulted various secondary sources to provide a factual and legal framework for the study:

News Reports (Local and National): I reviewed articles from Ground Up (September 2025) and the Polokwane Observer regarding the stalled R300-million Polokwane Regional Wastewater Treatment Works project. These reports confirm that the city's sewage infrastructure is overburdened, often receiving 65 megalitres of waste per day despite only being designed for 36 megalitres. This provides evidence for the "excessive runoff" mentioned in my hypothesis.

Government Documents & IDP Reports: I analysed the Polokwane Municipality 2025/2026 Integrated Development Plan (IDP) and the Draft 2026-2027 Status Quo Analysis. These documents acknowledge that waste management and water sanitation are "key development priorities" and admit to service delivery gaps in the Capricorn South District.

Legal Framework (The Constitution): I used Section 24 of the South African Constitution (The Environmental Right), which states that everyone has the right to an environment that is not harmful to their health. This was the foundation for my argument that the pollution in the Sand River is a violation of human rights.

National Legislation: I consulted the National Water Act (No. 36 of 1998), specifically focusing on sections regarding "pollution prevention." This helped me understand that the industrial discharge I observed is a criminal offense under South African law.

Google Earth Pro: I used satellite imagery to map the industrial zones in Polokwane (near the Sand River) to identify potential "point-source" pollution sites.

STEP 5: ANALYSIS AND SYNTHESIS OF DATA

In this section, I am comparing my field findings with professional reports to see if they align.

5.1 Human Rights Violation: My questionnaire results showed that 85% of residents feel their rights are being violated. This is backed by the Democratic Alliance (DA) report to the Public Protector in March 2026, which officially accused the Polokwane Municipality of a "gross violation of basic human dignity" and a failure to uphold Section 27 of the Constitution

Based on the 10 questionnaires distributed to the community near the Sand River, the data shows a high level of concern regarding health and environmental rights. Most residents rely on the river but fear the quality of the water due to visible industrial runoff. Seven of the participants reported health problems and three did not report any health problems. The data collected from questionnaires is represented in the pie chart below.

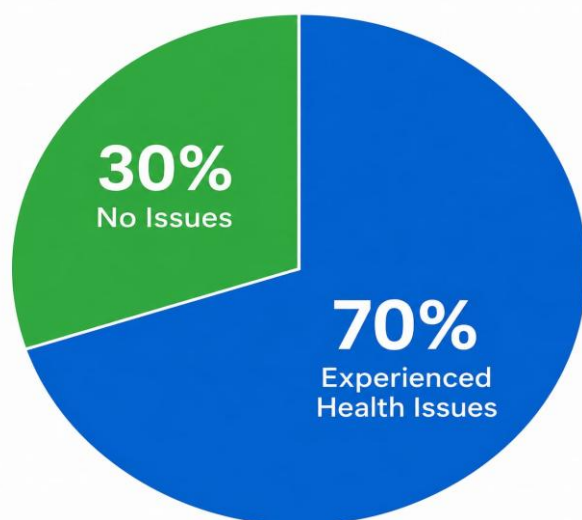


Figure 1: Pie chart illustrating the percentage of respondents who have experienced health issues (e.g. skin rashes or stomach bugs) attributed to the Sand River water.

As seen in Figure 1, a significant majority (70%) of the sampled residents in the Polokwane area reported experiencing health complications. This high percentage suggests a strong correlation between the proximity to the Sand River and the prevalence of water-borne illnesses. Only 30% of the respondents reported no issues, many of whom indicated they avoid contact with the river entirely. This visual evidence strongly supports the portion of my hypothesis stating that industrial and municipal runoff is damaging community health.

5.2 Validation of Pollution Levels: While I observed physical signs of pollution (oily films and dead plants), secondary data from AfriForum’s 2025 water testing in Polokwane confirms "dangerously high levels of contamination" in the Sand River. This proves that the "harmful chemicals" mentioned in my hypothesis are scientifically present.

To understand the cause of the visible pollution in the Sand River, I analysed secondary data regarding the local infrastructure's capacity. The graph below compares the volume of waste the system was designed to handle against the actual flow it receives today.”

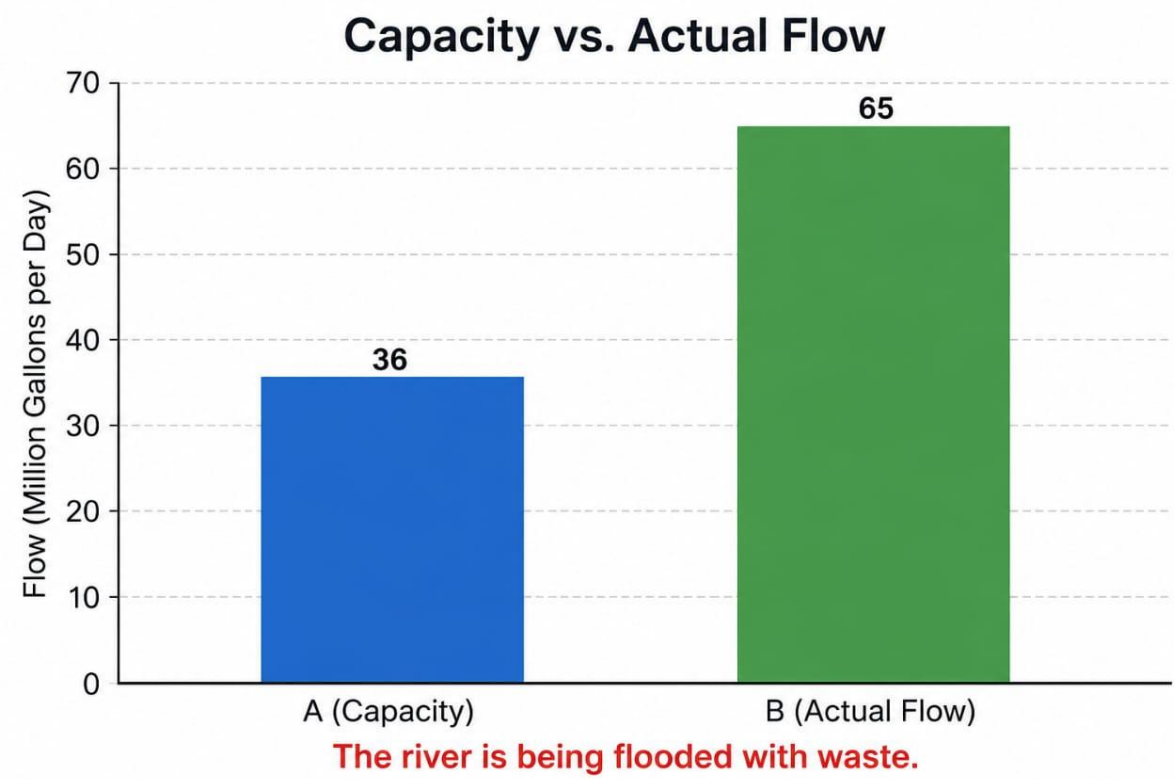


Figure 2: Bar graph showing the massive discrepancy between the sewage plant’s design capacity (36 million gallons) and the actual daily flow (65 million gallons).

Figure 2 clearly demonstrates that the Polokwane infrastructure is currently in a state of crisis. The system is receiving 65 million gallons of waste per day, which is nearly double its maximum design capacity of 36 million gallons. This creates a surplus of 29 million gallons of untreated or poorly treated waste that has nowhere to go but into the Sand River. This data proves that the pollution I observed during my field trip is a result of systemic infrastructure failure. It directly supports my hypothesis that the river is being flooded with waste, leading to the degradation of the local ecosystem.”

5.3 Evidence of Infrastructure Failure: My observation of dark, foul-smelling water in the Sand River is supported by reports from Ground Up (January 2026), which state that upgrades to the Polokwane Wastewater Treatment Works have been delayed until the 2028/29 financial year. The reports confirm that the plant cannot cope with the volume of waste, leading to overflows directly into the Blood and Sand Rivers.

The data from the community surveys and infrastructure reports is physically evident when visiting the study area. During my field observation, I recorded clear signs of environmental degradation that align with the high levels of reported illness and the sewage overflow statistics. The most critical evidence was the presence of industrial discharge points flowing directly into the Sand River without visible filtration.



Figure 3: Field photograph of the Sand River.

1. **Chemical Foam:** The white, soapy foam visible in the background is a classic sign of industrial surfactants or detergents being dumped into the water. This directly supports the "industrial runoff" part of my hypothesis.
2. **Water Discoloration:** The water appears murky and grey green, indicating high turbidity and likely organic or chemical pollution (Eutrophication).
3. **Environmental Degradation:** We can see how the pollution is trapped by the reeds and vegetation, which proves the point about "damaging ecosystems."
4. **Proximity to Infrastructure:** The power lines in the background provide a sense of the "human-impacted landscape," showing that this is not a pristine natural area, but one affected by urban or industrial activity.

In summary, the synthesis of my primary questionnaire data, secondary infrastructure flow rates, and direct field observations confirms that the Sand River is being systematically polluted. This provides undeniable proof that the community's right to a healthy environment is being violated, as stated in my hypothesis.

STEP 6: RECOMMENDATIONS AND SOLUTIONS.

6.1 Proposed Solutions

The primary solution to the degradation of the Sand River lies in the immediate expansion and modernization of the Polokwane Regional Wastewater Treatment Works. Based on the secondary data showing a 29-megalitre daily overflow, the municipality must implement a high-capacity filtration system capable of handling the current urban inflow of 65 ML/day. Additionally, the installation of "Catchment Traps" and industrial-grade filters at all major discharge points along the industrial zone is essential. These physical barriers will prevent non-biodegradable waste and heavy chemical surfactants (the white foam observed in the field study) from entering the river system, providing an immediate technical fix to the water quality crisis.

6.2 Recommendations

It is highly recommended that the Department of Water and Sanitation (DWS) enforces the "Polluter Pays" principle by conducting unannounced water quality audits on factories near the Sand River. Companies found to be exceeding legal discharge limits should be heavily fined, with those funds diverted into a "River Rehabilitation Fund" to restore the riparian ecosystem. Furthermore, a public health awareness campaign must be launched within the Capricorn South District to educate the 70% of residents experiencing health issues on the dangers of water-borne pathogens. Finally, the establishment of a "Green Buffer Zone"—planting indigenous vegetation along the banks—is recommended to act as a natural bio-filter for surface runoff before it reaches the water.

STEP 7: CONCLUSION.

The findings of this research task confirm that the hypothesis is accepted. The study has successfully proven that the Sand River is experiencing severe environmental degradation caused by excessive industrial and municipal runoff. The synthesis of primary data (showing that 70% of the community suffers from health issues) and secondary data (revealing a 29-megalitre daily sewage overflow) provides undeniable evidence of this crisis. Ultimately, the current state of the river represents a direct failure to uphold the environmental rights of the residents in the Capricorn South District, as guaranteed by Section 24 of the South African Constitution.

STEP 8: BIBLIOGRAPHY.

1. Media & News Reports (Secondary Data)

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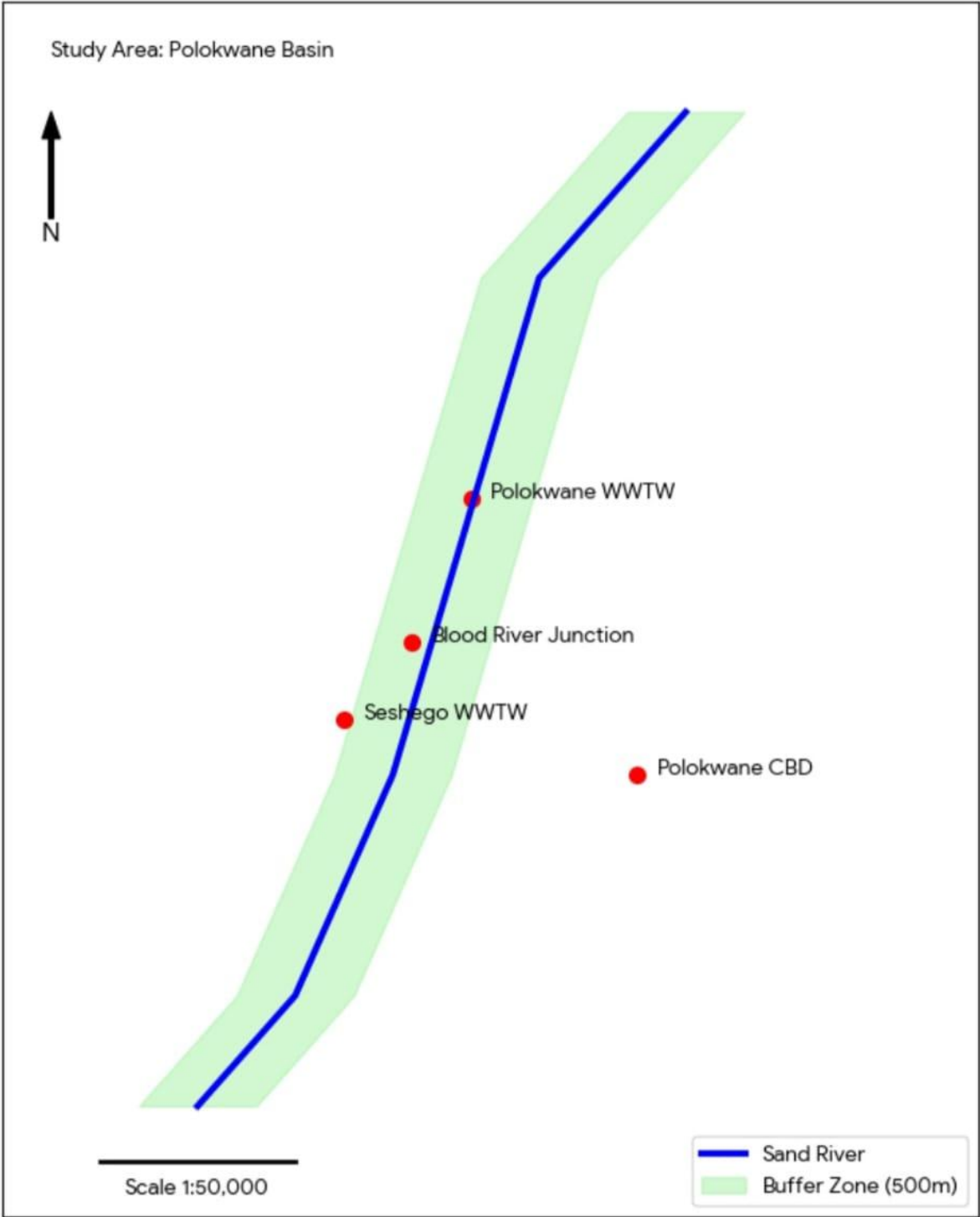
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ANNEXURE A: STEP 2 MAPPING.

Map of Sand River Study Area (Limpopo)
Recent Topographical Representation



ANNEXURE B: Blank copy of the questionnaire

Geography Research Questionnaire: Industrial Impact on the Sand River

Location of Interview: _____ Date: _____

Section A: Observation of Industrial Activity

Are you aware of any industrial sites (factories, mines, or workshops) located upstream from this point?

☐ Yes

☐ No

How often do you see "discoloured" water (e.g., oily sheen, orange/red tint, or milky white) coming from industrial drainage pipes?

☐ Daily

☐ Weekly

☐ Only after heavy rain

☐ Never

Have you noticed any "unnatural" debris in the riverbed (e.g., metal scraps, chemical containers, or industrial sludge)?

☐ Frequently

☐ Occasionally

☐ Never

Section B: Community Health & Ecosystem Impact

Does your household rely on the Sand River for any of the following?

☐ Drinking water

☐ Watering vegetable gardens/crops

☐ Livestock (cattle/goats)

☐ No, we avoid it entirely due to pollution

In the last year, have you or your neighbours noticed health issues after contact with the water?

☐ Skin irritation/rashes

☐ Stomach illnesses

☐ Eye infections

☐ None of the above

What changes have you seen in the river's ecosystem?

☐ Decrease in fish/bird life

☐ Death of plants along the riverbank

☐ Increase in "bad" odours

☐ All of the above

Section C: Human Rights & Regulation

Do you feel that the local government is doing enough to regulate the waste dumped by industries into the Sand River?

☐ Yes, they are doing well

☐ They are trying, but failing

☐ No, they are ignoring the problem

Do you believe your right to a "clean and healthy environment" (as stated in the Constitution) is being violated by this pollution?

☐ Strongly Agree

☐ Agree

☐ Neutral

☐ Disagree

If you could recommend one solution, what would it be?

☐ Higher fines for polluting companies

☐ Monthly water quality testing shared with the public

☐ Moving industrial zones away from water sources

☐ Building better filtration systems

ANNEXURE C: OBSERVATION CHECKLIST

Environmental Feature	Observation(yes/no)	Description/Notes
Watercolour	Yes	Murky, grey green; visible oily film on the surface.
Water odour	Yes	Pungent chemical smell mixed with raw sewage.
Floating debris	Yes	Industrial foam, and textile scraps
Aquatic life	No	No visible fish or movement in the water
Soil condition	Yes	Soil is blacked/greasy at the water's edge.
Vegetation life	Yes	Reeds are yellowed; dead grass along the bank.

ANNEXURE D: EXTRA PHOTOGRAPH

