

Comparative Assessment of Seasonal Water Quality in Canals and Barrages of the Ajay River Influenced by Coal Mining Activities

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Abstract- Coal mining can influence riverine water quality through runoff, sediment transport, and the movement of dissolved constituents. This comparative study examines seasonal water-quality patterns reported in two related investigations of the Ajay River system: one covering two canals and the other covering three barrages. Both studies considered the rainy, winter, and summer seasons and reported physicochemical parameters, selected metals, chemical oxygen demand (COD), biochemical oxygen demand (BOD), dissolved oxygen (DO), and total coliform counts. The canal results showed rainy-season turbidity of 20 NTU in both canals, while winter turbidity differed sharply between Canal 1 (0 NTU) and Canal 2 (25 NTU). In the barrage study, turbidity ranged from 17–20 NTU during the rainy season, fell to 0 NTU in winter, and rose to 22–35 NTU in summer. The barrage sites also showed higher summer COD (8–13 mg/L), BOD (3–4 mg/L), and coliform counts ($2.3\text{--}2.7 \times 10^2$ CFU/100 mL) than in the rainy season. Across both studies, reported concentrations of most measured metals were low or below the stated detection limits, although iron varied in the barrage samples. The comparison indicates that seasonal conditions and the type of water body may shape the observed water-quality profile. However, the studies do not provide sufficient site-level information or statistical analyses to establish that coal mining alone caused the observed differences. Consistent sampling, clearly documented analytical methods, and expanded metal and microbial monitoring are recommended.

Keywords- Ajay River; coal mining; seasonal variation; canals; barrages; physicochemical parameters; heavy metals; water quality

I. INTRODUCTION

River systems in coal-mining regions may receive runoff containing suspended material and dissolved substances from disturbed land, waste deposits, and associated activities. The resulting changes in water quality can vary with rainfall, flow conditions, evaporation, and the characteristics of individual water bodies. Monitoring only one season or one location may therefore provide an incomplete picture of environmental conditions.

The Ajay River flows through parts of Jharkhand and West Bengal and supports domestic, agricultural, and other water uses. The two source articles considered here address water quality in different parts of this river system. The canal study reports results for two canals across the Ajay River, whereas the barrage study covers three barrages. Both assess seasonal variation during the rainy, winter, and summer periods. Their shared parameters make a broad comparison possible, although the studies do not provide matched site coordinates or evidence that samples were collected at directly comparable locations.

The present article brings the findings together to identify similarities, differences, and monitoring priorities. It compares

the reported pH, temperature, turbidity, electrical conductance, hardness, alkalinity, total solids, selected metals, COD, BOD, DO, and total coliform counts. The purpose is not to merge the datasets as if they came from one experiment, but to interpret them side by side while retaining the distinctions between canals and barrages. Since the source articles provide ranges or values rather than full raw datasets, the comparison remains descriptive and does not claim statistical significance.

II. MATERIALS AND METHODS

1. Source studies and seasonal coverage

This comparative assessment is based on the information reported in the two supplied Word manuscripts. The first study sampled two canals during the rainy, winter, and summer seasons. The second sampled three barrages during the same three seasons. The manuscripts describe analysis of physicochemical parameters and biological indicators, including COD, BOD, DO, and total coliform counts. The canal article cites APHA (2017) for standard analytical procedures; the barrage article lists the parameters examined but does not describe all laboratory procedures in equivalent detail.

2. Parameters compared

The comparison focused on parameters reported in both manuscripts: pH, water temperature, turbidity, electrical conductance, hardness, alkalinity, total solids, selected heavy metals, COD, BOD, DO, and total coliform counts. Values are presented in the units used in the source articles. Canal results are reported separately for Canal 1 and Canal 2, while barrage results are generally given as ranges across the three sites. The range format should not be interpreted as a mean or as a measure of statistical variation.

3. Interpretation and limitations

The comparison is descriptive. No raw replicate data, uncertainty estimates, statistical tests, detailed sampling dates, site coordinates, or complete quality-control records were supplied in the manuscripts. In addition, the two articles do not report precisely identical lists of metals or detection limits for every analyte. Therefore, comparisons are made only where the reported parameters and units are sufficiently similar. Explanations involving runoff, evaporation, reduced water volume, or sediment disturbance are treated as plausible interpretations reported or implied by the source manuscripts, rather than as independently demonstrated causes.

III. RESULTS AND DISCUSSION

1. pH and water temperature

The canal samples were generally close to neutral during the rainy and summer seasons. Rainy-season pH was 7.13 in Canal 1 and 7.02 in Canal 2; summer values were 7.19 and 7.04, respectively. In winter, Canal 1 reached pH 8.15, while Canal 2 recorded 7.27.

The barrage study reported rainy-season pH of 7.08–7.35, winter values of 8.02–8.14, and summer values of 7.11–7.68. Thus, both studies show a shift toward more alkaline conditions in winter, although the reported values differ between individual canals and barrage sites.

Water temperature followed a seasonal pattern in both investigations. Canal temperatures fell to 26.6°C in winter and rose to approximately 32°C in summer. The barrage study similarly recorded winter temperatures of 26.6–27.3°C and warmer summer conditions of 29.6–33.5°C. These changes are consistent with seasonal weather conditions, but temperature alone cannot identify a mining-related effect. Differences between sampling times, shading, water depth, and local flow could also influence the readings.

2. Turbidity and suspended material

Turbidity provides one of the clearest contrasts between the two studies. In the rainy season, both canals recorded 20 NTU. During winter, however, Canal 1 had no measurable turbidity (0 NTU), while Canal 2 remained at 25 NTU. Summer values then declined to 7 NTU in Canal 1 and 1 NTU in Canal 2. The canal results therefore do not support a single seasonal pattern that applies equally to both locations.

The barrage results showed a different pattern. Turbidity ranged from 17–20 NTU during the rainy season, dropped to 0 NTU in winter, and rose to 22–35 NTU in summer. Rainfall-driven runoff plausibly explains the rainy-season values, while the summer increase may reflect sediment disturbance under lower-water conditions, as the source article suggests. The contrast is important: while winter water appeared clearer at the barrage sites, the canals did not behave uniformly, because Canal 2 retained high winter turbidity. Local conditions and water movement may therefore matter as much as the broad season.

Turbidity should not be treated as a direct measurement of toxic contamination. It indicates the presence of light-scattering particles and can affect water clarity. Still, suspended particles require further characterisation to establish their composition and possible association with mining waste or metals.

RESULT OF ANALYSIS			
SAMPLE CODE: IJ20201010001			
SAMPLE DESCRIPTION: Water Sample from Barrage (Site 1)			
LONGITUDE: 86.8005346			
LATITUDE: 24.1419575			
SAMPLE QUANTITY: 1 liter			
DATE OF SAMPLING: 01.11.2020			
TESTING PERIOD: 04.11.2020 to 12.11.2020			
S.No.	Parameters	Results	Test Method
1	pH Value	8.15	IS: 3025 (Pt-313)-1983
2	Temperature °C	26.6	IS: 3025 (Pt-099)-1984
3	Turbidity, NTU	0.0	IS: 3025 (Pt-135)-1984
4	Electrical Conductivity, µs/cm	181	IS: 3025 (Pt-143)-1984
5	Total Hardness (as CaCO ₃), mg/l	42.7	IS: 3025 (Pt-216)-2000
6	Alkalinity (as CaCO ₃), mg/l	38.8	IS: 3025 (Pt-253)-1986
7	Total Solids, mg/l	115.3	IS: 3025 (Pt-255)-1984
8	Total Arsenic (as As), mg/l	< 0.01	IS: 3025 (Pt-375)-1988
9	Iron (as Fe), mg/l	0.08	IS: 3025 (Pt-332)-2005
10	Fluoride (as F), mg/l	< 0.1	IS: 3025 (Pt-465)-2008
11	Zinc (as Zn), mg/l	< 0.01	IS: 3025 (Pt-485)-1984
12	Total Chromium (as Cr), mg/l	< 0.01	IS: 3025 (Pt-522)-2005
13	Lead (as Pb), mg/l	< 0.01	IS: 3025 (Pt-473)-1984
14	Cadmium (as Cd), mg/l	< 0.001	IS: 3025 (Pt-413)-1992
15	Copper (as Cu), mg/l	< 0.01	IS: 3025 (Pt-475)-1992
16	Mercury (as Hg), mg/l	< 0.005	IS: 3025 (Pt-445)-1994
17	Chemical Oxygen Demand (COD), mg/l	7.0	IS: 3025 (Pt-385)-2006
18	Biochemical Oxygen Demand (BOD ₅), mg/l	2.0	IS: 3025 (Pt-445)-1994
19	Dissolved Oxygen (DO), mg/l	5.6	IS: 3025 (Pt-143)-1984
20	Total Coliform (100ml)	1.8x10 ³	IS: 3025 (Pt-143)-1984

RESULT OF ANALYSIS			
SAMPLE CODE: E20201100002			
SAMPLE DESCRIPTION: Water Sample from Barrage (Site 2)			
LONGITUDE: 86.8066183			
LATITUDE: 24.1539526			
SAMPLE QUANTITY: 1 liter			
DATE OF SAMPLING: 01.11.2020			
TESTING PERIOD: 04.11.2020 to 12.11.2020			
S.No	Parameters	Results	Test Method
1.	pH Value	8.14	IS:3025 (pH-11)-1981
2.	Temperature, °C	27.3	IS:3025 (pH-11)-1981
3.	Turbidity, NTU	0.0	IS:3025 (pH-11)-1981
4.	Electrical Conductivity, $\mu\text{S/cm}$	219	IS:3025 (pH-11)-1981
5.	Total Hardness (as CaCO_3), mg/L	48.5	IS:3025 (pH-11)-1981
6.	Alkalinity (as CaCO_3), mg/L	81.2	IS:3025 (pH-11)-1981
7.	Total solids, mg/L	118.7	IS:3025 (pH-11)-1981
8.	Total Arsenic (as As), mg/L	< 0.01	IS:3025 (pH-11)-1981
9.	Iron (as Fe), mg/L	0.06	IS:3025 (pH-11)-1981
10.	Fluoride (as F), mg/L	< 0.1	IS:3025 (pH-11)-1981
11.	Zinc (as Zn), mg/L	< 0.01	IS:3025 (pH-11)-1981
12.	Total Chromium (as Cr), mg/L	< 0.01	IS:3025 (pH-11)-1981
13.	Lead (as Pb), mg/L	< 0.01	IS:3025 (pH-11)-1981
14.	Cadmium (as Cd), mg/L	< 0.001	IS:3025 (pH-11)-1981
15.	Copper (as Cu), mg/L	< 0.01	IS:3025 (pH-11)-1981
16.	Manganese (as Mn), mg/L	< 0.001	IS:3025 (pH-11)-1981
17.	Chemical Oxygen Demand (COD), mg/L	8.8	IS:3025 (pH-11)-1981
18.	Biochemical Oxygen Demand (BOD), 5 days at 27 °C, mg/L	3.0	IS:3025 (pH-11)-1981
19.	Dissolved Oxygen (DO_5), mg/L	5.3	IS:3025 (pH-11)-1981
20.	Total Coliforms/100ml	2.1x10 ³	IS:1622-1981
END OF REPORT			

RESULT OF ANALYSIS			
SAMPLE CODE: E20201100003			
SAMPLE DESCRIPTION: Water Sample from Canal (Site 2)			
LONGITUDE: 86.8227012			
LATITUDE: 24.0776707			
SAMPLE QUANTITY: 1 liter			
DATE OF SAMPLING: 01.11.2020			
TESTING PERIOD: 04.11.2020 to 12.11.2020			
S.No	Parameters	Results	Test Method
1.	pH Value	7.23	IS:3025 (pH-11)-1981
2.	Temperature, °C	26.8	IS:3025 (pH-11)-1981
3.	Turbidity, NTU	0.0	IS:3025 (pH-11)-1981
4.	Electrical Conductivity, $\mu\text{S/cm}$	117	IS:3025 (pH-11)-1981
5.	Total Hardness (as CaCO_3), mg/L	38.2	IS:3025 (pH-11)-1981
6.	Alkalinity (as CaCO_3), mg/L	49.5	IS:3025 (pH-11)-1981
7.	Total solids, mg/L	92.2	IS:3025 (pH-11)-1981
8.	Total Arsenic (as As), mg/L	< 0.01	IS:3025 (pH-11)-1981
9.	Iron (as Fe), mg/L	0.05	IS:3025 (pH-11)-1981
10.	Fluoride (as F), mg/L	< 0.1	IS:3025 (pH-11)-1981
11.	Zinc (as Zn), mg/L	< 0.01	IS:3025 (pH-11)-1981
12.	Total Chromium (as Cr), mg/L	< 0.01	IS:3025 (pH-11)-1981
13.	Lead (as Pb), mg/L	< 0.01	IS:3025 (pH-11)-1981
14.	Cadmium (as Cd), mg/L	< 0.001	IS:3025 (pH-11)-1981
15.	Copper (as Cu), mg/L	< 0.01	IS:3025 (pH-11)-1981
16.	Manganese (as Mn), mg/L	< 0.001	IS:3025 (pH-11)-1981
17.	Chemical Oxygen Demand (COD), mg/L	4.8	IS:3025 (pH-11)-1981
18.	Biochemical Oxygen Demand (BOD), 5 days at 27 °C, mg/L	1.0	IS:3025 (pH-11)-1981
19.	Dissolved Oxygen (DO_5), mg/L	5.8	IS:3025 (pH-11)-1981
20.	Total Coliforms/100ml	1.7x10 ³	IS:1622-1981
END OF REPORT			

3. Electrical conductance, hardness, alkalinity, and total solids

Electrical conductance was higher in winter than in the rainy season in both datasets. In the canals, rainy-season values were 138 and 112 $\mu\text{S/cm}$, increasing to 182 and 177 $\mu\text{S/cm}$ in winter. Summer values were 151 and 150 $\mu\text{S/cm}$. In the barrages, conductance ranged from 158–165 $\mu\text{S/cm}$ in the rainy season and 181–219 $\mu\text{S/cm}$ in winter, before reaching 154–183 $\mu\text{S/cm}$ in summer. This shared winter increase may indicate a greater concentration of dissolved ions, although the available results do not identify which ions were responsible.

Hardness also increased from rainy to winter conditions in the reported ranges. Canal hardness rose from 39.4 and 30.0 mg/L in the rainy season to 47.9 and 38.2 mg/L in winter; summer values were 44.8 and 44.2 mg/L. In the barrage study, hardness ranged from 42.9–48.6 mg/L during the rainy season, 42.7–52.1 mg/L in winter, and 48.2–56.5 mg/L in summer. The highest reported range was therefore in summer at the barrage sites. These findings suggest that dissolved mineral content did not follow the same seasonal trajectory at all locations.

Alkalinity in the canals was lower in winter (61.4 mg/L in Canal 1 and 49.5 mg/L in Canal 2) than in summer (88.7 and 86.7 mg/L). The barrage study likewise reported lower winter alkalinity (58.9–64.3 mg/L) and higher summer alkalinity (92.9–112.7 mg/L). This is one of the more consistent patterns across the two investigations. Total solids, however, showed a winter increase followed by a modest reduction in summer in the reported barrage ranges: 94.9–98.5 mg/L in the rainy

RESULT OF ANALYSIS			
SAMPLE CODE: E20201100001			
SAMPLE DESCRIPTION: Water Sample from Canal (Site 1)			
LONGITUDE: 86.87991928			
LATITUDE: 24.1406512			
SAMPLE QUANTITY: 1 liter			
DATE OF SAMPLING: 01.11.2020			
TESTING PERIOD: 04.11.2020 to 12.11.2020			
S.No	Parameters	Results	Test Method
1.	pH Value	8.13	IS:3025 (pH-11)-1981
2.	Temperature, °C	26.8	IS:3025 (pH-11)-1981
3.	Turbidity, NTU	0.0	IS:3025 (pH-11)-1981
4.	Electrical Conductivity, $\mu\text{S/cm}$	181	IS:3025 (pH-11)-1981
5.	Total Hardness (as CaCO_3), mg/L	47.9	IS:3025 (pH-11)-1981
6.	Alkalinity (as CaCO_3), mg/L	81.2	IS:3025 (pH-11)-1981
7.	Total solids, mg/L	116.3	IS:3025 (pH-11)-1981
8.	Total Arsenic (as As), mg/L	< 0.01	IS:3025 (pH-11)-1981
9.	Iron (as Fe), mg/L	0.06	IS:3025 (pH-11)-1981
10.	Fluoride (as F), mg/L	< 0.1	IS:3025 (pH-11)-1981
11.	Zinc (as Zn), mg/L	< 0.01	IS:3025 (pH-11)-1981
12.	Total Chromium (as Cr), mg/L	< 0.01	IS:3025 (pH-11)-1981
13.	Lead (as Pb), mg/L	< 0.01	IS:3025 (pH-11)-1981
14.	Cadmium (as Cd), mg/L	< 0.001	IS:3025 (pH-11)-1981
15.	Copper (as Cu), mg/L	< 0.01	IS:3025 (pH-11)-1981
16.	Manganese (as Mn), mg/L	< 0.001	IS:3025 (pH-11)-1981
17.	Chemical Oxygen Demand (COD), mg/L	8.8	IS:3025 (pH-11)-1981
18.	Biochemical Oxygen Demand (BOD), 5 days at 27 °C, mg/L	2.0	IS:3025 (pH-11)-1981
19.	Dissolved Oxygen (DO_5), mg/L	5.7	IS:3025 (pH-11)-1981
20.	Total Coliforms/100ml	2.0x10 ³	IS:1622-1981
END OF REPORT			

season, 115.2–122.9 mg/L in winter, and 109.2–113.4 mg/L in summer. Canal total solids also rose in winter and remained relatively high in summer. Together, these measurements indicate seasonal changes in the dissolved and particulate material present in the water, but they do not by themselves identify the source of that material.

4. Heavy metals

Both manuscripts report low concentrations for several metals. In the canal study, arsenic, zinc, chromium, and lead were below 0.01 mg/L in the rainy and winter seasons. Iron was reported at 0.01 mg/L in both canals during the rainy season. In summer, the article states that arsenic, zinc, chromium, lead, and cadmium remained below detection limits. The barrage study reports arsenic below 0.01 mg/L and fluoride below 0.1 mg/L in the rainy season, with iron ranging from 0.01–0.06 mg/L. It states that arsenic, iron, fluoride, and zinc remained within permissible limits during winter. In summer, arsenic, fluoride, and zinc were reported below detection limits, while iron remained variable at 0.01–0.06 mg/L.

The source articles therefore do not show a reported exceedance of the stated limits for the metals discussed. Nevertheless, this should not be interpreted as proof that all forms of metal-related risk are absent. The manuscripts do not consistently provide the full analyte list, detection limits, analytical methods, quality-control results, or site-specific metal values. Also, a result below a detection limit means that the substance was not quantified above that method's threshold; it does not mean the concentration was exactly zero. Future studies should report metal concentrations for each site and season, the method detection and quantification limits, and the relevant standard used for each comparison.

5. COD, BOD, and dissolved oxygen

COD and BOD provide complementary indicators of substances that may consume oxygen during chemical or biological processes. In the canal study, rainy-season COD was 5 mg/L in Canal 1 and 7 mg/L in Canal 2. Winter values were 8 and 4 mg/L, while summer values were 5 mg/L in both canals. BOD remained at 2 mg/L in the rainy and summer seasons, decreasing to 1 mg/L in Canal 2 during winter. These results show that COD did not peak in the same season at both canals.

The barrage study showed a more pronounced summer increase. COD ranged from 6–8 mg/L during the rainy season and 7–8 mg/L in winter, rising to 8–13 mg/L in summer. BOD was 2 mg/L during the rainy season, 2–3 mg/L in winter, and

3–4 mg/L in summer. The summer pattern suggests a greater oxygen demand at the barrage sites during this period, although the data do not establish the exact sources of the demand. Higher temperatures, changes in water volume, organic inputs, and other local factors may all influence these measurements.

DO levels remained within a relatively narrow range in both studies. The canals recorded 5.9–6.1 mg/L during the rainy season, around 5.7–5.8 mg/L in winter, and 5.7–5.8 mg/L in summer. Barrage values were 5.7–5.9 mg/L in the rainy season, 5.5–5.7 mg/L in winter, and 5.4–5.6 mg/L in summer. The gradual reduction in reported barrage DO toward summer coincided with increased COD and BOD. This relationship is environmentally plausible, but additional measurements and statistical analysis would be needed to determine whether the changes are linked and whether they are ecologically significant.

6. Total coliform counts

Microbial indicators showed a notable difference between the canal and barrage results. In the canals, rainy-season counts were 1×10^2 CFU/100 mL at both locations. Winter counts rose to 2×10^2 CFU/100 mL in Canal 1 and 1.7×10^2 CFU/100 mL in Canal 2, before decreasing in summer to 1.2×10^2 and 1.1×10^2 CFU/100 mL. Consequently, the highest reported canal counts occurred in winter rather than in the rainy season.

In the barrage study, rainy-season counts were $2.0\text{--}2.1 \times 10^2$ CFU/100 mL. Winter values ranged from $1.8\text{--}2.1 \times 10^2$ CFU/100 mL, while summer counts increased to $2.3\text{--}2.7 \times 10^2$ CFU/100 mL. The highest reported counts across the two manuscripts were therefore found in the summer barrage samples. This difference reinforces the importance of considering each water body separately rather than assuming that all locations respond identically to seasonal changes.

Total coliform counts indicate microbial contamination but do not, by themselves, confirm the presence of specific disease-causing organisms or establish that water is safe or unsafe for a particular use. Follow-up monitoring should include appropriate indicator organisms and should interpret the results against standards relevant to the intended use of the water.

IV. COMPARATIVE OVERVIEW

The two studies share several broad findings. First, pH was generally near neutral to moderately alkaline, with higher values commonly reported during winter. Second, electrical

conductance and hardness were often higher in winter or summer than during the rainy season, suggesting seasonal changes in dissolved mineral content. Third, several reported metals were below the stated detection limits or described as within permissible limits. Finally, both studies found measurable microbial indicators and seasonal variation in COD, BOD, and DO.

The strongest differences concern turbidity and indicators of organic and microbial pollution. The barrage study reported its highest turbidity in summer (22–35 NTU), whereas the canal study recorded its highest value in winter at Canal 2 (25 NTU), with lower summer turbidity at both canals. The barrage sites also showed their highest COD, BOD, and coliform counts in summer. In the canal study, COD varied between canals and seasons, and coliform counts peaked in winter. These differences could reflect local hydrology, sediment conditions, inflows, sampling conditions, or other site-specific factors. The available information is not sufficient to determine which explanation is most important.

A key methodological point is that the two datasets should not be combined into a single numerical average. The canal article reports two individual site values, while the barrage article generally reports ranges across three locations. Without matched sampling dates, replicate measurements, and a common analytical protocol documented in full, direct statistical comparison would be unreliable. The appropriate conclusion is that the studies provide complementary evidence of seasonal variation, not a controlled test proving that one type of water body is more polluted than the other.

V. ENVIRONMENTAL IMPLICATIONS AND RECOMMENDATIONS

The results support continued monitoring of the Ajay River system, particularly in locations influenced by mining activity and in water bodies used for irrigation or other community purposes. Monitoring should be conducted at fixed, clearly identified sites during all three seasons and, ideally, at additional times following major rainfall events. Sampling upstream and downstream of suspected discharge points would help distinguish background conditions from changes associated with particular inputs.

Future reports should include site coordinates, sampling dates and times, weather and flow conditions, sample preservation procedures, analytical methods, instrument details, detection limits, calibration records, and quality-control results. Replicate samples and appropriate blanks should be used, and

results should be reported with measures of uncertainty. A complete table of site-wise values would make seasonal comparisons more transparent than ranges alone.

Metal analysis should include a consistent list of analytes across sites and seasons, with clear identification of dissolved versus total concentrations. Turbidity and total solids should be complemented, where feasible, by suspended-solids measurements and sediment analysis. Microbial assessment should use indicators suited to the intended water use. Where water is considered for drinking or domestic use, the relevant drinking-water requirements and suitable microbiological tests must be applied; the present results alone are not sufficient to establish potability.

Finally, water-quality monitoring should be paired with information on mining activity, rainfall, river discharge, and nearby land use. Such information would help evaluate possible links between observed changes and particular sources. Management measures should be guided by verified site-specific evidence and the applicable regulatory standards rather than by seasonal patterns alone.

Limitations of the Comparative Study

This article relies exclusively on the two supplied manuscripts. The source material does not include raw datasets, replicate counts, statistical tests, detailed site descriptions, or complete analytical quality-assurance information. Some parameters and metal lists differ between the articles, and the term “permissible limits” is not accompanied consistently by the specific standard and limit applied. The reported observations therefore support a descriptive comparison but not a causal conclusion that coal mining was solely responsible for the measured differences. Further fieldwork using harmonised methods is needed to validate and extend these findings.

VI. CONCLUSION

The comparative assessment shows that water quality in the studied Ajay River canals and barrages varied across the rainy, winter, and summer seasons. Both studies reported near-neutral to alkaline pH, seasonal changes in conductance and hardness, measurable COD and BOD, and total coliform counts. The barrage samples showed a clear summer increase in turbidity, COD, BOD, and coliform counts, together with slightly lower DO. The canal samples displayed more site-specific patterns: winter turbidity was negligible in Canal 1

but remained high in Canal 2, and microbial counts were highest during winter.

Most of the metals discussed in the source articles were reported below detection limits or within the stated permissible limits, although iron varied in the barrage samples. These findings are reassuring within the limits of the reported measurements, but they do not eliminate the need for systematic metal monitoring. Overall, the studies suggest that water-quality assessment in the Ajay River system should account for both seasonal conditions and local differences between canals and barrages. Long-term monitoring, transparent reporting, consistent analytical methods, and evidence-based management are necessary to better understand pollution pressures and protect aquatic ecosystems and community water uses.

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