



Thematic Fact Sheet

RESOURCE CONSERVATION INITIATIVE

WATER QUALITY FACT SHEET

What Illegal Mining (Galamsey) Does to a River

Backed by Laboratory evidence from the Tano Offin Forest Reserve on the impact of illegal mining on water quality, aquatic life and public health — Atwima Mponua District, Ashanti Region

RESCONI . AUGUST 2026.

ABOUT THIS FACT SHEET

Every scientific fact and observation in this fact sheet is drawn from the RESCONI Final Study Report, *Support to Promote Community Resilience and Rights in Competing Land Use for Mining, Agriculture and Forest Utilization in Ghana* (November 2023), and is referenced to the section, table or figure it came from. Four water samples were collected on 5 April 2023 from two water bodies in Compartments 165 and 168 of the Tano Offin Forest Reserve and analysed at the KNUST Central Laboratory. Charts have been redrawn from the report's own laboratory results table.

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1. The reserve, the rivers and the method

Two water bodies inside the same forest reserve. The same rainfall, the same geology, the same catchment. One difference: mining on the floodplain.

KEY FACTS

- Tano Offin is Ghana's **4th largest** Globally Significant Biodiversity Area (GSBA), covering **41,392 hectares**.
- It is the **watershed** for several streams and tributaries of the **Tano** and **Offin** rivers.
- Four samples** were taken from **two** water bodies on **5 April 2023** and analysed at the **KNUST Central Laboratory**.
- Sampling, storage and transport followed **GS 1212:2019** protocols.
- Ground investigation confirmed **intense galamsey activity** within the floodplains along River Desiri.
- The report cites that more than **12 hectares** of Tano Offin have been destroyed by illegal miners.

Why this reserve

The Tano Offin Forest Reserve sits in the Atwima Mponua District and is administered by the Nkawie Forest District of the Forest Services Division. It is the fourth largest Globally Significant Biodiversity Area in Ghana, and its streams feed tributaries of two of the country's major river systems. It is also under sustained pressure from illegal mining, with little effective state protection.

On 5 April 2023 the RESCONI research team, working with the Nkawie Forest District, visited the Kasotie portion of Compartments 165 and 168. River Desiri runs through this section and feeds a waterfall; the Apapramasu Stream runs almost parallel through the same compartments. Four samples — two from each water body, at mid-stream and down-stream positions — were collected into sealed plastic containers and sent to the KNUST Central Laboratory to determine physicochemical parameters, nutrient levels, and heavy metals and metalloids.

Where we sampled

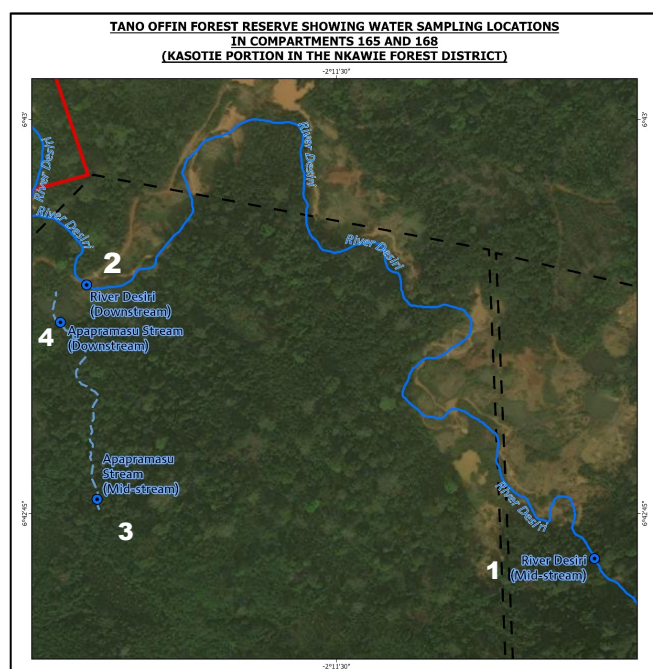


Figure 1. Water sampling locations at Compartments 165 and 168, Tano Offin Forest Reserve, Nkawie Forest District. **Source:** RESCONI Final Study Report (2023), Figure 3.1, p. 59.

A natural experiment

The two water bodies differ in one respect that matters: the land use in their immediate catchment. Ground investigation revealed intense *galamsey* activity within the floodplains along River Desiri. The Apapramasu Stream is relatively undisturbed, and was therefore selected as a control. Because the two run almost parallel through the same reserve, differences in their water chemistry can be attributed to that single variable rather than to rainfall, geology or season.



Plate 1. River Desiri — sediment-laden.



Plate 3. Apapramasu — the control.

Source: RESCONI Final Study Report (2023), Plates 3.1 and 3.2; Section 3.3.

Sampling points

#	Water body	Position	Elev.
1	Desiri River	Mid-stream	308 m
2	Desiri River	Downstream	271 m
3	Apapramasu stream	Mid-stream	301 m
4	Apapramasu stream	Downstream	305 m

Table 1. Sampling locations, Compartments 165 and 168. **Source:** RESCONI Final Study Report (2023), Table 3.1, p. 57.

A reserve without effective protection

Tano Offin is home to endangered species, including Gold Star and Black Star flora and fauna. Even so, the report records that it has been subjected to the threat of illegal mining with little state protection, and that small-scale mining permits granted in the district have been reported to cause deforestation, land degradation, water pollution and ecosystem disruption.

Ghana's Minerals and Mining Act, 2006 requires anyone exploiting mineral resources to obtain a licence from the Minerals Commission. Illegal miners do not — which is precisely why the damage recorded overleaf falls outside any regulatory monitoring regime.

2. What the laboratory found

River Desiri failed the physicochemical and heavy-metal requirements of the WHO and GS 175-1:2013. The control stream, metres away, passed almost every one.

Sediment: the water you can see

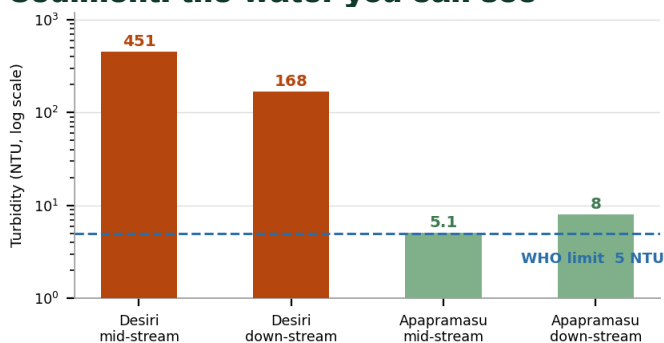


Figure 2. Turbidity at the four sampling points against the WHO potable-water threshold of 5 NTU. **Source:** RESCONI Final Study Report (2023), Table 3.2, p. 59.

Heavy metals: the water you cannot see

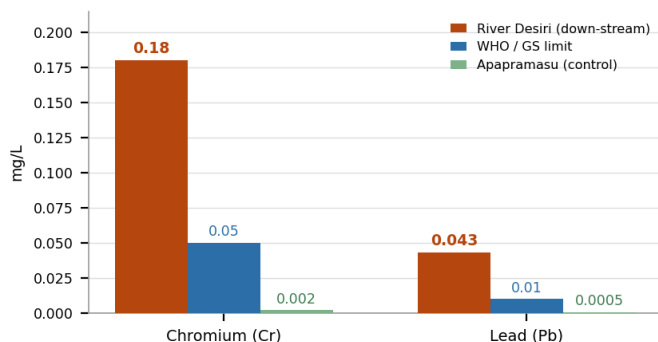


Figure 3. Chromium and lead in River Desiri (down-stream) against the WHO/GS limit and the Apapramasu control. **Source:** RESCONI Final Study Report (2023), Table 3.2, p. 5

Solids and iron

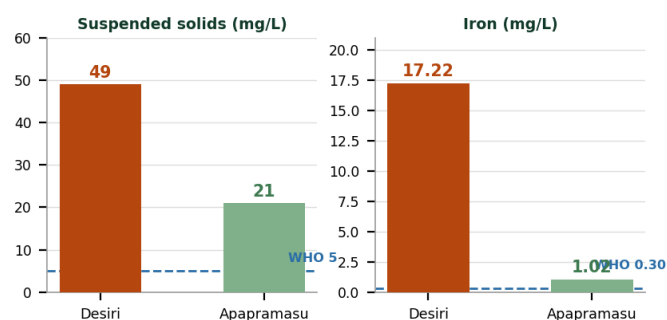


Figure 4. Total suspended solids and iron. **Source:** RESCONI Final Study Report (2023), Table 3.2, p. 59.

Low dissolved oxygen threatens aquatic life

Dissolved oxygen was sharply reduced in the mining-impacted river and fell below safe levels for aquatic life, while remaining normal in the undisturbed control stream. Oxygen is the single clearest measure of whether a river can still support fish and invertebrates — and on this measure the Desiri is failing.

Source: RESCONI Water Quality Fact Sheet data; Final Study Report (2023), Section 3.3.

Full results

Parameter	Desiri mid	Desiri down	Apap. mid	Apap. down	WHO / GS
Physico-chemical					
pH (SU)	7.03	6.98	7.02	7.01	6.5 – 8.5
Conductivity (µS/cm)	67.7	47	43.8	43.8	500
Turbidity (NTU)	451	168	5.1	8	5
Total dissolved solids (mg/L)	13.0	18.0	19.0	27.0	1000
Total suspended solids (mg/L)	47.0	49.0	22	21.0	5
Hardness (mg/L)	2.30	1.54	3.40	3.58	500
Alkalinity (mg/L)	25.0	3.80	15.0	10.0	200
Chloride (mg/L)	3.25	30.0	2.44	1.79	250
Nutrients					
Sulphate (mg/L)	1.30	2.93	0.14	0.02	250
Nitrate (mg/L)	0.42	0.03	0.11	0.10	50
Nitrite (mg/L)	0.01	0.35	0.008	0.011	0.1
Phosphate (mg/L)	0.30	0.01	0.20	0.23	0.3
Heavy metals and metalloids					
Chromium (mg/L)	0.06	0.18	0.002	0.002	0.05
Lead (mg/L)	0.013	0.043	0.0003	0.0005	0.01
Arsenic (mg/L)	0.004	0.01	0.001	BDL	0.01
Manganese (mg/L)	0.20	0.16	0.033	0.034	0.4
Copper (mg/L)	0.03	0.021	0.01	0.001	0.05
Mercury (mg/L)	0.0002	0.0001	BDL	0.0000021	0.01
Nickel (mg/L)	0.015	0.012	0.001	0.001	0.07
Iron (mg/L)	17.22	11.75	0.86	1.02	0.30

Table 2. Laboratory analysis of water samples. Values in rust exceed the WHO/GS limit. BDL = below detection limit. **Source:** RESCONI Final Study Report (2023), Table 3.2, p. 59 (KNUST Central Laboratory).

Nutrients

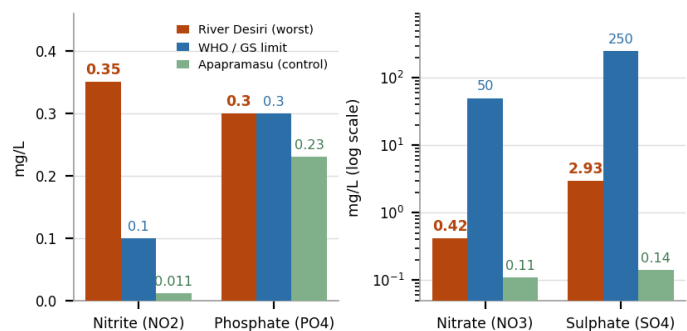


Figure 5. Nutrient levels against WHO/GS limits. Nitrite down-stream of the mining reach is the single nutrient exceedance. **Source:** RESCONI Final Study Report (2023), Table 3.2

Mercury was also flagged among the elevated heavy metals in the reserve's rivers, though the concentrations recorded in these four samples remained below the WHO/GS ceiling.

3. Why it matters, and what must change

What the readings mean

River Desiri mid-stream was very turbid, carried high suspended solids, and recorded levels of lead and chromium above the WHO and Ghana Standard limits for potable water — although it remained within the Water Resources Commission requirements for raw water. The report attributes the turbidity and suspended solids to excessive contamination from illegal mining upstream, near the waterfall.

Down-stream the picture does not improve. Turbidity of 168 NTU and suspended solids of 49 mg/L remain far above the WHO limit of 5 mg/L, and lead was detected at the recommended ceiling. Iron exceeded the permissible limit in every Desiri sample, though the report notes iron is an essential mineral in moderate amounts and may not itself pose adverse effects.

The control tells the opposite story. Almost every parameter at the Apapramasu mid-stream point fell within WHO, GS and WRC limits, indicating no immediate health or environmental concern. Its slight turbidity exceedance is consistent with normal conditions in a fast-flowing water body.

Water from River Desiri is of poor quality and does not meet the physicochemical and heavy-metal requirements stipulated by WHO, GS 175-1:2013 and the WRC — with a strong correlation to sediment runoff and chemical discharge from illegal mining along the river floodplain.

Paraphrased from RESCONI Final Study Report (2023), Section 3.3, Discussion.



An image of the Desiri River, Kasotie portion.



Water Sample from River Desiri for Lab Tests

Livelihoods in the water

The damage does not stop at chemistry. Reduced dissolved oxygen and heavy-metal contamination disrupt aquatic ecosystems and food chains, and **declining fish stocks** alongside contaminated farmland undermine fishing and farming income and the food security that depends on them. A river that cannot hold oxygen cannot hold a livelihood either.

The national picture

What was measured in Tano Offin is not isolated. Roughly **65%** of Ghana's freshwater bodies have been polluted through illegal mining. The report also documents the knock-on cost: illegal mining damages water-treatment equipment, and the price of treating polluted water reaches consumers.

Exposure downstream

Elevated lead and chromium in a river that feeds tributaries of the Tano and Offin is a direct public health exposure, not a distant abstraction. The report records that mining-related toxic emissions are associated with neurological disorders, respiratory problems and developmental abnormalities, and that contaminated water becomes unsuitable for agricultural and domestic use.

For the communities drawing on these rivers day to day, the exposure shows up in more familiar form: water that requires treatment before it is safe to drink, and illness linked to **diarrhoea, skin rashes and respiratory infection** — falling hardest on children and the elderly.

SDG Goal 6 commits Ghana to safe, affordable water for all by 2030 — a target the report warns will stay out of reach while illegal mining continues at this scale.

What communities already report

16.15% of respondents in Atwima Mponua named decreased water quality among the environmental challenges they face — against **6.38%** in Asutifi North, where mining pressure on water bodies is lower.

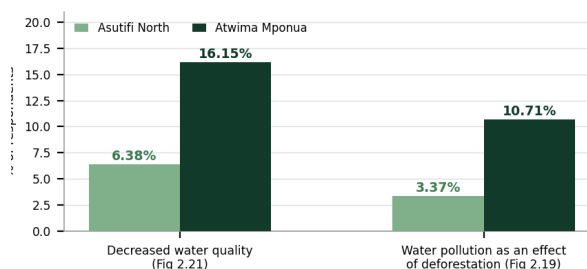


Figure 6. Water-related environmental concerns by district.

Source: RESCONI Final Study Report (2023), Figure 2.19, p. 37 and Figure 2.21, p. 39.

What RESCONI recommends

- Address competing land use within a **national land use plan** binding District Assemblies, regulators, traditional authorities and the private sector.
- Adopt **IFAMMA** — the Integrated Forestry and Mining & Management Approach — to restore degraded forest lands and mined-out areas.
- Redefine **artisanal mining permits** to require the consent of Traditional Authorities before any grant.
- Invest in **water-treatment infrastructure** — filtration and disinfection systems for downstream communities pending remediation upstream.
- Run **community awareness campaigns** on water-quality risks, through community meetings, radio and educational materials.
- Build a **web-based reporting solution** with CSOs to report illegal felling and mining to law enforcement, and strengthen **inter-agency coordination** with clearly defined roles.

REFERENCES

1. Resource Conservation Initiative (RESCONI). *Support to Promote Community Resilience and Rights in Competing Land Use for Mining, Agriculture and Forest Utilization in Ghana* — Final Study Report: RESCONI, November 2023. Sections 1.1, 3.1, 3.3, 4.1, 4.2, 5.1 and 5.2; Figures 2.19 (p. 37), 2.21 (p. 39) and 3.1 (p. 59); Tables 3.1 and 3.2 (pp. 57, 59); Executive Summary, p. x.
2. Laboratory analysis by the KNUST Central Laboratory, Kwame Nkrumah University of Science and Technology, on samples collected 5 April 2023. Reported in RESCONI Final Study Report (2023), Table 3.2, p. 59. Dissolved-oxygen and fisheries observations reported in RESCONI's companion Water Quality Fact Sheet.
3. Reference standards: WHO Guidelines for Drinking-Water Quality; GS 175-1:2013; GS 1212:2019 (sampling); Ghana WRC Raw Water Quality Criteria and Guidelines (2003). Secondary figures are cited in the source report to Emmanuel et al. (2018), Nyabor (2019), Aning (2023) and Asante (2021). Companion policy brief: *What Happens When There Is No Water to Drink in Biodiversity Rich Atwima Mponua District, Whilst the Rivers Are Flowing?* (November 2023) — resconi.org/publication.php.