WATER QUALITY MONITORING REPORT

February - November 2022

PROJECT: PROTECTING ATEWA CRITICAL ECOSYSTEM THROUGH BIODIVERSITY ASSESSMENTS AND PARTICIPATORY MONITORING

IMPLEMENTOR:

GHANA ROCHA
Caring for God's Creation

DONOR:

CRITICAL ECOSYSTEM PARTNERSHIP FUND

PARTNERS:

Forestry Commission

WRC
WATER RESOURCES COMMISSION

GHANA WATER COMPANY LIMITED

November 2022

Executive Summary

We took data for 4 water parameters: PH, Turbidity, Temperature, and Dissolved Oxygen from February to November 2022. Parameters such as Temperature, PH, and Dissolved Oxygen remained steadily low from February through to November 2022. However, high water turbidity were recorded at the Ghana Water Company Birem Abstraction Point - Kibi (High >1000 NTU: September and Low < 66.6 NTU: June). Ghana Water Company Birem Abstraction Point – Osino (High >1000 NTU: March, May,August, September, October and Low > 424 NTU: November) Ayensu Stream - Anum Apapam, (High>1000 NTU: May and Low < 3.2 NTU: February, March). Ghana Water Company Densu Abstraction Point – Densuso (High > 945 NTU: March, and Low <27.5 NTU: February). These turbidity values are far above the World Health Organization (WHO) standard (5 NTU) suitable for human consumption. However, the Birem Stream - Atewa Forest Reserve, Densu Stream - Atewa Range Forest Reserve, Densu Stream - Potroase, Ghana Water Company Awusu Abtraction Point - Kwabeng**,** Supon Stream - Atewa Range Forest Reserve, Subri Stream - Atewa Range Forest Reserve, Wankobi Stream - Atewa Range Forest Reserve, Akwadru Stream - Apampatia and Ayensu Stream - Atewa Range Forest Reserve had relatively low turbidities (Range: min < 0 NTU, max < 100 NTU).

Table of Contents

Key Words:

Dissolved oxygen (DO): The amount of oxygen that is present in water.

PH: Acidity or Alkalinity of a solution.

Temperature (Degree Celsius): The degree of hotness or coldness of a body or medium.

Turbidity (NTU): Turbidity is the measure of the relative clarity of a liquid.

INTRODUCTION

A Rocha Ghana in collaboration with Municipal and District Assemblies within the Atewa Range Forest Reserve Landscape and with support from regulatory institutions initiated a series of activities under its flagship program: **"*Developing Pathway to Alternative Livelihoods and Initiating Citizen-Based Biodiversity Monitoring Scheme Among Key Communities around the Atewa Range Forest Reserve*"**. The regulatory institutions collaborating with A Rocha Ghana in conducting these activities are Environmental protection Agency, Water Resource Commission, Forest Service Division, Wildlife Division and Ghana Water Company.

This is within a long-term program to improve biodiversity conservation in Ghana towards post-2020 biodiversity framework actions, by empowering communities as agents of change. Among activities under the program was the monitoring of water quality using a U 50 series water quality monitoring device. This exercise is aimed at safeguarding biodiversity and critical ecosystems within the landscape especially, our water bodies. Therefore, a monthly water quality monitoring exercise on selected rivers/streams and water abstraction points of the Ghana Water Company was embarked on within the Atewa Range Forest Reserve Landscape.

Four (4) major water parameters were focused on from February to November 2022, namely; PH, Turbidity, Temperature, and Dissolved Oxygen. PH refers to the acidity or alkalinity of a solution. Therefore, a PH is said to be Acidic when the PH ranges between 0–6, Neutral at 7, and Alkaline when it ranges from 7 to 14. Turbidity is the measure of the relative clarity of a liquid. It is an optical characteristic of water and is a measurement of the amount of light that is scattered by material in the water when light is shined through the water sample. The higher the intensity of scattered light, the higher the turbidity. Materials that cause water to be turbid includes clay, silt, very tiny inorganic and organic matter, algae, dissolved colored organic compounds, and plankton and other microscopic organisms. High turbidity makes water cloudy or opaque. The units of turbidity from the U 50 Probe are Nephelometric Turbidity Units (NTU) and the allowable turbidity in drinking water should not be higher than 5.0 Nephelometric Turbidity Units (NTU). Temperature is the degree of coldness or hotness of a substance and was measured in degree Celsius. Dissolved Oxygen (DO) is also the amount of oxygen that is present in water. Water bodies receive oxygen from the atmosphere and from aquatic plants. Running water, such as that of a swift-moving stream dissolves more oxygen than still water of a pond or lake. With Dissolved Oxygen each organism has its own DO tolerance

range, generally, DO levels below 3 milligrams per litre (mg/L) are of concern, and waters with levels below 1 mg/L are considered hypoxic and usually devoid of life.

METHODOLOGY

The U 50 series water quality monitoring device was powered on and calibrated to record water parameters such as Temperature, Turbidity, PH, Dissolved Oxygen, Oxidation reduction potential, Total Dissolved Solids, Salinity, and Conductivity. The device was allowed to establish a GPS location for about 5 minutes. This was to ensure accurate recording of the sampling location. The device was gently lowered into the water body with the aid of its long rope.

1.0 Water Sampling Point – Atewa Range Forest Reserve Landscape.

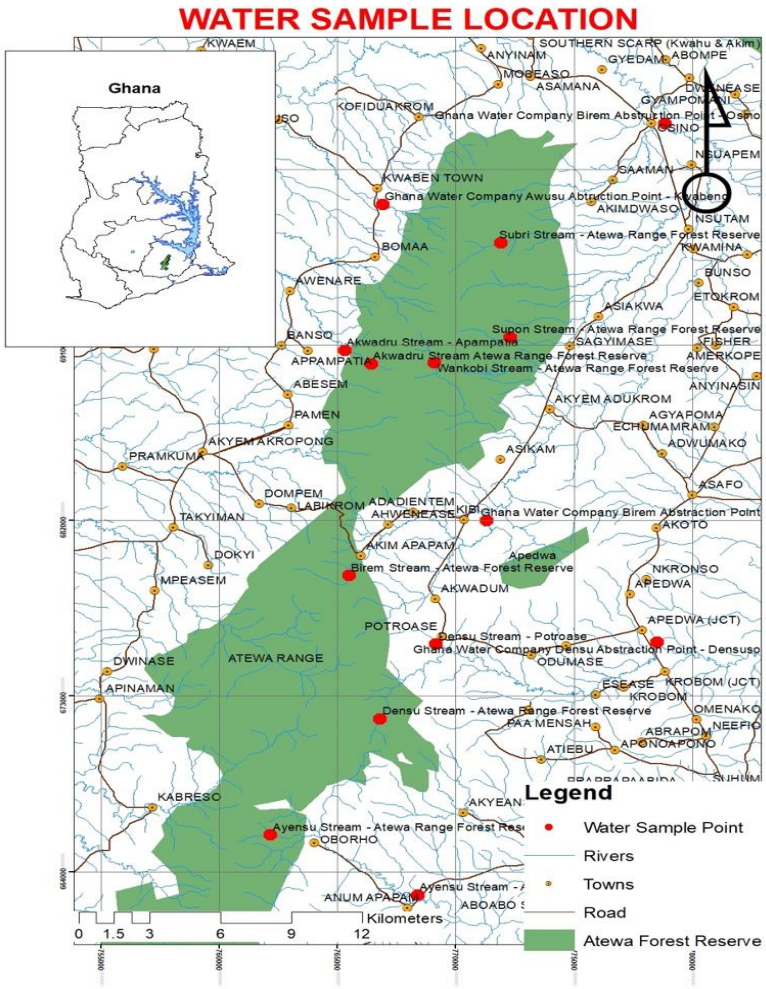

Figure 1.0 Water Sampling Point – Atewa Range Forest Reserve Landscape.

RESULTS

1.1 BIREM STREAM - ATEWA FOREST RESERVE

Water quality was generally good at the Birem Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (23.33°c ± 1.19), PH (8.08 ± 0.46), Turbidity (14.67 NTU ± 4.7), and Dissolved Oxygen (10.809 mg/L ± 1.5).

1.1 BIREM STREAM - ATEWA FOREST RESERVE

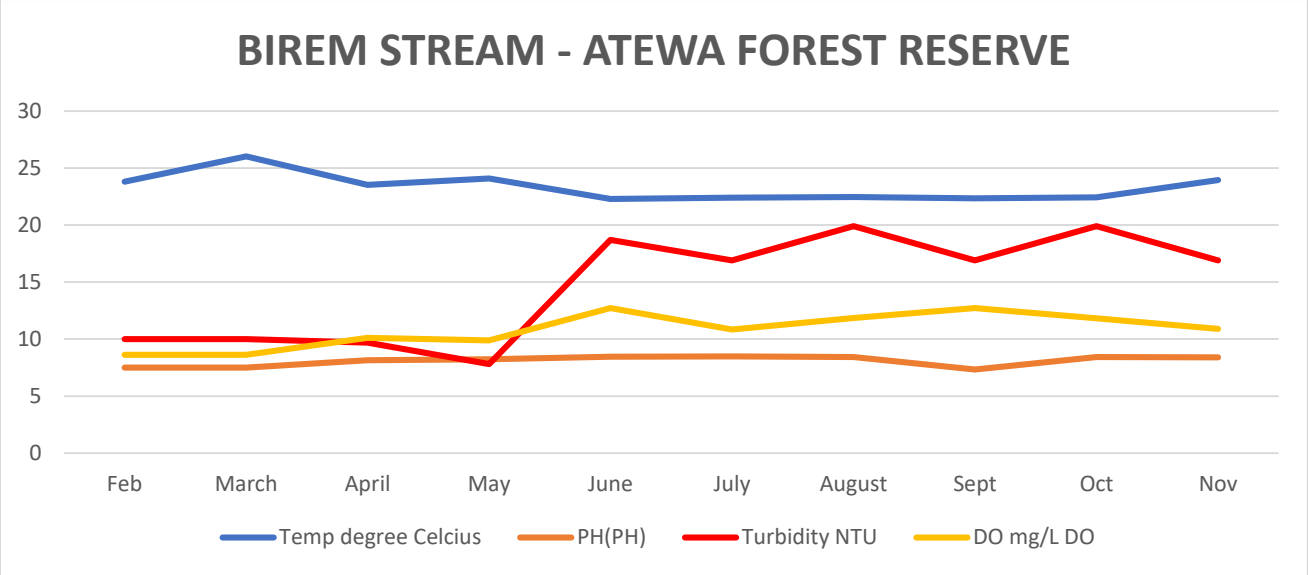

Figure 1.1 Birem Stream - Atewa Forest Reserve

1.2 GHANA WATER COMPANY BIREM ABSTRACTION POINT

Water quality was generally poor at the Ghana Water Company Birem abstraction point over the period with a mean Temperature (25.27°c ± 0.60), PH (8.2 ± 0.45), Turbidity (421.49 NTU ± 398.75) and Dissolved Oxygen (8.43 mg/L ± 3.1).

1.2 GHANA WATER COMPANY BIREM ABSTRACTION POINT

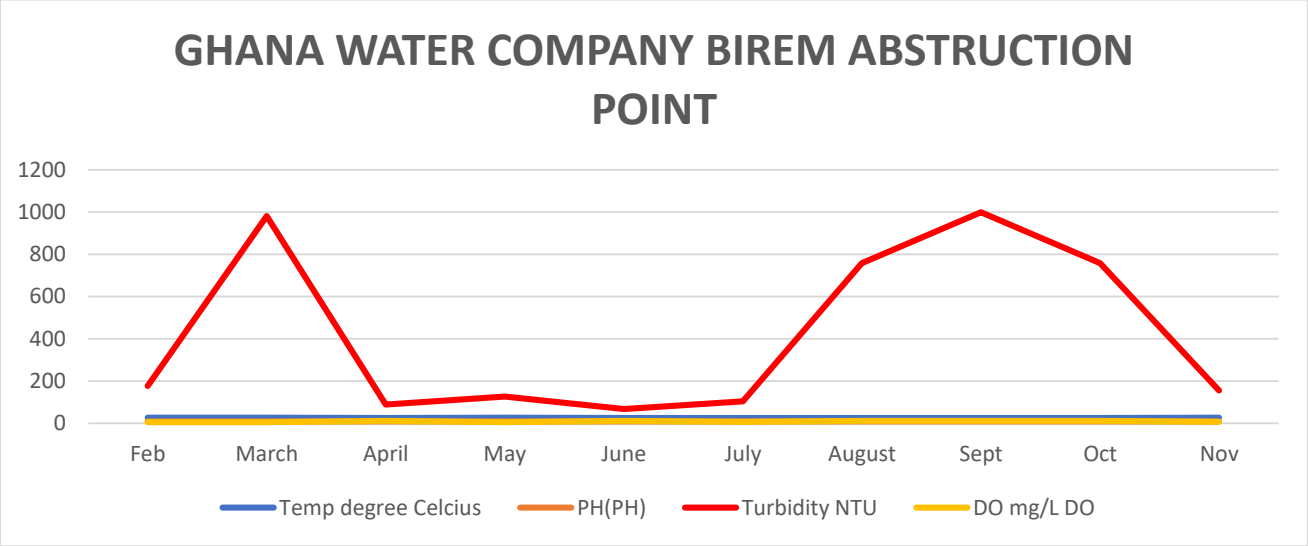

Figure 1.2 Ghana Water Company Birem Abstraction Point

1.3 DENSU STREAM - ATEWA RANGE FOREST RESERVE

Water quality was generally very good at the Densu Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (23.27 °c ± 1.13), PH (8.12 ± 0.4), Turbidity (5.43 NTU ± 11.8) and Dissolved Oxygen (9.17 mg/L ± 1.56).

1.3 DENSU STREAM - ATEWA RANGE FOREST RESERVE

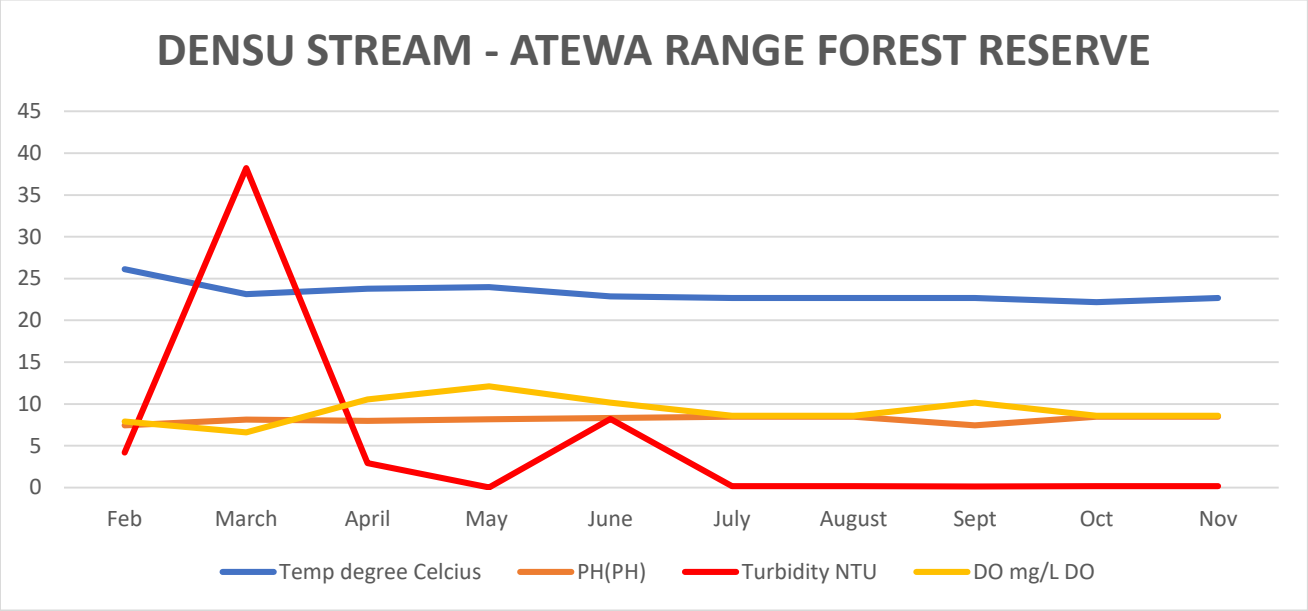

Figure 1.3 Densu Stream - Atewa Range Forest Reserve

1.4 DENSU STREAM – POTROASE

Water quality was generally very poor at the Densu Stream at Potroase over the period with a mean Temperature (24.34 °c ± 1.13), PH (8.05 ± 0.41), Turbidity (42.41 NTU ± 27.18) and Dissolved Oxygen (9.41 mg/L ± 1.71).

1.4 DENSU STREAM – POTROASE

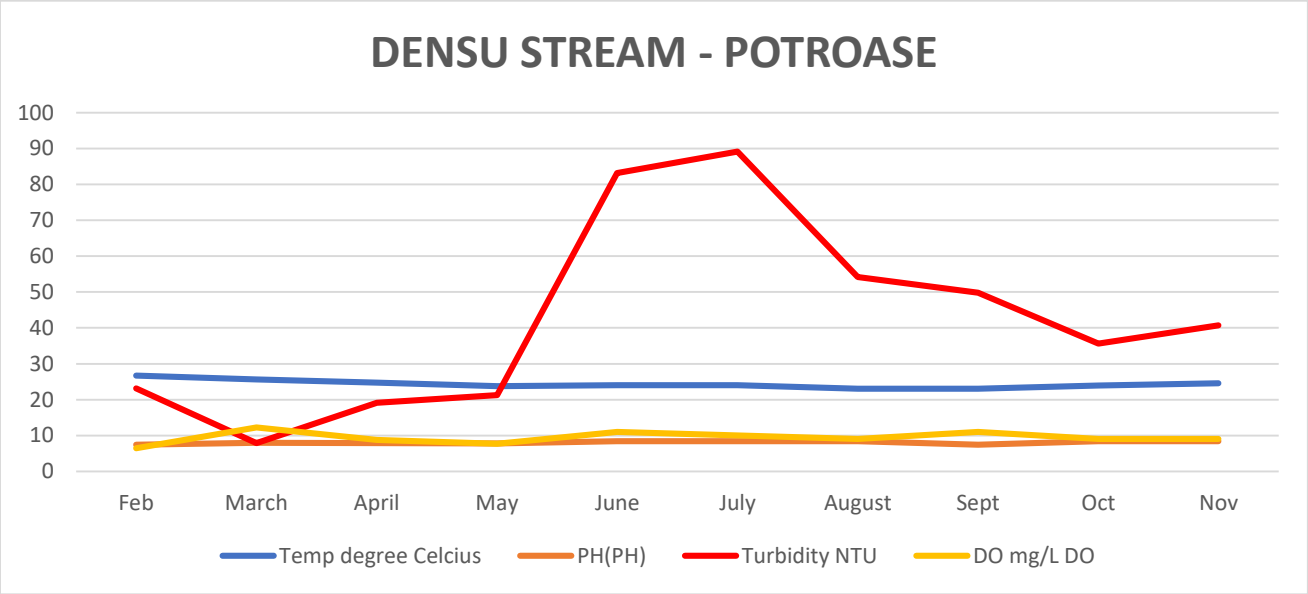

Figure 1.4 Densu Stream - Potroase

1.5 GHANA WATER COMPANY BIREM ABSTRACTION POINT - OSINO

Water quality was generally worse at the Ghana Water Company Birem abstraction point at Osino over the period with a mean Temperature (26.52 °c ± 0.74), PH (8.01 ± 0.42), Turbidity (844.9 NTU ± 215.06), and Dissolved Oxygen (9.24 mg/L ± 2.7).

1.5 GHANA WATER COMPANY BIREM ABSTRACTION POINT - OSINO

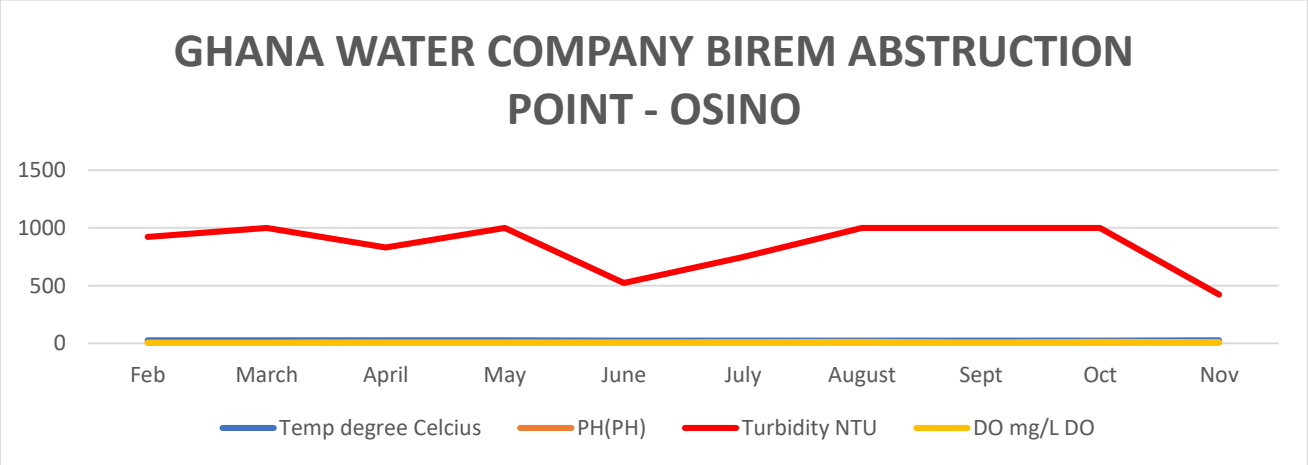

Figure 1.5 Ghana Water Company Birem Abstruction Point – Osino

1.6 GHANA WATER COMPANY AWUSU ABTRUCTION POINT - KWABENG

Water quality was generally good at the Ghana water company Awusu abstraction point at Kwabeng over the period with a mean Temperature (24.85 °c ± 1.24), PH (7.83 ± 0.3), Turbidity (16.08 NTU ± 11.39), and Dissolved Oxygen (9.08 mg/L ± 2.33).

1.6 GHANA WATER COMPANY AWUSU ABTRUCTION POINT - KWABENG

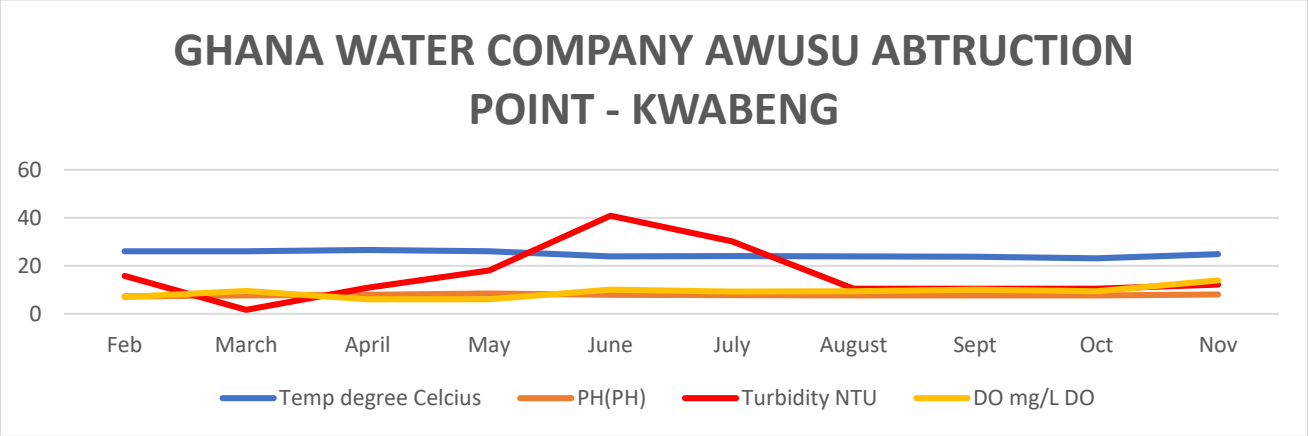

Figure 1.6 Ghana Water Company Awusu Abtruction Point - Kwabeng

1.7 SUPON STREAM - ATEWA RANGE FOREST RESERVE

Water quality was generally very good at the Supon Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (23.1 °c ± 1.37), PH (8.15 ± 0.44), Turbidity (6.11 NTU ± 3.68), and Dissolved Oxygen (9.52 mg/L ± 0.8).

1.7 SUPON STREAM - ATEWA RANGE FOREST RESERVE

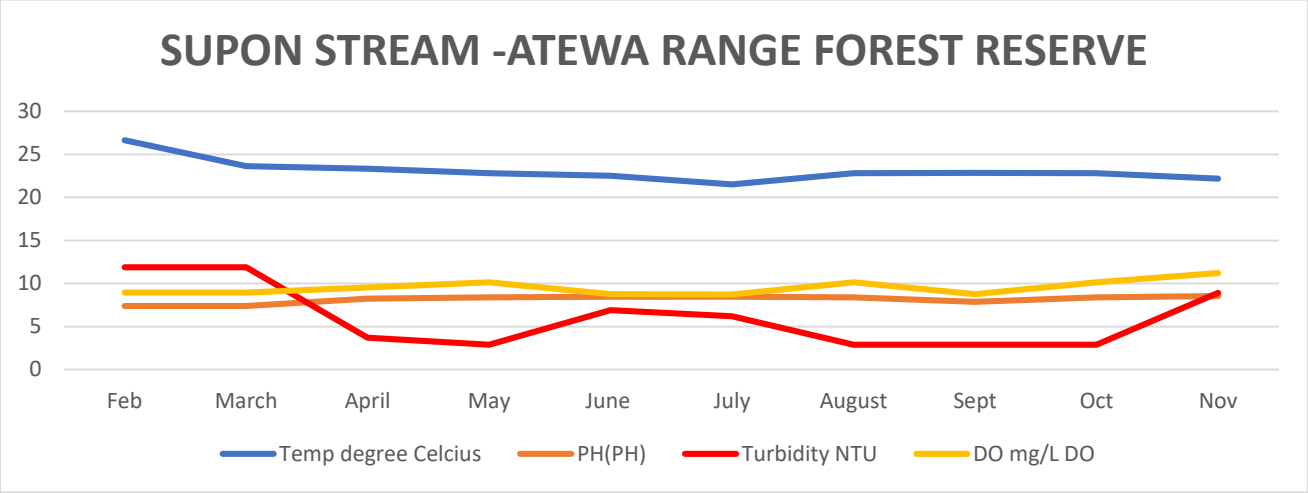

Figure 1.7 Supon Stream - Atewa Range Forest Reserve

1.8 SUBRI STREAM - ATEWA RANGE FOREST RESERVE

Water quality was generally very good at the Subri Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (22.00 °c ± 0.97), PH (7.87 ± 0.29), Turbidity (4.32 NTU ± 3.85), and Dissolved Oxygen (9.16 mg/L ± 1.03).

1.8 SUBRI STREAM - ATEWA RANGE FOREST RESERVE

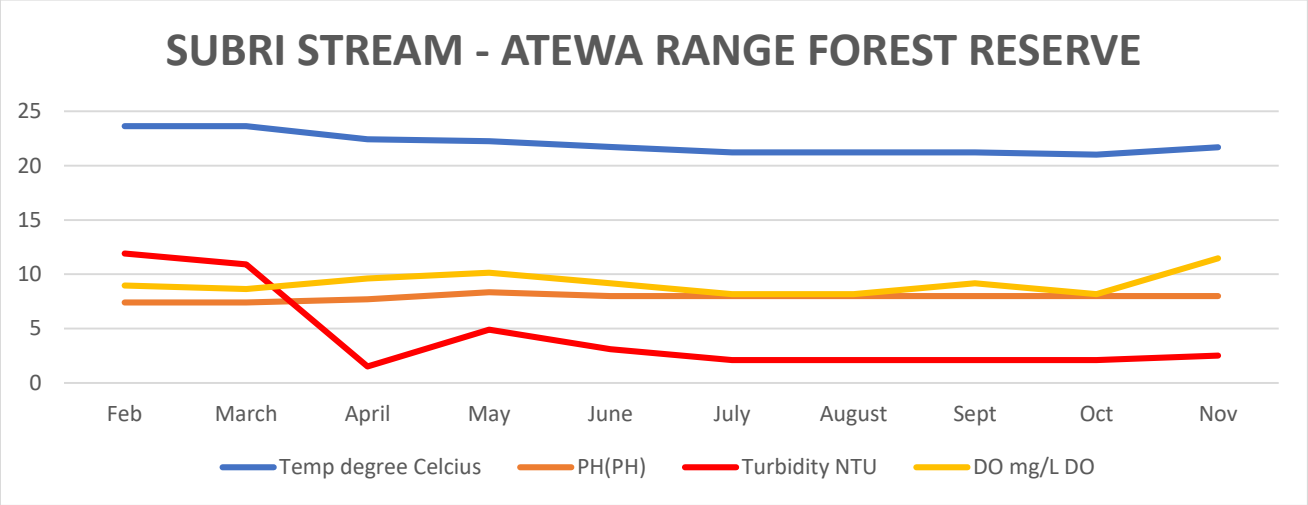

Figure 1.8 Subri Stream - Atewa Range Forest Reserve

1.9 WANKOBI STREAM - ATEWA RANGE FOREST RESERVE

Water quality was generally very good at the Wankobi Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (22.33 °c ± 0.75), PH (7.77 ± 0.45), Turbidity (5.36 NTU ± 2.43), and Dissolved Oxygen (9.25 mg/L ± 2.81).

1.9 WANKOBI STREAM - ATEWA RANGE FOREST RESERVE

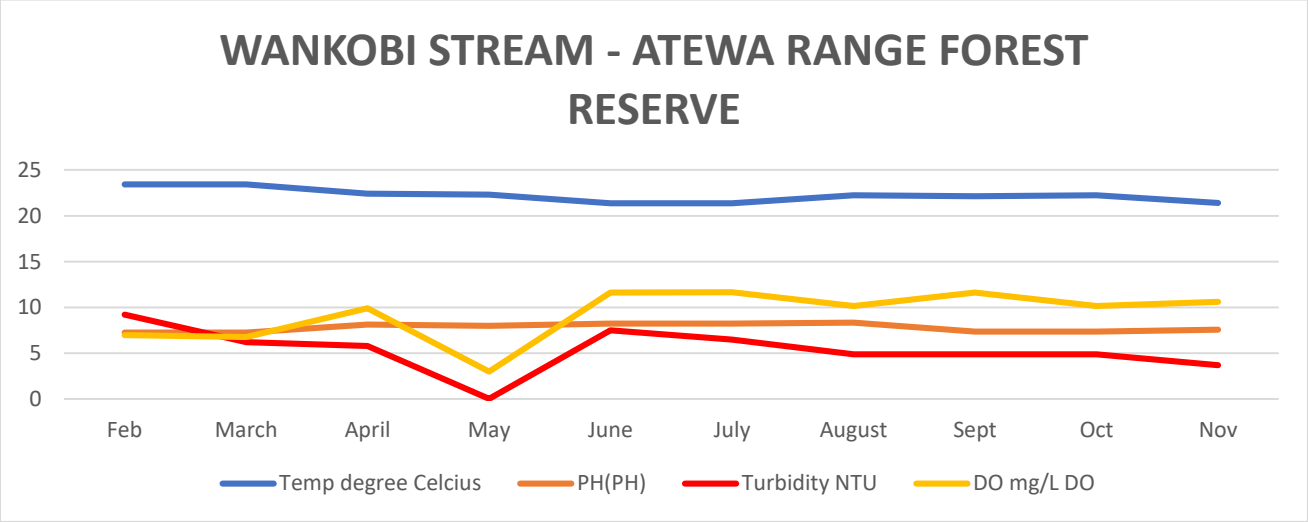

Figure 1.9 Wankobi Stream - Atewa Range Forest Reserve

1.10 AKWADRU STREAM ATEWA RANGE FOREST RESERVE

Water quality was generally very good at the Akwadru Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (23.32 °c ± 0.97), PH (7.81 ± 0.55), Turbidity (2.21 NTU ± 1.47), and Dissolved Oxygen (11.11 mg/L ± 2.19).

1.10 AKWADRU STREAM ATEWA RANGE FOREST RESERVE

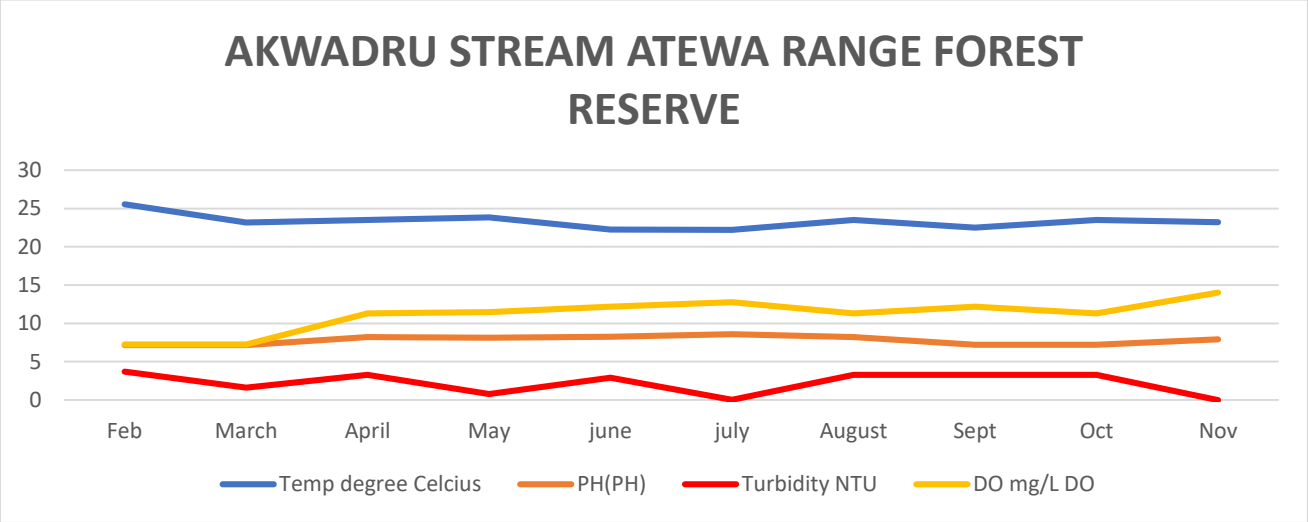

Figure 1.10 Akwadru Stream Atewa Range Forest Reserve

1.11 AKWADRU STREAM – APAMPATIA

Water quality was generally very good at the Akwadru Stream at Apampatia over the period with a mean Temperature (25.09 °c ± 1.45), PH (7.82 ± 0.34), Turbidity (20.75 NTU ± 10.92), and Dissolved Oxygen (10.55 mg/L ± 1.12).

1.11 AKWADRU STREAM – APAMPATIA

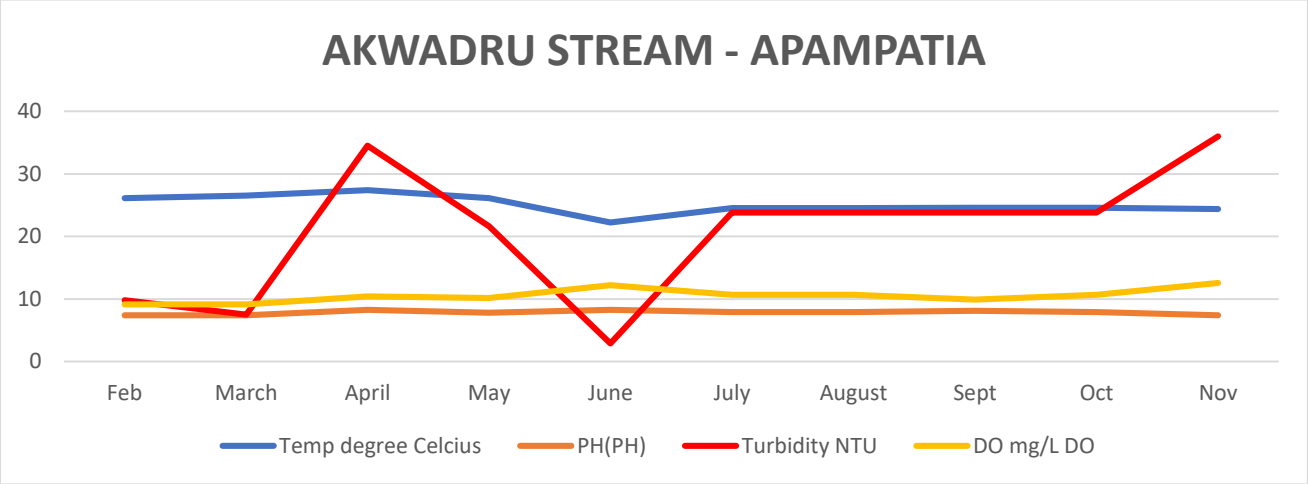

Figure 1.11 Akwadru Stream – Apampatia

1.12 AYENSU STREAM - ATEWA RANGE FOREST RESERVE

Water quality was generally very good at the Ayensu Stream within the Atewa Range Forest Reserve over the period with a mean Temperature (23.85 °c ± 1.67), PH (7.65 ± 0.46), Turbidity (22.52 NTU ± 9.95), and Dissolved Oxygen (8.45 mg/L ± 3.24).

1.12 AYENSU STREAM - ATEWA RANGE FOREST RESERVE

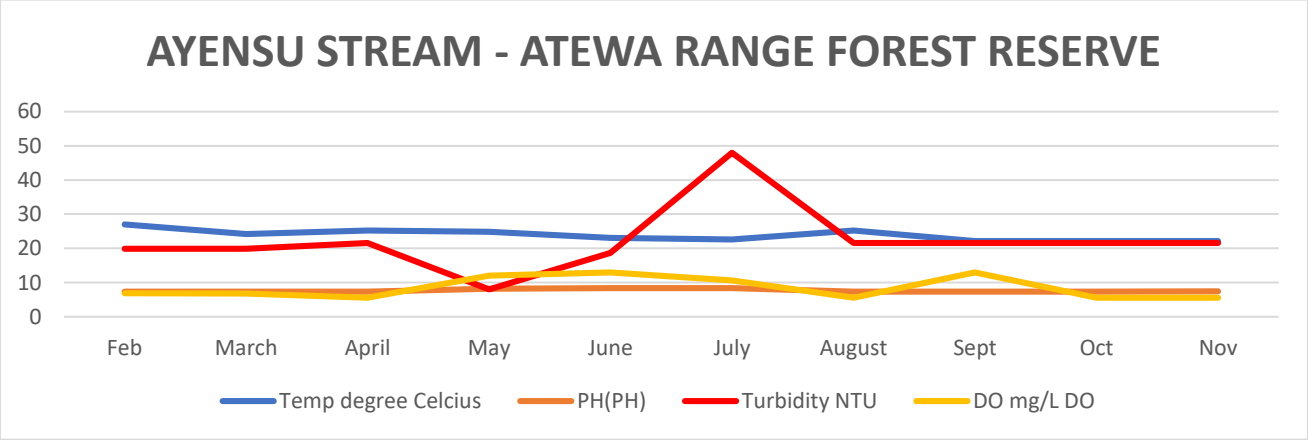

Figure 1.12 Ayensu Stream - Atewa Range Forest Reserve

1.13 AYENSU STREAM - ANUM APAPAM

Water quality was generally very good at the Ayensu Stream at Annum Apapam over the period with a mean Temperature (24.74 °c ± 0.82), PH (8.18 ± 0.4), Turbidity (184 NTU ± 325.82), and Dissolved Oxygen (9.54 mg/L ± 1.09).

1.13 AYENSU STREAM - ANUM APAPAM

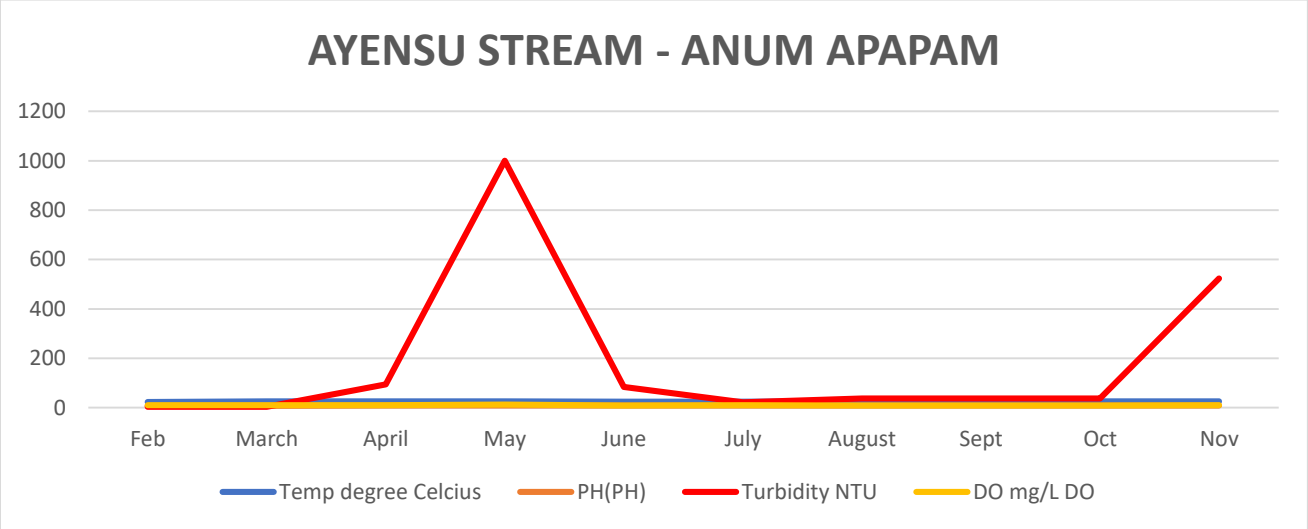

Figure 1.13 Ayensu Stream - Anum Apapam

1.14 GHANA WATER COMPANY DENSU ABSTRACTION POINT – DENSUSO

Water quality was generally very good at the Ghana Water Company Densu Abstraction Point at Densuso over the period with a mean Temperature (25.12 °c ± 1.11), PH (8.25 ± 0.46), Turbidity (172.18 NTU ± 275.84), and Dissolved Oxygen (9.14 mg/L ± 2.58).

1.14 GHANA WATER COMPANY DENSU ABSTRACTION POINT – DENSUSO

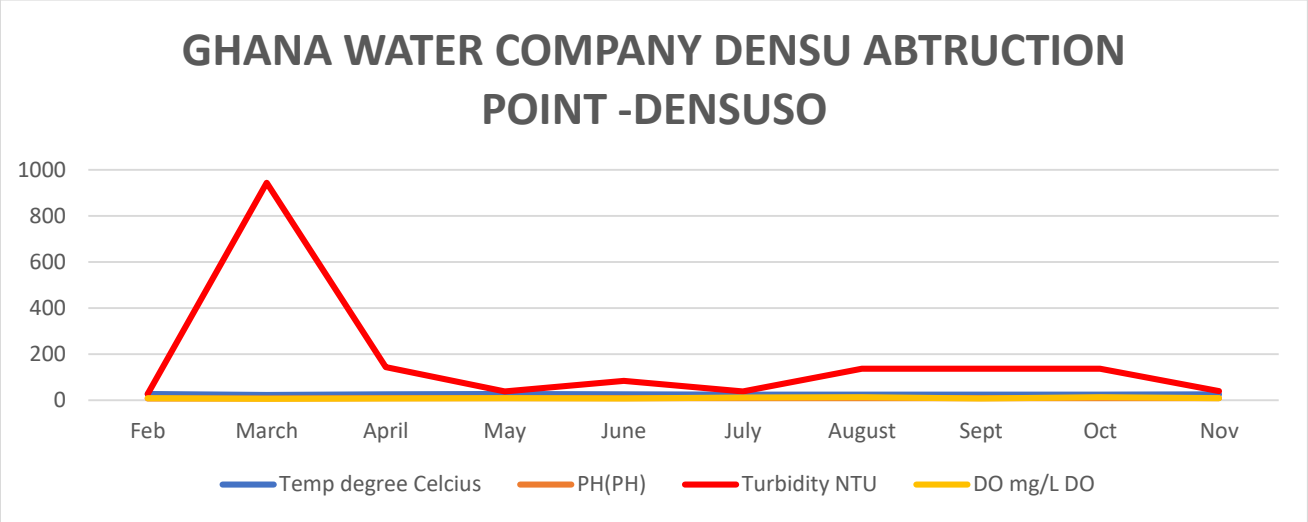

Figure 1.14 Ghana Water Company Densu Abstraction Point - Densuso

DISCUSSION:

Parameters such as Temperature, PH, and Dissolved Oxygen remained steadily low from February through to November 2022 but not for turbidity.

Turbidity:

Turbidity reflects water clarity; **Total Dissolved Solids** (TDS) is the combined content of all inorganic and organic substances contained in a liquid in molecular, ionized or micro-granular suspended form. **Total Soluble Solids** (TSS) are solids in water that can be trapped by a filter, such as sediment, decaying plant and animal matter, and industrial wastes. High water turbidity were recorded at the Ghana Water Company Birem Abstraction Point - Kibi (High >1000 NTU: September and Low < 66.6 NTU: June). Ghana Water Company Birem Abstraction Point – Osino (High >1000 NTU: March, May, August, September, October and Low > 424 NTU: November) Ayensu Stream - Anum Apapam, (High>1000 NTU: May and Low < 3.2 NTU: February, March). Ghana Water Company Densu Abstraction Point – Densuso (High > 945 NTU: March, and Low <27.5 NTU: February). These turbidity values are far above the World Health Organization (WHO) standard (5 NTU) suitable for human consumption. However, the Birem Stream - Atewa Forest Reserve, Densu Stream - Atewa Range Forest Reserve, Densu Stream - Potroase, Ghana Water Company Awusu Abtraction Point - Kwabeng**,** Supon Stream - Atewa Range Forest Reserve, Subri Stream - Atewa Range Forest Reserve, Wankobi Stream - Atewa Range Forest Reserve, Akwadru Stream - Apampatia and Ayensu Stream - Atewa Range Forest Reserve had relatively low turbidities (Range: min < 0 NTU, max < 100 NTU). According to World Health Organizations Standards. The allowable turbidity in drinking water must not be higher than 5.0 Nephelometric Turbidity Units (NTU). Turbidity values below this threshold were only recorded at sites within the Atewa Range Forest Reserve.

Temperature:

Temperatures outside the Atewa Range Forest Reserve were observed to be higher compared to those recorded in the forest Reserve. This could be attributed to the canopy closures within the forest Reserve. High temperatures were found to correlate with high turbidity.

PH:

PH Acidic - (0 – 6), Neutral - (7), and Alkaline - (7 - 14). PH were generally observed to be Alkaline across site. Alkalinity was found to correlate with increasing turbidity. This can be attributed to the soil particle load from Mining activities along the banks of water bodies especially the Birem River.

Dissolved Oxygen:

The amount of oxygen present in water is termed Dissolved Oxygen (DO). Water bodies receive oxygen from the atmosphere and from aquatic plants. Running water, such as that of a swift-moving stream dissolves more oxygen than still water of a pond or lake. Even though each organism has its own DO tolerance range However, generally, DO levels below 3 milligrams per litre (mg/L) are of concern, and waters with levels below 1 mg/L are considered hypoxic and usually devoid of life.

The DO recordings were generally good across site (min: 8mg/L and Max: 12mg/L). However, DO during the period were relatively higher within the Atewa Range Forest Reserve (min: 9mg/L and Max: 12mg/L)

LESSONS LEARNT:

Mining activities within the Atewa Range Forest Reserve landscape have been on the rise and hence affecting water bodies, especially on the Birem river. However, Turbidity was found to be low outside the Atewa Range Forest Reserve in the month of June. This could be attributed to the annual Ohum festival celebrated by the people of the Akyem Abuakwa Traditional Council in June. This festivity period bans people from tilling the land and unnecessary noise making such as loud music or drumming. This potrays the influence of traditional custom in saving our environment which must be exploited.

CONCLUSION AND RECOMMENDATIONS:

The results showed high turbidity at the Ghana Water Company Birem Abstraction Point - Kibi, Ghana Water Company Birem Abstraction Point - Osino, and Ayensu Stream - Anum Apapam (Turbidity >1000 NTU). Water at these sites also were generally more Alkaline with high Temperatures low levels of Dissolved Oxygen. This could be attributed to mining activities along these streams. These areas were observed to be plagued with mining activities. It is therefore highly recommended that, mining companies along the Birem and Ayensu streams should be identified, and their activities regulated.

STAKEHOLDER ENGAGEMENT

The results of the water quality monitoring has been shared with key stakeholders notably the Municipal Assembly, Water Resources Commission, Ghana Water Company and the Environmental Protection Agency in the Eastern Region and within the Atewa Landscape.

Following the sharing of the results, The Municipal Security Council (MUSEC) in a stakeholder meeting requested the Kyebi Water Supply Station to shut down and a task force instructed to investigate and bring perpetuators of mining activities within the Birim watershed to book. The owner of an excavator that was responsible for some mining activities within the Birim watershed was later arrested and prosecuted according to reports by MUSEC.