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POLICY BRIEF

WHAT HAPPENS WHEN THERE IS NO WATER TO DRINK IN BIODIVERSITY RICH ATWIMA MPONUA DISTRICT WHILST THE RIVERS ARE FLOWING?

A CRISIS OF LIVELIHOODS AND HEALTH.



Prepared by:
Resource Conservation Initiative (RESCONI)
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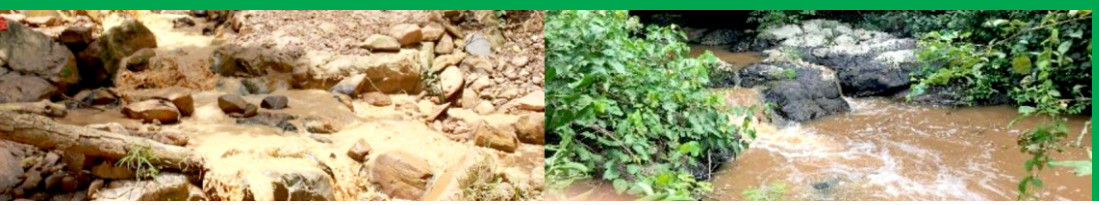

Briefing Note
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What Happens when there is no water to drink in biodiversity rich Atwima Mponua District whilst the rivers are flowing?
A crisis of livelihoods and health.

Introduction

The 6th Sustainable Development Goal (SDG 6) aims at ensuring availability and sustainable management of clean water for all. It recognizes that water is at the core of sustainable development and the range of services it provides ensures poverty reduction, economic growth and environmental sustainability.

This envisioned state is however rendered a challenge against the backdrop of human activities such as deforestation, forest degradation, illegal logging, illegal mining, and agricultural expansion amongst others that have resulted in severe water stress and shortage in rural communities around the world. It is important therefore to effectively and efficiently manage water resources for a sustainable supply of safe and affordable drinking water.

This necessitates ensuring freshwater supplies, implementation of effective inland water resource management, protection and restoration of water catchments and related ecosystems amongst others. The targets of this SDG can be attained by offering the needed technical support in water management policy, decision making and implementation of planned activities with local communities.

In Ghana, the guiding policy for water has been developed by the Ministry of Water Resources, Works and Housing to provide the overarching framework for water management. It provides the introduction and policy context, strategic actions of policy and policy implementation arrangements.

This National Water Policy, 2007 aims to achieve sustainable development, management and use of Ghana's water resources to improve health and livelihoods, reduce vulnerability while assuring good governance for present and future generations.

The Tano Offin Forest Reserve (TOFR), is the largest forest reserve in the Atwima Mponua District (AMD) of Ghana. It lies within longitude 2° 17'0'W and 1° 59'0'W and latitude 6° 20'0'N and 6° 60'0' and found in the wet semi-equatorial forest zone in Ghana.

The reserve is administratively under the management of the Nkawie Forest District of the Forest Services Division (FSD).

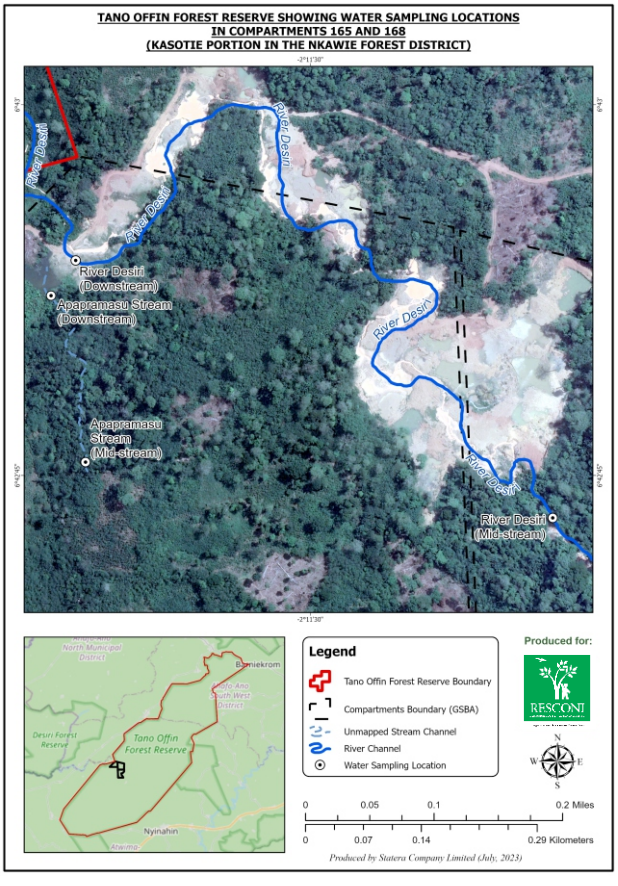
It is a vital ecological treasure that covers an area of 41,392 hectares and is the fourth largest Globally Significant Biodiversity Area (GSBA) in the country. It is a source of timber and Non-Timber Forest Products (NTFPs), and importantly, it also serves as the lifeline of the numerous forest fringe communities. It is the watershed for several streams and tributaries of Rivers Tano and Offin and sustains agricultural activities whilst providing clean water for downstream communities.

Presently, this forest reserve has been inundated with massive illegal mining activities that threatens its provisioning of environmental services and its very existence. There have been several reported cases of illegal farming, illegal mining, illegal logging and lumbering, and pollution of the water bodies amongst other unsustainable environmental practices.

These developments have found their existence in scientific publications, the electronic and print media and complaints of the local populace to the District Assembly. It is against this background that a study titled "*Support to Promote Community Resilience and Rights in Competing Land Use for Mining, Agriculture and Forest Utilization in Ghana*" was undertaken by the Resource Conservation Initiaitve (RESCIONI). The project scope covered Atwima Mponua District (AMD) in the Ashanti Region where a detailed study was undertaken of the riverine system.

Out of this study, this policy brief specifically on the status of the riverine and aquatic ecosystem of the Tano Offin Forest Reserve has been specially prepared to engage the relevant stakeholders in our collective action to find lasting solution to this environmental and social menace.

This policy brief delves into the intricate dynamics of the current state of water quality in the Tano Offin Forest Reserve, highlighting the detrimental impacts of illegal mining, deforestation, and agricultural practices on the river's health. It proposes a comprehensive range of policy interventions to address these issues and safeguard the well-being of downstream communities. It is the fervent expectation of RESCONI that the Atwima Mponua District Assembly and the Traditional Authorities will work together to own this policy brief and ensure that stakeholders work in concert in ensuring that the forest and its resources and water bodies are maintained in a more stable environment for the present and future generations.



Methodology

Non-participant observations were carried out during a visit to the Kasotie portion of Compartment 165 and 168 of Tano Offin Forest Reserve on 5th April 2023. There was the collection of water samples (Table 1) for laboratory analysis at two locations each (midstream & downstream) on River Desiri and the adjoining and undisturbed Apapramasu Stream using standard water sampling, preservation and transportation methods stipulated by GS 1212:2019. The results as shown in Table 2 were benchmarked against the WHO Guidelines for drinking water quality (2010),

GS 175-1:2013 and the Water Resources Commission (WRC) of Ghana Raw Water Quality Criteria and Guidelines for Protection of Aquatic Ecosystems (2003).

Table1: GPS Coordinates of Sampling Locations in Compartment 165 and 168 in Tano Offin Forest Reserve

Point ID	River / Stream	Source	Coordinates		Elevation (M)
			Latitude (N)	Longitude (W)	
1	Desiri River	Mid-stream	06^{0}42'43.6"	002^{0}11'19.8"	308
2	Desiri River	Down-stream	06^{0}42'53.7"	002^{0}11'39.5"	271
3	Apapramasu Stream	Mid-stream	06°42'45.54"	002°11'39.10"	301
4	Apapramasu Stream	Down-stream	06°42'52.27"	002°11'40.50"	305

Source: RESCONI field data, April 2023

Table2: Results of Water Sample analysis

PARAMETER	RESULTS				WHO [1] /GS[2]	WRC[3]
	River Desiri (Mid-stream)	River Desiri (Down-stream)	Apapramasu Stream (Mid-stream)	Apapramasu Stream (Down-stream)		
Physico-Chemical						
pH (SU)	7.03	6.98	7.02	7.01	6.5-8.5	-
Conductivity (Scm^{-1})	67.7	47	43.8	43.8	500	-
Turbidity (NTU)	451	168	5.1	8	5	-
Salinity (gL^{-1})	BDL	BDL	BDL	BDL	200	-
Total dissolved solids (mgL^{-1})	13.0	18.0	19.0	27.0	1000	-
Total suspended solids (mgL^{-1})	47.0	49.0	22	21.0	5	-
Calcium, Ca (mgL^{-1})	1.27	BDL	2.04	2.27	N/A	0 - 100
Magnesium, Mg (mgL^{-1})	1.02	2.28	1.24	1.34	N/A	0 – 100
Hardness (mgL^{-1})	2.30	1.54	3.40	3.58	500	500
Alkalinity (mgL^{-1})	25.0	3.80	15.0	10.0	200	-
Chloride, Cl^{-1} (mgL^{-1})	3.25	30.0	2.44	1.79	250	-
Nutrients						
Sulphate, SO_4^{2-} (mgL^{-1})	1.30	2.93	0.14	0.02	250	-
Nitrate, NO_3^- (mgL^{-1})	0.42	0.03	0.11	0.10	50	-
Nitrite, NO_2^- (mgL^{-1})	0.01	0.35	0.008	0.011	0.1	-
Phosphate, PO_4^{3-} (mgL^{-1})	0.30	0.01	0.20	0.23	0.3	-

1.WHO Guidelines for Drinking-water Quality, 2010
2.GS 175-1:2013
3.Water Resources Commission. (2003). Ghana Raw Water Quality Criteria and Guidelines for Protection of Aquatic Ecosystems

Heavy Metals and Metalloids						
Chromium, Ci (mgL^{-1})	0.06	0.18	0.002	0.002	0.05	0-7
Lead, Pb (mgL^{-1})	0.013	0.043	0.0003	0.0005	0.01	0.5
*Arsenic, As (mgL^{-1})	0.004	0.01	0.001	BDL	0.01	-
Manganese, Nn (mgL^{-1})	0.20	0.16	0.033	0.034	0.4	-
*Selenium (mgL^{-1})	0.01	0.009	0.008	0.006	0.01	-
Copper, Cu (mgL^{-1})	0.03	0.021	0.01	0.001	0.05	0.4 – 0.8
Mercury, Hg (mgL^{-1})	0.0002	0.0001	BDL	0.0000021	0.01	0.04
Nickel, Ni (mgL^{-1})	0.015	0.012	0.001	0.001	0.07	-
Iron, Fe (mgL^{-1})	17.22	11.75	0.86	1.02	0.30	-
BDL – Below detection limit						

Source: RESCONI field data, April 2023

Threats to the Sustainability and Health of Tano Offin Forest Reserve (TOFR)

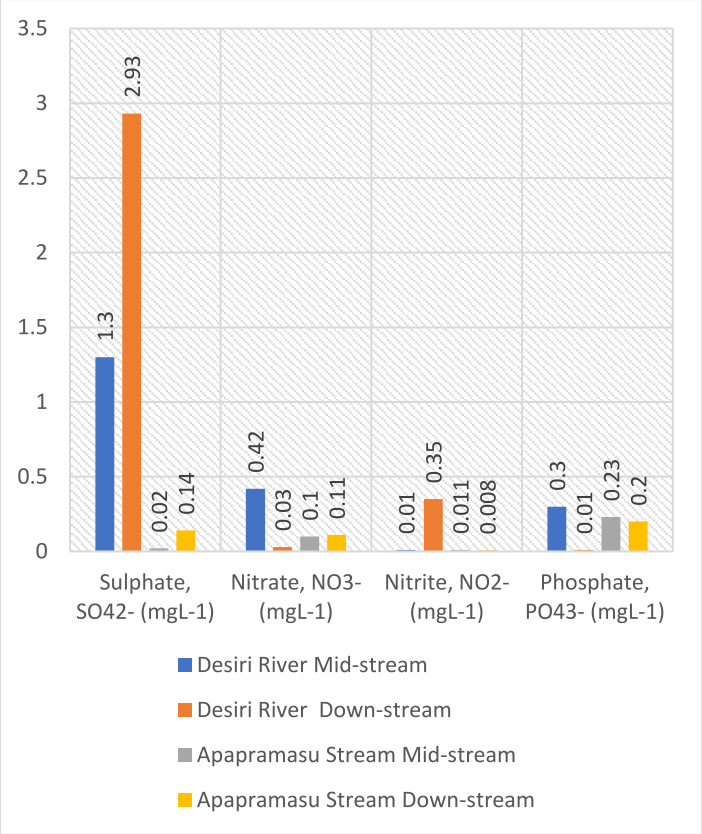
The TOFR has undergone a steady decline in recent years, primarily due to a combination of anthropogenic activities that have disrupted the delicate balance of the Reserve's ecosystem. The following factors were observed as major threats:

1. **Unrestrained Illegal Mining:** Illegal mining operations have proliferated within the TOFR, particularly, the Kasotie forest fringe community. This has unleashed a torrent of sediment and heavy metals into the Desiri River that traverse the Tano Offin Forest Reserve. This influx of pollutants has resulted in excessive turbidity (451 & 168 NTU), elevated Total Suspended Solids (TSS) of 47 mg/l & 49 mg/l, and alarming concentrations of lead (0.013 & 0.043 mg/l), iron (17.22 & 11.75 mg/l) and chromium (0.06 & 0.18 mg/l).

   The downstream cumulative effect is also reported by Akankpo et al., 2022. Conversely, the undisturbed Apapramasu Stream recorded lower levels of turbidity (8 & 5 NTU), TSS values of (22 & 21 mg/l) as well as heavy metal levels compliant with all the benchmarks considered.
2. **Rampant Deforestation:** The unchecked deforestation within the TOFR has stripped away the protective vegetation cover, exacerbating erosion and sedimentation while diminishing the natural filtration mechanisms for pollutants (Asare et al., 2021).

   This loss of vegetation has rendered the soil vulnerable to erosion, leading to the transportation of sediment into the rivers, further impairing water quality.

3. Intensive Agricultural Practices: The intensification of agricultural practices in the vicinity of the TOFR has introduced a new set of threats to the quality of water within the reserve catchment. The indiscriminate use of pesticides and fertilizers, often in excessive quantities, has led to increased runoff of these chemicals into the rivers, contaminating the water and posing risks to human health and aquatic ecosystems (Amoako et al., 2020). Though the nutrients analysed in River Desiri were compliant, they were higher relative to the levels recorded in the undisturbed Apapramasu Stream. For instance, sulphate recorded in River Desiri were 1.30 & 2.93 mg/l while that of Apapramasu Stream were 0.14 & 0.02 mg/l.



The Current State of Water Quality: A Cause for Concern

The combined effects of illegal mining, deforestation, and unsustainable agricultural practices have resulted in a severe deterioration of water quality in the TOFR's river systems. The water quality parameters now fall far short of the physicochemical and heavy metal standards set by the World Health Organization (WHO), Ghana Standards Authority (GS) 175-1:2013, and Water Resources Commission (WRC). These indices worth emphasizing are:

1. Excessive Turbidity: Turbidity levels in the rivers within the TOFR consistently exceed the WHO and GS thresholds, as a direct consequence of the uncontrolled mining activities upstream (Gyamfi et al., 2018). This excessive turbidity reduces the penetration of sunlight into the water, hindering photosynthesis and disrupting the delicate balance of aquatic ecosystems.

2. **Elevated Heavy Metal Concentrations:** The rivers within the TOFR harbour elevated concentrations of heavy metals, including lead, iron, mercury and chromium, posing severe health risks to downstream communities and aquatic life (Adjei-Mensah et al., 2021). These heavy metals accumulate in the tissues of organisms, and are reported to lead to a range of health problems, including neurological disorders, developmental abnormalities, and even death.
3. **Low Dissolved Oxygen:** The Dissolved Oxygen (DO) levels in the rivers within the TOFR have plummeted, and this is attributable to the high organic matter content, which undergoes decomposition, consuming oxygen and endangering aquatic organisms (Ofori-Sarpong et al., 2022). The low DO levels stress aquatic life, making it difficult for them to survive and reproduce.

Impact on Downstream Communities: A Crisis of Health and Livelihoods

The deteriorating quality of river systems within the TOFR continues to have a devastating impact on downstream communities, disrupting their livelihoods and threatening their health:

1. ***Unsafe Drinking Water***: Water from the TOFR river systems are no longer safe for consumption without proper treatment, leading to the spread of waterborne diseases such as diarrhoea, skin rashes, and respiratory problems (Asenso-Okyere et al., 2019). These diseases have a disproportionate impact on children and the elderly, exacerbating existing health disparities in these communities.
2. ***Threatened Livelihoods***: The pollution of the Tano River and its tributaries including the Desiri River has severely hampered fishing and farming activities, depriving local communities of their primary sources of income and food security (Asiedu et al., 2017). The decline in fish stocks has forced many fishermen to abandon their trade, while the contamination of agricultural land has reduced crop yields and made it difficult for farmers to sustain their livelihoods.
3. ***Biodiversity Loss:*** Contamination of the river systems within the TOFR has decimated aquatic life, disrupting the delicate ecosystem and contributing to a significant loss of biodiversity (Ntiamoah et al., 2020). The decline in fish populations has had cascading effects on the entire food chain, while the loss of other aquatic species has further destabilized the ecosystem.

Policy Recommendations: A Path to Recovery and Resilience

To address the worsening water quality crisis in the TOFR catchment and safeguard the well-being of downstream communities, the following comprehensive policy interventions are proposed:

1. ***Stringent Crackdown on Illegal Mining:*** Rigorous measures are required to curb illegal mining operations in the Tano Offin Forest Reserve. This entails enforcing existing laws with increased vigour, implementing stricter regulations, and developing innovative strategies to deter and prevent illegal mining (Akankpo et al., 2022).The Forest Services

Division (FSD) must work in concert with the Atwima Mponua District Assembly, Traditional Authorities and the local communities to establish effective monitoring and enforcement mechanisms, ensuring that illegal mining activities are effectively curtailed.

2. ***Prioritized Reforestation Initiatives:*** Reforestation efforts must be prioritized to restore the vegetation cover in the Tano Offin Forest Reserve, as well as the degraded areas along the major river bodies and stream. This will mitigate erosion and sedimentation, enhance soil quality, and improve water filtration (Asare et al., 2021). The government, in partnership with local communities and non-governmental organizations, must implement large-scale reforestation programs, planting native tree species that will restore the lost vegetation cover.

3. ***Promoted Sustainable Agricultural Practices:*** There is the need for adoption of sustainable agricultural practices essential to reduce the use of harmful pesticides and fertilizers, thereby minimizing agricultural runoff and protecting the Tano River and its tributaries (Amoako et al., 2020). The government must provide incentives and support for farmers to transition to sustainable practices, such as organic farming and integrated pest management.

4. ***Investment in Water Treatment Infrastructure:*** The downstream communities must have access to safe drinking water. In this regard, the government must invest in water treatment infrastructure, including filtration systems and disinfection technologies, to provide clean water to these communities (Gyamfi et al., 2018). This investment will not only improve public health but also enhance the quality of life for residents.

5. ***Empowered Awareness Raising Campaigns:*** Effective awareness-raising campaigns are crucial to educate local communities about the importance of water quality and the impact of pollution on human health and the environment (Adjei-Mensah et al., 2021). These campaigns should utilize a variety of communication channels, including community meetings, radio broadcasts, and educational materials, to reach a wide audience.

Conclusion: River Systems Restored for Thriving Communities

TOFR stands as a testament to the delicate balance between human activities and the natural world. By implementing the policy recommendations outlined in this brief, we can embark on a path to restore the health of the forest reserve and its river systems, ensuring that its pristine waters continue to nourish and sustain not only the communities that depend on it today but also for generations unborn. This legacy of sustainability requires a collective effort from the government, local communities, and civil society organizations.

Some important summary findings of the study are as follows:

i. The trajectory of forest cover decline leaves much worry and may indicate a failure of management, programmes and initiatives aimed at arresting deforestation and forest degradation. The spatial evidence gathered reveals a dwindling forest cover. This has been confirmed through a 30-year land cover change analysis between 1990 and 2021.

ii. Farming was the dominant economic activity in the study districts. A significant proportion of the respondents were from farming households (94.22% for Asutifi North District (AND) and 95.30% for Atwima Mponua District (AMD) while less than 6% (5.78% for AND and 4.7% for AMD) were from mining households.

iii. There are three (3) key forest and land resource-based livelihood activities (farming, illegal mining, and logging) in the study districts. More than 90% of respondents are engaged in farming (91% for AND and 94% for AMD) and they are mostly smallholder farmers, Moreso, farming employs a large proportion of the population and contributes to food security and economic development and there is also commercial farming, to a lesser degree, to produce export-oriented crops such as cocoa.

iv. The majority of lands are used for farming activity whilst a comparatively small extent are used as mining sites (represented as 7% and 5% for AND and AMD, respectively), and this has contributed adversely to negative environmental impacts. This, comparatively appears to be on the ascendency and a threat to the sustainability of the environment and socio-economic development of the local impacted communities.

v. On cocoa production and livelihood nexus, cocoa production has been a key economic activity.

vi. Mining activities in these communities have resulted in deforestation, soil erosion, water pollution, and habitat destruction. These environmental changes can harm ecosystems and disrupt the livelihoods of communities that depend on natural resources for their subsistence, such as farming and fishing. It was observed that increased temperature, erratic rainfall pattern and drought negatively affected agricultural production. Thus, it is important to promote climate-smart agricultural practices and technologies (sustainable land management, water conservation, agroforestry, and the use of improved seeds and crop varieties) that improve resilience and adaptation.

vii. Unsustainable logging practices, illegal mining, agricultural expansion, and fuelwood collection, all contribute to deforestation and forest degradation in the study districts. This has led to the loss of biodiversity, ecosystem services, and negatively affects the livelihoods of communities dependent on forest resources.

viii. On Water Quality Parameters, the surface water sampled from River Desiri, one of the major rivers within the Tano Offin Forest Reserve confirms the damaging environmental impact of illegal mining on river systems as well as the significant health risks exposure to downstream users of water bodies. There was evidence of high turbidity (6,000% > the WHO threshold), as well as the presence of harmful heavy metals (chromium (240% > WHO threshold), and lead (280% > WHO threshold)), when compared with an undisturbed stream.

ix. Interest in lands given out to other parties in the study districts were for illegal small-scale mining. The use of lands for illegal small-scale mining activity by other parties could arguably lead to less arable land for cocoa production and increase potential negative impacts on cocoa productivity levels.

There is the urgency and need to balance farming, mining, and forest resources utilization in project districts. This necessitates effective forest resources utilization for a balance between environmental sustainability, social inclusiveness and economic development.

GALLERY OF STUDY EVENTS

RESCONI Research Team

Group Photograph with Kasotie Community after a Focus Group Discussion on Illegal Mining Menace on Forestry and Agriculture

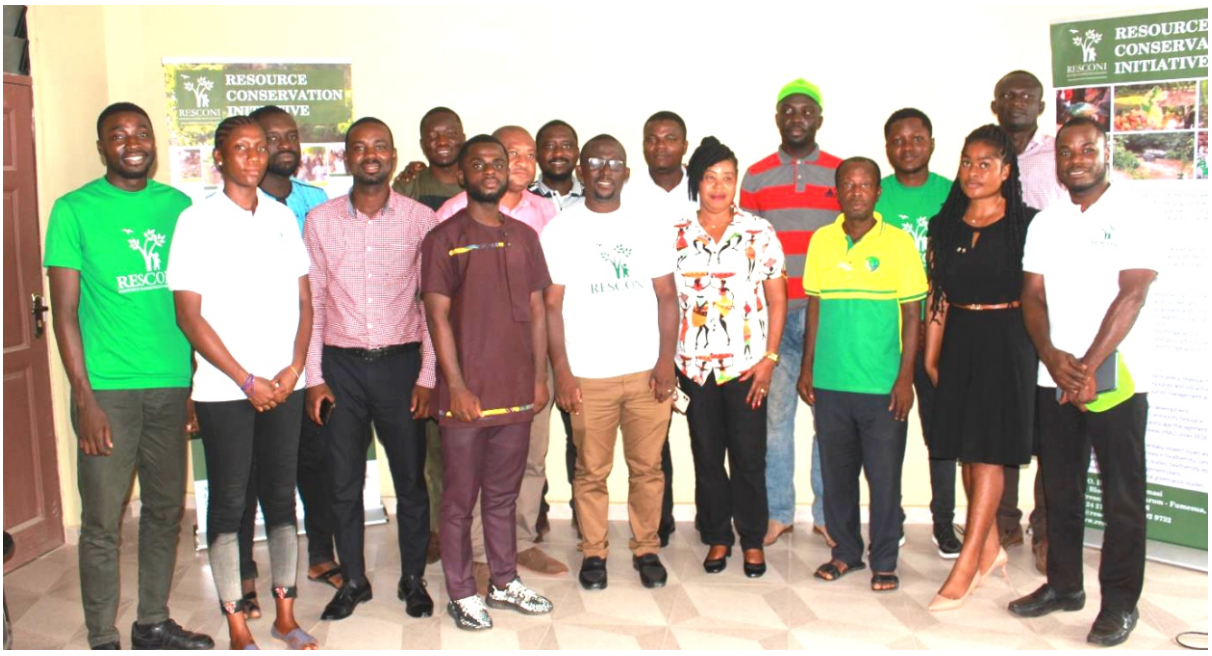
GALLERY OF STUDY EVENTS

RESCONI Research Officer, infront and Forest Range Manager of Nkawie Forest District traversing Compartment 168 of Tano Offin Forest Reserve to the disturbed Waterfall which carries Desiri River

Polluted Desiri River flowing through Kasotie Portion of Tano Offin FR (Compartment 168)

GALLERY OF STUDY EVENTS

RESCONI Research Team with management of Nkawie Forest District of the Forest Services Division (FSD) after Stakeholder Engagement activity



RESCONI Research Team with management of Atwima Mponua District Assembly after a Stakeholder Engagement activity

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