CLIMATE RESILIENT WATER SYSTEM UTILIZATION PROJECT

Environmental and Social Impact Assessment (ESIA)

for the proposed Climate Resilient Water System Utilization Project in Nine (9) Selected Ghana Water Limited (GWL) operational Regions of Ghana



@October 2025

Final Version

Supervising Ministry:

MINISTRY OF WORKS, HOUSING AND WATER RESOURCES
Republic of Ghana

Implementing Agency:

GHANA WATER LTD.

Financiers:

AFRICAN DEVELOPMENT BANK GROUP

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ABBREVIATIONS

AfDB–CAW	African Development Bank's Climate Action Window
CRWSUP	Climate Resilient Water System Utilization Project
dB	Decibels
DUR	Department of Urban Roads
EA	Environmental Assessment
EHS-MP	Environment Health and Safety Management Plan
GoG	Government of Ghana
GRC	Grievance Redress Committee
GWL	Ghana Water Limited
HDPE	High Density Polyethylene (pipe)
HEPA	High-Efficiency Particulate Air
HSE	Health Safety and Environment
LI	Legislative Instrument
LIUC	Low-Income Urban Community
LICSD	Low-Income Community Support Department
MMCPU	Municipal/Metropolitan Planning and Development Unit
MLGRD	Ministry of Local Government and Rural Development
NEAP	National Environmental Action Plan
NRW	Non-Revenue Water
OD	Outside Diameter
OP	Operational Policy
PAPs	Project Affected Persons
PM_{10}	Particles are less than 10 microns (Particulate Matter)
PPD	Project Planning Department

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PPE	Personal Protective Equipment
PVC	Polymerized Vinyl Chloride (pipe)
RAP	Resettlement Action Plan
RoW	Right of way
TSP	Total Suspended Particles
$\mu g/m^3$	Microgram per cubic meter

EXECUTIVE SUMMARY

The Climate Resilient Water System Utilization Project (CRWSUP) is a strategic initiative by the Government of Ghana, implemented through Ghana Water Limited (GWL) with support from the African Development Bank's Climate Action Window (AfDB-CAW). The project's overarching goal is to expand access to safe and reliable drinking water in Low-Income Urban Communities (LIUCs) across nine (9) GWL operational regions in Ghana. This effort directly addresses the national gap in access to safely managed water estimated at only 41% in 2020 and contributes to the achievement of SDG 6.1 (universal access to safe water).

The specific objectives are to:

- Improve water security and service reliability through the rehabilitation and expansion of existing distribution networks.
- Leverage under-utilized production capacity to serve underserved populations.
- Introduce advanced metering infrastructure to optimize water use and reduce non-revenue water.
- Strengthen the resilience of water systems and communities against climate-induced risks.
- Promote equitable access to safe water, thereby improving public health and socio-economic wellbeing.

Project Components

The project will have 4 components, described below:

Component 1: Infrastructure Development involves constructing robust, climate-resilient water infrastructures such as pipelines and distribution points capable of withstanding increased climate variability and extreme weather events, like floods and droughts.

- Sub-component 1.1: Building small-scale water networks with materials selected for durability and adaptability to changing climate conditions.

- Sub-component 1.2: Installing subsidized household water connections with smart metering and leak detection systems for targeted LIUCs (households, schools, health centres, public spaces).

Component 2: Capacity Building and Technical Assistance focuses on enhancing operational and managerial skills within GWL and LIUC to manage climate risks and implement adaptation strategies effectively (*)

- Sub-component 2.1: Training for GWL and LICSD staff on climate resilience aspects of water utility management.

- Sub-component 2.2: Workshops on sustainable water service delivery models incorporating climate change adaptation and resilience building.

* Funded under existing partnership arrangements such as VEI's WaterWorX, Danish Strategic Sector Corporation, GRCS behavioural change campaign MoU.

Component 3: Community Engagement and Empowerment aims to involve local communities in water management with a focus on adapting to climate change impacts.

- Sub-component 3.1: Establishing WUAs to also foster community-based climate adaptation initiatives.

- Sub-component 3.2: Encouraging community participation in water management decisions with an emphasis on resilience to climate variability.

Component 4: Monitoring, Evaluation, and Learning ensures project effectiveness and adaptability to climate change, with a focus on tracking climate resilience outcomes and lessons learned.

-Sub-component 4.1: Conducting impact assessments to evaluate climate resilience improvements.

- Sub-component 4.2: Establishing adaptation and continuous improvement mechanisms for climate risk management.

The project's structure aligns with the CAW's focus on climate adaptation and resilience. Incorporating sustainable materials and community involvement, it demonstrates an innovative approach that can be replicated in other African utilities. The thorough planning and diverse components reflect the project's alignment with the Joint MDB methodologies for adaptation, ensuring its relevance under the CAW criteria. This comprehensive approach positions the project as a viable model for sustainable, climate-resilient water management in Africa.

Main Activities

The construction work will involve the following main activities at the sites:

- Securing the right-of-way for project execution
- Excavation, trenching, and pipe laying
- Thrust boring

- Transportation of HDPE and PVC pipelines to construction sites
- Road diversion will be undertaken to ensure the uninterrupted movement of pedestrians and motorists during the period of construction
- Backfilling and compacting
- Pipe Laying Works
- Concrete works to construct inspection chambers
- Construction of standpipes
- Pressure Testing of Pipelines
- Disinfection of the pipelines
- Re-instatement of demolished properties on the Right-of-Way of the pipe laying activities
- Re-planting of disturbed areas during construction

Project Alternatives

In line with Ghana's Environmental Protection (Environmental Assessment) Regulations, LI 2504 (2025), alternatives were examined to ensure the proposed water-supply improvements are environmentally sound, socially acceptable, economically efficient, and climate-resilient. Options reviewed covered pipeline materials, routing, metering technology, and a No-Project scenario.

1) Pipeline Material Alternatives

- Cast iron: Strong under pressure but heavy, shorter lengths, prone to corrosion and sediment build-up; higher installation and lifecycle costs. Not preferred.
- Ductile iron: High strength, tolerant to ground movement, recyclable, favorable lifecycle for large diameters; costly. Preferred only for above-ground stream crossings and select on-demand connections where mechanical robustness is essential.
- Steel: Durable and available in long lengths, but higher cost, corrosion protection challenges, and lower safety factors for potable networks. Not preferred for distribution mains.
- Concrete: Durable but very heavy, difficult to repair/tap, and uneconomical in required sizes. Not preferred.
- Copper: Long life and corrosion-resistant but very high cost and theft risk. Not preferred.
- HDPE (Plastic-based): Light, flexible, corrosion-resistant, easy to install/join (no open flame), dampens surge, lower cost, and less prone to illegal tapping. Preferred material for distribution mains, services, and household connections (≈110–630 mm).

Material choice (Preferred Option): Use HDPE for most mains/services and limited ductile iron for above-ground stream crossings and special connections.

2) Pipeline Routing Alternatives

- Entirely new routes: Would keep existing networks active during construction, but require new rights-of-way, trigger higher land acquisition/resettlement risks and costs, and increase environmental footprint in greenfield areas. Not preferred.
- Dynamic routing (hybrid): Replace selected sections, divert where encroachment/compensation is high, and lay new pipes alongside existing lines to optimize reach and constructability. Asbestos lines are decommissioned in place (left buried) and new pipes installed in parallel to avoid handling risks. Old recyclable materials are removed where feasible.

Routing choice (Preferred Option): Adopt dynamic routing optimized for:

- constructability and safe tie-ins to existing systems;
- minimal crossings of major roads and utilities;
- avoidance of sensitive receptors (sacred sites, churches, streams);
- least-cost resettlement and disruption;
- alignment with spatial plans and proximity to target LIUC households.

3) Technological (Metering) Alternatives

- Mechanical meters: Low unit cost and locally available but require physical access, create safety/access issues for staff, and are prone to reading errors.
- Smart meters (AMI/AMR): Higher upfront cost but allow remote reads, improve accuracy and billing, support demand management, and reduce non-revenue water.

Technology choice (Preferred Option): Pilot and scale smart water meters as part of GWL's innovation agenda, complemented by mechanical meters where appropriate during transition.

4) "No Project" Scenario

Maintaining the status quo would perpetuate intermittent supply, dependence on costly informal vendors, elevated public-health risks, and climate vulnerability in LIUCs. It would forego benefits such as:

- increased potable water access and improved sanitation;
- reduced physical/commercial losses;
- enhanced climate resilience;
- progress toward SDG 6 (with co-benefits for SDGs 3 & 10);
- alignment with WSSDP and national water policies;
- expanded GWL revenue base from new customers.

Conclusion: The No-Project option is not acceptable given clear environmental, social, and economic drawbacks.

- **Preferred Alternative & Rationale**

HDPE led networks plus targeted ductile iron at crossings plus dynamic routing plus smart metering. This portfolio best meets LI 2504 requirements by:

- Minimizing environmental footprint (reuse corridors, avoid greenfields, reduce corrosion/leaks);
- Reducing social risks/costs (less land take, fewer displacements, safer construction);
- Improving economic efficiency (lower lifecycle costs, reduced NRW, scalable deployment);
- Enhancing climate resilience (materials tolerant to ground movement/temperature swings; demand management via smart metering);
- Managing legacy hazards (asbestos left safely in place; new parallel lines).

Brief Description of Project Sites

The proposed project is a linear development that will be implemented in nine (9) GWL operational regions or eight (8) administrative regions of Ghana with populations in low-income urban communities. The GWL Climate Resilient Water System Utilization project will be implemented within thirty-four (37) low-income urban communities across the nine regions of Ghana. Each of the regions selected contains between 1 and 10 carefully selected Low-Income and Vulnerable Urban Communities

According to land use categorisations conducted by ESRI et al. (2022), the land uses identified within the beneficiary communities include medium to high residential and population densities with a high degree of informality manifesting as the presence of home and neighbourhood-based economic activities, especially along the pipe routes. Residential, commercial, and mixed residential commercial land use activities have usurped the wayleaves for water and other utilities lines and installations. Built up areas occupy about 94.5 percent of the total land area of the beneficiary communities. Trees cover about 0.5 percent of the total area while grass, crops, shrub and bare ground cover about 5 percent.

Intitutional and legal framework for implementation of the project

This chapter outlines the national policies, legal and regulatory instruments, institutional frameworks, and international conventions that guide the implementation of the Climate Resilient Water System Utilization Project (CRWSUP). The framework ensures the project's full

compliance with Ghanaian environmental and social laws, African Development Bank (AfDB) Integrated Safeguards System (ISS), and international best practices. It provides the governance structure and assigns institutional roles and responsibilities essential for the effective management of environmental and social safeguards throughout the project lifecycle.

Policy and Regulatory Alignment

The proposed project aligns with the key national development policies, including:

- Ghana National Environmental Policy (2013): Promotes environmental sustainability through prior environmental assessments and pollution control measures.
- National Water Policy (2007): Supports equitable investment in extending water services to low-income urban communities.
- National Gender Policy (2015): Ensures equitable access and participation of women, children, and vulnerable groups.
- National Climate Change Policy (2013): Encourages climate-resilient and low-carbon infrastructure through efficient resource use.
- National Employment Policy (2012): Promotes local employment and improved livelihoods through project-based job creation.
- National Health and Land Policies: Ensure protection of public health, sustainable land use, fair compensation, and protection of land rights.

The project further adheres to the Environmental Protection Act, 2025 (Act 1124) and the Environmental Assessment Regulations, 2025 (LI 2504), which mandate environmental assessment prior to implementation, ensuring impacts are mitigated and environmental quality maintained.

Institutional Roles and Responsibilities

1. Ministry of Works, Housing and Water Resources (MWHWR)

- Lead Ministry and overarching policy authority for water and sanitation.
- Provides strategic direction, policy harmonization, and oversight of GWL's project implementation.
- Ensures compliance with national WASH strategies and alignment with Sustainable Development Goals (SDG 6).

2. Ghana Water Limited (GWL)

- Implementing Agency responsible for executing the CRWSUP.
- Oversees engineering design, construction, quality assurance, and adherence to ESMP and environmental permit conditions.

- Liaises with EPA, MMDA, and AfDB for compliance and reporting.
- Ensures stakeholder engagement, community health and safety, and social inclusion during implementation.

3. Ministry of Finance (MoF)

- Provides financial oversight, including mobilization, allocation, and disbursement of project funds.
- Ensures compliance with public financial management laws, debt sustainability, and transparent resource utilization.

4. Ministry of Local Government, Decentralization and Rural Development (MLGDRD)

- Coordinates project activities with local governance structures.
- Ensures effective integration of the ESIA findings into district development plans and community-level monitoring.
- Promotes sanitation and hygiene management at the local level.

5. Metropolitan, Municipal and District Assemblies (MMDAs)

- Responsible for local-level coordination, supervision, and enforcement of environmental and construction by-laws.
- Facilitate community engagement, waste management, and traffic safety during construction.
- Support grievance redress, monitoring, and post-project maintenance within their jurisdictions.

6. Environmental Protection Agency (EPA)

- Regulatory authority for environmental compliance and enforcement under Act 1124 and LI 2504.
- Reviews and approves the ESIA, issues the Environmental Permit, and monitors compliance with environmental and social standards.
- Coordinates with GWL and other agencies to ensure mitigation measures and monitoring programs are implemented effectively.

7. Ministry of Roads and Highways (MRH) / Department of Urban Roads (DUR)

- Provides technical oversight on road crossings and drainage structures affected by pipeline installations.
- Ensures road safety, traffic management, and restoration of road surfaces after construction.

- Collaborates with MMDAs and GWL to maintain road infrastructure integrity during project works.

8. Lands Commission and Land Use and Spatial Planning Authority (LUSPA)

- Provide technical and policy guidance on right-of-way (RoW) management, land acquisition, and resettlement processes.
- Ensure alignment of project routes with approved spatial plans and resolve land-use conflicts.
- Oversee valuation and compensation in cases of unavoidable displacement or asset loss.

9. Ghana Standards Authority (GSA)

- Ensures compliance with environmental and health protection standards, including noise (GS 1222:2018), air quality (GS 1236:2019), and water quality (GS 175-1:2018).
- Certifies materials and equipment used in project implementation for safety and quality.

10. Ministry of Employment and Labour Relations / Factories Inspectorate Department

- Enforces occupational health and safety standards under the Factories, Offices and Shops Act, 1970 (Act 328) and Labour Act, 2003 (Act 651).
- Conducts inspections to ensure compliance with worker welfare, accident prevention, and safe equipment use.
- Supports enforcement of the Workmen's Compensation Law (PNDC 187) for any occupational injuries.

11. Ministry of Health / Public Health Directorate

- Guides project compliance with the Public Health Act, 2012 (Act 851) to prevent communicable diseases and safeguard community health.
- Coordinates health sensitization programs related to waterborne disease prevention.

12. National Road Safety Authority (NRSA)

- Ensures safe traffic management during pipeline construction within road reservations.
- Requires implementation of road signage, barricades, and traffic wardens to prevent accidents.

13. Public Utilities Regulatory Commission (PURC)

- Regulates water tariffs and service standards to ensure affordability and fair pricing.
- Reviews and approves tariff proposals related to the project's operational phase.

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14. Other Stakeholders

- Contractors and Consultants: Ensure implementation of the ESMP, adherence to environmental permit conditions, occupational health and safety standards, and community engagement plans.
- Community Members and Traditional Authorities: Participate in stakeholder consultations, monitor local impacts, and support grievance resolution.
- African Development Bank (AfDB): Provides financial support and technical oversight, ensuring project compliance with AfDB's Integrated Safeguards System (ISS) and Operational Safeguard (OS) policies.

Key Environmental and Social Impacts

A synthesis of the key environmental and social impacts associated with the proposed project is presented in the table below. The significance of the impacts and risks are evaluated using quantitative and qualitative methods.

Table 0-1: Quantitative Assessment of Biophysical Impacts

ACTIVITY	IMPACT	RECEPTOR	SIGN	PRE-MITIGATION QUANTITATIVE ASSESSMENT								POST-MITIGATION QUANTITATIVE ASSESSMENT							
				E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)	E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)
PRE-CONSTRUCTION AND CONSTRUCTION PHASE																			
○ **Consultation/ Notices to the public** ○ **Design of water supply network** ○ **RoW tour** ○ **Transportation and delivery of construction materials and equipment** ○ **Excavation, civil works, pipelines installation and backfilling** ○ **Management of solid waste** ○ **Flashing and disinfection of the new water transmission lines** ○ **Water testing and approval** ○ **Test run and commissioning**	Soil erosion	Land	-	4	2	2	2	8	18	Medium	Yes	2	1	2	2	2	9	Negligible	No
	Air quality degradation	Air/Human	-	4	4	2	2	8	20	Medium	Yes	2	2	1	1	2	8	Negligible	No
	Potential contamination of potable water	Water	-	4	2	4	4	4	18	Medium	Yes	2	2	2	2	2	10	Negligible	No
	Construction and hazardous waste generation & disposal	Land/ Water	-	8	2	4	4	8	26	High	Yes	2	1	4	4	2	13	Low	No
	Loss of flora and fauna	Vegetation	-	4	2	4	4	4	18	Medium	Yes	2	2	2	2	2	10	Negligible	No

Table 0-2: Qualitative Assessment of Socioeconomic Impacts

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
PRE-CONSTRUCTION AND CONSTRUCTION PHASE										
	Road and traffic impacts	-	Moderate	Medium	Moderate	Yes	Moderate	Low	Low	No
○ **Consultation/Notices to the public** ○ **Design of water supply network** ○ **Transit tour** ○ **Transportation and delivery of construction materials and equipment** ○ **Excavation, civil works, pipelines installation and backfilling** ○ **Management of solid waste** ○ **Flashing and disinfection of the new water transmission lines** ○ **Water testing and approval** ○ **Test run and commissioning**	Negative community perception about the proposed project	-	Moderate	Medium	Moderate	Yes	Moderate	Low	Low	No
	Disruption of utility lines	-	Moderate	Medium	Moderate	Yes	Moderate	Low	Low	No
	Public and occupational health and safety impacts	-	Major	Medium	Substantial	Yes	Small	Low	Negligible	No
	Increase in water and sanitary related diseases	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No
	Non-local labour influx into project communities	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No
	Risk of illicit sexual affairs and increased STDs	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No
	Risk of conflicts (violation of local norms, increase in incidence of pilfering)	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
	Employment and income opportunities	+	Moderate	Medium	Moderate	Yes	Moderate	High	Substantial	Yes
OPERATIONAL AND MAINTENANCE PHASE										
○ **Operationalization of the newly installed pipelines** ○ **Routine inspection and maintenance**	Health and safety impacts on pipeline maintenance personnel and community members	-	Moderste	Medium	Moderate	Yes	Small	Low	Negligible	No
	Breakdown and improper functioning of the pipeline facilities leading to scarcity of water	-	Major	Medium	Substantial	Yes	Small	Medium	Low	No
	Reduction in maternal mortality	+	Moderate	Medium	Moderate	Yes	Moderate	High	Substantial	Yes
	Income generation in local communities	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Reduction in the incidence of water related diseases	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Improved sanitation practices	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Improved school attendance	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Increased revenue prospects of GWL	+	Moderate	Medium	Moderate	Yes	Major	High	High	Yes

Consultations

Stakeholder consultations, both institutional and community were undertaken as part of the project planning process and feedback from these engagements were obtained. Summary of concerns bothering on environmental and social issues of the Proposed Project gathered are outlined in table 0-3 below.

Table 0-3: Institutional and Community Stakeholder Consultation Concerns and Feedback Matrix

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Environmental Protection Authority, Head Office	Completed and submitted form EA2 One-on-one interaction	▪ Project classified as one requiring a Preliminiary Environmental Report ▪ Directed for a Preliminiary Environmental Report to be undertaken for each project region to focus the report on the key issues, concerns and decision areas as well as solicit input and guidance from all stakeholders ▪ Environmental monitoring regime should comply with the guidelines provided by the Authority. ▪ Ensure relevant stakeholders are consulted and concerns integrated into the pipeline designs.	▪ The environmental and social study has taken into consideration assessment of bio-physical and socio-economic conditions the project is likely to interact with.
Ghana Water Limited (GWL), Head Office	One-on-one interaction	▪ The project will increase clientele base of the company and afford low-income community members to have access to portable water after successful completion. ▪ Possible negative impacts include physical and economic displacement, dust emission, public health risk, disruption of normal traffic, upsurge in teenage pregnancy inter alia. ▪ Expected positive impacts include increase accessibility, improved hygiene, revenue generation and job creation.	-
Public Utility Regulatory Commission (PURC), Head Office, Accra	One-on-one interaction	▪ All customers of GWL that will be affected by disruptions in the transmission water pipelines during construction should be duly notified and if practical, alternative water supply measures explored to reduce the impact. ▪ Customer complaints such as water rationing, pipe burst, leakages, low pressure and over billing are	▪ Public communication and awareness of potential water supply interruptions is considered. ▪ Implementation of the project will resolve most complaints lodged by customers.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		expected to surface during the operational phase of the project. ▪ Implement pipeline construction in phases so large areas are not affected at once.	
Ghana Highway Authority (GHA), Head Office	Official Letter One-on-one interaction	▪ Adequate notice should be given to road users of potential road closures. Alternative transportation routes should be proposed during such communications. ▪ The Regional Offices of the Authority should be informed when cutting through the highway for further assessment. ▪ Pipeline construction can interfere with utility lines within the RoW. Hence site meeting with utility engineers is required.	▪ Public communication and awareness of potential road closures will be adhered to. ▪ The Authority will be notified when cutting through any highway in any of the project Regions. ▪ Site meetings will be held with engineers of the various utility service providers.
Department of Urban Roads, Head Quarters, Accra	One-on-one interaction	▪ Proposed project should conform to future developments. ▪ Road closures should be well planned to facilitate adequate control of traffic and also make it possible for use of alternative routes ▪ All road crossings should be repaired according to specifications vetted by Department of Urban Roads Engineers. ▪ Furnish the Department at both National and regional level with designs and drawings of the pipeline and should indicate the location of other utility facilities (Example ECG poles) on the RoW. ▪ Affected Metropolitan and Municipal Assemblies should be consulted where roads will be cut.	▪ Site meetings will be held with engineers of the various utility service providers. ▪ Crossings will be repaired according to specifications vetted by Department of Urban Roads Engineers ▪ Metropolitan, Municipal Assemblies and the Department will be officially notified of urban road cuts. ▪ Pipeline designs will be shared when finalised.
Department of Feeder Roads, Accra	One-on-one interaction	▪ Adequate road signs should be installed to inform road users of ongoing project activities along/across roads	▪ Requirements in the Regional Engineering Coordinating Team guidelines will be incorporated in the final pipeline designs.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Ensure compliance to the Regional Engineering Coordinating Team guidelines. ▪ Construction of ducts should be considered where necessary.	▪ Project Contractors will liaise with the Beneficiary Metropolitan and Municipal Assemblies and MTTD of Ghana Police to effectively manage traffic situations.
Electricity Company of Ghana, Head Quarters, Accra	One-on-one interaction	▪ ECG will identify its properties that will be affected and prepare a bill for possible relocation. ECG admonished that relocation can be very expensive. Hence the pipeline routes should avoid ECG poles and buried cables as much as possible. ▪ Project impact includes revenue loss because sometimes they have to go off for relocation or construction works to be done. ▪ Damages to underground cables	▪ ECG will be notified of all site meetings prior to commencement of construction works. ▪ Finalised pipeline designs will be shared with ECG. ▪ The pipelines will avoid ECG poles as much as possible
Telecommunication Companies (MTN, Vodafone, AirtelTigo), Head Offices, Accra	One-on-one interaction	▪ Formal notices should be served to the Telecommunication Company (Telecos) detailing the implementation plan to provide support in identifying areas where underground fibre cables are present to reduce the risk of accidental fibre cuts. ▪ Fibre cuts can lead to income loss and backlash from customers ▪ The project may result in social, economic and financial impacts.	▪ The Telecos at the regional levels will be notified of all site meetings prior to commencement of construction works. ▪ Accidental punch or fibre cuts will be reported immediately.
Motor, Traffic and Transport Department of the Ghana Police Service, Regional Offices	One-on-one interaction	▪ Formal notices should be served to the Service at least 48 hours to the closure of any major road or diversion of traffic for planning and designation of personnel to support in traffic management. ▪ Contractor must ensure to complete the project on schedule	▪ Formal notices will be served to the Service well in advance.
Land Use and Spatial Planning	One-on-one interaction	▪ Pipeline construction should be within the reserved RoW	▪ Finalised pipeline designs and drawings will be shared with the Authority.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Authority, Regional Offices		▪ The Authority need to be furnished with final designs and drawings of the pipelines to enable it integrate into their spatial plans. ▪ The pipeline dimension must meet planning standards defined by the Authority. ▪ Comply with zoning guidelines and planning standards	▪ Pipeline design, drawings and selected RoW will conform to the existing zoning and planning standards.
Ghana National Fire Service, Regional Office, Regional Offices	One-on-one interaction	▪ Compliance with fire prevention measures.	▪ All activities related to the construction shall be in line with the necessary fire prevention requirements.
Water Resources Commission, Accra and Kumasi	One-on-one interaction	▪ Compliance with integrated water management plan ▪ Management of water pollution ▪ Permit required for water abstraction/ water use	▪ Provisions and management measures outlined in the integrated water management plan will be considered. ▪ The ESIA will identify mitigation measures for water pollution and its implementation will be ensured. ▪ The Commission will be notified of any water use required by the project and relevant permit obtained by the Contractors.
Municipal Assemblies	Official Letter In-person interaction	▪ Community risk can stem from unclosed trenches, air and noise pollution during construction. ▪ Accessibility to people's home and shops will be affected. ▪ The community needs the project and should speed up with implementation. ▪ Construction workers should be properly screened of diseases in order not to affect the community members.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Finalised pipeline designs and drawings will be shared with the Metropolitan and Municipal Assemblies through LUSPA and the Regional Engineering Coordinating Teams. ▪ GWL will ensure that relevant permits are obtained by selected pipeline extension Contractors. ▪ The Assemblies will be officially notified when the Contractors are ready to mobilise to site.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Provide the Assembly with final designs and drawings of the pipeline for physical planning purposes. ▪ Construction Contractor must obtain excavation permit from the Assembly prior to commencing work. ▪ Contractor to comply with bye-laws of the Assembly including proper waste management. ▪ The Contractor must notify the Assembly before moving to site.	▪ Compliance with existing bye-laws will be ensured.
Traditional and Opinion Leaders	One-on-one interaction	▪ The main concerns highlighted include the risks of unattended open trenches, air pollution from dust, and noise disturbances from construction activities as the primary worries. ▪ Equitable beneficiary selection	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ GWL has a defined criterion for selecting beneficiary communities which fair and transparent.
COMMUNITY ENGAGEMENTS *See Appendix 3 for detailed reports on the community engagements*			
Ashanti Region			
Traditional and Opinion Leaders at Kumawu 18-08-2025	Key Informant Interview	▪ Ensure water distribution lines are extended throughout the entire community, with no areas left behind. ▪ Incorporate critical safety infrastructure, such as reservoirs, hydrants, and valves, into the project design. ▪ The youth should not be denied employment opportunities	▪ The project will cover the determined pipeline distribution route. Thus, greater part of the community will have access to water. ▪ Management of GWL will consider the incorporation of hydrants and reservoirs since the current scope does not include those works. ▪ GWL will encourage the contractor to prioritise the local content for employment
Kumawu (Men and women/Girls) 18-08-2025 to 20-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Consider phasing the excavation works. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Beneficiary communities accepts the project since it will promote long term health benefits.	▪ GWL will play a supervisory role. Hence adequate signages will be ensured.
Konongo Zongo (Men and women/Girls) 20-08-2025	Focused Group Discussion	▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Consider phasing the excavation works. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water.	▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ GWL will ensure that the contractor carry out the work in phases. ▪ The contractors will submit to GWL an implementable site-specific ESMP.
Konongo Mayanka (Men and women/Girls) 21-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ Risk of harassment for women and girls ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints

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Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Odumase Zongo (Men and women/Girls) 22-08-2025	Focused Group Discussion	▪ Youth should be given priority during job openings. ▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Consider phasing the excavation works. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured.
Traditional and Opinion Leaders at Konongo 21-08-2025	Key Informant Interview	▪ Concerned about potential delay of project execution	▪ AfDB is committed to ensuring adequate funds are made available for the execution of the project as soon as the needed documentations are done
Western Region			
Traditional and Opinion Leaders at Aboadze 19-08-2025	Key Informant Interview	▪ Expectant of project and ready to lend support for successful implementation ▪ Ensure the project is completed on schedule. ▪ Open trenches should be closed timely to avoid the risk of road users falling into them. ▪ Pipe connection cost should be highly subsidized.	▪ Strict adherence to project timelines. Duration for the construction phase is six (6) months and defect notification is also twelve (12) months. Beyond this is not contemplated. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ Owing to the objectives of the project, cost of tapping will be very affordable.
Aboadze (Men and women/Girls) 19-08-2025	Focused Group Discussion	▪ Roads/paths blocked may affect movement within the community ▪ Children's safety near open trenches ▪ Water supply being cut during works	▪ Construction activities will be limited to just the project RoW. ▪ Road blocks will be communicated ahead of time with alternative routes

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Flooding from blocked drains ▪ More dust in the air from digging ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Cutting of trees ▪ Waste/rubbish left after construction	▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ No tree will be cut. Preliminary assessment of the pipeline RoW revealed there are no trees.
Traditional and Opinion Leaders at Shama 20-08-2025	Key Informant Interview	▪ Youth should be given priority during job openings. ▪ Expectant of project and ready to lend support for successful implementation ▪ Ensure the project is completed on schedule. ▪ Open trenches should be closed timely to avoid the risk of road users falling into them.	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Strict adherence to project timelines. Duration for the construction phase is six (6) months and defect notification is also twelve (12) months. Beyond this is not contemplated. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP.
Shama (Men and women) 20-08-2025	Focused Group Discussion	▪ Youth should be given priority during job openings. ▪ Indicated acceptance of the project ▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks.	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured.
Central Region			
Abura Dunkwa (Girls/Women and Men) 23-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ Risk of harassment for women and girls ▪ More dust in the air from digging ▪ Loud noise during the day/night	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts	▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints
Traditional and Opinion Leaders at Abura Dunkwa 22-08-2025	Key Informant Interview	▪ The main social risk identified is the potential for inequitable access to water, which could worsen existing vulnerabilities. The Leaders highlighted that women, children, and the poor are the groups most affected by current water shortages and would be most at risk if the new system is not inclusive.	▪ The project has keen interest in ensuring that the vulnerable people in the communities have equal access to potable water.
Abakrampa (Girls/Women and Men) 22-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Abakrampa 22-08-2025	Key Informant Interview	▪ Expectant of project and ready to lend support for successful implementation ▪ Pipe connection cost should be highly subsidized. ▪ Community health and safety risks.	▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP.
Volta Region			
Kpando Dzoanti and Gadza (Women and Men)	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines	▪ The contractors will submit to GWL an implementable site-specific ESMP.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
20-08-2025		▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Kpando Torkor (Girls/Women and Men) 21-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Dzoanti and Gadza 22-08-2025	Key Informant Interview	▪ Ensure water distribution lines are extended throughout the entire community, with no areas left behind. ▪ Prioritize the connection of the local hospital to the new water system. ▪ Incorporate critical safety infrastructure, such as reservoirs, hydrants, and valves, into the project design.	▪ The project will cover the determined pipeline distribution route. Thus, greater part of the community will have access to water. ▪ Management of GWL will consider the incorporation of hydrants and reservoirs since the current scope does not include those works. ▪ The hospital lies close proximity to the new pipeline extension RoW. Hence, it will be connected.
Kpando Global City (Girls/Women and Men)	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Community members should be given priority during job openings.	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ ESIA is being prepared to ensure project impacts are mitigated.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
22-08-2025		▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Eastern Region			
Akim Swedru (Girls/Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Akim Oda Old Town (Girls/ Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Akim Asuboa	Key Informant Interview	▪ Community members should be given priority during job openings. ▪ Expectant of project and ready to lend support for successful implementation	▪ Contractors will give priority to local content particularly with unskilled labour.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
27-08-2025		▪ The project will promote economic development in the community	
Traditional and Opinion Leaders at Ofoasekuma 28-08-2025	Key Informant Interview	▪ Expectant of project and ready to lend support for successful implementation ▪ Pipe connection cost should be highly subsidized. ▪ Community health and safety risks. ▪ The project will enhance development in the community. ▪ Risk of harassment for women and girls	▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Upper East			
Traditional and Opinion Leaders at Zaare, Tindonmolgo 27-08-2025	Key Informant Interview	▪ Youth should be given priority during job openings. ▪ Expectant of project and ready to lend support for successful implementation ▪ Ensure the project is completed on schedule. ▪ Open trenches should be closed timely to avoid the risk of road users falling into them. ▪ Risk of harassment for women and girls	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Strict adherence to project timelines. Duration for the construction phase is six (6) months and defect notification is also twelve (12) months. Beyond this is not contemplated. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Yikene (Girls/ Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Caution tape and signage should be provided on-site.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Tindonmolgo (Girls/ Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Daporitindongo (Girls/ Women and Men) 28-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Zaare (Girls/ Women and Men) 28-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Bono Region			
Wenchi Town - Boadan (Girls/ Women and Men) 20-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Koase (Girls/ Women and Men)	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems	▪ The contractors will submit to GWL an implementable site-specific ESMP.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
20-08-2025		▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls ▪ Cost for tapping when the project is completed might be high.	▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ Owing to the objectives of the project, cost of tapping will be very affordable.
Wurompo (Girls/ Women and Men) 21-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Wurompo and Koase	Key Informant Interview	▪ Ensure water distribution lines are extended throughout the entire community, with no areas left behind.	▪ The project will cover the determined pipeline distribution route. Thus, greater part of the community will have access to water.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
21-08-2025		▪ Incorporate critical safety infrastructure, such as reservoirs, hydrants, and valves, into the project design.	▪ Management of GWL will consider the incorporation of hydrants and reservoirs since the current scope does not include those works.
Upper West			
Kambali (Girls/ Women and Men) 20-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls ▪ Cost for tapping when the project is completed might be high.	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ Owing to the objectives of the project, cost of tapping will be very affordable.
Piisi/Komfabiala (Girls/ Women and Men) 21 and 22-08-2025	Focused Group Discussion	▪ Cost for tapping when the project is completed might be high. ▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
			▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Kambali 21-08-2025	Key Informant Interview	▪ Implement strict safety protocols during construction, particularly regarding the immediate covering or clear marking of all excavated trenches. ▪ Develop a transparent and equitable process for selecting beneficiaries to prevent accusations of preferential treatment. ▪ Establish subsidized connection fees for vulnerable groups, specifically the aged and people with disabilities. ▪ Continue to engage with traditional and religious leaders alongside the Assembly to ensure community buy-in and smooth coordination. ▪ Poor sanitation in the community	▪ The contractors will submit to GWL an implementable site-specific ESMP. GWL will ensure strict implementation of the ESMP as well as mitigations outlined in the project ESIA. ▪ Owing to the project objectives, the connection fee will be affordable. ▪ Stakeholder consultation is an ongoing process. Hence, GWL will continue to engage all relevant stakeholders throughtout the project lifecycle.

Environmental and Social Management Plan (ESMP)

The Environmental and Social Management Plan (ESMP) outlines mitigation and enhancement measures designed to prevent, minimize, or compensate for the potential adverse environmental and social impacts associated with the Climate Resilient Water System Utilization Project (CRWSUP) during its pre-construction, construction, and operational phases.

The ESMP establishes clear roles, responsibilities, and monitoring frameworks for effective implementation and compliance with Ghanaian environmental regulations, the Environmental Protection Agency (EPA) Act 1124, (2025), and the African Development Bank (AfDB) Integrated Safeguards System (ISS).

It is estimated that the cost for implementing environmental and social mitigation measures for pre-construction and construction phases of the proposed project excluding the works contract price, is Seven Hundred and Forty-nine Thousand and Two Hundred Ghana Cedis. (GHC 749,200.00).

Furthermore, it is estimated that an amount of Two-Hundred and Sixty Hundred and five Hundred Ghana Cedis (GHC260, 500.00) will be required to implement the operational phase annually by GWL.

Table 0-4: Environmental and Social Management Plan

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
PRE-CONSTRUCTION AND CONSTRUCTION PHASE								
Lack of awareness about the project and resettlement issues among the project beneficiary communities	▪Negative perception about the project in the communities ▪Lack of cooperation and political support from key project stakeholders	▪ Create early awareness about the project objectives, scope & resettlement issues among the project beneficiary communities & key stakeholders. ▪ Ensure there is continual stakeholder engagement process throughout the project lifecycle.	▪ Record of preliminary community consultation & meetings held. ▪ Knowledge of communities of the project objectives, scope and activities	Monthly during project preparation activities	Project communities and MMDA	▪GWL LICSD Officer, ▪GWL Safeguards Officers/ Specialists	▪Chief Manager, PPD ▪Chief Manager, LICSD	70, 000.00
Selection of unqualified/ inexperienced pipeline design engineer	▪Substandard pipeline facility design for construction	▪ Procure qualified & experienced pipeline design engineers ▪ Use National & AfDB standard procurement methods for selecting the design engineers	▪Record of procurement/ selection method of pipeline facility design engineer	Weekly	GWL	GWL Procurement Manager	GWL	This cost will be included in the project cost.
Pipeline routes excavation works	▪Soil erosion	▪ Demarcate pipeline routes & limit construction activities to demarcated areas only	▪ Excavation operations taking place within demarcated areas.	Daily	Pipeline routes	Contractor, GWL Safeguards Officer	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Immediate laying of pipelines & backfilling of trenches	▪ Pipeline trenches backfilled					
Use of construction equipment and machinery for site clearance & excavation works	▪Noise & vibration: -Hearing impairment of workers and nearby residents -Vibration and weakening of structures near pipe routes	▪ Provide ear plugs for construction workers & enforce use of the ear plugs ▪ Avoid noise making activities during the night when people have to sleep. ▪ Use manual trenching methods in densely populated areas to minimise vibration ▪ Use manual labour during trenching near foundation of building ▪ Re-instatement of structure damaged by vibration ▪ Ensure job rotation ▪ Implement planned and unplanned maintenance	▪ Construction workers wearing ear plugs ▪ Absence of construction noise during night hours ▪Observable manual trenching near foundations of buildings ▪Maintenance records of construction equipment and machinery	Daily	Pipeline routes	▪Contractors ▪GWL Safeguards Officers ▪LICSD Officers	Supervising Consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		of construction equipment and vehicles						
Site clearance	▪Loss of flora and fauna	▪ The project contractors should avoid loss of mature trees and damage to other vegetation wherever possible. ▪ They are to ensure that clearance of the pipeline RoW is limited to the project's footprints to be developed. ▪ The project contractors should minimize the amount of destruction caused by machinery by promoting non-mechanized methods of construction. ▪ Backfilling should be done early enough to restore habitat of the microorganisms. ▪ No gaming or killing of domestic animals found within the project	▪ Excavation operations taking place within demarcated areas. ▪ Number of complaints received on killing of domestic animals ▪ Approach adopted for digging ▪ Time taken to backfill ▪ Economic trees lost due to site clearance	Daily	Pipeline routes	▪Contractors ▪GWL Safeguards Officers	Supervising Consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		corridor by the contractor's workers.						
Pipeline routes excavation works, site clearance, emissions from construction equipment and movement on untarred roads	▪Air quality degradation	▪ Provide construction workers with nose masks and enforce their use ▪ Ensure routine watering of active construction sites and haulage streets to suppress dust ▪ Cover construction materials in haulage with tarpaulin ▪ Set and enforce speed limit of 20km/hr for construction vehicles and equipment at dusty areas and haulage streets ▪ Ensure compliance with road regulations ▪ Maintain construction equipment regularly to minimize exhaust fume emissions ▪ Ensure to switch-off idling construction	▪ Construction workers wearing nose masks during construction activities ▪ Observable air-borne dust particles and exhaust fumes in the surrounding environment ▪ Haulage trucks carrying sand and chippings covered with tarpaulin environment ▪ Equipment and vehicle maintenance records ▪ Record/evidence of sprinkling water on	Daily	Pipeline routes, construction communities, schools	▪Contractor ▪GWL Safeguards Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		equipment and trucks to minimize exhaust emissions ▪ Constantly monitor air quality levels ▪ Undertake noise generation activities near schools during weekends when schools are not in session and/or after schools have closed for the day.	excavated materials ▪ Compliance with 20km/hr speed limit for construction vehicles within the project communities ▪Number of complaints received from community members due to emissions					
Haulage of construction materials and construction of chambers in urbanised communities	▪ Road and Traffic impacts	▪ The project contractors to collaborate with the relevant institutions such as the road departments of the MMDAs and GWL to ensure that adequate notices are given to road users of potential road closures. ▪ Alternative transportation routes or diversions will be	▪ Number of accidents recorded due to contractor negligence ▪ Traffic or road congestion on site ▪ Visible safety signs	Weekly	Pipeline RoW	▪Contractor ▪MTTD	Supervising Consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		provided during such communications. ▪ Adequate road signs should be installed to inform road users of ongoing project activities along/across roads. ▪ Road closures should be well planned to facilitate adequate control of traffic and make it possible for use of alternative routes. Traffic wardens should be engaged, in collaboration with the MTTD of the Ghana Police Service and respective Assemblies to control traffic when working along/across existing urban roads and highways. ▪ The project contractors to ensure compliance to the Road Reservation	▪ Presence of traffic wardens					

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		Management Manual for Coordination. ▪ All road crossings would be repaired according to specifications vetted by engineers from the Ghana Highway Authority, Department of Urban Roads or Department of Feeder Road. ▪ Transportation of construction materials should be done outside the peak rush hours.						
Site clearance, excavated earth, excess HDPE pipes, refuse from workers (water sachet, cement papers, food packs, etc.), waste electronic water meters	▪Construction and hazardous waste generation and haphazard disposal & littering along the pipe routes	▪ Prepare a Waste Management Plan (WMP) for ensuring proper collection and disposal of all construction wastes. The Management Plan should include collection and disposal of items ▪ Provide dust bins with cover to collect all housekeeping waste	▪ Availability of Waste Management Plan (WMP) ▪ Absence of construction wastes and refuse on pipeline routes, construction communities and inside local drains	Daily	▪Pipeline routes ▪Construction communities ▪Drainage corridors	▪Contractor ▪GWL Safeguards Officers, MMDA ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		(sachet water rubber, food packs) & construction spoils like cement papers, pieces of wood and iron rods etc along the pipeline routes for disposal to the MMDA approved waste disposal site. Immediate collection and disposal of all construction wastes to MMDA approved dump sites on daily basis. ▪ Only waste management service providers registered with the MMDA should be engaged for waste disposal. ▪ Reuse the normal construction waste materials where appropriate (for backfilling of trenches and gullies and pot holes in the communities)	▪ Availability of separate waste collection bins with covers on sites for normal construction waste. ▪ Availability of mobile toilets on sites for the workers ▪ Absence of workers using toilets of community people ▪Volume of soil excavated versus volume of soil reused ▪Records of final disposal of waste water meters.					

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Ensure that construction waste materials are not deposited/disposed in walkways of in the project communities and drains ▪ Provide mobile toilet on site for construction workers. ▪ Ensure proper segregation of waste streams. All waste particularly hazardous waste should be labelled.						
Soils, backflow of contaminated materials, welding debris and others connecting to the potable water system	▪Potential contamination of potable water	▪ Generally, contamination during replacement or laying of new pipelines will be addressed by following construction standards and specifications which include guidance on materials (including pipelines) storage, handling, transport, flushing, swabbing, disinfection, contact	▪Water quality test results	Prior to commissioning	▪Pipelines in project communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		time and water quality testing and field compliance audits. ▪ Also, contamination will be minimized through pipe cleaning (swabbing) and disinfection after replacement and installation of new pipelines as well as water quality testing (visual/turbidity) prior to commissioning. ▪ Sectional valve controls will be used to reduce potentially contaminated water from further transmission.						
Use and repairs of construction equipment and machinery onsite	▪Potential pollution of surface and ground water bodies	▪ The contractor will ensure that erosion and sediment control best management practices are implemented to avoid washing of top and trip soil into nearby rivers and lake.	▪ Absence of oily substances in local streams and drains ▪ Absence of construction waste and spent lubricants spilled around pipeline	Daily	▪Corridors of local drain and streams in project communities ▪Construction sites	▪Supervising Consultant ▪ GWL Safeguards Specialists/ Officer	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Construction equipment, trucks and vehicles are to be maintained properly to avoid fuel and oil leakage. ▪ Do not service, wash or clean construction equipment and trucks inside or near local drains/water bodies in communities to avoid release of oils and lubricants into drainage courses. Only emergency servicing shall be permitted onsite but at a minimum distance of 50metres away from the pipeline and water bodies. ▪ Avoid discharge of municipal and construction wastes such as excess food, plastics, excess pipes, spent lubricants and oils into local streams and drains	routes & construction sites ▪ Record of servicing of construction equipment ▪ Availability of waste bins onsite			▪Contractor's Safeguards Officer. ▪LICSD Officers		

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Repair works on all construction equipment should be carried out at approved centres ▪ Excavated trenches should be backfilled quickly and compacted properly to avoid erosion into nearby water bodies. ▪ Ducts available at bridges where the pipeline is crossing a water body will be used to reduce disturbance or direct interaction with the water body						
Pipeline route excavation activities	▪Disruption of Utility Services	▪ Engage the Utility Service companies (TELCOS, ECG) and Urban Roads Departments of the MMDA in a site meeting to identify their underground service supply lines and road crossings in the proposed pipeline route prior to	▪ Numbers and names of utility service companies & Departments consulted. ▪ Record of consultation meetings and agreements held	Weekly	Pipeline routes	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising Consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		commencement of works; ▪ Carry out relocation /reinstatement of all affected utility lines promptly in collaboration with the relevant utility companies	with the utility companies; ▪ Quantity of utility service supply lines damaged. ▪ Number of utility service supply lines and roads re-instated. ▪ Complaints by utility service companies & Roads Departments.					
All construction activities (handling of construction equipment & materials; falling of construction objects, accidents)	▪Occupational Health and Safety: workers injury and accidents	▪ Prepare a Health & Safety Management Plan for the works & provide education on the Plan to workers. ▪ Provide construction workers with PPEs (reflector jackets, safety boots, nose masks, goggle, hand gloves, etc) and enforce the use of PPE	▪ Availability of Contractor's Health and Safety Plan ▪ Usage of PPEs by construction workers (such as hand gloves, hard hats, reflector jackets, construction boots, etc.)	Daily	▪Project corridor ▪Project communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	i). Cost of PPEs for all construction workers = 101, 500.00 ii) Cost of condoms =20,000.00 iii) Training and

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Provide education and training to workers on risk associated with their job. ▪ Provide toilet facilities on site for the workers, ▪ Provide safety induction trainings for new workers ▪ Provide signage to warn workers of dangers on site ▪ Provide HIV/AIDS education and condoms to workers to prevent the risk of spread of sexually transmitted diseases i.e HIV/AIDs. ▪ Provide First Aid Box on site and stocked with appropriate drugs ▪ Prepare Contractor's code of conduct to address workers and	▪ Record of daily tool box meeting ▪ Existence of accident/incident book and capturing work related incidents ▪ Number of first aid boxes stocked with necessary drugs per number of workers ▪ Availability of signage ▪ Availability of mobile toilet facility on site for workers ▪Health and safety training records					Sensitization: = 50, 500.00 iv) First aid Box and drugs = 17, 200.00

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		public health and safety during the construction. ▪ Use caution tape to fence excavations and provide appropriate signs to warn the public and workers of potential hazards ▪ Avoid manual handling where possible and if it is impossible to avoid, use proper techniques, avoid overweight loads, use appropriate PPE and ensure a firm grip. ▪ Conduct manual handling risk assessment and introduce appropriate measures such as work sequencing, modification of work routine, use of teams and/or equipment to undertake lifting and movement of loads.						

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
▪Lack of awareness creation programmes on health and safety by contractor; ▪Exposure to slip and fall at pipeline trenches and pits on walkways and construction sites; ▪Absence of alternative routes for road users ▪Over speeding by project trucks; ▪Absence of signage to warn the public of	▪Public Health and Safety: -Accidents and injury to community members and the public	▪ Cordon off all active construction areas to prevent entry of unauthorized persons and children and slip, fall, injury and accidents; ▪ Ensure construction materials (i.e. pipes, chippings, sand, wood, cement blocks) and equipment (excavators, haulage trucks, concrete mixers etc.) are not placed on walkways within the project communities ▪ Level disturbed areas at the construction sites/ around trenches to prevent slip and fall, injury and accidents. ▪ Provide temporary wooden planks for people and cars to cross where entrance are dug. ▪ Excavation and pipeline laying should be planned	▪ Active construction areas and trenches cordoned off with caution tapes, barricades, etc. preventing unauthorized people from accessing pipeline trenches, inspection chamber/ manholes. ▪ Presence of signage warning people of dangers at construction site ▪ Availability of alternative access route for the public during construction period ▪ Absence of construction	Daily	▪Pipeline routes and adjacent areas.	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
danger. Absence of cordoning of active construction site.		in a way that once the trenches are excavated, they are laid immediately on the same day and backfilled. ▪ Cordon off all excavated manhole pits under construction with rigid materials in a way that prevent community members and children from having access to the pits to prevent falling into them ▪ Provide temporary alternative routes/access for pedestrians and motorists where their access routes are taken over temporarily by the pipeline works. ▪ Provide road diversion signs and educate the communities ▪ Provide appropriate signage around the pipeline corridors to	materials (i.e. pipes, pieces of wood etc.) deposited on walkways along pipeline routes and also open spaces in the construction communities ▪ Records of health and safety awareness about the project among the adjacent communities ▪ Number of people injured in the communities due to the works ▪ Record of HIV/AIDs awareness education held for adjacent communities					

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		warn people ahead about dangers within the landscape of the construction works ▪ Educate the adjacent community members about the signage and their importance ▪ As much as possible, cover all trenches created to avoid stagnant water breeding mosquitoes to cause malaria ▪ Enforce speed limit 20km/hr for all construction trucks and equipment at the construction sites and project communities to prevent accidents and injury through installation of road signs and temporary speed ramps.	▪Contractor's code of conduct contains measures that prevents abuse of women, child labour & rape					

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
Stagnation of water in trenches and manhole pits	▪Increase in the incidence of water and sanitary related diseases	▪ Ensure to cover all excavated pits to prevent stagnation of water and breeding of mosquitoes, and malaria incidences in the beneficiary communities ▪ Regularly pump out stagnated water in trenches to prevent breeding of mosquitoes ▪ Provide mobile toilets for construction workers to prevent open defecation by construction workers	▪ Complaints from the project beneficiary communities about increasing malaria incidence ▪ Absence of stagnant water in pits at construction sites ▪Records of increased water and sanitation related diseases from community health services (hospitals, clinics etc.)	Weekly	▪Pipeline routes ▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost
Trenching	▪Ponding of adjoining properties	▪ Ensure proper construction planning and drainage management. Trenching works should be scheduled during the dry season as far as practicable to reduce the	▪ Absence of uncovered pipeline trenches and chamber pits along the pipeline routes ▪Absence of carrying out excavation works	Bi-weekly	▪Pipeline routes ▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		likelihood of stormwater interference. ▪ The Contractor should plan activities considering the weather forecast from Meteorological Agency of Ghana. ▪ Before excavation begins, contractors should confirm existing natural drainage channels and ensure that these are not obstructed by construction activities. Temporary diversion channels or culverts could be constructed to maintain the natural flow of runoff where trenches intersect drainage paths. ▪ The contractors will ensure excavated materials are properly stockpiled away from drains, water bodies, and	during heavy down pour ▪Ponding incidence					

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		low-lying areas. On completion of pipe laying, trenches will be promptly backfilled and compacted to restore the natural ground profile and drainage flow. ▪ Regular site inspections are to be conducted, especially after rainfall, to identify and rectify any areas of ponding or erosion.						
Sexual promiscuity among construction workers	▪Increased risk of communicable and sexually transmitted diseases including HIV/AIDs in the communities resulting from Illicit sexual affairs	▪ Sensitise contractors' employees on the dangers associated with illicit sexual affairs e.g. prostitution, rape, sexual exploitation of women, unprotected sex ▪ Undertake HIV/AIDS/STI awareness campaigns among workers and project beneficiary communities especially	▪Availability of contractor's code of conduct that prevents prostitution, rape & illicit sexual behaviour by construction workers ▪Record on training of workers on HIV/AIDs education and the code of conduct	Weekly	▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	i) Contractor employees and community awareness creation on HIV/AIDS /STDs meetings: 2 meetings in each project

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		for young girls and women ▪ Provide condoms to contractor's staff in each community ▪ Undertake community sensitisation on the risks associated with illicit sexual affairs using information vans ▪ Prepare Code of Conduct for contractors that prevents rape, defilement and other illicit sexual affairs as well as Gender Based Violence among construction workers	▪Employees signed on to the Code of conduct as part of their employment conditions ▪Number of contractor's action taken against GBV infractions and related matters ▪Availability of condoms for construction workers ▪Complaints by residents					community = 70, 000.00
Influx of non-local labour into project communities	▪Risk of social Conflicts ▪Including Risk of spread of communicable and sexually	▪ Maximize the use labour from the project beneficiary communities ▪ Establish Grievance Redress Committees which includes local Assembly Members to	▪Number of local community people employed as construction workers as against outsiders ▪Availability of functional Grievance Redress	Weekly	▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Costs related to GRC implementation under the project is presented at the section on

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
	transmitted diseases	resolve project related conflicts ▪ Report crimes such as theft, rape and defilement to the nearest police station directly or through the grievance redress committee. ▪ Contractor should provide code of conduct which prevents disrespect for community norms and values and create awareness on the code among construction workers. ▪ Integrate the code of conduct into the employment conditions of the workers. ▪ Pay adequate salaries for workers to reduce incentive for theft.	Committees at the local community levels including local community opinion leaders and Assembly members ▪Number of contractor's action taken against infractions on community social norms including theft, etc. ▪Availability of Contractor's code of conduct that prevents disrespect for community norms and values, theft and illicit sexual behaviour ▪Record on training of workers on the code of conduct and community social norms and values					GRM in this report.

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Summary dismal of employees who engage in criminal activities.	▪Employees signed on to the Code of conduct as part of their employment conditions ▪Complaints by residents					
▪Influx of non-local labour into subproject communities; ▪Inadequate awareness about Gender-based violence from labor influx among workers and local communities	▪Gender-Based Violence (including sexual harassment of women employees, child abuse, etc.)	▪ Ensure GBV information and awareness on the code of conduct and sanctions therein. ▪ Regular training of labour force on the code of conduct. ▪ Integrate the code into the employment conditions of the workers. In this case, contractor should insert contractual clauses against rape, defilement, sexual harassment, sexual exploitation and child labour. ▪ All workers should sign onto the code during entry into the	▪ Record of GBV awareness raising campaigns ▪ Number of Gender Based Violence Cases reported to Police and Grievance Committee Members or GWL ▪ Number of Gender Based Violence Cases under investigation or prosecutions ▪ Availability of Contractor's code of conduct which has GBV issues	Weekly	▪Project communities ▪MMDA Offices ▪GWL Offices	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project implementation cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		employment on the construction ▪ Commitment policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence; ▪ Providing alternative work schedules or shifts to accommodate the hiring of more local female workers. ▪ Enforcement of the Code of conduct during construction activities.	integrated i.e. sexual harassment of women employees, sexual exploitation, rape ▪ Record of trainings held for workers on gender-based violence prevention and the code of conduct; ▪ Code of conduct integrated into employment conditions of workers; ▪ Number of workers charged with discrimination based on gender considerations. ▪Number of gender-based violence					

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
			complaints by the residents					
Influx of non-local labour into project communities	▪Child labour and school dropout	▪ Ensure that children and minors are not employed directly or indirectly on the project by checking birth certificates of potential employees and/or letting responsible persons'/opinion leaders in their communities e.g. Priests, Civil Servants, Assembly members guarantee the application forms that they are of minimum 16 years old. Workers below 18 years will not be engaged in hazardous work. ▪ The contractor's code of conduct should prevent sexual harassment of women employees, sexual exploitation and child labour.	▪ Number of under aged children found engaged in construction works ▪ Record of construction worker's recruitment process ▪ Number of construction staff sanctioned as a result engagement of child labour on the works ▪Evidence of child labour prohibition in the contractor's code of conduct and integration into the workers condition of employment	Bi-monthly	▪Project communities ▪Pipeline routes	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project implementation cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
Recruitment of labour	▪Risk of labour exploitation	▪ Strict adherence to the Ghana labour laws and regulations to ensure fair wages, safe working conditions, and reasonable working hours ▪ Establish mechanisms for reporting labour abuses anonymously. ▪ Provide workers with proper training and education on their rights and safety measures is vital in ensuring their well-being.	▪ Number of labour abuse cases reported ▪ Wage paid verse working hours ▪ Physical observation of working conditions onsite	Weekly	▪Project labour ▪Project site	▪Contractor ▪GWL Safeguards Officers	Supervising engineer	Project implementation cost
Pressure from unemployed residents in the project communities interested to be employed for the civil works	▪Conflict between contractor and residents over employment opportunities during the works	▪ Give preference to local communities in terms of employment for semi-skilled and unskilled labour including women. ▪ Contractor to hire workers through a systematic process managed by the Human Resource (HR) office and avoid hiring persons	▪ Number of construction employees recruited from the local beneficiary communities ▪Evidence of recruitment process job seekers through HR office of the contractor	Bi-monthly	▪Project beneficiary communities	Contractor	Supervising engineer	Project implementation cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		below the age of 16 years and also discourage spontaneous influx of job seekers and migrant workers. ▪ Engage the appropriate authorities during conflict. Do not be confrontational	rather than recruitment at the gate.					
Total								**329,200.00**
OPERATIONAL AND MAINTENANCE PHASE								
Occupational Health and Safety (Field inspection of pipeline routes by maintenance personnel)	▪Injury and accidents to personnel engaged in monitoring and maintenance on the pipeline routes during the operation phase	▪ Provide pipeline maintenance personnel with PPE (boots, hard hats, reflector jackets) ▪ Engage only experienced personnel for the maintenance works; ▪ Provide the maintenance workers with First Aid Box ▪ Provide signage at pipeline route to signal the presence of personnel at work	▪ Proper usage of PPEs ▪ Number of signage mounted ▪Availability of pipeline maintenance monitoring reports	During pipeline routine inspection and maintenanc e	▪Pipeline routes ▪Pipeline communities	GWL PPD	Chief Manager, PPD Chief Manager, LICSD	GWL pipelines maintenance Budget. Estimated annual budgets are as follows: i) Provision of PPEs for pipeline route inspection

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
								workers = 42,000.00 ii. First Aid Box, drugs and signage = 18,500.00
Pipeline maintenance activities	▪Community health and safety risks (Accident, marginal increase in traffic and knock-downs)	▪ Provide signage to alert community members about presence and dangers posed by maintenance equipment and trucks etc. ▪ Maintenance trucks should not speed over 20km/hr in the communities. ▪ Pipeline inspectors and maintenance personnel should ensure not to block access roads and pathways in the communities with pipeline maintenance materials and trucks/equipment	▪ Availability of signage directing community people away from dangers during pipeline maintenance works ▪ Alternative routes available for people/lorries displaced on their routes by the maintenance works ▪ Trucks/cars moving under 20km/hr in the communities	During pipeline routine inspection and maintenance	▪Pipeline routes ▪Project communities	GWL Engineers	Chief Manager of PPD	Annual GWL pipelines maintenance budget

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
			▪ Incident/ accident records					
Pipelines and manhole leakages and pipeline bursts due to lack of maintenance	▪Risk of flooding of adjacent homes and communities	▪ Conduct regular inspection and monitoring of burst pipes and water leakages ▪ Regular maintenance on pipelines and inspection chambers ▪ Prepare and implement a Facility management plan for the pipeline maintenance	▪ Availability of Pipeline Facility Management Plan guiding the inspection and maintenance of the pipeline facility. ▪ Number of pipeline bursts recorded and repaired. ▪ Pipeline routes inspection and maintenance monitoring reports	During pipeline routine inspection and maintenance	▪Pipeline routes ▪Project communities	GWL Engineers	Chief Manager of Operations	Estimated annual maintenance cost of the pipeline & manholes leakage: =200,000.00
Pipelines and manhole leakages and pipeline bursts due to lack of maintenance	▪Breakdown and improper functioning of pipeline facilities leading to water scarcity	▪ Conduct regular inspection and monitoring of burst pipes and water leakages ▪ Regular maintenance on pipelines and inspection chambers	▪ Availability of Pipeline Facility Management Plan guiding the inspection and maintenance of the pipeline facility.	During pipeline routine inspection and maintenance	▪Pipeline routes ▪Project communities	GWL Engineers	Chief Manager for Operations	Included in the annual maintenance cost estimate above

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Prepare and implement a Facility management plan for the pipeline maintenance ▪ Ensure the public is adequately informed of water scarcity and alternative measures to be implemented	▪ Number of pipeline bursts recorded and repaired. ▪ Pipeline routes inspection and maintenance monitoring reports ▪ Alternative water supplied ▪ Public complaints					
Maintenance activities and availability of water	▪Increase in disposal of sullage (wastewater)	▪ During maintenance activities, wastewater and scum shall be properly contained, collected, and disposed of through approved waste management service providers. ▪ GWL maintenace team will ensure that maintenance sites are equipped with portable containment facilities and that wastewater is	▪ Public complaints on improper wastewater management by GWL maintenance team ▪ Number of sensitizations and trainings conducted for community members on wastewater management	Twice a year	▪Project communities	LICSD Officers Local Assembly	Chief Manager for Operations	Part of LICSD Officers reponsibility

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		not discharged indiscriminately into the environment or open drains. ▪ All maintenance staff should be trained on safe waste handling and disposal practices, including spill prevention and response procedures. ▪ In addition, community education and sensitization are vital to promoting responsible water use and wastewater management. ▪ Beneficiary communities will be trained on how to dispose of household sullage safely, maintain clean surroundings, and prevent illegal discharge of wastewater into storm drains or open spaces.						

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
Total								**260,500.00**

1. INTRODUCTION

Access to safely managed drinking water remains a critical challenge in Ghana and across sub-Saharan Africa. While the World health Organisation (WHO)/ United Nations Children's Fund (UNICEF) Joint Monitoring Programme (JMP) estimates global access to safely managed water at 74%, the figure for sub-Saharan Africa is markedly lower at approximately 30%[1]. In Ghana, access was estimated at 41% in 2020, indicating a significant gap that must be closed to achieve Sustainable Development Goal (SDG) 6.1 by 2030[2]. This deficit is particularly acute in Low-Income Urban Communities (LIUCs), where populations often suffer from intermittent supply, high water costs from informal vendors, and vulnerability to climate-induced water shortages.

The Government of Ghana (GoG), through its Water Sector Strategic Development Plan (WSSDP), aims to provide sustainable water and basic sanitation for all by 2025[3]. In support of this goal, Ghana Water Limited (GWL), with catalytic grant funding from the African Development Bank (AfDB) under the Climate Action Window (CAW), has designed the Climate Resilient Water System Utilization Project (CRWSUP). The CRWSUP is a strategic intervention designed to address critical water security challenges in LIUCs across nine (9) GWL operational regions/ eight (8) administrative regions of Ghana (the proposed project). This project entails pipeline improvement works, expansion of household water connections, and the installation of advanced metering infrastructure to optimize consumption measurement[4]. Its core objective is to leverage under-utilized water production capacity and transition vulnerable populations towards a more reliable and climate-resilient water source, thereby directly enhancing public health, socio-economic development, and urban resilience.

In accordance with the Ghanaian Environmental Protection (Environmental Assessment) Regulations, 2025 (LI 2504) and the AfDB's Integrated Safeguards System (ISS), an Environmental and Social Impact Assessment (ESIA) is a mandatory requirement for project appraisal, permitting, and financing[5].

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[1] World Health Organization & United Nations Children's Fund. (2021). *Progress on household drinking water, sanitation and hygiene 2000-2020: Five years into the SDGs.* JMP.

[2] World Health Organization & United Nations Children's Fund. (2021). *JMP Country File: Ghana.*

[3] Ministry of Sanitation and Water Resources. (2014). *Water Sector Strategic Development Plan (WSSDP).* Government of Ghana. Retrieved from https://www.mswr.gov.gh/projects-publications/publications/wssdp-2012-2025/

[4] Ghana Water Company Limited. (2024). *Technical Design Report for the Climate Resilient Water System Utilization Project.* [Internal Project Document - Not Publicly Available]

[5] Environmental Protection Agency, Ghana. (1999). *Environmental Assessment Regulations, 1999 (L.I. 1652)*

This ESIA presents the findings of a comprehensive assessment conducted to identify, predict, and evaluate the potential environmental impacts and social risks associated with the proposed project. The purpose of this document is to demonstrate to the AfDB and other stakeholders that all environmental and social safeguards have been comprehensively incorporated into the proposed project's design and planning[6]. The ESIA process ensures that potential adverse impacts are avoided, minimized, or mitigated, while positive impacts are enhanced, aligning the project with both national developmental goals and international best practices for sustainable and resilient infrastructure development.

1.1 Project Background

The challenge of urban water access in Ghana is characterized by a paradox of under-utilized treatment capacity alongside significant service deficits in low-income communities. While GWL has made substantial investments in water production, distribution networks in many LIUCs remain underdeveloped or dilapidated. This project is strategically designed to address this imbalance by maximizing existing assets. It involves targeted pipeline improvements and expansion of subsidized household connections in nine (9) selected GWL operational regions/eight (8) administrative regions of Ghana where verified production capacity remains under-utilized[3]. This approach ensures a cost-effective and rapid increase in access to safe, affordable water.

The proposed project is a direct response to intersecting health and climate risks. Inadequate water access forces communities to rely on unsafe sources, increasing vulnerability to waterborne diseases. Concurrently, climate change manifests through erratic rainfall and prolonged droughts, threatening water security and destabilizing urban settings. This project builds resilience by upgrading infrastructure with climate-adapted materials [e.g., high-density polyethylene (HDPE) pipelines, which are known to be drought-resistant] and introducing advanced metering infrastructure that promotes water conservation and reduces non-revenue water[7]. By doing so, it mitigates socio-economic vulnerabilities and reinforces community capacity to withstand climate-related shocks.

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[6] African Development Bank. (2013). *Integrated Safeguards System: Policy Statement and Operational Safeguards.* African Development Bank Group. Retrieved from https://www.afdb.org/en/documents/integrated-safeguards-system-policy-statement-and-operational-safeguards

[7] International Water Association. (2023). *IWA Climate Smart Utilities Recognition Programme: Recognised Practitioners.* International Water Association. Retrieved from https://iwa-network.org/programs/climate-smart-utilities/recognition-programme/

The AfDB's involvement is pivotal, providing not only essential financial resources but also unparalleled technical expertise and a steadfast commitment to climate resilience. The Bank's role, particularly through the catalytic grant funding from the CAW, extends beyond financing to include rigorous policy guidance and the application of regional best practices, ensuring the project aligns with broader continental development objectives[8]. This model has already proven effective; the innovative approach of GWL's Low-Income Consumer Support Unit (LICSU), which forms the core of this project's implementation strategy, received international recognition in the 2023 International Water Association (IWA) Climate Smart Utilities Recognition Programme[9]. This endorsement underscores the proposed project's validity and its potential to serve as a replicable model for other African utilities facing the dual challenges of service expansion and climate adaptation. The proposed project will be implemented in 37 selected clusters encompassing numerous LIUCs, targeting an estimated 19,901 new household connections and potentially benefiting over 236,926 people, making a substantial contribution to improving the quality of life and achieving universal access to potable water goals[10].

1.2 Purpose and Objectives of the ESIA Process

The ESIA process, as defined by the AfDB, is a fundamental risk management and due diligence instrument integral to the Bank's commitment to sustainable development. Its primary function is to ensure that potential environmental and social risks and impacts associated with a proposed project are identified, assessed, and mitigated in a systematic and transparent manner from the earliest stages of the project cycle. This process is not merely a regulatory hurdle but a proactive tool to enhance project sustainability, safeguard local communities and their environments, and protect the Bank's investment. The ESIA process serves to operationalize the AfDB's ISS by providing a structured framework for borrowers and clients to demonstrate how they will comply with the Bank's environmental and social standards. This involves a thorough examination of potential impacts on human populations, including issues of community health and safety, involuntary resettlement, and the protection of vulnerable groups, as well as impacts on the

[8] African Development Bank. (2021). *Climate Change and Green Growth Strategic Framework: 2021-2030*. African Development Bank Group. Retrieved from https://www.afdb.org/en/documents/climate-change-and-green-growth-strategic-framework-2021-2030

[9] Public Sector Global. (2023). *Ghana Water Company receives international recognition for climate-smart initiatives*. Retrieved from https://publicsectormag.net/2023/12/18/ghana-water-company-receives-international-recognition-for-climate-smart-initiatives/

[10] Ghana Water Company Limited. (2024). *Baseline Survey Report for the Climate Resilient Water System Utilization Project*.

natural environment, including biodiversity, pollution, and the sustainable management of living natural resources. A critical purpose is to facilitate informed decision-making by providing the Bank, the borrower, and stakeholders with a comprehensive understanding of the project's implications, thereby enabling the selection of environmentally and socially sound alternatives, designs, and mitigation measures. Furthermore, the process mandates meaningful stakeholder engagement, ensuring that the views of affected people are considered and that a robust grievance mechanism is established to address concerns. Ultimately, the ESIA process is designed to integrate environmental and social considerations into the heart of project planning and implementation, thereby avoiding, minimizing, and mitigating adverse impacts, enhancing positive outcomes, and promoting equitable and sustainable development outcomes across the African continent.

In the context of the proposed project, the ESIA process transcends a mere regulatory formality to become a critical strategic framework for ensuring the proposed project's long-term viability and developmental integrity. The proposed project's core objective—to enhance climate resilience and water access for vulnerable communities—inherently intersects with complex environmental and social dynamics that the ESIA is designed to manage. The purpose of the ESIA is thus to systematically interrogate the proposed project's design and implementation strategy to ensure that its commendable goals are not undermined by unintended adverse consequences.

The ESIA process is fundamental for identifying and mitigating project-specific risks that could otherwise erode its climate resilience objectives. For instance, the construction of pipelines and installation of meters, while beneficial in the long term, will involve excavation, potential disruption to community livelihoods, and temporary increases in local traffic and noise. The ESIA provides the necessary due diligence to anticipate these transient impacts and develop robust mitigation measures, such as carefully planned work schedules and community communication protocols, to prevent them from causing lasting harm or fostering community opposition. Furthermore, the process is essential for assessing the proposed project's interaction with the natural environment, ensuring that construction does not degrade aquatic ecosystems that the pipeline construction might traverse, thereby safeguarding the very water resources the proposed project aims to utilize.

Moreover, the AfDB's emphasis on social safeguards is particularly pertinent for a project targeting low-income and vulnerable urban communities. The ESIA process mandates a

thorough social baseline and continuous stakeholder engagement, which is crucial for understanding the unique vulnerabilities, cultural practices, and economic activities of the beneficiary populations. This ensures that the proposed project's design is not only technically sound but also socially appropriate and equitable. It provides a structured mechanism to identify and address potential risks such as community safety during construction, ensuring equitable access to new connections, and preventing instances of Sexual Exploitation, Abuse, and Harassment (SEAH). By integrating an Environmental and Social Management Plan (ESMP) in the ESIA, the ESIA process institutionalizes accountability, defining clear roles, responsibilities, and budgets for managing these risks throughout the proposed project's lifecycle. Ultimately, for the CRWSUP, the ESIA is an indispensable tool for translating the AfDB's principles of sustainability and inclusive development into tangible on-the-ground practices, thereby protecting both the proposed project's beneficiaries and the Bank's investment, and ensuring that the outcome is truly resilient in both an environmental and social sense.

The specific objectives of ESIA process are as follows:

- Facilitate an understanding of the elements of the existing baseline conditions that are relevant to resources/ receptors that could be potentially impacted by the proposed project;
- Identify the aspects of the project that could potentially result in significant environmental and social impacts on resources/ receptors;
- Document how stakeholders have been engaged during the ESIA process, and how stakeholder feedback has been considered in the ESIA;
- Identify the aspects of the project that need to be managed, and recommend appropriate and justified mitigation and enhancement measures;
- Determine the significance of residual impacts, considering the implementation of mitigation measures;
- Generate plans for the management and monitoring of impacts and risks, including plans for decommissioning of the proposed project;
- Provide a framework that demonstrates sustainable implementation of the proposed project for responsible financing decision-making by the AfDB; and
- Demonstrate GWL's commitment to sustainable development of the proposed project as well as set the framework for the project's ESMP in line with the AfDB's ISS.

1.3 Scope of the ESIA

This ESIA has been prepared to cover the ToR received from GWL for this assignment while ensuring compliance with Ghanaian regulatory requirements and the AfDB's ISS. It identifies the potential environmental impacts and social risks that could be associated with the proposed project activities and its associated facilities including those of an indirect and cumulative nature.

The study area for the ESIA covers all the project beneficiary LIUCs, including where supporting activities will take place. The scope of the impact assessment includes project activities that may affect the existing environment and social setting. Details of the project including location, project overview and components, schedule, project facilities and activities, associated facilities, construction, and operational process, are described in this report.

1.4 Justification for the Project

The imperative for this proposed project is firmly anchored in the confluence of national development priorities, the urgent need for climate adaptation, and the pursuit of international development targets. At the international level, the project directly contributes to achieving Sustainable Development Goal (SDG) 6 (Clean Water and Sanitation), SDG 13 (Climate Action), and SDG 1 (No Poverty) by ensuring reliable and affordable water access for the most vulnerable[11]. Furthermore, it operationalizes the principles of the AfDB's Climate Change and Green Growth Strategic Framework and aligns with the ambitions of the Paris Agreement by promoting low-carbon, climate-resilient infrastructure.[12]

Nationally, the CRWSUP serves as a direct implementation vehicle for key governmental strategic frameworks, operationalizing their objectives into tangible on-the-ground action. The project is intrinsically aligned with the goals of Ghana's National Water Policy (2007), which prioritizes the provision of safe, affordable, and reliable water to all citizens, with specific emphasis on improving equity in access for poor and vulnerable communities. By targeting LIUCs with subsidized connections, the proposed project directly addresses the Policy's core objective of reducing disparities in water service delivery.

Furthermore, the proposed project is a concrete step towards achieving the targets outlined in the Water Sector Strategic Development Plan (WSSDP) 2012-2025. The WSSDP provides the

[11] United Nations. (2015). *Transforming our world: the 2030 Agenda for Sustainable Development*.

[12] African Development Bank. (2021). *Climate Change and Green Growth Strategic Framework: 2021-2030*

blueprint for sector development, explicitly identifying the expansion of piped water supply to underserved urban populations as a critical priority[13]. The proposed project moves beyond planning into execution, utilizing proven methodologies from GWL's LICSU to implement the WSSDP's mandate in a financially sustainable and socially inclusive manner.

Critically, the project's design embodies the principles of Ghana's National Climate Change Policy (NCCP) and its accompanying National Adaptation Plan (NAP). The NCCP calls for the mainstreaming of climate change adaptation into national development efforts, particularly in climate-sensitive sectors like water resources[14]. The proposed project responds to that call by moving beyond traditional infrastructure. The integration of drought-resistant pipeline materials, advanced metering for water conservation, and community-based climate risk management practices are deliberate adaptations to the threats posed by climate variability and change. Therefore, the proposed project intends to not merely supply water; it secures water access against the increasing pressures of a changing climate, making it a demonstrable model of the climate-compatible development envisioned in Ghana's national policies.

The proposed project further addresses a critical market failure—the lack of affordable, formal water connections in LIUCs by using grant funding to subsidize connection costs, thereby unlocking economic potential and improving public health outcomes[15]. The economic justification is robust: improved water access reduces the time and financial burden of water collection, primarily on women and girls, freeing them for educational and income-generating activities. For Small and Medium Enterprises (SMEs), reliable potable water reduces operational costs associated with water treatment, enhancing profitability and driving local economic development.

This proactive approach to building resilience is essential to safeguarding Ghana's water security, protecting developmental gains, and justifying the strategic investment from the AfDB's Climate Action Window. This project is not merely an infrastructure upgrade; it is a necessary adaptation to a changing climate and a critical step towards equitable, sustainable development.

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[13] Ministry of Sanitation and Water Resources. (2014). *Water Sector Strategic Development Plan (WSSDP) 2012-2025*. Government of Ghana. Retrieved from https://www.mswr.gov.gh/projects-publications/publications/wssdp-2012-2025/

[14] Ministry of Environment, Science, Technology and Innovation. (2013). *Ghana National Climate Change Policy*. Government of Ghana. Retrieved from https://www.un-page.org/files/public/ghanaclimatechangepolicy.pdf

[15] Ministry of Water Resources, Works and Housing. (2007). *National Water Policy*. Government of Ghana.

1.5 The ESIA Process/ Methodology

The following technical activities were carried out during this ESIA process.

- Technical desktop research and collection of secondary data;
- Iterative review of documents relevant to the project development;
- Review of applicable local policies, regulations and legislations, international conventions ratified by Ghana including gender, climate change and other related policies as well as relevant international requirements including the AfDB ISS;
- Application of geospatial analysis and generation of thematic maps;
- Collection and analysis of bio-physical and socio-economic baseline information;
- Site verification visits and collection of primary data;
- Consultation with relevant institutional stakeholders and project beneficiary communities to obtain concerns and anticipated impacts/ risks; and
- Multidisciplinary team inputs and quality assurance.

Outputs from these activities have been incorporated in various sections of the report.

2. POLICY, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

2.1 Introduction

This chapter examines relevant policies, legislative and regulatory frameworks, international conventions and requirements, African Development Bank (AfDB) Environmental and Social Safeguards/Operational Policies and how they relate to the proposed project.

2.2 Ghanaian Requirements

International standards require adherence to host country legislation and regulatory requirements when carrying out investment projects. Laws and policies of Ghana relevant to the successful implementation of all components of the proposed project have been considered, and applicable licensing and permitting requirements have also been identified and followed.

2.2.1 Policy Framework

2.2.1.1 Ghana National Environmental Policy (2013)

This Policy aims at a sound management of resources and environment, and the reconciliation between economic planning and environmental resources utilization for sustainable national development. It also seeks among others, to institute an environmental quality control and sustainable development programs by requiring prior Environmental Assessment of all developments, and to take appropriate measures to protect sensitive receptors against harmful effects, nuisance, or destructive practices. Hence, the preparation of this report is in line with the framework of the Ghana National Environmental Policy. The report will ensure that management measures proposed are commensurate with identified environmental and social risks and impacts.

2.2.1.2 National Water Policy, 2007

Consistent with the Ghana Poverty Reduction Strategy (GPRS), the overall goal of the National Water Policy is 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." Issues relating to urban water are captured under Focus Area 2, “Access to Water.” Section 2.3 of the policy document is dedicated to Urban Water. Under this section, low access to potable water in low-income communities was identified as a major challenge.

Among the five-point policy measures or actions outlined to enhance access to urban water, the last point (iv) supports the investments being made under this sub-project, Government of Ghana (2007:14) states, “ensure that an equitable amount of investment resources is dedicated to

extending services to low-income communities." The policy also covers water for food security, financing, water for non-consumptive and other uses, climate variability and change and capacity building and public awareness creation, integrated water resources management, planning and research and international co-operation in the sector thus emphasizing the cross sectorial nature of water resource conservation and supply issues.

The proposed project involves the improvement of urban water supply system and extension of potable water supply to low-income communities in eight (8) administrative regions of Ghana. Therefore, implementation of the proposed project will contribute towards achievement of the Policy as well as a management measure to the challenges identified in the Policy.

2.2.1.3 National Gender Policy, 2015

The goal of Ghana's Gender Policy, "Mainstreaming Gender Equality and Women's Empowerment into Ghana's Development Effort," is to mainstream gender equality concerns into the national development processes by improving the social, legal, civic, political, economic and socio-cultural conditions of the people of Ghana, particularly women, girls, children, the vulnerable and people with special needs; persons with disability and the marginalized. The policy is anchored on five (5) main policy commitments and strategies the namely;

i. Women's Empowerment and Livelihoods;
ii. Gender-Based Violence;
iii. Women's leadership and Accountable Governance;
iv. Economic Opportunities for Women; and
v. Gender Roles and Relations

In addition to outlining the strategies and commitments to achieve the goal of the policy, the Gender Policy also identifies existing challenges and problems militating against gender mainstreaming in Ghana, institutional roles and responsibilities and a framework for resource mobilization, monitoring and evaluation. The implementation processes of the proposed project will be guided by the National Gender Policy which guarantees equitable water access to women and children.

2.2.1.4 National Climate Change Policy (NCCP), 2013

This Policy is Ghana's integrated response to climate change within the context of the nation's sustainable development priorities. It provides strategic direction and co-ordinates issues of climate change in Ghana.

The Policy aims to promote a "climate resilient and climate compatible economy while achieving sustainable development through equitable low carbon economic growth for Ghana". Thus, the execution of the proposed project will lead to efficient use of water resources, which is a climate mitigation initiative, by ensuring that water connections are metered to enable potential customers pay for the exact amounts consumed. The integration of climate resilience features such as advanced metering infrastructure (AMI) for water conservation that results in less energy consumption and resultant emissions reduction, and the use of drought-resistant pipeline materials will further support the attainment of this policy.

2.2.1.5 National Employment Policy, 2012

The National Employment Policy aims to rectify and resolve issues of employment. Its overarching goal is to achieve full employment and to enable all men and women who are available and willing to work, to attain secured and sustainable livelihood through productive and freely chosen employment and work. Key objectives of the Policy, which are relevant to this project, include the stimulation of economic growth and development, eradicating poverty and improving living standards, safeguarding the basic rights and interests of workers, as well as securing improvement in the productivity of the labour force to improve private sector competitiveness. To enhance GWL's contribution to the Policy, high local content will be ensured during recruitment of construction workers especially semi-skilled and unskilled labour. This will improve their livelihoods with positive multiplier effects on the local economy and neighbouring communities.

2.2.1.6 National Health Policy (2007)

The National Health Policy document which aims at creating wealth through health, among other things places emphasis on improvements in personal hygiene, immunization of mothers and children. The National Health Policy also argues that a healthy population could only be achieved if there were improvements in environmental hygiene and sanitation, proper housing and town planning, provision of safe water, safe food and nutrition and encouragement of regular physical exercise.

Provision of safer water and replacement of old pipelines under this project will further enhance hygiene practices and reduce risk of water borne diseases in the project communities.

2.2.1.7 National Land Policy (1999)

The Land Policy of Ghana aims at the judicious use of the nation's land and all its natural resources by all sections of the Ghanaian society in support of various socio-economic activities

undertaken in accordance with sustainable resource management principles and in maintaining viable ecosystems. The specific objectives of this policy include: -

- Ensure that shared water bodies are utilised to the mutual benefit of all stakeholder countries.
- Ensure that every socio-economic activity is consistent with sound land use through sustainable land use planning in the long-term national interest.
- Protect the rights of landowners and their descendants from becoming landless or tenants on their own lands.
- Ensure the payment, within reasonable time, of fair and adequate compensation for land acquired by government from stool, skin or traditional council, clan, family and individuals.
- Instil order and discipline into the land market to curb the incidence of land encroachment, unapproved development schemes, multiple or illegal land sales, land speculation and other forms of land racketeering.

The key aspects of the policy relevant to the project include:

- The use of any land in Ghana for sustainable development, the protection of water bodies and the environment and any other socioeconomic activity will be determined through national land use planning guidelines based on sustainable principles in the long-term national interest.
- All land and water resources development activities must conform to the environmental laws in the country and where Environmental Impact Assessment report is required, this must be provided. Environmental protection within the 'polluter pays' principle will be enforced.

2.2.1.8 National Workplace HIV and AIDS Policy, 2012

This Policy was developed by the National Tripartite Committee and guided by the 1992 Constitution of Ghana as well as other key principles as enshrined in the International Labour Organisation (ILO) Code of Practice (2001) and Recommendation 200 (2010). It provides broad national guidelines to direct the formulation and implementation of workplace HIV and AIDS policies and programmes. The general objectives of the Policy are to provide protection from discrimination in the workplace for people living with HIV and AIDS; prevent the spread of HIV

and AIDS amongst workers; and to provide care, support, and counselling for those infected and affected.

The proposed project is anticipated to employ a few technical and many non-technical workers. The involvement of persons from diverse backgrounds means that social and sexual relationships in the project communities can increase which could result in increase in the spread of the disease either from community members to the construction workers or vice versa, hence the relevance of this Policy to the proposed project. GWL will ensure that Contractors demonstrate their commitment to the fight against HIV and AIDS through the formulation and implementation of a workplace HIV and AIDS policy. The policy should include a commitment to:

- Provide protection from all forms of stigma and discrimination in the workplace to people with real or perceived HIV infection;
- Prevent the spread of HIV amongst workers and their families and dependents; and
- Provide access to treatment, care and support including counselling for persons infected and affected by HIV and AIDS.

2.2.2 Legal and regulatory Framework

There are several laws and regulations concerned with development, health related matters and the environment in general. The major environmental laws related to this project include:

2.2.2.1 1992 Constitution of the Republic of Ghana

Chapter five (5) of the 1992 Constitution of Ghana guarantee the fundamental human rights and freedoms all Ghanaians subject to respect for the rights and freedoms of others and for the public interest. The relevance of this chapter to the proposed projects hinges on the management of encroachers within the pipeline right-of-way. Management of encroachers will comply with Chapter 5 of the Constitution. Provisions related to forced labour are found in the Constitution at article 16(2) which declares that no person shall be required to perform forced labour and the Criminal Code which criminalizes compelling the service of any person using any species of coercion or restraint under section 314.

Also, Chapter six (6) of the 1992 constitution of Ghana, entitled the Directive Principles of State Policy by Article 36(9) makes it the constitutional duty of the State:

- To take appropriate measures to protect and safeguard the national environment for posterity.
- To co-operate with other states and bodies to protect the wider global environment.

- To endeavour to preserve and protect places of historical interest and preserve artefacts

The project requirements are in line with the government objectives of ensuring adequate protection for the larger environment within Ghana. As part of the environmental and social management plan process, broader stakeholder consultations were taken to ensure that adequate information is received to help protect the environment from any potential impacts or risks associated with the project implementation.

2.2.2.2 Environmental Protection Act, 2025 (Act 1124)

Act 1124 gives a mandate to the Environmental Protection Authority (EPA) to ensure compliance of all investments and undertakings with laid down Environmental Assessment (EA) procedures in the planning and execution of development projects, including compliance in respect of existing ones. Section 29 confers enforcement and control powers on the EPA to compel an entity to conduct an environmental assessment of its operations and submit same to the Authority within a specified period as a management tool for effective pollution control. The EPA is responsible for issuing environmental permits for operations such as this project; subject to EPA review.

Part Three of Act 1124 and its attendant Legislative Instrument (LI 2250) provide directions for the control, management, and disposal of hazardous waste, electrical and electronic waste, and for related purposes. This section of the Act operates in two dimensions; one section deals with electrical and electronic waste whilst the other section deals with hazardous waste and other waste and seeks to domesticate the Basel Convention on the Control of Transboundary Movement of Hazardous Waste and their Disposal.

GWL will follow all EPA requirements for the planning and execution of the proposed project including obtaining an environmental permit and complying with the permit conditions. GWL will ensure that all applicable aspects of this Act are complied with during all phases of the project. GWL will also ensure that the requirements of Part Three of Act 1124 are taken into consideration during construction and operation, especially with the management of hazardous wastes covered under the regulation such as waste oil from vehicles as well as construction waste.

Part Three of Act 1124 states that “a person involved in the management of hazardous wastes or other wastes shall take the steps that are necessary to prevent from hazardous wastes and other wastes arising from the management and where pollution occurs, minimise the consequences of the pollution on human health and the environment”. This will involve, among others, maintaining an adequate waste inventory, using appropriate packaging and containers for

transport of hazardous wastes and ensuring proper labelling. GWL's existing waste (including hazardous waste) management protocols will be implemented throughout the lifecycle of the project.

2.2.2.3 Environmental Protection (Environmental Assessment) Regulation 2025 (LI 2504)

The EA process is guided by Legislative Instrument (LI 2504), the principal enactment within the EPA Act 1124. The Regulations require that activities likely to have an adverse effect on the environment must be subject to an appropriate level of environmental assessment prior to the issuance of a permit and before commencement of the activity.

To obtain environmental authorisation, the procedures and regulations must be applied in a systematic manner and be acceptable to the EPA. The purpose of the procedures and regulations contained within LI 2504 is to protect sensitive environments and the interests of potentially affected communities, organisations and individuals. The regulations also ensure that environmental and social impacts are thoroughly assessed, documented and minimised as much as possible, before the EPA will allow the development of the proposed project to commence. Preparation of this report follows LI 2504.

2.2.2.4 Fees and Charges (Miscellaneous Provision) Act 2022, Act 1080

This Instrument provides for matters in relation to fees and charges for document processing and issuance of environmental permits and certificates. Payment of such fees and charges will be made to the EPA as specified in the schedules.

2.2.2.5 Hazardous, Electronic and Other Wastes (Classification), Control and Management Regulations, 2016 (LI 2250)

LI 2250 clearly stipulates the classification of wastes and standard management practices to guide the implementation of Part Three of Act 1124. The requirements of LI 2250 will be relevant for the management of potential hazardous waste streams generated from implementation of the proposed project.

2.2.2.6 Local Governance Act 2016 Act 936

The Local Governance Act 2016 (Act 936) seeks to give a fresh expression to government's commitment to the concept of decentralization. It is a practical demonstration of a bold attempt to bring the process of governance to the doorstep of the populace at the regional and more importantly, the district level. The Act establishes metropolitan, municipal and district assemblies as the highest decision-making authority at the local level with powers to enforce zoning and building regulation as well as responsibility of waste management. The selected

Contractors will comply with all relevant by-laws of the MMDA within the catchment area of the project.

2.2.2.7 Land Use and Spatial Planning Act 2016, Act 925

The Act consolidates the laws on land use and spatial planning. It provides sustainable development of land and human settlements through a decentralized planning system and ensures judicious use of land to improve the quality of life, promote health and safety in respect of human settlements. This gives a clearer direction to ensure compliance and enforcement of development regulations by the Ghanaian society. It will also contribute to a more sustainable and well-functioning land administration system that is fair, efficient, cost effective and decentralized and will enhance land tenure security in the country.

The proposed project will be implemented on routes already vested and zoned by the Lands Commission. No land use conflicts are therefore expected to arise due to the proposed project implementation.

Also, this Act establishes the Land Use and Spatial Planning Authority (LUSPA) who is a major stakeholder with respect to the proposed project. The Authority has been engaged from the pipeline design stage till now. Should there be any conflict with other road reservation users, the Authority will be engaged.

2.2.2.8 Lands (Statutory Wayleaves) Act – 1963 (Act 186)

This is an Act of Parliament to provide for entry on land for the construction, installation and maintenance works of public utility, and for the creation of rights of way and any other similar rights in respect of those works for related matters. Other relevant land laws that may influence aspects of project implementation are:

- The State Lands Acts, 1962 (Act 125) which gives authority for land to be acquired;
- The State Lands Regulations 1962 (LI 230); and
- The State Lands (Amendment) (No.2) Regulations 1963 (LI 285).

2.2.2.9 The State Lands Act 1963, Act 125

The Act 125 vests the authority to acquire land for the public interest in the President of the Republic. It also gives responsibility for registering a claim on the affected person or group of persons and provides details of the procedure to do this. The State Lands Act, 1962 provides some details to be taken into consideration when calculating compensation such as definitions for (1) cost of disturbance, (2) market value, (3) replacement value, and so on.

2.2.2.10 Lands Commission Act 2008 (Act 767)

This Act provides for the management of public lands and other lands and for related matters. The Commission manages public lands and any other lands vested in the President by the Constitution or by any other enactment or the lands vested in the Commission. The Act advises the Government, local authorities and traditional authorities on the policy framework for the development of particular areas to ensure that the development of individual pieces of land is coordinated with the relevant development plan for the area concerned.

The Minister may, with the approval of the President, give general directions in writing to the Commission on matters of policy in respect of the management of public lands. The Commission has the following divisions:

- Survey and Mapping;
- Land Registration;
- Land Valuation; and
- Public and Vested Lands Management.

The Public and Vested Lands Management Division of the Lands Commission is the principal land management organization of the Government. All public lands are vested in the President of Ghana and held in trust by him for the people of Ghana.

The proposed project will be implemented within the Right of Way (RoW) or lands already designated for the transmission of water. Technical advisory on water transmission RoW and management of encroachers from the Commission will be considered and incorporated in this environmental and social management plan.

2.2.2.11 Ghana Standard Authority Act, 1973 (NRCD 173)

The Ghana Standards Authority (GSA), formerly Ghana Standards Board, is the agency responsible for the maintenance of acceptable standards for products and services, and sound management practices in industries and public institutions. All equipment and materials procured by GWL and the Contractors for implementation of the proposed project will be checked for compliance to GSA requirements, where necessary.

The Authority has also established the Ghana Standards for Environment and Health Protection (see Section 2.1.1.2) that will guide the determination of thresholds and test methods for monitoring the environmental performance of the project in areas of noise, emissions, and dust generation.

2.2.2.12 Factories, Offices and Shops Act, 1970 (Act 328)

This Act enjoins all companies to register with the Department of Factories Inspectorate to facilitate inspection of the project site by the Chief Inspector/Inspector of Factories. This is to ensure compliance with provisions of the Act relating to health, safety and welfare of workers as well as protection from dangers posed to employees in the working environment amongst others. Act 328 runs concurrently with the provisions of the Labour Act, 2003 (Act 651) on matters relating to health, safety, notification of accidents and hours of work. This Act is relevant to the proposed project since the project activities will result in occupational and community health and safety issues. In this way, health and safety provisions of the Act will have to be ensured at all phases of the project implementation. Also, only lifting equipment inspected and sanctioned by the Inspectorate will be used during construction.

2.2.2.13 Labour Act 2003 (Act 651)

This act runs concurrently with the provisions of the Factories, Offices and Shops Act, 1970 (Act 328) on matters relating to industrial relations and wellbeing of workers at workplaces. The Act prescribes the working hours and working conditions (including health and safety provisions) and determination for overtime and holiday compensations for workers. This Law relates to the proposed project since people will be engaged for the actual implementation. Requirements of the law will be complied with at all levels of the proposed project.

2.2.2.14 Workmen's Compensation Law 1987 (PNDC 187)

This Act seeks to address the necessary compensations needed to be awarded to workers for personal injuries arising out of and in the course of their employment. Possible compensation issues could arise in the course of the project implementation should any employee die or sustain an injury that is liable for compensation. Hence this Act will be very instrumental and relevant in managing injuries arising out of proposed construction activities.

2.2.2.15 Lands Act, 2020 (Act 1036)

AN ACT is to revise, harmonise and consolidate the laws on land to ensure sustainable land administration and management, effective and efficient land tenure and to provide for related matters.

Under Section 29, the Lands Commission may, in the performance of the functions of the Commission under this Act and any other enactment, may cause any land to be valued especially for compensation under compulsory acquisition. Also, Section 265 highlights resettlement of displaced inhabitants. It states that (1) Where compulsory acquisition or occupation of land under

this Act involves displacement of the inhabitants, the Lands Commission or any other person directed by the President shall resettle the displaced inhabitants on suitable alternative land with due regard for their economic well-being and the social and cultural values of the inhabitants.

Though the proposed project will be implemented on reserved utility corridor but where compulsory acquisition becomes a necessity due to prevailing conditions, provisions in this Act will serve as a guide and Lands Commission will be notified accordingly.

2.2.2.16 National Road Safety Act, 2019 (Act 993)

The Act establishes the National Road Safety Authority and mandates it to develop and promote road safety in the country, to co-ordinate and regulate activities, procedures and standards related to road safety and to provide for related matters. The object of the Authority is to reduce the incidence of road traffic crashes, fatalities and injuries. Thus, the Authority requires adequate safety measures including visibly displaying road safety signages, use of visible barricades (where possible), traffic wardens to be implemented during any developmental activity that takes place either on the road networks or road reservations.

Since the pipelines will run along and cut through most road networks in the selected communities, there is a potential for road accidents and injuries hence compliance with directives of the Authority is very key. Consequently, development and implementation of road safety measures for the project will take into consideration the directives of the Authority.

2.2.2.17 Public Health Act, 2012 (Act 851)

This Act was enacted in 2012 to consolidate the laws relating to public health that seek to prevent disease; promote, safeguard, maintain and protect the health of humans and to provide for other associated matters. Potential risks related to the spread of communicable diseases, environmental sanitation as well as food safety management for workers will be guided by the requirements of Act 851.

2.2.2.18 Public Utilities Regulatory Commission Act 1997 (Act 538)

The Public Utilities Regulatory Commission Act 1997 (Act 538) provides for the establishment of the Public Utilities Regulatory Commission to regulate and oversee the provision of utility services by public utilities to consumers and to provide for related matters. The Commission examines and approves rates chargeable for provision of utility services. Consistent with this function of the Commission, Management of Ghana Water Limited intends to engage the Commission about the proposed project.

2.2.3 Relevant National Standards

2.2.3.1 Ghana Standards for Environment and Health Protection

These Standards were formulated by the Ghana Standards Authority (GSA) in collaboration with the EPA of Ghana and other stakeholders to set acceptable thresholds and test methods for measuring the quality of some environmental parameters. These include the Ghana Standards for Environment and Health Protection Requirements for:

- Ghana Standards for Environment and Health Protection: Ambient Air Quality and Point Source/Stack Emissions (GS 1236:2019);
- Ghana Standards for Environment and Health Protection: Ambient Noise Control (GS 1222:2018);
- Ghana Standards for Environment and Health Protection: Motor Vehicle Emissions (GS 1219:2018); and
- Ghana Standards for Environment and Health Protection: GSA Water Quality-Specification for Drinking Water (GS 175-1:2018).

Section 5.4 of GS 1222:2018 requires that an entity responsible for a construction site shall:

- Ensure that maximum noise levels near the construction site do not exceed:
  - 75 dB (A) Leq (5 mins) in an industrial area; and
  - 66 dB (A) Leq (5 mins) in other areas.

These standards provide guidance and requirements for the following components of the project:

- Dust emissions from the pipeline excavation/construction activities as well as truck movements;
- Emissions from vehicles/trucks;
- Noise generation from all operations of the project; and
- Quality of potable water for workers.

Selected Contractors and GWL will ensure compliance with the requirements of the Ghana Standards for Environment and Health Protection during construction and operation of the proposed project respectively. No effluents are expected from the proposed project.

2.2.4 Institutional Framework

2.2.4.1 Ministry of Works, Housing and Water Resources (MWHWR)

The Ministry of Works, Housing and Water Resources (MWHWR) has responsibility for overall policy formulation, planning, coordination and harmonization, monitoring, and evaluation of programs for water and sanitation. The Ministry, which is the implementing Ministry of the GWL Climate Resilient Water System Utilization project, has a vision of having people living in Ghana to have easy access to affordable, safe, and sustained drinking water and sanitation services, and a clean/hygienic environment by the year 2025. The MWHWR has a mandate to provide safe drinking water, and sanitation services; ensure proper and timely collection and management of solid and liquid wastes; to set service standards and implement mechanisms for ensuring compliance and quality assurance; coordinate and harmonize strategies, technologies and approaches to ensure cost-effective delivery of WASH services; and leverage market mechanisms to create jobs to all segments of people living in Ghana through WASH service delivery.

The Ministry is committed to advancing the President's objectives for water and sanitation by creating and exercising an organization that is unprecedented and exemplary in its culture of innovation, its reliance on integrated strategies, its collaboration with external stakeholders, and its creation of a viable economy through building new markets and partners.

2.2.4.2 Ghana Water Limited (GWL)

Ghana Water Ltd. (GWL) is a utility company, fully owned by the Government of Ghana, and is responsible for potable water supply to all urban communities in the country. The GWL, which is an Agency under the Ministry of Works, Housing and Water Resources (MWHWR), was established on 1st July 1999 following the conversion of Ghana Water and Sewerage Corporation into a state-owned limited liability company under the Statutory Corporations (Conversion to Companies) Act 461 of 1993 as amended by LI 1648. The parent Ministry (MWHWR) is responsible for formulating water supply policy and overseeing the operations of the GWL, including sourcing funding from external support agencies for the operations of the Company. Under the general direction of the Ministry, GWL is governed by a Board of Directors which has overall responsibility for the setting of sector policies and control of corporate programmes.

Currently, the company manages and operates eighty-four (84) water systems comprising sixty-one (61) surface water systems and twenty-three (23) ground water systems. These systems serve about 14 million people nation-wide. The company operates in 15 regional offices with 103 district offices.

Additionally, GWL average production is 950,995 m3/day (209 million gallons/day) with a demand of 1,129,361 m3/day (248 million gallons/day). The urban access is 84.2% which serves 1,008,301 customers of which 89% are metered.

Among the core functions of the Company are abstraction, treatment and supply of potable water to urban communities; planning and development of water supply systems in urban communities; conduct of research and engineering surveys relative to water and related subjects; design, construction, rehabilitation and expansion of existing as well as new water supply infrastructure; and provision of quality service delivery to consumers in respect of quantity and quality of water supplied; periodic submission of proposals to the Public Utility Regulatory Commission for tariff review; management of applications for new service connections; issuance of water bills to customers; and revenue collection from customers.

The GWL is the implementing agency responsible for the implementation of the Ministry of Works, Housing, and Water Resources (MWHWR) Project.

2.2.4.3 Ministry of Finance

The Ministry of Finance was established with responsibility for ensuring effective and efficient macroeconomic and financial management of Ghana's economy. With the goal to ensure efficient management of the economy towards the attainment of upper middle-income status and poverty reduction, the key functions of the Ministry are:

i. Support the development of an efficient financial sector that supports structural transformation of the economy, promotes financial inclusion and is well integrated into the global financial system;
ii. formulate, implement, monitor and evaluate macroeconomic, fiscal and financial policies for sustainable development;
iii. ensure effective mobilization of domestic and eternal resources;
iv. ensure efficient and effective allocation and prudent management and utilization of resources;
v. establish and disseminate performance – guidelines and deploy efficient financial management information systems;
vi. ensure commitment to transparency, probity and accountability in the management and utilization of financial resources; and
vii. ensure sustainable debt levels.

The Ministry is the Government agency that manages the central government's budget. The Ministry has the overall oversight responsibility for the financial management of the GWL Climate Resilient Water System Utilization project finances.

2.2.4.4 Ministry of Local Government and Rural Development

The Ministry of Local Government and Rural Development (MLGRD) exists to promote the establishment and development of a vibrant and well-resourced decentralized system of local government for the people of Ghana to ensure good governance and balanced rural based development, and responsibility for sanitation and hygiene at local levels.

2.2.4.5 Metropolitan, Municipal and District Assemblies

As part of the political and administrative authorities of the Metropolitan Assemblies, Municipal Assemblies and District Assemblies, the primary functions of the Assemblies are responsibility of overall development of their areas of jurisdictions.

The assemblies are mandated to:

- formulate and execute plans, programmes and strategies for the effective mobilization of resources necessary for the overall development of the Metropolis, Municipality and District;
- promote and support productive activity and social development in district and remove any obstacles to initiative and development;
- initiate programmes for the development of basic infrastructure and provide municipal works and services in the district;
- be responsible for development, improvement and management of human settlements and the environment in the district; and
- initiate, sponsor or carry out studies that may be necessary for the discharge of any of their duties.

2.2.4.6 Environmental Protection Agency (EPA)

The Environmental Protection Agency is the body responsible for regulating the environment and ensuring the implementation of government policies on the environment. The functions of the Agency include:

- ensuring compliance with any laid down environmental impact assessment procedures in the planning and execution of development projects, including compliance in the respect of existing projects;
- promoting effective planning in the management of the environment; and

- imposing and collecting environmental protection levies in accordance with the Environmental Protection (Environmental Assessment) Regulations 2025 (LI 2504) and in liaison and co-operation with government agencies, District Assemblies and other bodies and institutions to control pollution and generally protect the environment.

2.2.4.7 Ministry of Roads and Highways

The Ministry of Roads and Highways is a government establishment responsible for policy formulation, monitoring and evaluation with regard to the transport sector which consists of the following:

- Road Infrastructure sub-sector.
- Road Transport Services and Safety sub-sector;
- Road Transport Training;
- Road Maintenance Financing.

The Department relevant to the GWL Climate Resilient Water System Utilization project that operate under the direct ambit of the Ministry in respect to road and drains infrastructure is Department of Urban Roads (DUR). While DUR funds, procures and supervises the construction and maintenance of roads and drains in the MMDA, these responsibilities are gradually devolved to the Works Department within the Metropolitan and Municipal Assemblies. The proposed water supply distribution network construction may cut through roads and drainage structures which are under the mandate of the DUR in the project beneficiary MMDA.

2.3 International Policy and Regulatory Requirements

This section addresses global policies and regulations that may influence the execution of this project. There is a higher likelihood that this climate-resilient water system utilization project will attract donors from many different organizations that will require compliance with various international policies and standards. The project implementation will be guided by the following international policies and regulatory frameworks.

2.3.1 African Development Bank Safeguards Policies

The African Development Bank (AfDB) has ten (10) Environmental and Social (E&S) Operational Safeguard (OS) policies, which are used to guide the safe development of projects supported by the Bank. The Policies and applicability status are outlined in the table below;

Table 2-1: AfDB Operational Safguard Policies and their Applicability to the Proposed Project

Operational Safeguard (OS)	Policy Objective and Description	Applicability	Justification/Remarks
OS 1: Assessment and Management of Environmental and Social Risks and Impacts.	Ensures environmental and social sustainability is integrated into project design and implementation through proper impact assessment, mitigation, and monitoring.	Applicable	The project involves pipeline extensions, excavation, and civil works that may cause localized environmental and social impacts such as noise, dust, erosion, and waste generation inter alia. Based on an assessment done by the AfDB and considering the nature of the project, this project has been categorised as one needing an Environmental and Social Impact Assessment (ESIA). Hence this report is prepared in fulfilment of that.
OS 2: Labour and Working Conditions	Protects the rights of workers, ensures safe working conditions, prevents child and forced labour, and promotes occupational and community health and safety.	Applicable	The project will employ both skilled and unskilled labour. Risks include workplace accidents, poor waste handling, and potential labour exploitation. The project includes provisions for OHS training, PPE use, code of conduct enforcement, and adherence to national labour laws.
OS 3: Resource Efficiency and Pollution Prevention and Management	Promotes sustainable resource use, pollution control, and minimization of GHG emissions during project activities.	Applicable	Construction activities may generate dust, noise, and construction waste. The project promotes efficient use of materials, adopts environmentally sound waste management, and uses energy-efficient equipment to minimize emissions.
OS 4: Community Health, Safety, and Security	To anticipate and avoid adverse impacts on the health and safety of project-affected communities during the project or operation lifecycle from both routine and non-routine circumstances.	Applicable	Health and safety impacts such as slip, trip and fall into open excavations, human-vehicular collision and water pollution during construction, inter alia are anticipated. Therefore, this OS is applicable. Issues of community health and safety have been addressed under chapter 6 and 7 of this report.
OS 5: Land Acquisition, Restrictions on Access to Land and Land Use, and Involuntary Resettlement	This OS addresses the adverse impacts on persons and communities as a result of Project related land acquisition and restrictions on land use.	Not Applicable	Under this project, no new land will be acquired. Existing already earmarked public utility reservation corridor for utility services will be used for the pipeline construction works. Assessment of the RoW also revealed that there will be no resettlement issues.

OS 6: Habitat and Biodiversity Conservation, and Sustainable Management of Living Natural Resources	It aims to protect and conserve biodiversity, maintain the benefits from ecosystem services, and promote the sustainable management of living natural resources through the adoption of practices that integrate conservation needs and development priorities.	Applicable	Generally, the proposed project RoW is not a biologically sensitive environment, no sensitive habitat and endemic species have been identified in the area. However, the construction works will make use of natural resources such as sand, gravel and water for the chamber construction. Such resources will be utilised sustainabily.
OS 7: Vulnerable Groups	Protects the rights of women, children, the elderly, persons with disabilities, and other marginalized groups	Applicable	During the stakeholder engagement, vulnerable people within the project beneficiary communities were identified and consulted. The project planning and design took into consideration impacts of the project on such people. See in the attachment, engagement records of vulnerable people (women).
OS 8: Cultural Heritage	Preserves physical and intangible cultural resources and ensures respectful handling of cultural property	Partially applicable	Though the RoW of the pipeline routes do not traverse any designated active archaeological site, requirements of this Policy will be considered and a Chance Find Procedure shall be developed by the Contractor for implementation during Project execution to guide actions in the unlikely event of a discovery of any archaeological resource.
OS 9: Financial Intermediaries	To promote good E&S management practices in the subprojects that the FI finances	Applicable	This ESIA has been prepared to ensure that all key environmental and social risks and impacts of the proposed project are identified and mitigated adequately.
OS 10: Stakeholder Engagement and Information Disclosure	Requires transparent consultation, participation, and grievance mechanisms	Applicable	Stakeholder engagement has been conducted in a structured manner with relevant stakeholders. These are detailed in Section 5.0 of this Report. This report will be disclosed publicly at various levels.

2.3.2 IFC Performance Standards

The IFC Policy on Environmental and Social Sustainability defines the IFC's commitments to Environmental and Social (E&S) sustainability. The requirements for Projects in managing environmental and social risks are defined in the IFC Performance Standards (PS).

The Performance Standards may also be applied by other financial institutions electing to apply them to projects in emerging markets. The Project applies the standards as a policy requirement of the funding agency. Though this project is not sponsored by IFC, the eight (8) Performance Standards below will serve as a guide in implementing the proposed project. They are:

- ✓ Performance Standard 1: Assessment and Management of Environmental and Social Risks and Impacts.
- ✓ Performance Standard 2: Labour and Working Conditions.
- ✓ Performance Standard 3: Resource Efficiency and Pollution Prevention.
- ✓ Performance Standard 4: Community Health, Safety, and Security.
- ✓ Performance Standard 5: Land Acquisition and Involuntary Resettlement.
- ✓ Performance Standard 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources.
- ✓ Performance Standard 7: Indigenous Peoples; and
- ✓ Performance Standard 8: Cultural Heritage.

There are no Indigenous People in the Project Area of Influence, hence PS 7 does not apply to the Project. The ESIA study will therefore cover all the remaining seven (7) aspects of the PS. The proposed project will incorporate relevant aspects of the PS to ensure safeguarding the environment and the PAPs as indicated supra.

2.3.3 OECD Recommendations (Common Approaches)

The OECD Common Approaches are a series of recommendations for addressing environmental and social aspects and are applied by export credit agencies (ECAs) operating in OECD countries. The OECD Common Approaches promote good practices, application of international standards, and are designed to contribute to sustainable development through the consideration of international environmental, climate change, social, and human rights policies, and commitments under relevant international agreements and conventions. The proposed project will impact the biophysical environment, socio-cultural environment, and livelihood. However,

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the risks associated with this kind of infrastructure are potentially limited adverse environmental or social risks and/or impacts that are few in number, generally site-specific, largely reversible, and readily addressed through mitigation measures. Therefore, the project is assigned to environmental Category B (Moderate Risk) under the World Bank International Finance Corporation (IFC) Standards and Organisation for Economic Co-operation and Development (OECD) common approaches on the Environment and Officially Supported Export Credits.

2.3.4 Equator Principles IV

The Equator Principles (EPs) are a voluntary set of standards for determining, assessing, and managing social and environmental risk in project financing. The EPs are considered the financial industry's 'gold standard' for sustainable project finance. EP Financial Institutions (EPFIs) will only provide loans to projects that comply with Principles 1-10, shown below:

Table 2-2: Equator Principles

Equator Principles IV (2020)
EP 1: Review and Categorisation - Requires that a project proposed for financing be categorised based on the magnitude of potential impacts and risks in accordance with the E&S screening criteria of the IFC
EP 2: Environmental and Social Assessment - Requires that for Category A or B projects, the relevant E&S impacts and risks be addressed through an E&S Assessment process, to include assessments of potential adverse Human Rights impacts and climate change risks as part of the ESIA or other assessment
EP 3: Applicable Environmental and Social Standards - Requires projects in non-designated countries, such as Ghana, to be in compliance with the IFC Performance Standards and the World Bank EHS Guidelines
EP 4: Environment and Social Management System and Equator Principles Action Plan - Requires that all Category A and Category B projects to develop and maintain an ESMS as well as prepare an MP to address the findings of the Assessment. This will describe and prioritise actions necessary to manage the impacts and risks identified by the Assessment
EP 5: Stakeholder Engagement - Requires that all Category A and Category B projects to demonstrate effective Stakeholder Engagement as an ongoing process in a structured and culturally appropriate manner with Affected Communities and, where relevant, Other Stakeholders
EP 6: Grievance Mechanism - Requires that all Category A and, as appropriate, Category B projects to establish a grievance mechanism as a component of their management system
EP 7: Independent Review - Requires that for all Category A projects and, as appropriate, Category B projects, an Independent Environmental and Social Consultant, must review the management plans, ESMS and Stakeholder Engagement process and assess compliance with Equator Principles
EP 8: Covenants - Requires that for all Category A and Category B projects the borrower ensures that all financial documentation will be compliant with the set covenant agreement. If compliance is not achieved, the EPFI will work with the borrower on remedial actions to bring the Project back into compliance. If unsuccessful, the EPFI reserves the right to exercise remedies, including calling an event of default, as considered appropriate
EP 9: Independent Monitoring and Reporting - Requires that for all Category A projects and, as appropriate, Category B projects, an independent expert will verify all monitoring and reporting information that is shared with EPFIs
EP 10: Reporting and Transparency - Requires that each EPFI commits to report publicly at least annually about its Equator Principles implementation processes and experience

2.4 International Conventions

International conventions ratified by Ghana on Environment and Sustainability, Climate, and Labour are presented in the table below:

Table 2-3: International conventions

No	Convention	Ratification Date	Applicability to Proposed Project
1.	**United Nations Convention on Biological Diversity** The three goals of the CBD are to promote the conservation of biodiversity, the sustainable use of its components, and the fair and equitable sharing of benefits arising out of the utilization of genetic resources. The convention calls for the adoption of national strategies, plans, and programmes for the conservation and sustainable use of biological diversity into their relevant sectoral and cross-sectional plans, programmes, and policies. One of the tools that is prescribed for the management of biodiversity is an environmental assessment. Article 14 of the convention deals with the impact assessment and minimization of adverse impacts.	29 Aug 1994	Ghana is a signatory to these international conventions, which are also relevant to the proposed project. The proposed project has potential impacts on biodiversity and will have to implement appropriate climate change adaptation measures. The ESIA identifies critical habitats and endangered species in the project area and recommends appropriate mitigation measures for their protection and conservation.
2.	**Convention on International Trade in Endangered Species of Wild Fauna and Flora (CITES)** The objective of the Convention is to conserve wildlife and prevent international trade from threatening species with extinction.	14 Nov 1975	The ESIA identifies species of conservation concern in the project area and recommends appropriate mitigation measures for their protection and conservation
3.	**United Nations Framework Convention on Climate Change (UNFCCC)** The UNFCCC provides the basis for global action to protect the climate system for present and future generations. The ultimate objective of this Convention and any related legal instruments that the Conference of the Parties may adopt is to achieve, in accordance with the relevant provisions of the Convention, stabilization of greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system. Such a level should be achieved within a time frame sufficient to allow ecosystems to adapt naturally to climate change, to ensure that food production is not threatened, and to enable economic	06 Sept 1995	Emissions, including equipment and vehicular fumes, especially at the construction phase, will be checked to minimize their impact on the climate.

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No	Convention	Ratification Date	Applicability to Proposed Project
	development to proceed in a sustainable manner.		
4.	**United Nations Convention to Combat Desertification in those Countries Experiencing Serious Drought and/or Desertification, Particularly in Africa (UNCCD)** The UNCCD aims at combating desertification and mitigating the effects of drought through national action programs that incorporate long-term strategies supported by international cooperation and partnership arrangements. It is based on the principles of participation, partnership, and decentralization—the backbone of good governance and sustainable development.	27 Dec 1996	The project implementation will lead to some loss of vegetation as part of site clearing and preparation. Measures have been proposed to minimize vegetation loss and avert desertification.
5.	**Forced Labour Convention, 1930 (No. 29)** It undertakes to suppress the use of forced or compulsory labour in all its forms within the shortest possible period.	20 May 1957	The project will employ workers, and employment and labor relations will be guided fundamentally by the ILO conventions ratified by Ghana
6.	**Freedom of Association and Protection of the Right to Organise Convention, 1948 (No. 87)** Stipulates that workers and employers, without distinction whatsoever, shall have the right to establish and, subject only to the rules of the organisation concerned, to join organisations of their own choosing without previous authorisation.	2 June 1965	
7.	**Right to Organise and Collective Bargaining Convention, 1949 (No. 98)** Workers shall enjoy adequate protection against acts of anti-union discrimination in respect of their employment. Such protection shall apply more particularly in respect of acts calculated to-- (a) make the employment of a worker subject to the condition that he shall not join a union or shall relinquish trade union membership. (b) cause the dismissal of or otherwise prejudice a worker by reason of union membership or	2 July 1959	

No	Convention	Ratification Date	Applicability to Proposed Project
	because of participation in union activities outside working hours or, with the consent of the employer, within working hours.		
8.	**Equal Remuneration Convention, 1951 (No. 100)** Requires members to, by means appropriate to the methods in operation for determining rates of remuneration, promote and, in so far as is consistent with such methods, ensure the application to all workers of the principle of equal remuneration for men and women workers for work of equal value.	14 March 1968	The project will employ workers, and employment and labor relations will be guided fundamentally by the ILO conventions ratified by Ghana
9.	**Abolition of Forced Labour Convention, 1957 (No. 105)** Requires members to suppress and not to make use of any form of forced or compulsory labour- (a) as a means of political coercion or education or as a punishment for holding or expressing political views or views ideologically opposed to the established political, social or economic system; (b) as a method of mobilising and using labour for purposes of economic development; (c) as a means of labour discipline; (d) as a punishment for having participated in strikes; (e) as a means of racial, social, national or religious discrimination.	15 December 1958	
10.	**Discrimination (Employment and Occupation) Convention, 1958 (No. 111)** Requires members to declare and pursue a national policy designed to promote, by methods appropriate to national conditions and practice, equality of opportunity and treatment in respect of employment and occupation, with a view to eliminating any discrimination in respect thereof.	4 April 1961	The project will employ workers, and employment and labor relations will be guided fundamentally by the ILO conventions ratified by Ghana
11.	**Minimum Age Convention, 1973 (No. 138)** Requires members to pursue a national policy designed to ensure the effective abolition of child labour and to raise progressively the	3 June 2009	

No	Convention	Ratification Date	Applicability to Proposed Project
	minimum age for admission to employment or work to a level consistent with the fullest physical and mental development of young persons.		
12.	**Worst Forms of Child Labour Convention, 1999 (No. 182)** Requires members to take immediate and effective measures to secure the prohibition and elimination of the worst forms of child labour, such as: (a) all forms of slavery or practices similar to slavery, such as the sale and trafficking of children, debt bondage and serfdom, and forced or compulsory labour, including forced or compulsory recruitment of children for use in armed conflict. (b) the use, procuring, or offering of a child for prostitution, for the production of pornography, or for pornographic performances. (c) the use, procuring, or offering of a child for illicit activities, in particular for the production and trafficking of drugs as defined in the relevant international treaties. (d) work which, by its nature or the circumstances in which it is carried out, is likely to harm the health, safety, or morals of children.	13 June 2000	The project will employ workers, and employment and labor relations will be guided fundamentally by the ILO conventions ratified by Ghana

3. DESCRIPTION OF PROJECT

The proposed project entails climate resilient water supply pipeline improvement works in selected locations of vulnerable Low-Income Urban Communities within nine regions of Ghana.

3.1 Project Location, Service Area and Beneficiaries

The proposed project is a linear development that will be implemented in nine (9) GWL operational regions or eight (8) administrative regions of Ghana with populations in low-income urban communities. The GWL Climate Resilient Water System Utilization project will be implemented within thirty-four (37) low-income urban communities across the nine regions of Ghana. Each of the regions selected contains between 1 and 10 carefully selected Low-Income and Vulnerable Urban Communities as listed in the table 3-1 below.

Table 3-1: Beneficiary Communities

S/N	Cluster	Region	LIUCs	Houses Prop.	GWL (Cover)	Interested	Max Conn.	Max Reach
1	18	Ashanti North	Abotanso; Woraso	259	5%	97%	238	6,689
2	82	Ashanti North	Kumawu	123	3%	97%	116	1,148
3	124	Ashanti North	Besoro; Bodomase; Temante	599	26%	83%	368	4,900
4	159	Ashanti North	Adukro; Ayensua; Nyankasu; Offinso - Asamankese; Offinso - Dapul; Offinso - Habitat; Offinso - Mehame; Offinso - Old Town; Offinso - Tutuase	1,180	12%	88%	907	10,042
5	11	Ashanti South	Ahinsan Baptist; Anwomanso; Boadi; Fumesua/ Okyerekrom; Kentikrono; Nahinso; Nsiene; Ramseyer; Sewua Junction; Twumdua	1,670	14%	33%	473	4,172
6	42	Ashanti South	Konongo Mayanka; Odumasi Zongo/ Kwakwaso; Santresu	385	28%	63%	175	1,302
7	58	Ashanti South	Aburaso; Akyeremade;	1,243	8%	43%	490	5,201

S/N	Cluster	Region	LIUCs	Houses Prop.	GWL (Cover)	Interested	Max Conn.	Max Reach
			Apire; Atiwa Boko; Brofuyeduru; Kokoben; Kotwi; Kromoase					
8	88	Brong Ahafo	Wenchi Town; Wurompo	312	9%	93%	263	2,293
9	151	Brong Ahafo	Asuano; Beposo (BA); Droboso; Koase; Nkosia; Yoyoano	728	31%	63%	319	5,488
10	5	Central	Akrofo; Akroma; Amosima; Edukrom; Miensa; Moree; Wiomua; Woraba	1,145	30%	64%	515	3,906
11	68	Central	Agona Duakwa (Abombosu); Agona Nsaba (Adwenpaye); Agona Nsaba (Freetown); Agona Nsaba (Health Center); Agona Nsaba (Zambia); Duakwa (Nyanka Junction -Salvation School)	504	17%	78%	326	2,653
12	93	Central	Acquahkrom; Bebianeha New Site; Burgers Estate; Mfuom; Oxford; Takyikrom	1,260	19%	78%	798	7,924
13	103	Central	Breman Asikuma	931	30%	70%	459	4,816
14	129	Central	Abaka; Abakrampa; Aboase; Abura Dunkwa; Bando; Egyirkrom; Ekroful; Mpradwo; New Ebu; New Odonase	1,463	15%	70%	868	6,615
15	153	Central	Owiredu School – Akyempim	469	9%	75%	322	2,828
16	15	Eastern	Aboabo (Quarters Top & Dam Site); Akim Swedru & Aduasa; Odasco & Sda	1,341	10%	31%	378	3,014

S/N	Cluster	Region	LIUCs	Houses Prop.	GWL (Cover)	Interested	Max Conn.	Max Reach
17	66	Eastern	Amanforom (Sadams); Bonawu & Zongo; Gcd Camp; Number 8; Osabarima Estate; Roman Ridge; Staff Village	2,471	21%	43%	851	13,549
18	81	Eastern	Akim Ofoase	903	13%	49%	382	3,493
19	156	Eastern	Asuom	1,236	16%	61%	634	7,179
20	17	Upper East	Nangalikinia	410	6%	89%	343	3,322
21	48	Upper East	Vunania	466	9%	89%	378	4,008
22	79	Upper East	Winkongo	854	7%	89%	704	10,406
23	134	Upper East	Daporitindongo; Dorongo; Sawaba; Tindonmolgo; Yikene; Zaare; Zuarungu	2,303	28%	90%	1,498	18,428
24	2	Upper West	Piisi/ Konfabiala	494	0%	96%	476	5,331
25	32	Upper West	Siriyiri	385	11%	99%	340	3,091
26	65	Upper West	Nakori	417	3%	95%	385	4,459
27	83	Upper West	Danko	462	21%	98%	357	3,938
28	132	Upper West	Dokpong; Fifamuni; Kambali; Limanyiri/ Nayiri; Sikpeyiri/ Tendamba; Tamparepani; Wapaani/ Fongu; Zindeli	3,259	29%	95%	2,184	27,591
29	137	Upper West	Dorimon	399	2%	94%	368	3,374
30	10	Volta	Agudzi; Aziave; Bame; Dzewoe; Dzigbe; Dzuanti; Gabi; Gadza; Kudzram; Togorme	784	17%	83%	536	4,372
31	94	Volta	Afeviafe; Agbateh; Avetlle; Blengo;	830	48%	75%	326	2,296

S/N	Cluster	Region	LIUCs	Houses Prop.	GWL (Cover)	Interested	Max Conn.	Max Reach
			Dzogbati; Tsame; Wudome					
32	95	Volta	Agbagorme; Agbakope; I Lakpo Zorme; Lakpo; Xikpo	672	19%	76%	413	8,281
33	106	Volta	Abotia; Avedzi; Bethel Pentecost Lane; Ebledokuikope; Kluma; Mataheko North Extention; North Juapong Clinic; Nuundu & Aboasa Communities; Sahara Village; Sokpokope	1,278	19%	72%	742	8,834
34	127	Volta	Abutiakope; Akosombo; Anloga-agorve; Dzelukope; Tegbi-Adziakpor; Tegbi-Wagana; Tegbi-Xekpa; Tettevikope; Woe-Avume; Woe-Tegbi	1,880	33%	53%	669	15,159
35	16	Western	Anto; Apemanim; Asemasa; Assorko; Assorko Essaman; Kwabenanokrom; Ohiamadwen; Old Daboase Junction; Yabew	886	15%	53%	399	3,385
36	67	Western	Adientem; Anaji Mount Zion; Asekea; Kasawrodo; Ketan; Kojokrom; Mampong (W); Mpatado; Nkroful; Windo	1,103	16%	52%	487	9,765
37	97	Western	Aboadze Abuesi; Dwomo; Inchaban-Anarfo; Ituma; Nyankrom; Shama; Shama Amenano; Shama Junction; Sofokrom Old	1,036	31%	59%	424	3,682

S/N	Cluster	Region	LIUCs	Houses Prop.	GWL (Cover)	Interested	Max Conn.	Max Reach
			Town, New Takoradi					
	Total			**36,131**			**19,901**	**236,926**

3.2 Adjoining Land Uses

The Proposed Project beneficiary areas are scattered within the nine Ghana Water Operational Regions. According to land use categorisations conducted by ESRI et al. (2022), the land uses identified within the beneficiary communities include medium to high residential and population densities with a high degree of informality manifesting as the presence of home and neighbourhood-based economic activities, especially along the pipe routes. Residential, commercial, and mixed residential commercial land use activities have usurped the wayleaves for water and other utilities lines and installations. Built up areas occupy about 94.5 percent of the total land area of the beneficiary communities. Trees cover about 0.5 percent of the total area while grass, crops, shrub and bare ground cover about 5 percent.

3.3 Zoning Status of Proposed Project Land Take

The Proposed Project will be implemented on Government of Ghana's already allocated reservation for utility service providers. The project will share space at some locations with other utility service providers such as the telecommunication companies. Within the residential corridors, the project will utilise existing ancillary road networks.

3.4 Description of the Proposed Project

The goal of this project is to improve water services for vulnerable communities in Low Income Urban Communities (LIUCs) across Ghana through a transition towards a more climate-resilient source of water. The specific development objectives include enhanced water access for all, which ensures the delivery of clean and dependable water services to LIUCs. It emphasizes providing treated water for human consumption and agricultural use, supporting livestock hydration for holistic community development.

This project, envisioned as a standalone investment within a larger portfolio focusing on small-scale network extensions and subsidized water connections, aims to maximize existing water treatment capacities while introducing innovative climate resilience measures, potentially serving as a model for broader water management and climate resilience programs across African utilities. Leveraging previous investments in water treatment capacity, it integrates climate resilience features such as Advanced Metering Infrastructure (AMI) for water

conservation that results in less energy consumption and resultant emissions reduction, and the use of drought-resistant pipeline materials, supported by grant funding to subsidize new service connections and enhance network expansion feasibility.

The project, financed through contributions from GWL's development partners, with the Climate Action Window (CAW) grant acting as a catalyst, emphasizes climate resilience in infrastructure design and community water management practices. By defining the project as standalone, it enables focused implementation, monitoring, and evaluation, integrating climate risk assessments and resilience planning to address specific challenges in water access and climate resilience.

3.5 Project Components

The project will have 4 components, described below:

Component 1: Infrastructure Development involves constructing robust, climate-resilient water infrastructures such as pipelines and distribution points capable of withstanding increased climate variability and extreme weather events, like floods and droughts.

- *Sub-component 1.1: Building small-scale water networks with materials selected for durability and adaptability to changing climate conditions.*
- *Sub-component 1.2: Installing subsidized household water connections with smart metering and leak detection systems for targeted LIUCs (households, schools, health centres, public spaces).*

Component 2: Capacity Building and Technical Assistance focuses on enhancing operational and managerial skills within GWL and LIUC to manage climate risks and implement adaptation strategies effectively (*)

- *Sub-component 2.1: Training for GWL and LICSD staff on climate resilience aspects of water utility management.*
- *Sub-component 2.2: Workshops on sustainable water service delivery models incorporating climate change adaptation and resilience building.*

** Funded under existing partnership arrangements such as VEI's WaterWorX, Danish Strategic Sector Corporation, GRCS behavioural change campaign MoU.*

Component 3: Community Engagement and Empowerment aims to involve local communities in water management with a focus on adapting to climate change impacts.

- *Sub-component 3.1: Establishing WUAs to also foster community-based climate adaptation initiatives.*
- *Sub-component 3.2: Encouraging community participation in water management decisions with an emphasis on resilience to climate variability.*

Component 4: Monitoring, Evaluation, and Learning ensures project effectiveness and adaptability to climate change, with a focus on tracking climate resilience outcomes and lessons learned.

- *Sub-component 4.1: Conducting impact assessments to evaluate climate resilience improvements.*
- *Sub-component 4.2: Establishing adaptation and continuous improvement mechanisms for climate risk management.*

The project's structure aligns with the CAW's focus on climate adaptation and resilience. Incorporating sustainable materials and community involvement, it demonstrates an innovative approach that can be replicated in other African utilities. The thorough planning and diverse components reflect the project's alignment with the Joint MDB methodologies for adaptation, ensuring its relevance under the CAW criteria. This comprehensive approach positions the project as a viable model for sustainable, climate-resilient water management in Africa.

3.6 Description of Proposed Project Activities

The project activities involve laying water distribution lines of varying sizes for potable water supply to the beneficiary low-income communities. Trenches measuring up to 1.2 metres deep and 0.6 metres wide will be dug to lay the pipes, after which they will be backfilled and compacted. Labour-intensive methods of construction will be used for the work. This notwithstanding, thrust boring will be used at road crossings and other places where the need be.

The construction work will involve the following activities at the sites:

- Securing the right-of-way for project execution
- Excavation, trenching, and pipe laying
- Thrust boring
- Transportation of HDPE and PVC pipelines to construction sites
- Road diversion will be undertaken to ensure the uninterrupted movement of pedestrians and motorists during the period of construction

- Backfilling and compacting
- Pipe Laying Works
- Concrete works to construct inspection chambers
- Construction of standpipes
- Pressure Testing of Pipelines
- Disinfection of the pipelines
- Re-instatement of demolished properties on the Right-of-Way of the pipe laying activities
- Re-planting of disturbed areas during construction

3.7 Construction Method

3.7.1 General Excavation and Pipe Laying

The Proposed Project will be implemented in communities where corridors or reservations for pipe-laying along roads are normally small and, in some instances, almost non-existent. Under these circumstances, most of the excavations for pipe-laying will be manually done. On the contrary, where the reservation is wide enough for equipment to maneuver, then an excavator/back-hoe would be employed.

The HDPE pipes would be welded outside the trenches, after which the pipeline would be lowered into position in the prepared trench bottom/bed. Immediate backfilling would be done using appropriate backfill material as per the design drawings. Backfilling on top of the pipeline to the original ground shall be compacted using a plate compactor.

3.7.2 River Crossings

At river/drain crossings, the pipelines will be mounted on reinforced concrete piers fastened in position with galvanized steel clamps with approved epoxy-based anti-corrosion coating/paint. The pipes will not have any contact with water bodies.

3.7.3 Road Crossing

Excavations will be made along the road corridor. In the event that there is a need to cross a road, the procedure for road crossing will be adopted. Road crossings/cuttings will be done using the Thrust boring method: Thrust boring is a jacked and drilling trenchless boring method used for the installation of pipes and conduits. This technique is used in applications where excavations are undesirable, such as in developed locations, roads with high traffic volumes, or areas with a high risk of ground collapse. The jacking and drilling technique is one of the most dependable and economical, particularly with a variety of ground conditions – including

hard rock, wet soil, and sand. This means it can be used above or below the groundwater table. Above-ground disturbance is minimal due to the use of just an entry and exit hole for the piercing tool to bore through, allowing reinstatement costs to be low. The thrust boring process typically includes the following:

- Dig the Entry and Exit Pits
- Create the Pilot Bore
- Commence Thrust Boring
- Install the Product Pipe
- Where there is limited space/reservation, pipe-laying in these areas would have to be placed in the roadside-walk pavements or shoulders.

3.7.4 Construction Materials and Construction Equipment

The main construction materials are HDPE pipes, sand, cement, stone chippings, wood, nails, and water. When it comes to equipment, machines including backhoes, tipper trucks, concrete mixers, light-duty vibrators, soil compactor, dewatering pump, pick axe, spade, thrust boring machine, waste dump trucks, and water storage tanks will be deployed to make the work safer and easier to implement.

3.7.5 Labour requirements

The entire project will be contracted to eight (8) competitively selected contractors in eight (8) lots. It is anticipated that each contractor would have approximately 35 workers, totalling about 280 workers for implementation of the proposed project. Contractors would be encouraged to recruit unskilled/ semi-skilled workers from the local area. Other skilled labour may be sourced locally based on the needs of each contractor.

Trained staff of GWL will manage the installed pipelines and associated facilities during the operation and maintenance phase.

3.7.6 Decommissioning of Construction Sites after Project Construction Activities

Upon completion of all construction activities, all spoilt and unused construction materials, including spent HDPE and PVC pipes, stone chippings, cement blocks, concrete wastes, and cement papers, will be collected and disposed of at approved MMDA waste disposal sites by the contractor. Also, all construction equipment, including that which has become obsolete, will have to be removed from the construction sites by the contractor, i.e., excavators, concrete mixers. Furthermore, all disturbed areas and pits will have to be restored to pre-project status.

3.8 Operation of the Pipelines

Once completed, the pipelines, chambers, meters, and standpipes will require inspection and monitoring, and maintenance to keep the pipeline network functioning properly after construction. Lack of regular inspection, monitoring, and maintenance could result in pipeline leakages, and consequent flooding of adjacent communities, loss of property, and livelihoods. Pipe bursts and leakages can also result in waste of water, water contamination, and revenue loss to the company. Furthermore, a lack of regular inspection and monitoring of the pipeline routes in the communities may lead to destruction and/or unacceptable encroachment on the underground pipelines by some other infrastructure excavations/developments in the future, such as road works, housing schemes, and community upgrade interventions, which can make repairs very difficult and the project unsustainable.

3.9 Consideration of Project Alternatives

This section provides a comparative discussion of environmental, social, and economic feasible alternatives for the proposed project in compliance with the Environmental Protection (Environmental Assessment) Regulation, 2025 (LI 2504). The LI 2504 emphasizes locational considerations guided by a rationale for the choice of the proposed project space and whether any other locational alternatives were considered. The "no-go" alternative is also considered in line with LI 2504, which requires considering the options where the proposed project is not executed. These potential alternatives and "no-go alternative" to the proposed project are espoused subsequently.

3.9.1 Pipeline Material Alternatives

Over the years, several pipeline materials have been used by GWL, including ductile iron, HDPE, PVC, and, up until recently, asbestos pipelines. GWL ceased the installation of new asbestos pipelines due to its global classification as a known human carcinogen (a substance that causes cancer). Asbestos pipelines are therefore not considered as alternative pipeline materials during this project. Other pipeline materials used in the water distribution industry include copper, cast iron, and steel pipes.

a. Cast Iron Pipes

Cast iron pipes are quite stable and well-suited for high water pressure. However, cast iron pipes are heavy, which makes them unsuitable for inaccessible places due to transportation problems. In addition, due to their weight, they generally come in short lengths, increasing

costs for layout and jointing. Corrosion, sediment build-up, pressure resistance, thermal conductivity, and chemical resistance have all been problems with cast iron pipes.

b. Ductile Iron Pipes

Ductile iron pipes are a type of graphite-rich cast iron. While most varieties of cast iron are weak in tension and brittle, ductile iron exhibits significantly greater impact and fatigue resistance due to its nodular graphite inclusions. Ductile iron pipes are easy to join, can be laid in all weather conditions, and often do not require specially selected backfill. Its high safety factor and ability to accommodate ground movement make it the ideal pipeline material for a wide range of applications. The strength of ductile iron allows it to withstand significant internal pressure and also makes it less susceptible to impact damage. Ductile iron is primarily made from recycled iron and steel scrap. It is therefore recyclable and has no end of life, thereby reducing the environmental footprint due to repetitive use. Larger diameters of ductile iron pipes (≥ 30 in) have a lower global warming potential based on emissions from manufacturing, transportation, and installation. However, due to the relatively high financial implications of using ductile iron pipes, they will only be used for above-ground stream crossings.

c. Steel Pipes

Steel pipes are manufactured from steel and widely used for oil lines, water treatment facilities, bridges, and fences, among others. Steel pipes are extremely long-lasting and durable. They can withstand high water pressure, come in convenient (longer) lengths than most other pipes, and thus incur lower installation/transportation costs. They can also be easily welded. However, they are more expensive relative to ductile iron, have fewer safety factors, and are difficult to protect from the effects of corrosion and are difficult to use. This will have an adverse impact on its ability to maintain a clean water supply over time.

d. Concrete Pipes

Concrete pipelines are very durable and are not susceptible to corrosion when used for a potable water supply. However, they are heavy, hence present transportation challenges and may increase the cost of installation. Concrete pipes are also difficult to repair. They are rigid and require a uniform and level bed for laying. They are difficult to tap and use in pipeline networks that will have multiple “branches” off the main water service line. Concrete pipes in the sizes required for the proposed project are not economical.

e. Copper Pipes

For decades, copper pipes have been a standard in the plumbing industry. This type of plumbing pipe can endure up to 50 years, is corrosion-resistant, and can safeguard water quality. Copper pipe can be used both underground and above ground. However, it is susceptible to some soils and should be protected with a protective sleeve if used underground. Copper pipes are also very costly and prone to theft due to their market value and ease of recycling into other objects.

f. Plastic-Based Pipes

The High-Density Polyethylene (HDPE) pipe is used in most modern homes since it is easier to deal with. The HDPE pipes have inherent advantages, and it is an environmentally friendly alternative for potable water distribution. HDPE is lighter weight, and they are flexible, which can simplify installation. HDPE pipes are typically lower in cost and resist the corrosion and scaling plagues metals in several applications. HDPE pipes do not require an open flame to join. HDPE is robust and long-lasting, but its strengths differ, and its applications are diverse. HDPE is harder and more resistant to abrasion and heat. HDPE pipes have been discovered to be able to dampen and absorb shock waves and high-water pressure, reducing water supply disruptions from burst pipelines. HDPE is less expensive relative to other pipes. Based on GWL's experience with water supply in Ghana, HDPE pipes have also been identified to be less prone to illegal tapping.

HDPE pipes would therefore be preferred for main distribution and service lines as well as for household connections. High-density Polyethylene (HDPE) pipes of sizes ranging from 110 mm to 630 mm will be the main pipe material used for the proposed project due to their durability, ease of transportation and installation, low cost, and low susceptibility to illegal tapping/connections. This would be used for the main distribution and service lines. Very limited quantities of ductile iron pipes would be used for above-ground stream crossings and would also be used for on-demand household service connections.

3.9.2 Pipeline Routing Alternatives

Alternative pipeline routes were considered during the design of the proposed project. The primary objective was to identify routes and evaluate their suitability based on the availability and ease of access to the right-of-way, livelihood, and resettlement risks.

For this project, which would involve the laying of pipelines by creating an entirely new pipeline route, the following routing considerations were made:

a. Creating Entirely New Water Supply Pipeline Routes:

Creating new routes for the project component will imply rerouting all the water supply pipelines. This will limit the impacts associated with the disruption of the water supply during implementation of the project, since existing networks will still be in use. Conversely, this will lead to the project abandoning existing pipeline networks or routes, as well as associated materials that could be salvaged for recycling and resource recovery. Considering the current land use dynamics, rapid urbanization, and high land value within the project areas, acquiring a new right-of-way will have significant social, economic, and land management challenges. Where greenfield areas are explored for new routes, the environmental footprint of excavating such areas will be high relative to existing routes.

b. Dynamic Routing Options:

This option involves the replacement of some water supply pipeline sections, diversion in some sections, and also laying new pipelines along the old water supply pipelines. Thus, where displacement and the related compensation costs would be high due to heavy encroachment, route diversions would be preferred. Removal of old pipelines made of materials that are recyclable would also be preferred, where replacement of existing water supply pipelines is feasible. In order to avoid the risks of handling asbestos, it is preferred that new water supply pipelines be installed alongside the existing asbestos pipelines. Thus, old asbestos pipelines would be decommissioned and left buried in the ground while new pipelines are installed parallel to the decommissioned asbestos pipes. Based on the social, economic, land management, and environmental advantages of considering dynamic routing options, this alternative will be adopted by the component of the project.

For the component of this project, initial pipeline route designs were not considered suitable since they were identified to have some social impacts, as there would be a few compensation and resettlement-related issues to be handled, with a direct adverse impact on the project cost and implementation feasibility. There was also the need to ensure that pipeline routes are aligned to optimise the much-needed connection to households within the project beneficiary communities. The current approved designs have therefore been based on the following primary consideration factors:

- Constructability.
- Minimum number of crossings with existing utility infrastructure.
- Optimize the use of utility reservations along roads.
- Minimize interaction with sensitive receptors such as sacred areas, churches, and streams.

- Avoid permanent displacement and reduce temporary livelihood and physical resettlement impacts, associated compensation, and project implementation cost.
- Minimum number of major road (urban and highway) crossings.
- Suitable tie-in to existing water transmission/ distribution infrastructure.
- Compatibility for future water distribution expansions based on the spatial plan forecast.
- Optimize proximity to target households within beneficiary communities.

3.9.3 Technological Alternatives

Technological considerations factored into the selection of meters for the component of the proposed project.

a. Mechanical Water Meters:

Mechanical water meters are widely used by GWL. They are cheap, cost-effective with available local suppliers. They require physical access to the meter to record water consumption. However, some mechanical water meters are installed inside the facilities of customers and are therefore difficult to access without the customer's presence. In some cases, workers of GWL have been exposed to unsafe conditions during manual reading of meters.

b. Smart Water Meters:

Smart water meters are being introduced into the commercial operations of GWL as a mitigation to the challenges encountered with the use of mechanical meters. In spite of the high cost of smart meters, they are easy to read without necessarily accessing the customer's premises. It also offers a higher level of accuracy in recording customer water consumption and reduces errors with human recording of readings.

GWL, as part of its innovation drive, has taken the initiative to pilot the introduction of smart water meters as part of the proposed project. The preference for smart water meters is based on their comparative advantage over traditional mechanical water meters.

3.9.4 The "No Project" Scenario

The urban population of Ghana is expected to increase due to high birth rates and migration. This increasing urbanization has resulted in increased water demand and further severely compromised urban access to clean water. With the increasing demand for potable water, diverse water sources have emerged, ranging from the most common packaged water sources, such as sachet and bottled water, to piped sources, among others. The informal and private

sector plays a vital role in expanding drinking water services beyond GWL water systems, especially in low-income urban communities, to keep up with urbanization.

In light of this, both water production and the water supply network need to be expanded soon and significantly. More so, access to potable water, affordability, and quality continue to be a challenge with multiplier risks to standard sanitation, health, and socio-economic development, especially in low-income communities within the country.

At this rate and with the limited investments into the water production and distribution sector, there is a need to optimize and ensure that potable water distribution targets these low-income communities to facilitate improvement in sanitation practices and promote socio-economic development. Absence of the proposed project will deny the Region and GWL the inherent benefits of the proposed project, including but not limited to:

- Increased access to potable water supply within the project beneficiary communities.
- Improved sanitation in low-income communities with an indirect beneficial impact on community health, inequality, and socio-economic development.
- Improvement in climate change resilience and adaptation measures.
- Reduced physical and commercial loss.
- Contribution towards the achievement of SDG Goal 6 with indirect positive impacts on SDG 3 and 10.
- Contribution towards achievement of national water and sanitation sector policies such as the Water Sector Strategic Development Plan (WSSDP); and
- Contribution towards increased revenue for GWL due to an increased customer base.

Drawing from the environmental, economic, social, and climate change adaptation benefits of the proposed project, its implementation is crucial to the urban population of Ghana, GWL, and the Government of Ghana as a whole.

3.10 Description of Estimated Waste Generation

Typical of pipeline construction works, the stream of waste expected to be generated includes but not limited to construction waste, hazardous waste, domestic waste and other waste. The estimated volumes of waste to be generated from the over 100km pipeline is outlined in the table below.

Table 3-2: Estimated Waste to be Generated from the Proposed Project Activities

No.	Type of Waste	Sources/ Description	Estimated Volume (m^3 per 100km pipeline)	Management Consideration
1	Construction Waste	Excess soil, vegetation cleared for right-of-way, trench spoil, pipe off-cuts, scrap metal.	72,000 - 192,000m^3 soil and spoil	Reuse of topsoil, recycling metal, disposal of residual waste appropriately.
2	Hazardous Waste	Contaminated soil, oily wastes, cleaning chemicals, spilled hydrocarbons	50 - 100 m^3	Strict containment and regulated disposal.
3	Domestic Waste	Food waste, general refuse, sewage, greywater from camps/workers.	50 - 150 m^3	Solid waste collection and sewage treatment.
4	Other Waste	Sludges, wastewater from equipment washdowns and hydrostatic test waters.	50 - 200 m^3	Secure storage and disposal per environmental regulations.

3.11 Project Implementation Schedule

The project would be implemented in eight (8) lots by contractors selected through GWL's competitive bidding process in line with regulations of the Public Procurement Authority (PPA). The entire project is expected to take a period of 1.5 years. The construction phase will be six (6) months followed by a defect notification period of twelve (12) months. The project implementation timelines (tentative) are shown in Table 3-3.

Table 3-3: Project Implementation Schedule (Tentative)

Activity	2025	2026				2027		
	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter
Finalisation of project designs, technical studies and contractor selection process								
Construction of first 50 km								
Construction of remaining pipeline length								

Activity	2025	2026				2027		
	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter	4th Quarter	1st Quarter	2nd Quarter	3rd Quarter
Operation and defect notification period								

4. ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

Existing environmental and socio-economic characteristics of the project environment are discussed in this Section. The purpose of describing the environmental settings of the project is to assess the existing environmental quality to serve as a benchmark for future impact and risk monitoring; identify environmentally significant factors or natural ecological areas that could preclude any future development as well as understand the environmental and socio-economic characteristics of the project catchment areas.

4.1 Area of Influence (AoI)

The proposed project will be implemented in several communities across multiple local government areas in eight administrative regions of Ghana. The AoI for the proposed project has been defined based on the local government [metropolitan, municipal and district assemblies (MMDAs)] boundaries within which the project beneficiary communities lie as shown in Figure 4-1. This jurisdictional approach has been adopted since the MMDAs provide the smallest unit of administrative and developmental planning in Ghana and will provide a well-defined context for assessing the environmental impacts and socio-economic risks of the proposed project.

The scope of description of the existing biophysical and socio-economic environment for the proposed development is therefore guided by an AoI developed from a jurisdictional or neighbourhood approach. Although the project concept is such that it has the potential to have an influence at the community, district/ municipal, regional and to some extent at the national level (for instance in terms of procurement, etc.), majority of impacts; both positive and negative; will be experienced at the community level with cumulative impacts on the project administrative MMDAs. An assessment of environmental impacts and socio-economic risks are therefore focused within the project beneficiary communities with a less detailed examination of impacts at the MMDA level.

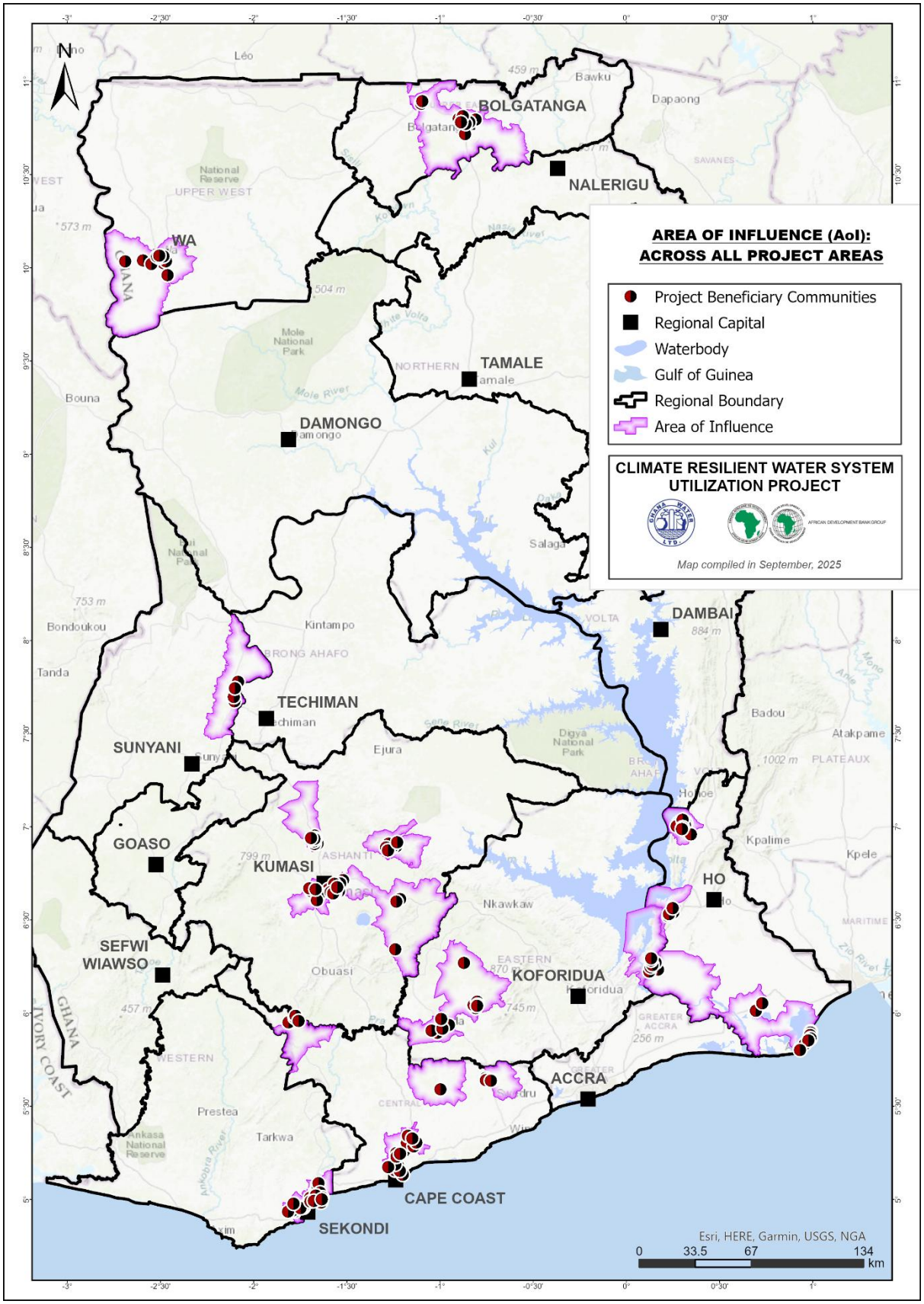


Figure 4-1: Area of Influence (AoI) for the proposed project

4.2 Methodology for Data Collection

Several primary and secondary data sources were relied on to understand the biophysical and socio-economic baseline characteristics of the project beneficiaries and their corresponding AoIs. The methods deployed include the following:

4.2.1 Air quality and noise level analysis

Ambient air quality and noise level monitoring was carried out in October, 2025 across sampled locations within the project beneficiary communities to establish a current baseline to serve as a benchmark for impact monitoring and remediation. The locations were hierarchically sampled with the first tier determined based on the region, the second tier based on the AoI/ spatial cluster and the final tier purposively determined based on sensitive locations and land use. The sampling locations are listed in Table 4-1 and shown in Figure 4-3. The monitoring methodology and equipment were consistent with the requirements of GS 1236:2019 and GS 1222:2018. The monitoring was carried out continuously for 24 hours at each sampling location for ambient noise [dB(A)] as well as ambient air quality (NO_2, SO_2, $PM_{2.5}$ and PM_{10}). Results were benchmarked against Ghanaian thresholds specified by GS 1236:2019 and GS 1222:2018. Factors accounting for the exceedances recorded in noise levels or ambient air quality concentrations have also been detailed in each result table. A photo gallery of some of the air quality and noise level monitoring activities have been provided in *Figure* 4-2.

Table 4-1: Air quality and noise level monitoring locations

Code	Coordinates	Region	Description
UE1	10°48'13.72"N, 0°53'55.02"W	Upper East	Residential area in Yikene close to an untarred road
UE2	10°52'59.24"N, 1° 5'50.11"W		Elisha Preparatory School in Nangalikinia
UE3	10°43'8.91"N, 0°51'55.24"W		Open field in Winkongo adjacent a main road and residential facilities
UW1	10° 3'59.11"N, 2°30'21.90"W	Upper West	Residential area in Wapaani/ Fongu close to a residential road, public toilet and a music studio
UW2	10° 2'30.29"N, 2°35'34.68"W		Residential area in Siriyiri about 62 meters from the untarred Wa-Maase Road
UW3	10° 2'11.47"N, 2°28'13.40"W		Open field at Danko near farms and about 70 meters from the closest residential facility
BR1	7°46'37.09"N, 2° 5'4.45"W	Bono	Church in Wurompo adjacent the main road passing through the community
BR2	7°44'23.93"N, 2° 6'24.76"W		Commercial area in Wenchi Town and adjacent the Wa – Bole dual carriageway (N12) in the town
BR3	7°40'40.06"N, 2° 6'23.74"W		Koase Senior High technical School in Koase and about 70 meters from the Wenchi-Techiman Road (N12)

Code	Coordinates	Region	Description
AS1	6°54'58.51"N, 1°13'44.27"W	Ashanti North and South	Technology Solution Center in Temante about 90 m from the main road through the town and 50 m from the closest residential facility
AS2	6°52'20.88"N, 1°16'46.53"W		Near the Woraso public market (commercial area) in Woraso and adjacent the main road traversing the town
AS3	6°56'23.67"N, 1°40'36.70"W		Within the Offinso Chief Palace in a residential area in Offinso
AS4	6°40'11.49"N, 1°42'1.94"W		On the football field of Atwima Boko Roman Catholic School in Atiwa Boko, a peri-urban area of Kumasi
AS5	6°39'52.83"N, 1°35'53.74"W		In front of the Ahinsan Baptist Church in a largely residential area with minor commercial activities
AS6	6°42'38.16"N, 1°31'34.51"W		In front of the Forestry Research Institute of Ghana (FORIG) in Fumesua, adjacent the Kumasi – Ejisu Highway (N6)
AS7	6°36'45.40"N, 1°12'49.12"W		Residential area in Konongo-Mayanka with several untarred roads
ER1	5°53'48.62"N, 1° 0'47.17"W	Eastern	Close to the Astro turf football pitch in Akim Swedru surrounded by residential facilities and a school
ER2	6° 1'37.73"N, 0°48'30.08"W		Residential area in Amanforom (Sadams)
ER3	6°16'24.37"N, 0°52'32.97"W		Asuom Senior High School in Asuom surrounded by residential facilities and undeveloped areas
CR1	5°58'34.44"N, 1°46'46.25"W	Central	St. Paul Catholic Church in Acquahkrom
CR2	5° 7'59.90"N, 1°11'58.89"W		The Church of Jesus Christ of Latter Days Saints at Moree
CR3	5°19'36.57"N, 1° 8'54.59"W		Along the RoW at Abura Dunkwa
WR1	5° 01'18.07"N, 1°40'07.18"W	Western	Along the Cape coast – Takoradi Road (N1) at Shama Junction adjacent minor commercial activities (food vending, mechanic shop, table-top vending, etc)
WR2	4°59'14.77"N, 1°38'40.76"W		Aboadze Abuesi off the Inchaban Road
WR3	4°56'13.62"N, 1°46'57.56"W		Off the Jonfiah Avenue in Anaji Mount Zion in a residential area
VR1	7° 1'52.01"N, 0°17'29.77"E	Volta	At Dzewoe Basic School at Dzewoe, a rural community
VR2	7°00'59.67"N, 0°19'07.85"E		At Kpando- Gadza MA Basic School, a rural community
VR3	6°59'58.83"N, 0° 15'26.51"E		Kpando-Torkor Basic School surrounded by residential facilities
VR4	6° 1'55.53"N, 0°42'29.63"E		Along the Accra – Aflao Road (N1) in Agbakope with some commercial activities (retailing of

Code	Coordinates	Region	Description
			Portland cement and provisions, mobile money vending, etc.)
VR5	5°51'51.45"N, 0°59'13.04"E		At Queen of Peace Catholic Church at Tegbi-Adziakpor about 370 m from the Gulf of Guinea shoreline and within a residential area




Anaji, Mount Zion (WR3)




Ahinsan (AS5)




Agbakope (VR4)

Figure 4-2: Photo gallery of selected air quality monitoring activities

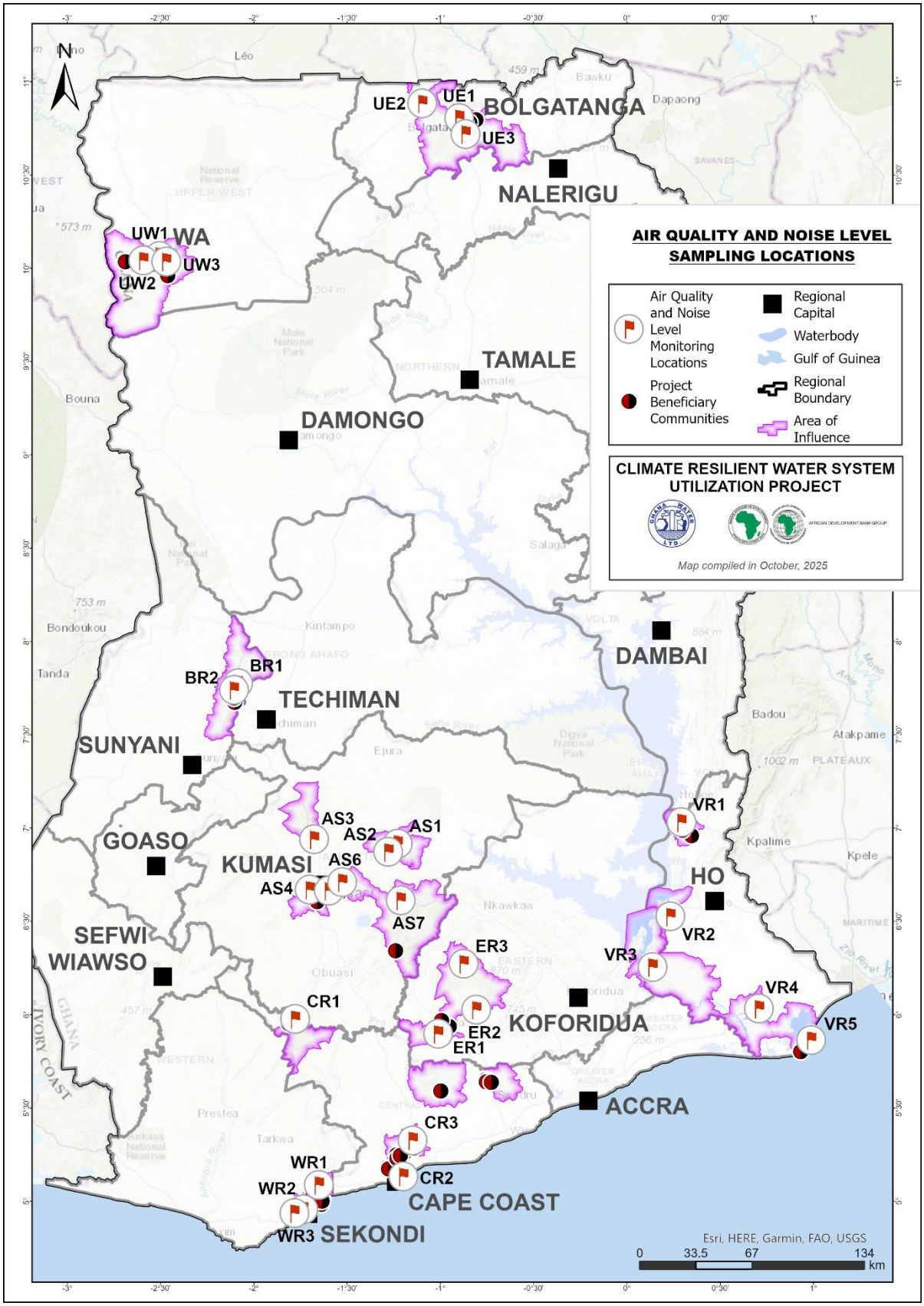


Figure 4-3: Air quality and noise level monitoring locations

4.2.2 Flora and fauna screening

The immediate project implementation environment is largely built-up with isolated open spaces, which are largely impacted by anthropogenic activities. The likelihood of these spaces providing habitats for any significant flora and fauna species is limited. A detailed fauna and flora assessment/ survey was therefore not relevant as part of the baseline data collection. A flora and fauna screening exercise was carried out within the project implementation communities in October, 2025. This involved visual observations and random informer interviews. This was augmented with secondary data of flora and fauna species in the AoI from the relevant MMDA to obtain an understanding of existing and potential flora and fauna species that could be impacted by the proposed project. Generally, the flora species were limited to common shrubs, isolated big trees, grasses and ornamental plants. Fauna species identified were largely domestic with periodic reports of some reptiles such as snakes. The flora and fauna species identified through this approach have been compiled for the project beneficiary regions.

4.2.3 Water quality analysis

There are limited surface waterbodies within the project beneficiary communities. The water bodies that will be traversed by the proposed project works are very limited. Screening of the surface water bodies in the respective AoIs and the proposed project implementation footprint identified only two (2) locations [Kpando Torkor (7° 3'54.95"N, 0°16'50.51"E -upstream and 6°57'3.63"N, 0°16'10.20"E - downstream) and Konongo-Patriansa (6°39'38.18"N, 1°10'33.77"W – upstream and 6°39'34.81"N, 1°10'33.60"W – downstream)] where surface water bodies are likely to have any direct impacts from the project implementation activities. Samples from these water bodies (upstream and downstream) were therefore taken and laboratory analysis undertaken by the Water Research Institute (WRI) of the Council of Scientific and Industrial Research (CSIR) to establish a baseline of the surface water quality of these water bodies. The sampling approach, sample storage, transportation and method of analysis were consistent with the requirements of GS 1212:2019. The parameters analysed by WRI were determined based on historic consultations with the Water Resources Commission (WRC) on similar projects. Results were benchmarked against the regulatory thresholds of Ghana Standards on drinking water quality (GS 175-6) and World Health Organisation guidelines for drinking water since the streams are natural water resources within the various communities. The results have been included in the relevant project beneficiary region's baseline description.



Surface water sampling at Kononga-Patriensa (Upstream)



Sampling at Kpando Torkor (downstream of the Volta Lake)

Figure 4-4: Photo gallery of selected surface water sampling activities

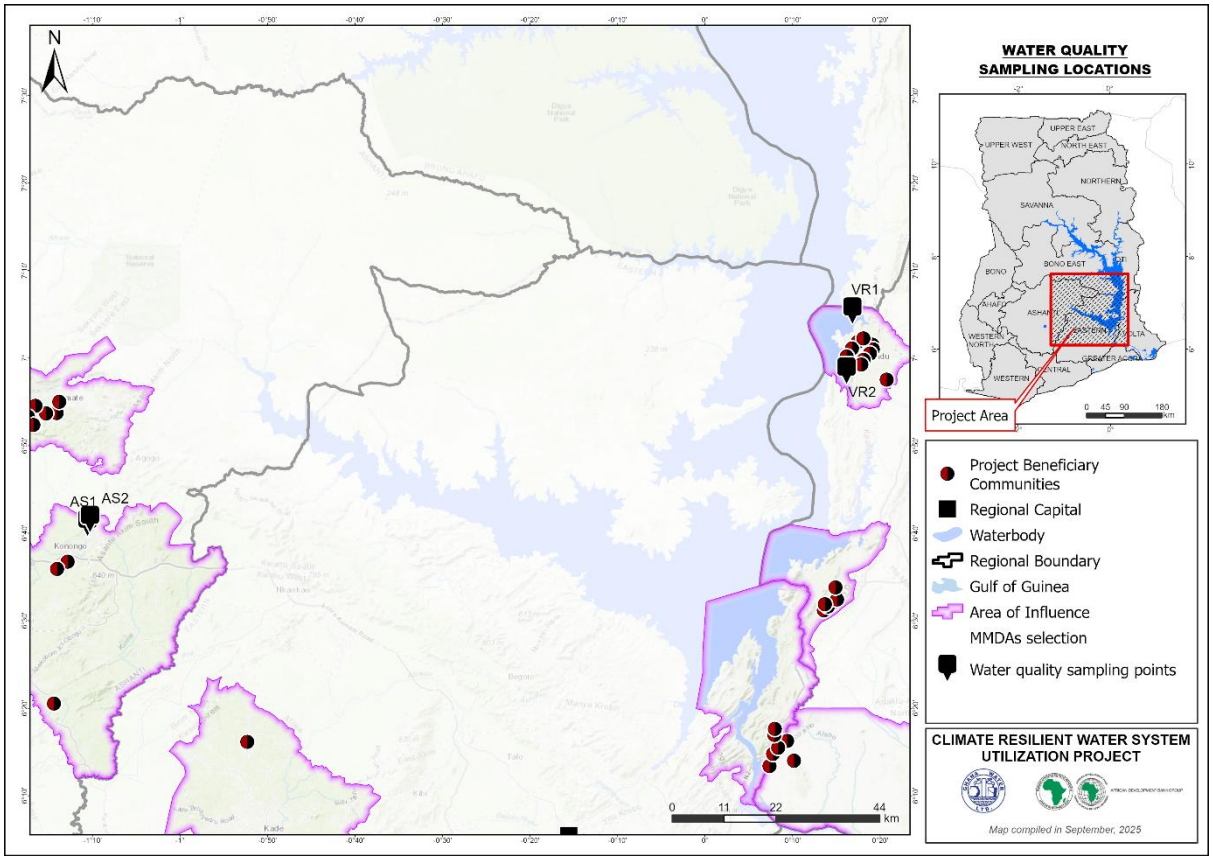


Figure 4-5: Surface water sampling locations

4.2.4 Socio-economic baseline

Socio-economic characteristics of the project beneficiary communities were obtained from studies carried out by consultants engaged by GWL to collect primary socio-economic data of the project beneficiary communities. These studies were carried out in 2025 and have been the main reference for the socio-economic baseline provided in this ESIA. MMDA level information was obtained from the respective MMDAs while demographic information was sourced from the Ghana Statistical Service (GSS), where local level population estimates were lacking. The 2025 regional population data used in this report are values projected by GSS using an annual population growth rate of 1.91%.

4.2.5 Geospatial analysis

The study area was delineated using GIS and remote sensing techniques. This technique made use of readily available and credible environmental spatial data, field acquired geospatial information and accredited online mapping platforms. Geographic data was obtained from spatial data of the project beneficiary communities provided by GWL as well as the determined AoI and overlaid with environmentally relevant geospatial data to help determine environmental issues of concern.

4.3 Ashanti North and South Region

4.3.1 Regional Overview

The Ashanti Region lies in the southern half and is centrally located in the middle belt of Ghana. It lies between longitudes 0.15W and 2.25W, and latitudes 5.50N and 7.46N, occupying a total land surface of 24,389 km^2 (9,417 sq mi) or 10.2 percent of the total land area of Ghana. According to GSS, the region is projected to have a population of 5,751,660 with 2,832,912 being males and 2,918,748 being females in 2025. The population of the region is concentrated in a few districts. The Kumasi metropolis alone accounts for nearly one-third of the region's population. Slightly over half, 51.5 per cent, of the population of the region is in four districts. While more than half of the population in the region resides in urban areas, in 15 of the 18 districts, over half the population lives in rural areas. The high level of urbanization in the region is due mainly to the high concentration of the population in the Kumasi metropolis (which has almost a third of the region's population). The urban population (51.3%) in the region exceeds that of the rural population (48.7%). The region is currently the second most urbanized in the country, after Greater Accra (87.7%). The growth of the mining industry in Obuasi and the increase in commercial activities in Kumasi may account partly for the relatively high urban population in the region.

One other factor that has also contributed to the high urban population in the region is the growth in some of the localities which were hitherto considered as rural settlements but have now attained urban status (localities with a population of 5,000 and above).

4.3.2 Description of Project Beneficiary Communities

Table 4-2 below provides a vivid description of the nature of the selected beneficiary community with a focus on its low-income urban status.

Table 4-2: Description of Project Beneficiary Communities

Community Name	Description of low-income status
Abotanso	Abotanso is a small peri-urban settlement located within the Ashanti Region. It is predominantly a farming community with residents engaged in the cultivation of food crops such as maize, cassava, and plantain. The community is characterized by dispersed housing patterns, unpaved roads, and strong kinship ties. It remains semi-rural, though younger populations are increasingly engaged in trading and artisanal work in nearby towns.
Ahinsan Baptist	Ahinsan Baptist is a residential community within the Kumasi Metropolitan area, noted for its proximity to the Ahinsan Estate and the Baptist mission institutions. The area has both indigenous settlers and migrant populations, with housing developments

Community Name	Description of low-income status
	expanding steadily. Economic activity is dominated by trading, small-scale commerce, and service provision due to its closeness to Kumasi's urban core.
Anwomanso	Anwomanso is a mixed residential and farming community located on the outskirts of Kumasi. Farming, particularly cassava, cocoyam, and vegetables, is a major livelihood, though proximity to the city provides opportunities in trading and transport. The settlement is semi-urban, with growing residential development encroaching on farmlands
Boadi	Boadi is a large town near Kumasi and one of the rapidly growing residential enclaves within the Oforikrom Municipality. It is home to a significant population (estimated at about 28,860 in 2015) and accommodates students and workers from the Kwame Nkrumah University of Science and Technology (KNUST). The area has seen increasing real estate development, with many modern houses, hostels, and commercial activities emerging alongside traditional subsistence farming.
Fumesua / Okyerekrom	Fumesua and Okyerekrom are twin settlements within the Ejisu Municipality. Fumesua is best known for hosting the Forestry Research Institute of Ghana (FORIG), making it a center for forestry and environmental research. Okyerekrom, adjacent to Fumesua, has a strong farming base but is also developing into a residential hub due to its closeness to the Kumasi–Accra highway. Together, they reflect a blend of research-driven institutions and traditional agrarian lifestyles.
Kentikrono	Kentikrono is a growing residential community situated close to KNUST, making it attractive to students, lecturers, and urban workers. Housing estates, hostels, and commercial ventures dominate the landscape. Though farming still exists on its peripheries, it is gradually transitioning into a fully urbanized settlement.
Nahinso	Nahinso is a small peri-urban community situated in the Ashanti Region. It is predominantly agrarian, with farming households cultivating staples like maize, yam, and plantain. The settlement is characterized by dispersed housing and communal living. Its closeness to larger towns makes it partly dependent on external markets for trade and services.
Nsiene	Nsiene is a rural community with a strong farming base. Residents depend heavily on rain-fed agriculture, cultivating food crops for subsistence and local markets. The community has limited infrastructure and relies on nearby urban centers for social services such as education and healthcare.
Ramseyer	Ramseyer is a semi-urban residential settlement within the Kumasi area. The community developed around mission activities of the Ramseyer Presbyterian Mission and thus has strong Christian

Community Name	Description of low-income status
	religious roots. Today, it is primarily residential, with residents engaged in education, trading, and small-scale businesses.
Sewua Junction	Sewua Junction is located along a major road corridor and serves as a gateway to the larger Sewua community. The area is semi-urban, with roadside trading, transport services, and farming forming the basis of economic life. It is gradually transforming into a commercial node due to its strategic location
Twumdua / Konongo Mayanka	Twumdua and Konongo Mayanka are small farming-based settlements within the Asante Akyem Municipality. Residents are engaged in subsistence agriculture and petty trading. Konongo Mayanka is particularly influenced by its closeness to Konongo town, which provides access to mining-related economic activities
Odumasi Zongo / Kwakwaso	Odumasi Zongo and Kwakwaso are twin communities characterized by a blend of farming and Zongo (migrant) settlement patterns. The Zongo section has a strong trading culture, while the surrounding community engages in smallholder agriculture. Social life is shaped by Islamic traditions and inter-ethnic cohabitation
Santresu / Aburaso	Santresu and Aburaso are neighboring communities within the Kumasi peri-urban zone. Both are expanding residential settlements but retain strong agrarian roots. Residents cultivate food crops while increasingly participating in the urban economy through trading, artisanship, and transport
Akyeremade	Akyeremade is a farming-dominated settlement. Agriculture, particularly food crop farming, is the mainstay of the economy. The settlement is relatively small, with modest housing, communal structures, and close social networks. Urban expansion is slowly influencing its development.
Apire/Atiwa Boko	Apire is a semi-rural community known for subsistence farming and petty trading. It is located within the Kumasi peri-urban belt, making it a transitional community between rural agricultural livelihoods and urban-based employment. Atiwa Boko is a rural farming community. Residents rely mainly on crop cultivation, including yams, cassava, and maize. The community is relatively remote with limited infrastructure and depends on larger market towns for economic exchange
Brofuyeduru	Brofuyeduru is a small farming village with dispersed settlement patterns. Agriculture dominates, with limited access to modern infrastructure. Like many rural Ashanti communities, it depends on kinship networks and seasonal farming cycles.
Kokoben	Kokoben is a mixed residential and farming settlement. It serves as a roadside community with active trading activities, but also retains farming on its outskirts. Its location along a transport route makes it more commercially oriented than other purely agrarian villages.

Community Name	Description of low-income status
Kotwi	Kotwi is a fast-growing residential suburb within the Atwima-Kwanwoma District. It lies along the Kumasi–Obuasi road and has become an important dormitory town for workers in Kumasi. The area has both modern housing estates and traditional farming activities, making it a transitional community between rural and urban lifestyles.
Kromoase	Kromoase is a farming-based community in the Ashanti Region. It is relatively rural, with residents engaged in crop cultivation. Like many peri-urban settlements, it is gradually experiencing population growth due to spillovers from Kumasi's urban expansion.

4.3.3 Climatic Conditions

The Ashanti Region lies predominantly within the moist semi-deciduous forest ecological zone, extending into the transitional zone in its northern parts. The climate is strongly influenced by two major wind systems: the south-west monsoon winds from the Gulf of Guinea, which bring moisture and rainfall, and the north-east trade winds (Harmattan) from the Sahara, which usher in drier and dustier conditions between November and February. Relative humidity in the region is generally high throughout the year, averaging between 70% and 85% in the mornings and dropping to around 55%–65% in the afternoons. Humidity levels are highest during the peak rainy seasons and lowest during the Harmattan period.

Temperature patterns across the Ashanti Region are fairly uniform, though slightly moderated in elevated areas such as Mampong, Agona, and Obuasi. Data from the Ghana Meteorological Agency (GMET) indicates mean annual temperatures ranging between 23°C (cool mornings and evenings) and 33°C (hot midday periods). During the Harmattan season, night-time temperatures in northern Ashanti can fall below 20°C, while daytime conditions remain dry and hot.

Rainfall follows the typical double maxima regime of southern Ghana. The major rainy season occurs from April to July, peaking in June, while the minor rainy season spans September to October, peaking in October. The dry periods occur from December to February (Harmattan) and a relatively short dry spell in August. GMET data (2010–2020) shows annual rainfall totals ranging from 1,200 mm to 1,600 mm, with the heaviest rains recorded in the forested zones around Kumasi, Obuasi, and Bekwai. The northern transitional belt, including Ejura and Offinso, records slightly lower but well-distributed rainfall, supporting both cocoa cultivation in the forest belt and cereals in the northern areas.

4.3.4 Geology and Soil

The Ashanti Region is predominantly underlain by the Birrimian Supergroup of rocks, which covers much of central and southern Ghana. These consist of metasedimentary and metavolcanic formations, intruded in many places by granitoid complexes. A geological map of the project beneficiary communities within the Ashanti North and South GWL operational regions are are shown in Figure 4-6 and Figure 4-7 respectively. As shown in Figure 4-6, Adukro; Ayensua; Nyankasu; Offinso - Asamankese; Offinso - Dapul; Offinso - Habitat; Offinso - Mehame; Offinso - Old Town and Offinso – Tutuase lie within a Dahomeyan rock base. Abotanso; Woraso; Kumawu; Besoro; Bodomase and Temante lie within an Upper Volteien rock formation. In Ashanti South (as shown in Figure 4-7), Anwomaso; Boadi; Fumesua/ Okyerekrom; Kentikrono; Nahinso; Nsiene; Ramseyer; Sewua Junction; Twumdua; Konongo Mayanka; Odumasi Zongo/ Kwakwaso; Santresu; Aburaso; Akyeremade and Atiwa Boko lie in the Dahomeyan rock formation. Ahinsan Baptist; Apire; Brofuyeduru; Kokoben; Kotwi and Kromoase are within the Birimian Sediments while Konongo Mayanka and Odumasi Zongo/ Kwakwaso are within the Tarkwaian and Birimian Volcanics geological base respectively.

The soils of the Ashanti Region are the result of intense tropical weathering under high rainfall and temperature regimes, leading to deep, leached profiles with varying fertility levels. Three major soil associations can be distinguished:

- Forest Ochrosols – These dominate large portions of the forest zone, including Kumasi, Obuasi, and Bekwai areas. They are well-drained, loamy soils and generally fertile.
- Lateritic Soils – Occurring extensively in the upland and plateau areas, particularly around Ejisu, Mampong, and Offinso, these soils are rich in iron and aluminum oxides, giving them a characteristic reddish-brown coloration. While moderately fertile, they tend to harden under prolonged exposure and require careful management. The lateritic crust is also quarried for road construction and building.
- Alluvial Soils – Found along the valleys and floodplains of major rivers such as the Offin, Pra, and Oda, these soils are relatively fertile due to periodic deposition of silts and clays.

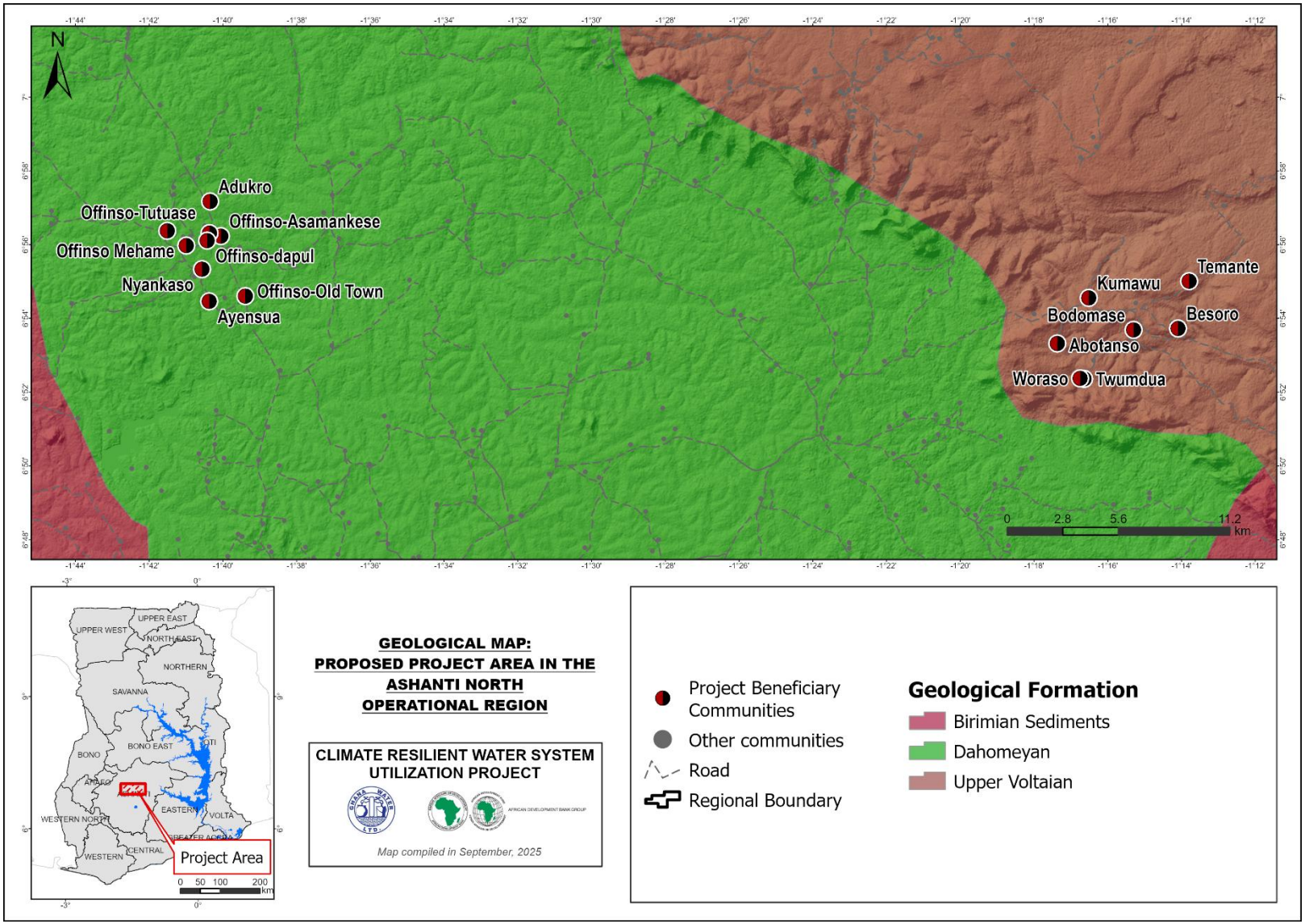


Figure 4-6: Geological map of the Ashanti North project beneficiary area

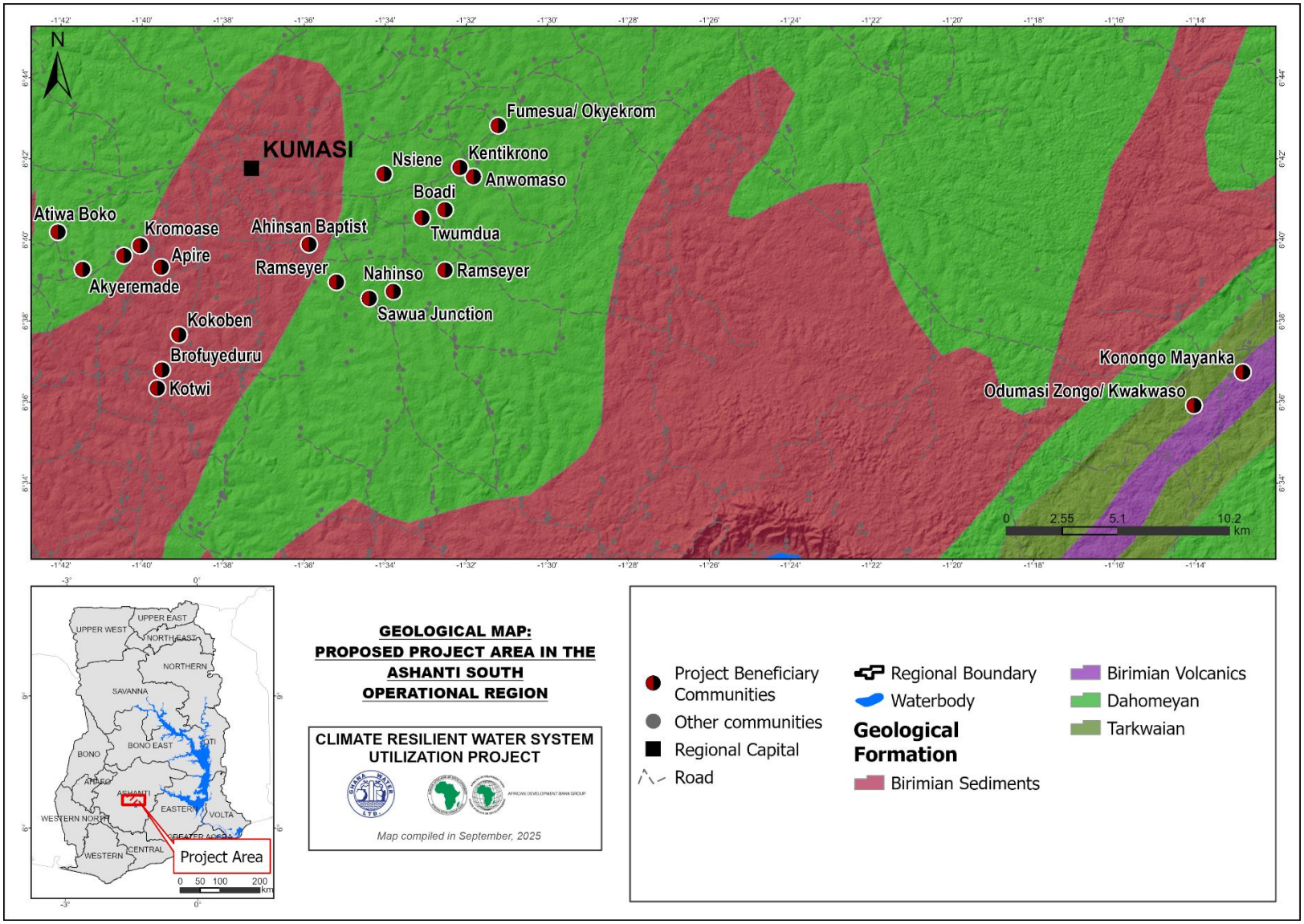


Figure 4-7: Geological map of the Ashanti South project beneficiary area

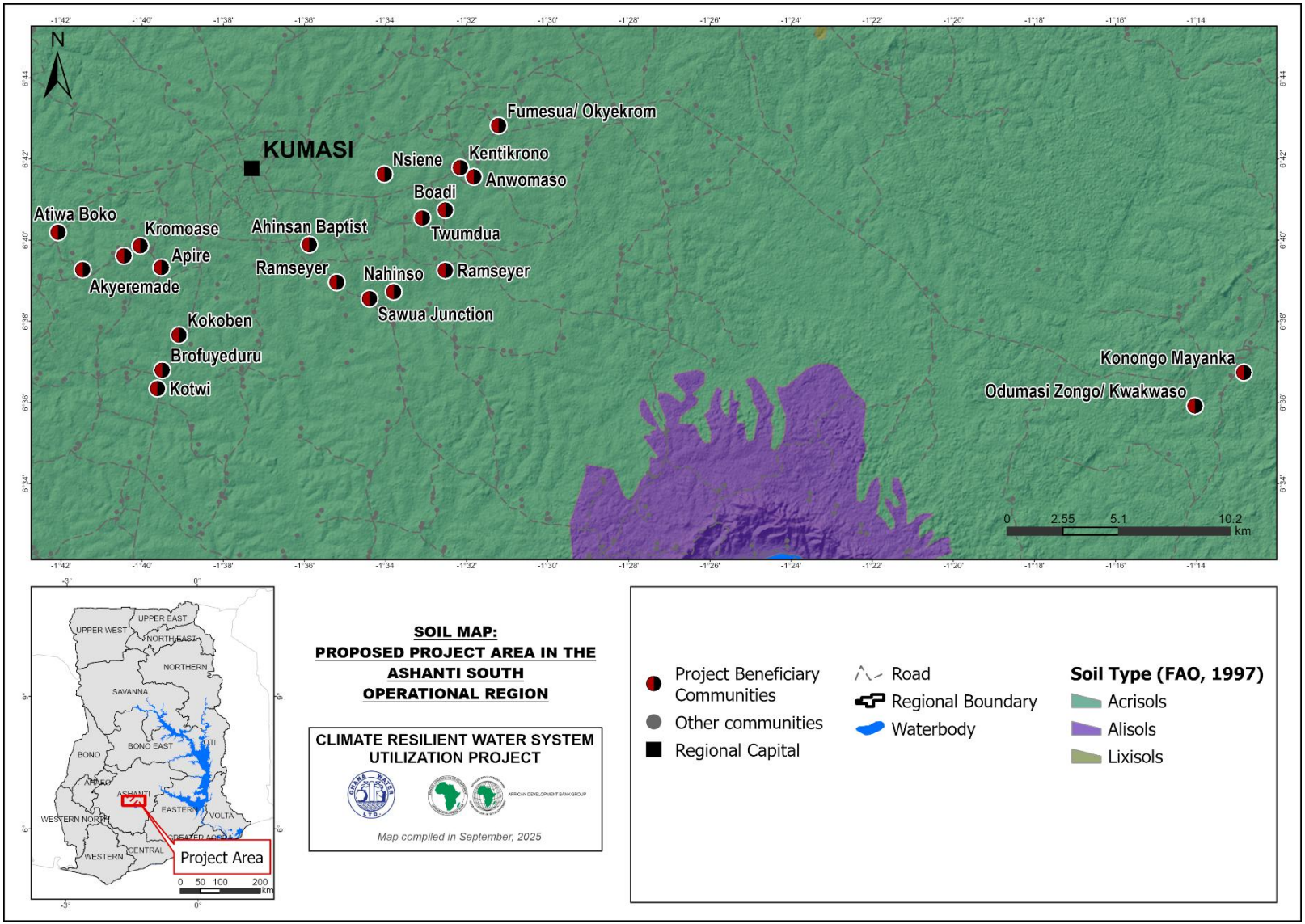


Figure 4-8: Soil map of the Ashanti North project beneficiary area

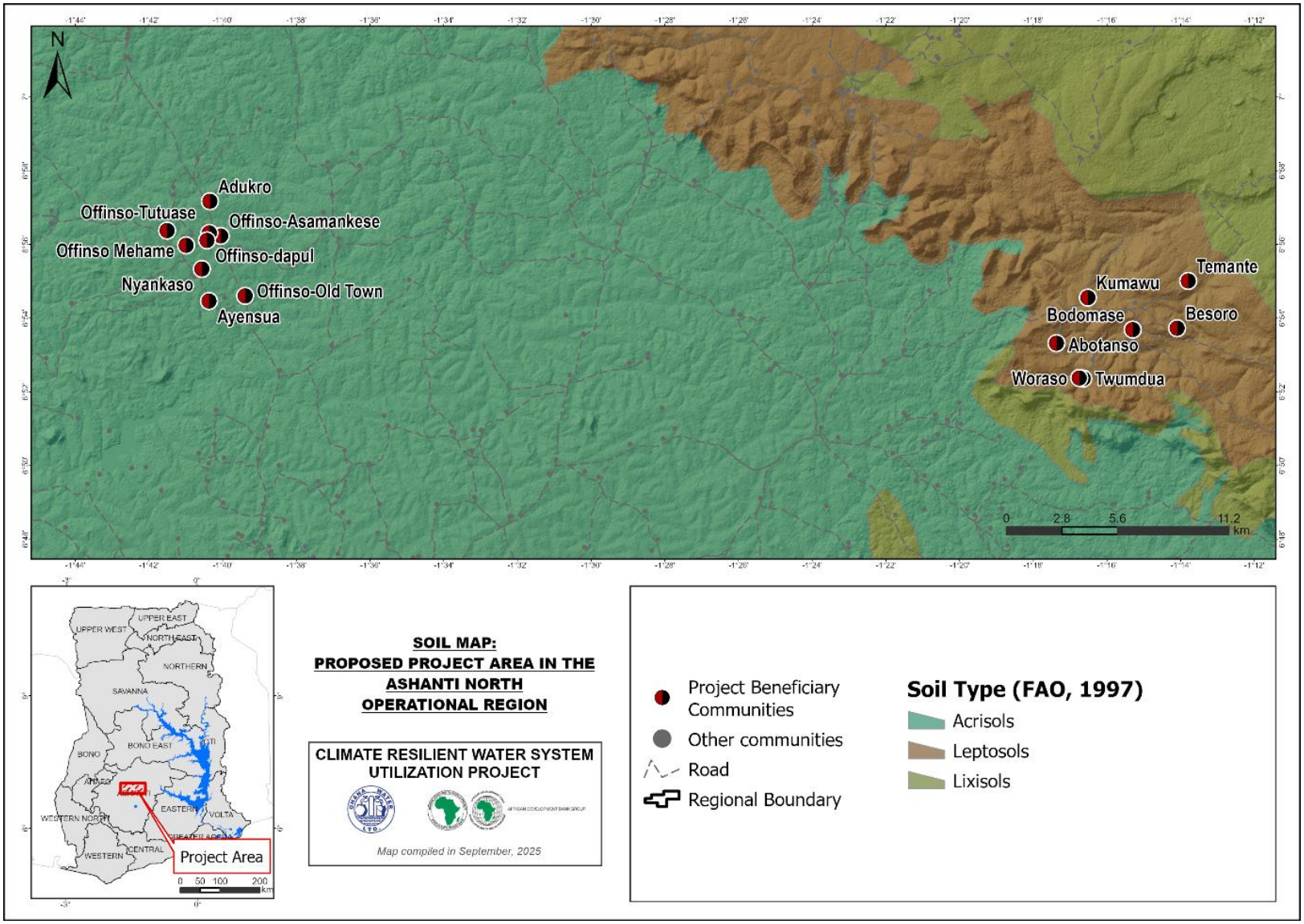


Figure 4-9: Soil map of the Ashanti South project beneficiary area

A soil map of the project beneficiary areas in the Ashanti North and South GWL operational regions are shown in Figure 4-8 and Figure 4-9, respectively. All the communities in the Ashanti North are within Acrisol soil types while the Ashanti South region has all the communities with Acrisol soil type with the exception of Kumawu, Temante, Besoro, Abotanso, Woraso, Twundua and Bodomase with Leptosol soil types.

4.3.5 Air and Noise Quality

Air quality in the Ashanti Region is generally considered moderate to good, particularly in the peri-urban and rural settlements where vegetation cover helps filter dust and pollutants. However, localized deterioration in air quality is common in densely populated towns such as Kumasi, Obuasi, Konongo, and Ejisu, where rapid urbanization, vehicular emissions, and commercial activity increase particulate concentrations.

One of the most significant contributors to air pollution is dust from untarred and poorly maintained roads. In addition, vehicular exhaust emissions particularly from older diesel-powered minibuses (“trotros”) and commercial trucks contributes to air quality deterioration. From Table 4-3 below, the ambient air quality results indicate that the air quality values of the communities are within the thresholds. This is due to the fact that the project RoWs are located in residential areas and the onset of the raining season douse the dust on the untarred roads.

Noise levels vary across the region but are generally higher in urban and peri-urban areas. From the table below, Temante, Woraso and Offinso have high noise levels during the day and this is attributed commercial activities, and widespread use of public address systems by churches, mosques, drinking spots, and funerals. New sites and rural suburbs such as Abotanso, Akyeremade, and Apire, noise levels are lower and usually limited to communal events.

Table 4-3: Air quality and noise level monitoring results in the Ashanti Region

Code	Noise Level				Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	dB_{max}	dB_{min}		dB(A)		µg/m³		µg/m³		µg/m³		µg/m³
AS1	Day	93.1	61.9	71.9	**55**	19.0	**150 (24 hours)**	22.2	**50 (24 hours)**	14.9	**35 (24 hours)**	33.9	**70 (24 hours)**
	Night	63.8	45.4	47.1	**48**								
AS2	Day	87.4	45.1	67.7	**55**	18.3	**150 (24 hours)**	20.1	**50 (24 hours)**	15.8	**35 (24 hours)**	30.2	**70 (24 hours)**
	Night	69.4	45.7	46.7	**48**								
AS7	Day	79.2	67.8	73.4	**75**	35.5	**150 (24 hours)**	22.7	**50 (24 hours)**	20.3	**35 (24 hours)**	22.6	**70 (24 hours)**
	Night	79.5	58.1	63.1	**65**								
AS3	Day	59.5	50.3	53.4	**55**	17.8	**150 (24 hours)**	14.7	**50 (24 hours)**	11.4	**35 (24 hours)**	19.1	**70 (24 hours)**
	Night	55.6	48.7	46.0	**48**								
AS4	Day	70.8	60.5	59.8	**55**	20.3	**150 (24 hours)**	34.0	**50 (24 hours)**	30.0	**35 (24 hours)**	50.3	**70 (24 hours)**
	Night	65.2	43.1	46.2	**48**								
AS5	Day	55.3	45.1	53.4	**55**	19.4	**150 (24 hours)**	12.0	**50 (24 hours)**	11.8	**35 (24 hours)**	16.8	**70 (24 hours)**
	Night	50.9	42.8	45.7	**48**								
AS6	Day	60.6	44.4	51.8	**55**	18.6	**150 (24 hours)**	15.3	**50 (24 hours)**	12.3	**35 (24 hours)**	16.3	**70 (24 hours)**
	Night	50.9	42.5	44.2	**48**								

4.3.6 Topography

The Ashanti Region exhibits a diverse and undulating topography, dominated by forested uplands, dissected plateaus, and broad low-lying plains. Elevations range from about 150 meters above mean sea level in the southern and western lowlands (around Obuasi, Bekwai, and parts of Offinso) to over 700 meters in the central and northern highlands, particularly around the Kumasi escarpment, Mampong scarp, and the Bosome and Asante Akyem uplands.

The region is largely underlain by the Kumasi Basin and Ashanti Belt, which have been shaped into gently rolling plains interspersed with steep ridges and isolated hills. The Kwahu-Mampong Scarp, which runs in a north-east to south-west direction, forms one of the most prominent topographic features, rising abruptly above the surrounding lowlands and serving as a natural boundary between the forest belt and the northern savannah transition.

Much of the central Ashanti landscape, including areas around Kumasi, Ejisu, and Konongo, consists of rolling hills and dissected plateaus, with slopes generally ranging between 8–15 percent, making them suitable for settlement and agriculture. However, along the escarpments and hilly zones such as Mampong, Sekyere, and Offinso highlands, slopes become steeper (20–30 percent), posing challenges for construction and mechanized farming but offering scenic views and opportunities for eco-tourism.

In contrast, the southern and western parts of the region, including Obuasi, Bekwai, and Amansie West, are dominated by broad valleys and low-lying plains. These areas are dissected by major river systems such as the Pra, Offin, and Oda rivers, whose alluvial valleys provide fertile grounds for agriculture and settlements. The northern margins of the region gently merge into the Voltaian basin plains, characterized by wider floodplains and open savannah woodland.

The topography of the project area in the Ashanti North and South regions are shown in Figure 4-10 and Figure 4-11 respectively.

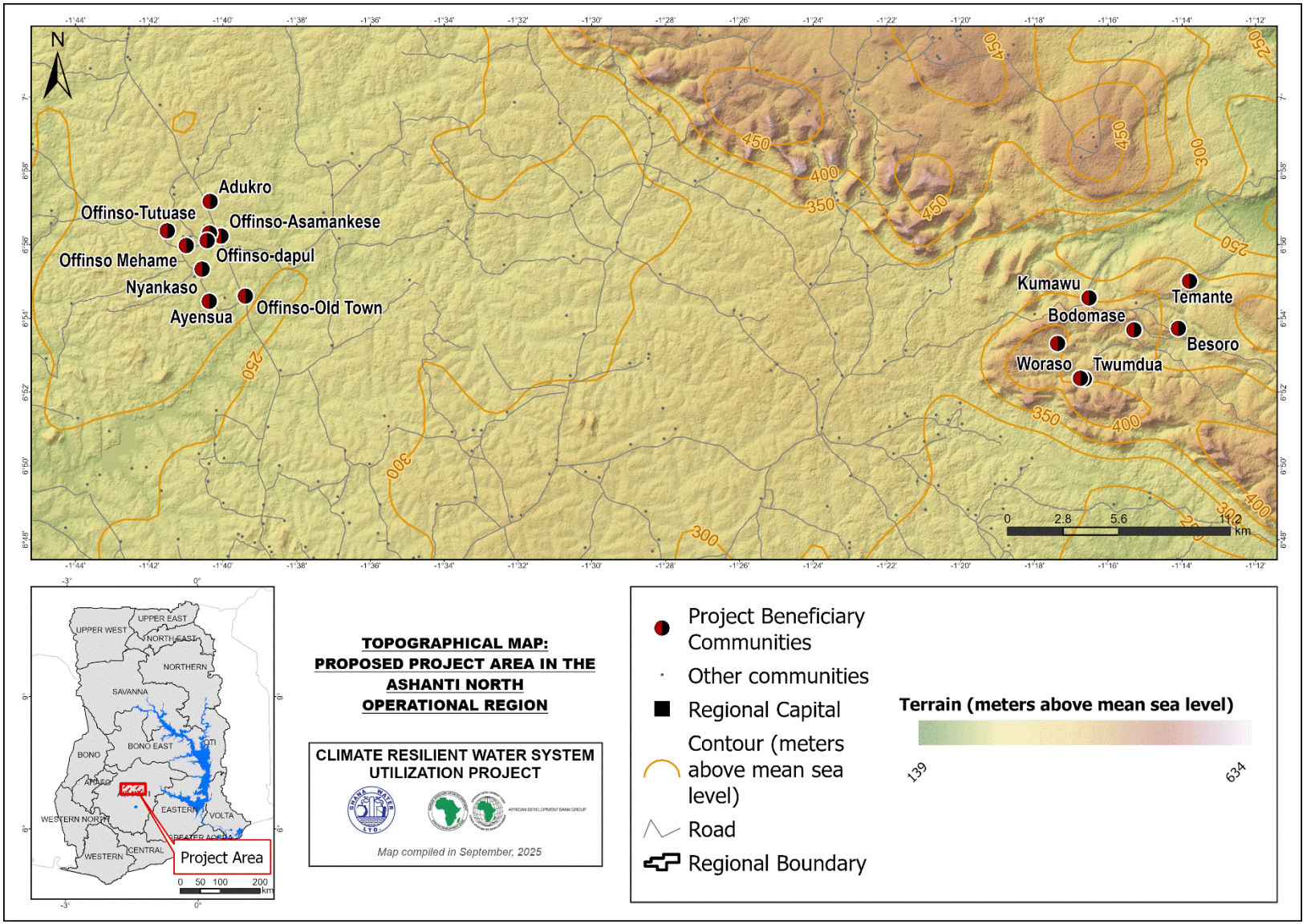


Figure 4-10: Topographical map of the Ashanti North project beneficiary area

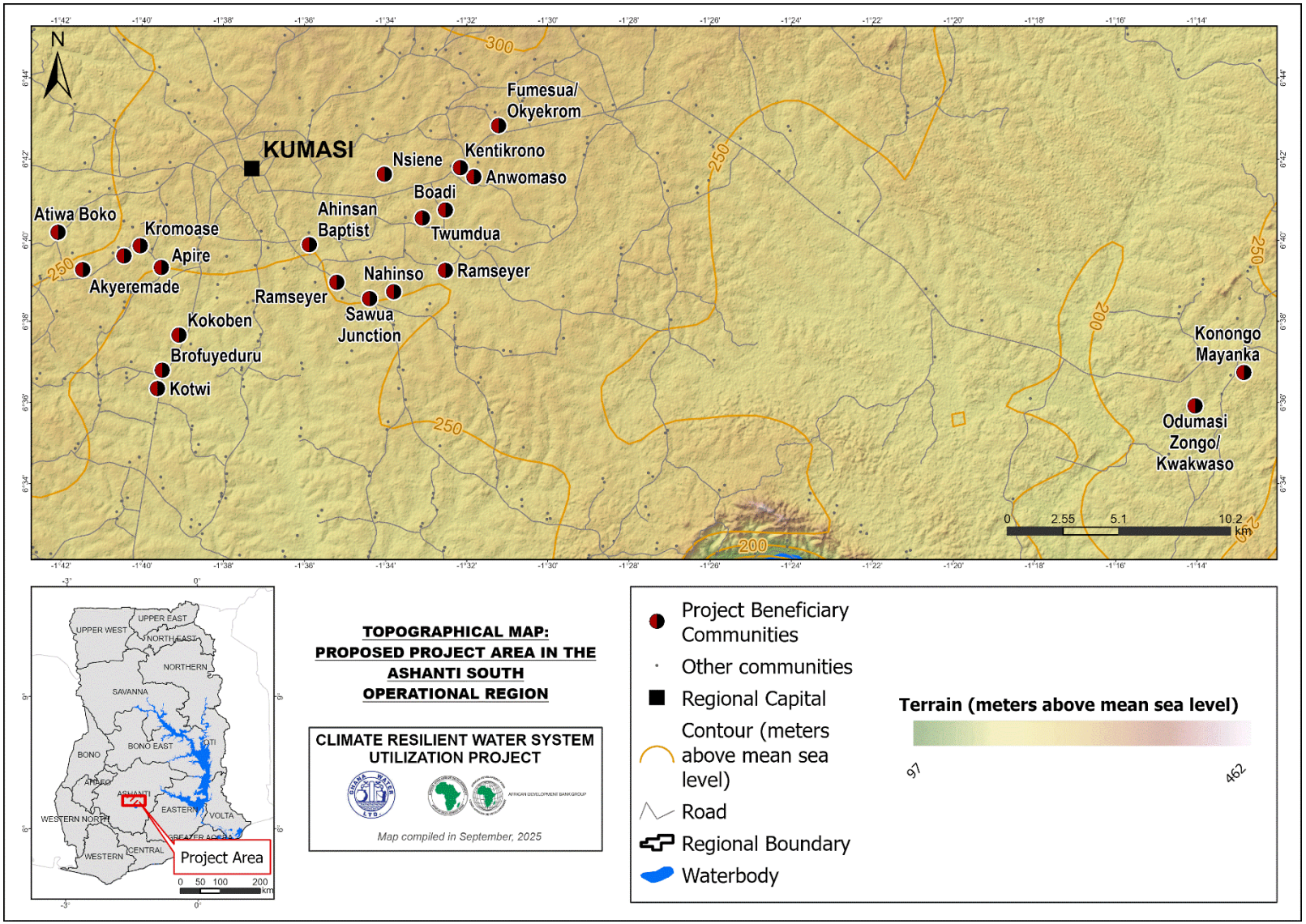
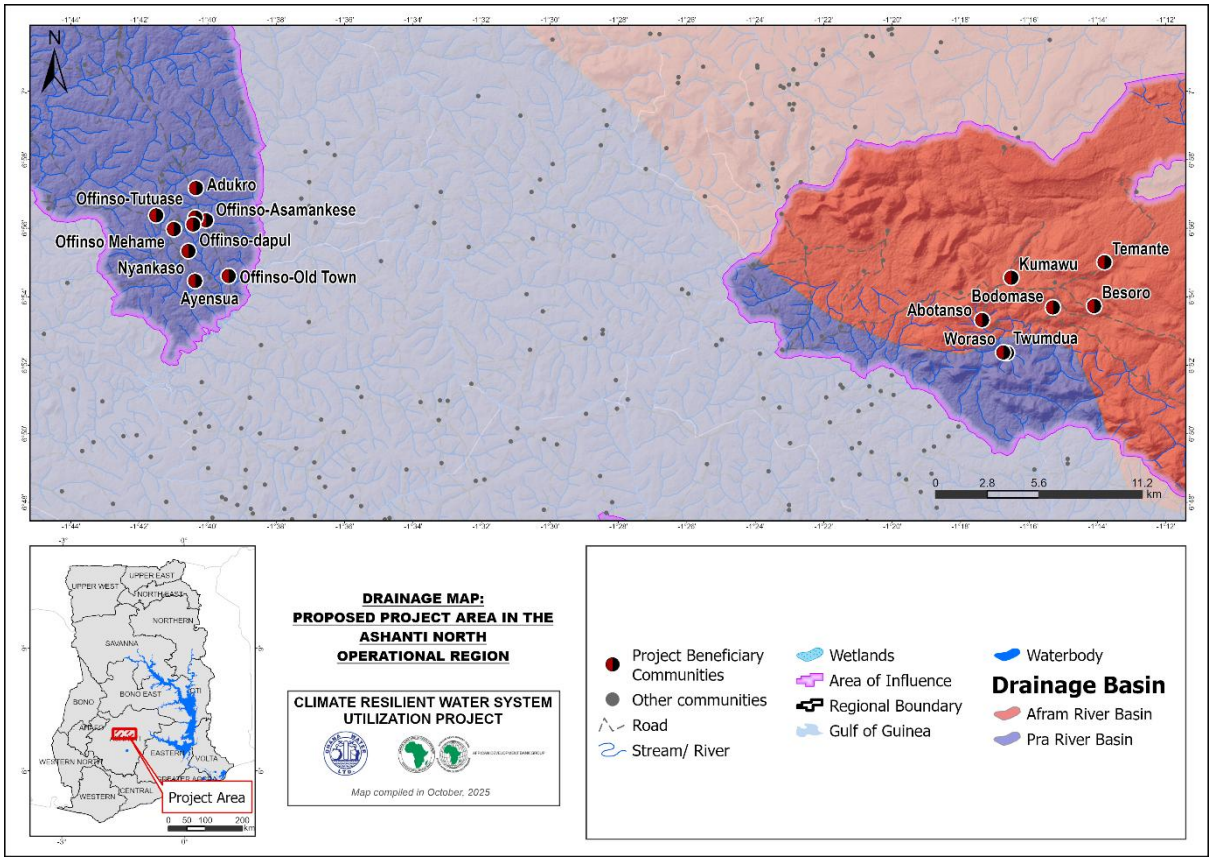


Figure 4-11: Topographical map of the Ashanti South project beneficiary area

4.3.7 Hydrology and water resources



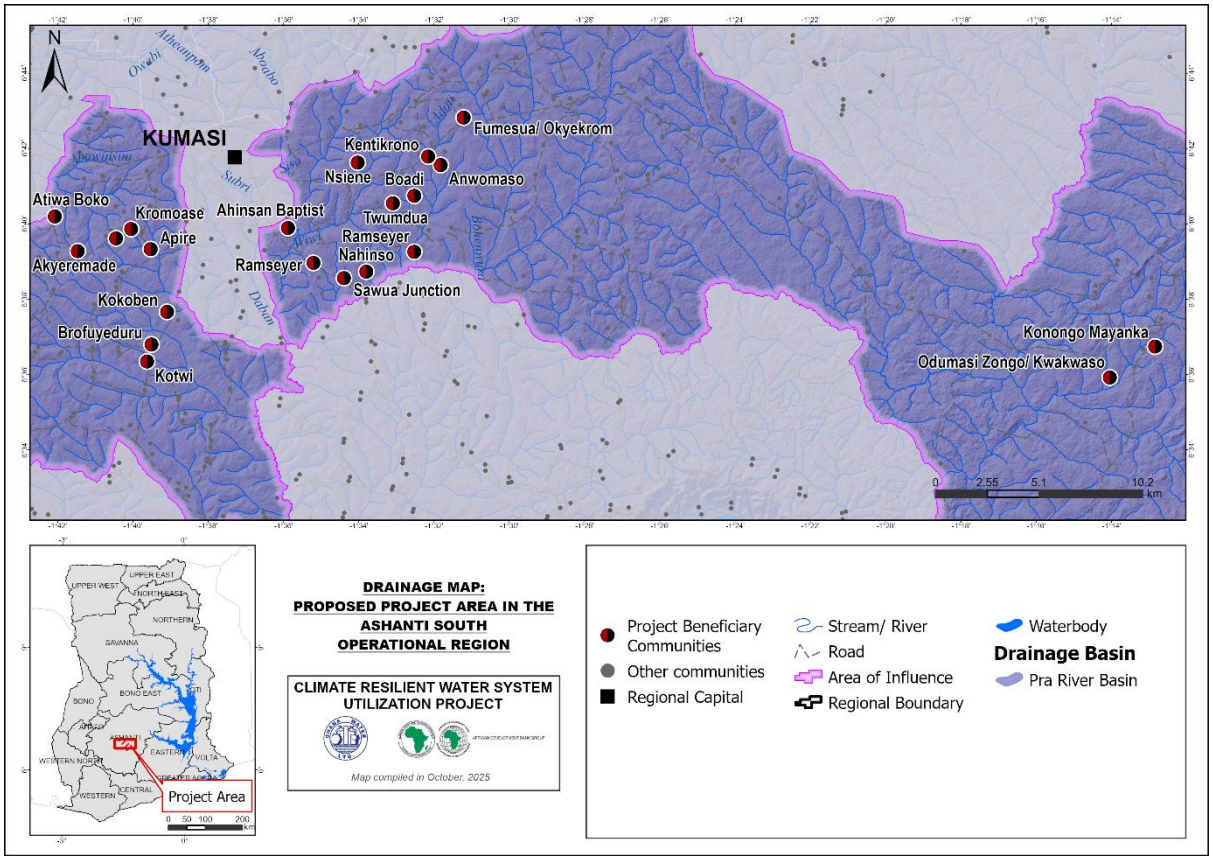


Figure 4-12: Drainage map of the Ashanti South and North of the project beneficiary area

The main drainage basin in the Ashanti North and South is the Pra Basin, one of Ghana's major drainage systems. However, from Figure 4-12 above, the western part of Ashanti North lies within the Afram river basin particularly for communities such as Kumawu, Bodomase, Woraso, Abotanso and Besoro. The basins exhibit a dendritic drainage pattern, characterized by a dense network of small streams and tributaries that flow predominantly southeastward into the main Pra River. The area's drainage is influenced by moderate relief and a humid tropical climate, resulting in perennial and seasonal streams that maintain flow throughout most of the year.

Surface water resources in the project district include numerous streams, small rivers, and localized waterbodies, which serve as vital sources for domestic use, irrigation, and ecological sustenance. The western section around Kumasi is more dissected with closely spaced tributaries, while the eastern section around Konongo is gentler, with broader valleys and slower-flowing streams. Overall, the drainage characteristics support favorable hydrological conditions for the implementation of the Climate Resilient Water System Utilization Project, enhancing water availability and management within beneficiary communities.

During site verification, it was observed that Owere River at Konongo-Patriensa is the only surface water body within the Ashanti Region that will interact directly with the project. Assessment of the water body revealed that turbidity, ammonia, colour and iron values exceeded the WHO guideline values. Total suppended solids also exceeded GSA standard value, thereby making it not suitable for drinking (see Appendix 6 for results of water quality assessment). Engagement with residents in the area confirmed activities of galamseyers further upstream which is impacting on the water quality level. It is however expected that the project implementation should not cause further deterioration of the water quality.

4.3.8 Flora and Fauna

The pipeline extension corridors in the Ashanti Region traverse densely settled and peri-urban communities, where the original moist semi-deciduous forest cover has been extensively degraded by farming, logging, mining, and urban expansion. As a result, natural vegetation along the proposed routes is largely absent, with only patches of secondary regrowth, smallholder crop farms, grasses, and scattered trees such as neem, mango, coconut, oil palm, and teak commonly observed in the landscape. In built-up areas, vegetation cover is almost non-existent. Consequently, pipeline construction activities will require only minimal vegetation clearance. The landcover and vegetation within the Ashanti North and South region is shown in Figure 4-13 and Figure 4-14 respectively.

Fauna within the project corridors is scarce, owing to high levels of human disturbance and habitat loss. Wildlife species such as antelopes, duikers, and monkeys are now largely restricted to protected forest reserves like Bobiri, Tano-Offin, and Subri River Forest Reserves, all of which are located well outside the project alignment. Within the project-affected suburbs, fauna is limited to small reptiles including lizards and amphibians like frogs, and non-venomous snakes, as well as common avifauna like weaverbirds, doves, pied crows, and sparrows, which thrive in disturbed and urbanized environments. See Appendix 9 for comprehensive data on flora and fauna species spotted during flora and fauna screening of the pipeline project corridor.

4.3.9 Socio-Economic characteristics

The Ashanti Region, home to the Asante ethnic group, is Ghana's most populous region and a major cultural and economic hub. The Akan, particularly the Asante, dominate the population, though significant minority groups such as the Ewe, Ga-Adangbe, Mole-Dagbani, Frafra, and other northern migrant communities are also present, particularly in urban and mining settlements. Christianity is the predominant religion, with sizeable Islamic communities (notably in Zongo settlements) and adherents of traditional religion maintaining their presence.

Livelihoods in the region are shaped by both its agrarian base and urban economy. In rural and peri-urban communities, farming remains the backbone, with major crops including cocoa, plantain, cassava, yams, maize, rice, and vegetables, supported by oil palm and citrus in specific zones. The Ashanti Region is one of Ghana's leading cocoa-producing areas, while food crop farming sustains both local consumption and trade. In urban areas such as Kumasi, Obuasi, and Konongo, the economy is highly diversified, with activities in trading, transport, construction, artisanship, services, and public sector employment.

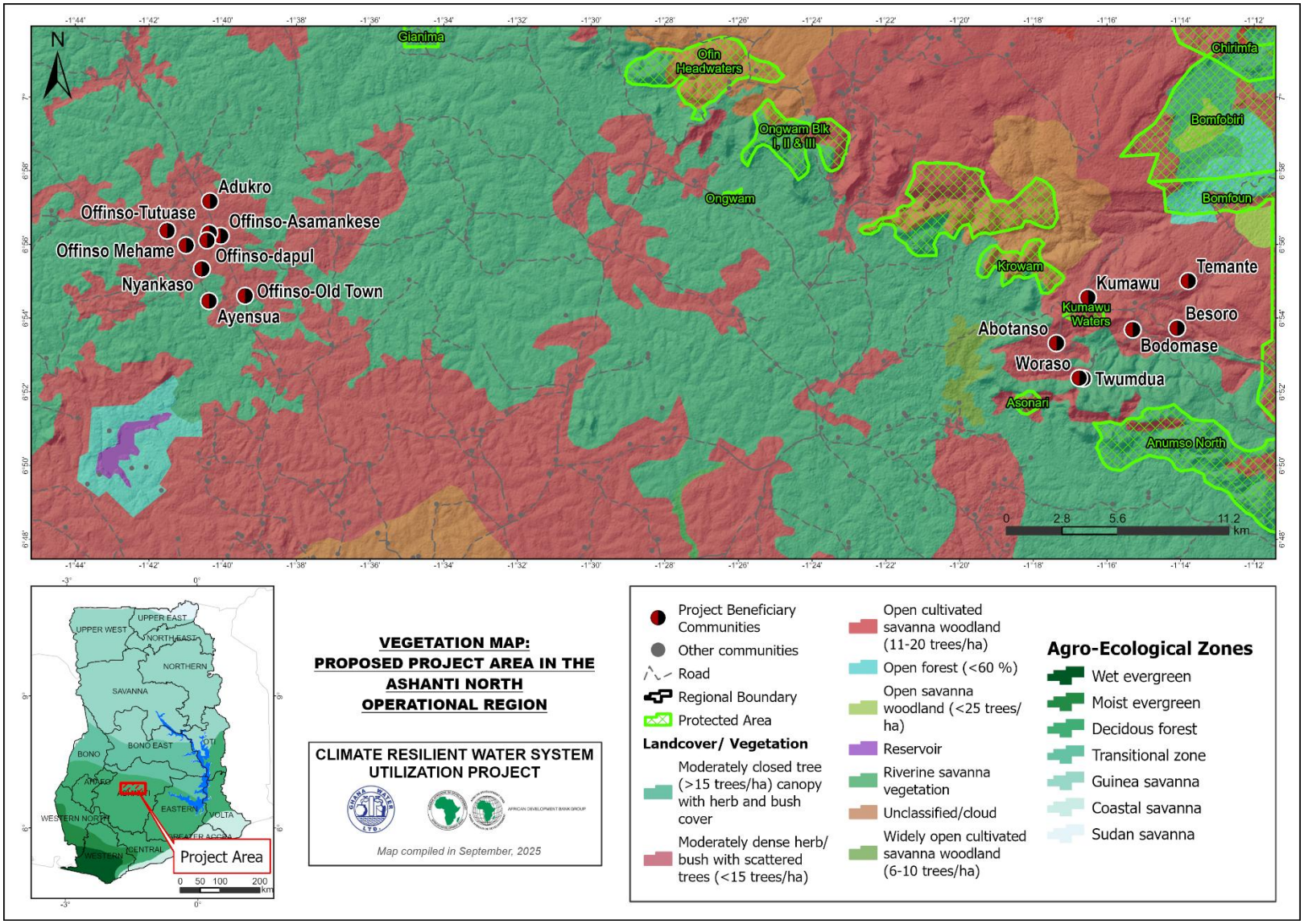


Figure 4-13: Vegetation and land cover map of the Ashanti North project beneficiary area

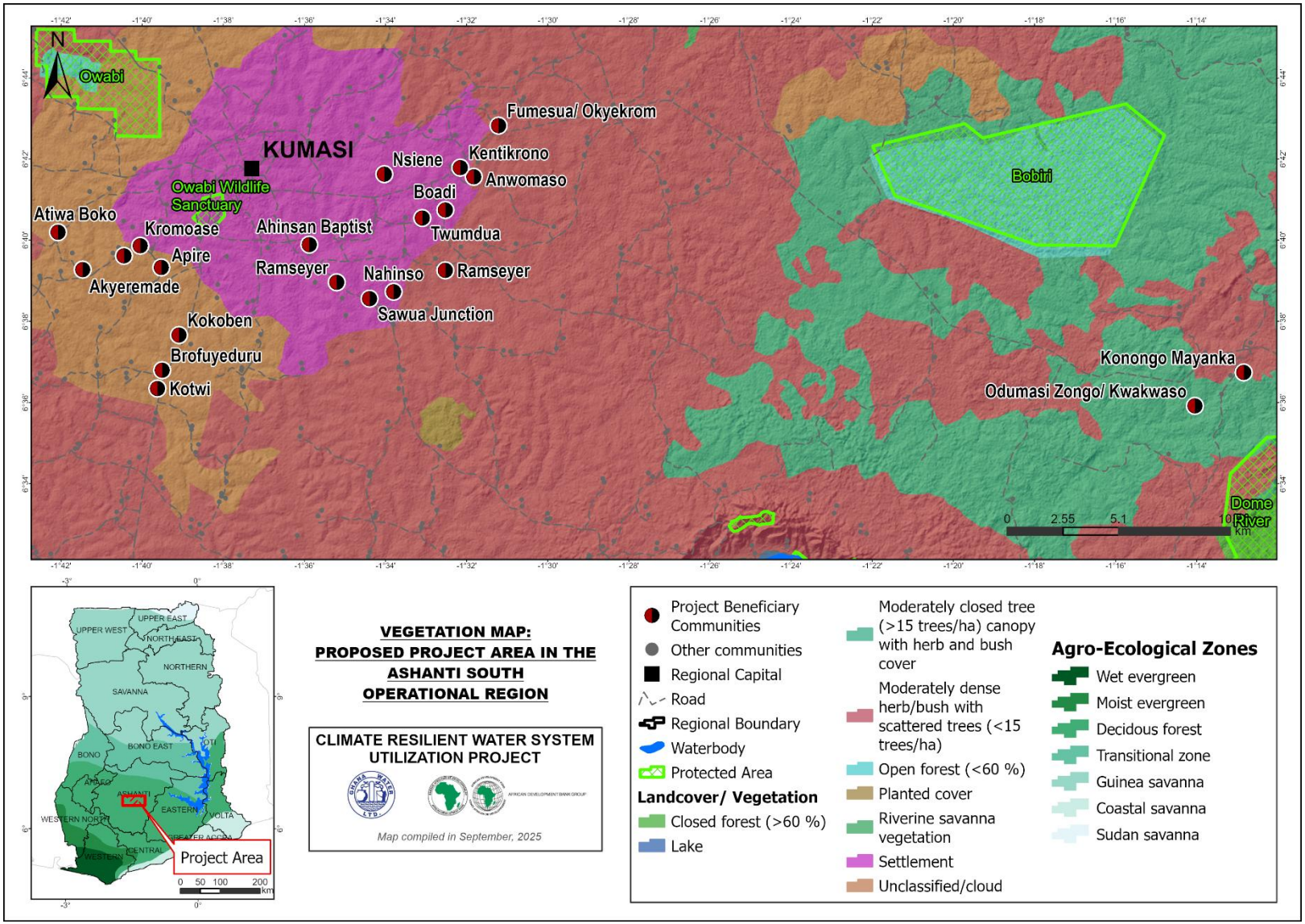


Figure 4-14: Vegetation and landcover map of the Ashanti South project beneficiary area

The Kumasi Central Market, one of West Africa's largest open markets, serves as the economic heart of the region, linking rural producers with urban consumers and export networks.

Low-income urban and peri-urban communities often rely on the informal sector, including petty trading, street vending, commercial motorbiking "Okada", and casual construction labor. Migrant populations contribute significantly to this informal economy. Remittances from relatives in other parts of Ghana and abroad also supplement household incomes.

Despite its economic vibrancy, the region faces several socio-economic challenges. Youth unemployment, particularly among educated young people, remains a major issue. In rapidly growing settlements, inadequate housing, poor sanitation, waste management issues, and pressure on the potable water supply are persistent problems. Access to quality education and healthcare is uneven, with rural communities often disadvantaged compared to Kumasi and other urban centers.

4.3.9.1 Population of Beneficiary Communities

The beneficiary communities in the Ashanti Region are predominantly urban and peri-urban, with many exceeding the Ghana Statistical Service (GSS) threshold of 5,000 persons for urban classification. The population structure is youthful, with a high proportion under 35 years, reflecting both natural increase and steady migration flows into the region.

Population growth is driven by the region's strong economic pull, especially in Kumasi, Obuasi, Konongo, and other commercial or mining centers, which attract migrants from both within and outside Ghana. Improved road networks, trading opportunities, educational institutions, and access to health facilities have also contributed to rapid settlement expansion in peri-urban areas such as Kentikrono, Anwomanso, and Fumesua.

Communities along transport corridors (e.g., Kumasi–Ejisu, Kumasi–Obuasi, Kumasi–Offinso roads) tend to show denser populations due to their role as residential enclaves for commuters working in Kumasi and other urban hubs. In contrast, rural farming communities like Apire, Akyeremade, and Atiwa Boko record lower population densities but still show moderate growth from natural increase and localized migration.

The population composition is economically active, dominated by traders, artisans, transport operators, small-scale miners, and farmers in rural areas. Household sizes are generally large, averaging 5–6 members, consistent with national patterns in Akan-dominated communities. Gender balance is relatively even, though female-headed households are increasingly visible in urban Zongo communities such as Odumasi Zongo/Kwakwaso.

4.3.9.2 Ethnicity of the Residents of the Project Communities

The ethnic composition of the project communities in the Ashanti Region reflects the dominance of Akan subgroups (primarily Asante), who are the indigenous people of the region. However, the rapid urbanization of Kumasi and surrounding peri-urban towns has attracted significant populations of Ewe, Ga-Adangbe, and northern ethnic groups (Dagomba, Mamprusi, Gonja, Hausa, Grushi, and others), particularly in Zongo-type settlements and roadside commercial areas. Migration linked to trading, artisanal work, and educational opportunities has created a cosmopolitan and culturally diverse population mix, though Akans remain the majority in nearly all settlements.

4.3.9.3 Religion

Religious affiliation across the project communities in the Ashanti Region is strongly dominated by Christianity, which accounts for between 82% and 90% of the population. The largest denominations represented include Pentecostal/Charismatic, Methodist, Presbyterian, and Roman Catholic, reflecting the strong Christian missionary influence in Ashanti.

Islam is the second most practiced religion, with its proportions varying widely depending on the settlement type. In peri-urban and predominantly Akan communities, Muslims make up less than 10% of residents. However, in Zongo-type settlements such as *Odumasi Zongo/Kwakwaso* and *Konongo Mayanka*, Islam is more prominent, ranging from 15% to 25% of the population, due to the concentration of Northern and Hausa migrant communities.

A small proportion of residents, estimated at 3–5%, continue to practice Traditional African Religion, particularly among older generations in peri-urban farming communities. Other minority faiths, such as Jehovah's Witnesses, Seventh Day Adventists, and small groups affiliated with new religious movements, are present but in marginal numbers.

4.3.10 Economic Activities

Economic activities across the project communities in the Ashanti Region are dominated by the informal sector, though patterns vary between urban, peri-urban, and farming settlements.

- Urban and peri-urban communities (Boadi, Kentikrono, Ahinsan Baptist, Fumesua/Okyerekrom): These areas are characterized by trading, food vending, transportation services, and artisan work such as carpentry, masonry, tailoring, hairdressing, welding, and mechanics. Proximity to Kumasi and institutions like KNUST and Fumesua Research Centre has also fostered petty commerce, student-related services, and small-scale hospitality (hostels, eateries, and shops).

- Zongo and migrant communities (Odumasi Zongo/Kwakwaso, Konongo Mayanka, parts of Ramseyer): Economic activity is strongly tied to petty trading, food vending (notably Hausa foods), transport services, mechanics, and artisanal crafts. Migrants from northern Ghana also dominate in cattle rearing, butchery, and small-scale retailing, while women are active in street vending and food processing.
- Farming and semi-rural communities (Apire, Atiwa Boko, Akyeremade, Brofuyeduru, Kromoase, Nsiene): Agriculture remains the backbone, with residents cultivating cassava, plantain, maize, cocoyam, vegetables, and cocoa in some areas. Many combine farming with petty trading or seasonal labor in Kumasi.
- Emerging residential enclaves (Sewua Junction, Aburaso, Kokoben, Kotwi): These settlements are transitioning into semi-urban areas. Economic activity is mixed—subsistence farming in the outskirts, alongside transport, trading, and construction-related jobs. Many residents commute daily to Kumasi for work, reflecting their dependence on the city's economy.

Land use along the pipeline routes is dominated by dense residential settlements, mostly low- to middle-income housing with kiosks and petty trading along road corridors. Commercial uses such as markets, food vending, and workshops are concentrated at junctions and transport nodes. Civic and institutional facilities like schools, churches, mosques, and health centers are scattered throughout, with major institutions such as KNUST and the Sewua Regional Hospital serving as key landmarks.

In rural suburbs**,** farmlands, fallow lands, and secondary vegetation remain significant, with crops like cassava, maize, plantain, and vegetables commonly cultivated. Zongo settlements (e.g., Odumasi Zongo, Konongo Mayanka) are high-density, mixed-use areas combining housing with small-scale trade and mosques. Parts of the route also follow road and utility corridors, where land use is transitional and heavily influenced by informal roadside activities.

4.3.11 Educational Facilities along Pipeline route

Educational facilities along the proposed pipeline routes in the Ashanti Region are limited and unevenly distributed across the beneficiary communities. While some larger suburbs such as Fumesua/Okyerekrom, Kentikrono, Boadi, and Kotwi have at least one basic school located within or close to the pipeline corridors, many others are either without formal schools or rely on facilities in neighboring settlements.

- Communities without schools along pipeline routes are Smaller or peri-urban settlements such as Abotanso, Ahinsan Baptist, Anwomanso, Nahinso, Nsiene, Ramseyer, Sewua Junction, Twumdua, Mayanka (Konongo), Odumasi Zongo/Kwakwaso, Santresu, Aburaso, Akyeremade, Apire, Atiwa Boko, Brofuyeduru, Kokoben, and Kromoase have no schools directly along the pipeline routes. Children in these areas typically walk to nearby towns for access to primary or junior high education.
- Communities with one school along the pipeline routes Fumesua/Okyerekrom – Home to Fumesua Anglican Basic & JHS, one of the largest public schools in the area, with significant enrollment but facing congestion challenges. Kentikrono – Hosts a community basic school and several private institutions serving the peri-urban population around KNUST. Boadi – Contains at least one public basic school and private educational institutions within reach of the pipeline route. Kotwi – Has Kotwi SDA Basic School and a few smaller private schools along the corridor.

4.3.12 Health Facilities along Pipeline route

Health infrastructure along the proposed pipeline corridors in the listed Ashanti Region communities is relatively limited. The majority of settlements rely on nearby public health centers, CHPS compounds, and private clinics, while advanced medical services are sought in larger urban centers such as Kumasi, Ejisu, and Konongo.

4.3.12.1 Observed Health Facilities

Along the pipeline routes, only a few health facilities are directly located within or close to the alignments. These include:

- Fumesua Health Centre – A public facility located close to the Okyerekrom/Fumesua stretch, providing primary health care, maternal services, and child immunizations to both Fumesua and neighboring communities.
- Kentikrono Community Clinic – A private clinic situated along the Kumasi–Ejisu corridor, serving the growing student population and residents in Kentikrono and Anwomanso.
- Sewua Junction CHPS Compound – A publicly owned facility offering basic outpatient, maternal, and preventive services. It caters to Sewua, Ramseyer, and nearby peri-urban settlements.

4.3.12.2 Communities Without Direct Health Facilities Along the Routes

Abotanso, Ahinsan Baptist, Anwomanso, Boadi, Nahinso, Nsiene, Ramseyer, Twumdua, Konongo Mayanka, Odumasi Zongo/Kwakwaso, Santresu, Aburaso, Akyeremade, Apire, Atiwa Boko, Brofuyeduru, Kokoben, Kotwi and Kromoase do not have a health facility directly along the pipeline routes, though residents' access nearby town facilities. In these areas, residents typically depend on larger hospitals and clinics in Kumasi, Ejisu, Offinso, and Konongo for secondary and tertiary care.

4.3.13 Morbidity Trends in the Project Zones

Morbidity data for the Ashanti Region project communities reflect the public health challenges typical of peri-urban and low-income urban settlements in Ghana. The Ghana Health Service statistics from the relevant municipalities show that the disease burden is primarily driven by environmental and sanitation-related conditions, exacerbated by inadequate waste management, poor drainage, limited potable water access, and overcrowded housing.

4.3.13.1 Dominant Morbidity Trends

Across the project localities, the top ten reported diseases are consistent with national patterns for peri-urban and rural Ghana, with the following featuring prominently:

- Malaria – The single leading cause of outpatient attendance across nearly all the project communities. Its prevalence is linked to stagnant water, poor drainage systems, and vegetation cover in peri-urban zones.
- Diarrhea Diseases – Highly reported, particularly in Zongo and low-income communities such as Odumasi Zongo/Kwakwaso and Konongo Mayanka, due to poor sanitation, limited potable water, and reliance on public latrines.
- Skin Diseases – Conditions such as scabies and fungal infections are widespread, often resulting from overcrowding, poor hygiene practices, and inadequate access to clean water.
- Respiratory Infections (URTIs) – Common in densely populated settlements like Kentikrono, Boadi, and Fumesua/Okyerekrom, driven by poor housing ventilation, household air pollution (firewood/charcoal use), and dusty road conditions.
- Intestinal Worms and Typhoid – Linked to unsafe water sources and poor environmental sanitation, reported in farming-peri-urban areas like Abotanso, Akyeremade, and Brofuyeduru.

- Hypertension & Other Non-communicable diseases (NCDs) – Increasingly observed in semi-urban communities such as Boadi, Kentikrono, and Kokoben, where lifestyle changes, urban diets, and reduced physical activity are becoming more common.

4.3.14 Observations in the community

In general, the following observations were made across all the selected beneficiary communities within the region.

- Peri-urban agrarian communities **(**Abotanso, Brofuyeduru, Atiwa Boko, Apire, Akyeremade): High prevalence of malaria, diarrhea diseases, and intestinal worms due to poor drainage and agricultural-related exposure.
- Urban/semi-urban settlements (Kentikrono, Boadi, Fumesua/Okyerekrom, Ahinsan Baptist): Mix of communicable diseases (malaria, diarrhea, respiratory infections) alongside rising cases of hypertension and diabetes.
- Zongo-type communities (Odumasi Zongo/Kwakwaso, Konongo Mayanka): Higher burden of diarrhea diseases, skin infections, and malaria due to overcrowding, poor sanitation, and limited water access.
- Rapidly growing fringe towns like Kotwi, Kromoase, Sewua Junction, Ramseyer, and some others transitional morbidity profile still dominated by malaria and diarrhea but are gradually recording NCDs due to urbanization pressures.

4.4 Bono Region

4.4.1 Regional Overview

The Bono Region was created in December 2018 when it was carved out of the former Brong-Ahafo Region, along with the Bono East and Ahafo regions. This change was part of a broader initiative to enhance local governance and development in Ghana. The region covers an area of approximately 11,481 square kilometers and has a population of about 1,343,499 according to the 2025 projected estimate from GSS. Unlike the highly ruralized Volta, Upper West and Upper East Regions, the region remained largely urban, with a rural population share of about 39%, and urban dwellers making up around 61%**.**

The capital of the Bono Region is Sunyani, often referred to as the "green city of Ghana" due to its lush environment. Sunyani serves as a major conference destination and is known for being one of the cleanest cities in the country.

The region is largely urban in character and has significant urban centers, including Sunyani (the regional capital), Wenchi, Dormaa, Jaman South and Berekum.

The economy of the Bono Region is predominantly agrarian, with a significant portion of the population engaged in agriculture. The region is known for producing cash crops such as cashew and timber, as well as food crops like maize, cassava, and plantain. The fertile soil and favorable climate contribute to its agricultural productivity.

The region is ethnically diverse, with the Bono (Brong) and Ahafo (Akan) groups forming the majority, alongside significant migrant populations from Northern Ghana and neighboring West African countries, attracted by fertile lands and agricultural opportunities. Religiously, Christianity was the dominant faith, followed by Islam and Traditional African Religion.

4.4.2 Description of Project Beneficiary Communities

Table 4-4 below provides a vivid description of the nature of the selected beneficiary community with a focus on its low-income urban status.

Table 4-4: Description of Project Beneficiary Communities in Bono Region

Community Name	Description of low-income status
Asuano	Asuano is a farming community located within the Wenchi Municipality of the Bono Region. The settlement is predominantly rural, with households engaged in subsistence and small-scale commercial farming. Major crops include yam, cassava, plantain, and maize, alongside cashew, which has emerged as a cash crop. The community is made up of indigenous Bono people, though migrants from the north of Ghana also reside there due to fertile farmlands. Social amenities are modest, with access to schools and health services dependent on nearby Wenchi town.
Beposo (BA)	Beposo in the Bono Region is a medium-sized rural settlement known for its farming activities. The land use pattern is dominated by farmlands interspersed with residential clusters. The community is also known for livestock rearing, particularly goats and poultry, which supplement crop production. Social life is strongly tied to traditional festivals and local markets, which attract surrounding hamlets. Access roads link the community to Wenchi and Techiman, supporting the trading of foodstuffs.
Droboso	Droboso is a peri-urban community located close to Wenchi town. Unlike other smaller rural communities, Droboso has benefited from Wenchi's urban expansion, gradually transforming into a residential suburb with semi-urban characteristics. Residents are engaged in both farming and trading, with some commuting to Wenchi for employment and education. Basic schools are present within the settlement, but secondary and health facilities are accessed in Wenchi.

Community Name	Description of low-income status
Koase	Koase is a prominent farming community within the Wenchi Municipality. It is larger than most surrounding settlements and hosts a vibrant local market that serves as a trade center for nearby farming villages. Koase Senior High Technical School (KSTS) is located here, making the community an educational hub. Agriculture is the backbone of the local economy, with yams, maize, and cashews being major outputs. Koase's relatively larger size means it has more social amenities than smaller hamlets
Nkosia	Nkosia is a smaller, rural farming community within the Wenchi area. It is primarily agrarian, with households depending on maize, cassava, and yam cultivation. The settlement structure is dispersed, with compounds separated by farmlands. It has limited social infrastructure, so residents rely on nearby larger communities for services.
Yoyoano	Yoyoano is another farming settlement near Wenchi, Bono Region. It is characterized by extensive food crop production, particularly yams and maize, which are sold in Wenchi and Techiman markets. Social services such as schools and clinics are either limited or absent, compelling residents to access them in Wenchi. Migration from northern Ghana for farm labor is common.
Wurompo	Wurompo is a rural farming community near Wenchi. The settlement is agrarian in nature, with cashew plantations gaining prominence alongside food crop cultivation. It is relatively small, with dispersed housing patterns. Social services are minimal, and residents depend on Wenchi and Koase for education, health, and market access.
Kromoase	Kromoase is a medium-sized farming community within the Wenchi area, Bono Region. The community produces yam, maize, and cashew and participates in the Wenchi market economy. Settlement patterns are clustered, with family compounds surrounded by farmland. Though rural, its location along connecting routes gives it access to trade and transport services.

4.4.3 Climatic Conditions

The Bono Region lies mainly within the forest-savannah transitional ecological zone, stretching into the moist semi-deciduous forest in its southern portions and the Guinea savannah in its northern parts. The climate is shaped by two dominant wind systems: the south-west monsoon winds from the Gulf of Guinea, which bring rainfall and humidity, and the north-east trade winds (Harmattan) from the Sahara, which dominate between November and February with dry and dusty conditions. Relative humidity varies seasonally, averaging between 65% and 85% in the mornings and dropping to around 50%–60% in the afternoons. The highest humidity levels occur during the rainy seasons, while Harmattan brings marked dryness and reduced visibility.

Temperatures across the Bono Region are generally warm to hot, with mean annual values ranging between 22°C in the cooler mornings and 34°C during the hottest afternoon periods. Elevated areas such as Wenchi and Techiman experience slightly moderated conditions compared to the lower-lying savannah zones.

Rainfall distribution reflects the transitional location of the region, showing a double maxima pattern similar to southern Ghana but with slightly reduced totals. The major rainy season spans April to July, peaking in June, while the minor rainy season occurs between September and October, peaking in October. Dry spells dominate between December and February (Harmattan) and a short August break. Annual rainfall ranges between 1,100 mm and 1,400 mm, according to Ghana Meteorological Agency (GMET) data (2010–2020).

4.4.4 Geology and Soils

The Bono Region is underlain largely by the Voltaian Sandstone Basin in the eastern and northern sections and the Birrimian and associated granitoid formations in the southern and western zones. The Birrimian belts host significant gold deposits, making the area a prospective mining center.

The region also contains resources such as bauxite, clay, and laterite, though these are exploited on a smaller scale. The widespread lateritic caps reflect long-term tropical weathering and are locally used for construction and road-building materials. The geology of the project area in the Bono GWL operational region is shown in Figure 4-15.

The proposed project communities lie in the upper voltaian rock formation. This rock formation has sandstone layers which act as aquifers, storing and transmitting groundwater. Many boreholes and hand-dug wells in parts of the communities tap into these aquifers. This makes the formation vital for rural water supply, irrigation, and livelihoods in semi-arid areas.

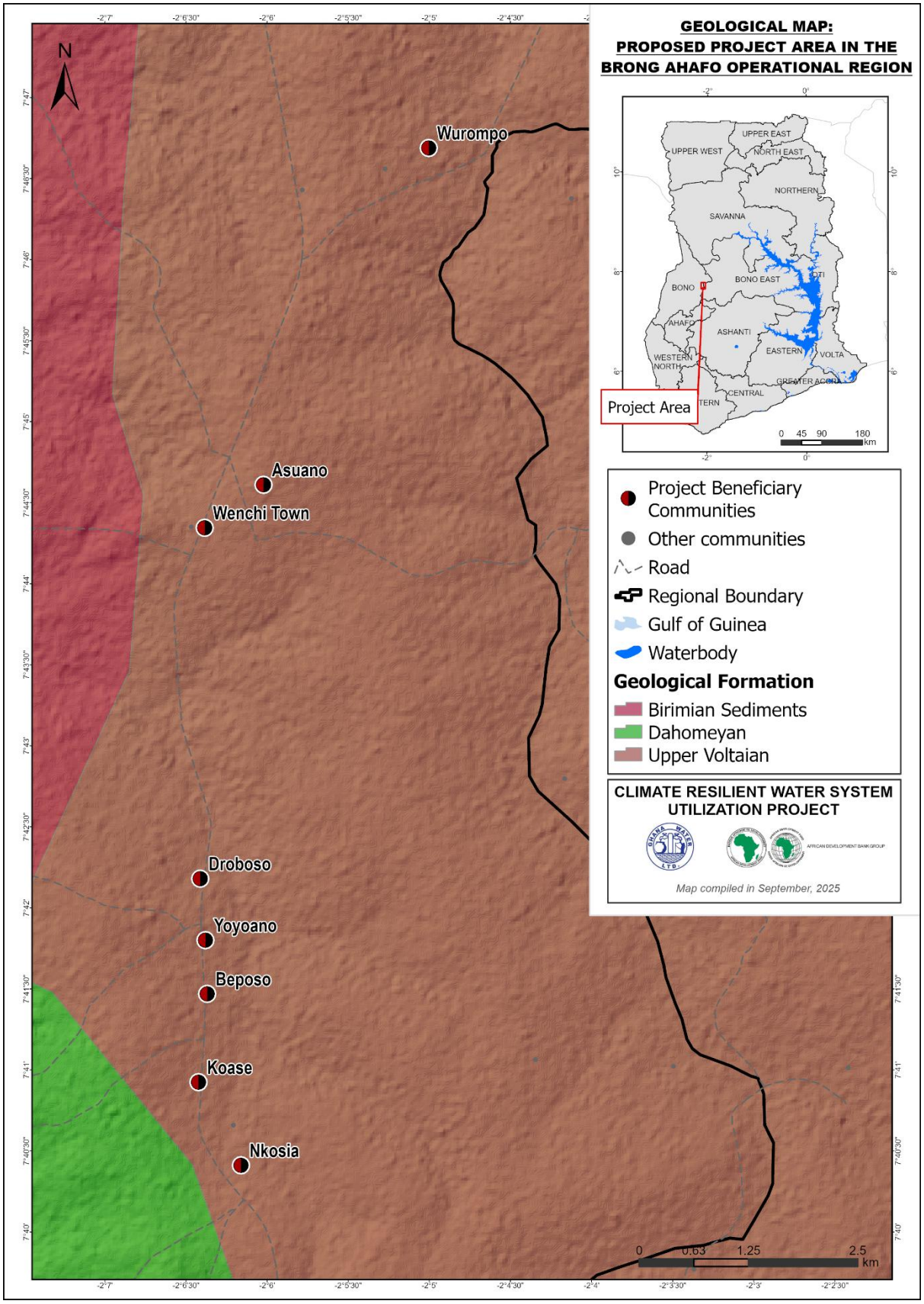


Figure 4-15: Geological map of the Bono Region project beneficiary area

The soils of the Bono Region are diverse, reflecting the transition from moist semi-deciduous forest in the south to savannah in the north. Intense tropical weathering has produced deep, well-leached profiles, though fertility varies considerably by zone. Three major soil associations are notable:

- Forest Ochrosols – These dominate the southern and central forested zones, including Dormaa, and Sunyani. They are well-drained, loamy, and moderately fertile, supporting cocoa, coffee, oil palm, cashew, and citrus cultivation, along with staples like yam, plantain, maize, and cassava. These soils form the backbone of the region's export-oriented farming economy, particularly cocoa and cashew production.
- Alluvial Soils – Occurring along the valleys and floodplains of rivers such as the Tano, these soils are relatively fertile due to periodic deposition of silt and clay. They are well-suited for rice, sugarcane, vegetables, and irrigated farming schemes. Communities along these river valleys often practice small-scale market gardening to supply urban centers like Sunyani, Techiman, and Wenchi.

All project beneficiary communities in the Bono GWL operational region have Lixisol soil types as shown in Figure 4-16.

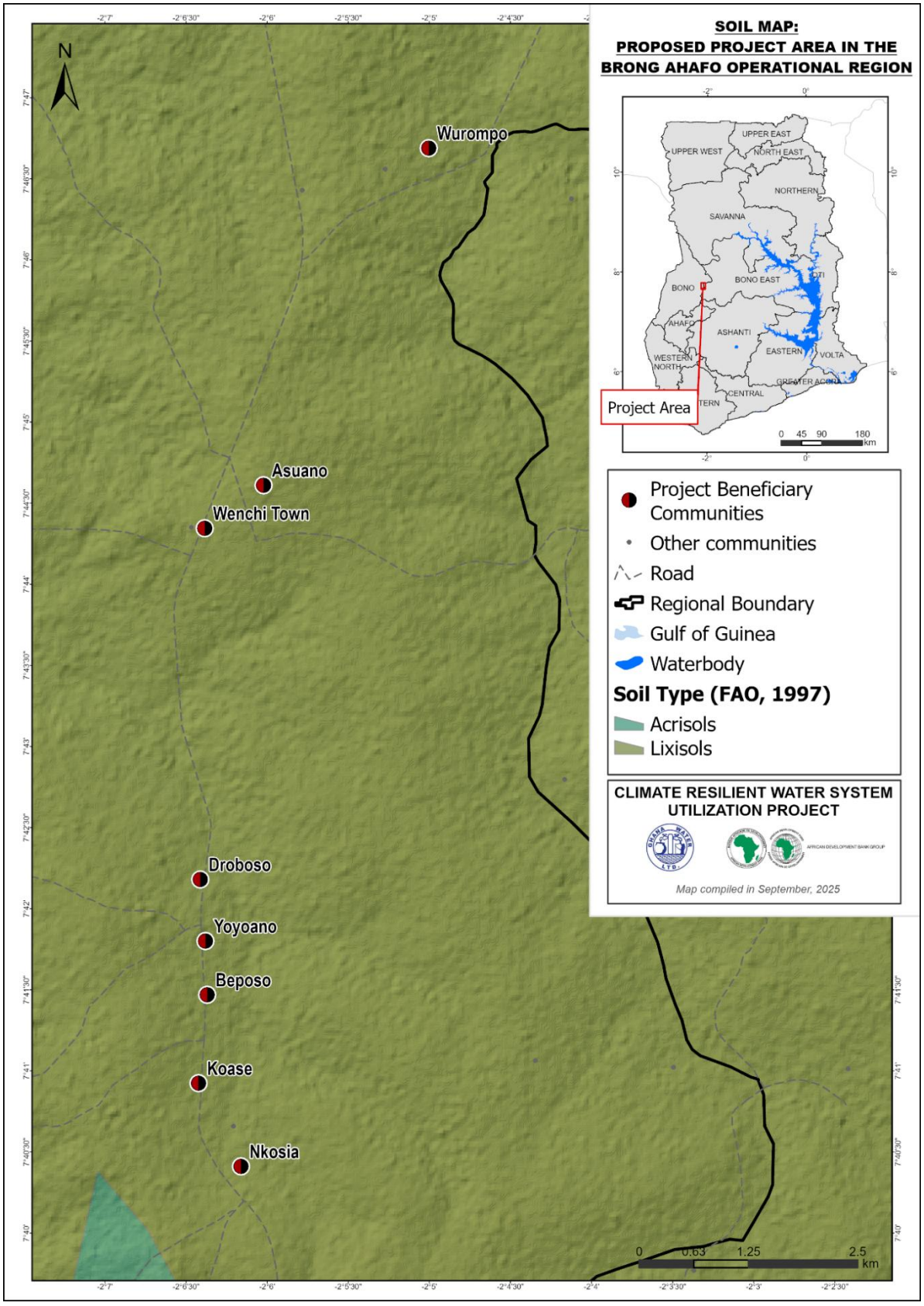


Figure 4-16: Soil map of the Bono Region project beneficiary area

4.4.5 Air and Noise Quality

Air quality in the Bono Region is generally assessed as good to moderate, particularly in rural and peri-urban communities where vegetation cover is extensive and helps trap dust and other airborne particles. However, localized declines in air quality are evident in rapidly growing urban centers such as Sunyani, Wenchi, and Berekum where population growth, vehicular activity, and commercial operations generate higher concentrations of particulates and fumes.

From Table 4-5, the ambient air and noise quality levels for both day and night are within Ghana Standards threshold for residential areas. Though some form of commercial activities goes on in the communities particularly at Wenchi Town, these activities do not generate a lot of nuisance.

Table 4-5: Air quality and noise level monitoring results in the Bono Region

Code	Noise Level			Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	**dB_{max}**	**dB_{min}**		**dB(A)**		**µg/m³**		**µg/m³**		**µg/m³**	
BR1	Day	59.5	50.3	53.4	**55**	17.8	**150 (24 hours)**	14.7	**50 (24 hours)**	11.4	**35 (24 hours)**	19.1	**70 (24 hours)**
	Night	55.6	48.7	46.0	**48**								
BR2	Day	55.3	45.1	53.4	**55**	19.4	**150 (24 hours)**	12.0	**50 (24 hours)**	11.8	**35 (24 hours)**	16.8	**70 (24 hours)**
	Night	50.9	42.8	45.7	**48**								
BR3	Day	60.6	44.4	51.8	**55**	18.6	**150 (24 hours)**	15.3	**50 (24 hours)**	12.3	**35 (24 hours)**	16.3	**70 (24 hours)**
	Night	50.9	42.5	44.2	**48**								

4.4.6 Topography

The Bono Region displays a varied and moderately undulating landscape, marked by forested uplands, dissected plateaus, and extensive low-lying plains. Elevations generally range from about 120 meters above mean sea level in the southern lowland areas to over 600 meters in the upland zones of Wenchi, where parts of the Gambaga Escarpment extension create more elevated relief.

Much of the region is underlain by the Voltaian sedimentary basin in the east and Birrimian rock formations in the west, shaping the land into gently rolling plains interspersed with steep ridges and isolated hills. The Tano and Banda uplands in the western portions form one of the most distinctive topographic features, providing elevated terrain that separates the dense forest belt to the south from the savannah transition to the north.

The central Bono landscape, including areas around Sunyani and Wenchi, consists largely of rolling hills and dissected plateaus, with slope gradients of 8–15 percent. These areas are well-suited for settlement, cocoa farming, and mixed agriculture.

The southern and western portions of the region, particularly around Dormaa, are dominated by broad valleys and low-lying plains. These are dissected by major river systems such as the Tano whose alluvial floodplains provide fertile agricultural lands and water resources for farming and settlements.

The topography and terrain of the project beneficiary communities in the Bono Regions are shown in Figure 4-17.

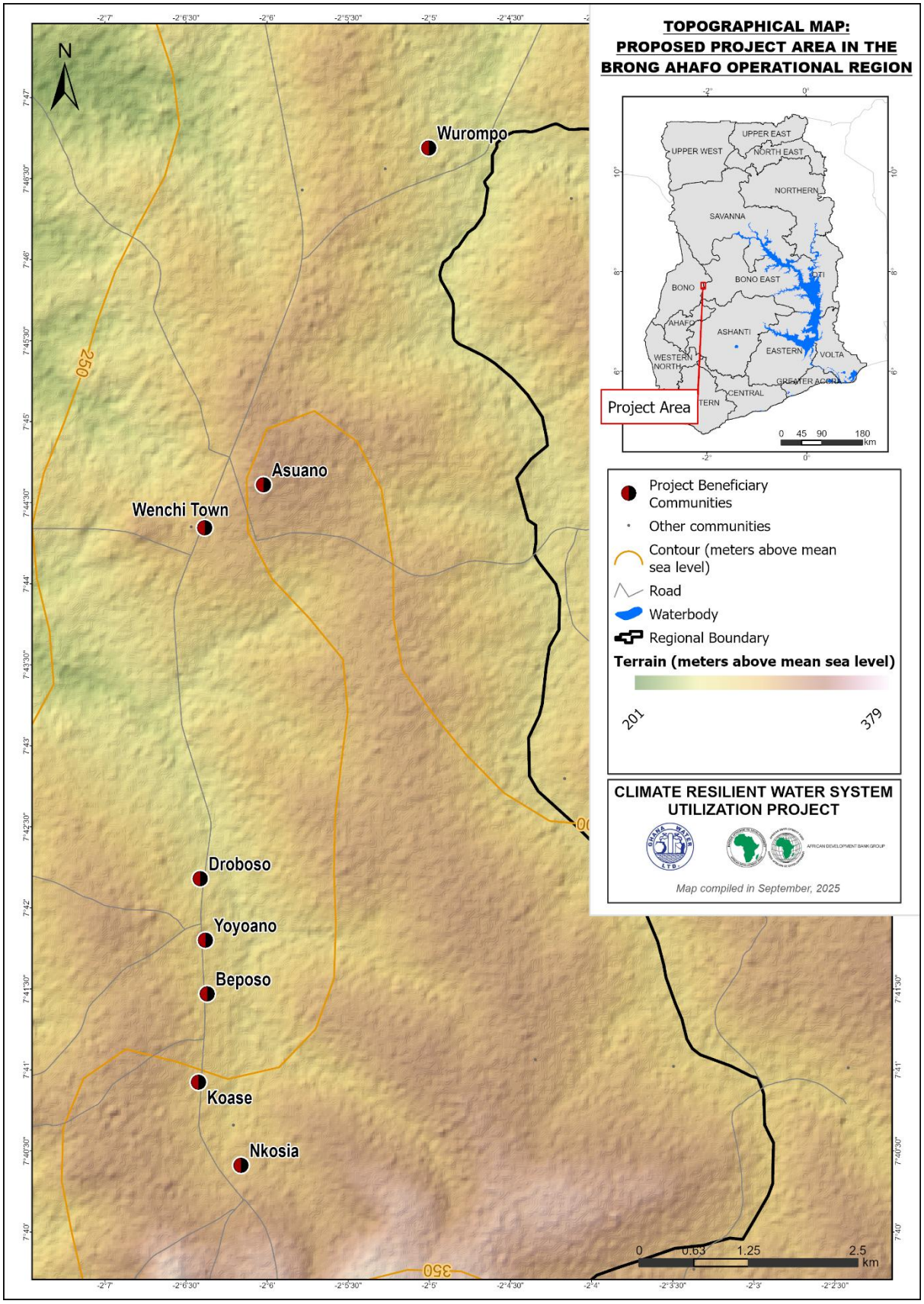


Figure 4-17: Topographical map of the Bono Region project beneficiary area

4.4.7 Hydrology and water resources

The project area, located within the Bono Operational Region, falls under the Black Volta River Basin, one of Ghana's major hydrological systems. The drainage pattern is predominantly dendritic, characterized by a network of small, branching streams and tributaries that flow generally northwest to southwest, ultimately draining into the Black Volta River along the western boundary of the basin.

Surface water features include seasonal and perennial streams, which support local water use for domestic and agricultural purposes. The terrain is gently undulating, facilitating surface runoff toward the Black Volta and its tributaries. Key beneficiary communities such as Wenchi, Asuano, Droboso, Yoyoano, Beposo, Koase, Nkosia, and Wurompo lie within this catchment, where streamflow patterns are influenced by the area's sedimentary geology and seasonal rainfall. However, the project RoW does not interact with any surface water body in the project area.

Overall, the drainage system provides favorable conditions for climate-resilient water management and supply interventions under the proposed project.

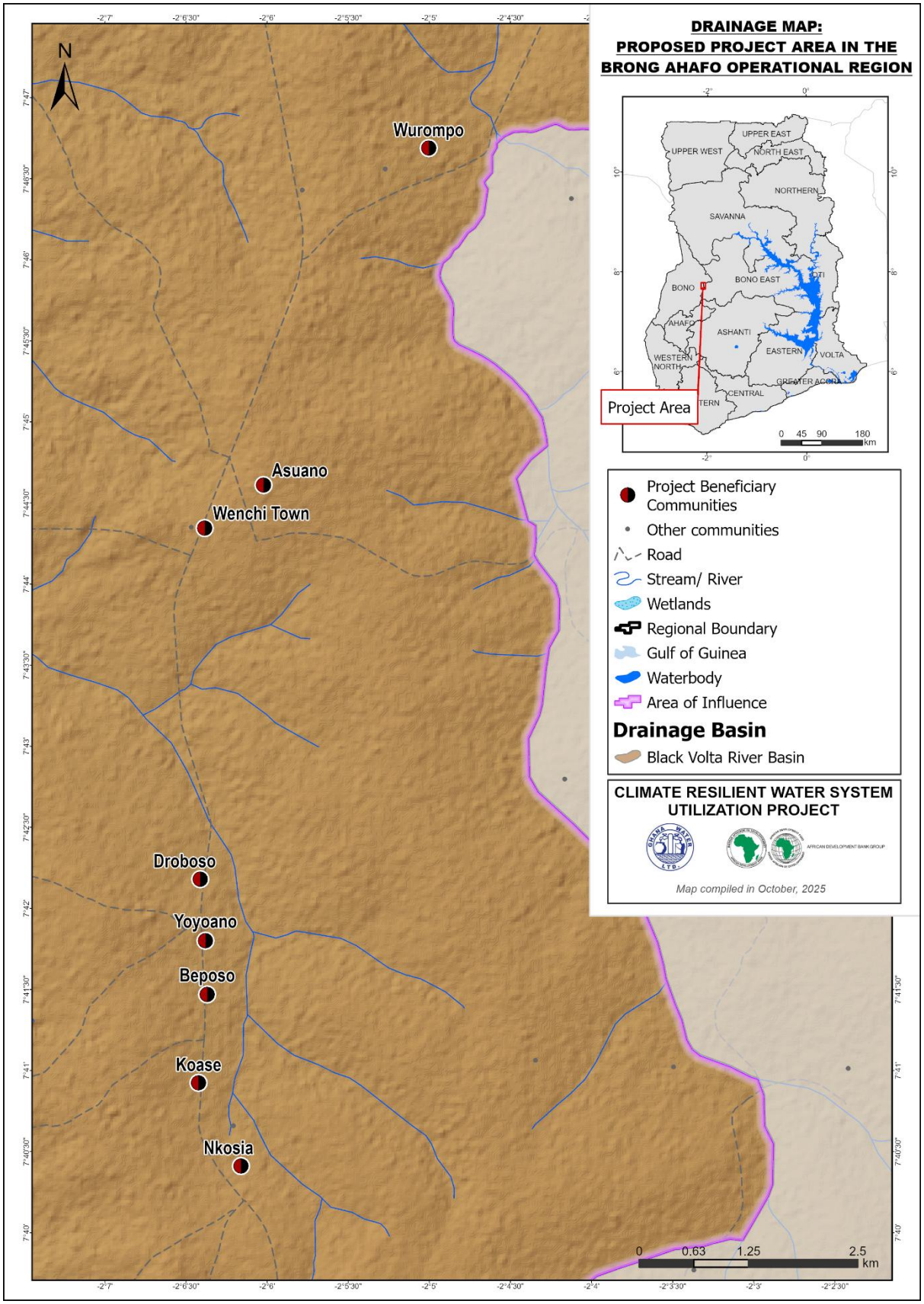


Figure 4-18: Drainage map of the Bono Region project beneficiary area

4.4.8 Flora and Fauna

The pipeline extension corridors in the Bono Region pass through a mixture of peri-urban settlements, farmlands, and transitional forest–savannah zones, where the original vegetation has been significantly degraded by settlement expansion. As a result, natural forest cover along the proposed routes is now limited, with only patches of secondary regrowth, grasses, and scattered trees such as mango and neem visible across the landscape at Asuano, Koase, Yoyoano, Dobroso and Wurompo. In urban and densely built-up areas such as Wenchi, vegetation cover is entirely absent as the area is heavily residential. Consequently, pipeline construction in these areas will require no clearance of vegetation.

Fauna within the project corridors is similarly sparse, largely due to habitat disturbance and human activity. Larger wildlife such as antelopes, duikers, and monkeys are now mainly confined to protected reserves and forest patches like the Tano Nimiri, Bia Tano, and Kintampo Forest Reserves, which lie outside the project alignment. Within the project area, fauna is restricted to small mammals such as grasscutters, reptiles including lizards, amphibians such as frogs, and non-venomous snakes, as well as common bird species such as doves, pied crows, weaverbirds, and sparrows, which thrive in disturbed and semi-urban environments. See Appendix 9 for comprehensive data on flora and fauna species spotted during flora and fauna screening of the pipeline corridor.

The vegetation and landcover in the project beneficiary communities are shown in Figure 4-19.

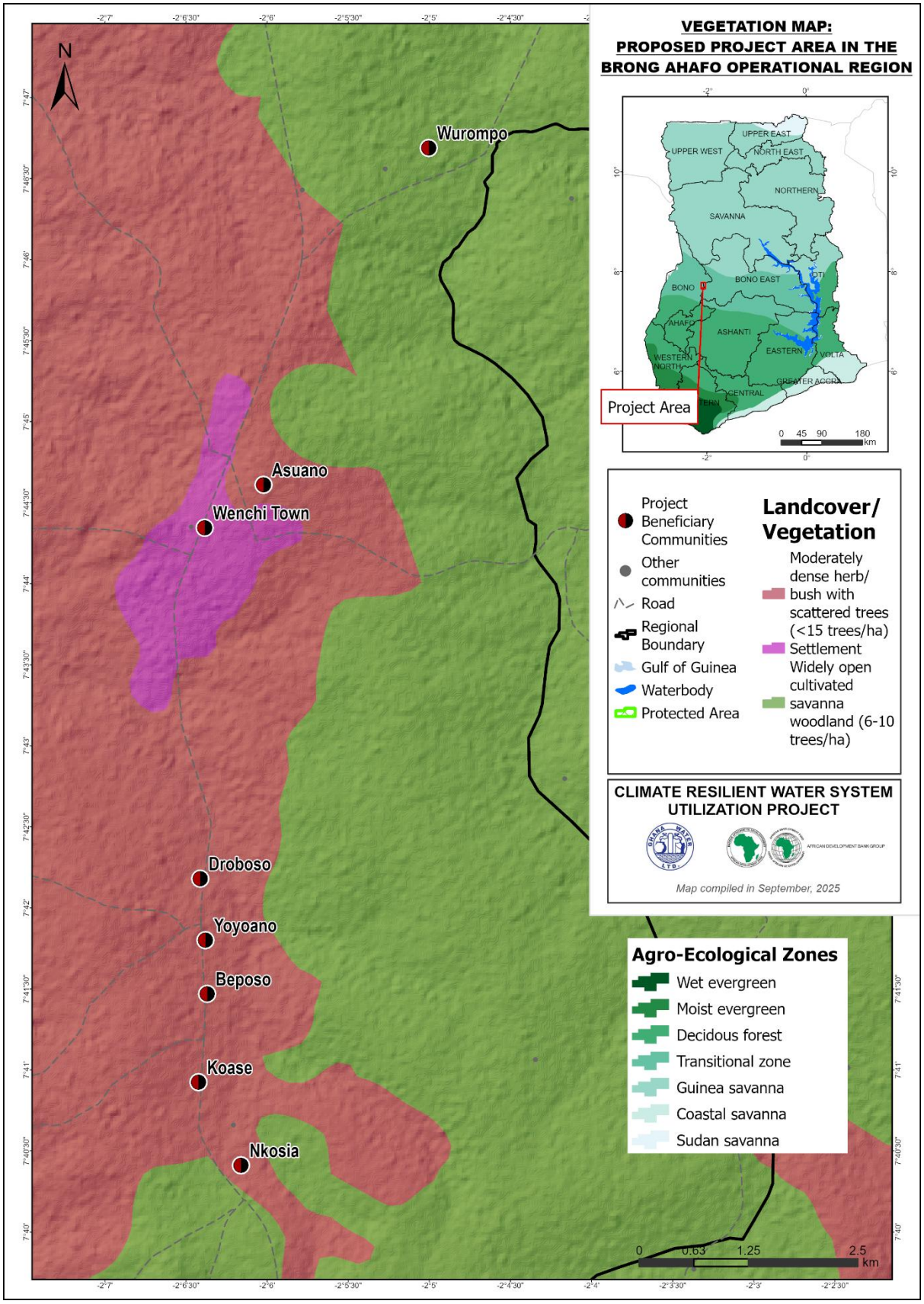


Figure 4-19: Vegetation and Landcover map of the Bono Region project beneficiary area

4.4.9 Socio-demographic Characteristics

The Bono Region, traditionally inhabited by the Bono and other Akan sub-groups, is one of Ghana's most agriculturally productive regions and an important socio-economic hub. While the Akan remain the dominant ethnic group, the region also hosts significant populations of Mole-Dagbani, Ewe, Ga-Adangbe, Frafra, and other migrant communities, especially in commercial and farming towns such as Sunyani, Wenchi, and Dormaa. Christianity is the predominant religion, with notable Islamic communities in Zongo settlements, alongside adherents of traditional belief systems.

The region's livelihoods are largely driven by its agrarian base, earning it recognition as one of Ghana's major food-basket areas. Farming dominates in rural and peri-urban communities, with major crops including yam, plantains, cassava, maize, rice, groundnuts, and vegetables, complemented by cash crops such as cocoa, cashew, and oil palm. In urban centers like Sunyani, the economy is more diversified, with employment opportunities in trading, transport, construction, artisanship, services, education, and public administration.

In farming settlements, many households depend on the informal economy, including petty trading, street hawking, commercial motorbiking (Okada), small-scale agro-processing, and casual labor. Seasonal migrant farmers from northern Ghana and neighboring Sahelian countries (Burkina Faso, Mali, Côte d'Ivoire) play a significant role in the agricultural labor force, especially during peak farming seasons. Remittances from relatives within Ghana and abroad also provide important financial support to households.

4.4.9.1 Population of Beneficiary Communities

The beneficiary communities in the Bono Region reflect a mix of urban, peri-urban, and rural settlements, with population structures that are youthful, dynamic, and closely tied to agriculture and trade. Household sizes average 5–6 persons, consistent with Akan-dominated communities, while natural increase and migration drive population growth. Many communities are expanding rapidly due to educational opportunities, fertile farmlands, and trade linkages with Wenchi and other district capitals.

- Asuano: A medium-sized rural farming community with a steadily growing population, dominated by yam, cassava, and maize production. Migration inflows of farm laborers from northern Ghana are common. Household sizes are large, and family farming remains the mainstay of livelihoods.

- Beposo (BA): A small-to-medium settlement with relatively lower density. Population growth is slower, with many young people migrating to Wenchi and Techiman for education and jobs. The community is primarily agrarian, with a strong reliance on subsistence farming.
- Droboso: A peri-urban community located close to Wenchi, with a population showing steady increase due to its role as a residential enclave. The area hosts a mix of farmers, traders, and transport operators. Droboso's population growth is supported by better road access and proximity to schools and health facilities in Wenchi.
- Koase: One of the larger beneficiary settlements, Koase has a vibrant and youthful population. It serves as both a farming base (yam, maize, groundnut, and cashew) and a growing market center, attracting migrants from surrounding rural communities. Household sizes are large, with an active population engaged in both farming and petty trading.
- Nkosia: A small rural community with lower population density compared to the larger settlements. The population is relatively stable, with agriculture as the dominant occupation. Outmigration of youth to Wenchi and Kumasi for education and jobs is common, leaving an older farming population behind.
- Yoyoano: A moderately populated agrarian settlement, Yoyoano has a youthful demographic and is steadily expanding. Farming remains the primary livelihood, supported by small-scale trading activities. Migration inflows are modest but steady, mainly seasonal farm labor.
- Wenchi Town: The largest and most urbanized beneficiary community serves as the municipal capital and commercial hub. Its population is highly diverse, with a mix of indigenous Bono, migrants from northern Ghana, and settler traders from across the country. Wenchi is a service, education, and trading hub, with population growth fueled by its strong economic pull, better infrastructure, and role as a transport node. Household structures are increasingly nuclear in the urban core but remain extended in peri-urban fringes.
- Wurompo: A small rural community with relatively low population density. Farming is the primary livelihood, and household sizes remain large. Outmigration of youth to Wenchi and Techiman for better opportunities is noticeable, leaving behind a farming-dominated population structure.

4.4.9.2 Ethnicity of the Residents of the Project Communities

The ethnic composition of the project communities in the Bono Region is characterized by the dominance of the Bono people, who are the indigenous Akan subgroup of the area. The Bono form the cultural and political backbone of most towns and rural settlements, maintaining strong traditional institutions, chiefly systems, and festivals that reinforce their identity.

However, the region's fertile farmlands, thriving trade centers, and educational institutions have attracted significant migrant populations from other parts of Ghana and neighboring West African countries. Ethnic groups from northern Ghana, including the Dagomba, Mamprusi, Gonja, Frafra, and Grushi, are widely represented, especially in farming communities where they work as tenant farmers, sharecroppers, and seasonal laborers. Their presence is also notable in Zongo communities, where they live alongside Hausa and Fulani settlers engaged in cattle rearing, trading, transport operations, and butchery.

In addition, small but visible numbers of Ewe and Ga-Adangbe migrants can be found in commercial centers such as Wenchi, and Berekum, often participating in trading, artisanal work, and services. These groups, together with other migrant communities, contribute to the region's reputation as one of Ghana's most agriculturally productive and culturally diverse areas.

Despite the cultural mix, the Bono (Akan) remain the majority across nearly all settlements, providing continuity in local language, customs, and socio-political leadership. The growing ethnic diversity, however, has fostered a cosmopolitan character in larger towns like Wenchi, where inter-ethnic coexistence, intermarriage, and cultural blending are common.

4.4.9.3 Religion

Christianity is the dominant religion in the Bono Region, accounting for about 80–88% of the population, with Pentecostal/Charismatic, Methodist, Presbyterian, and Catholic churches being most common. Islam is the second major faith, more concentrated in Zongo settlements such as Wenchi and Techiman, where it represents 15–25% of residents, compared to under 10% in farming communities. A small minority (3–6%) continues to practice Traditional African Religion, especially among older generations in rural areas

4.4.10 Economic Characteristics

Labor and employment patterns across the project communities in the Bono Region show a strong dominance of the informal sector, with only a small proportion of residents engaged in professional jobs. In towns such as Wenchi, Dormaa, Sunyani, and Berekum, between 4% and

18% of respondents are employed in formal professional roles including teaching, banking, health, and civil service. The majority, however, are engaged in informal activities.

Trading (mainly food sales and petty commerce) emerges as the single most important occupation, employing an average of 40% of residents in peri-urban and market-centered settlements. Artisans—such as hairdressers, tailors, seamstresses, mechanics, masons, carpenters, and welders—account for around 20% of livelihoods. Technical and service-related jobs, including drivers, electricians, and transport operators, employ about 17% of the population.

Professional employment is relatively lower in smaller farming and, semi-rural settlements such as Asuano Beposo, Droboso, Koase, Nkosia, Yoyoano, and Wurompo, where farming is the backbone of the local economy. Agricultural activities employ about 20–30% of the population, with a focus on yam, cassava, maize, plantain, cashew, and cocoa. Many households combine farming with petty trading or artisanal work.

4.4.11 Land Uses along the Proposed Pipeline Routes

The project communities in the Bono Region are predominantly low- to middle-income residential areas, with housing largely characterized by modest, closely built compounds and family dwellings. Close to the proposed pipeline routes, mixed residential and commercial developments are common, particularly in town centers and along major road corridors where trading, kiosks, and small shops operate.

In addition to residential use, the routes also lie in close proximity to areas with educational, religious, and civic functions, including schools, churches, and mosques that serve as community focal points. Petty trading activities, roadside markets, and small eateries are also prominent in many of the settlements.

In more communities' sections of the project area (e.g., Asuano, Nkosia, Wurompo), parts of the pipeline traverse through undeveloped land and farmlands, with visible agricultural use such as maize. These stretches highlight the mixed land-use character of the region, where farming, housing, and commercial activities coexist.

4.4.12 Educational Facilities along the Pipeline Routes

In the Bono Region, most of the beneficiary communities located along the proposed pipeline routes have limited access to educational facilities. Several settlements, such as Asuano, Beposo, Nkosia, Yoyoano, and Wurompo, do not have schools situated directly along the pipeline alignment.

However, some communities, including Koase, Droboso, and Wenchi Town, have schools positioned close to or along the routes. These are mainly basic schools (primary and junior high schools), providing education for children from both the host communities and surrounding settlements. Enrollment levels are generally higher in larger urban centers such as Wenchi Town, while smaller rural settlements tend to record lower pupil numbers.

The distribution of schools along the proposed pipeline routes in the Bono Region is shown in Table 4-6 below.

Table 4-6: Distribution of Schools in Brong Ahafo Region

Community	Road ID	Number of Schools	Total Enrollment
Koase	1	1	784
Droboso	2	1	416
Wenchi Town	3	2	1,352
Asuano	–	0	–
Beposo (BA)	–	0	–
Nkosia	–	0	–
Yoyoano	–	0	–
Wurompo	–	0	–

4.4.13 Health Facilities along the Pipeline Routes

A few health facilities were identified along the proposed pipeline routes in the Bono Region. These include:

- Koase Health Centre, situated along the road in Koase.
- Droboso Community Clinic, located along the road in Droboso.
- Wenchi Municipal Hospital, positioned along the road in Wenchi Town.

Out of these three (3) facilities, only one is publicly owned, the Wenchi Municipal Hospital, which serves as the main referral center for surrounding rural communities. The Koase Health Centre and the Droboso Community Clinic are privately operated but play an important role in delivering primary healthcare services to residents along the pipeline corridor.

4.4.13.1 Morbidity Trends in the Project Zones

The morbidity profile of the project communities in the Bono Region is largely characterized by water and sanitation-related diseases. The most frequently reported cases include malaria, diarrhea diseases, and various skin infections, which consistently rank among the top conditions recorded in health facilities across the zone. Data from the Ghana Health Service

further highlights these as the leading health concerns within the beneficiary municipalities along the proposed pipeline routes.

4.5 Western Region

4.5.1 Regional Overview

The Western Region, situated in the southwestern part of Ghana, is one of the country's resource-rich and economically dynamic regions. It shares boundaries with Central Region to the east, Côte d'Ivoire to the west, Ashanti and Western North Regions to the north, and the Gulf of Guinea (Atlantic Ocean) to the south. Covering a land area of about 13,842 km², the region accounts for approximately 9.4% of Ghana's total land area.

The region features a diverse mix of large urban centers, mining towns, fishing villages, and rural agricultural communities. The regional capital, Sekondi-Takoradi, serves as a major administrative, industrial, and commercial hub, widely recognized as Ghana's "Oil City" due to its proximity to offshore petroleum operations. Other important towns include Tarkwa, Prestea, Axim, Elubo, and Sefwi Wiawso, which are significant centers for mining, trade, fishing, and cross-border commerce.

The economy of the Western Region is anchored by mining (particularly gold, bauxite, and manganese), offshore oil and gas production, cocoa farming, and fishing. Artisanal and industrial fishing are widespread along the coast, while agriculture thrives in the fertile forest zones.

4.5.2 Description of project communities

The project communities in the Western Region combine farming, fishing, and trading livelihoods. Inland areas such as Anto, Apemanim, and Asemasa are largely agrarian, while coastal towns like Shama, Assorko, and Aboadze Abuesi focus on artisanal fishing and fish processing. Settlements including Kojokrom, Ketan, Nkroful, and Sofokrom Old Town show diversified economies, with residents engaged in trading, services, and non-farm work due to their proximity to Sekondi-Takoradi and Shama's industrial zones.

4.5.3 Climatic Conditions

The Western Region lies predominantly within the wet evergreen and moist semi-deciduous agro-ecological zones. In this ecological setting, relative humidity is generally high, averaging around 75% to 85% in the mid-afternoon and rising to 95% to 100% at night, especially during the rainy season. Temperatures range from 24°C to 32°C, with the hottest periods usually between February and March, while cooler conditions prevail from June to August during peak

rains. Light to moderate south-westerly winds from the Atlantic Ocean influence the area throughout much of the year.

Rainfall records from the Ghana Meteorological Agency (GMET, 2020–2025) show that the Western Region consistently receives some of the highest annual rainfall totals in Ghana, ranging from about 1,500 mm to over 2,200 mm. The highest annual rainfall during the period was recorded in 2017 (over 2,200 mm), while relatively lower totals (around 1,500 mm) were observed.

Like other southern parts of Ghana, the Western Region experiences a double maxima rainfall regime. The major rainy season spans April to July, with rainfall peaking in June, while the minor season occurs from September to November, peaking in October.

4.5.4 Geology and Soils

The Western Region is geologically underlain by extensive Birrimian rock formations, Tarkwaian sediments, granitic intrusions, and volcanic belts, forming part of Ghana's rich mineral-bearing geology. This geology gives rise to a diverse landscape that includes undulating forested highlands, lateritic uplands, river valleys, and low-lying coastal plains. The region is historically and economically significant for its gold, bauxite, and manganese deposits, particularly within the Tarkwa, Prestea, Bogoso belts and Nsuta areas, where both large-scale and small-scale mining are active. Quarrying of granite, clay, and laterite is also common, supplying raw materials for construction and road infrastructure.

The soils of the Western Region are strongly influenced by its wet evergreen and moist semi-deciduous forest zones, with high rainfall and prolonged weathering shaping fertility levels. The major soil groups include:

1. Forest Ochrosols and Ferric Acrisols: These dominate the inland forest districts such as Tarkwa-Nsuaem, Wassa Amenfi, and Sefwi areas. They are well-drained, loamy to clay-loam soils of moderate fertility, supporting crops such as cocoa, rubber, citrus etc.
2. Lateritic Soils: Found mainly on upland plateaus and ridges around areas such as Sekondi-Takoradi, Tarkwa, and Wassa. These reddish-brown, gravelly, and weathered soils have relatively low natural fertility. Lateritic crusts are widely used as roadbuilding and construction materials.
3. Alluvial and Coastal Sandy Soils: Occur along the floodplains of major rivers such as the Ankobra, Pra, Bonsa, and Tano, as well as the coastal belt stretching from Shama

to Jomoro. These clayey to sandy-loam soils are relatively fertile due to sediment deposition.

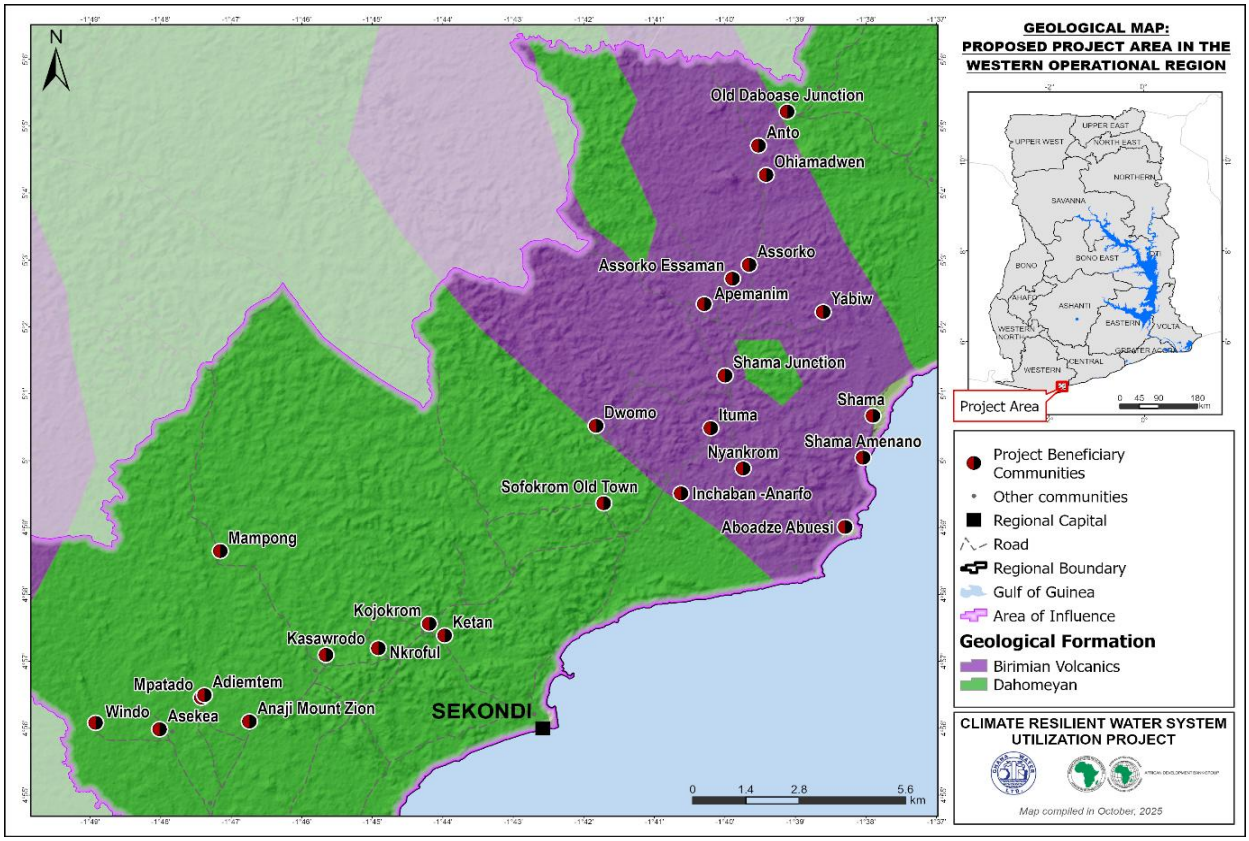


Figure 4-20: Geological map of the Western Region project beneficiary area

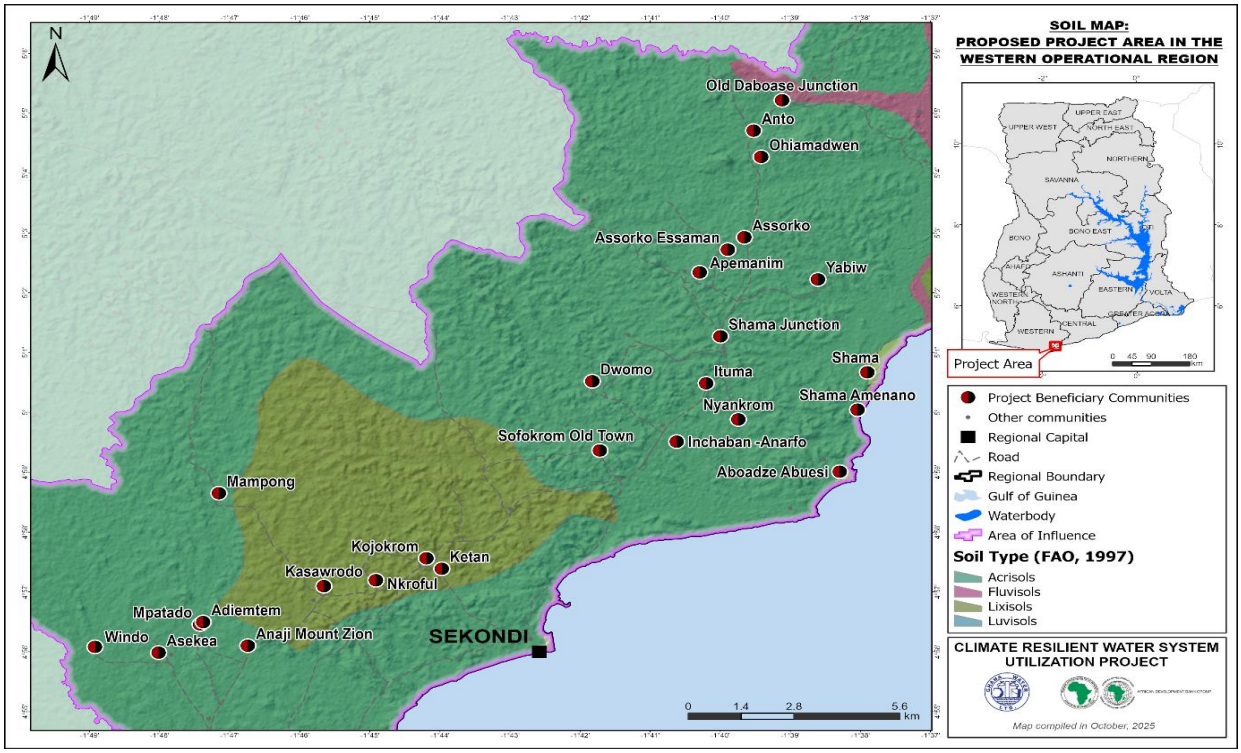


Figure 4-21: Soil map of the Western Region project beneficiary area

4.5.5 Air and Noise Quality

Baseline measurements of ambient noise levels and air quality were undertaken at three monitoring locations (Shama Junction-WR1, Aboadze Abuesi-WR2, and Anaji Mount Zion-WR3) within the project area to establish existing environmental conditions. The results were compared against the Ghana Standards Authority (GSA) requirements outlined in GS 1222:2018 for noise and GS 1236:2019 for ambient air quality.

During the daytime, recorded equivalent continuous noise levels (dB(A)) ranged from 53.4 dB(A) at WR3 to 73.4 dB(A) at WR2, with maximum readings up to 93.1 dB(A) at WR1. Nighttime noise levels were comparatively lower, ranging from 46.0 dB(A) to 63.1 dB(A) across the three sites.

Daytime noise levels at WR1 and WR2 exceeded the GS 1222:2018 guideline limits for residential and mixed-use areas (55–70 dB(A)), suggesting the influence of vehicular movements, human activities, and localized commercial operations. Nighttime values were generally within acceptable limits, reflecting reduced anthropogenic activity after dusk.

Ambient concentrations of key air pollutants—Nitrogen Dioxide (NO_2), Sulphur Dioxide (SO_2), Particulate Matter ($PM_{2.5}$ and PM_{10})—were measured and compared to the GS 1236:2019 standards.

- NO_2 concentrations ranged between 14.9 and 22.7 µg/m³, well below the 24-hour limit of 200 µg/m³.
- SO_2 concentrations varied from 11.4 to 22.2 µg/m³, significantly lower than the permissible limit of 50 µg/m³.
- $PM_{2.5}$ levels (14.9–20.3 µg/m³) were below the 35 µg/m³ (24-hour) standard.
- PM_{10} levels (19.1–33.9 µg/m³) also complied with the 70 µg/m³ (24-hour) limit.

Overall, air quality parameters were within acceptable limits, indicating minimal air pollution within the project area. The results suggest that local air quality is generally good, with dust and vehicular emissions being the dominant sources of particulate matter.

The baseline data indicate that air quality conditions are satisfactory, posing no immediate environmental or public health concern. However, daytime noise levels in certain sections, particularly around WR1 and WR2, marginally exceed permissible limits and will require mitigation during construction activities to prevent cumulative impacts. Continuous

environmental monitoring is recommended throughout project implementation to ensure compliance with national standards.

Table 4-7: Air quality and noise level monitoring results in the Western Region

Code	Noise Level				Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	**dB_{max}**	**dB_{min}**		**dB(A)**		**µg/m³**		**µg/m³**		**µg/m³**		**µg/m³**
WR1	Day	93.1	61.9	71.9	**55**	19.0	**150 (24 hours)**	22.2	**50 (24 hours)**	14.9	**35 (24 hours)**	33.9	**70 (24 hours)**
	Night	63.8	45.4	47.1	**48**								
WR2	Day	79.2	67.8	73.4	**75**	35.5	**150 (24 hours)**	22.7	**50 (24 hours)**	20.3	**35 (24 hours)**	22.6	**70 (24 hours)**
	Night	79.5	58.1	63.1	**65**								
WR3	Day	59.5	50.3	53.4	**55**	17.8	**150 (24 hours)**	14.7	**50 (24 hours)**	11.4	**35 (24 hours)**	19.1	**70 (24 hours)**
	Night	55.6	48.7	46.0	**48**								

4.5.6 Topography

The Western Region is characterized by a diverse landscape of coastal plains, rolling hills, and forested highlands, with elevations ranging from sea level along the Gulf of Guinea to about 300 to 600 meters inland. The terrain is shaped by Precambrian rock formations and mineral-rich soils, producing a mix of low-lying coastal areas, undulating plateaus, and dissected hills that form part of the region's forest zone.

Along the coastal stretch from Shama through Sekondi-Takoradi to Axim, the topography is dominated by low-lying plains, sandy beaches, lagoons, and rocky headlands. These areas support crop cultivation, but are also prone to tidal flooding, storm surges, and coastal erosion.

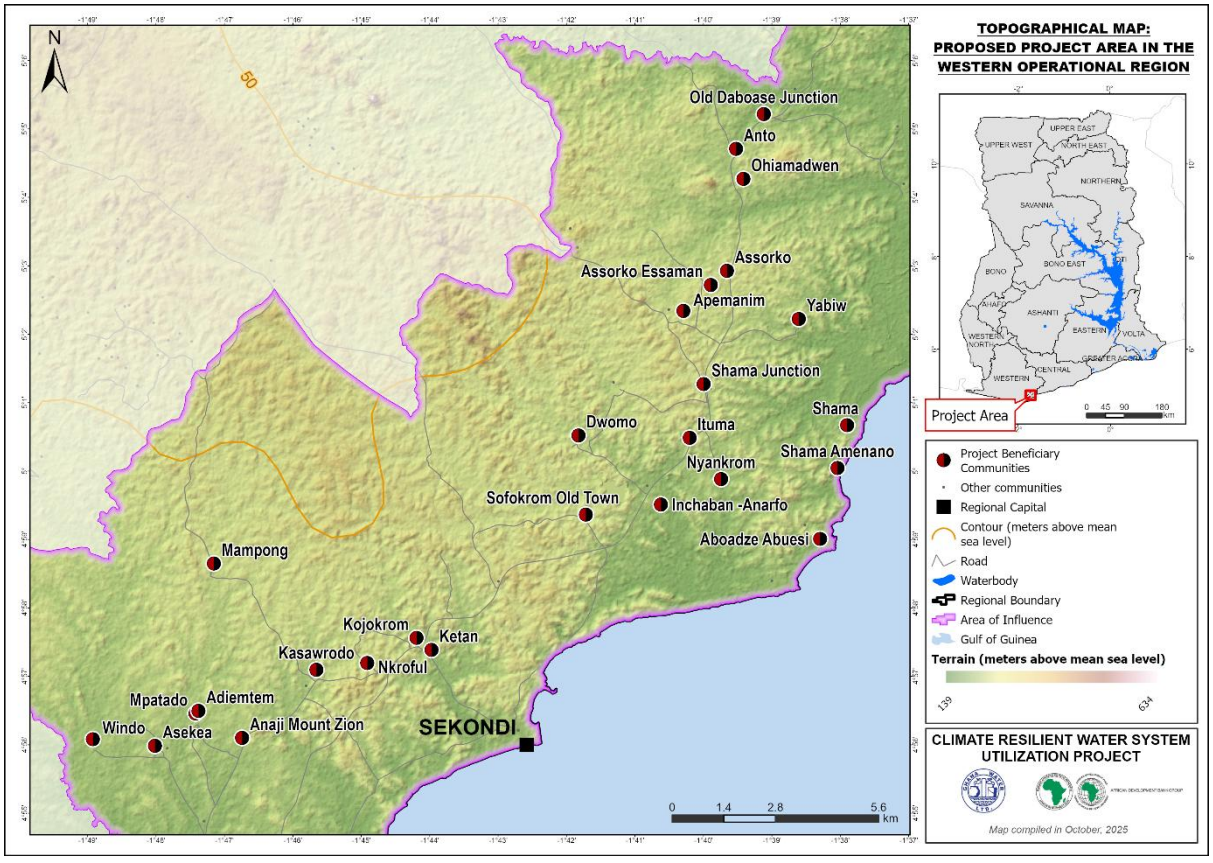


Figure 4-22: Topographical map of the Western Region project beneficiary area

4.5.7 Hydrology and water resources

The project area within the Western Operational Region is characterized by a well-developed and dense drainage network that primarily falls within the Minor Coastal Basin and the Pra River Basin. The drainage pattern is largely dendritic, reflecting the influence of the region's undulating topography and relatively high rainfall.

Major rivers and streams in the area flow generally southward and southeastward, discharging into the Gulf of Guinea. Key watercourses include tributaries of the Pra River system in the northeastern sector and smaller coastal streams and wetlands that dominate the southern and eastern coastal zones near Sekondi, Shama, and Aboadze-Abuesi. However, none of these tributaries directly interacts or lies in close proximity to the project RoW.

The presence of extensive wetland and estuarine systems along the coastal fringe enhances natural drainage and provides important ecological functions such as flood regulation and water filtration. These hydrological features support the livelihoods of local communities through fishing, irrigation, and domestic water use.

Overall, the drainage system of the project area ensures effective surface runoff conveyance but is vulnerable to sedimentation and pollution from human activities.

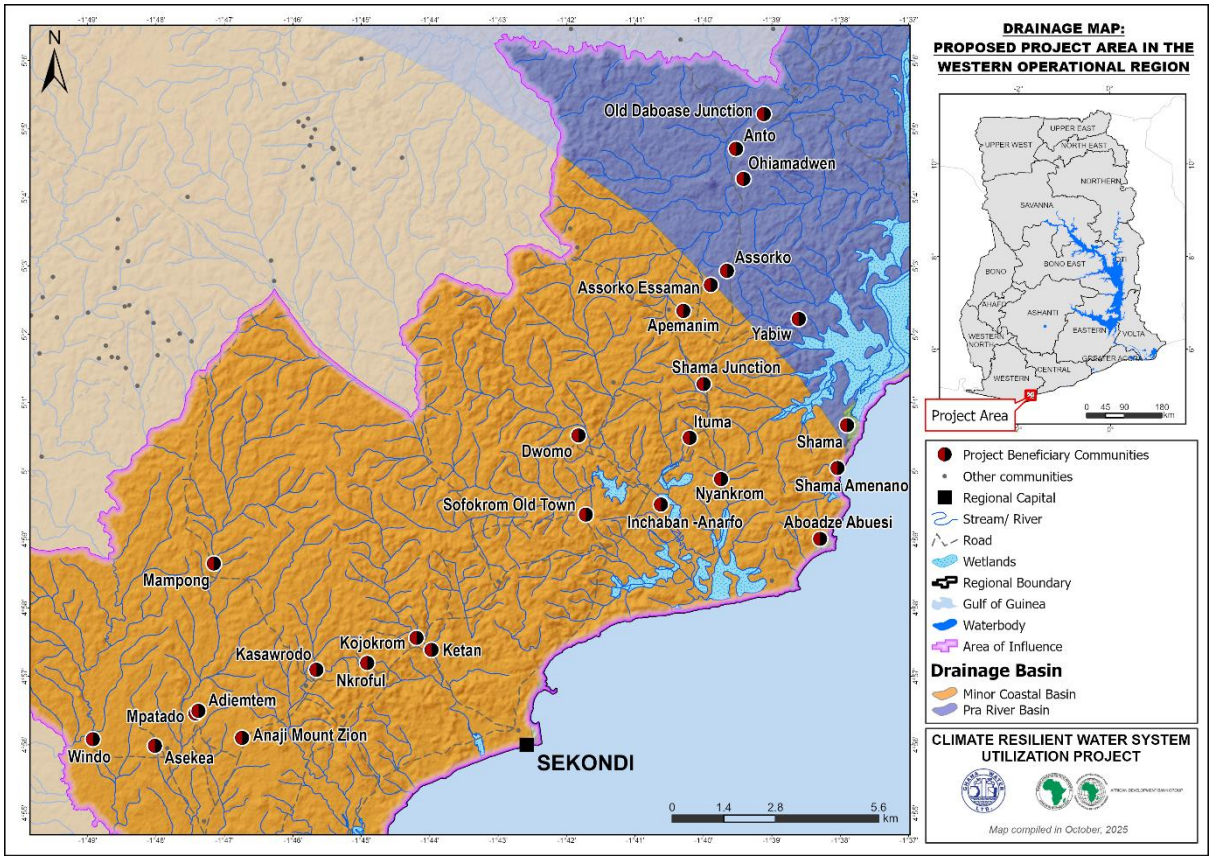


Figure 4-23: Drainage map of the Western Region project beneficiary area

4.5.8 Flora and Fauna

The project area in the Western Region falls within the moist evergreen and semi-deciduous forest ecological zones, noted for dense vegetation with tall hardwood species, secondary forests, and scattered shrubs. However, within the specific project communities, much of the natural forest cover has been significantly degraded by farming, logging, mining, charcoal production, and settlement expansion.

Fauna presence within the project corridors is also considerably diminished compared to intact forest reserves. Although the wider Western Region is naturally rich in wildlife, most species have been displaced from the project communities due to human activity. Given that the proposed pipeline routes largely follow existing road reserves and previously disturbed areas affected by farming, utilities, and settlement development, the anticipated impacts on both flora and fauna are minimal.

See Appendix 9 for comprehensive data on flora and fauna species spotted during flora and fauna screening of the pipeline corridor.

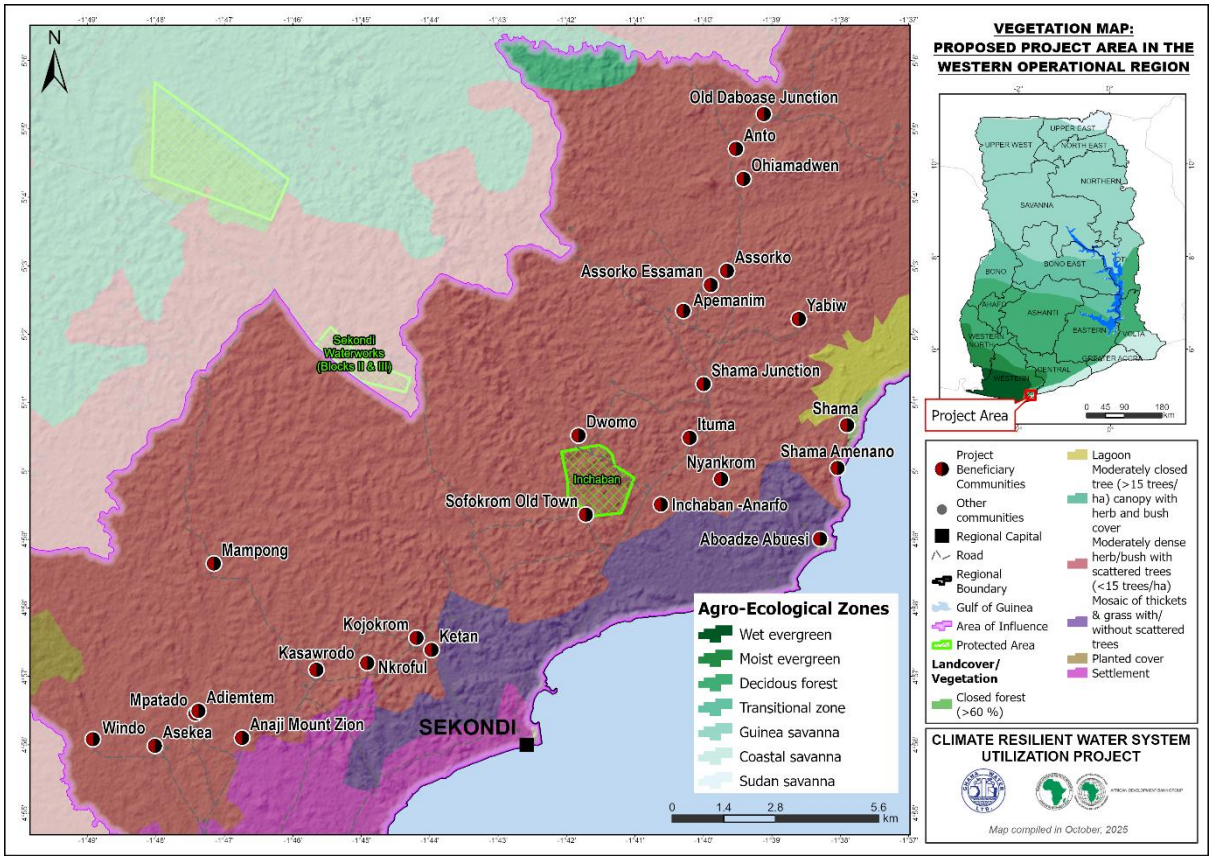


Figure 4-24: Vegetation map of the Western Region project beneficiary area

4.5.9 Economic Activities (Occupations)

In the project communities of the Western Region, economic activities are largely driven by the informal sector, which remains the backbone of local livelihoods. Survey results indicate that only about 5% to 15% of respondents are employed in professional jobs such as teaching, health services, banking, and public administration, while the vast majority depend on informal occupations.

In urbanized and peri-urban areas such as Sekondi-Takoradi, Kojokrom, and Shama, trading and petty commerce (including food vending, fish processing, and retail sales) are the dominant sources of income, employing an estimated 35% to 45% of respondents. Artisanal work including dressmaking, hairdressing, carpentry, masonry, and mechanical services accounts for around 20%, while transport related occupations such as driving and electrical/mechanical repairs represent about 15% to 18%.

Coastal communities such as Aboadze, Abuesi, and Shama place significant emphasis on fishing and fish processing, which remain major household income sources. Inland settlements including Anto, Apemanim, and Inchaban-Anarfo combine small-scale farming with trading

and artisanal services, although agriculture employs only about 2% to 5% of respondents overall due to the region's increasing urbanization and industrial activities.

4.5.10 Population of Beneficiary Communities

The beneficiary communities in the Western Region are predominantly coastal, industrial, and peri-urban settlements with relatively youthful populations and average household sizes of 4 to 6 persons. Population growth is influenced by natural increase, rural–urban migration, and the rapid expansion of towns such as Sekondi-Takoradi, Shama, Kojokrom, and Nkroful. While fishing and small-scale farming continue to play important roles in coastal and inland communities, livelihoods are increasingly diversified into trading, transport, artisanal services, and industrial-related employment, particularly around Shama and Takoradi due to their industrial and port activities. The strategic location of many settlements along major highways and close to economic hubs has supported this transition from predominantly agrarian livelihoods toward more urbanized, service-based, and industrial occupations.

The beneficiary communities targeted by the project in the Western Region are largely urban in character, consistent with the Ghana Statistical Service's urban threshold of 5,000 inhabitants. Most of these communities have witnessed steady population growth between 2021 and 2025, driven by natural increase, rural–urban migration, and economic opportunities associated with industrial, commercial, and port-related activities in Sekondi-Takoradi and its surrounding towns.

The project corridor communities such as Anto, Shama, Nkroful, Assorko, Assorko Essaman, Asemasa, Kojokrom, Kasawrodo, Sofokrom Old Town, and Inchaban-Anarfo, as well as emerging peri-urban enclaves like Anaji Mount Zion, Apemanim, Kwabenanokrom, and Mampong (W), fall within this trend of urban expansion.

Table 4-8: Estimated Population of Project Corridor Communities (Western Region)

Community / District	2021 Population	2025 Population (Projected)
Sekondi-Takoradi Metropolitan (covering Anaji, Kojokrom, Ketan, Sofokrom, Kasawrodo, etc.)	655,202	693,400
Shama District (Shama, Aboadze, Abuesi, Inchaban, Anto, Dwomo, Nyankrom, etc.)	131,721	142,034
Mpohor District (covering communities such as Apemanim, Asemasa, Kwabenanokrom, Ohiamadwen)	53,872	58,086

Community / District	2021 Population	2025 Population (Projected)
Ellembelle District (Nkroful and environs)	120,893	130,356
Wassa East District (Old Daboase Junction, Adientem, Ituma, Yabew, etc.)	121,698	131,216

Source: Ghana Statistical Service (Projected from 2021 Census; District Assembly reports).

4.5.11 Ethnicity of Residents of the Project Communities

According to the Ghana Statistical Service and community-level observations, the project communities in the Western Region are predominantly Akan (Ahanta, Nzema, and Wassa subgroups), though there is significant ethnic diversity, particularly in coastal, peri-urban, and industrially linked settlements.

- Shama, Shama Amenano, Shama Junction, Aboadze, and Abuesi are mainly populated by Ahanta and Fante groups (about 70 to 75%), but due to their fishing and industrial activities, there are notable populations of Ewe, Ga-Adangbe, and northern Ghanaian migrants, along with some West African nationals engaged in fishing and trading.
- Nkroful, Apemanim, and surrounding towns in Ellembelle and Mpohor districts are predominantly Nzema (75 to 85%), with smaller migrant populations of Ewe, Ga-Adangbe, and Hausa/Zabarmas attracted by trade and farming.
- Assorko, Assorko Essaman, Inchaban-Anarfo, Anto, Dwomo, Yabew, and Adientem, being coastal and semi-urban communities, display moderate ethnic diversity. While Ahanta and Fante together make up about 65–70%, migrant fisherfolk from the Volta Region (Ewe), Ga-Adangbe, and northern groups form significant minorities.
- Anaji Mount Zion, Kasawrodo, Ketan, Kojokrom, Mampong (W), Mpatado, Sofokrom Old Town, and Ohiamadwen, located within or near the Sekondi-Takoradi Metropolitan area, are more ethnically mixed. While Ahanta and Fante remain the dominant groups (55 to 65%), there is a high presence of Ewe, Ga-Adangbe, and northern migrants due to the urbanized, commercial, and port-related economy.
- Asemasa, Kwabenanokrom, Asekea, Windo, and Ituma are smaller peri-urban farming and trading settlements, where Wassa and Ahanta are the majority groups (70 to 80%), with minority populations of Ewe, Ga-Adangbe, and northern ethnic groups engaged in artisanal, trading, and transport-related activities.

4.5.12 Religion

The beneficiary communities are predominantly Christian (70 to 85%), with churches serving as focal points of social and cultural life in towns such as Shama, Nkroful, Kojokrom, Kasawrodo, and Anaji Mount Zion.

Islam (10 to 20%) is mainly concentrated in trading and fishing settlements like Aboadze, Abuesi, Inchaban-Anarfo, Assorko Essaman, and Shama Junction, supported by migrant populations from northern Ghana and neighboring West African countries. A smaller share (3 to 7%) of residents, especially in rural or peri-urban areas such as Kwabenanokrom, Ohiamadwen, and Adientem, continue to practice traditional African religions, where shrines and festivals remain culturally significant.

4.5.13 Economic Activities (Project Communities)

Livelihoods in the Western Region project communities are largely dominated by the informal economy, with only a limited proportion of residents employed in formal jobs such as teaching, health services, and public sector roles.

- Trading (35 to 45%) is the most common occupation, especially in urban and peri-urban settlements such as Kasawrodo, Kojokrom, Shama, Anaji Mount Zion, and Ketan, driven by vibrant local and regional markets.
- Fishing and fish processing are key sources of livelihood in coastal towns such as Aboadze, Abuesi, Assorko Essaman, and Shama Amenano, supporting both local consumption and regional supply chains.
- Artisanal and vocational work (18 to 22%) including carpentry, masonry, tailoring, hairdressing, welding, and mechanics is widely practiced across communities like Nkroful, Mpatado, and Apemanim.
- Transport services (5 to 15%) such as taxis, minibuses, tricycles, and motorcycles are vital in peri-urban and trading hubs like Kojokrom, Sofokrom Old Town, Shama Junction, and Inchaban-Anarfo.
- In areas such as Kwabenanokrom, Ohiamadwen, Adientem, Dwomo, and Ituma, farming (25 to 35%) remains central to local livelihoods, with cassava, maize, vegetables, and oil palm commonly cultivated.

4.5.14 Land Uses along the Proposed Pipeline Routes

The project communities in the Western Region are primarily low- to middle-income residential settlements, with housing comprising traditional compound houses, block structures, and a growing number of modest modern family houses, particularly in peri-urban areas.

Along the proposed pipeline routes, there is a blend of residential and commercial land uses, especially in larger and more urbanized settlements such as Kasawrodo, Kojokrom, Shama, Anaji Mount Zion, and Ketan, where roadside kiosks, petty trading stalls, retail shops, and food vendors are sparsely concentrated few metres away from the pipeline routes.

4.5.15 Educational Facilities along the Pipeline Routes

Across the project communities in the Western Region, access to educational facilities directly along the proposed pipeline routes is generally limited. Several settlements such as Anto, Apemanim, Asemasa, Kwabenanokrom, Ohiamadwen, Old Daboase Junction, Yabew, Adientem, Ituma, Nyankrom, and Dwomo do not have schools situated directly along their pipeline routes.

However, some communities, including Shama, Shama Junction, Anaji Mount Zion, Kojokrom, Kasawrodo, Ketan, and Sofokrom Old Town, host at least one school each, mostly at the basic and junior high levels, providing educational services to surrounding areas.

Table 4-9: School facilities along the pipeline routes (Western Region – Illustrative)

Community	Total No. of Schools	Total Enrollment
Shama	2	1,320
Shama Junction	1	750
Kojokrom	2	1,280
Kasawrodo	1	695
Ketan	1	640
Anaji Mount Zion	1	720
Sofokrom Old Town	1	680
Nkroful	1	560
Aboadze/Abuesi/Windo	1	810

Community	Total No. of Schools	Total Enrollment
Mpatado	0	–
Inchaban-Anarfo	0	–
Anto	0	–
Apemanim	0	–
Asemasa	0	–
Kwabenanokrom	0	–
Ohiamadwen	0	–
Old Daboase Junction	0	–
Yabew	0	–
Adientem	0	–
Asekea	0	–
Mampong (W)	0	–
Dwomo	0	–
Ituma	0	–

4.5.16 Health Facilities along the Pipeline Routes

Several health facilities were identified along the proposed pipeline routes within the Western Region project communities. These include:

- Shama Health Centre: Main referral facility for the area.
- Aboadze/Abuesi Health Centre: Provides outpatient and maternal care for fishing and trading communities.
- Kojokrom Health Centre: Community-level facility offering preventive and curative services.

Shama serves as the main referral hub, while Aboadze/Abuesi and Kojokrom deliver essential primary healthcare to residents along the pipeline corridor.

4.5.16.1 Morbidity Trends in the Project Zones

The morbidity profile of the project communities in the Western Region is shaped by challenges related to water, sanitation, and environmental conditions. Malaria remains the most frequently reported illness, followed by skin infections, which consistently account for a large share of outpatient cases. Records from the Ghana Health Service highlight these conditions as the leading public health concerns across the beneficiary settlements along the proposed pipeline routes.

4.6 Central Region

4.6.1 Regional Overview

The Central Region, located along Ghana's southern coast, is one of the country's historically significant and culturally vibrant regions. It shares boundaries with the Western Region to the west, the Greater Accra Region to the east, the Ashanti and Eastern Regions to the north, and the Gulf of Guinea (Atlantic Ocean) to the south. Geographically, the region covers a land area of about 9,826 km², representing approximately 6.6% of Ghana's total land area. In 2025, the region can boast of a total population of about 2.8 million with 1.3 million being males and 1.4 being females.

The region is a mix of large towns, fishing villages, and rural settlements. The regional capital, Cape Coast, is a major administrative, educational, and cultural hub, known for its historic forts and castles. Other important towns include Elmina, Mankessim, Assin Fosu, Agona Swedru, Saltpond, and Winneba, which serve as centers for trade, fishing, education, and commerce. Compared to highly urbanized regions such as Greater Accra, the Central Region is less densely developed but maintains strong links to both coastal and inland economic activities.

The economy is largely based on fishing, farming, and commerce. Along the coast, artisanal and semi-industrial fishing are dominant, providing livelihoods for a large proportion of residents. The region is also noted for its salt production, quarrying, and an emerging tourism economy anchored by its historic heritage sites and coastal resorts.

4.6.2 Description of Project Communities

The project communities in the Central Region are predominantly agrarian, with farming of cassava, maize, cocoyam, plantain, and oil palm serving as the main livelihood activities. Livestock rearing (goats, sheep, and poultry) is practiced on a small scale across most rural settlements. Along the coast, particularly in Moree and Amosima, artisanal fishing and fish processing play an important role in household incomes.

Several communities, including Agona Nsaba, Agona Duakwa, Breman Asikuma, Abakrampa, Abura Dunkwa, and their satellite settlements combining farming with trading, transport, and services. These towns serve as commercial and service centers, offering relatively better access to schools, health facilities, and markets compared to the smaller farming villages.

Emerging communities such as Bebianeha New Site, Burgers Estate, Mfuom, Oxford, Takyikrom, and Kambali reflect clustered housing and increasing non-farm livelihoods due to urban expansion.

4.6.3 Climatic Conditions

The Central Region falls largely within the moist semi-deciduous forest and coastal savannah transition zones, characterized by a mix of forest vegetation, farmlands, and scattered trees such as oil palm, cocoa, mango, and acacia, as well as stretches of mangroves and coastal shrubs along the shoreline.

The climate is influenced by two main wind systems: the south-west monsoon winds from the Atlantic Ocean, which bring moisture and rainfall, and the north-east trade winds (Harmattan) from the Sahara, which dominate between December and February, resulting in drier, dust-laden conditions. Relative humidity is generally high, averaging 75%–95% during the rainy season, but may fall to around 50%–60% during the Harmattan period.

Temperatures are fairly stable throughout the year, with mean daily values ranging between 23°C and 33°C. The hottest period typically occurs in February–March, while cooler conditions are experienced around July–August during peak rains.

Rainfall in the Central Region follows a bimodal pattern, with two distinct wet seasons: the major rainy season from April to July (peaking in June) and the minor rainy season from September to November. Annual rainfall averages 1,200–1,600 mm (GMET, 2020–2025), with coastal areas receiving relatively less compared to the forested inland areas.

4.6.4 Geology and Soils

The Central Region is geologically underlain mainly by Birrimian rock formations, granitic intrusions, and associated volcanic belts, which are part of Ghana's mineral-rich geology. In addition, Cape Coast granite complexes, Tarkwaian sediments, and coastal sandstones and shales are prominent in parts of the region. These formations shape the region's diverse landscape, which ranges from gently undulating forested uplands to lateritic plateaus and low-lying coastal plains. The area is historically significant for gold and bauxite deposits, particularly within the Birimian and Tarkwaian belts, with active small- to large-scale gold

mining in places such as Dunkwa, Obuasi's peripheries, and Assin areas. Quarrying of granite, clay, and laterite is also common, providing materials for construction and road works. Figure 4-25 shows the rock types underlying the project beneficiary communities in the Central Region. Most of the communities are underlain by the Dahomeyan rock formation.

The soils of the Central Region reflect its forest–savannah transition and coastal influences, with fertility levels shaped by high rainfall and weathering. The major soil groups include:

1. Forest Ochrosols and Ferric Acrisols: These dominate the inland forested districts such as Assin, Twifo, and Breman Asikuma. They are well-drained, loamy to clay loam soils, with moderate fertility that supports cocoa, oil palm, citrus, cassava, maize, and plantain.
2. Lateritic Soils: Found mainly on upland areas and plateaus around Abura Dunkwa, Assin Fosu, and Mankessim. These are reddish-brown, gravelly, and highly weathered soils with relatively low natural fertility but suitable for hardy crops such as cassava, maize, and groundnuts. The lateritic crusts are also widely used as building and road construction materials.
3. Alluvial and Coastal Sandy Soils: Occurring along the floodplains of rivers such as the Pra, Ankobra, and Kakum, as well as along the Atlantic coast. These soils are clayey to sandy-loam, fertile, and enriched by periodic sediment deposits. They support rice cultivation, sugarcane, vegetables, coconut, and fishing-related agriculture in coastal areas.

As shown in Figure 4-26, Acrisols and Lixisols are the dominant soil types in the Central regional project beneficiary communities.

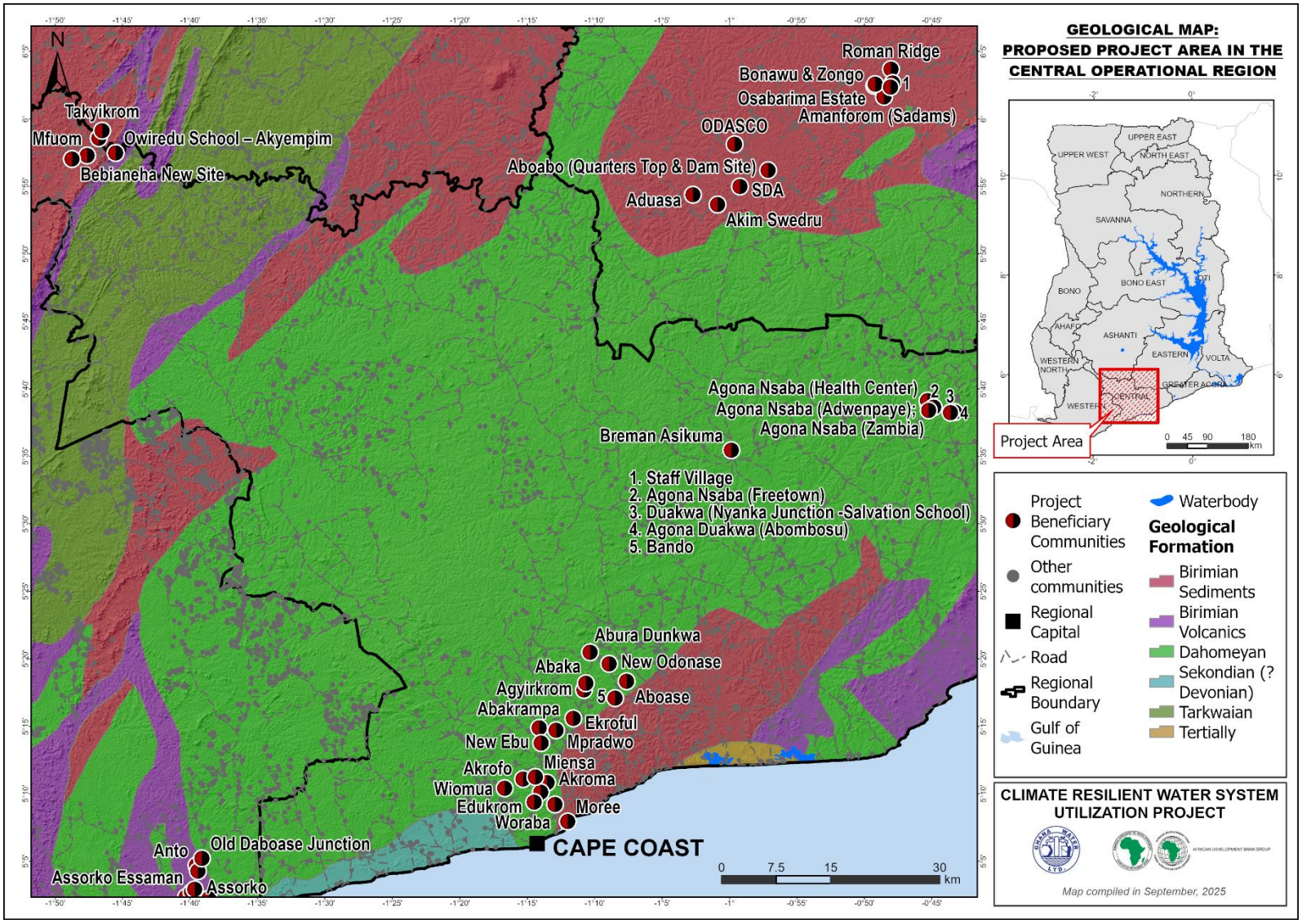


Figure 4-25: Geological map of the Central Region project beneficiary area

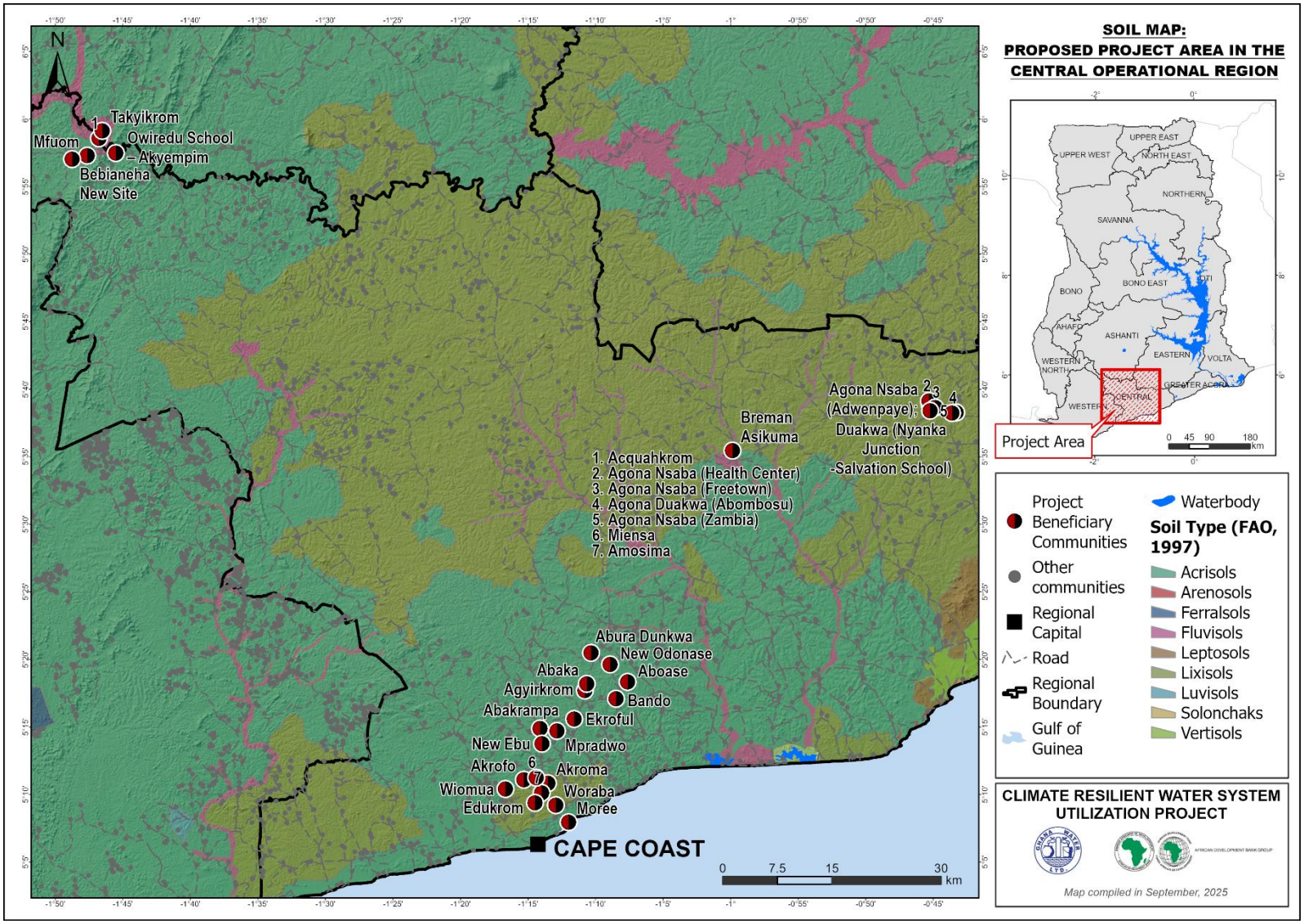


Figure 4-26: Soil map of the Central Region project beneficiary area

4.6.5 Air and Noise Quality

Noise monitoring conducted at three sampling locations (Acquahkrom-CR1, Moree-CR2 and Abura Dunkwa-CR3) during day and night periods showed average daytime levels between 51.8 and 53.4 dB(A) and nighttime levels between 44.2 and 46.0 dB(A). These results are within the Ghana Standards Authority (GS 1222:2018) permissible limits for residential and mixed-use environments, indicating a generally quiet ambient noise environment.

Air quality assessments for NO_2, SO_2, $PM_{2.5}$, and PM_{10} recorded concentrations ranging from 16.3–19.4 µg/m³ (NO_2), 11.4–15.3 µg/m³ (SO_2), 11.4–12.3 µg/m³ ($PM_{2.5}$), and 16.3–19.1 µg/m³ (PM_{10}). All measured values were below the national standards (GS 1236:2019), signifying good ambient air quality with minimal particulate and gaseous pollution.

Overall, the baseline conditions indicate that the project pipeline RoW has acceptable environmental quality, with no significant noise or air quality concerns. Continued monitoring and standard mitigation measures are recommended during project implementation to maintain compliance and protect community health.

Table 4-10: Air quality and noise level monitoring results in the Central Region

Code	Noise Level			Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	**dB_{max}**	**dB_{min}**		**dB(A)**		**µg/m³**		**µg/m³**		**µg/m³**	
CR1	Day	59.5	50.3	53.4	**55**	17.8	**150 (24 hours)**	14.7	**50 (24 hours)**	11.4	**35 (24 hours)**	19.1	**70 (24 hours)**
	Night	55.6	48.7	46.0	**48**								
CR2	Day	55.3	45.1	53.4	**55**	19.4	**150 (24 hours)**	12.0	**50 (24 hours)**	11.8	**35 (24 hours)**	16.8	**70 (24 hours)**
	Night	50.9	42.8	45.7	**48**								
CR3	Day	60.6	44.4	51.8	**55**	18.6	**150 (24 hours)**	15.3	**50 (24 hours)**	12.3	**35 (24 hours)**	16.3	**70 (24 hours)**
	Night	50.9	42.5	44.2	**48**								

4.6.6 Topography

The Central Region is characterized by a varied landscape of coastal plains, rolling hills, and forested uplands, with elevations ranging from sea level along the Gulf of Guinea to about 250–300 meters above sea level inland. The terrain reflects the influence of Precambrian rock formations and forest soils, giving rise to a mixture of flat lowlands, dissected hills, and gently undulating plateaus. The topography of the Central Regionl project beneficiary communities are shown in Figure 4-28 below.

In the coastal belt, stretching through towns such as Cape Coast, Elmina, Moree, and Winneba, the topography is marked by low-lying plains, sandy beaches, and rocky headlands. This zone is suitable for fishing, coconut and vegetable cultivation, but some areas are vulnerable to coastal erosion and tidal flooding.

4.6.7 Hydrology and water resources

The project area in the Central Region is characterized by a complex and well-defined drainage network that spans multiple major basins, including the Ankobra, Pra, Ayensu, Kakum, and Minor Coastal Basins. The drainage pattern is predominantly dendritic, reflecting the influence of the region's undulating topography and extensive rainfall regime as shown in Figure 4-27 below.

Rivers and streams in the northern and central portions, such as those within the Pra and Ankobra basins, flow southward, while those in the coastal areas particularly the Ayensu and Kakum systems drain directly into the Gulf of Guinea. Several wetlands and estuarine zones occur along the coastal plains near Cape Coast, Abura Dunkwa, and Moree, providing important ecological services such as flood regulation, groundwater recharge, and habitat support for aquatic species.

The drainage system supports both surface and groundwater resources critical for domestic, agricultural, and ecological sustainability. However, localized risks of flooding and sedimentation exist in low-lying and coastal zones, necessitating careful hydrological management during project implementation.

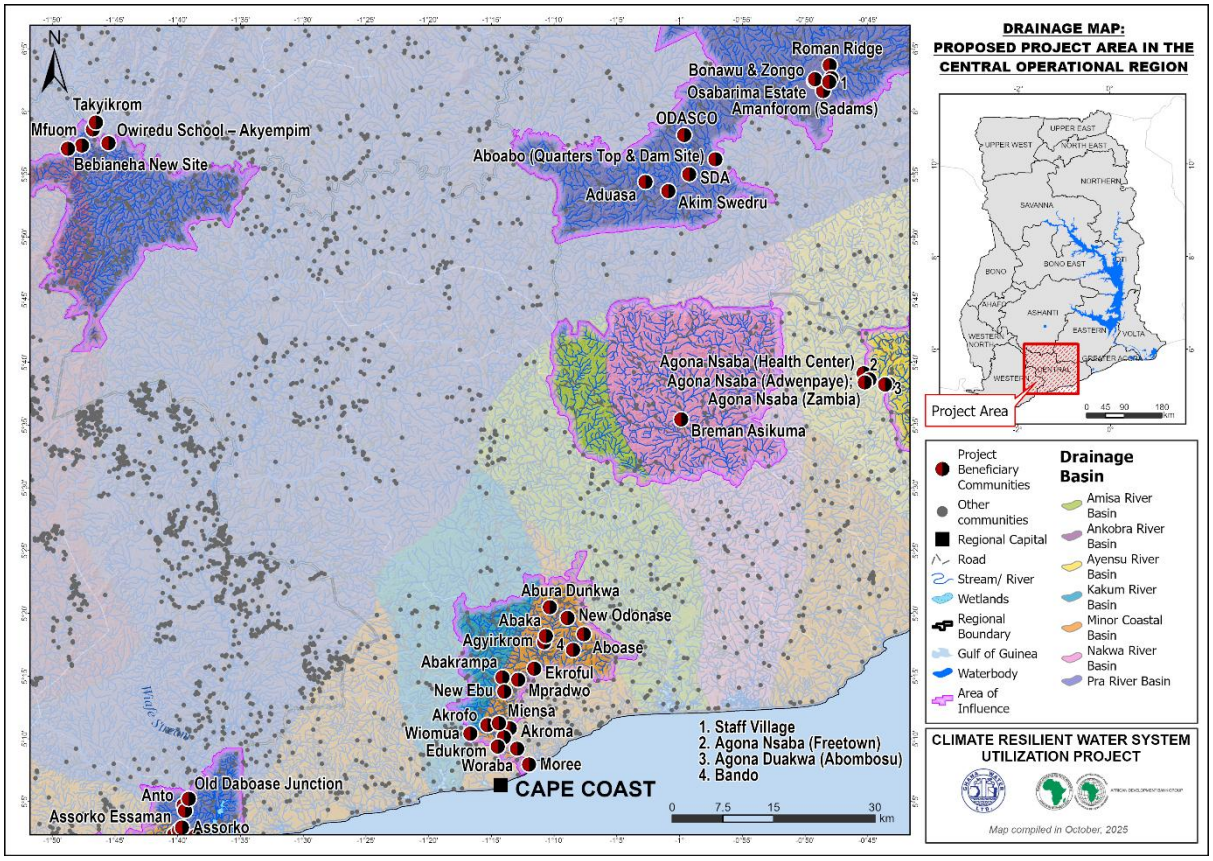


Figure 4-27: Drainage map of the Central Region project beneficiary area

4.6.8 Flora and Fauna

The project area in the Central Region lies within the moist semi-deciduous forest ecological zone, characterized by a mix of tall hardwood tree species, along with secondary growth vegetation and shrubs. However, in the specific project communities, much of the original forest cover has been extensively degraded due to continuous farming, logging, charcoal burning, and settlement expansion.

Fauna within the project corridors is also highly reduced compared to intact forest areas. While the wider Central Region is naturally home to forest wildlife, these have been largely displaced from the project communities due to human activities. Since the pipeline routes predominantly follow existing road reserves and already disturbed areas affected by farming, utilities, and settlements, the potential impacts on both flora and fauna are expected to be minimal. The landcover and vegetation of the Central Region project beneficiary area is shown in Figure 4-29.

See Appendix 9 for comprehensive data on flora and fauna species spotted during flora and fauna screening of the pipeline corridor.

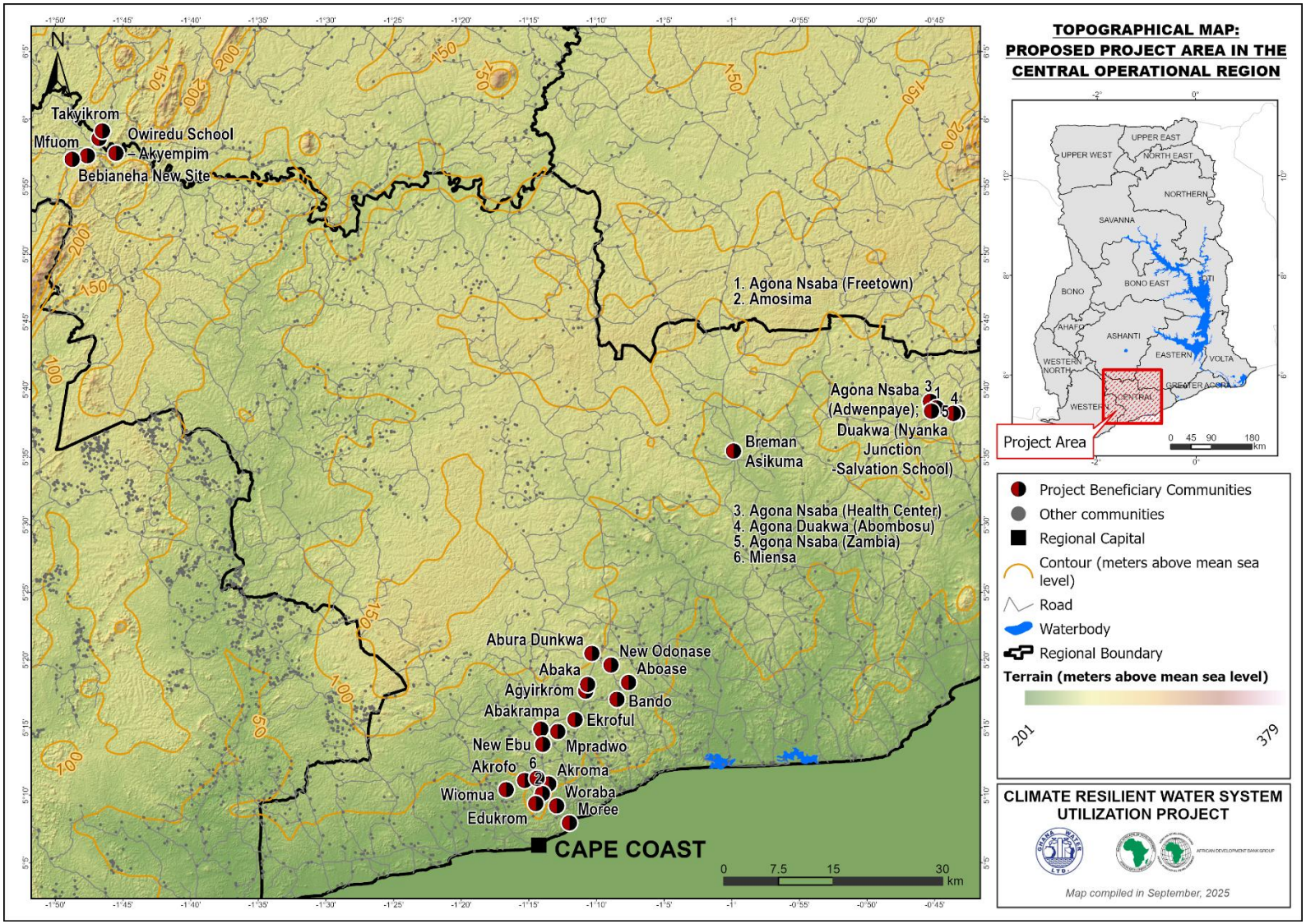


Figure 4-28: Topographical map of the Central Region project beneficiary area

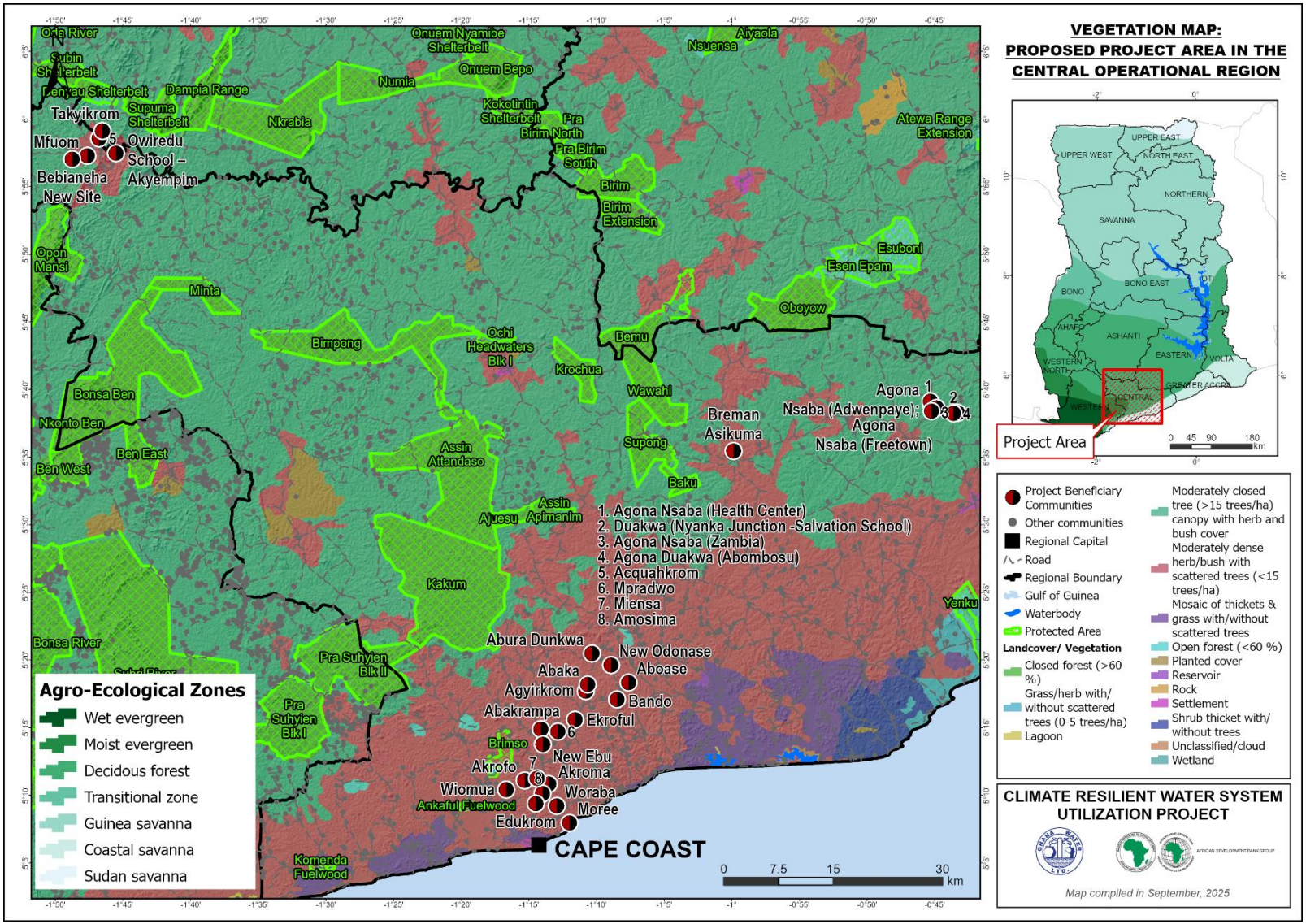


Figure 4-29: Vegetation and Landcover map of the Central Region project beneficiary area

4.6.9 Socio-Demographic Characteristics

In the project communities of the Central Region, economic activity is dominated by the informal sector, with trading and small-scale businesses forming the backbone of livelihoods. Survey findings indicate that between 4% and 18% of respondents were employed in professional jobs such as teaching, civil service, and banking. The remaining majority were engaged in informal occupations.

In towns such as Cape Coast, Elmina, and Mankessim, trading (particularly food vending, fish processing, and petty sales) emerged as the most common activity, employing an average of about 40% of respondents. Artisans including dressmakers, hairdressers, carpenters, and mechanics accounted for roughly 20%, while technical workers such as drivers and electricians represented about 17%. A smaller proportion (10–12%) of respondents were in professional employment, while about 1–3% are engaged in agriculture-related activities, mainly in peri-urban and inland communities where cassava, maize, and vegetables are cultivated.

Similar trends were recorded in communities such as Saltpond, Winneba, and Abura-Dunkwa, where informal sector activities dominate, particularly fish processing and trading in coastal areas, and food vending and artisanal services inland. Overall, the survey confirms that the informal sector—anchored by trading, fishing, and artisanal work—remains the main source of employment and livelihood, with formal employment opportunities limited to a smaller proportion of the population.

4.6.9.1 Population of Beneficiary Communities

The beneficiary communities in the Central Region are largely coastal, trading, and peri-urban settlements with youthful populations and average household sizes of 4–6 persons. Population growth is driven by natural increase, rural–urban migration, and the expansion of towns such as Cape Coast, Elmina, Winneba, Mankessim, and Saltpond. While fishing and farming remain central in coastal and rural areas, livelihoods are increasingly diversified into trading, transport, services, and artisanal work, especially in peri-urban and urban communities. The proximity of many settlements to major roads and administrative centers has supported this gradual shift from agrarian-based economies toward more urbanized and service-oriented activities.

The beneficiary communities targeted by the project are predominantly urban or peri-urban, as per the Ghana Statistical Service's threshold of 5,000 inhabitants. Most of these communities have experienced steady population growth between 2021 and 2025, fueled by natural increase

and migration tied to commercial, educational, and infrastructural developments. Table 4-11 shows the estimated population of the project corridor communities in the Central region.

Table 4-11: Estimated Population of Project Corridor Communities (Central Region)

Community / District	**2021 Population**	**2025 Projected Population**
Cape Coast Metropolitan	189,925	204,804
Komenda-Edina-Eguafo-Abirem (Elmina Municipal)	166,017	178,008
Abura-Asebu-Kwamankese (Abura-Dunkwa)	-	-
Mfantsiman Municipal (Saltpond area)	-	-
Agona East (Agona Nsaba and environs)	-	-
Breman Asikuma (Asikuma-Odoben-Brakwa District)	236,527	254,092
Effutu Municipal (Winneba area)	107,798	116,228
Assin North (peri-Mankessim region)	80,539	86,858
Effutu District (Saltpond region)	168,905	182,145

Source: Ghana Statistical Service (Projection from 2021 Census; District Assembly report).

4.6.9.2 Ethnicity of Residents of the Project Communities

According to the Ghana Statistical Service (2021 PHC) and community surveys, the project communities in the Central Region are predominantly Akan (Fante subgroup), though varying levels of ethnic diversity exist, particularly in peri-urban, fishing, and trading settlements.

- Akrofo, Akroma, Amosima, Edukrom, Miensa, Breman Asikuma, Abaka, Abakrampa, Aboase, Egyirkrom, Ekroful, Mpradwo, New Ebu, and New Odonase are largely homogenous, with Fante populations making up over 75–85%, and minority households from Ewe, Ga-Adangbe, and northern Ghanaian groups.
- Agona Duakwa (Abombosu, Nyanka Junction–Salvation School, Acquahkrom, Bebianeha New Site, Burgers Estate, Mfuom, Oxford, Takyikrom) and Agona Nsaba (Adwenpaye, Freetown, Health Center, Zambia) exhibit moderate ethnic diversity. While Fante remain dominant is about 65–70% these communities attract Ewe, Ga-

Adangbe, Hausa/Zabarmas, and northern migrants due to their location along trade routes and proximity to commercial centers.

- Moree, Wiomua, and Woraba, being coastal fishing communities, are the most ethnically diverse. Here, Fante makes up about 55–60%, while Ewe and Ga-Adangbe fisherfolk form a significant presence. Migrants from other West African countries, especially in fishing and trading, contribute to their diversity.
- Abura Dunkwa and Bando, as district centers with strong trading activity, are also ethnically mixed. Fante constitutes roughly 65–70%, complemented by migrant groups such as Ewe, Ga-Adangbe, and northern settlers engaged in commerce and artisanal work.

4.6.9.3 Religion (Project Communities – Central Region)

According to the socio-economic baseline profiles, the beneficiary communities in the Central Region are predominantly Christian, with proportions ranging between 70% and 85% across settlements such as Akrofo, Akroma, Amosima, Edukrom, Miensa, Breman Asikuma, Abakrampa, and Abura Dunkwa. The communities with the strongest Christian presence include Agona Nsaba, Agona Duakwa, Abura Dunkwa, and Breman Asikuma, where churches of various denominations are highly visible and central to community life.

Islam represents the second largest religious group, accounting for about 10–20% of residents. Muslim populations are more concentrated in trading communities such as Moree, Wiomua, Woraba, Agona Duakwa, and Agona Nsaba, where mosques and Islamic groups support growing migrant communities engaged in fishing, trading, and artisanal work.

A smaller proportion of residents, estimated at 3–7%, continue to practice Traditional African Religions, especially in rural communities such as Edukrom, Miensa, Takyikrom, and Mpradwo, where traditional shrines, festivals, and ancestral practices remain central to cultural identity and community cohesion.

4.6.10 Economic activities

Livelihoods in the Central Region project communities are largely dominated by the informal economy, with only a small share of residents in formal jobs (mainly teaching, health, and public service).

- Trading is the largest occupation (35–45%), especially in Agona Nsaba, Agona Duakwa, Abura Dunkwa, Moree, and Breman Asikuma, driven by access to local and regional markets.

- Fishing and fish-processing play a major role in Moree and Wiomua.
- Artisanal/vocational work (18–22%) includes carpentry, tailoring, hairdressing, masonry, mechanics, and welding.
- Transport services (2–16% such as taxis, trotros, and motorcycle/tricycle operations are important in urban/peri-urban centers.
- In communities like Akrofo, Amosima, Edukrom, Miensa, Takyikrom, and New Odonase, farming (30–40%) remains the backbone of the local economy.

4.6.11 Educational Facilities on the Proposed Pipeline Route

Across the project communities in the Central Region, access to schools along the proposed pipeline routes is limited. Several communities including Akrofo, Akroma, Edukrom, Miensa, Wiomua, Woraba, Bebianeha New Site, Oxford, Takyikrom, Abaka, Abakrampa, Aboase, Egyirkrom, Ekroful, Mpradwo, New Ebu, and New Odonase do not have any educational facilities located directly along their pipeline routes.

Other communities, however, such as Moree, Agona Nsaba (Health Center Zone), Agona Nsaba (Adwenpaye), Duakwa (Nyanka Junction–Salvation School), Acquahkrom, and Abura Dunkwa, each have at least one school situated along their routes, serving both basic and junior high levels.

Enrollment figures in these schools vary widely, with larger towns like Abura Dunkwa, Agona Nsaba, and Breman Asikuma showing relatively higher student numbers compared to smaller settlements such as Amosima and Burgers Estate (see Table 4-12).

Table 4-12: School Facilities along the Pipeline Routes

Community	Total No. of Schools	Total Enrollment
Moree	2	1,245
Agona Nsaba (Adwenpaye)	1	720
Agona Nsaba (Freetown)	0	-
Agona Nsaba (Health Center Zone)	1	810
Agona Nsaba (Zambia)	0	-
Duakwa (Nyanka Junction – Salvation School)	1	635
Acquahkrom	1	510
Abura Dunkwa	2	1,430
Breman Asikuma	2	1,365

Community	Total No. of Schools	Total Enrollment
Amosima	0	-
Burgers Estate	0	-
Akrofo	0	-
Akroma	0	-
Edukrom	0	-
Miensa	0	-
Wiomua	0	-
Woraba	0	-
Bebianeha New Site	0	-
Oxford	0	-
Takyikrom	0	-
Abaka	0	-
Abakrampa	1	690
Aboase, Bando, Egyirkrom, Ekroful, Mpradwo, New Ebu, New Odonase	0	-
Owiredu School – Akyempim	1	540

4.6.12 Health Facilities along the Pipeline Routes

A number of health facilities were identified along the proposed pipeline routes within the Central Region project communities. These include:

- Agona Nsaba Health Centre, located close to the main township and serving as a primary point of care.
- Abura Dunkwa Health Centre, which provides outpatient services and maternal care for surrounding settlements.
- Breman Asikuma Health Centre, a well-established facility supporting both preventive and curative health services.

Among these facilities, the Agona Nsaba Health Centre operates as the main public referral point for adjoining communities, handling cases referred from smaller community-based units. The Abura Dunkwa and Breman Asikuma health facilities function as community-level service providers, delivering essential primary healthcare to residents along the pipeline corridor.

4.6.12.1 Morbidity Trends in the Project Zones

The morbidity profile of the project communities in the Central Region reflects health challenges largely linked to water, sanitation, and environmental conditions. The most frequently reported illnesses include malaria and respiratory/skin infections, which consistently rank among the top cases at local health facilities. Ghana Health Service records indicate that these conditions remain the primary public health concerns across the beneficiary communities situated along the proposed pipeline routes.

4.7 Eastern Region

4.7.1 Regional Overview

The Eastern Region occupies a land area of 19,323 kilometers and constitutes 8.1 per cent of the total land area of Ghana. It is the sixth-largest region in terms of land area. It lies between latitudes 6° and 7° North and between longitudes 1030' West and 0030' East. The region shares common boundaries with the Greater Accra and Central Regions to the south, to the north by the Bono East Region, the Ashanti Region to the west, and the Volta Lake and Volta Region to the east. Eastern Region is one of the sixteen administrative regions of Ghana, with Koforidua as the administrative capital. The Districts in the Colony that were located in the Eastern Region were the Akwapem-New Juaben and Birim, which respectively had two and four native authorities. These Districts still belong to the Eastern Region of today, but other areas have been added at different times after independence. There are 33 Municipalities and Districts in the region today. The 2025 population of the Eastern Region, according to GSS is projected to stand at 3,950,684 with 1,928,191 males and 2,022,493 females.

4.7.2 Description of Project Communities

Table 4-13 below provides a vivid description of the nature of the selected beneficiary community with a focus on its low-income urban status.

Table 4-13: Selected Beneficiary Community

Community Name	Description of low-income status
Amanforom (Sadams)	Amanforom, also known locally as Sadam, is a residential community within the Kpone-Katamanso Municipal Assembly (KKMA). It is located in the northern section of the municipality. The community is bordered to the north by Appolonia, to the east by Gbetsile, to the west by Oyibi (in the Ga East Municipality), and to the south by Sebrepor. Amanforom is a growing settlement with a mix of indigenous Ga settlers and migrant populations. It is developing into a semi-urban residential area due to its proximity to the Appolonia City project and the Oyibi enclave.

Community Name	Description of low-income status
Bonawu & Zongo	Bonawu and Zongo are twin communities within the KKMA. Bonawu is mainly inhabited by indigenous families, while Zongo is characterized by a more diverse migrant population, especially from northern Ghana and neighboring West African countries. The area is bordered to the north by Kpone, to the east by Gbestile, to the south by Zenu, and to the west by Sebrepor. Both Bonawu and Zongo have vibrant social and commercial activities, with Zongo noted for its bustling small-scale trade, food markets, and artisan work.
GCD Camp	GCD Camp is a resettlement community originally established to accommodate workers of the Ghana Consolidated Diamonds Company. It lies within the eastern corridor of the KKMA. To the north, it is bordered by Appolonia; to the south by Katamanso; to the east by Kpone; and to the west by Oyibi. The community still retains its structured layout from its origins as a workers' settlement, with modest housing and communal facilities. It has been experiencing gradual population growth as non-mining families have moved in due to affordable housing and land availability.
Number 8	Number 8 is a small but notable settlement within KKMA. It is bordered by Zenu to the south, Domeabra to the west, and Sebrepor to the east. The area derives its name from an early land demarcation system, where plots were identified numerically. Today, Number 8 is gradually expanding as families from Ashaiman and Tema acquire land for residential purposes. It is semi-urban, with both unplanned housing and new estate developments appearing along its peripheries.
Osabarima Estate	Osabarima Estate is a planned residential enclave in the KKMA. It is located closer to the Ashaiman boundary and is bordered by Zenu to the north, Ashaiman Municipality to the south, and Sebrepor to the east. The estate was developed by private real estate investors to provide middle-income housing. It features neatly laid-out streets, modern houses, and access roads, although infrastructure development such as drainage and paved roads remains ongoing. Its proximity to Tema and Ashaiman makes it attractive to working-class families.
Roman Ridge (KKMA)/ Staff Village	Roman Ridge in KKMA is a local residential community within the Zenu–Sebrepor area. It is bordered to the north by Sebrepor, to the west by Domeabra, and to the south by Ashaiman Municipality. The community is named informally, likely after the Accra suburb, by early settlers or landlords. It is semi-urban, with a mixture of traditional compounds and newly constructed self-contained houses. Staff Village is a purpose-built settlement within KKMA, originally created to house workers from nearby institutions and companies, including those tied to Tema's industrial hub. It is bordered by Zenu to the west, Sebrepor to the north, and Ashaiman to the south. The area is more organized than the surrounding communities, with a layout of residential blocks and open spaces. Over time, non-staff

Community Name	Description of low-income status
	residents have also settled in the area, turning it into a mixed community with both planned and unplanned residential development.
Akim Ofoase	Akim Ofoase is the district capital of the Akyemansa District in the Eastern Region of Ghana. It is strategically located along the Ofoase–Ayirebi road and serves as an administrative, educational, and commercial hub for surrounding rural communities. The town is bordered to the north by Ayirebi, to the south by Brenase, to the west by Abenase, and to the east by Akokoaso. The population is a mix of indigenous Akyem families and migrants, with agriculture being the mainstay of the local economy.
Asuom	Asuom is the district capital of Kwaebibirem Municipality in the Eastern Region of Ghana. It is located along the Kade–Akwatia–Oda corridor and plays an important role as a commercial and administrative center. The town is bordered to the north by Abaam, to the south by Subi, to the east by Banso, and to the west by Kade. The area has fertile land, making it significant. Asuom has a semi-urban character, with a blend of modern residential housing and traditional compounds, and it serves as a link between rural communities and the larger towns of Kade and Oda.
Aboabo (Quarters Top & Dam Site)	Aboabo is a major residential suburb within the Akim Oda area of the Birim Central Municipality in the Eastern Region. It is divided into two main sections: Quarters Top and Dam Site. ▪ Quarters Top: This section derives its name from government-built residential quarters that once housed civil servants and workers of state institutions. It has a more organized layout compared to other parts of Aboabo and features schools, churches, and easy road access to the main Oda township. ▪ Dam Site: Located closer to a former water supply dam, this area developed as workers' housing and later expanded into a mixed residential neighborhood. It is more densely populated, with a combination of self-built houses and rental units. Aboabo as a whole is bordered by Jamaica and Akim Oda town center to the south, Awisa to the east, and Akim Swedru to the north
Akim Swedru & Aduasa	Akim Swedru is a town in the Birim South District of the Eastern Region. It serves as the district capital and is an important administrative and commercial center. It is bordered by Aduasa to the east, Apoli to the west, and Awisa to the south. The town is well known for the Akim Swedru Senior High School (SWESCO), one of the prominent second-cycle schools in the region. Akim Swedru has a large market that supports trade in cocoa, timber, foodstuffs, and textiles, reflecting its position as a hub for surrounding farming communities. Aduasa is a smaller settlement that shares a close boundary with Akim Swedru. It is more residential in character, with a significant

Community Name	Description of low-income status
	farming population. The town contributes to the agricultural output of the district, mainly food crops and cash crops like cocoa. Many residents of Aduasa depend on Akim Swedru for schooling, healthcare, and administrative services.
Odasco & SDA (Akim Oda)	These are educational institutions and their surrounding communities within Akim Oda, the capital of Birim Central Municipality. ▪ Odasco (Oda Senior High School): This is one of the largest senior high schools in the Eastern Region, located on the outskirts of Akim Oda. The school has a large campus, residential facilities, and playing fields. The community surrounding Odasco is semi-urban, with hostels, teachers' quarters, shops, and rental housing that serve students and staff. ▪ SDA (Seventh-Day Adventist School/Area): The SDA enclave in Oda is centered around the SDA Senior High School and the SDA church mission facilities. The area has both residential and institutional facilities, with a population made up of students, staff, and church members. It is located close to Aboabo and serves as a quieter residential suburb compared to the bustling Oda township.

4.7.3 Climatic conditions

The Eastern Region lies within the semi-deciduous forest and transitional ecological zones of Ghana. The climate is largely influenced by the south-west monsoon winds from the Atlantic Ocean and the north-east trade winds from the Sahara, which together create alternating wet and dry conditions. Relative humidity is generally high, ranging between 70% and 80% in the mornings and averaging 60%–65% in the afternoons across most of the year.

Temperature records from the Ghana Meteorological Agency (GMET) over the past decade indicate mean annual temperatures between 22°C (minimum at dawn) and 32°C (maximum during midday). Cooler conditions are often experienced in the highland areas such as Kwahu, Begoro, and Abetifi, where average temperatures can be 2–4°C lower than the lowland areas around Nkawkaw, Oda, and Kade.

Rainfall in the Eastern Region follows the double maxima rainfall regime typical of southern Ghana. The major rainy season extends from April to July, peaking in June, while the minor rainy season occurs from September to October, with a peak in October. GMET data (2020–2025) shows that annual rainfall ranges between 1,200 mm and 1,800 mm, with the highest amounts recorded in forested areas like Akim Oda and Kade, while the Kwahu highlands record lower but more evenly distributed rainfall.

4.7.4 Geology and Soil

The Eastern Region of Ghana is underlain predominantly by the Birrimian rock system, which forms the foundation of most of southern Ghana. The Birrimian rocks consist mainly of metasedimentary and metavolcanic formations, intruded by granitoid complexes. These geological formations are highly significant because they are associated with gold and bauxite deposits, which are extensively mined in areas such as Akyem Abuakwa (gold) and Kibi (bauxite). In addition, parts of the Kwahu plateau contain sandstone formations of the Tarkwaian system, which also host mineralization.

All project beneficiary communities in the region have a Birimian Sediment rock base with the exception of Akim Ofoase, which has a Tarkwaian rock base as shown in Figure 4-30.

The soils of the region are largely products of prolonged weathering under humid tropical conditions, leading to the development of deep, highly leached, and lateritic profiles. Three broad soil associations are dominant in the region:

1. Forest Ochrosols – These are well-drained, loamy soils developed under the semi-deciduous forest zone. They are highly fertile and suitable for cash crops such as cocoa, oil palm, and citrus, as well as staples like cassava, plantain, and maize. They dominate in areas around Akim Oda, Kade, and Nsawam.
2. Lithosols and Skeletal Soils – Found in the Kwahu highlands and scarp areas, these soils are shallow, stony, and less fertile due to the steep slopes and rapid runoff. They support secondary forest, grassland, and limited farming, though they provide good sites for settlement and tourism infrastructure.
3. Lateritic and Alluvial Soils – Lateritic soils, rich in iron and aluminum oxides, occur widely in upland areas and are typically reddish in color. Alluvial soils occur along the Pra, Birim, and Densu river valleys, where they are relatively fertile and used for rice cultivation, vegetables, and sugarcane farming.

Acrisols and fluvisols are the main soil types within the project beneficiary communities in the region as shown in Figure 4-31.

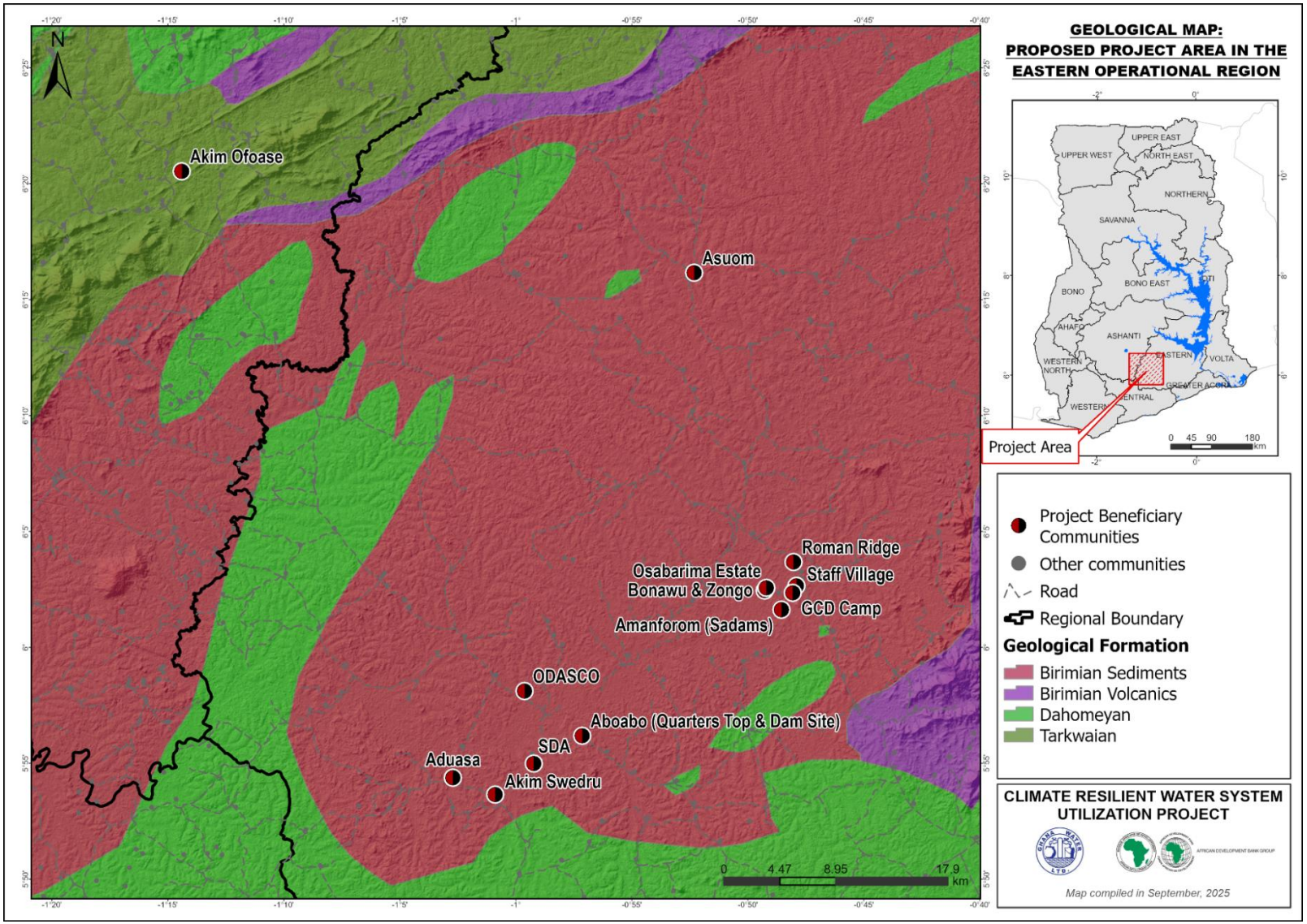


Figure 4-30: Geological map of the Eastern Region project beneficiary area

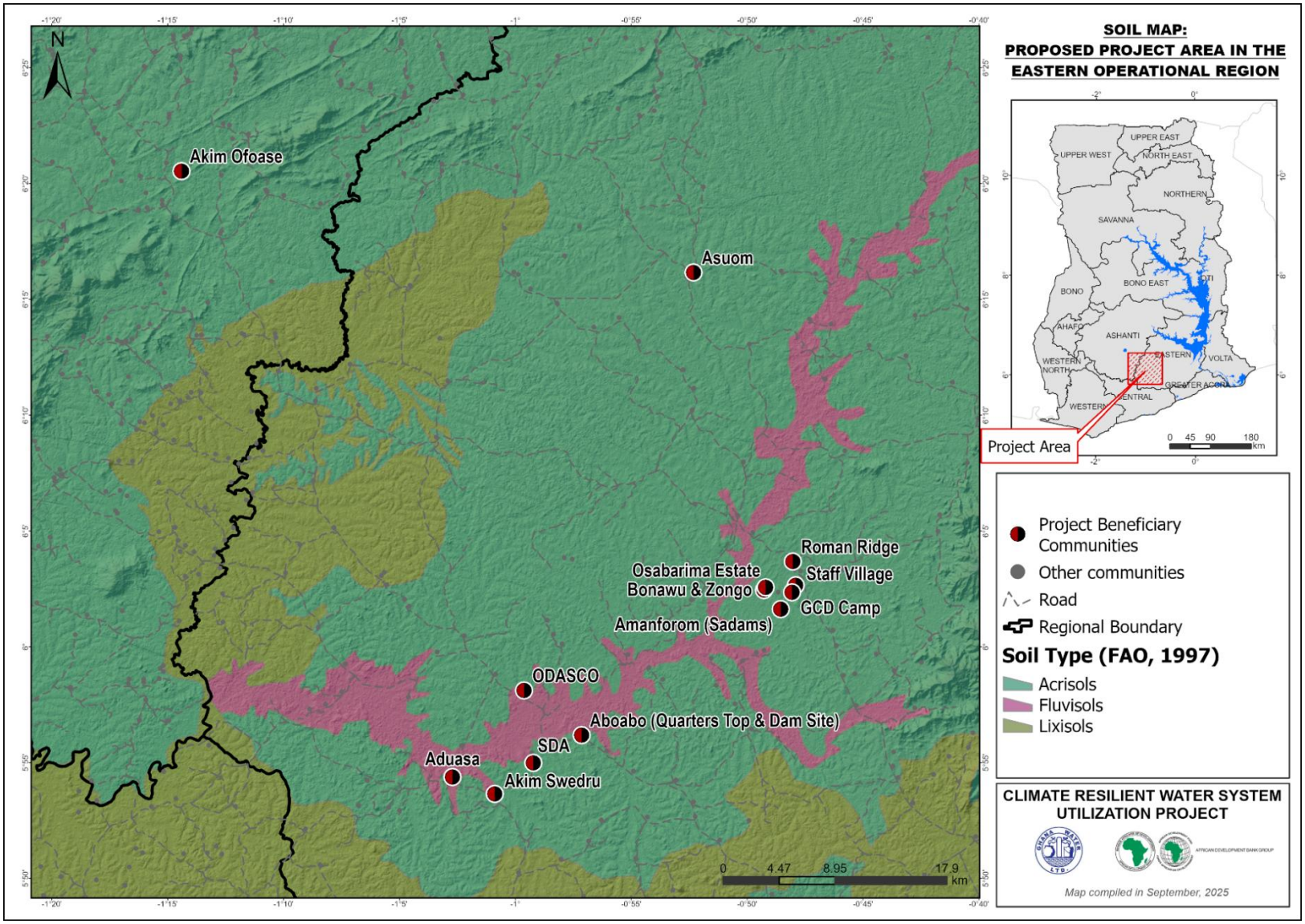


Figure 4-31: Soil map of the Eastern Region project beneficiary area

4.7.5 Air and Noise Quality

Baseline measurements for ambient noise and air quality were conducted at three monitoring locations (Akim Swedru-ER1, Amanforom-ER2, and Asuom-ER3) within the proposed project RoW to establish existing environmental conditions prior to project implementation. Sampling and analytical procedures were undertaken in accordance with Ghana Standards Authority requirements and international best practice.

Daytime and nighttime noise measurements were compared against the Ghana Standard GS 1222:2018 – Environmental Noise Control Requirements. Daytime noise levels ranged from 51.8 dB(A) (ER3) to 59.8 dB(A) (ER2). While most stations recorded values within the permissible limit of 55 dB(A) for residential/mixed-use areas, ER2 marginally exceeded the standard, reflecting its proximity to moderate vehicular and human activity zones.

Nighttime noise levels ranged from 44.2 dB(A) to 46.2 dB(A), all of which were within the prescribed limit of 48 dB(A), indicating low nocturnal disturbance and minimal anthropogenic activity after dusk.

The results indicate that the ambient acoustic environment is generally quiet, with only localized exceedances potentially attributable to transient sources such as traffic and commercial operations.

Ambient air quality parameters measured included nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter ($PM_{2.5}$ and PM_{10}), assessed against the Ghana Standards GS 1236:2019 – Ambient Air Quality Requirements.

- NO_2 concentrations ranged from 17.8 µg/m³ to 20.3 µg/m³, well below the 24-hour standard of 150 µg/m³.
- SO_2 concentrations varied between 14.7 µg/m³ and 34.0 µg/m³, remaining within the acceptable threshold of 50 µg/m³.
- $PM_{2.5}$ concentrations (11.4–30.0 µg/m³) and PM_{10} concentrations (16.3–50.3 µg/m³) were generally below the respective 24-hour limits of 35 µg/m³ and 70 µg/m³, except for ER2, where elevated values suggest localized dust generation from unpaved surfaces.

Generally, the results demonstrate that ambient air quality within the project area is satisfactory, with all measured parameters below the Ghanaian regulatory thresholds. The data

further suggest that the study area is characterized by low atmospheric pollution levels, typical of semi-urban environments with limited industrial activity.

In summary, the baseline environmental monitoring indicates that both ambient noise and air quality conditions comply with national regulatory standards, with only minor exceedances observed in areas of concentrated anthropogenic activity. These data provide a robust reference for assessing potential project-induced impacts during the actual implementation of the proposed project.

Table 4-14: Air quality and noise level monitoring results in the Eastern Region

Code	Noise Level			Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	**dB_{max}**	**dB_{min}**		**dB(A)**		**µg/m³**		**µg/m³**		**µg/m³**	
ER1	Day	59.5	50.3	53.4	**55**	17.8	**150 (24 hours)**	14.7	**50 (24 hours)**	11.4	**35 (24 hours)**	19.1	**70 (24 hours)**
	Night	55.6	48.7	46.0	**48**								
ER2	Day	70.8	60.5	59.8	**55**	20.3	**150 (24 hours)**	34.0	**50 (24 hours)**	30.0	**35 (24 hours)**	50.3	**70 (24 hours)**
	Night	65.2	43.1	46.2	**48**								
ER3	Day	60.6	44.4	51.8	**55**	18.6	**150 (24 hours)**	15.3	**50 (24 hours)**	12.3	**35 (24 hours)**	16.3	**70 (24 hours)**
	Night	50.9	42.5	44.2	**48**								

4.7.6 Topography

The Eastern Region has a varied topography comprising low-lying plains, rolling hills, and highland plateaus. Elevations range from below 60 meters above mean sea level in the southern plains around Nsawam, Suhum, and Akim Oda, to over 760 meters in the Kwahu Plateau and the Akwapim-Togo Ranges. The slopes across much of the region are gentle, generally below 10–12 percent, except along the escarpments of the Kwahu Plateau and the Akwapim-Togo Ranges where they are steep. The central highland areas, including the Kwahu Plateau, rise sharply above the Afram Plains to the north, while the eastern boundary is marked by the Akwapim-Togo Ranges running in a north–south direction. In contrast, the southern and western sections, particularly around Koforidua and Akim Oda, are gently undulating with broad river valleys. Overall, the landform of the Eastern Region combines upland ridges and plateaus with extensive low-lying plains, which influence settlement, agriculture, and transportation.

The topography of the region relative to the project beneficiary communities is shown in Figure 4-33.

4.7.7 Hydrology and water resources

The drainage system in the Eastern Region forms a hierarchical network of rivers and streams that drain from the elevated interior toward the Gulf, creating a mosaic of major basins, tributaries, wetlands, and floodplain corridors. The system is characterized by a predominantly dendritic pattern with several named basins, including the Ayensu and Pra River basins, which converge toward coastal outlets. The network supports a series of wetland complexes and floodplains that influence sediment transport, nutrient cycling, and hydrological connectivity across the landscape.

From the Figure 4-32 below, all the project communities are within the Pra basin. The basins exhibit a dendritic drainage pattern, characterized by a dense network of small streams and tributaries that flow into the main Pra River. The area's drainage is influenced by moderate relief and a humid tropical climate, resulting in perennial and seasonal streams that maintain flow throughout most of the year.

Site verification revealed that no surface water resources interact with the proposed project RoW. However, the general drainage characteristics support favorable hydrological conditions for the implementation of the Climate Resilient Water System Utilization Project, enhancing water availability and management within beneficiary communities.

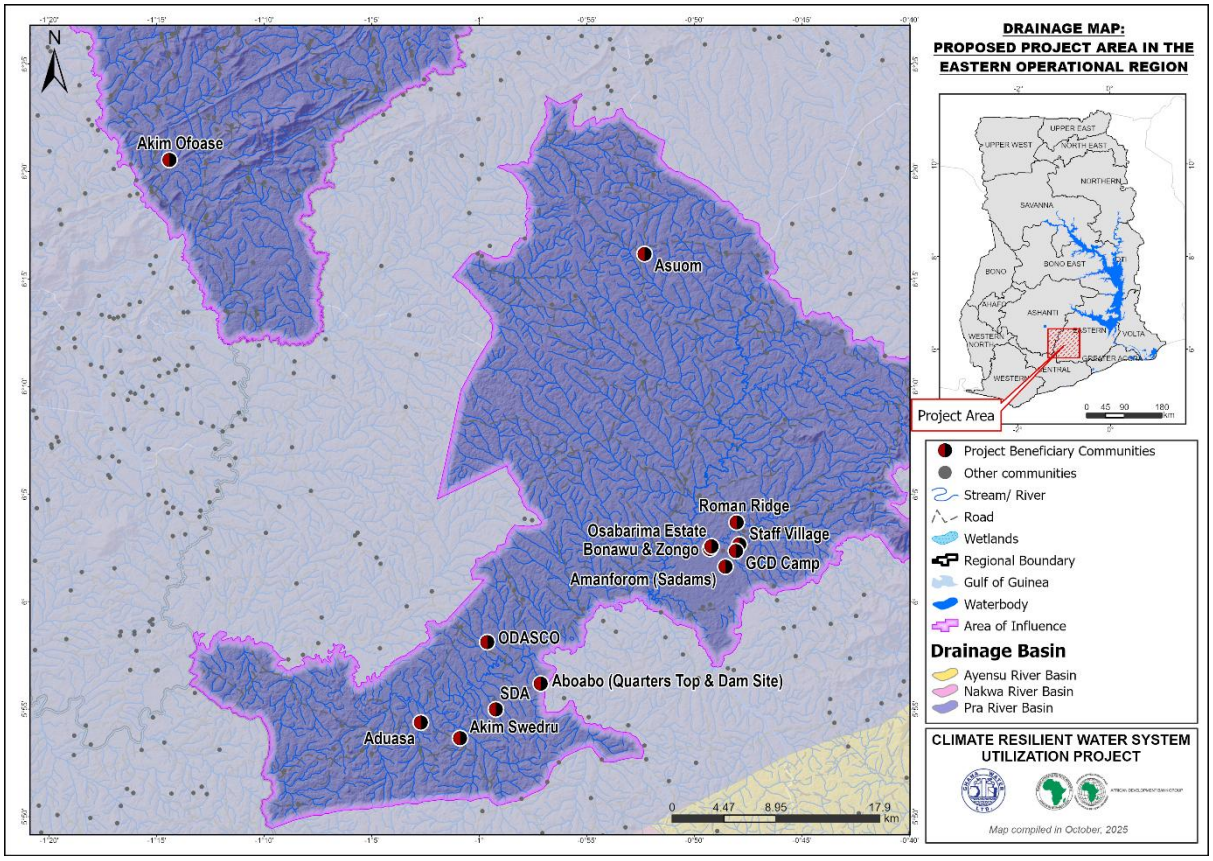


Figure 4-32: Drainage map of the Eastern Region project beneficiary area

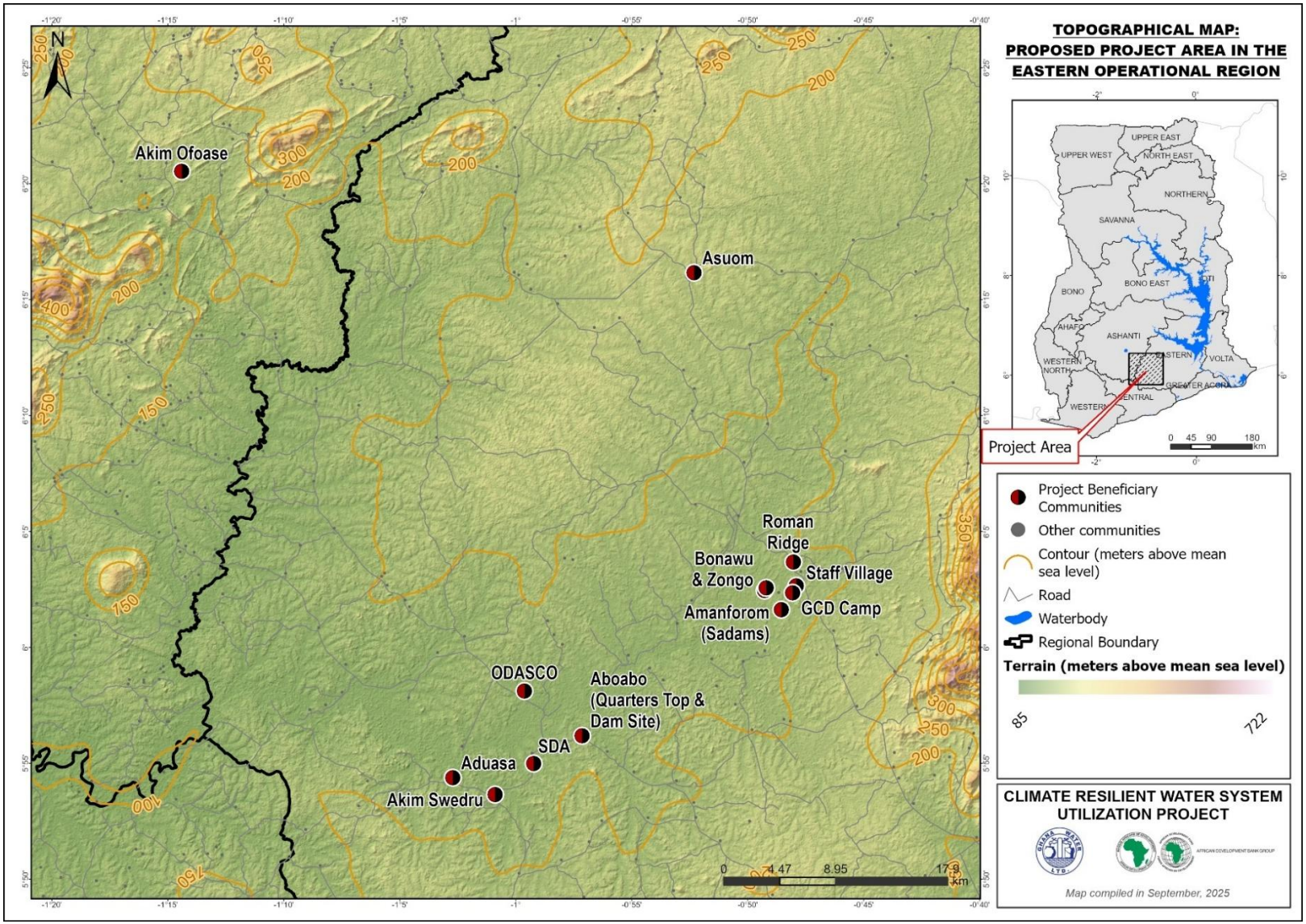


Figure 4-33: Topographical map of the Eastern Region project beneficiary area

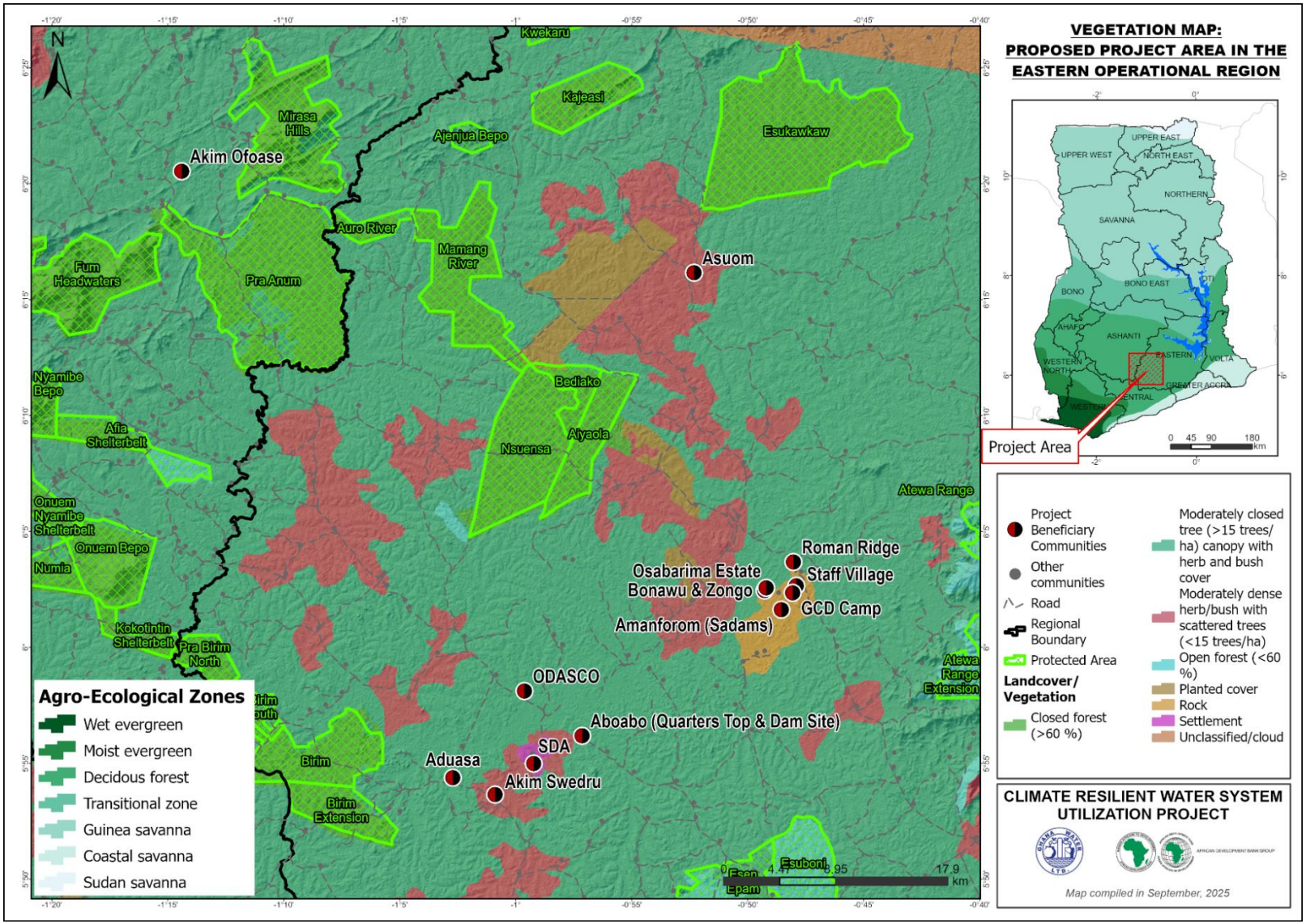


Figure 4-34: Vegetation and Landcover map of the Eastern Region project beneficiary area

4.7.8 Flora and Fauna

The pipeline extension corridors in the Eastern Region pass through settlement-dense and peri-urban communities where the natural moist semi-deciduous forest cover has been significantly altered by human settlement. Vegetation along the proposed pipeline routes is therefore limited to secondary regrowth, grass cover, and scattered trees such as mango. In most built-up sections, vegetation cover is almost non-existent. As a result, only minor vegetation clearance will be required during pipeline construction.

Fauna is equally scarce along the pipeline routes due to the high level of human disturbance. Wildlife such as monkeys, antelopes, and duikers are confined to distant forest reserves like Atewa and Esukawkaw, well outside the project alignment. In the project-affected areas, fauna is limited to reptiles like lizards, and common bird species including weaverbirds and doves, which adapt to degraded habitats. Domestic animals such as goat, sheep, fowl and dogs were sighted. Overall, the pipeline extension will have minimal ecological impact since construction will take place largely within existing road reservations and disturbed landscapes where natural vegetation and wildlife are already absent.

The landcover and vegetation of the project beneficiary communities in the GWL Eastern regional operational area is shown in Figure 4-34 above.

See Appendix 9 for comprehensive data on flora and fauna species spotted during flora and fauna screening of the pipeline corridor.

4.7.9 Social-Demographic Conditions

The Eastern Region has a diverse population dominated by the Akan (Akyem, Akuapem, and Kwahu), with minorities including Ewe, Ga-Adangbe, and Mole-Dagbani migrants. Christianity is the main religion, followed by traditional beliefs and Islam. Livelihoods are largely agrarian, with cocoa, oil palm, cassava, maize, and vegetables as major crops, while urban areas such as Koforidua and Nkawkaw show greater diversification into trading, transport, artisanship, services, and public employment. Low-income urban communities rely heavily on the informal sector, petty trading, and casual labor, supplemented by remittances. Key socio-economic challenges include youth unemployment, poor sanitation, inadequate housing, and unequal access to potable water and quality education.

4.7.9.1 Population of Beneficiary Communities

The beneficiary communities are largely urban, with most exceeding the Ghana Statistical Service urban threshold of 5,000 persons. Population growth is driven by migration, economic

opportunities, and improved social amenities, resulting in dense, youthful, and economically active settlements, especially in major towns and along transport corridors.

4.7.9.2 Ethnicity of the Residents of the Project Communities

The ethnic composition of the project communities in the Eastern Region reflects the region's cosmopolitan nature, which is largely shaped by historical migration, settlement patterns, and economic activities. The dominant ethnic groups across these communities include Akans, Ga-Dangme, and Ewes, while smaller proportions of Northerners (Dagombas, Mamprusis, Builsas, and others) are also present, particularly in Zongo-type settlements.

- Amanfrom Amanfrom is predominantly Ga-Dangme (62.7%), followed by Akans (23.5%), Ewes (7.8%), and other minority groups (2%). The area reflects the strong indigenous Ga-Dangme presence but is also characterized by significant Akan and Ewe migration due to economic opportunities in peri-urban Accra and surrounding towns.
- Bonawu & Zongo: These areas display a highly multi-ethnic composition typical of Zongo settlements. While Akans and Ga-Dangme form notable proportions, there is a substantial population of Northerners (Dagombas, Mamprusis, Builsas, and Hausas), creating a culturally diverse setting. The Zongo settlement patterns have also allowed for smaller populations of Ewes and migrants from neighboring West African states to settle here.
- Odase Odase and its surrounding communities are dominated by Akans, who form the largest ethnic group. However, Ga-Dangme is also present, reflecting historical settlement patterns. A smaller share of Ewes and northern ethnic groups exist, but their numbers are marginal compared to the Akan population.
- GCB Camp & Number: These communities are mixed settlements largely shaped by migration linked to urban expansion and employment. Akans are the majority, but there is a strong presence of Ewes and Ga-Dangme, while smaller groups of Northerners add to the ethnic diversity.
- Roman Ridge & Staff Village: Roman Ridge and Staff Village reflect a more cosmopolitan and urbanized demographic, where Akans are strongly represented, followed by Ga-Dangme and Ewes. Northerners are also present but in smaller numbers. Staff Village, being closely linked to institutional housing, attracts a more diverse population from different parts of Ghana, although Akans still dominate.

- Akim Ofoase: As part of the Akan heartland in the Eastern Region, Akim Ofoase is overwhelmingly Akan, with Ga-Dangme and Ewes present only in minor proportions. Migrants from northern Ghana are also present but not in significant numbers.
- Asuomosa Barima Estate & Adasa Odase: These communities are largely Akan dominated, reflecting the settlement history of the Akim and other Akan sub-groups. However, Ewes and Ga-Dangme minorities are present due to inter-regional migration. Northern ethnic groups form a very small share of the population, primarily engaged in informal trade and services.
- Akim Swear & Aboabo: Akim Swear is predominantly Akan, consistent with surrounding Akim communities, though Ewes and Ga-Dangme migrants are represented in smaller numbers. Aboabo, on the other hand, shows a more Zongo-like profile, with strong representation from Northerners (Dagombas, Mamprusis, Hausas) alongside Akans and Ga-Dangme.

4.7.9.3 Religion

Religious affiliation across the project communities in the Eastern Region is strongly dominated by Christianity, with proportions ranging from 83.5% to 91% of the population. Islam constitutes the second most practiced religion, though its presence varies significantly across communities, ranging from 1.8% to 16.4%. In addition, a small proportion of residents (around 4.6%) continue to practice Traditional African Religion and other minority faiths.

The differences in religious composition largely reflect settlement history, migration, and urban influences, with Christian dominance being strongest in peri-urban and formal settlements, while Muslim populations are more prominent in Zongo-type and migrant communities.

4.7.10 Economic Conditions

Economic activities across the project communities in the Eastern Region are dominated by the informal sector, particularly trading, food vending, and artisan work (such as carpentry, masonry, tailoring, hairdressing, and mechanics).

- Amanfrom, Bonawu & Zongo, Odase, GCB Camp, Number, and Aboabo: Trading and petty commerce are the primary occupations, with strong representation of artisans and transport workers. Zongo-type communities like Bonawu and Aboabo also show high proportions of migrants engaged in hawking, food vending, and manual labor.

- Roman Ridge & Staff Village: These areas are more urbanized, with a relatively higher share of residents in formal professional jobs (teaching, banking, civil service), though trading and artisan work still play a significant role.
- Akim Ofoase, Asuomosa Barima Estate, Adasa Odase, and Akim Swederu: Occupations are dominated by trading and artisanal work, but unlike the more urban settlements, small-scale farming and food crop cultivation are more visible, especially in Akim Ofoase and Akim Swederu.

4.7.11 Land Uses Along the Proposed Pipeline Routes

Land use along the proposed pipeline routes in the Eastern Region is dominated by residential settlements, often densely packed and low-income in nature. These are interspersed with petty trading, kiosks and food vending, as well as civic uses such as schools, churches, mosques etc. In peri-urban areas like Akim Ofoase and Asuomosa Barima Estate, the routes also pass through new sites. Overall, the land use pattern reflects a mix of residential, commercial, civic, and undeveloped uses, typical of both urban and peri-urban communities.

4.7.12 Educational Facilities Along the Pipeline Routes

Educational facilities along the pipeline corridors in the Eastern Region are sparse, with most communities either having none or just one basic school. Access to education is therefore largely dependent on facilities located outside the immediate pipeline route but within the wider community.

4.8 Upper East Region

4.8.1 Regional Overview

The Upper East Region is one of Ghana's smallest but strategically important regions, located in the north-eastern corner of the country. It shares borders with Burkina Faso to the north, Togo to the east, and the Upper West and North East Regions to the west and south, respectively. Geographically, the region lies between longitudes 0.00° and 1.30°Wand latitudes 10.30°N and 11.10°N, covering a total land surface area of about 8,842 km²—representing approximately 2.7% of Ghana's total land area, making it one of the most compact regions in the country. The region is predominantly rural in character, though it contains several notable urban centers such as Bolgatanga (the regional capital), Navrongo, Bawku, Zebilla, and Sandema. Unlike larger regions such as Ashanti or Bono, where urbanization is more pronounced, the Upper East has smaller towns scattered across the landscape, with rural settlements forming the majority.

Agriculture dominates the local economy, with the region serving as a key producer of sorghum, millet, maize, rice, groundnuts, beans, onions, tomatoes, and leafy vegetables. The fertile valleys of the White and Red Volta Rivers support irrigation schemes, most notably the Tono and Vea dams, which enable dry-season farming and vegetable cultivation for both local consumption and export. Livestock rearing (goats, cattle, sheep, and poultry) is also significant. Cross-border trade with Burkina Faso and Togo further strengthens the region's economic activities.

Demographically, the Upper East Region is home to about 2,1937,28 people (2025 projection by GSS). It is one of the most densely populated regions in northern Ghana, despite its relatively small land size. The population structure is youthful, with a high proportion under 35 years, and household sizes are typically large, averaging 5–6 members. Migration flows are common, with seasonal migration of young people to southern Ghana in search of jobs. The region is ethnically diverse, with major groups including the Gurunsi (Frafra), Kassena, Nankana, Kusasi, Builsa, Bimoba, and Talensi, alongside settler communities of Mamprusi, Mossi, and Hausa. The diversity has created a vibrant cultural landscape, though occasional tensions have arisen in some areas, particularly around chieftaincy and land disputes (e.g., in Bawku).

In terms of religion, Christianity is the dominant faith, followed by Islam and Traditional African Religion, which still has strong adherents in many rural communities.

Although the region lags behind southern Ghana in terms of urbanization and infrastructure development, towns such as Bolgatanga, Navrongo, and Bawku are experiencing steady growth due to trade, education, and administrative functions. Unlike Bono or Ashanti, where population growth is spread across multiple large towns or concentrated in a dominant city, the Upper East remains small-town based, with urbanization closely tied to market centers and border trade.

4.8.2 Description of Project Communities

The details below provide a vivid description of the nature of the selected beneficiary community with a focus on its low-income urban status.

- *Nangalikinia* is a small rural settlement within the Bolgatanga Municipality. The community is predominantly agrarian, with households engaged in subsistence farming of millet, sorghum, groundnuts, and maize. Due to limited rainfall, dry-season vegetable cultivation is practiced along nearby streams and irrigation points. Settlement

patterns are dispersed, and social amenities are modest, with residents relying on Bolgatanga town for advanced health, education, and commercial services.

- *Vunania* is a farming and livestock-rearing community located in the Kassena Nankana area near Navrongo. Crops such as rice, maize, millet, and groundnuts are commonly cultivated, while cattle, goats, and poultry form an important part of household livelihoods. The community is closely tied to Navrongo's market economy, with farmers selling produce there. Social and cultural life is marked by traditional festivals, while social amenities remain limited within the settlement.
- *Winkongo* is a peri-urban community located close to Bolgatanga. It has gradually transformed from a small rural farming village into a settlement with semi-urban features, partly due to its proximity to the regional capital. Residents are engaged in both farming (millet, maize, and vegetables) and petty trading, while some commute to Bolgatanga for work and school. Basic education facilities exist within the community, but higher-level services are accessed in Bolgatanga.
- *Daporitin Dongo* is a rural farming settlement, largely agrarian in character. The main livelihood activities include cultivation of maize, millet, sorghum, and groundnuts, supported by small-scale livestock rearing. Housing is mostly traditional compounds scattered across farmland. Social services are minimal, so the community depends on larger towns nearby for schools, healthcare, and markets.
- *Dorongo* is a medium-sized community situated in the Bolgatanga Municipality. Farming is the primary occupation, with millet, maize, rice, and groundnuts dominating production. In addition, Dorongo is noted for traditional crafts, particularly pottery and smock weaving, which supplement incomes. The settlement is closely linked to Bolgatanga for trade and services, while social life revolves around both traditional and Christian religious practices.
- *Sawaba* is a farming community with a growing residential population due to its proximity to Bolgatanga. Agriculture, especially maize, millet, and vegetable cultivation, forms the backbone of the economy, but many households are also engaged in petty trading and small-scale services. Settlement is increasingly clustered, reflecting its semi-urban growth. Schools and basic clinics are present, but residents depend on Bolgatanga for higher-level facilities.

- *Tindonmolgo* is a traditional farming settlement near Bolgatanga. Agriculture is dominated by millet, sorghum, and groundnut farming, with vegetable gardening also practiced during the dry season under irrigation. The settlement maintains a strong cultural identity, with traditional shrines and festivals playing important roles in community life. Access to social services remains limited, with residents depending on Bolgatanga for most essential services.
- *Yikene* is a peri-urban community on the outskirts of Bolgatanga. It is characterized by a mix of farming and non-farm livelihoods, with increasing numbers of residents working in trade, transport, and small-scale services in Bolgatanga. Farming, particularly vegetables and cereals, still plays an important role. Settlement is clustered, with modern housing gradually replacing traditional compounds. Proximity to Bolgatanga provides relatively better access to schools, health facilities, and markets.
- *Zaare* is a community known for its vibrant cultural and artisanal activities in addition to farming. While millet, maize, and ground nuts remain important crops, the community is also recognized for pottery, crafts, and smock weaving. Settlement is clustered, with compounds close to each other. Zaare benefits from its location within the Bolgatanga Municipality, with easier access to schools, health services, and markets compared to more remote villages.
- *Zuarungu* is one of the largest settlements in the Bolgatanga East District. It functions as both a farming and trading center. Agriculture focuses on maize, millet, rice, and vegetables, supported by livestock rearing. Zuarungu has a vibrant local market that serves surrounding smaller villages, and its location along major roads enhances trade and transport. The community has relatively better social amenities, including schools and clinics, compared to other rural settlements.

4.8.3 Climatic Conditions

The Upper East Region lies entirely within the Guinea Savannah ecological zone, characterized by open parkland vegetation and scattered trees such as baobab, shea, and neem. The climate is strongly influenced by two dominant wind systems: the south-west monsoon winds from the Atlantic Ocean, which bring rain between May and October, and the north-east trade winds (Harmattan) from the Sahara, which prevail between November and March, creating long dry spells with dusty and hazy conditions.

Relative humidity fluctuates sharply across the seasons, ranging between 70% and 80% during the peak rainy months and dropping as low as 20%–30% in the peak of the Harmattan. The dry season is marked by very low atmospheric moisture, high evaporation rates, and reduced visibility due to dust haze.

Temperatures in the Upper East Region are generally high throughout the year, with mean annual values ranging from about 21°C in the coolest mornings to above 40°C during the hottest afternoons in March and April. The hot, dry season preceding the rains is the most extreme, while night-time temperatures during the Harmattan months (December–January) may fall to as low as 18°C, especially in river valleys.

Rainfall distribution follows the unimodal pattern typical of northern Ghana. The single rainy season begins in May, peaks in August–September and tapers off by October. This is followed by a prolonged dry season lasting from November to April. Annual rainfall totals are relatively low, averaging between 800 mm and 1,100 mm (GMET, 2020–2025), and are highly variable across years. This climatic regime supports short-season food crops such as millet, sorghum, groundnuts, and maize, with dry-season irrigation schemes along the White and Red Volta Rivers, the Tono and Vea irrigation dams, and dugouts sustaining vegetable farming during the long dry months.

4.8.4 Geology and Soils

The Upper East Region is underlain predominantly by Birrimian formations and associated granites, together with extensive areas of Voltaian sandstone and shale in certain districts. These geological formations give rise to a rugged landscape of rocky outcrops, inselbergs, and shallow soils. Unlike the forested southern regions of Ghana, the Upper East is not a major mining hub; however, localized deposits of gold, manganese, and lateritic ironstone occur, especially around Bongo, Talensi, and Nabdam, where small-scale artisanal mining activities are common. Lateritic crusts are widespread, forming prominent cappings across upland areas and providing an important local source of gravel and stone for construction and road-building.

Dahomeyan and Tarkwaian rocks underly the project beneficiary communities in the Upper East GWL operational region as shown in Figure 4-35.

The soils of the region reflect the dominance of Sudan and Guinea Savannah vegetation, with shallow profiles and limited organic content due to seasonal rainfall and high temperatures. Three main soil groups are notable:

1. Savannah Ochrosols and Lithosols – These are the most widespread, found across much of Bolgatanga, Bawku, Talensi, and Kassena-Nankana. They are sandy to loamy in texture, well-drained but often shallow and gravelly, with moderate to low fertility. They support staple crops such as millet, sorghum, maize, groundnuts, and cowpea.
2. Lateritic Soils – Found in upland areas and on inselbergs, these soils are coarse-textured, reddish-brown, and strongly weathered. Though less fertile, they are widely used for the cultivation of hardy crops such as millet, groundnuts, and sorghum. The lateritic crusts are also quarried locally for construction.
3. Alluvial Soils – These occur along the floodplains of the White and Red Volta Rivers and their tributaries. They are relatively fertile, containing loamy to clayey textures enriched by seasonal silt deposits. These soils are suitable for rice, vegetables, and irrigated dry-season farming, which are particularly important in irrigation schemes such as the Tono and Vea projects.

Lixisols, Leptosols and Fluvisols are the soil types are dominate the project beneficiary communities in the region (see Figure 4-36).

4.8.5 Air and Noise Quality

Baseline monitoring of ambient noise and air quality was undertaken at three sampling locations (Yikene-UE1, Nangalikinia-UE2 and Winkongo-UE3) within the project's area of influence.

Noise levels were recorded during both daytime and nighttime periods to capture diurnal variation. Daytime noise levels ranged between 51.8 and 59.8 dB(A). Stations UE2 and UE3 recorded average values within the permissible limit of 55 dB(A) for residential/mixed-use areas, while UE1 slightly exceeded the limit (59.8 dB(A)), likely due to its proximity to areas with higher vehicular or human activity.

Nighttime noise levels ranged from 44.2 to 46.2 dB(A), remaining within the allowable threshold of 48 dB(A), indicating relatively quiet nocturnal conditions.

These results from Table 4-15 suggest that the ambient acoustic environment across the project area is generally compliant with national standards, except for localized daytime exceedances in activity-concentrated zones.

Ambient air quality monitoring focused on nitrogen dioxide (NO_2), sulphur dioxide (SO_2), particulate matter ($PM_{2.5}$), and particulate matter (PM_{10}), assessed against GS 1236:2019

standards. All measured concentrations were well below Ghana's regulatory thresholds, indicating that the ambient air quality is good with minimal pollutant loading. Slightly higher particulate matter concentrations observed at UE1 may be attributed to local dust emissions from unpaved surfaces and moderate human activity.

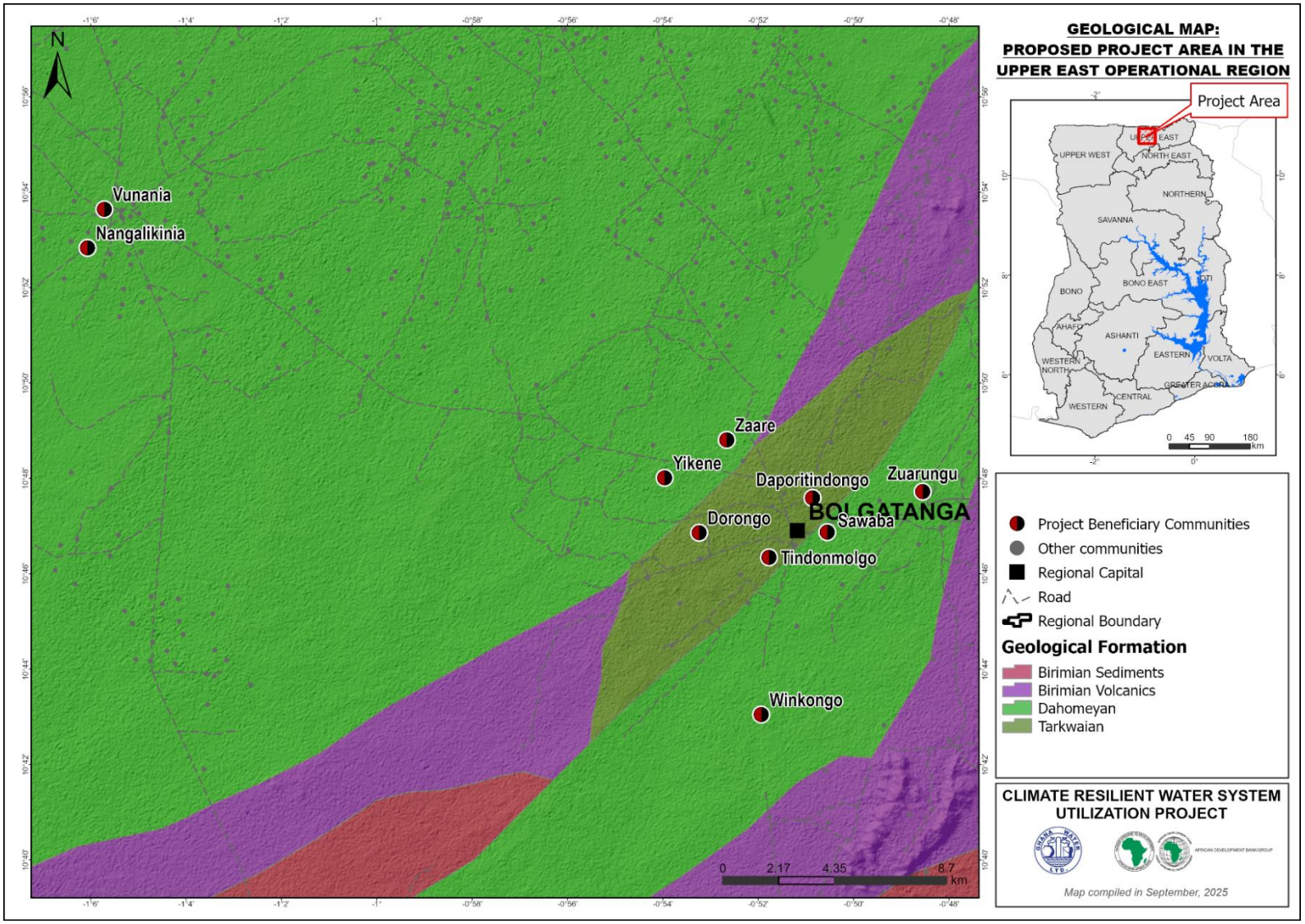


Figure 4-35: Geological map of the Upper East Region project beneficiary area

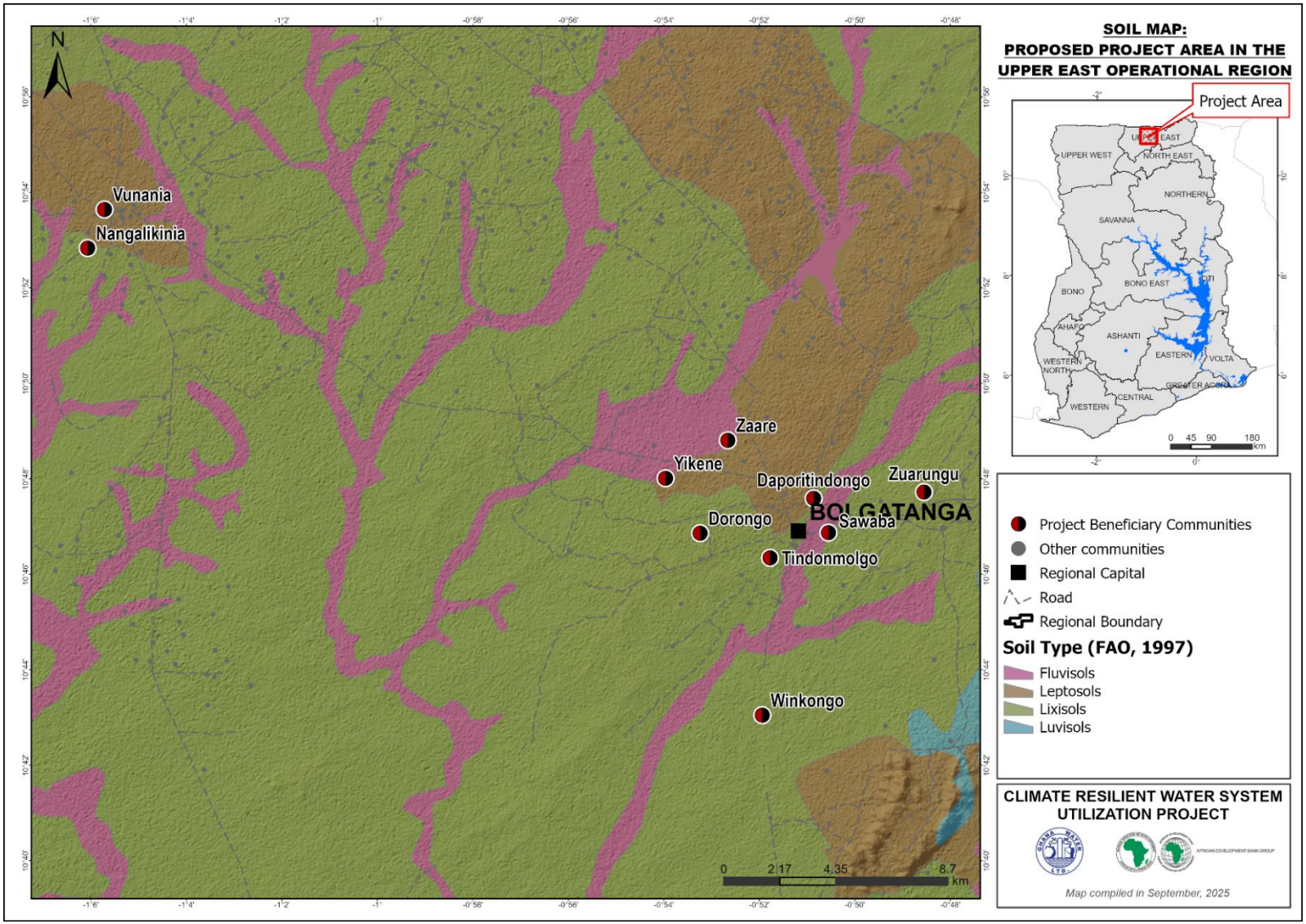


Figure 4-36: Soil map of the Upper East Region project beneficiary area

Table 4-15: Air quality and noise level monitoring results in the Upper East Region

Code	Noise Level				Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	**dB_{max}**	**dB_{min}**		**dB(A)**		**µg/m³**		**µg/m³**		**µg/m³**		**µg/m³**
UE1	Day	70.8	60.5	59.8	**55**	20.3	**150 (24 hours)**	34.0	**50 (24 hours)**	30.0	**35 (24 hours)**	50.3	**70 (24 hours)**
	Night	65.2	43.1	46.2	**48**								
UE2	Day	55.3	45.1	53.4	**55**	19.4	**150 (24 hours)**	12.0	**50 (24 hours)**	11.8	**35 (24 hours)**	16.8	**70 (24 hours)**
	Night	50.9	42.8	45.7	**48**								
UE3	Day	60.6	44.4	51.8	**55**	18.6	**150 (24 hours)**	15.3	**50 (24 hours)**	12.3	**35 (24 hours)**	16.3	**70 (24 hours)**
	Night	50.9	42.5	44.2	**48**								

4.8.6 Topography

The Upper East Region is characterized by a generally low-lying and gently undulating landscape, with elevations ranging from about 120 meters to 400 meters above sea level. The terrain is shaped largely by Precambrian Birrimian rock formations and granite outcrops, which give rise to scattered inselbergs, rocky hills, and isolated ridges amidst extensive open plains.

The central and northern areas, including Bolgatanga, Bongo, and Kassena-Nankana, are dominated by broad granite outcrops and rocky escarpments, which punctuate the otherwise flat terrain. These rock outcrops often serve as cultural landmarks and provide scenic views but limit intensive farming and settlement expansion in their immediate vicinity.

The southern and eastern zones, particularly around Bawku, Zebilla, and Garu, feature rolling plains and gently sloping valleys, dissected by seasonal rivers such as the White Volta, Red Volta, and their tributaries. During the rainy season, these valleys become fertile floodplains that support rice, millet, and vegetable cultivation, though they remain dry and bare in the long dry season.

In the western portions, notably around Navrongo and Paga, the land transitions into more open savannah woodlands and expansive plains, well-suited for livestock rearing and cereal cultivation. The relatively flat terrain facilitates settlement patterns but also makes the area prone to seasonal flooding and erosion during heavy rain.

The topography of the region relative to the project beneficiary communities are depicted in Figure 4-37. The elevation is generally below 200 meters above mean sea level.

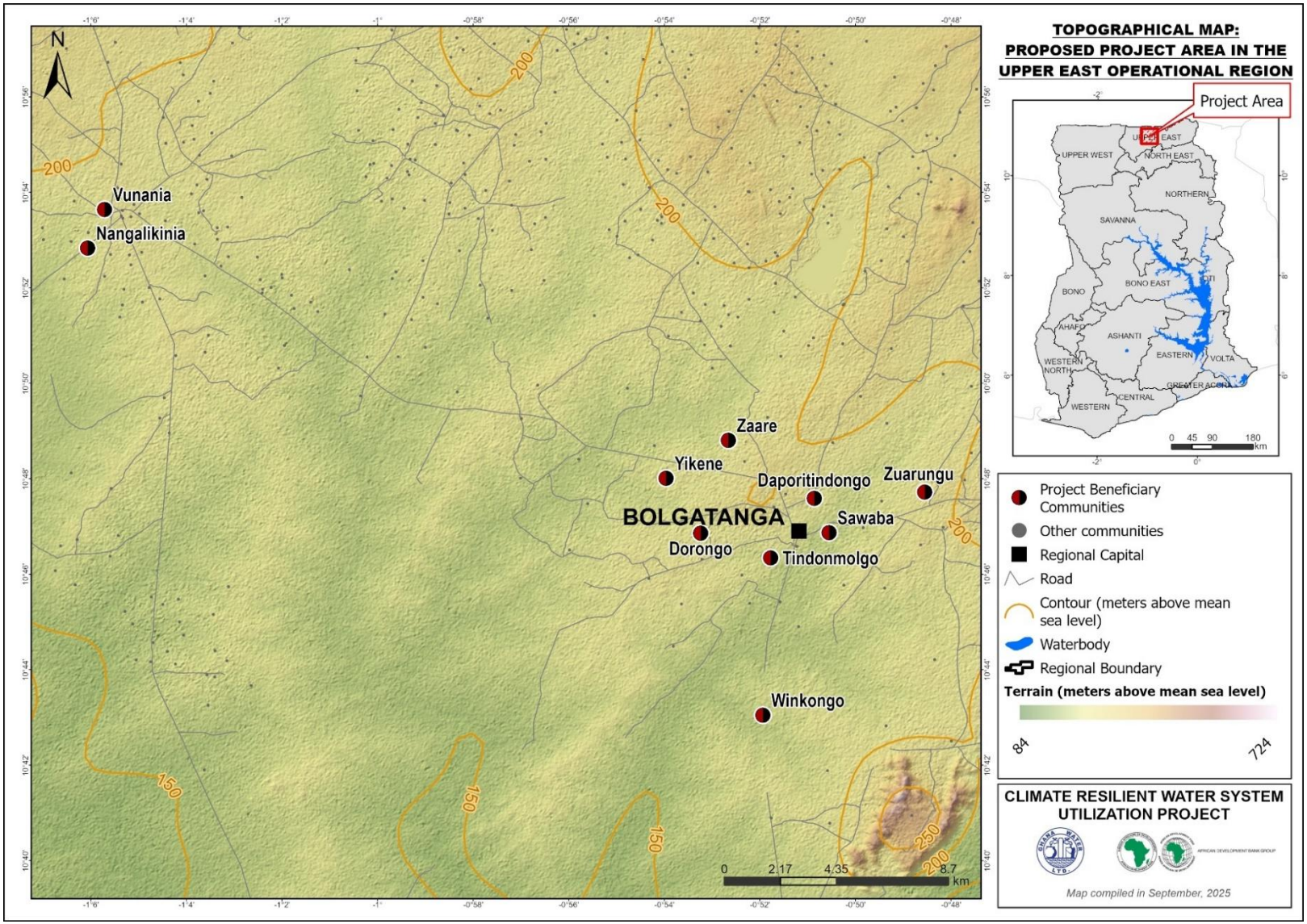


Figure 4-37: Topographical map of the Upper East Region project beneficiary area

4.8.7 Hydrology and water resources

The drainage map delineates the proposed project area within the Upper East Region, specifically covering Bolgatanga Municipality and adjoining beneficiary communities including Vunania, Nangalikinia, Zaare, Yikene, Dorongo, Tindomolgo, Daporitindongo, Sawaba, Zuarungu, and Winkongo. Though the project area falls entirely within the White Volta River Basin, which represents the dominant hydrological system in the region, no surface water resource lies or interacts directly with the proposed RoW in the beneficiary communities.

Generally, the drainage network is characterized by a dendritic pattern, with numerous ephemeral and perennial streams converging southeastward towards the White Volta River. These tributaries facilitate surface runoff and local groundwater recharge, particularly during the wet season. Figure 4-38 further identifies wetland zones and minor waterbodies that serve as temporary retention areas influencing hydrodynamics and flood attenuation.

Hydrologically, the project municipality exhibits moderate drainage density, with surface flows controlled largely by topography and seasonal rainfall intensity. The delineated basin boundary defines the project's area of influence with respect to potential impacts on surface water flow, sediment transport, and water quality.

The project contractor will have to consider the drainage system of the area during trenching.

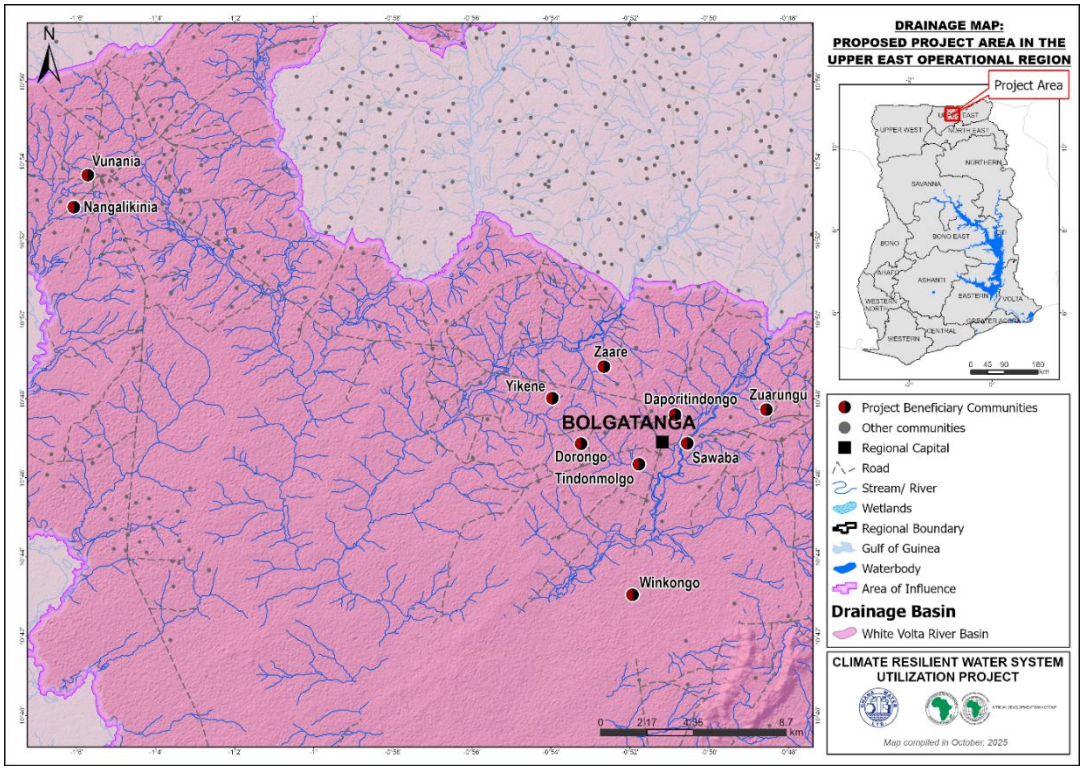


Figure 4-38: Drainage map of the Upper East Region project beneficiary area

4.8.8 Flora and Fauna

The project area lies within the Sudan savannah ecological zone, which is characterized by vast grasslands interspersed with scattered shrubs and drought-resistant trees such as shea (Vitellaria paradoxa), baobab (Adansonia digitata), neem, and acacia species. Vegetation cover is generally sparse and strongly influenced by seasonal rainfall, with grasses dominating during the wet season but drying up and leaving the land bare in the prolonged dry season.

Within the specific project localities, however, vegetation cover is highly degraded and limited, as much of the land has been altered by settlements, farming, and human activities. As a result, only scattered trees and pockets of shrubs are visible along the proposed pipeline corridors. Minor vegetation clearance will therefore be required during construction, but the impact is expected to be minimal given the already degraded state of the environment.

Fauna within the project zones is also highly limited, owing to the built-up and cultivated nature of the areas. Wildlife species that once thrived in the savannah, such as small antelopes, hares, and reptiles, are now scarce and mostly restricted to less disturbed zones outside settlements. Along the proposed pipeline routes, fauna is almost non-existent, with only domestic animals such as goats, sheep, poultry, and cattle commonly observed.

The pipelines will largely follow existing road reservations and community corridors, many of which are already encroached by structures, farms, and utility lines. Consequently, both vegetation and wildlife disturbance along the route are expected to be minimal.

The landcover and vegetation in the project beneficiary area in the region is shown in Figure 4-39. The communities are generally not in close proximity to any protected area.

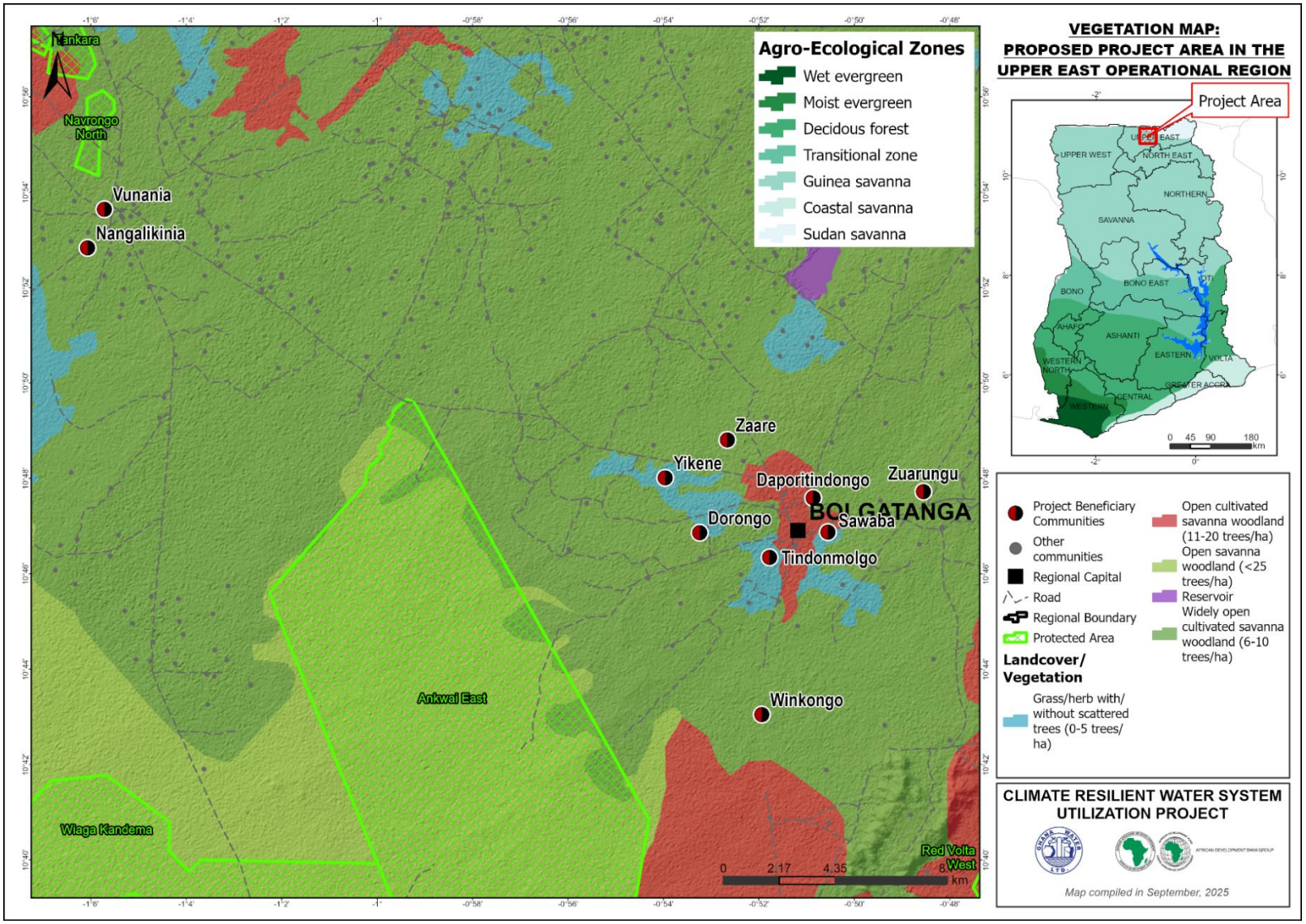


Figure 4-39: Vegetation and landcover map of the Upper East Region project beneficiary area

4.8.9 Social-Demographic Conditions

The Upper East Region, traditionally inhabited by ethnic groups such as the Kusasi, Gurunsi, Builsa, Frafra, and Nabdam, is one of Ghana's least urbanized but agriculturally significant regions. While these indigenous groups form the majority, the region also hosts migrant populations from Mole-Dagbani, Ewe, and other ethnic backgrounds, particularly in towns like Bolgatanga, Bawku, Navrongo, and Sandema, which serve as administrative and commercial hubs. Christianity and Islam are the predominant religions, complemented by widespread adherence to traditional belief systems, which remain deeply integrated into cultural practices.

Livelihoods in the Upper East Region are primarily agrarian, with most households engaged in subsistence farming and livestock rearing. The region is also well known for livestock production, particularly goats, sheep, guinea fowl, and poultry, which provide an important source of income and food security. Small-scale irrigation schemes along the White Volta, Red Volta, and Vea Dam support dry-season vegetable farming, especially tomatoes, onions, and leafy greens, which are traded within Ghana and across the Burkina Faso border.

In urban centers like Bolgatanga and Bawku, the economy is more diversified, with significant participation in trading, transport, handicrafts, services, and public administration.

4.8.9.1 Population of Beneficiary Communities

The beneficiary communities in the Upper East Region are largely agrarian with population the youths, family-oriented, and closely tied to small-scale farming and trading. Household sizes average 5–7 persons, with extended family systems still dominant. Population growth is shaped by natural increase, seasonal migration, and the expansion of peri-urban areas around Bolgatanga and Zuarungu. While farming remains the primary livelihood, proximity to Bolgatanga and key road networks has supported diversification into small-scale trading, transport, and artisan work.

- Nangalikinia: A small agrarian settlement where household sizes remain large. The community's population growth is modest, with farming (millet, maize, and groundnuts) as the mainstay. Seasonal migration of youth to southern Ghana is common.
- Vunania: A moderately populated rural community located close to Bolgatanga. Its population is youthful, with farming and small-scale trading as primary occupations. Access to nearby markets supports modest growth.

- Winkongo: A medium-sized community with a steadily increasing population, supported by its location along the Bolgatanga–Tongo road. Livelihoods include farming, trading, and artisan activities. Proximity to Tongo and Bolgatanga attracts migrants from surrounding villages.
- Daporitinga/Dongo: A relatively small rural community with low-to-moderate population density. Farming dominates livelihoods, with sorghum, millet, and groundnuts as the main crops. Population growth is stable but slow, with high outmigration among the youth.
- Dorongo: A growing peri-urban settlement near Bolgatanga. Its population is youthful and increasingly engaged in both farming and non-farm livelihoods such as petty trading and transport services. Migration inflows from smaller villages support its growth.
- Sawaba: A moderately populated settlement characterized by farming households. Outmigration of young people for work and education in Bolgatanga and southern Ghana is common, leaving an older farming population behind.
- Tindonmolgo: A small-to-medium settlement where farming is the main occupation. Household sizes are large, with extended families common. Population growth is modest, supported by subsistence agriculture and limited trading.
- Yikene: A peri-urban community on the outskirts of Bolgatanga, experiencing rapid population growth due to urban expansion. Household structures are shifting towards smaller nuclear families in some areas, with livelihoods spanning farming, trading, and artisan work.
- Zaare: A densely populated settlement near Bolgatanga, showing steady population growth linked to its role as a residential area and small trading center. Farming remains important, though non-farm occupations are increasingly common.
- Zuarungu: A major peri-urban settlement east of Bolgatanga, Zuarungu is experiencing rapid population growth due to its strategic location and commercial role. The population is highly youthful and diverse, engaged in farming, trading, artisan work, and transport services. Its growth is supported by better road access and administrative functions.

4.8.9.2 Estimated Population of the Project Corridor Communities

The beneficiary communities in the Upper East Region display a youthful population with household sizes averaging 5–7 persons. Population growth of 2025 has been influenced by natural increase and migration patterns. While rural settlements maintain stable but slower growth, peri-urban and roadside towns such as Yikene, Zaare, and Zuarungu have experienced more rapid increases due to their proximity to Bolgatanga and major road networks (see Table 4-16).

Table 4-16: Population of the Porject Corridor Communities in Upper East

Community	**2025 Projected Population**
Nangalikinia	710
Vunania	1,664
Winkongo	4,747
Daporitinga/Dongo	954
Dorongo	2,478
Sawaba	2,955
Tindonmolgo	1,536
Yikene	5,235
Zaare	7,097
Zuarungu	10,610

Source: Ghana Statistical Service (Projected from 2021 Census; District Assembly report).

4.8.9.3 Ethnicity of Residents of the Project Communities

According to the Ghana Statistical Service (2021 PHC) and subsequent community surveys, the project communities in the Upper East Region are ethnically diverse but predominantly occupied by indigenous Gurune (Frafra) populations.

- In Nangalikinia, Dorongo, Tindonmolgo, Sawaba, and Yikene, over 70% of residents identify as Gurune/Frafra, with minority groups including Builsa, Talensi, and Kusasi migrants.
- Winkongo and Vunania also have strong Gurune dominance is between 65% and 72%, complemented by Builsa, Kassena, and Mole-Dagbani settlers, reflecting their proximity to Bolgatanga and Navrongo trade routes.
- In Zaare and Zuarungu, the population is more mixed due to their rural-urban growth and economic links to Bolgatanga township. Gurune residents make up about 55 to

60%, while Kusasi, Builsa, Dagomba, and Hausa/Zabarmas form a significant share of the migrant population (20–25%).

- Daporitinga/Dongo, being relatively small and rural, is more homogenous, with over 80% Gurune/Frafra, and a small presence of Kassena and Builsa households.

4.8.9.4 Religion (Project Communities)

According to the socio-economic baseline profiles, the beneficiary communities in the Upper East Region are predominantly Christian, with proportions ranging from 80% to 89% across settlements such as Nangalikinia, Winkongo, Dorongo, Zaare, and Zuarungu. The communities with the highest share of Christians include Winkongo and Nangalikinia, while Sawaba and Yikene record relatively lower proportions.

Islam represents the second largest religious group, accounting for between 8% and 18%, with higher concentrations in Sawaba, Yikene, and parts of Zuarungu, where Zongo and peri-urban settlements have established Muslim populations.

A smaller fraction of residents, estimated at 3–6%, continue to adhere to Traditional African Religious practices, particularly in rural communities like Tindonmolgo, Dorongo, and Daporitin Dongo, where ancestral and cultural rituals remain part of community life.

4.8.10 Economic Conditions

Labour and employment patterns across the project communities in the Upper East Region reveal a heavy reliance on the informal economy, with only a small share of residents employed in formal professional jobs. In peri-urban and urbanized settlements such as Zaare, Zuarungu, and Winkongo, between 5% and 15% of residents are engaged in formal occupations such as teaching, nursing, civil service, and security services.

The informal sector, however, remains dominant. Trading especially the sale of foodstuffs, farm produce, and petty commerce is the single most important occupation, employing about 35 to 45% of residents in communities such as Sawaba, Zaare, and Yikene, where access to Bolgatanga town markets drives economic activity.

Artisanal work is also common, with hairdressers, tailors, seamstresses, masons, carpenters, weavers, and bicycle/motorcycle repairers collectively accounting for about 18–22% of livelihoods across communities. Service-related jobs such as transport operations (commercial motorbikes *okada*, tricycle riders *"yellow yellow"*, and drivers), electricians, and mechanics employ another 15–18% of the working population.

In the more rural settlements—including Nangalikinia, Daporitin Dongo, Tindonmolgo, and Dorongo—farming is the backbone of the local economy, engaging between 25% and 35% of residents.

4.8.11 Land Uses along the Proposed Pipeline Routes

The project communities in the Upper East Region are predominantly low- to middle-income residential settlements, with housing largely made up of traditional compound houses and modest family dwellings. Along the proposed pipeline routes, mixed residential and commercial land uses are common, especially in communities closer to Bolgatanga township such as Zaare, Zuarungu, Winkongo and Yikene, where roadside kiosks, small shops, and trading stalls are concentrated. Small eateries, kiosks, and petty trading activities are also prominent along major road corridors in settlements like Sawaba, Zuarungu, and Dorongo.

In the more rural communities such as Nangalikinia, Daporitin Dongo, and Tindonmolgo, sections of the proposed routes pass through undeveloped and agricultural lands.

4.8.12 Educational Facilities along the Pipeline Routes

In the Upper East Region, the beneficiary communities along the proposed pipeline routes have varying levels of access to educational facilities. Several smaller rural settlements, such as Nangalikinia, Daporitin Dongo, and Tindonmolgo, do not have schools directly located along the pipeline alignment, requiring children to travel to nearby communities to access basic education.

On the other hand, communities like Zaare, Winkongo, Zuarungu, Yikene, and Dorongo have schools sited close to or along the proposed routes. These are mostly basic schools (primary and junior high schools), serving children from both the host communities and neighboring settlements. Larger peri-urban areas such as Zuarungu and Zaare tend to record higher enrollment levels compared to smaller rural communities where school-going populations are relatively lower.

The distribution of schools along the proposed pipeline routes in the Upper East Region is summarized in Table 4-174-17.

Table 4-17: Distribution of Schools Along the Proposed Pipeline Routes

Community	Number of Schools	Total Enrollment
Zaare	1	612
Winkongo	1	478
Zuarungu	2	1,120

Community	Number of Schools	Total Enrollment
Yikene	1	395
Dorongo	1	352
Sawaba	0	-
Nangalikinia	0	-
Vunania	0	-
Daporitin Dongo	0	-
Tindonmolgo	0	-

4.8.13 Health Facilities along the Pipeline Routes

A few health facilities are identified along the proposed pipeline routes in the Upper East Region. These include:

- Winkongo Health Centre, located along the road.
- Zaare Community Health Planning and Services (CHPS) Compound, situated along the pipeline route.
- Zuarungu Health Centre, positioned along the road.

Of these three (3) facilities, the Zuarungu Health Centre is publicly owned and serves as a key referral point for surrounding communities. The Winkongo Health Centre and the Zaare CHPS Compound are community-based facilities that play an important role in providing primary healthcare services to residents along the pipeline corridor.

4.8.13.1 Morbidity Trends in the Project Zones

The morbidity profile of the project communities in the Upper East Region is largely dominated by diseases linked to water, sanitation, and environmental conditions. The most frequently reported cases include malaria, diarrhea diseases, and skin infections, which consistently feature among the top health conditions recorded in local health facilities. Data from the Ghana Health Service indicates that these remain the leading public health concerns across the beneficiary communities along the proposed pipeline routes.

4.9 Upper West Region

4.9.1 Regional Overview

The Upper West Region is one of Ghana's least populated but territorially expansive regions, located in the north-western corner of the country. It shares international boundaries with Burkina Faso to the north and west, and domestic borders with the Upper East Region to the

east and the Savannah Region to the south. Geographically, the region lies between longitudes 1.25°W and 2.50°W and latitudes 9.30°N and 11.00°N, covering a land surface area of about 18,476 km² representing nearly 12.7% of Ghana's total land area, making it one of the largest regions by size, though sparsely populated.

The region is predominantly rural, with settlements scattered across wide stretches of savannah grasslands. The major urban center is Wa, the regional capital, which serves as the administrative, educational, and commercial hub. Other important towns include Lawra, Jirapa, Tumu, Nandom, and Hamile, though these are relatively small compared to southern urban centers. Unlike the more urbanized Ashanti or Greater Accra Regions, the Upper West is largely characterized by dispersed villages and small towns.

The economy is agriculture-based, with most residents engaged in subsistence farming and livestock rearing. The region's long dry season makes farming highly seasonal, though irrigation schemes along the Black Volta and Kulpawn valleys support dry-season vegetable farming in limited areas. Livestock production particularly cattle, goats, sheep, and poultry is an important livelihood activity. In addition, cross-border trade with Burkina Faso plays a key role in the local economy, especially in towns such as Hamile and Tumu.

According to GSS, the region is projected to have a population of about 1,600,250 in 2025 with 776,685 males and 823,565 females, making it the least populous region in Ghana. Despite its small population, it has one of the lowest population densities, with an average household size of about 5-6 members. The region also experiences seasonal migration, with many young people traveling to southern Ghana in search of employment during the dry season.

Ethnically, the Upper West is home to groups such as the Dagaaba, Sissala, Wala, and Lobi, alongside minority groups including Chakali, Birifor, and migrant communities such as Mossi and Hausa.

4.9.2 Description of Project Communities

The details below provide a vivid description of the nature of the selected beneficiary community with a focus on its low-income urban status.

- Piisi/Konfabiala is a small agrarian settlement located within the Wa Municipality. The community is primarily engaged in subsistence farming of millet, maize, groundnuts, and yams, complemented by small-scale livestock rearing such as goats and poultry. Housing is mostly traditional compounds scattered across farmland. Access to

advanced services is limited, with residents depending on Wa town for healthcare, education, and commercial activities.

- Siriyiri situated in the Wa West District, is a rural farming community. The main livelihoods include the cultivation of maize, sorghum, and groundnuts, alongside cattle and goat rearing. The community has a close cultural identity rooted in traditional festivals and practices. Basic amenities are minimal, with residents relying on nearby Wa or Wechau for markets, clinics, and schools.
- Nakori is a medium-sized settlement near Wa. It is a farming community, producing staple crops such as millet, maize, and groundnuts, while dry-season vegetable gardening supports household food security. Some residents also engage in petty trading. Social amenities are modest, and the community depends on Wa town for advanced education and health services.
- Danko located close to Wa, is a peri-urban community gradually transitioning from a farming village into a semi-urban settlement. Farming of maize, millet, and vegetables remains important, but many households engage in trading, transport, and other non-farm livelihoods. The settlement is increasingly clustered, with modern housing structures replacing traditional compounds.
- Dokpong is a farming-based settlement within the Wa Municipality. Millet, maize, sorghum, and groundnuts are the major crops cultivated, alongside livestock rearing. The community also benefits from its proximity to Wa, where residents access schools, clinics, and markets. Social life reflects a mix of traditional and Islamic practices.
- Fifamuni is a rural settlement characterized by subsistence agriculture and animal husbandry. Farmers cultivate crops such as sorghum, millet, and maize, supported by small-scale goat and sheep rearing. Social amenities are limited, and the settlement depends on nearby towns for essential services.
- Kambali is a peri-urban community on the outskirts of Wa. While farming (maize, vegetables, and millet) continues to play a role, non-farm livelihoods such as trading, transport, and small-scale services are becoming increasingly significant. Settlement patterns are clustered, with modern housing developments emerging due to urban expansion from Wa.
- Limanyiri/Nayiri is a rural farming community. Agriculture is centered on staple crops such as millet, maize, and sorghum, while dry season vegetable cultivation is practiced

on a small scale. Livestock rearing, especially goats and sheep, supplements household livelihoods. Social services are limited, with Wa serving as the main access point for schools, health, and trade.

- Sikpeyiri/Tendamba is a traditional farming community. Residents are primarily engaged in cultivating maize, millet, and groundnuts, with livestock rearing forming an integral part of household economies. The settlement maintains strong cultural traditions, with festivals and shrines central to social life. Social amenities are basic, and residents often rely on Wa for health and education services.
- Tamparepani is a small agrarian settlement. Farming of millet, sorghum, and maize is the primary livelihood, with small-scale vegetable gardening practiced during the dry season. Livestock rearing is also common. Social amenities are limited, requiring reliance on Wa and other nearby towns for education, healthcare, and markets.
- Wapaani/Fongu is a growing peri-urban settlement within Wa Municipality. While agriculture, especially maize and vegetables, remains important, the community is increasingly integrated into Wa's urban economy. Residents are engaged in small-scale trade, services, and transport, while settlement patterns reflect urban clustering and expansion. Access to schools and clinics is better than in more remote communities.
- Zindeli is a rural farming village with livelihoods centered on millet, maize, sorghum, and groundnuts, supplemented by small-scale livestock rearing. Settlement is dispersed, with traditional compound housing dominating. Social amenities are minimal, and residents depend on Wa and other towns for essential services.
- Dorimon is one of the larger settlements in the Wa West District. The community is well-known for farming (maize, millet, sorghum, and groundnuts) and livestock rearing. Dorimon also serves as a local trading hub, with markets that attract traders from surrounding villages. Social amenities, including schools and clinics, are relatively better compared to smaller rural settlements

4.9.3 Climatic Conditions

The Upper West Region lies within the Guinea Savannah ecological zone, characterized by open woodland and scattered trees such as baobab, dawadawa, shea, and acacia. The climate is shaped by two dominant wind systems: the south-west monsoon winds from the Atlantic Ocean, which rain from May to October, and the north-east trade winds (Harmattan) from the

Sahara, which prevail from November to March, creating long dry spells accompanied by dust-laden and hazy conditions.

Relative humidity shows strong seasonal variation—rising to about 70%–85% during the peak rainy season and dropping as low as 20%–30% in the height of the Harmattan. The dry season is associated with very low atmospheric moisture, high evaporation rates, and poor visibility due to heavy dust haze.

Temperatures are generally high throughout the year. Mean annual temperatures range from about 22°C during the coolest mornings to above 40°C in the hottest afternoons, particularly in March and April. The hot, dry season preceding the rains is the most intense, while night-time temperatures in December–January may fall to around 18°C, especially in low-lying valleys.

Rainfall follows a unimodal pattern, beginning in May, peaking between August and September, and tapering off by October. This is followed by a long dry season (November–April). Annual rainfall averages between 900 mm and 1,200 mm (GMET), though distribution is highly variable.

4.9.4 Geology and Soils

The Upper West Region is predominantly underlain by Birrimian rock formations and associated granitic intrusions, with parts of the region also covered by Voltaian sandstone and shale sequences. These geological structures give rise to a gently undulating to rugged landscape marked by rocky outcrops, lateritic uplands, and inselbergs. Compared to Ghana's forest zones, the Upper West is not a major center for large-scale mining; however, localized deposits of gold, lateritic ironstone, and clay are present, particularly in districts such as Wa East, Lawra, and Nandom, where small-scale artisanal mining and quarrying activities take place. Lateritic crusts are common, providing an important source of stone, gravel, and laterite for construction and road works.

Dahomeyan underlies most of the project beneficiary communiities in the region with the exception of Dorimon, which has a Birimian Sediment rock base and Siriyiri, which has a Birimian Volcanics rock base (see Figure 4-40).

The soils of the region reflect the Guinea Savannah vegetation and the influence of seasonal rainfall and high temperatures, which limit organic matter accumulation. Three main soil groups dominate:

1. Savannah Ochrosols and Lithosols – These soils are widespread across districts such as Wa, Sissala, and Lawra. They are sandy to loamy in texture, moderately drained but shallow and gravelly in many places, with low to moderate fertility.
2. Lateritic Soils – Found mainly on upland areas and plateaus, these soils are coarse-textured, reddish-brown, and highly weathered. The lateritic crusts are extensively used for quarrying, road construction, and housing materials.
3. Alluvial Soils – Occurring along the floodplains of the Black Volta River, Kulpawn, and Sissala rivers, these soils are loamy to clayey, relatively fertile, and enriched by annual silt deposits.

Lixisols is the only soil type in the project beneficiary communities in the region (see Figure 4-41).

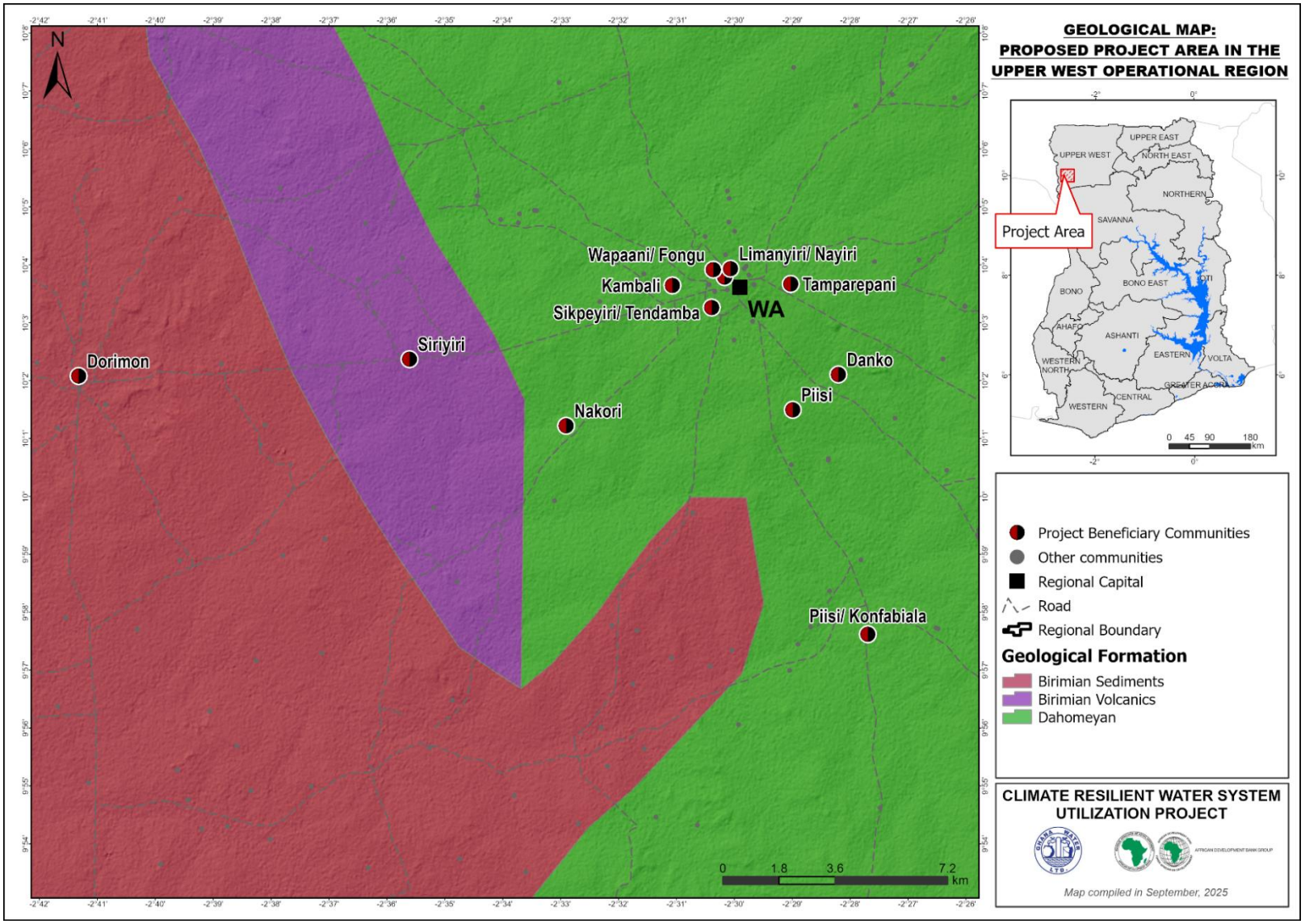


Figure 4-40: Geological map of the Upper West Region project beneficiary area

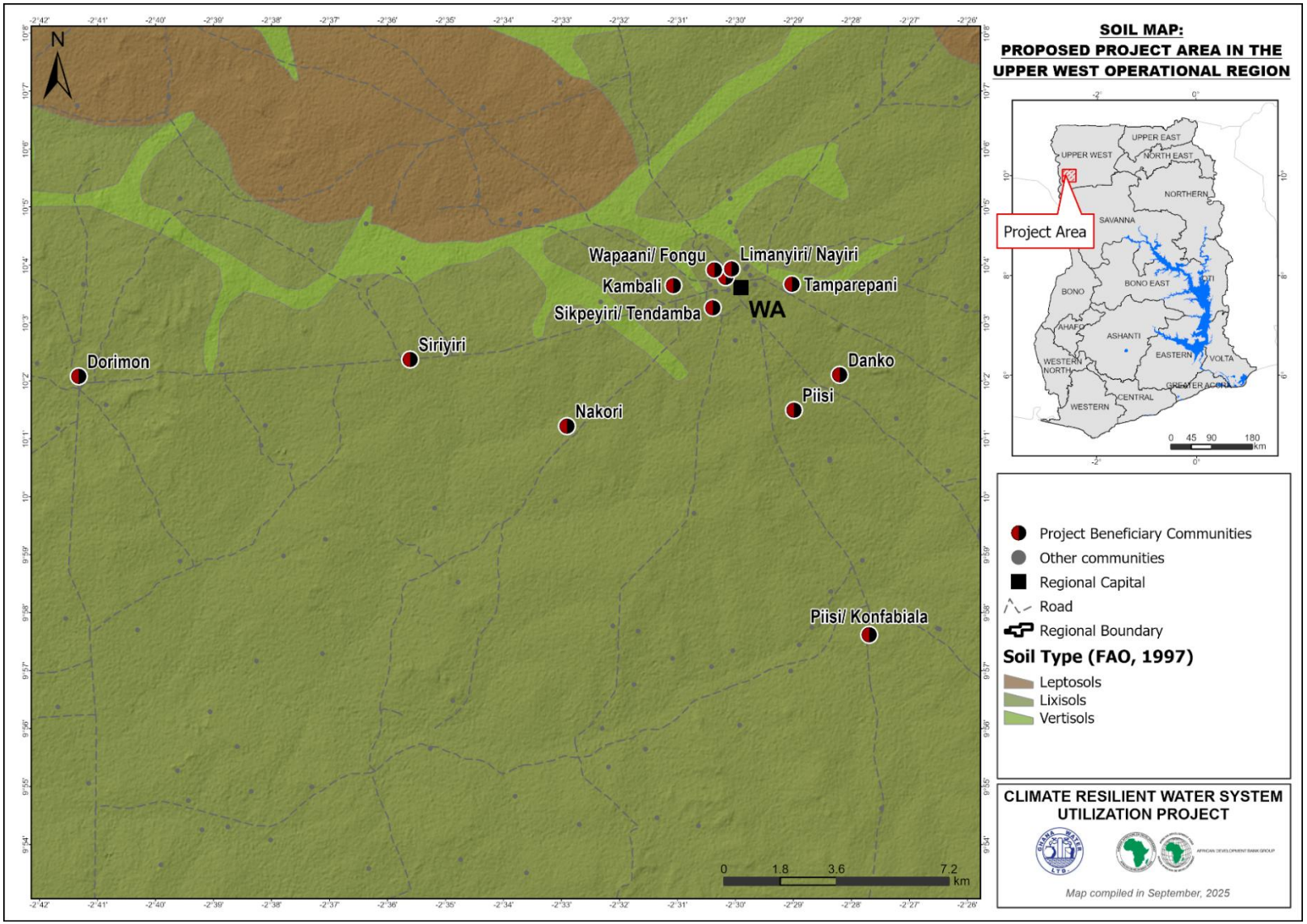


Figure 4-41: Soil map of the Upper West Region project beneficiary area

4.9.5 Air and Noise Quality

Environmental monitoring was conducted at three sampling locations within the project beneficiary communities (Wapaani-UW1, Siriyiri-UW2, and Danko-UW3) to determine compliance with the Ghana Standards Authority (GSA) environmental quality limits, specifically: Noise levels – GS 1222:2018 and Air quality (NO_2, SO_2, $PM_{2.5}$, PM_{10}) – GS 1236:2019.

From Table 4-18, the daytime noise levels at UW1 (71.9 dB(A)) slightly exceed the GSA limit of 55 dB(A), likely due to vehicular movement on untarred road and exhaust emissions. UW2 and UW3 recorded acceptable levels for both day and night, within the standards for mixed residential and light industrial zones. Night-time levels across all sites were generally compliant, indicating low nocturnal disturbance.

All measured concentrations of NO_2, SO_2, $PM_{2.5}$, and PM_{10} were well below the Ghana Standard limits, indicating good ambient air quality conditions. Slight variations between sites may be attributed to local dust resuspension and traffic emissions, but concentrations remain within acceptable environmental and health thresholds. No evidence of acute or chronic pollution levels was observed across the sampling period.

The monitoring results indicate that ambient air quality within the project area is satisfactory, with pollutant levels below national standards. However, localized noise exceedances (notably at UW1 during daytime) suggest the need for noise control measures during construction.

Table 4-18: Air quality and noise level monitoring results in the Upper West Region

Code	Noise Level				Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	**dB_{max}**	**dB_{min}**		**dB(A)**		**µg/m³**		**µg/m³**		**µg/m³**		**µg/m³**
UW1	Day	93.1	61.9	71.9	**55**	19.0	**150 (24 hours)**	22.2	**50 (24 hours)**	14.9	**35 (24 hours)**	33.9	**70 (24 hours)**
	Night	63.8	45.4	47.1	**48**								
UW2	Day	87.4	45.1	53.7	**55**	18.3	**150 (24 hours)**	20.1	**50 (24 hours)**	15.8	**35 (24 hours)**	30.2	**70 (24 hours)**
	Night	69.4	45.7	46.7	**48**								
UW3	Day	79.2	67.8	73.4	**75**	35.5	**150 (24 hours)**	22.7	**50 (24 hours)**	20.3	**35 (24 hours)**	22.6	**70 (24 hours)**
	Night	79.5	58.1	63.1	**65**								

4.9.6 Topography

The Upper West Region is generally characterized by a gently undulating to flat terrain, with elevations ranging from approximately 150 meters to 450 meters above sea level. The landscape is shaped by Birrimian and Voltaian geological formations, interspersed with lateritic crusts and isolated rocky outcrops that rise above expansive savannah plains.

In most of the communities around Wa, Nadowli, and Jirapa, the terrain is dominated by broad upland lateritic surfaces and gently sloping plains. These areas are well-suited for cereal cultivation and livestock grazing, though shallow soils in certain upland sections limit agricultural intensity.

To the northern and northwestern parts, including Lawra, Lambussie, and Tumu, the landform transitions into open plains with scattered ridges and low hills. Seasonal streams dissect the area, creating valleys that become fertile floodplains during the rainy season and support rice, maize, and vegetable cultivation. However, these same low-lying zones are prone to seasonal flooding and erosion.

The topography shows most project beneficiary communities having an elevation above 300 meters above mean sea level with the exception of Dorimon, Siriyiri, Nakori and Piisi/ Konfabiala, which are below 300 meters above mean sea level (see Figure 4-42).

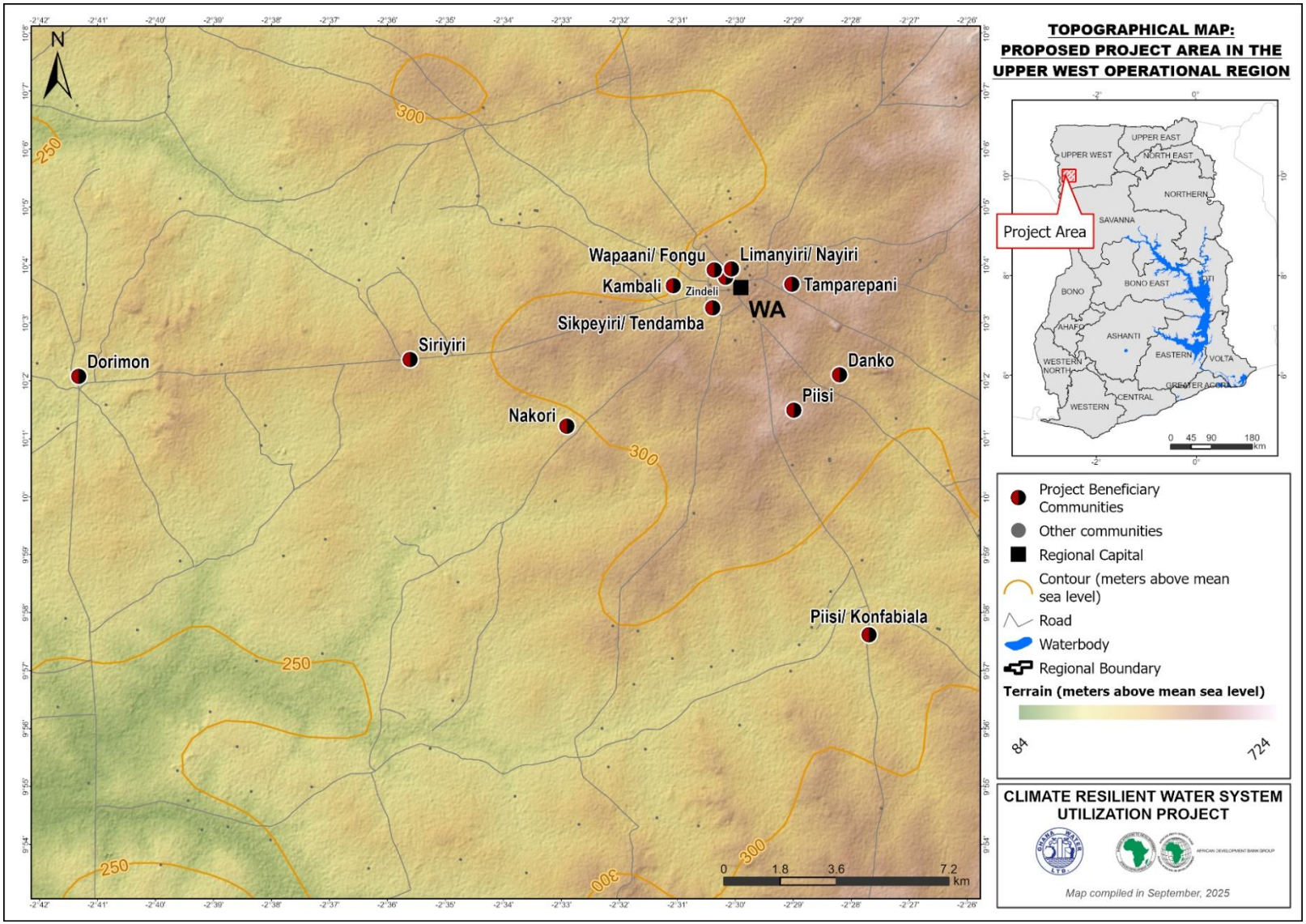


Figure 4-42: Topographical map of the Upper West Region project beneficiary area

4.9.7 Hydrology and water resources

The proposed project area is situated within the Upper West Region, encompassing Wa Municipality and surrounding beneficiary communities including Dorimon, Siriyiri, Nakori, Kambali, Danko, Tamperepani, Limanyiri, Nayiri, Wapaani/Fongu, Sikpeiyiri, Tendamba, Pilsi, and Konfabila. The drainage system within the area is primarily influenced by the Black Volta River Basin and the Kulpawn River Basin, which define the principal hydrological regimes of the region.

The drainage network exhibits a dendritic pattern, typical of gently undulating terrain underlain by weathered Precambrian rocks. Numerous ephemeral and seasonal streams drain toward the south and southeast, ultimately discharging into the Black Volta River. The map below indicates moderate drainage density, with streams interconnected by a system of small tributaries and wetland depressions that facilitate surface runoff during the wet season.

Hydrologically, the area experiences seasonal flow variability, with active stream discharge concentrated in the rainy season (May to October) and minimal flow during the dry season. Wetlands and low-lying areas along the drainage courses serve as temporary retention and infiltration zones, supporting groundwater recharge and reducing flood risk.

Despite the nature of the drainage system in the project area, during site verification, it was observed that no surface water body traverses the proposed pipeline RoW. Nothwithstanding, the construction contractor will have to avoid polluting underground water resources through its activities.

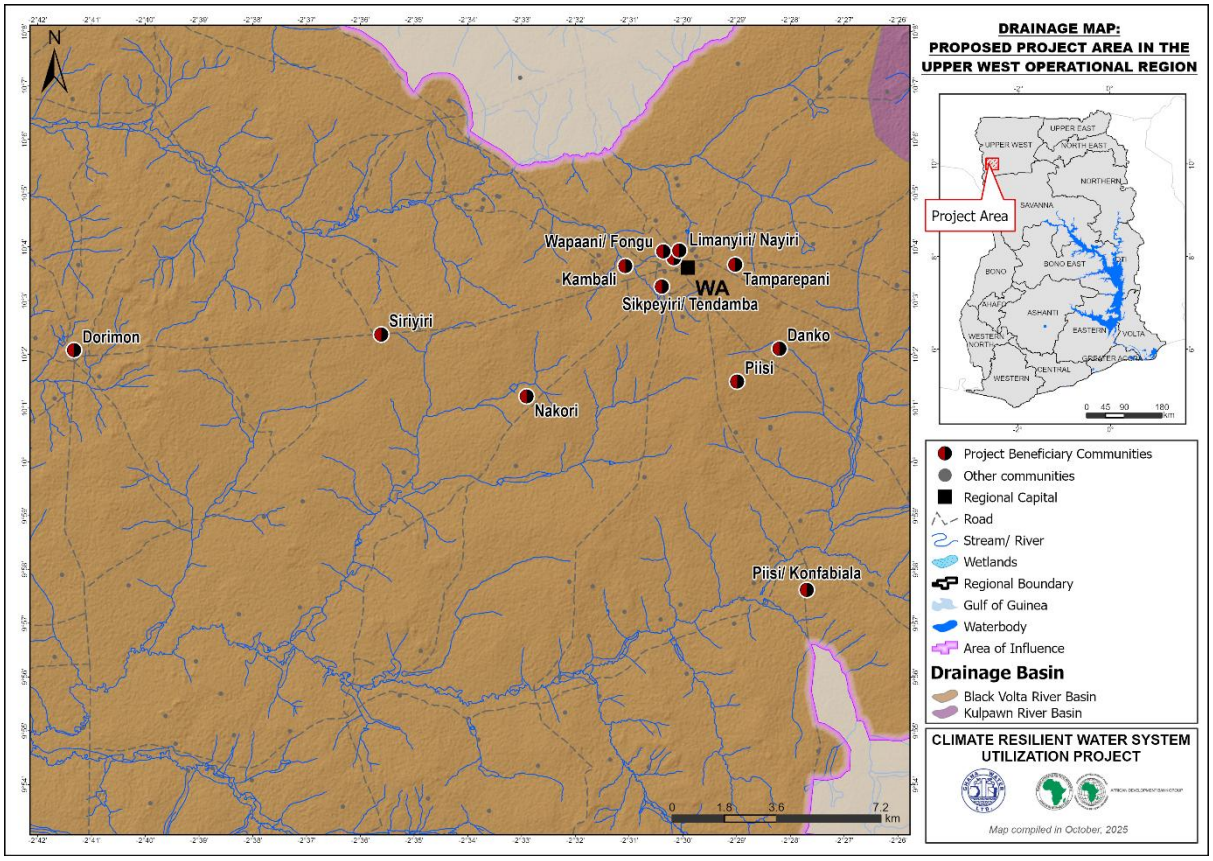


Figure 4-43: Drainage map of the Upper West Region project beneficiary area

4.9.8 Flora and Fauna

The project area lies within the Sudan Savannah ecological zone, which is typified by grasslands interspersed with scattered shrubs and short trees, including species such as shea (Vitellaria paradoxa), neem (Azadirachta indica), and baobab (Adansonia digitata). However, in the specific project communities of the Upper West Region, vegetation cover is sparse and highly degraded, owing to continuous farming, grazing, and settlement expansion. Along the proposed pipeline routes, vegetation is either non-existent or very scanty, particularly where road reservations and community paths have already been heavily encroached. As a result, only minimal vegetation clearance will be required during construction.

Fauna is also very limited within the project corridors. Along the proposed pipeline alignments, the only animals commonly observed are domestic livestock. Since the pipeline routes will largely follow existing road reserves that are already affected by farming, structures, utilities, and daily human activity, the potential disturbance to both flora and fauna will be negligible.

The vegetation of the project area within the Upper West GWL operational region is shown in Figure 4-44. Tamparepani is close to the Wa Town Plantation, a protected area in the Region.

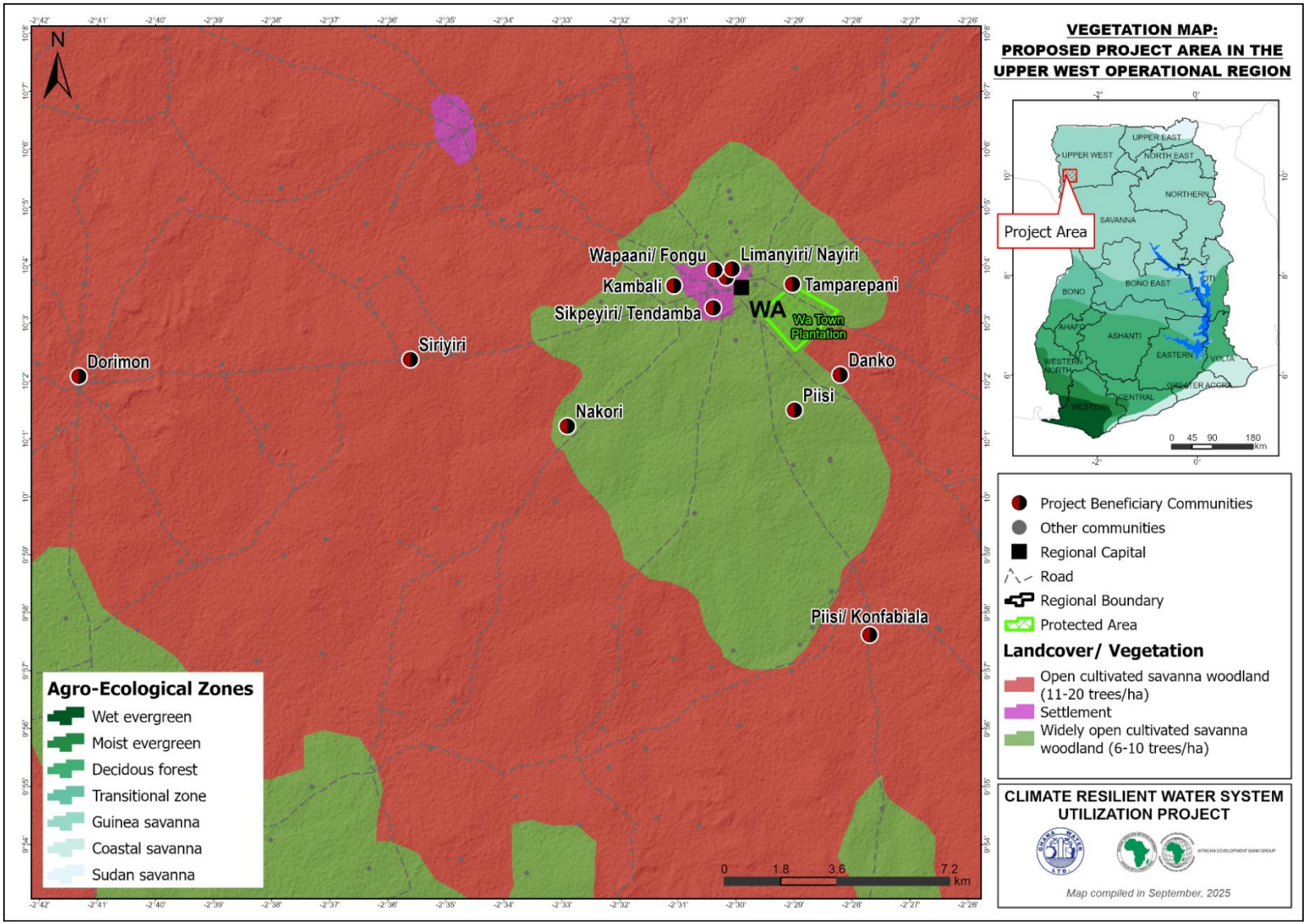


Figure 4-44: Vegetation and Landcover map of the Upper West Region project beneficiary area

4.9.9 Social-Demographic Characteristics

The Upper West Region is traditionally inhabited by ethnic groups such as the Dagaaba, Sissala, and Wala, who form the majority of the population. In addition to these indigenous groups, the region also hosts migrant communities, including Mole-Dagbani, Fulani, and other ethnic minorities, particularly in towns such as Wa, Tumu, Lawra, and Jirapa, which serve as important administrative, educational, and commercial hubs.

Livelihoods in the Upper West is primarily agrarian, with most households depending on subsistence farming and livestock rearing. Major crops cultivated include millet, sorghum, maize, groundnuts, yam, and cowpeas, with increasing cultivation of rice and vegetables in lowland valleys and irrigated sites. The region is also well known for livestock production, particularly cattle, goats, sheep, pigs, guinea fowl, and poultry, which provide income, protein, and serve as a form of savings for households. Seasonal dry-season farming, supported by dugouts, small dams, and irrigation schemes, enables the cultivation of vegetables such as tomatoes, peppers, and leafy greens for both household use and market sales.

In urban centers such as Wa, Tumu, and Lawra, the economy is relatively more diversified, with people engaged in trading, transport, education, public service, construction, and small-scale manufacturing. The region is also noted for its handicrafts and cultural products, including smock weaving, leatherwork, and pottery, which contribute to household incomes and form part of its cultural identity.

4.9.9.1 Description of Beneficiary Communities

The beneficiary communities in the Upper West Region are largely agrarian and peri-urban, with populations that are youthful, family-oriented, and dependent on farming and small-scale trading. Household sizes average 5–7 persons, with extended family systems still dominant. Population growth is driven by natural increase, rural–urban migration, and peri-urban expansion around Wa and other district centers. While subsistence farming remains central, proximity to Wa and key road networks has supported a gradual shift into trading, transport, and artisan livelihoods.

- Piisi/Konfabiala: A modestly populated agrarian community where household sizes remain large. Farming (maize, millet, and groundnuts) dominates livelihoods, while seasonal migration of youth to southern Ghana is common.

- Siriyiri: A moderately populated settlement with a predominantly youthful population. Farming is the mainstay, but small-scale trading and transport services are emerging due to its location near Wa.
- Nakori: A medium-sized community with steady population growth. Farming and trading are the dominant activities, while artisan work provides supplemental income. Proximity to Wa attracts migrants from surrounding rural areas.
- Danko: A peri-urban settlement near Wa with a youthful and growing population. Livelihoods span farming, trading, and informal services. Its growth is supported by migration inflows from nearby villages.
- Dokpong: A moderately populated community where farming remains dominant. Population growth is modest, though outmigration of youth to Wa and southern Ghana is common, leaving behind an older farming population.
- Fifamuni: A relatively small agrarian community with low-to-moderate population density. Farming of millet, sorghum, and groundnuts is central, with population growth remaining stable but slow.
- Kambali: A peri-urban settlement on the outskirts of Wa, experiencing rapid population growth due to urban expansion. Livelihoods are diversified, spanning farming, trading, artisan work, and transport services.
- Limanyiri/Nayiri: A small-to-medium settlement with large household sizes and extended family systems. Farming dominates, though small-scale trading supplements household incomes.
- Sikpeyiri/Tendamba: A peri-urban community with steadily growing population due to its proximity to Wa. Livelihoods include farming, petty trading, and transport-related activities.
- Tamparepani: A small farming community with modest growth. Households rely on subsistence agriculture, particularly sorghum, millet, and maize, with limited diversification into trading.
- Wapaani/Fongu: A densely populated settlement near Wa, experiencing rapid growth linked to its role as a residential area and small trading hub. Farming remains important, though non-farm activities are increasingly common.

- Zindeli: A modestly populated rural community with slow population growth. Livelihoods are mainly farming-based, with youth outmigration shaping household structures.
- Dorimon: A major agrarian settlement west of Wa, Dorimon is experiencing steady population growth. The population is youthful, engaged in farming, trading, and artisan work. Its growth is supported by better road access and its role as a local service center.

4.9.9.2 Estimated Population of the Project Corridor Communities

The beneficiary communities in the Upper West Region display a youthful population with average household sizes ranging between 5 and 7 persons. Population growth in 2025 has been shaped by natural increase, rural-urban expansion around Wa, and migration flows. While smaller rural settlements have recorded modest but steady growth, and roadside communities such as Kambali, Wapaani/Fongu, and Danko have experienced more rapid increases due to their proximity to Wa and major road corridors.

Table 4-19 shows the estimated population of the project corridor communities.

Table 4-19: Estimated Population of the Project Corridor Communities

Community	**2025 Projected Population**
Piisi/Konfabiala	849
Siriyiri	1,524
Nakori	3,362
Danko	4,398
Dokpong	2,059
Fifamuni	954
Kambali	5,608
Limanyiri/Nayiri	1,582
Sikpeyiri/Tendamba	3,013
Tamparepani	1,140
Wapaani/Fongu	6,992
Zindeli	1,245
Dorimon	4,595

Source: Ghana Statistical Service (Projected from 2021 Census; District Assembly report).

4.9.9.3 Ethnicity of Residents of the Project Communities

According to the Ghana Statistical Service and follow-up community surveys, the project communities in the Upper West Region are ethnically diverse, though the Waala/Dagaaba groups form the majority, with minority presence of Sissala, Lobi, and Mole-Dagbani settlers in some peri-urban areas.

- Piisi/Konfabiala, Siriyiri, Nakori, and Dorimon are predominantly Waala and Dagaaba communities, where these groups account for over 75–80% of the population, with minority groups including Sissala and Lobi households.
- Danko, Dokpong, and Limanyiri/Nayiri also show Waala dominance (about 70–75%), but their proximity to Wa township has attracted migrants from Mole-Dagbani, Ewe, and other ethnic groups engaged in trading and services.
- Kambali and Wapaani/Fongu, being major peri-urban neighborhoods within Wa, are far more ethnically mixed. Waala and Dagaaba make up about 55–60%, while migrant groups such as Sissala, Dagomba, Hausa/Zabarmas, and Lobi collectively form 25–30% due to commercial and residential expansion.
- Sikpeyiri/Tendamba and Tamparepani are moderately diverse communities, with Waala and Dagaaba constituting about 65–70%, complemented by Sissala, Lobi, and smaller groups who have settled for farming and trading.
- Fifamuni and Zindeli, being relatively small and rural, are more homogenous, with over 80% Waala/Dagaaba, and only a limited presence of other ethnic households.

4.9.9.4 Religion (Project Communities)

According to the socio-economic baseline profiles, the beneficiary communities in the Upper West Region are predominantly Islamic, with proportions ranging between 75% and 85% across settlements such as Piisi/Konfabiala, Siriyiri, Nakori, Danko, and Dorimon. The communities with the highest share of Muslims include Nakori, Dorimon, and Danko, where mosques and Islamic learning centers form important parts of community life.

Christianity represents the second largest religious group, accounting for about 12–20% of residents. It is more prominent in peri-urban and town-based communities such as Kambali, Wapaani/Fongu, Limanyiri/Nayiri, and Dokpong, where churches are well established and attract both youth and adult congregations.

A smaller proportion of residents, estimated at 3–5%, continue to practice Traditional African Religions, especially in rural communities such as Fifamuni, Sikpeyiri/Tendamba, Tamparepani, and Zindeli, where ancestral rituals and cultural practices remain integral to community identity and social cohesion

4.9.10 Economic Conditions

Labour and employment patterns across the project communities in the Upper West Region indicate a strong reliance on the informal economy, with only a limited proportion of residents employed in formal professional jobs. In peri-urban and urbanized settlements such as Kambali, Wapaani/Fongu, Nakori, Danko, and Dorimon, between 6% and 12% of residents work in formal occupations such as teaching, nursing, civil service, security services, and local government administration.

The informal sector dominates, with trading emerging as the single largest economic activity. Between 35% and 45%of residents in communities like Kambali, Wapaani/Fongu, and Limanyiri/Nayiri are engaged in petty commerce, including the sale of farm produce, foodstuffs, clothing, and household goods. Access to Wa township and its market serves as a key driver of economic activity in these areas.

Artisanal work is also widespread, employing about 18–22% of the working population across the project communities. Occupations include tailoring, weaving, hairdressing, carpentry, masonry, blacksmithing, and bicycle/motorcycle repairs. Service-related jobs such as transport operations (tricycle riding “yellow yellow,” motorcycle taxis, and driving), mechanics, and electrical work engage another 14–18% of residents, particularly in peri-urban centers like Danko, Nakori, and Dorimon.

In the more rural settlements—including Piisi/Konfabiala, Fifamuni, Sikpeyiri/Tendamba, Tamparepani, and Zindeli—farming remains the backbone of the local economy, engaging between 30% and 40% of residents.

4.9.11 Land Uses along the Proposed Pipeline Routes

The project communities in the Upper West Region are largely low to middle income residential settlements, with housing dominated by traditional compound houses, mud or block dwellings, and a growing number of modest modern family houses in peri-urban areas. In close proximity to the utility reservation line is mixed residential and commercial land uses particularly in settlements closer to Wa township such as Kambali, Nakori, Danko,

Wapaani/Fongu, and Dorimon, where roadside kiosks, small retail shops, food vendors, and trading stalls are concentrated.

In addition to residential and trading functions, the pipeline routes lie close to areas with social and civic land uses, including schools, churches, mosques, and community centers, which serve as important focal points for daily life.

4.9.12 Educational Facilities along the Pipeline Routes

In the Upper West Region, the beneficiary communities along the proposed pipeline routes exhibit varying levels of access to educational facilities. Several smaller rural settlements, such as Piisi/Konfabiala, Siriyiri, Fifamuni, Sikpeyiri/Tendamba, Tamparepani, and Zindeli, do not have schools directly located along the pipeline alignment. Children in these communities often travel to nearby larger settlements to access basic education.

In contrast, communities such as Kambali, Nakori, Danko, Wapaani/Fongu, Dokpong, Limanyiri/Nayiri, and Dorimon have schools situated close to or along the proposed routes. These are mostly basic schools (primary and junior high schools) that serve both local children and those from adjoining rural communities. Enrollment levels tend to be higher in rural-urban areas closer to Wa township (e.g., Kambali, Wapaani/Fongu, and Danko) compared to the smaller rural settlements, where school-going populations remain relatively lower.

The distribution of schools along the proposed pipeline routes in the Upper West Region is summarized in Table 4-20.

Table 4-20: Distribution of Schools Along the Proposed Pipeline Routes

Community	**Number of Schools**	**Total Enrollment**
Kambali	1	635
Nakori	1	482
Danko	1	520
Wapaani/Fongu	2	1,185
Dokpong	1	410
Limanyiri/Nayiri	1	365
Dorimon	1	330
Piisi/Konfabiala	0	-
Siriyiri	0	-
Fifamuni	0	-
Sikpeyiri/Tendamba	0	-

Tamparepani	0	-
Zindeli	0	-

4.9.13 Health Facilities along the Pipeline Routes

A few health facilities were identified along the proposed pipeline routes in the Upper West Region. These include:

- Kambali Health Centre, located along the main road.
- Wapaani CHPS Compound.
- Nakori Health Centre.

Of these three (3) facilities, the Nakori Health Centre is publicly owned and functions as a key referral point for nearby communities. The Kambali Health Centre and the Wapaani CHPS Compound are community-based facilities, providing essential primary healthcare services to residents along the pipeline corridor.

4.9.13.1 Morbidity Trends in the Project Zones

The morbidity profile of the project communities in the Upper West Region is similarly shaped by health conditions associated with water, sanitation, and environmental factors. The most commonly reported illnesses include malaria, diarrhea diseases, and skin infections, which consistently rank among the top cases recorded in local health facilities. According to data from the Ghana Health Service, these diseases remain the major public health concerns across the beneficiary communities along the proposed pipeline routes.

4.10 Volta Region

4.10.1 Regional Overview

The Volta Region, located in the eastern part of Ghana, is one of the country's most diverse and culturally rich regions. It shares boundaries with the Oti Region to the north, the Eastern Region to the west, the Greater Accra Region to the southwest, the Gulf of Guinea (Atlantic Ocean) to the south, and the Republic of Togo to the east. Geographically, the Volta Region covers a land area of approximately 20,570 km², representing about 9% of Ghana's total land area.

The region comprises a mix of urban centers, fishing communities, farming settlements, and rural villages. The regional capital Ho serves as the main administrative and educational hub, while other important towns such as Keta, Hohoe, Kpando, Aflao, and Sogakope function as key centers for trade, fishing, cross-border commerce, and social services. Compared to Greater

Accra, the Volta Region is less urbanized but remains economically significant due to its coastal and inland economic networks.

The economy is primarily driven by farming, fishing, and trade. Along the coast, artisanal and semi-industrial fishing dominate, supporting livelihoods in towns like Keta and Anloga. Inland areas are known for crop farming—including cassava, maize, yam, and rice—while the lower Volta basin supports irrigation-based agriculture. The region also has emerging sectors such as aquaculture, salt mining, and tourism, with attractions including Mount Afadja (Afadjato), Wli Waterfalls, Lake Volta, and Keta Lagoon, making it an important cultural and eco-tourism destination.

4.10.2 Description of Project Communities

The project communities in the Volta Region are predominantly agrarian, with farming serving as the backbone of livelihoods. Major crops cultivated include cassava, maize, yam, rice, cocoyam, and vegetables, alongside small-scale oil palm and coconut farming. Livestock rearing is mainly goats, sheep, pigs, and poultry is also practiced across rural settlements, contributing to household food security and income.

Along the coast, particularly in Anloga-Agorve, Dzelukope, Tegbi (Adziakpor, Wagana, Xekpa), Woe (Avume, Tegbi), and surrounding fishing villages, artisanal fishing and fish processing are key economic activities, sustaining large portions of the population.

Several inland and semi-urban towns, including Sokpokope, Juapong (North Juapong), Abutia-Kope, Agbagorme, and Lakpo, combine farming with trading, transport, and service-related occupations, functioning as local commercial and service hubs. These communities generally have better access to markets, schools, and health facilities compared to the farming communities such as Agudzi, Aziave, Bame, Dzigbe, and Dzuanti.

Emerging settlements like Sahara Village, Avedzi, Bethel Pentecost Lane, Mataheko North Extension, Ebledokuikope, and Blengo reflect clustered residential growth and expanding non-farm livelihoods, linked to urbanization and migration pressures from larger centers such as Sogakope, Anloga, and Ho.

4.10.3 Climatic Conditions

The Volta Region spans diverse ecological zones, ranging from coastal savannah along the Gulf of Guinea to the moist semi-deciduous forest in the central belt, and the highland areas of the Akwapim-Togo ranges. Vegetation varies accordingly, with coastal grasslands and

mangroves, inland farmlands interspersed with oil palm, cocoa, maize, and cassava, and dense forest cover in the hilly areas.

The climate is shaped by two major wind systems: the south-west monsoon winds from the Atlantic Ocean, which bring rains, and the north-east trade winds (Harmattan) from the Sahara, which dominate from December to February, creating dry, hazy conditions. Relative humidity is generally high during the wet season (75%–95%) but can fall to 50%–60% during the Harmattan months.

Temperatures remain relatively stable year-round, with mean daily values ranging from 22°C to 32°C. The hottest months are typically February to March, while July–August bring relatively cooler conditions with the peak of rainfall.

Rainfall follows a bimodal pattern, with two rainy seasons: the major season from April to July (peaking in June) and the minor season from September to November. Average annual rainfall ranges between 1,100 mm and 1,800 mm (GMET, 2025), with coastal and northern savannah zones receiving less rainfall than the central highland and forest areas.

4.10.4 Geology and Soils

The Volta Region is underlain mainly by geological formations of the Dahomeyan system, Togo series, and Buem volcanic rocks, which date back to the Middle to Upper Precambrian Age. These consist largely of gneiss, schists, quartzites, and volcanic materials. The soils of the region are derived from the prolonged weathering and decomposition of these formations, aided by the region's warm and humid climate. As a result, the soils occur in varied colours, including grey, reddish-brown, yellowish-brown, and whitish tones. Figure 4-45 shows the geological rock formations in the project areas within the Volta GWL operational region.

The surface layer typically consists of sandy or silty clays, regarded as drift materials, underlain by a lateritic horizon of quartz gravels. These quartz-rich layers represent weathered products of the parent bedrock, intermixed with transported sandy and silty materials. The combination of these features has given rise to soils with varying fertility levels, supporting diverse land uses ranging from food crop cultivation to tree crops and settlements across the region. The soil type in the project beenficairy areas are shown in Figure 4-46.

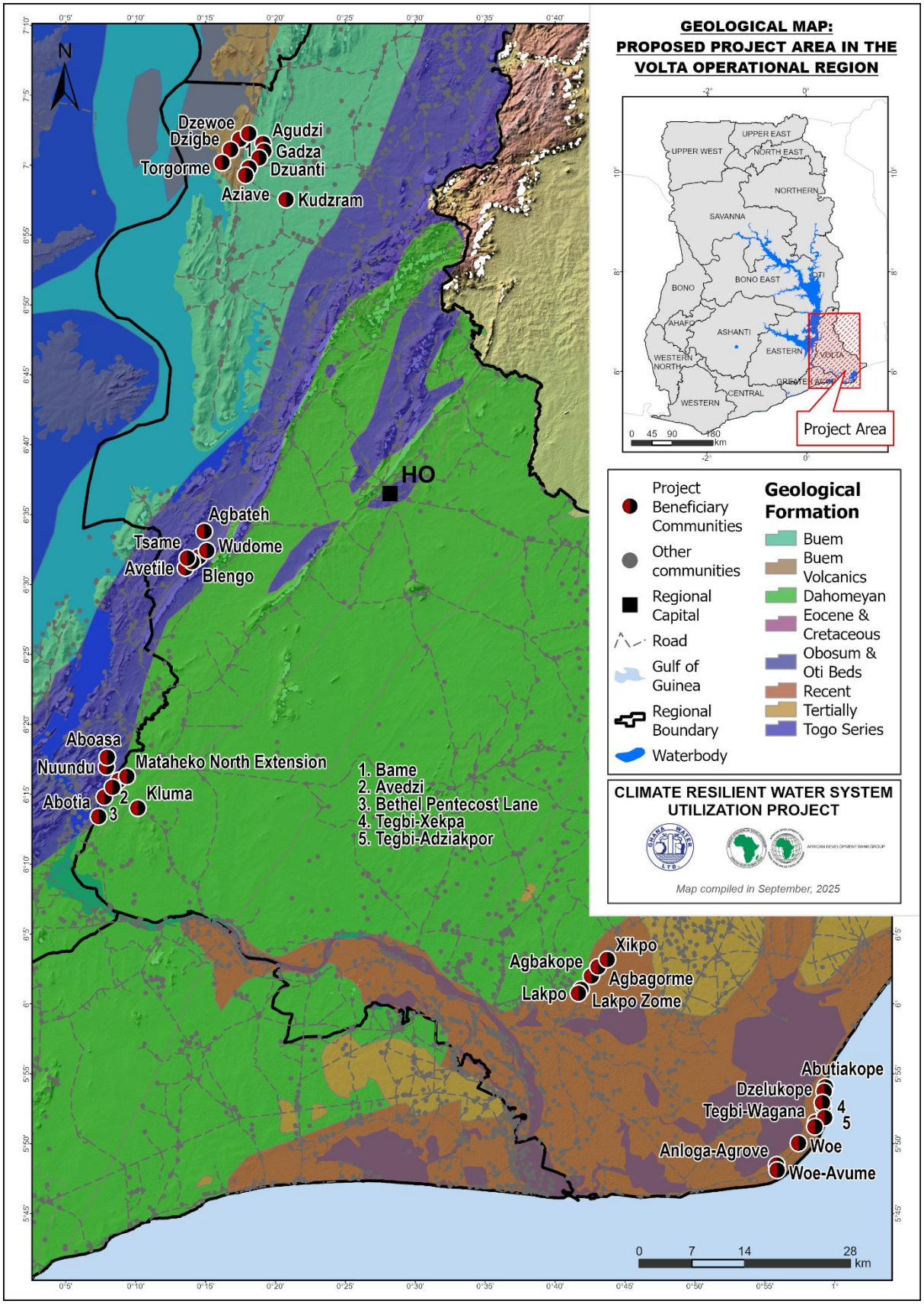


Figure 4-45: Geological map of the Volta Region project beneficiary area

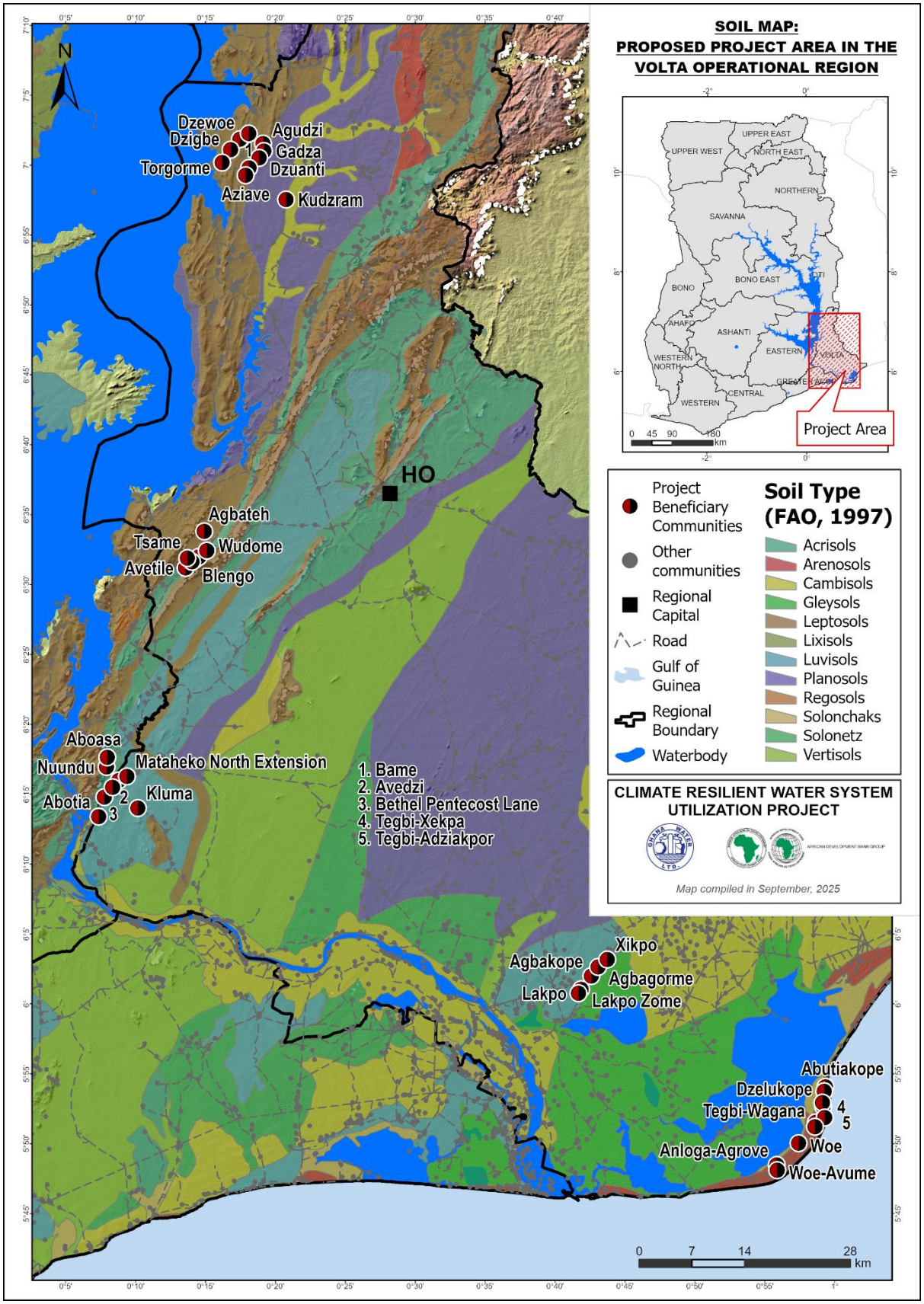


Figure 4-46: Soil map of the Volta Region project beneficiary area

4.10.5 Air and Noise Quality

Baseline noise and air quality measurements were undertaken at five (5) monitoring stations within the project communities to establish existing environmental conditions prior to project implementation. The project communities are Dzewoe (VRI), Kpando-Gadza (VR2), Kpando-Torkor (VR3), Agbakope (VR4) and Tegbi-Adziakpor (VR5).

Noise measurements were conducted during both daytime (06:00–22:00 hours) and night-time (22:00–06:00 hours) periods at each sampling location. In the table below, daytime noise levels at VR1 and VR4 exceeded the permissible GSA limit of 55 dB(A) for residential areas, likely due to vehicular movement on untarred road and commercial activity. However, the exceedances were marginal and localized. Noise levels at VR2, representative of a rural setting, were within the applicable standard of 75 dB(A). Nighttime levels across all communities were compliant, indicating reduced anthropogenic activity during nocturnal hours.

In the table below, all recorded pollutant concentrations were below the respective Ghana ambient air quality standards (GS 1236:2019). The relatively low concentrations indicate good ambient air quality within the project communities. The slightly elevated particulate matter levels at VR4 may be attributed to localized dust emissions from unpaved roads or surface disturbances, but these values remain within acceptable limits.

The baseline conditions are favorable for project implementation, provided adequate noise and dust control measures are adopted during construction and operation phases.

Table 4-21: Air quality and noise level monitoring results in the Volta Region

Code	Noise Level				Standard (GS 1222:2018)	NO_2	Standard (GS 1236:2019)	SO_2	Standard (GS 1236:2019)	$PM_{2.5}$	Standard (GS 1236:2019)	PM_{10}	Standard (GS 1236:2019)
	Time	dB_{max}	dB_{min}		dB(A)		µg/m³		µg/m³		µg/m³		µg/m³
VR1	Day	87.4	45.1	67.7	**55**	18.3	**150 (24 hours)**	20.1	**50 (24 hours)**	15.8	**35 (24 hours)**	30.2	**70 (24 hours)**
	Night	69.4	45.7	46.7	**48**								
VR2	Day	79.2	67.8	73.4	**75**	35.5	**150 (24 hours)**	22.7	**50 (24 hours)**	20.3	**35 (24 hours)**	22.6	**70 (24 hours)**
	Night	79.5	58.1	63.1	**65**								
VR3	Day	59.5	50.3	53.4	**55**	17.8	**150 (24 hours)**	14.7	**50 (24 hours)**	11.4	**35 (24 hours)**	19.1	**70 (24 hours)**
	Night	55.6	48.7	46.0	**48**								
VR4	Day	70.8	60.5	59.8	**55**	20.3	**150 (24 hours)**	34.0	**50 (24 hours)**	30.0	**35 (24 hours)**	50.3	**70 (24 hours)**
	Night	65.2	43.1	46.2	**48**								
VR5	Day	55.3	45.1	53.4	**55**	19.4	**150 (24 hours)**	12.0	**50 (24 hours)**	11.8	**35 (24 hours)**	16.8	**70 (24 hours)**
	Night	50.9	42.8	45.7	**48**								

4.10.6 Topography

The Volta Region features a highly diverse landscape, ranging from low-lying coastal plains along the Gulf of Guinea to elevated uplands and dissected hills further inland. Elevations vary from sea level in the coastal zone to over 800 meters in the Akwapim-Togo mountain ranges, which form some of the highest points in southern Ghana. The terrain reflects the influence of the Precambrian Dahomeyan and Togo rock systems, resulting in a mix of flat plains, rugged hills, valleys, and undulating plateaus.

Along the coast, stretching through Anloga, Keta, Woe, and Tegbi, the topography is dominated by sandy beaches, lagoons, and low-lying plains, many of which are prone to tidal flooding and coastal erosion. Inland, around Ho, Amedzofe, and surrounding communities, the landscape is hilly and mountainous, supporting forest cover, cocoa, plantain, cassava, and vegetable farming. The Volta River basin further adds fertile alluvial valleys, supporting irrigated farming and fishing activities.

Figure 4-47 shows the topography of the region with a focus on the project beneficiary areas.

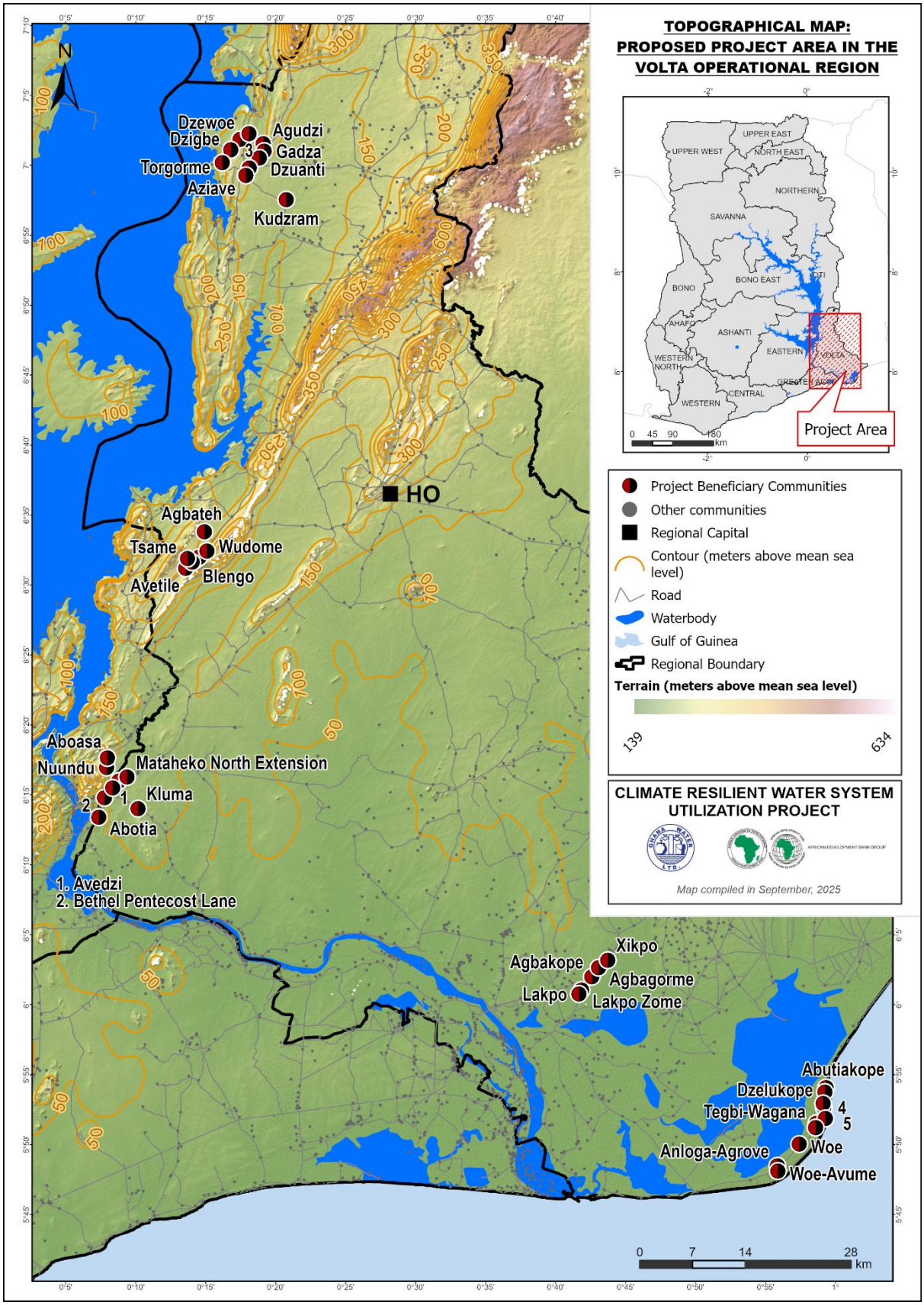


Figure 4-47: Topographical map of the Volta Region project beneficiary area

4.10.7 Hydrology and water resources

The proposed project area lies within the Volta Operational Region, primarily draining into the Volta Lake through a network of river basins including the Afram, Alabo, Bayi, Obosum, and Todze River Basins. The region exhibits a complex hydrological system characterized by interconnected streams, rivers, and wetlands that support both surface and groundwater recharge.

The drainage pattern is predominantly dendritic, with flow generally directed southeast toward the Gulf of Guinea and eastward into Volta Lake. Major watercourses serve as natural drainage conduits for the project communities such as Anloga, Tegbi, Woe, Avetile, Kluma, and Aziave, among others.

Wetlands and floodplains, especially within the lower catchment areas of Keta and Anloga, act as significant hydrological buffers that moderate flooding and support aquatic biodiversity. The drainage basins also sustain agricultural activities and domestic water use within the Ho, Keta, Anloga, and Tongu districts.

Overall, the drainage network is a critical ecological and socio-economic resource; however, it is sensitive to potential alterations in water flow, sedimentation, and pollution that may arise from project construction and operation phases.

During site verification, it was observed that construction activities if not controlled could impact on the surface water body (Volta Lake) at Kpando – Torkor due to its promity to the pipeline RoW at some sections. Assessment of the Volta Lake (Dowstream) revealed that turbidity value exceeded WHO guideline values. Total suppended solids also exceeded GSA standard value, thereby making it not suitable for drinking (see Appendix 6 for results of water quality assessment). This was noted to be as a result of commercial activities including fishing that takes place downstream.

The physico-chemical constituents of the upstream of the Volta lake were satisfactory due to limited human activities. Nothwithstanding, it is expected that the project implementation should not cause further deterioration of the water quality.

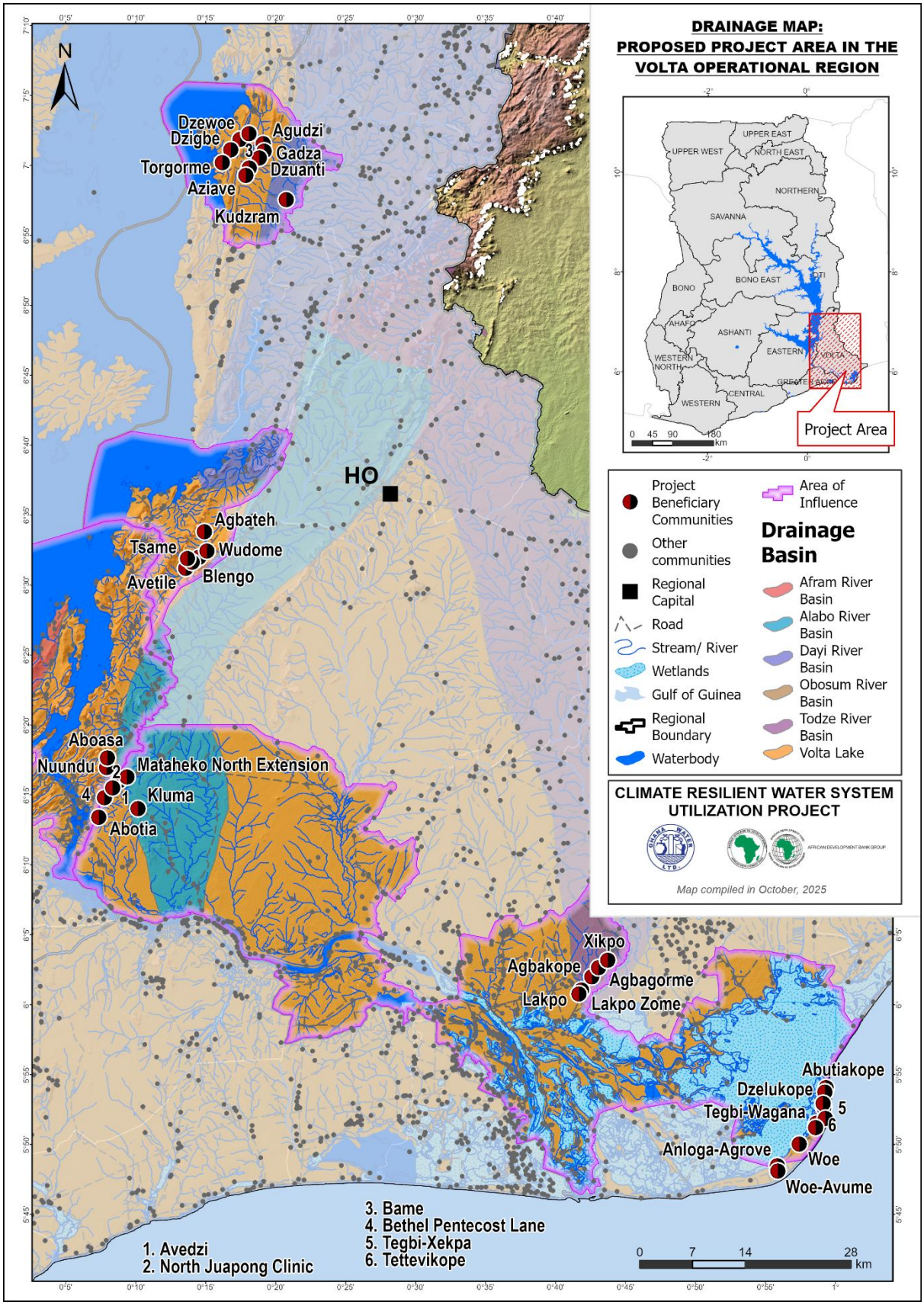
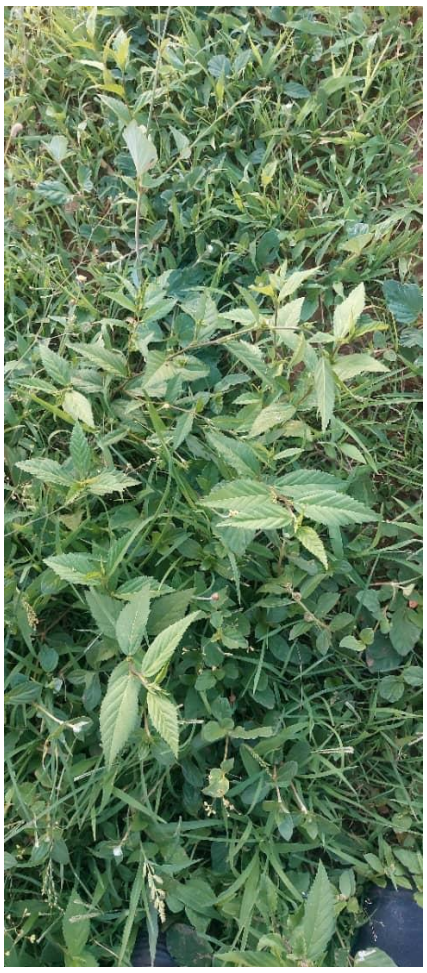


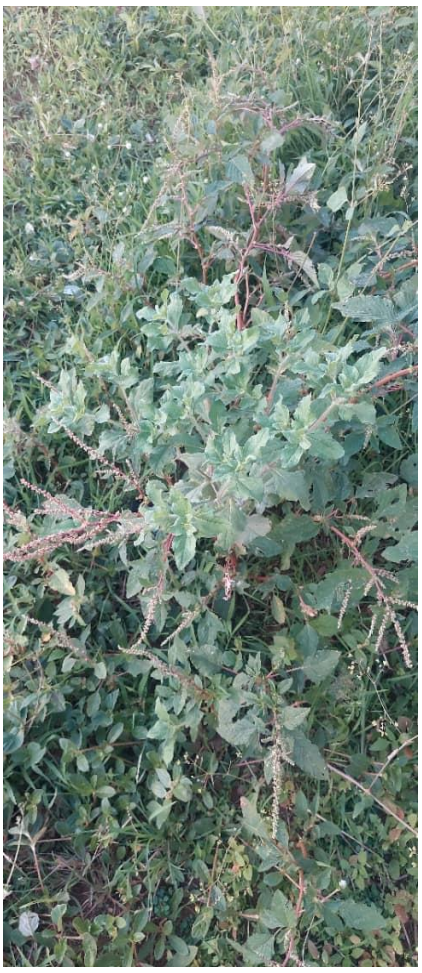
Figure 4-48: Drainage map of the Volta Region project beneficiary area

4.10.8 Flora and Fauna

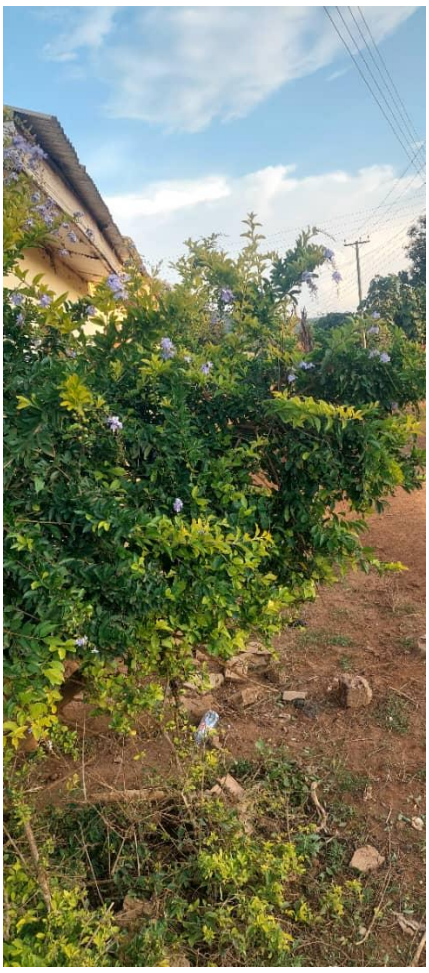
The project area within the Volta Region falls largely within the coastal savannah and transitional vegetation zones, characterized by grasses interspersed with shrubs, short trees such as neem and acacia, as well as patches of mangroves and wetlands in low-lying areas. However, due to the relatively dense settlement patterns and human activities in most of the project communities, natural vegetation cover is sparse along the proposed pipeline routes. As a result, only limited vegetation clearance is expected during construction Flora speices sighted on the RoW at Torkor and Gadza includes *side acuta, amaranthus spinosus* and *duranta erecta* (shown in Figure 4-49 below).



Name: Common wireweed
Scientific name: *Side Acuta*



Name: Spiny pigweed
Scientific name: *amaranthus spinosus*



Name: Sky flower
Scientific name: *duranta erecta*

Figure 4-49*: Sighted Flora Species at Torkor and Gadza RoW in the Volta Region*

Faunal presence within the proposed routes is minimal, as most areas are heavily built-up or used for farming, trade, and other human activities. The pipeline is planned along existing road corridors and public right-of-way zones, many of which are already encroached with structures, utility services, and community infrastructure.

The land cover and vegetation of the project beneficiary communities in the Volta GWL operational region is shown in Figure 4-50.

4.10.9 Social-Demographic Characteristics

In the project communities of the Volta Region, economic activity is largely dominated by the informal sector, with trading, fishing, and small-scale enterprises serving as the backbone of livelihoods. Survey findings indicate that only about 4%-15% of respondents were engaged in professional jobs such as teaching, civil service, and banking, while the vast majority relied on informal occupations.

In coastal towns such as Anloga, Dzelukope, Tegbi, and Woe, fishing and fish processing remain the most dominant sources of employment, engaging about 40% of respondents. Women are particularly active in fish processing, marketing, and petty trading. Inland and peri-urban communities such as Juapong, Sokpokope, and Abutia reported trading and artisanal work including dressmaking, carpentry, mechanics, hairdressing, and food vending as key occupations, representing roughly 20%-25% of livelihoods. Drivers, electricians, and other technical workers made up about 15%-18% of respondents.

A smaller proportion of residents (around 8%-10%) were employed in formal professions, while 2%-5% engaged in farming activities, particularly cassava, maize, vegetables, and livestock rearing in rural areas such as Bame, Kudzram, and Dzewoe. Across all project communities, the survey confirms that the informal sector anchored by fishing, trading, and artisanal work remains the primary source of employment, with formal job opportunities concentrated among a limited minority.

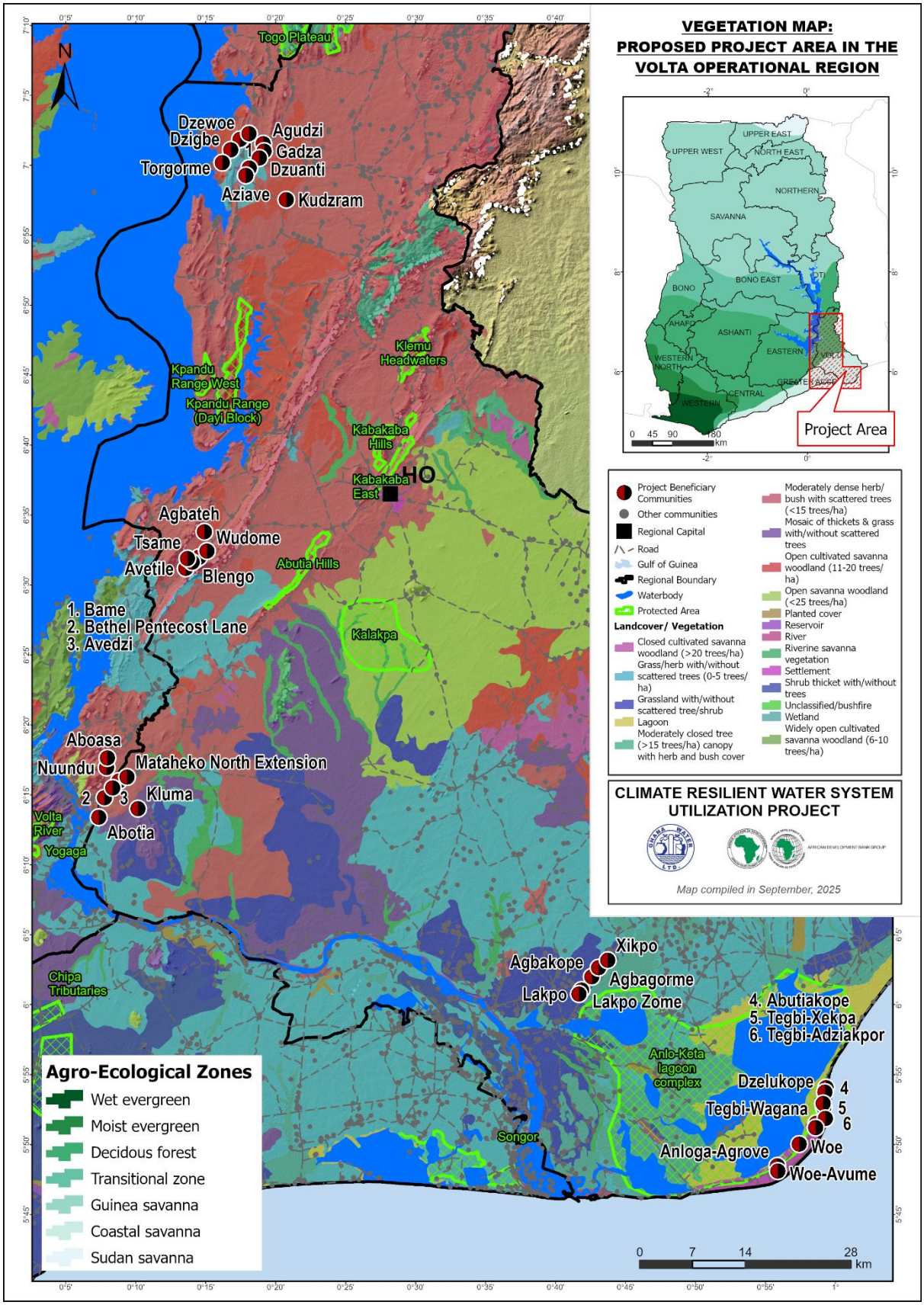


Figure 4-50: Vegetation and landcover map of the Volta Region project beneficiary area

4.10.9.1 Population of Beneficiary Communities – Volta Region

The communities in the Volta Region consist of a mix of coastal, inland, and peri-urban settlements, with generally youthful populations and average household sizes ranging between 4 and 6 persons. Population growth is influenced by natural increase, migration, and the expansion of towns. While fishing and farming remain the mainstay of livelihoods in coastal and rural areas, there is increasing diversification into trading, transport, services, and artisanal occupations in peri-urban and urbanized communities. The strategic location of many settlements along major road corridors and near administrative centers has facilitated this gradual transition from predominantly agrarian economies to more urban-oriented and service-driven activities.

The beneficiary communities targeted by the project are predominantly urban and peri-urban in character, following the Ghana Statistical Service's threshold of 5,000 inhabitants. Many of these settlements have experienced steady population growth between 2021 and 2025, driven by natural increase, rural–urban migration, and expansion linked to commercial, educational, and infrastructural developments. Coastal towns such as Anloga, Keta, Dzelukope, Tegbi, and Woe, together with inland and peri-urban communities around Juapong, Sokpokope, and Akosombo, are among the most prominent in the project corridor (see Table 4-22).

Table 4-22: Estimated Population of Project Corridor Communities (Volta Region)

Community / District	**2021 Population**	**2025 Population**
Keta Municipal (Anloga, Dzelukope, Tegbi, Woe areas)	183,879	198,335
Anloga District (Anloga-Agorve, Tegbi-Environs)	98,684	106,442
South Tongu District (Sogakope, Sokpokope, Agbagorme)	113,114	122,007
Central Tongu District (Adidome and adjoining communities)	83,803	90,391
North Tongu District (Juapong, Battor, Aveyime areas)	122,071	131,1668
Ho Municipal (Aziave, Bame, Kluma, Mataheko North Extension)	214,000	230,824
Ho West District (Dzolokpuita, adjoining rural settlements)	131,000	141,299
Akatsi South District (Akatsi, Wute, Avetile, environs)	121,896	131,479

Source: Ghana Statistical Service (Projected from 2021 Census; District Assembly report)

4.10.9.2 Ethnicity of Residents of the Project Communities

According to the Ghana Statistical Service (2021 PHC) and field surveys, the project communities in the Volta Region are predominantly inhabited by the Ewe ethnic group, though ethnic diversity is evident in towns with significant trading, fishing, and transport activities.

- Agudzi, Aziave, Bame, Dzewoe, Dzigbe, Dzuanti, Gabi, Gadza, Kudzram, Togorme, Afeviafe, Agbateh, Avetlle, Blengo, Dzogbati, Tsame, Wudome, Agbagorme, Lakpo, Xikpo, Abotia, Kluma, and Mataheko North Extension are largely homogenous, with Ewe households accounting for over 80–90% of the population. Minority groups include migrants from northern Ghana (Dagombas, Konkombas) and smaller Ga-Adangbe households.
- Sokpokope, Nuundu & Aboasa, Sahara Village, and Juapong (including North Juapong Clinic area) exhibit moderate diversity due to their location along the Accra–Ho–Akosombo trade corridor. While Ewe remain dominant (about 70–75%), there are significant settlements of Akan traders, Ga-Adangbe transport workers, and Hausa/Zabarmas engaged in commerce.
- Anloga, Dzelukope, Tegbi (Adziakpor, Wagana, Xekpa), Woe (Avume, Tegbi areas), and Abutiakope are coastal fishing communities and among the most ethnically diverse. Here, Ewe form about 60–65%, while fishing households from Fante, Ga-Adangbe, and migrants from Togo, Benin, and Nigeria make up the rest. The presence of West African fisherfolk contributes strongly to the cosmopolitan character of these communities.
- Akosombo and Avedzi (Bethel Pentecost Lane, Ebledokuikope, etc.), being key residential and commercial centers, are also ethnically mixed. The Ewe population makes up about 65–70%, complemented by migrant populations including Akan (mainly Asante and Fante), Ga-Adangbe, northern ethnic groups, and Hausa/Zabarmas, who are engaged in trade, services, and artisanal work.

4.10.9.3 Religion (Project Communities – Volta Region)

According to socio-economic baseline profiles, the beneficiary communities in the Volta Region are predominantly Christian, with proportions ranging between 75% and 88% across settlements such as Agudzi, Aziave, Bame, Dzewoe, Dzigbe, Gabi, Gadza, Blengo, Dzogbati, Tsame, Wudome, Lakpo, Xikpo, Abotia, and Kluma. The communities with the strongest Christian presence include Anloga, Dzelukope, Tegbi, Woe, Sokpokope, and Juapong, where churches of multiple denominations (Catholic, Evangelical, Pentecostal, and Apostolic) are highly visible and central to community life.

Islam represents the second largest religious group, accounting for about 8-15% of residents. Muslim populations are more concentrated in trading and transport-oriented communities such as Sokpokope,

Nuundu, Aboasa, Sahara Village, Akosombo, and Juapong, where mosques and Islamic groups support migrant populations engaged in commerce, transport services, and artisanal work.

A smaller proportion of residents, estimated at 3-6%, continue to practice Traditional African Religions, particularly in rural and semi-rural communities such as Dzuanti, Kudzram, Togorme, Afeviafe, Agbateh, and Ebledokuikope. In these areas, traditional shrines, festivals, ancestral rites, and community rituals remain important aspects of cultural identity and cohesion.

4.10.10 Economic Characteristics

Economic activities in the Volta Region project communities are largely dominated by the informal economy, with relatively few residents employed in formal jobs (mainly in teaching, health, and local government services).

- Trading and petty commerce (30-2%) form the largest source of employment, especially in communities such as Juapong, Sokpokope, Avedzi, Akosombo, Anloga, Dzelukope, and Woe, where vibrant markets and transport linkages support retail, food vending, and cross-regional trade.
- Fishing and fish-processing are major occupations in coastal settlements including Anloga, Dzelukope, Tegbi (Adziakpor, Wagana, Xekpa), and Woe, where artisanal fishing and fish-smoking dominate household economies.
- Artisanal and vocational activities (15–20%) such as tailoring, carpentry, hairdressing, masonry, and mechanics are common across both inland and peri-urban centers like Blengo, Tsame, Kluma, and Nuundu, providing services for local and nearby communities.
- Transport services (5–15%) including taxis, trotros, motorcycle/tricycle operations, and loading work are especially important in trading hubs such as Juapong, Sokpokope, Sahara Village, and the North Juapong Clinic area, where connectivity supports both local movement and long-distance trade.
- In inland farming communities such as Agudzi, Aziave, Bame, Dzigbe, Dzuanti, Gabi, Gadza, Kudzram, Togorme, Afeviafe, and Ebledokuikope, agriculture (25–38%) remains the backbone of livelihoods, with cassava, maize, yam, rice, and vegetables widely cultivated for both subsistence and local markets.

4.10.11 Land Uses along the Proposed Pipeline Routes – Volta Region

The project communities in the Volta Region are largely low to middle income residential settlements, with housing consisting of a mix of traditional compound houses, block structures, and gradually

increasing modest modern homes, especially in peri-urban areas such as Juapong, Sokpokope and Avedzi.

Along the proposed pipeline routes, land use is predominantly residential with commercial pockets, particularly in larger and more urbanized communities like Juapong, Sokpokope, Avedzi, Akosombo, Anloga, Dzelukope, Tegbi, and Woe.

Some sections of the routes traverse areas with social and civic facilities, including schools and churches, which function as key gathering points for residents. Informal commercial activities such as roadside eateries, kiosks, fish-smoking sheds, and petty trading stalls are especially concentrated along the main roads in Anloga, Dzelukope, Tegbi, Woe, and Juapong, reflecting the vibrant trading and fishing economies of these towns.

4.10.12 Educational Facilities along the Pipeline Routes

Across the project communities in the Volta Region, access to educational facilities directly along the proposed pipeline routes is uneven (see Table 4-23). Many smaller or farming-dominated settlements such as Agudzi, Aziave, Bame, Dzewoe, Dzigbe, Dzuanti, Gabi, Gadza, Kudzram, Togorme, and Afeviafe do not have schools situated directly on the pipeline corridors.

However, in larger and more urbanized settlements such as Juapong (North Juapong Clinic area), Avedzi, Akosombo, Anloga-Agorve, Dzelukope, Tegbi (Adziakpor, Wagana, Xekpa), Woe (Avume, Tegbi), and Sokpokope, at least one basic or junior high school can be found along the routes, serving children from both the host communities and neighboring villages.

Enrollment figures are relatively higher in schools located in towns like Juapong, Sokpokope, Akosombo, Anloga, and Woe due to their larger populations and status as commercial/administrative centers. In contrast, smaller settlements such as Tsame, Blengo, and Avetlle record lower enrollment numbers, reflecting both their limited population size and fewer school facilities.

Table 4-23: School Facilities along the Pipeline Routes (Volta Region – Mock-up)

Community	Total No. of Schools	Total Enrollment
Juapong (North Juapong Clinic Zone)	2	1,280
Avedzi	1	750
Sokpokope	2	1,340
Akosombo	2	1,495
Anloga-Agorve	1	820
Dzelukope	1	780
Tegbi-Adziakpor	1	650
Tegbi-Wagana	1	610

Tegbi-Xekpa	0	–
Tettevikope	0	–
Woe-Avume	1	720
Woe-Tegbi	1	690

4.10.13 Health Facilities along the Pipeline Routes

Several health facilities are located along the proposed pipeline routes within the Volta Region project communities. These include:

- North Juapong Clinic, serving as a key healthcare access point for surrounding settlements and providing outpatient and basic maternal services.
- Akosombo Health Centre, a relatively larger facility offering preventive, curative, and limited emergency services to residents in the area.
- Anloga-Agorve Health Centre, which delivers primary healthcare and maternal-child health services.

Among these facilities, the North Juapong Clinic functions as a primary referral facility for adjoining communities, handling cases referred from smaller CHPS compounds and community-based health units. The Akosombo and Anloga-Agorve centres serve as community-level service providers, supporting the delivery of essential outpatient, maternal, and preventive healthcare along the pipeline corridor.

4.10.13.1 Morbidity Trends in the Project Zones

The morbidity profile of the project communities in the Volta Region reflects health challenges closely tied to water, sanitation, and environmental conditions. The most reported illnesses include malaria, diarrheal diseases, and respiratory/skin infections, which continue to dominate case records in local health facilities. Data from the Ghana Health Service indicate that these conditions remain the leading public health concerns across the beneficiary communities situated along the proposed pipeline routes.

5. STAKEHOLDER CONSULTATIONS

5.1 Introduction

Stakeholder consultation is fundamental in preparation of Environmental and Social Impact Assessment (ESIA) for a proposed project activity as it facilitates an effective dialogue amongst the full range of stakeholders including project affected persons in:

i. identifying critical environmental and social issues of concern to stakeholders at very early in the ESIA design process;
ii. ensuring that the views of the proposed project beneficiaries are captured including their perceived and real potential impacts of the project, and their concerns taken care of in the ESIA and the project design.
iii. Providing timely feedback in the ESIA design;
iv. Reducing negative environmental and social impacts of the proposed project including unnecessary disputes between local project communities and project management and enhancing benefits from the project in a way that is environmentally and socially sound.

In this context, the stakeholder consultations helped to:

- Provide timely information to project beneficiaries about the proposed project, the scope and the ESIA process and related activities.
- Obtain the cooperation and participation of project beneficiaries and other stakeholders in ESIA planning and implementation.
- Provide avenues for the stakeholders to air their views and concerns regarding the proposed project;
- Create understanding about the needs and priorities of PAPs regarding the project impacts on their health and safety and other activities to be undertaken; and
- Enable the project to design the proposed activities in a manner to fit the needs and priorities of project-affected-persons.

5.2 Stakeholder Identification

The interest of the various stakeholders, engagement approach and potential areas of concern have been considered including local and international compliance and key issues identification. Expert knowledge, technical review of relevant literature and snowballing were the techniques used in ensuring a holistic identification of all relevant stakeholders. Stakeholders identified and their interest/concerns are summarized in Table 5-1 below.

Table 5-1: Stakeholder Identification

Stakeholder	Category	Interest/Relationship
African Development Bank	Secondary	▪ Compliance with Environmental and Social Safeguard Policies ▪ Project is implemented in a sustainable and cost effective manner ▪ Skills transfer e.g. in the area of environmental and social safeguards
Ministry of Works, Housing and Water Resources	Secondary	▪ Lead implementing Ministry for the Proposed Project ▪ Support MMDA in ensuring that contractors comply with safeguards and other requirements
Ministry of Local Government and Rural Development	Secondary	▪ Political authority under which the project beneficiary MMDA derive their mandate. ▪ Promote decentralization and responsibility for sanitation and hygiene at local levels
Ghana Water Limited	Primary	▪ Expansion of pipe water into the selected project communities ▪ Project is delivered on time and within budget to increase the water supply network ▪ Capacity building for the ESMP implementation ▪ Effective monitoring of project construction works
Environmental Protection Agency	Secondary	▪ Compliance with Act 1124 (2025) and Environmental Protection (Environmental Assessment) Regulations L.I. 2504 (2025) ▪ Environmental governance of the sub project
Municipal Assemblies	Secondary	▪ Improve access to safe water in their respective municipal areas with minimal social and environmental discruptions ▪ Local activities are effectively co-ordinated to ensure successful implementation of the project ▪ Capacity building for implementing ESMP ▪ Grievance redress
Department of Urban Roads Department of Feeder Roads Ghana Highways Authority	Secondary	▪ Protection of road infrastructure in the project communities from destruction due to the pipeline works ▪ Road diversion notifications
Contractors/Consultants	Secondary	▪ Successful implementation of civil works (laying of the pipes) in compliance with the safeguards requirements ▪ Financial rewards
Utility Service Providers (ECG, MTN, Vodafone)	Secondary	▪ Disruption of service lines and associated cost
Opinion Leaders such as Assembly Members	Primary	▪ Improved access to safe water at least cost ▪ Minimum social and environmental disturbance

Stakeholder	Category	Interest/Relationship
		▪ Feedback on effectiveness of project planning, design, participation and implementation ▪ Grievance redress
Residents of the project beneficiary communities	Primary	▪ Improved access to safe water at least cost ▪ Minimum social and environmental disturbance ▪ Feedback on effectiveness of project planning, design, participation and implementation ▪ Grievance redress

5.3 Stakeholders Consulted

Stakeholder consultations, both institutional and community were undertaken as part of the project planning process and feedback from these engagements were obtained. Different methodologies were considered for the purposes of achieving the intended objective of the consultation. The methodology adopted for the institutional consultation was primarily an in-person interview. At the community level, the methodology used included focus group discussions, key person interview and community durbar. Inputs made by stakeholders during the consultations are considered and integrated into relevant chapters of this report. See appendix 4 for evidence of stakeholder engagements.

5.4 Summary of Common Concerns Raised by the Stakeholders during the Consultations

Concerns of the stakeholders (institutional and community) bothering on environmental and social issues of the Proposed Project gathered are outlined in table 5-2 below.

Table 5-2: Institutional and Community Stakeholder Consultation Concerns and Feedback Matrix

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Environmental Protection Authority, Head Office 18-06-2025	Completed and submitted form EA2 One-on-one interaction	▪ Project classified as one requiring a Preliminiary Environmental Report ▪ Directed for a Preliminiary Environmental Report to be undertaken for each project region to focus the report on the key issues, concerns and decision areas as well as solicit input and guidance from all stakeholders ▪ Environmental monitoring regime should comply with the guidelines provided by the Authority. ▪ Ensure relevant stakeholders are consulted and concerns integrated into the pipeline designs.	▪ The environmental and social study has taken into consideration assessment of bio-physical and socio-economic conditions the project is likely to interact with.
Ghana Water Limited (GWL), Head Office 18-08-2025	One-on-one interaction	▪ The project will increase clientele base of the company and afford low-income community members to have access to portable water after successful completion. ▪ Possible negative impacts include physical and economic displacement, dust emission, public health risk, disruption of normal traffic, upsurge in teenage pregnancy inter alia. ▪ Expected positive impacts include increase accessibility, improved hygiene, revenue generation and job creation.	-
Public Utility Regulatory Commission (PURC), Head Office, Accra 19-08-2025	One-on-one interaction	▪ All customers of GWL that will be affected by disruptions in the transmission water pipelines during construction should be duly notified and if practical, alternative water supply measures explored to reduce the impact. ▪ Customer complaints such as water rationing, pipe burst, leakages, low pressure and over billing are expected to surface during the operational phase of the project. ▪ Implement pipeline construction in phases so large areas are not affected at once.	▪ Public communication and awareness of potential water supply interruptions is considered. ▪ Implementation of the project will resolve most complaints lodged by customers.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Ghana Highway Authority (GHA), Head Office 18-08-2025	Official Letter One-on-one interaction	▪ Adequate notice should be given to road users of potential road closures. Alternative transportation routes should be proposed during such communications. ▪ The Regional Offices of the Authority should be informed when cutting through the highway for further assessment. ▪ Pipeline construction can interfere with utility lines within the RoW. Hence site meeting with utility engineers is required.	▪ Public communication and awareness of potential road closures will be adhered to. ▪ The Authority will be notified when cutting through any highway in any of the project Regions. ▪ Site meetings will be held with engineers of the various utility service providers.
Department of Urban Roads, Head Quarters, Accra 19-08-2025	One-on-one interaction	▪ Proposed project should conform to future developments. ▪ Road closures should be well planned to facilitate adequate control of traffic and also make it possible for use of alternative routes ▪ All road crossings should be repaired according to specifications vetted by Department of Urban Roads Engineers. ▪ Furnish the Department at both National and regional level with designs and drawings of the pipeline and should indicate the location of other utility facilities (Example ECG poles) on the RoW. ▪ Affected Metropolitan and Municipal Assemblies should be consulted where roads will be cut.	▪ Site meetings will be held with engineers of the various utility service providers. ▪ Crossings will be repaired according to specifications vetted by Department of Urban Roads Engineers ▪ Metropolitan, Municipal Assemblies and the Department will be officially notified of urban road cuts. ▪ Pipeline designs will be shared when finalised.
Department of Feeder Roads, Accra 22-08-2025	One-on-one interaction	▪ Adequate road signs should be installed to inform road users of ongoing project activities along/across roads ▪ Ensure compliance to the Regional Engineering Coordinating Team guidelines. ▪ Construction of ducts should be considered where necessary.	▪ Requirements in the Regional Engineering Coordinating Team guidelines will be incorporated in the final pipeline designs. ▪ Project Contractors will liaise with the Beneficiary Metropolitan and Municipal Assemblies and MTTD of Ghana Police to effectively manage traffic situations.
Electricity Company of Ghana, Head Quarters,	One-on-one interaction	▪ ECG will identify its properties that will be affected and prepare a bill for possible relocation. ECG admonished that relocation can be very	▪ ECG will be notified of all site meetings prior to commencement of construction works.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Accra 22-08-2025		expensive. Hence the pipeline routes should avoid ECG poles and buried cables as much as possible. ▪ Project impact includes revenue loss because sometimes they have to go off for relocation or construction works to be done. ▪ Damages to underground cables	▪ Finalised pipeline designs will be shared with ECG. ▪ The pipelines will avoid ECG poles as much as possible
Telecommunication Companies (MTN, Vodafone, AirtelTigo), Head Offices, Accra 26-08-2025	One-on-one interaction	▪ Formal notices should be served to the Telecommunication Company (Telecos) detailing the implementation plan to provide support in identifying areas where underground fibre cables are present to reduce the risk of accidental fibre cuts. ▪ Fibre cuts can lead to income loss and backlash from customers ▪ The project may result in social, economic and financial impacts.	▪ The Telecos at the regional levels will be notified of all site meetings prior to commencement of construction works. ▪ Accidental punch or fibre cuts will be reported immediately.
Motor, Traffic and Transport Department of the Ghana Police Service, Regional Offices 26-08-2025 to 29-08-2025	One-on-one interaction	▪ Formal notices should be served to the Service at least 48 hours to the closure of any major road or diversion of traffic for planning and designation of personnel to support in traffic management. ▪ Contractor must ensure to complete the project on schedule	▪ Formal notices will be served to the Service well in advance.
Land Use and Spatial Planning Authority, Regional Offices 26-08-2025 to 29-08-2025	One-on-one interaction	▪ Pipeline construction should be within the reserved RoW ▪ The Authority need to be furnished with final designs and drawings of the pipelines to enable it integrate into their spatial plans. ▪ The pipeline dimension must meet planning standards defined by the Authority.	▪ Finalised pipeline designs and drawings will be shared with the Authority. ▪ Pipeline design, drawings and selected RoW will conform to the existing zoning and planning standards.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Comply with zoning guidelines and planning standards	
Ghana National Fire Service, Regional Office, Regional Offices 26-08-2025 to 29-08-2025	One-on-one interaction	▪ Compliance with fire prevention measures.	▪ All activities related to the construction shall be in line with the necessary fire prevention requirements.
Water Resources Commission, Accra and Kumasi 01-09-2025	One-on-one interaction	▪ Compliance with integrated water management plan ▪ Management of water pollution ▪ Permit required for water abstraction/ water use	▪ Provisions and management measures outlined in the integrated water management plan will be considered. ▪ The ESIA will identify mitigation measures for water pollution and its implementation will be ensured. ▪ The Commission will be notified of any water use required by the project and relevant permit obtained by the Contractors.
Municipal Assemblies 08-09-2025 to 18-09-2025	Official Letter In-person interaction	▪ Community risk can stem from unclosed trenches, air and noise pollution during construction. ▪ Accessibility to people's home and shops will be affected. ▪ The community needs the project and should speed up with implementation. ▪ Construction workers should be properly screened of diseases in order not to affect the community members. ▪ Provide the Assembly with final designs and drawings of the pipeline for physical planning purposes. ▪ Construction Contractor must obtain excavation permit from the Assembly prior to commencing work.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Finalised pipeline designs and drawings will be shared with the Metropolitan and Municipal Assemblies through LUSPA and the Regional Engineering Coordinating Teams. ▪ GWL will ensure that relevant permits are obtained by selected pipeline extension Contractors. ▪ The Assemblies will be officially notified when the Contractors are ready to mobilise to site. ▪ Compliance with existing bye-laws will be ensured.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Contractor to comply with bye-laws of the Assembly including proper waste management. ▪ The Contractor must notify the Assembly before moving to site.	
Traditional and Opinion Leaders	One-on-one interaction	▪ The main concerns highlighted include the risks of unattended open trenches, air pollution from dust, and noise disturbances from construction activities as the primary worries. ▪ Equitable beneficiary selection	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ GWL has a defined criterion for selecting beneficiary communities which fair and transparent.
COMMUNITY ENGAGEMENTS *See Appendix 3 for detailed reports on the community engagements*			
Ashanti Region			
Traditional and Opinion Leaders at Kumawu 18-08-2025	Key Informant Interview	▪ Ensure water distribution lines are extended throughout the entire community, with no areas left behind. ▪ Incorporate critical safety infrastructure, such as reservoirs, hydrants, and valves, into the project design. ▪ The youth should not be denied employment opportunities	▪ The project will cover the determined pipeline distribution route. Thus, greater part of the community will have access to water. ▪ Management of GWL will consider the incorporation of hydrants and reservoirs since the current scope does not include those works. ▪ GWL will encourage the contractor to prioritise the local content for employment
Kumawu (Men and women/Girls) 18-08-2025 to 20-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Consider phasing the excavation works. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Reduction in head porterage of water. ▪ Beneficiary communities accepts the project since it will promote long term health benefits.	
Konongo Zongo (Men and women/Girls) 20-08-2025	Focused Group Discussion	▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Consider phasing the excavation works. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water.	▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ GWL will ensure that the contractor carry out the work in phases. ▪ The contractors will submit to GWL an implementable site-specific ESMP.
Konongo Mayanka (Men and women/Girls) 21-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ Risk of harassment for women and girls ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints
Odumase Zongo (Men and women/Girls) 22-08-2025	Focused Group Discussion	▪ Youth should be given priority during job openings. ▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Consider phasing the excavation works.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks.	
Traditional and Opinion Leaders at Konongo 21-08-2025	Key Informant Interview	▪ Concerned about potential delay of project execution	▪ AfDB is committed to ensuring adequate funds are made available for the execution of the project as soon as the needed documentations are done
Western Region			
Traditional and Opinion Leaders at Aboadze 19-08-2025	Key Informant Interview	▪ Expectant of project and ready to lend support for successful implementation ▪ Ensure the project is completed on schedule. ▪ Open trenches should be closed timely to avoid the risk of road users falling into them. ▪ Pipe connection cost should be highly subsidized.	▪ Strict adherence to project timelines. Duration for the construction phase is six (6) months and defect notification is also twelve (12) months. Beyond this is not contemplated. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ Owing to the objectives of the project, cost of tapping will be very affordable.
Aboadze (Men and women/Girls) 19-08-2025	Focused Group Discussion	▪ Roads/paths blocked may affect movement within the community ▪ Children's safety near open trenches ▪ Water supply being cut during works ▪ Flooding from blocked drains ▪ More dust in the air from digging ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Cutting of trees ▪ Waste/rubbish left after construction	▪ Construction activities will be limited to just the project RoW. ▪ Road blocks will be communicated ahead of time with alternative routes ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ No tree will be cut. Preliminary assessment of the pipeline RoW revealed there are no trees.
Traditional and Opinion Leaders at Shama 20-08-2025	Key Informant Interview	▪ Youth should be given priority during job openings. ▪ Expectant of project and ready to lend support for successful implementation ▪ Ensure the project is completed on schedule.	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Strict adherence to project timelines. Duration for the construction phase is six (6) months and defect notification is also twelve (12) months. Beyond this is not contemplated.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Open trenches should be closed timely to avoid the risk of road users falling into them.	▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP.
Shama (Men and women) 20-08-2025	Focused Group Discussion	▪ Youth should be given priority during job openings. ▪ Indicated acceptance of the project ▪ Adequate and timely communication of road closures or diversions. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks.	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured.
Central Region			
Abura Dunkwa (Girls/Women and Men) 23-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ Risk of harassment for women and girls ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints
Traditional and Opinion Leaders at Abura Dunkwa 22-08-2025	Key Informant Interview	▪ The main social risk identified is the potential for inequitable access to water, which could worsen existing vulnerabilities. The Leaders highlighted that women, children, and the poor are the groups most affected by current water shortages and would be most at risk if the new system is not inclusive.	▪ The project has keen interest in ensuring that the vulnerable people in the communities have equal access to potable water.
Abakrampa (Girls/Women and Men)	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high.	▪ ESIA is being prepared to ensure project impacts are mitigated

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
22-08-2025		▪ Youth should be given priority during job openings. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Abakrampa 22-08-2025	Key Informant Interview	▪ Expectant of project and ready to lend support for successful implementation ▪ Pipe connection cost should be highly subsidized. ▪ Community health and safety risks.	▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP.
Volta Region			
Kpando Dzoanti and Gadza (Women and Men) 20-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Kpando Torkor (Girls/Women and Men) 21-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks.	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Dzoanti and Gadza 22-08-2025	Key Informant Interview	▪ Ensure water distribution lines are extended throughout the entire community, with no areas left behind. ▪ Prioritize the connection of the local hospital to the new water system. ▪ Incorporate critical safety infrastructure, such as reservoirs, hydrants, and valves, into the project design.	▪ The project will cover the determined pipeline distribution route. Thus, greater part of the community will have access to water. ▪ Management of GWL will consider the incorporation of hydrants and reservoirs since the current scope does not include those works. ▪ The hospital lies close proximity to the new pipeline extension RoW. Hence, it will be connected.
Kpando Global City (Girls/Women and Men) 22-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Community members should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ ESIA is being prepared to ensure project impacts are mitigated. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Eastern Region			
Akim Swedru (Girls/Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Akim Oda Old Town (Girls/ Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Akim Asuboa 27-08-2025	Key Informant Interview	▪ Community members should be given priority during job openings. ▪ Expectant of project and ready to lend support for successful implementation ▪ The project will promote economic development in the community	▪ Contractors will give priority to local content particularly with unskilled labour.
Traditional and Opinion Leaders at Ofoasekuma 28-08-2025	Key Informant Interview	▪ Expectant of project and ready to lend support for successful implementation ▪ Pipe connection cost should be highly subsidized. ▪ Community health and safety risks. ▪ The project will enhance development in the community. ▪ Risk of harassment for women and girls	▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Upper East			
Traditional and Opinion Leaders at Zaare, Tindonmolgo 27-08-2025	Key Informant Interview	▪ Youth should be given priority during job openings. ▪ Expectant of project and ready to lend support for successful implementation ▪ Ensure the project is completed on schedule. ▪ Open trenches should be closed timely to avoid the risk of road users falling into them.	▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Strict adherence to project timelines. Duration for the construction phase is six (6) months and defect notification is also twelve (12) months. Beyond this is not contemplated.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Risk of harassment for women and girls	▪ Strict adherence to mitigation measures proposed in the ESIA as well as Contractor site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Yikene (Girls/ Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Tindonmolgo (Girls/ Women and Men) 27-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
Daporitindongo (Girls/ Women and Men) 28-08-2025	Focused Group Discussion	▪ Indicated acceptance of the project ▪ Cost for tapping when the project is completed might be high. ▪ Youth should be given priority during job openings. ▪ Caution tape and signage should be provided on-site. ▪ Increase in air pollution from dusty roads and excavations. ▪ Community health and safety risks. ▪ Increased water accessibility. ▪ Reduction in head porterage of water. ▪ Risk of harassment for women and girls	▪ ESIA is being prepared to ensure project impacts are mitigated ▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ Contractors will give priority to local content particularly with unskilled labour. ▪ Dust suppression mechanism will be considered. ▪ GWL will play a supervisory role. Hence adequate signages will be ensured. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Zaare (Girls/ Women and Men) 28-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Bono Region			
Wenchi Town - Boadan (Girls/ Women and Men) 20-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Koase (Girls/ Women and Men) 20-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls ▪ Cost for tapping when the project is completed might be high.	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ Owing to the objectives of the project, cost of tapping will be very affordable.
Wurompo (Girls/ Women and Men) 21-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
			▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Wurompo and Koase 21-08-2025	Key Informant Interview	▪ Ensure water distribution lines are extended throughout the entire community, with no areas left behind. ▪ Incorporate critical safety infrastructure, such as reservoirs, hydrants, and valves, into the project design.	▪ The project will cover the determined pipeline distribution route. Thus, greater part of the community will have access to water. ▪ Management of GWL will consider the incorporation of hydrants and reservoirs since the current scope does not include those works.
Upper West			
Kambali (Girls/ Women and Men) 20-08-2025	Focused Group Discussion	▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night ▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls ▪ Cost for tapping when the project is completed might be high.	▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment. ▪ Owing to the objectives of the project, cost of tapping will be very affordable.
Piisi/Komfabiala (Girls/ Women and Men) 21 and 22-08-2025	Focused Group Discussion	▪ Cost for tapping when the project is completed might be high. ▪ People can fall into open trenches ▪ Dust causing breathing/eye problems ▪ Accidents from big trucks and machines ▪ More dust in the air from digging ▪ Loud noise during the day/night	▪ Owing to the objectives of the project, cost of tapping will be very affordable. ▪ The contractors will submit to GWL an implementable site-specific ESMP. ▪ Code of conduct will be instituted to guide the operations of contractors and their workers

Stakeholders	Engagement Methods	Summary Feedback/Issue/Concern	Response by GWL
		▪ Blocked gutters leading to flooding ▪ Soil erosion from trenches ▪ Give timely notice before construction starts ▪ Risk of harassment for women and girls	especially on matters regarding sexual harassment. ▪ A supervision consultant will be engaged to supervise the activities of the contractors. ▪ Grievance Redress Mechanism will be established to receive complaints ▪ Code of conduct will be instituted to guide the operations of contractors and their workers especially on matters regarding sexual harassment.
Traditional and Opinion Leaders at Kambali 21-08-2025	Key Informant Interview	▪ Implement strict safety protocols during construction, particularly regarding the immediate covering or clear marking of all excavated trenches. ▪ Develop a transparent and equitable process for selecting beneficiaries to prevent accusations of preferential treatment. ▪ Establish subsidized connection fees for vulnerable groups, specifically the aged and people with disabilities. ▪ Continue to engage with traditional and religious leaders alongside the Assembly to ensure community buy-in and smooth coordination. ▪ Poor sanitation in the community	▪ The contractors will submit to GWL an implementable site-specific ESMP. GWL will ensure strict implementation of the ESMP as well as mitigations outlined in the project ESIA. ▪ Owing to the project objectives, the connection fee will be affordable. ▪ Stakeholder consultation is an ongoing process. Hence, GWL will continue to engage all relevant stakeholders throughtout the project lifecycle.

5.5 Potential Risks to Project Implementation

The following are potential risks that can delay implementation of the project:

i. Adverse weather conditions especially continuous heavy rainfall can slow down the pace of work and hence the delay completion of the works on schedule;
ii. Conflicts between the contractor's employees and residents of the project beneficiary communities can lead vandalism of the contractor's equipment; and
iii. Illicit sexual activities involving contractors' employees leading to social conflicts.

During the operational phase of the project, high connection fees as well as unit prices of water (tariffs) can undermine the project objective of improving access to safe water in the project communities. This will occur when households cut back on the use of the pipe water or substitute pipe borne water with cheaper alternatives thereby reducing demand for the pipe water. Apart from the health problems associated with inadequate pipe water, if connections and use of pipe water declines it will have a negative implication on cash flow of Ghana Water Limited. Vandalism and illegal connections by residents will also adversely impact on the project outcomes. Leaking pipes in the communities will also cause GWL to loss revenue and the sources of leakage can become sources of contamination for the tap water. Flashing the pipes way also produce water with dirt and other unwholesome materials.

5.6 Plans for Further Consultation on the ESIA Preparation and Implementation

Following the approval of the ESIA by the AfDB, the GWL will disclose the document at local community, national and AfDB levels. The disclosure aims to inform the public and project beneficiaries of the completion of the ESIA document and for them also to ascertain if their concerns raised during the consultation stages are addressed in the document, among others.

5.6.1 Disclosure of the ESIA Document at Local and National Levels:

The local and national level disclosures will involve publication of notice of completion of the ESIA in national daily newspapers. Also, hard copies of the ESIA document will be printed and physically distributed to the District and Regional Offices of the GWL, the project beneficiary MMDA, Governmental Agencies like the EPA, MWHWR, Zonal Council Offices in the beneficiary MMDA, community libraries in the project beneficiary communities, and among community stakeholders and women's groups who were consulted during the ESIA elaboration including the project affected persons. The disclosure activities will be carried out prior to the commencement of the actual construction works.

5.6.2 Disclosure of the ESIA Document at the AfDB Level:

Following the local and national level disclosures, GWL will forward the evidence of disclosure of the ESIA document at the local and national levels to the AfDB who will ensure the ESIA to is disclosed at the AfDB's external website as well.

5.6.3 Stakeholder Engagement during Construction and Operation of the water distribution pipelines:

Stakeholder consultation will continue into the construction and operation phases to ensure involvement of key stakeholders who have the responsibility to ensure that the ESIA measures are implemented as provided for in the document. Consequently, the GWL and the beneficiary Municipal Assemblies will have to ensure that there is constant flow of information between the communities and the works contractor(s). The communities will be informed about the contractor's work schedule in the community prior to commencement through posters, and information vans.

6. POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS OF THE PROPOSED PROJECT

This section presents key issues or potentially significant adverse and beneficial environmental and social issues. It captures the analysis and significance of identified pertinent issues associated with the Project, which may either impact positively or negatively, directly, or indirectly on the biotic and abiotic environment, and socio-economic resources.

Based on the activities involved, key environmental and social impacts are anticipated at all phases of the project. Many of these impacts are likely to be appropriately addressed by implementing suitable mitigation and management strategies.

Potential environmental and social impacts associated with the different activities of the proposed project will originate from:

- Pre-Construction and Construction Phase Activities; and
- Operation and Maintenance Phase Activities.

6.1 Impact Assessment Methodology

An impact is any change to a resource or receptor brought about by the presence of a project component or by the execution of a project related activity within a defined geographical area.

6.1.1 Impact Identification

Potential impacts were identified through site verification visits of the proposed Project's AoI, team discussions, reviews of project pipeline RoW, project related literature and guidelines (local and international), issues and concerns raised by stakeholders during the consultation process, and available information about the environmental effects of similar developments.

6.1.2 Criteria for Determining Impact Significance

6.1.2.1 Physical and Biological Environmental Impacts

The significance of identified environmental impacts was determined using the Conesa-Fernandez-Vitora[16] quantitative method summarised in Table 6-1. This methodology assesses the cumulative and residual impacts of various project implementation activities on environmental and social receptors within the project's area. The approach incorporates significance determination of identified impacts using the outcome of applied methodologies such as site verifications, GIS, assessments, compliance obligations as well as expert judgment. These provided inputs to the determination of

[16] Fernández-Vítora, V. C., Ripoll, V. C., Ripoll, L. A. C., Garro, V. R., & Bolea, M. T. E. (1997). Guía metodológica para la evaluación del impacto ambiental. Madrid: Mundi-Prensa

impact significance and magnitude. The resultant magnitude will aid the determination of the overall significance of the physical or biological environmental impact.

Table 6-1: Environmental Impact Significance Ranking System

Sign		**Degree of Perturbation (DP)**	
Beneficial Impacts	+	Low	1
Negative Impacts	-	Medium	2
		High	4
		Very high	8
		Total	12
Extension/ Extent (E)		**Duration (D)**	
Spot	1	Brief	1
Partial	2	Temporary	2
Extensive	4	Permanent	4
Total	8		
Critical	12		
Risk of Occurrence (RO)		**Reversibility (RV)**	
Irregular or discontinued	1	Short term	1
Periodical	2	Middle term	2
Continuous	4	Long term	4
IMPACT SIGNIFICANCE (IS)= +/- (DP + RO + E + D + RV)			
The significance of the impact varies between 5 and 36. Scores between 29 and 36 are considered very high; high between 23 and 28; medium between 17 and 22; low between 11 and 16; and very low between 5 and 10.			
Impact Significance	***Score***	***Colour Codes***	
Very High Impact	*(29 – 36)*		
High Impact	*(23 – 28)*		
Medium Impact	*(17 – 22)*		
Low Impact	*(11 – 16)*		
Very Low Impact	*(5 – 10)*		

Elements that constitute the matrix are explained as follows:

- *Sign (+ / -):* Impact sign refers to the beneficial (+) or prejudicial (-) character of the different Project actions on environmental elements.
- *Degree of Perturbation (DP):* Refers to the degree of disturbance the action causes over a particular environmental factor in the specific field of occurrence. It ranges between 1 and 12; where 12 corresponds to a total destruction situation and 1 is a minimal effect.
- *Risk of Occurrence (RO):* Refers to the frequency of the effect, whether cyclical or recurrent, unpredictable or temporally constant. It ranges between 1 and 4. Continuous effects are assigned a value of 4; periodical 2; and 1 for discontinuous occurrences.
- *Extension/Extent (E):* Refers to the theoretical area of influence of the impact related to the Project's overall area (percentage of impacted area). It ranges between 1 and 12. If the action produces a spot effect, the impact is considered localized (1). On the contrary, a generalized

influence over the Project is considered 8. Meanwhile, intermediate situations correspond to partial effects (2) and extensive effects (4). Critical areas are ranked 12.

- *Duration (D):* Refers to the period the effect remains and after which the affected environmental factor would return to the initial condition either by natural or corrective measures. If the effects last less than a year, it is considered that the action produces a short-term effect (1); between 1-5 years is considered medium term while between 5 and 10 years is considered a long-term/permanent effect.
- *Reversibility (RV):* Refers to the possibility of reconstitution of the affected element, that is, the possibility to return to the initial condition prior to the actions, by natural means, once the former stops acting over the affected media. A short term is assigned a value of 1; mid-term is 2; and irreversible effects are assigned a value of 4.

6.1.2.2 Socio-Economic Impacts and Risks

The key element of impact assessment is to determine the significance of impacts on resources / receptors. The significance of social impacts was assessed based on a qualitative criteria approach, combining a prediction of the magnitude of an impact with an assessment of the sensitivity / vulnerability/importance of the impacted resource/receptor. Accordingly, the magnitude of social impacts, which essentially describes the degree of change that the impact is likely to impart upon the resource/receptor, was based on the extent to which a human receptor gains or loses access to, or control over, socio-economic resources[17] resulting in a positive or negative effect on his or her wellbeing[18]. The term 'magnitude' in this respect covers all dimensions of the predicted impact to the natural or human environment including:

- The nature of the change (what resource and receptor is affected, and how);
- The spatial extent of the area impacted, or proportion of the population/ community affected;
- Temporary extent (i.e. duration, frequency, reversibility); and
- Where relevant, the probability of the impact occurring.

The assessment of impact magnitude needs to consider each of the factors detailed in Table 6-2. It is important to acknowledge that the scale of magnitude (from low to high) is in practice continuous and may not fit into a neat categorisation, and evaluation along the spectrum of professional judgement and experience. Each impact is evaluated on a case-by-case basis and the rationale

[17] Socio-economic resources in this context refers to natural, physical, social and financial capital (stock of resources)

[18] A concept combining an individual's health, prosperity, their quality of life and their satisfaction.

explicitly described in the analysis of each impact. The magnitude designations are: negligible, small, moderate, major.

Table 6-2: Magnitude criteria for social impacts

Parameter	Description
Nature	Resources: The term resources are used to describe features of the environment such as water resources, habitats, species, landscapes, etc. which are valued by society for their intrinsic worth and/or their social or economic contribution. For a socio-economic assessment, resources can be business or community assets, amenities, and opportunities. These include existing and potential resources within the areas of influence such as local business customers, employment and training opportunities, agricultural, residential, and commercial land values etc. Receptors: The term receptor is used to refer to people and communities who may be affected by the proposed Project.
Extent	On-site – impacts that are limited to the Project site only. Local – impacts that affect an area in a radius of 1 - 2 km around the development area. Regional – impacts that affect regionally important resources or are experienced at a regional scale as determined by administrative boundaries. National – impacts that affect nationally important resources or affect an area that is nationally important/ or have macro-economic consequences. Trans boundary/International – impacts that affect internationally important resources or have trans boundary consequences.
Duration	Temporary – impacts are predicted to be of short duration and are intermittent/ occasional. Short-term – impacts that are predicted to last only for the duration of the construction period. Long-term – impacts that will continue for the life of the project but cease when the Project stops operating. Permanent – impacts that cause a permanent change in the affected receptor and resource that endures beyond the Project lifetime.
Probability	The likelihood that an impact will occur: Unlikely - The impact is unlikely to occur. Likely - The impact is likely to occur under most conditions. Definite – The impact will occur.

In evaluating the sensitivity of resources and receptors for cultural and socio-economic impacts, the degree of sensitivity of a receptor is considered as *"a stakeholder's (or groups of stakeholders') resilience or capacity to cope with sudden changes or economic shock"*. The sensitivity of a resource is based on its quality and value/importance, for example: its local, regional, national, or international designation; its importance to the local or wider community; or its economic value. Stakeholders may be more sensitive for a variety of reasons including the following factors:

- age, gender, race or religion;
- land rights and ownership patterns;
- income/employment/unemployment;

- livelihood (current and extent of livelihood alternatives);
- services, e.g. health, amenities (quality and access);
- access to, and use of, natural resources including water;
- food security and reliance on some ecosystem services;
- education/skills;
- health or disability;
- support networks; and
- exclusion or marginalisation (e.g. degree of access to resources, services and formalised rights).

The groups that have been identified as being vulnerable, drawing on the above criteria include the following:

- female-headed households;
- the elderly;
- women;
- persons with disability; and
- children

As described above, magnitude and sensitivity are looked at in combination to evaluate whether an impact is significant, and if so, its degree of significance. For social impact assessments the perceptions of stakeholders of particular issues, expressed as opinions around certain issues, are particularly important and consequently the concept of perception is explicitly brought into the evaluation of significance after an impact is evaluated. The identification of an impact of significant stakeholder concern may raise the significance rating, for example, from moderate to major. The change in significance rating prompts the formulation of more rigorous and appropriate mitigation measures, which focus on the source of the impact, and addresses stakeholder concerns. Sensitivity importance designations are very low, low, medium, and high.

Once magnitude of impact and sensitivity have been characterized, the significance can be assigned for each impact using a matrix (Table 6-3) showing sensitivity and magnitude of impacts.

Table 6-3: Impact significance matrix

		Sensitivity of Resource / Receptor			
		Very Low	**Low**	**Medium**	**High**
Magnitude of Impact	**Negligible**	Negligible	Negligible	Negligible	Low
	Small	Negligible	Negligible	Low	Moderate
	Moderate	Negligible	Low	Moderate	Substantial
	Major	Low	Moderate	Substantial	High

In both assessment methodologies assigned significance is described as follows:

- *Negligible:* a resource/receptor will essentially not be affected in any way by a particular activity, or the predicted effect is deemed to be 'imperceptible' or indistinguishable from natural background variations. This impact would not have a direct influence on the decision to develop in the area.
- *Low:* a resource/receptor will experience a noticeable effect, but the impact magnitude is small (with or without mitigation) and/or the resource/receptor is of low sensitivity/ vulnerability/ importance. This impact would not have a direct influence on the decision to develop in the area.
- *Moderate:* An impact of moderate significance has an impact magnitude that is within applicable standards but falls somewhere in the range between a threshold below which the impact is minor, up to a level that might be just short of breaching a legal limit. This impact could influence the decision to develop in the area unless it is effectively mitigated.
- *Substantial:* An impact of major significance is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly sensitive/vulnerable/important resource/receptors. This impact must have an influence on the decision process to develop in the area.
- *High:* Potential fatal flaw in the proposed Project. This impact must have an influence on the decision process to develop in the area.

6.2 Impact Identification

A synthesis of the key environmental and social impacts associated with the proposed project is presented in this section. The key adverse and beneficial environmental and social concerns linked with the various stages that are likely to emerge because of the proposed project are identified below (see Table 6-4).

Table 6-4: Potential project-related key issues on environmental and social receptors

Phase	Potential Concerns and Risks	Nature of Benefits/Concerns on receptors
Pre-construction/ Construction	▪ Soil Erosion	▪ Direct adverse impact on the soil structure and microorganisms
	▪ Increase in noise level and vibration	▪ Direct adverse impact to workers and project community members
	▪ Ambient air quality degradation	▪ Direct adverse impact on workers and project community members
	▪ Road and traffic impacts	▪ Direct adverse impact on road users and indirect adverse impact on air quality ▪ Direct adverse impact on project community roads

	▪ Potential pollution of ground and surface water bodies	▪ Direct adverse impacts on water resources
	▪ Negative community perception about the proposed project	▪ Indirect adverse impact to the workers and project timeline
	▪ Generation and hazardous waste generation and disposal	▪ Direct adverse impact on land (dumpsite) and indirect negative impact on groundwater ▪ Direct impact to the workers and project communities
	▪ Risk of labour exploitation	▪ Direct adverse impact on labour
	▪ Potential contamination of potable water	▪ Direct adverse impacts on customer's health
	▪ Disruption of utility lines	▪ Direct adverse impact on telecommunication and indirect on users
	▪ Public and Occupational health and safety impacts	▪ Direct adverse impact to the workers and project community members ▪ Indirect impact on dependants including women and children
	▪ Ponding of adjoining properties	▪ Direct adverse impact on adjoining properties and indirect impact on the property owners
	▪ Increase in water and sanitary related diseases	▪ Direct adverse impact on health and hygiene of the workers and project community members
	▪ Non-local labour influx	▪ Direct adverse impact on project community and indirect adverse impact on infrastructure and security systems
	▪ Risk of llicit sexual affairs and increased STDs	▪ Direct adverse impact on project community members and indirect impact on health facilities
	▪ Risk of Gender-Based Voilence	▪ Direct adverse impact on community members particularly girls/women
	▪ Risks of conflicts (violation of local norms, increase in the incidence of pilfering)	▪ Direcct adverse impacts on community social system and indirect adverse impact on the security system
	▪ Loss of flora and fauna	▪ Direct adverse impacts on flora and fauna on the RoW
	▪ Employment including potential indirect employment and multipliers	▪ Direct beneficial impact to the workers and indirect beneficial impact on their dependants
Operational and Maintenance Phase	▪ Health and safety impacts	▪ Direct adverse impact to the workers and community members ▪ Indirect adverse impacts on dependants
	▪ Breakdown and improper functioning of the pipeline facilities leading to water scarcity	▪ Direct adverse impact to GWL clients and indirect adverse impact on health and hygiene

	▪ Induced flooding of adjacent homes and community	▪ Direct adverse impact on properties and indirect adverse impact on property owners and community members
	▪ Increase in disposal of (sullage) wastewater	▪ Driect adverse impact on water resources
	▪ Reduction in maternal mortality	▪ Direct beneficial impact to pregnant women and indirect beneficial impact on the health system
	▪ Income generation	▪ Direct beneficial impact to the workers and indirect beneficial impact on the local economy of the project communities
	▪ Reduction in the incidence of water related diseases	▪ Direct beneficial impact to community members and indirect beneficial impact on health infrastructure
	▪ Improved sanitation practices	▪ Direct beneficial impact to community members and indirect beneficial impact on health infrastructure ▪ Indirect beneficial impact of achieving SDG Goal 6
	▪ Improved school attendance	▪ Direct beneficial impact on student and indirect beneficial impact to the education system and the general community members
	▪ Increased access to potable water due to water transmission efficiencies from operation of the proposed project	▪ Direct beneficial impact to consumers ▪ Indirect beneficial impact on climate change adaptation/ resilience and achievement of SDG Goal 6
	▪ Increased revenue prospects of GWL	▪ Direct beneficial impact on GWL

6.3 Impact Significance

The significance of the proposed project's impacts and risks is evaluated using quantitative and qualitative methods. Biophysical environmental impact significance is based on the quantitative method detailed in Section 6.1.2.1, above and presented in, Table 6-5 below. The significance of socio-economic, health and safety risks are assessed based on the qualitative methodology detailed in Section 6.1.2.2, above and presented in Table 6-6 below.

Table 6-5: Quantitative Assessment of Biophysical Impacts

ACTIVITY	IMPACT	RECEPTOR	SIGN	PRE-MITIGATION QUANTITATIVE ASSESSMENT								POST-MITIGATION QUANTITATIVE ASSESSMENT							
				E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)	E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)
PRE-CONSTRUCTION AND CONSTRUCTION PHASE																			
○ Consultation/ Notices to the public ○ Design of water supply network ○ RoW tour ○ Transportation and delivery of construction materials and equipment ○ Excavation, civil works, pipelines installation and backfilling ○ Management of solid waste ○ Flashing and disinfection of the new water transmission lines ○ Water testing and approval ○ Test run and commissioning	Soil erosion	Land	-	4	2	2	2	8	18	Medium	Yes	2	1	2	2	2	9	Negligible	No
	Increase in ambient noise level and vibration	Air/humans	-	4	4	2	2	4	16	Low	No	2	1	1	2	2	8	Negligible	No
	Air quality degradation		-	4	4	2	2	8	20	Medium	Yes	2	2	1	1	2	8	Negligible	No
	Potential pollution of water resources (ground and surface)	Water	-	4	2	4	4	2	16	Low	No	2	1	4	2	1	10	Negligible	No
	Potential contamination of potable water		-	4	2	4	4	4	18	Medium	Yes	2	2	2	2	2	10	Negligible	No
	Construction and hazardous waste generation & disposal	Land/ Water	-	8	2	4	4	8	26	High	Yes	2	1	4	4	2	13	Low	No
	Loss of flora and fauna	Vegetation	-	4	2	4	4	4	18	Medium	Yes	2	2	2	2	2	10	Negligible	No

ACTIVITY	IMPACT	RECEPTOR	SIGN	PRE-MITIGATION QUANTITATIVE ASSESSMENT								POST-MITIGATION QUANTITATIVE ASSESSMENT							
				E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)	E	RO	RV	D	DP	Total	Impact Magnitude (IM)	Impact Significant? (IS)
OPERATIONAL AND MAINTENANCE PHASE																			
○ **Operationalization of the newly installed pipelines** ○ **Routine inspection and maintenance**	Increase in disposal of sullage (wastewater)	Land/Water	-	4	2	4	2	4	16	Low	No	1	1	2	2	2	9	Negligible	No

Table 6-6: Qualitative Assessment of Socioeconomic Impacts

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
PRE-CONSTRUCTION AND CONSTRUCTION PHASE										
○ Consultation/Notices to the public ○ Design of water supply network ○ Transit tour ○ Transportation and delivery of construction materials and equipment ○ Excavation, civil works, pipelines installation and backfilling ○ Management of solid waste ○ Flashing and disinfection of the new water transmission lines ○ Water testing and approval ○ Test run and commissioning	Road and traffic impacts	-	Moderate	Medium	Moderate	Yes	Moderate	Low	Low	No
	Negative community perception about the proposed project	-	Moderate	Medium	Moderate	Yes	Moderate	Low	Low	No
	Risk of labour exploitation	-	Small	Medium	Low	No	Small	Low	Negligible	No
	Disruption of utility lines	-	Moderate	Medium	Moderate	Yes	Moderate	Low	Low	No
	Public and occupational health and safety impacts	-	Major	Medium	Substantial	Yes	Small	Low	Negligible	No
	Ponding of adjoining properties	-	Small	Medium	Low	No	Small	Low	Negligible	No
	Increase in water and sanitary related diseases	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No
	Non-local labour influx into project communities	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No
	Risk of illicit sexual affairs and increased STDs	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
	Risk of Gender Based Voilence	-	Small	Medium	Low	No	Small	Low	Negligible	No
	Risk of conflicts (violation of local norms, increase in incidence of pilfering)	-	Moderate	Medium	Moderate	Yes	Small	Medium	Low	No
	Employment and income opportunities	+	Moderate	Medium	Moderate	Yes	Moderate	High	Substantial	Yes
OPERATIONAL AND MAINTENANCE PHASE										
○ **Operationalization of the newly installed pipelines** ○ **Routine inspection and maintenance**	Health and safety impacts on pipeline maintenance personnel and community members	-	Moderste	Medium	Moderate	Yes	Small	Low	Negligible	No
	Breakdown and improper functioning of the pipeline facilities leading to scarcity of water	-	Major	Medium	Substantial	Yes	Small	Medium	Low	No
	Induced flooding of adjacent homes and communities	-	Small	Medium	Low	No	Small	Low	Negligible	No
	Reduction in maternal mortality	+	Moderate	Medium	Moderate	Yes	Moderate	High	Substantial	Yes
	Income generation in local communities	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Reduction in the incidence of water related diseases	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes

ACTIVITY	IMPACT/ NATURE	SIGN	PRE-ENHANCEMENT ASSESSMENT				POST- ENHANCEMENT ASSESSMENT			
			Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?	Impact Magnitude	Sensitivity	Impact Significance (IS)	Impact Significant?
	Improved sanitation practices	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Improved school attendance	+	Moderate	Medium	Moderate	Yes	Major	Medium	Substantial	Yes
	Increased revenue prospects of GWL	+	Moderate	Medium	Moderate	Yes	Major	High	High	Yes

6.4 Positive Environmental and Social Impacts of the Project

The following are some of the positive social and environmental impacts associated with the proposed project.

6.4.1 Pre-Construction and Construction Phase

Employment and Income Opportunities

Short-term employment opportunities will be generated for unskilled, semi-skilled and skilled labour in the construction sector, ranging from labourers to civil engineers during the construction phase of the proposed project. This will lead to improved income profile for workers and their dependants. In addition, local food and other vendors and itinerant traders will sell food and other services to the site workers to earn a living. Employment generated during this phase though will be minor, short term and local, yet can help to trigger transformation for some of the beneficiaries.

6.4.2 Operational and Maintenance Phase

Reduction in maternal mortality

Reduction in maternal mortality depends strongly on the water supply and sanitation situation. A contributory factor to poor maternal health is contaminated water and poor hygiene, leading to infection and slow postnatal recovery. A better general health condition due to reduced health risks linked to insufficient water and sanitation will also have a positive impact on maternal mortality. However, reducing the health risk by improving water supply and sanitation needs to be linked to improving hygiene practices in order to bring about the desired impacts. Reduction in maternal mortality in the beneficiary communities will be long-term benefit.

Income generation in local communities

The presence and regular flow of pipe-borne water in the LIUCs will also provide opportunities for water vendors and support expansion of home and neighbourhood-based economic activities that will enhance the income of the beneficiary communities. Employment opportunities associated with the project will be direct, long term and localised.

Reduction in the Incidence of Water Related Diseases

There is a high correlation between living in the project beneficiary communities and incidence of water-related diseases such as diarrhoea especially among children. By making safe water available in these communities during the operational phase of the project, the expectation is that the incidence of water related diseases will reduce in the project beneficiary communities.

This is anticipated to be significant if one considers the fact that diarrhoeal diseases is part of the top 5 diseases that account for morbidity in all the project regions. This impact is long term and regional in nature as the effect of the project on the communities can spread to other parts of the region.

Improved Sanitary Practices

With more safe water regularly flowing in the project beneficiary communities during the operational phase, it is anticipated that personal hygiene and good sanitary practices will improve. Hand washing after toilet use and before eating as well as the use of flush toilet systems for example, will improve good hygiene practises and access to sanitation. This impact is significant, long term and regional.

Improved School Attendance

Engagement with management of some schools within the beneficiary communities such as Pentriansa in the Ashanti Region, Poasi Methodist Junior High School in the Western Region, Abura Dunkwa Baiden Walker D/A Junior High School in the Central Region revealed that school children report late due to unavailability of water and the distance at which they have to cover before accessing water is far. With the project implementation, lateness to school in the beneficiary project beneficiary communities is expected to reduce as in-house and yard connections will increase after the distribution lines are laid. This expansion in the GWL network and increase in house and yard connections and consistent flow of water will reduce both traveling distances and waiting time at community pipe stands during peak hours. With the drudgery associated with fetching water before school minimized, lateness to school should decline. This impact is considered positive, cumulative, long-term and of medium significance.

Improved Revenue Prospect for GWL

The proposed project will result in increase in the clientele base of GWL, reduced operational costs in the medium term as well as reduction in non-revenue water losses. These will improve the revenue prospects of GWL with a direct effect on Government of Ghana dividends accrued from GWL operations. This impact is considered positive, cumulative, long-term and of high significance.

6.5 Potential Adverse Environmental and Social Impacts

6.5.1 Pre-construction and Construction phase:

Soil erosion

Excavation, trenching and related earthwork activities may result in loosening of the soil structure to expose the soils to rain and wind action and erosion. However, the impacts are expected to be minor and can be easily managed through pegging of areas to be trenched, limiting the extent of excavation, immediate laying of pipes in the excavated trenches, backfilling and dressing of the surfaces. Furthermore, the exposed surfaces will be reinstated to restore degraded surface where appropriate.

Noise and Vibration

Intermittent ground vibration will occur during the construction phase of the project during excavation of trenches, drilling and thrust boring activities through the use of equipment like power dills or thrust boring machines and concrete mixers. Noise can cause hearing impairment of the workers and nearby residents. Vibrations can cause cracks in walls, weaken the foundation of buildings and eventual collapse of adjoining structures. It may also be a source of anxiety for those who live or work near the pipe routes. It is anticipated that noise generation will have marginal impact since it will be short-lived and localized to the immediate environs of the pipeline routes.

Air Quality Degradation

Air pollution may arise because of dust and emissions of fumes from excavation and land preparation activities, transportation of construction equipment and construction materials on untarred roads and operation of construction equipment. Use of poorly maintained construction equipment on the project may lead to exhaust fumes. Release of dust and emissions of smoke and soot can lead to dust and fume inhalation leading to respiratory discomfort among workers and people in adjoining areas. However, this impact will be minor as the excavation and use of construction equipment will be limited to the pipeline corridors and will be of short-term duration. Use of nose masks by workers will limit dust inhalation and respiratory discomfort. Regular spraying of water in dusty areas will suppress the generation of dust.

Road and Traffic Impacts

Most feeder roads and streets in the project communities such as Apire, Koase, Nkosia, Akim Ofoase, Winkongo, Dorimon, Piisi, Konfabiala, Lakpo inter alia, including those that might be used as access to specific project locations are currently untarred and some in deplorable conditions. The deplorable nature of the roads in the project communities can be worsened due

to erosion of improperly backfilled soils (creating gullies in the road), regular movement of construction equipment and vehicles, such as the movement of haulage trucks for the transportation of construction materials to the construction sites.

Again, the movement of vehicles and construction equipment on the existing road will also increase traffic.

Additionally, where roads have to be closed or reduced from double to single lanes to pave way for excavation works, there could be marginal increase in traffic. The impact on vehicular mobility will typically be limited to increased travel time and expenditures associated with delays, which will be of minimal inconvenience in most cases. Delays will be most noticeable during peak 'rush-hours' in the morning from 6:30am to 8:30am and evening from 5:30pm to 7:30pm in more urbanised areas such as Kentikrono, New Takoradi, Shama, Fumesua among others. Resulting delays will be most serious when they impact ambulances, and other emergency vehicles. However, these emergency vehicles have an advantage of using sirens to clear the pathway for safe and quick passage.

Review of the project pipeline RoW indicates that the pipeline will cut through few feeder roads and urban roads in the project vicinities particularly in Abura Dunkwa (Central Region), Capital Estate (Bono Region), New Takoradi (Wester Region) and Pentriansa (Ashanti Region). If proper measures are not adopted, there could be an increase in traffic situations in such areas. Whilst on some roads the traffic volumes will represent more than a doubling of existing traffic flows, the volumes are sufficiently low for this to be of no concern. No locations have been identified where the additional volumes will create significant delays, queues, or disadvantage to other road users.

Unattended mechanical breakdown of project vehicles on the roads can induce traffic and serious accidents. It is expected that traffic impacts of the proposed project would however be localized, short-lived due to the nature and duration of the proposed project and of low significance after post mitigation. This impact is also limited to very few places on the project RoW.

Potential pollution of ground and surface water bodies

Construction activities under the proposed project can adversely affect aquatic life or water bodies that are in close proximity to the pipeline RoW particularly at Kpando – Torkor in the Volta Region and Pentriensa in the Ashanti Region. The disturbance of water habitats could result in the pollution and loss of aquatic ecosystems especially where the RoW of the pipelines

interact with surface water. Excavation of the soil, as well as poor management of excavated spoil or debris could significantly increase suspended solids and turbidity of the water bodies which lie in close proximity to the pipeline RoW when it rains.

Baseline studies suggest that the pipelines have at least one river (Owere River at Pentriensa) crossing and at Kpando – Torkor, the Volta Lake lie in close proximity to the pipeline RoW. Sediments release is the major concern here (especially at the river crossing). High levels of suspended sediments can render water supplies unusable and subdue light levels within the water column, and can therefore impact freshwater ecosystems. Transported soil sediments through surface runoff may end up in the two surface water bodies. Also, oil and fuel spills from construction vehicles and equipment could result in contamination of soil and soil sediments transported by runoff further polluting surface water bodies.

Construction activities within the catchment area of waterbodies should be done quickly with environmentally friendly technologies in order to reduce impacts on lotic and lentic fauna and flora. Again, the protection of surface water resources has been a fundamental consideration in the route selection and engineering design for the pipelines and associated infrastructure. Hence, the resultant post mitigation impact would be of very low significance.

Loss of Flora and Fauna

The presence of flora and fauna was observed to be at various sections of the proposed pipe routes during a survey of the RoW. This observation was made at areas that are new sites particularly at Kumawu, Pepease, Bodomase, Yabiw, Kpando – Torkor/Torgome, Koase and Piisi. The flora is made up of flowers, bushes on fallow lands or already disturbed lands and cultivated lands. The fauna in the proposed routes is limited to microorganisms living in the soil as well as domestic animals such as goats, fowls, sheeps and dogs. Consequently, clearing the RoW and digging trenches in such areas will result in impacts on existing flora and fauna. It is worth mentioning that no economic tree or endangered species were sighted. Considering the nature of the project, cumulative length of lands with flora/fauna and duration of the project, the impact is expected to be medium.

Negative Community Perception about the Proposed Project

Late awareness creation about the proposed project among the project beneficiary MMDA and communities particularly on the project objectives and scope can trigger negative community perception about the proposed project and can result in lack of cooperation from community

stakeholders and cause delay of the project take-off. This impact is significant and could be of a long-term duration.

Construction and Hazardous Waste Generation and Disposal

Waste is expected to be generated from construction debris, excavated soils and surplus materials like HDPE pipes, broken blocks and pieces of wood. Additionally, greater volumes of workforce and administrative wastes such as paper, packaging, plastics, and food waste will be generated throughout the construction phase. Occasional and accidental spills/leaks will also be generated. Improper management of these waste streams could result in community and occupational health and safety risks. For instance, if not properly collected and disposed, wastes may clog up the local drainage channel to constrain drainage flow to cause flooding in the community and also obstruct walkways in the construction communities. The collection of wastes could restrict workers and truck circulation. As a result, these wastes will need to be controlled at various points throughout the construction process. Also considering the volume of excavated soil and other waste to be generated, there will be pressure on dumpsite within the project communities. In relation to impacts, generation of construction and hazardous waste is expected to be of very high significance at the pre-construction and construction phases though its duration will be short term.

Risk of Labour Exploitation

Typical of construction projects, there is always the risk of labour exploitation. This exploitation encompasses various aspects, including unfair wages, unsafe working conditions, long working hours, and other unethical practices.

One of the most common forms of labour exploitation in the construction industry is the payment of unfair wages. Many contractors take advantage of the vulnerability of labourers, offering wages that are often below the minimum wage and far from a living wage. As a result, workers struggle to make ends meet, leading to a cycle of poverty and economic hardship for them and their families.

Construction sites are inherently hazardous environments. However, labour exploitation often takes the form of inadequate safety measures and lack of proper training and protective equipment. Workers are exposed to a wide range of risks, from accidents to long-term health issues, without the necessary safeguards. Contractors, in their quest for higher profits, often cut corners on safety, leaving labourers vulnerable to life-threatening injuries and illnesses.

Many construction contractors demand excessive working hours from their labour force, sometimes exceeding legal limits. This extended working time can lead to severe physical and mental health issues, fatigue, and a lack of work-life balance. The relentless pursuit of profit at the expense of worker well-being is a prevalent issue in this kind of project, contributing to labour exploitation.

Exploitative practices in the recruitment of labourers are another aspect of labour exploitation in construction. Contractors may hire undocumented workers or manipulate employment contracts, making it difficult for labourers to assert their rights or seek legal protection. This lack of transparency in recruitment practices further exacerbates the vulnerability of the workforce.

The consequences of labor exploitation by construction contractors are dire for the workers involved. They endure financial hardship, physical and emotional stress, and often live in fear of reporting abuses. Additionally, the exploitation perpetuates a cycle of poverty that affects not only the workers but also their families, trapping them in a vicious cycle of economic insecurity.

Potential Contamination of Potable Water

The primary concern with the proposed project is the likelihood of contaminations from the soils, welding debris and others connecting to the potable water system. The piped systems are buried complex reticulations; that makes the system vulnerable to contamination of potable water. During construction, cross-connections can provide a pathway for backflow of contaminated materials into potable sources. Backflow can occur either because of reduced pressure in the distribution system (termed back siphonage) or the presence of increased pressure from a non-potable source (termed backpressure). Contamination introduced due to backflow into the distribution system may then flow freely into other customer connections which may probably cause health issues.

However, the concern is going to be short lived and would not go beyond the construction phase. To further prevent contamination of potable water at the initial stages, mitigation measures such as early warning signs to consumers, information on construction works and schedule will be considered.

Disruption of Utility Services

It was observed that the project beneficiary communities are a mixture of urbanised and new sites. The urbanised communities such as Moree, Wenchi, Town Ahinsan Baptist,

Anwomanso, Boadi, Kentikrono, Anaji Mount Zion, Kojokrom, Aboadze, Shama, Breman Asikuma, Konongo, Assorko Essaman, Akosombo among others are with presence of underground service lines of utility providers i.e. electricity cables, telecommunication service and water supply lines. There is the potential for these utility service lines to be accidentally tampered with during excavation and trenching. This may cause temporary disruptions in the supply services such as electricity supply and telecommunication services in some sections of the communities with a potential adverse impact on the operations of affected service providers. Such disruptions will inconvenience customers within the affected service areas.

This was a key issue raised during engagements with the telecommunication companies. However, this impact is expected to be temporary since there will be an active collaboration with the telecommunication companies to identify their lines and avoid/minimise potential disruptions as much as possible.

Public and Occupational Health and Safety Impacts.

Pipeline route survey activities will involve demarcation and pegging of the routes in the communities. These may pose the risk of slip and fall by the survey personnel/staff if they are not in appropriate PPEs. Also, pipeline routes and corridors where trenching and pipe laying are going on can become slippery and can pose threats of injury and accident to nearby community people including school children, passer byes and motorists walking through the works corridors. Stockpiles of construction materials and construction waste that are stored/deposited in haphazard manner along the pipeline routes in community open spaces or walkways can cause accidents and injury to community people, and others users. Over-speeding of construction vehicles within the project community may pose traffic congestion, pedestrian conflict and accidents.

Handling of construction equipment and materials by construction workers could cause accidents and injury if the workers are not properly clothed with PPEs and educated on health and safety measures on site. These accidents and lapses in health and safety could occur during trenching and test runs through pipe burst as well as joining of pipes and backfilling and may result in temporary or permanent injury and loss of lives. This impact, though likely to be significant, can be managed through putting in place public and workers health and safety measures to include safety awareness among the public and workers, health and safety training for workers, provision of PPEs by the contractors to workers and enforcement of use of the PPEs by the workers, cordoning of active construction sites, signage to warn the public and

workers of danger zones, provision of speed ramps, alternative routes and enforcement of speed limits for construction trucks and equipment, among others.

Ponding of Adjoining Properties

Activities like digging of trenches can block natural valleys that act as paths for runoff. This can create localized pools of water especially in places like Akim Aboabo in the Eastern Region; New Takoradi, Anaji, Shama, Kojokrom and Nkroful in the Western Region; Piisi, Konfabiala, Danko and Siriyili in the Upper West; and Sawaba and Winkongo in the Upper East Region inter alia. Run off during heavy rains may carry excavated material heaped along the pipe routes and deposit them in existing drains causing sedimentation and decreasing their carry capacity and increasing the potential to cause localised floods and contamination. Ponding is rated significant, short term and localised.

Increase in Water and Sanitary Related Diseases

The incidence of malaria in the project communities can increase as water collects in trenches created by construction activities and improper management of refuse generated by workers. This creates pools of stagnant water, which creates breeding grounds for mosquitoes. Littering and poor management of human waste and refuse within the work zones can also trigger the outbreak of other sanitary related diseases such as cholera. This local impact is short-term, but significant as it leads to morbidity and mortality.

Non-local labour Influx into Project Beneficiary Communities

As adequate and requisite labour may not be available in the beneficiary project communities, the Contractors may hire various categories of labour, skilled, semi-skilled and unskilled from outside. If proper background checks are not undertaken, under aged persons, persons with questionable character, who lack the qualification and experience to work in such an urban environment may be employed and deployed into the project beneficiary communities and could lead to social vices. These vices may include illicit sexual relationships with minors and teenage pregnancies, presence of sex workers in the communities, sexual harassment of female employees, child abuse and child labour, drug abuse and violence, theft, social conflict, gender-based violence, increased sexually transmitted diseases i.e. HIV/AIDs, etc. However, non-local labour influx will be minor as large labour force will not be required for the works in each of the project communities which will be of short duration. In addition, there is a lot of unemployed youths which are available for engagement in the communities and so employment of local workforce will eliminate labour influx. Furthermore, proper recruitment policy and background check on outside labour (where the need be), establishment of code of

conduct that prevents illicit behaviour by the construction workers, training on the project environmental reports, etc. will eliminate or minimize non- labour influx impacts.

Risk of Illicit Sexual Affairs and Increased Sexually Transmitted Diseases

During the construction phase of the project, the contractor workforce now earning a relatively higher incomes working on the project in the project communities may indulge in illicit behaviour such as sexual promiscuity. The workforce can introduce prostitution, rape, defilement and other sexual relationships within the construction communities and this can spread sexually transmitted diseases i.e. HIV/AIDs around. This impact is however expected to be minor since the project activities is limited in scope in each project community and will not involve large labour force to undertake. Furthermore, putting in place a code of conduct that prohibits illicit behaviours by construction workers and enforcement will help address occurrence of these social vices.

Risk of Gender -Based Violence

The contractors, male workers and their related suppliers may subject the female employees to sexual harassment, sexual exploitation, rape, and violence. Children under eighteen (18) may be directly or indirectly employed as errand boys/girls or labourers and they may be abused and defiled which are criminal under the laws of Ghana. Other forms of gender- based violence and discriminatory practises that workers may engage in threats, insults, beating and other forms of abuse on girls, women, children and other vulnerable groups. Gender-Based Violence is however expected to be minor and can be controlled during the project by adhering to the use of code of conduct that prescribes zero-tolerance for gender-based violence.

Risk of Social Conflicts i.e. (violation of local norms, increase in the incidence of pilfering)

Non-local construction workers may disrespect local community norms and values and can bring the contractor and his workers into conflict with the community people. Construction works such as pipe laying are normally associated with theft and pilfering of materials normally from the community members. Site workers can also steal from the project communities. There may also be conflicts that can arise because of accidents and destruction of property by the contractors' work force during demolition, site clearing, trenching and the laying of pipes as well as backfilling.

The risk of social conflict is expected to be minor as most of the unskilled labour will be recruited from the construction communities. Coupled with awareness raising on the project's requirements for code of conduct, provision of code of conduct for the workers that prohibits

stealing by workers and putting in place measures for protecting the health and safety of the public during the construction period, social conflicts will be nipped in the bud in the project beneficiary communities.

6.5.2 Operational and Maintenance Phase

Health and Safety Impacts on Pipeline Maintenance Personnel and Community Members

If personnel engaged in pipeline inspection and maintenance activities are not properly protected by providing them with PPEs and their (PPEs) use enforced, they may get injured i.e. through handling of maintenance equipment, slip and fall, and knock down by passing vehicles. Also, GWL personnel doing monitoring may over speed and knock down community members during the assignment. However, this impact is expected to be minor and can easily be managed through wearing of PPEs, compliance with speed limits and safety education for the workers, drivers and public.

Breakdown and Improper Functioning of the Pipeline Facilities Leading to Scarcity of Water

Like most constructed facilities, there is the danger that if the pipeline routes are not regularly inspected to identify leakages, the pipeline system will breakdown and not function properly. Consequently, the local communities will suffer water unavailability and resort to water sources which are of poor quality with consequent water borne and sanitation related diseases. Preparation and implementation of a pipeline monitoring and maintenance plan by the GWL will prevent breakdown of the newly constructed pipeline infrastructure.

Induced Flooding of Adjacent Homes and Communities

Pipe burst and or leakages during the operational phase can happen to cause localised flooding of adjoining homes and properties, loss of lives and livelihoods if the newly constructed pipelines routes are not inspected, monitored for repairs and maintenance carried out. Leakages can result in loss of treated water, loss of water revenue to the GWL and the State, and contamination of the water supply. This impact is significant; however, it can be addressed through development and implementation of a pipeline monitoring and maintenance plan by the GWL.

Increase in Disposal of Sullage (Wastewater)

The beneficiary communities are expected to use more water once the project is completed as there will be more pipe water at hand. With availability and accessibility improving, hygiene practises will also improve and neighbour and home-based economic activities. Consequently, utilisation of water will expand and generate sullage in the communities. Pipeline maintenance works may also generate wastewater and scum. Sullage disposal from maintenance activities

can be significant and if not properly collected and disposed may create environmental nuisance and even incidence of water related diseases.

7. ENVIRONMENT AND SOCIAL MANAGEMENT PLAN (ESMP)

7.1 Environmental and Social Management Plan

This section provides an Environmental and Social Management Plan (ESMP) as well as a monitoring plan when implemented will help to mitigate the potential adverse environmental and social impacts of the proposed water supply pipeline construction. The Plan identifies the potential impacts, actions for mitigation related to each potential impact, responsibilities of organizations and individuals who will be involved in the implementation of the management and monitoring plan during the different phases (pre-construction; construction, and operation) of the project. The overall aim of the Plan is to ensure that the mitigation measures are implemented and effective. It is also to determine whether the mitigation measures for the impacts on the physical, biological and socio-economic/cultural environments within the project's area of influence are adequate or additional mitigation measures are necessary. The estimated cost of the environmental and social management plan is also presented. In general, the potential environmental and social impacts are short-term and the approaches for addressing the mitigation actions do exist. The impacts will be managed successfully by the safeguards management systems currently in place at the GWL (Project Planning Department – PPD) through adherence to safeguards policies and procedures; standard construction practices; and monitoring. Ghana Water Limited has an oversight responsible for the implementation of this Plan, monitoring and reporting. The PPD is the in-house management unit set up for this project, with designated Specialists and Officers for Environmental and Social Safeguards. The Company will ensure the following:

i. the insertion of relevant mitigation measures in the bidding documents;
ii. the insertion of the environmental and social clauses in the construction and supervision contracts;
iii. the contractor has the overall responsibility for ensuring that all the proposed mitigation measures are properly implemented and reported during the construction phase. He/she shall employ and include seasoned safeguards staff in their respective teams to ensure that the environmental and social safeguards requirements, monitoring and reporting of the project are met. The safeguards person shall maintain regular contact with the GWL safeguards Specialists/Officers on the project;

iv. clearing/approving the Constructor ESMP which will be based on this report and ensuring the deadlines of critical standalone mitigation measures are marked in the overall work planning/schedule, and

v. reporting is done during the construction phase.

Table 7-1: Environmental and Social Management Plan

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
PRE-CONSTRUCTION AND CONSTRUCTION PHASE								
Lack of awareness about the project and resettlement issues among the project beneficiary communities	▪Negative perception about the project in the communities ▪Lack of cooperation and political support from key project stakeholders	▪ Create early awareness about the project objectives, scope & resettlement issues among the project beneficiary communities & key stakeholders. ▪ Ensure there is continual stakeholder engagement process throughout the project lifecycle.	▪ Record of preliminary community consultation & meetings held. ▪ Knowledge of communities of the project objectives, scope and activities	Monthly during project preparation activities	Project communities and MMDA	▪GWL LICSD Officer, ▪GWL Safeguards Officers/ Specialists	▪Chief Manager, PPD ▪Chief Manager, LICSD	70, 000.00
Selection of unqualified/ inexperienced pipeline design engineer	▪Substandard pipeline facility design for construction	▪ Procure qualified & experienced pipeline design engineers ▪ Use National & AfDB standard procurement methods for selecting the design engineers	▪Record of procurement/ selection method of pipeline facility design engineer	Weekly	GWL	GWL Procurement Manager	GWL	This cost will be included in the project cost.
Pipeline routes excavation works	▪Soil erosion	▪ Demarcate pipeline routes & limit construction activities to demarcated areas only ▪ Immediate laying of pipelines & backfilling of trenches	▪ Excavation operations taking place within demarcated areas. ▪ Pipeline trenches backfilled	Daily	Pipeline routes	Contractor, GWL Safeguards Officer	Supervising consultant	Project construction cost
Use of construction equipment and machinery for site clearance & excavation works	▪Noise & vibration: -Hearing impairment of workers and nearby residents -Vibration and weakening of structures near pipe routes	▪ Provide ear plugs for construction workers & enforce use of the ear plugs ▪ Avoid noise making activities during the night when people have to sleep. ▪ Use manual trenching methods in densely populated areas to minimise vibration ▪ Use manual labour during trenching near foundation of building ▪ Re-instatement of structure damaged by vibration ▪ Ensure job rotation ▪ Implement planned and unplanned maintenance of construction equipment and vehicles	▪ Construction workers wearing ear plugs ▪ Absence of construction noise during night hours ▪Observable manual trenching near foundations of buildings ▪Maintenance records of construction equipment and machinery	Daily	Pipeline routes	▪Contractors ▪GWL Safeguards Officers ▪LICSD Officers	Supervising Consultant	Project construction cost
Site clearance	▪Loss of flora and fauna	▪ The project contractors should avoid loss of mature trees and damage to other vegetation wherever possible. ▪ They are to ensure that clearance of the pipeline RoW is limited to the project's footprints to be developed. ▪ The project contractors should minimize the amount of destruction caused by	▪ Excavation operations taking place within demarcated areas. ▪ Number of complaints received on killing of domestic animals ▪ Approach adopted for digging ▪ Time taken to backfill ▪ Economic trees lost due to site clearance	Daily	Pipeline routes	▪Contractors ▪GWL Safeguards Officers	Supervising Consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		machinery by promoting non-mechanized methods of construction. ▪ Backfilling should be done early enough to restore habitat of the microorganisms. ▪ No gaming or killing of domestic animals found within the project corridor by the contractor's workers.						
Pipeline routes excavation works, site clearance, emissions from construction equipment and movement on untarred roads	▪Air quality degradation	▪ Provide construction workers with nose masks and enforce their use ▪ Ensure routine watering of active construction sites and haulage streets to suppress dust ▪ Cover construction materials in haulage with tarpaulin ▪ Set and enforce speed limit of 20km/hr for construction vehicles and equipment at dusty areas and haulage streets ▪ Ensure compliance with road regulations ▪ Maintain construction equipment regularly to minimize exhaust fume emissions ▪ Ensure to switch-off idling construction equipment and trucks to minimize exhaust emissions ▪ Constantly monitor air quality levels ▪ Undertake noise generation activities near schools during weekends when schools are not in session and/or after schools have closed for the day.	▪ Construction workers wearing nose masks during construction activities ▪ Observable air-borne dust particles and exhaust fumes in the surrounding environment ▪ Haulage trucks carrying sand and chippings covered with tarpaulin environment ▪ Equipment and vehicle maintenance records ▪ Record/evidence of sprinkling water on excavated materials ▪ Compliance with 20km/hr speed limit for construction vehicles within the project communities ▪Number of complaints received from community members due to emissions	Daily	Pipeline routes, construction communities, schools	▪Contractor ▪GWL Safeguards Officers	Supervising consultant	Project construction cost
Haulage of construction materials and construction of chambers in urbanised communities	▪ Road and Traffic impacts	▪ The project contractors to collaborate with the relevant institutions such as the road departments of the MMDAs and GWL to ensure that adequate notices are given to road users of potential road closures. ▪ Alternative transportation routes or diversions will be provided during such communications. ▪ Adequate road signs should be installed to inform road users of ongoing project activities along/across roads. ▪ Road closures should be well planned to facilitate adequate control of traffic and	▪ Number of accidents recorded due to contractor negligence ▪ Traffic or road congestion on site ▪ Visible safety signs ▪ Presence of traffic wardens	Weekly	Pipeline RoW	▪Contractor ▪MTTD	Supervising Consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		make it possible for use of alternative routes. Traffic wardens should be engaged, in collaboration with the MTTD of the Ghana Police Service and respective Assemblies to control traffic when working along/across existing urban roads and highways. ▪ The project contractors to ensure compliance to the Road Reservation Management Manual for Coordination. ▪ All road crossings would be repaired according to specifications vetted by engineers from the Ghana Highway Authority, Department of Urban Roads or Department of Feeder Road. ▪ Transportation of construction materials should be done outside the peak rush hours.						
Site clearance, excavated earth, excess HDPE pipes, refuse from workers (water sachet, cement papers, food packs, etc.), waste electronic water meters	▪Construction and hazardous waste generation and haphazard disposal & littering along the pipe routes	▪ Prepare a Waste Management Plan (WMP) for ensuring proper collection and disposal of all construction wastes. The Management Plan should include collection and disposal of items ▪ Provide dust bins with cover to collect all housekeeping waste (sachet water rubber, food packs) & construction spoils like cement papers, pieces of wood and iron rods etc along the pipeline routes for disposal to the MMDA approved waste disposal site. Immediate collection and disposal of all construction wastes to MMDA approved dump sites on daily basis. ▪ Only waste management service providers registered with the MMDA should be engaged for waste disposal. ▪ Reuse the normal construction waste materials where appropriate (for backfilling of trenches and gullies and pot holes in the communities) ▪ Ensure that construction waste materials are not deposited/disposed in walkways of in the project communities and drains ▪ Provide mobile toilet on site for construction workers.	▪ Availability of Waste Management Plan (WMP) ▪ Absence of construction wastes and refuse on pipeline routes, construction communities and inside local drains ▪ Availability of separate waste collection bins with covers on sites for normal construction waste. ▪ Availability of mobile toilets on sites for the workers ▪ Absence of workers using toilets of community people ▪Volume of soil excavated versus volume of soil reused ▪Records of final disposal of waste water meters.	Daily	▪Pipeline routes ▪Construction communities ▪Drainage corridors	▪Contractor ▪GWL Safeguards Officers, MMDA ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Ensure proper segregation of waste streams. All waste particularly hazardous waste should be labelled.						
Soils, backflow of contaminated materials, welding debris and others connecting to the potable water system	▪Potential contamination of potable water	▪ Generally, contamination during replacement or laying of new pipelines will be addressed by following construction standards and specifications which include guidance on materials (including pipelines) storage, handling, transport, flushing, swabbing, disinfection, contact time and water quality testing and field compliance audits. ▪ Also, contamination will be minimized through pipe cleaning (swabbing) and disinfection after replacement and installation of new pipelines as well as water quality testing (visual/turbidity) prior to commissioning. ▪ Sectional valve controls will be used to reduce potentially contaminated water from further transmission.	▪Water quality test results	Prior to commissioning	▪Pipelines in project communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost
Use and repairs of construction equipment and machinery onsite	▪Potential pollution of surface and ground water bodies	▪ The contractor will ensure that erosion and sediment control best management practices are implemented to avoid washing of top and trip soil into nearby rivers and lake. ▪ Construction equipment, trucks and vehicles are to be maintained properly to avoid fuel and oil leakage. ▪ Do not service, wash or clean construction equipment and trucks inside or near local drains/water bodies in communities to avoid release of oils and lubricants into drainage courses. Only emergency servicing shall be permitted onsite but at a minimum distance of 50metres away from the pipeline and water bodies. ▪ Avoid discharge of municipal and construction wastes such as excess food, plastics, excess pipes, spent lubricants and oils into local streams and drains ▪ Repair works on all construction equipment should be carried out at approved centres	▪ Absence of oily substances in local streams and drains ▪ Absence of construction waste and spent lubricants spilled around pipeline routes & construction sites ▪ Record of servicing of construction equipment ▪ Availability of waste bins onsite	Daily	▪Corridors of local drain and streams in project communities ▪Construction sites	▪Supervising Consultant ▪ GWL Safeguards Specialists/ Officer ▪Contractor's Safeguards Officer. ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Excavated trenches should be backfilled quickly and compacted properly to avoid erosion into nearby water bodies. ▪ Ducts available at bridges where the pipeline is crossing a water body will be used to reduce disturbance or direct interaction with the water body						
Pipeline route excavation activities	▪Disruption of Utility Services	▪ Engage the Utility Service companies (TELCOS, ECG) and Urban Roads Departments of the MMDA in a site meeting to identify their underground service supply lines and road crossings in the proposed pipeline route prior to commencement of works; ▪ Carry out relocation /reinstatement of all affected utility lines promptly in collaboration with the relevant utility companies	▪ Numbers and names of utility service companies & Departments consulted. ▪ Record of consultation meetings and agreements held with the utility companies; ▪ Quantity of utility service supply lines damaged. ▪ Number of utility service supply lines and roads re-instated. ▪ Complaints by utility service companies & Roads Departments.	Weekly	Pipeline routes	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising Consultant	Project construction cost
All construction activities (handling of construction equipment & materials; falling of construction objects, accidents)	▪Occupational Health and Safety: workers injury and accidents	▪ Prepare a Health & Safety Management Plan for the works & provide education on the Plan to workers. ▪ Provide construction workers with PPEs (reflector jackets, safety boots, nose masks, goggle, hand gloves, etc) and enforce the use of PPE ▪ Provide education and training to workers on risk associated with their job. ▪ Provide toilet facilities on site for the workers, ▪ Provide safety induction trainings for new workers ▪ Provide signage to warn workers of dangers on site ▪ Provide HIV/AIDS education and condoms to workers to prevent the risk of spread of sexually transmitted diseases i.e HIV/AIDs. ▪ Provide First Aid Box on site and stocked with appropriate drugs	▪ Availability of Contractor's Health and Safety Plan ▪ Usage of PPEs by construction workers (such as hand gloves, hard hats, reflector jackets, construction boots, etc.) ▪ Record of daily tool box meeting ▪ Existence of accident/incident book and capturing work related incidents ▪ Number of first aid boxes stocked with necessary drugs per number of workers ▪ Availability of signage ▪ Availability of mobile toilet facility on site for workers ▪Health and safety training records	Daily	▪Project corridor ▪Project communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	i). Cost of PPEs for all construction workers = 101, 500.00 ii) Cost of condoms =20,000.00 iii) Training and Sensitization: = 50, 500.00 iv) First aid Box and drugs = 17, 200.00

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ Prepare Contractor's code of conduct to address workers and public health and safety during the construction. ▪ Use caution tape to fence excavations and provide appropriate signs to warn the public and workers of potential hazards ▪ Avoid manual handling where possible and if it is impossible to avoid, use proper techniques, avoid overweight loads, use appropriate PPE and ensure a firm grip. ▪ Conduct manual handling risk assessment and introduce appropriate measures such as work sequencing, modification of work routine, use of teams and/or equipment to undertake lifting and movement of loads.						
▪Lack of awareness creation programmes on health and safety by contractor; ▪Exposure to slip and fall at pipeline trenches and pits on walkways and construction sites; ▪Absence of alternative routes for road users ▪Over speeding by project trucks; ▪Absence of signage to warn the public of danger. Absence of cordoning of active construction site.	▪Public Health and Safety: -Accidents and injury to community members and the public	▪ Cordon off all active construction areas to prevent entry of unauthorized persons and children and slip, fall, injury and accidents; ▪ Ensure construction materials (i.e. pipes, chippings, sand, wood, cement blocks) and equipment (excavators, haulage trucks, concrete mixers etc.) are not placed on walkways within the project communities ▪ Level disturbed areas at the construction sites/ around trenches to prevent slip and fall, injury and accidents. ▪ Provide temporary wooden planks for people and cars to cross where entrance are dug. ▪ Excavation and pipeline laying should be planned in a way that once the trenches are excavated, they are laid immediately on the same day and backfilled. ▪ Cordon off all excavated manhole pits under construction with rigid materials in a way that prevent community members and children from having access to the pits to prevent falling into them ▪ Provide temporary alternative routes/access for pedestrians and motorists where their access routes are	▪ Active construction areas and trenches cordoned off with caution tapes, barricades, etc. preventing unauthorized people from accessing pipeline trenches, inspection chamber/ manholes. ▪ Presence of signage warning people of dangers at construction site ▪ Availability of alternative access route for the public during construction period ▪ Absence of construction materials (i.e. pipes, pieces of wood etc.) deposited on walkways along pipeline routes and also open spaces in the construction communities ▪ Records of health and safety awareness about the project among the adjacent communities ▪ Number of people injured in the communities due to the works ▪ Record of HIV/AIDs awareness education held for adjacent communities ▪Contractor's code of conduct contains measures that prevents abuse of women, child labour & rape	Daily	▪Pipeline routes and adjacent areas.	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		taken over temporarily by the pipeline works. ▪ Provide road diversion signs and educate the communities ▪ Provide appropriate signage around the pipeline corridors to warn people ahead about dangers within the landscape of the construction works ▪ Educate the adjacent community members about the signage and their importance ▪ As much as possible, cover all trenches created to avoid stagnant water breeding mosquitoes to cause malaria ▪ Enforce speed limit 20km/hr for all construction trucks and equipment at the construction sites and project communities to prevent accidents and injury through installation of road signs and temporary speed ramps.						
Stagnation of water in trenches and manhole pits	▪Increase in the incidence of water and sanitary related diseases	▪ Ensure to cover all excavated pits to prevent stagnation of water and breeding of mosquitoes, and malaria incidences in the beneficiary communities ▪ Regularly pump out stagnated water in trenches to prevent breeding of mosquitoes ▪ Provide mobile toilets for construction workers to prevent open defecation by construction workers	▪ Complaints from the project beneficiary communities about increasing malaria incidence ▪ Absence of stagnant water in pits at construction sites ▪Records of increased water and sanitation related diseases from community health services (hospitals, clinics etc.)	Weekly	▪Pipeline routes ▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost
Trenching	▪Ponding of adjoining properties	▪ Ensure proper construction planning and drainage management. Trenching works should be scheduled during the dry season as far as practicable to reduce the likelihood of stormwater interference. ▪ The Contractor should plan activities considering the weather forecast from Meteorological Agency of Ghana. ▪ Before excavation begins, contractors should confirm existing natural drainage channels and ensure that these are not obstructed by construction activities. Temporary diversion channels or culverts could be constructed to maintain the	▪ Absence of uncovered pipeline trenches and chamber pits along the pipeline routes ▪Absence of carrying out excavation works during heavy down pour ▪Ponding incidence	Bi-weekly	▪Pipeline routes ▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project construction cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		natural flow of runoff where trenches intersect drainage paths. ▪ The contractors will ensure excavated materials are properly stockpiled away from drains, water bodies, and low-lying areas. On completion of pipe laying, trenches will be promptly backfilled and compacted to restore the natural ground profile and drainage flow. ▪ Regular site inspections are to be conducted, especially after rainfall, to identify and rectify any areas of ponding or erosion.						
Sexual promiscuity among construction workers	▪Increased risk of communicable and sexually transmitted diseases including HIV/AIDs in the communities resulting from Illicit sexual affairs	▪ Sensitise contractors' employees on the dangers associated with illicit sexual affairs e.g. prostitution, rape, sexual exploitation of women, unprotected sex ▪ Undertake HIV/AIDS/STI awareness campaigns among workers and project beneficiary communities especially for young girls and women ▪ Provide condoms to contractor's staff in each community ▪ Undertake community sensitisation on the risks associated with illicit sexual affairs using information vans ▪ Prepare Code of Conduct for contractors that prevents rape, defilement and other illicit sexual affairs as well as Gender Based Violence among construction workers	▪Availability of contractor's code of conduct that prevents prostitution, rape & illicit sexual behaviour by construction workers ▪Record on training of workers on HIV/AIDs education and the code of conduct ▪Employees signed on to the Code of conduct as part of their employment conditions ▪Number of contractor's action taken against GBV infractions and related matters ▪Availability of condoms for construction workers ▪Complaints by residents	Weekly	▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	i) Contractor employees and community awareness creation on HIV/AIDS /STDs meetings: 2 meetings in each project community = 70, 000.00
Influx of non-local labour into project communities	▪Risk of social Conflicts ▪Including Risk of spread of communicable and sexually transmitted diseases	▪ Maximize the use labour from the project beneficiary communities ▪ Establish Grievance Redress Committees which includes local Assembly Members to resolve project related conflicts ▪ Report crimes such as theft, rape and defilement to the nearest police station directly or through the grievance redress committee. ▪ Contractor should provide code of conduct which prevents disrespect for community norms and values and create	▪Number of local community people employed as construction workers as against outsiders ▪Availability of functional Grievance Redress Committees at the local community levels including local community opinion leaders and Assembly members ▪Number of contractor's action taken against infractions on community social norms including theft, etc. ▪Availability of Contractor's code of conduct that prevents disrespect for community norms and values, theft and illicit sexual behaviour	Weekly	▪Project beneficiary communities	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Costs related to GRC implementation under the project is presented at the section on GRM in this report.

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		awareness on the code among construction workers. ▪ Integrate the code of conduct into the employment conditions of the workers. ▪ Pay adequate salaries for workers to reduce incentive for theft. ▪ Summary dismal of employees who engage in criminal activities.	▪Record on training of workers on the code of conduct and community social norms and values ▪Employees signed on to the Code of conduct as part of their employment conditions ▪Complaints by residents					
▪Influx of non-local labour into subproject communities; ▪Inadequate awareness about Gender-based violence from labor influx among workers and local communities	▪Gender-Based Violence (including sexual harassment of women employees, child abuse, etc.)	▪ Ensure GBV information and awareness on the code of conduct and sanctions therein. ▪ Regular training of labour force on the code of conduct. ▪ Integrate the code into the employment conditions of the workers. In this case, contractor should insert contractual clauses against rape, defilement, sexual harassment, sexual exploitation and child labour. ▪ All workers should sign onto the code during entry into the employment on the construction ▪ Commitment policy to cooperate with law enforcement agencies investigating perpetrators of gender-based violence; ▪ Providing alternative work schedules or shifts to accommodate the hiring of more local female workers. ▪ Enforcement of the Code of conduct during construction activities.	▪ Record of GBV awareness raising campaigns ▪ Number of Gender Based Violence Cases reported to Police and Grievance Committee Members or GWL ▪ Number of Gender Based Violence Cases under investigation or prosecutions ▪ Availability of Contractor's code of conduct which has GBV issues integrated i.e. sexual harassment of women employees, sexual exploitation, rape ▪ Record of trainings held for workers on gender-based violence prevention and the code of conduct; ▪ Code of conduct integrated into employment conditions of workers; ▪ Number of workers charged with discrimination based on gender considerations. ▪Number of gender-based violence complaints by the residents	Weekly	▪Project communities ▪MMDA Offices ▪GWL Offices	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project implementation cost
Influx of non-local labour into project communities	▪Child labour and school dropout	▪ Ensure that children and minors are not employed directly or indirectly on the project by checking birth certificates of potential employees and/or letting responsible persons'/opinion leaders in their communities e.g. Priests, Civil Servants, Assembly members guarantee the application forms that they are of minimum 16 years old. Workers below 18 years will not be engaged in hazardous work.	▪ Number of under aged children found engaged in construction works ▪ Record of construction worker's recruitment process ▪ Number of construction staff sanctioned as a result engagement of child labour on the works ▪Evidence of child labour prohibition in the contractor's code of conduct	Bi-monthly	▪Project communities ▪Pipeline routes	▪Contractor ▪GWL Safeguards Officers ▪LICSD Officers	Supervising consultant	Project implementation cost

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ The contractor's code of conduct should prevent sexual harassment of women employees, sexual exploitation and child labour.	and integration into the workers condition of employment					
Recruitment of labour	▪Risk of labour exploitation	▪ Strict adherence to the Ghana labour laws and regulations to ensure fair wages, safe working conditions, and reasonable working hours ▪ Establish mechanisms for reporting labour abuses anonymously. ▪ Provide workers with proper training and education on their rights and safety measures is vital in ensuring their well-being.	▪ Number of labour abuse cases reported ▪ Wage paid verse working hours ▪ Physical observation of working conditions onsite	Weekly	▪Project labour ▪Project site	▪Contractor ▪GWL Safeguards Officers	Supervising engineer	Project implementation cost
Pressure from unemployed residents in the project communities interested to be employed for the civil works	▪Conflict between contractor and residents over employment opportunities during the works	▪ Give preference to local communities in terms of employment for semi-skilled and unskilled labour including women. ▪ Contractor to hire workers through a systematic process managed by the Human Resource (HR) office and avoid hiring persons below the age of 16 years and also discourage spontaneous influx of job seekers and migrant workers. ▪ Engage the appropriate authorities during conflict. Do not be confrontational	▪ Number of construction employees recruited from the local beneficiary communities ▪Evidence of recruitment process job seekers through HR office of the contractor rather than recruitment at the gate.	Bi-monthly	▪Project beneficiary communities	Contractor	Supervising engineer	Project implementation cost
Total								**329,200.00**
OPERATIONAL AND MAINTENANCE PHASE								
Occupational Health and Safety (Field inspection of pipeline routes by maintenance personnel)	▪Injury and accidents to personnel engaged in monitoring and maintenance on the pipeline routes during the operation phase	▪ Provide pipeline maintenance personnel with PPE (boots, hard hats, reflector jackets) ▪ Engage only experienced personnel for the maintenance works; ▪ Provide the maintenance workers with First Aid Box ▪ Provide signage at pipeline route to signal the presence of personnel at work	▪ Proper usage of PPEs ▪ Number of signage mounted ▪Availability of pipeline maintenance monitoring reports	During pipeline routine inspection and maintenance	▪Pipeline routes ▪Pipeline communities	GWL PPD	Chief Manager, PPD Chief Manager, LICSD	GWL pipelines maintenance Budget. Estimated annual budgets are as follows: i) Provision of PPEs for pipeline route inspection workers = 42,000.00 ii. First Aid Box, drugs and signage = 18,500.00
Pipeline maintenance activities	▪Community health and safety risks (Accident, marginal increase in	▪ Provide signage to alert community members about presence and dangers	▪ Availability of signage directing community people away from	During pipeline routine	▪Pipeline routes	GWL Engineers	Chief Manager of PPD	Annual GWL pipelines

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
	traffic and knock-downs)	posed by maintenance equipment and trucks etc. ▪ Maintenance trucks should not speed over 20km/hr in the communities. ▪ Pipeline inspectors and maintenance personnel should ensure not to block access roads and pathways in the communities with pipeline maintenance materials and trucks/equipment	dangers during pipeline maintenance works ▪ Alternative routes available for people/lorries displaced on their routes by the maintenance works ▪ Trucks/cars moving under 20km/hr in the communities ▪ Incident/ accident records	inspection and maintenance	▪Project communities			maintenance budget
Pipelines and manhole leakages and pipeline bursts due to lack of maintenance	▪Risk of flooding of adjacent homes and communities	▪ Conduct regular inspection and monitoring of burst pipes and water leakages ▪ Regular maintenance on pipelines and inspection chambers ▪ Prepare and implement a Facility management plan for the pipeline maintenance	▪ Availability of Pipeline Facility Management Plan guiding the inspection and maintenance of the pipeline facility. ▪ Number of pipeline bursts recorded and repaired. ▪ Pipeline routes inspection and maintenance monitoring reports	During pipeline routine inspection and maintenance	▪Pipeline routes ▪Project communities	GWL Engineers	Chief Manager of Operations	Estimated annual maintenance cost of the pipeline & manholes leakage: =200,000.00
Pipelines and manhole leakages and pipeline bursts due to lack of maintenance	▪Breakdown and improper functioning of pipeline facilities leading to water scarcity	▪ Conduct regular inspection and monitoring of burst pipes and water leakages ▪ Regular maintenance on pipelines and inspection chambers ▪ Prepare and implement a Facility management plan for the pipeline maintenance ▪ Ensure the public is adequately informed of water scarcity and alternative measures to be implemented	▪ Availability of Pipeline Facility Management Plan guiding the inspection and maintenance of the pipeline facility. ▪ Number of pipeline bursts recorded and repaired. ▪ Pipeline routes inspection and maintenance monitoring reports ▪ Alternative water supplied ▪ Public complaints	During pipeline routine inspection and maintenance	▪Pipeline routes ▪Project communities	GWL Engineers	Chief Manager for Operations	Included in the annual maintenance cost estimate above
Maintenance activities and availability of water	▪Increase in disposal of sullage (wastewater)	▪ During maintenance activities, wastewater and scum shall be properly contained, collected, and disposed of through approved waste management service providers. ▪ GWL maintenace team will ensure that maintenance sites are equipped with portable containment facilities and that wastewater is not discharged indiscriminately into the environment or open drains. ▪ All maintenance staff should be trained on safe waste handling and disposal practices, including spill prevention and response procedures.	▪ Public complaints on improper wastewater management by GWL maintenance team ▪ Number of sensitizations and trainings conducted for community members on wastewater management	Twice a year	▪Project communities	LICSD Officers Local Assembly	Chief Manager for Operations	Part of LICSD Officers reponsibility

Impact Source	Potential Impacts	Mitigation Measures	Monitoring Indicators	Frequency	Location	Responsibility	Supervision	Estimated Cost (GHC)
		▪ In addition, community education and sensitization are vital to promoting responsible water use and wastewater management. ▪ Beneficiary communities will be trained on how to dispose of household sullage safely, maintain clean surroundings, and prevent illegal discharge of wastewater into storm drains or open spaces.						
Total								**260,500.00**

7.1.1 Reporting on Monitoring Activities

Reporting on the monitoring of the mitigation measures implementation will be an integral part of the implementation of the ESIA. As already indicated, during the construction phase, the monitoring of the safeguards mitigation measures implementation will be carried out by contractor through his/her Safeguards officer (s). The GWL Supervising Consultant, GWL Safeguards Specialists/Officers and LICSD Officers will provide oversight responsibility to ensure that the contractor fulfils his/her environmental and social contractual responsibilities.

Standalone Reports on the environmental and social impacts mitigation measures implementation will be produced by the contractor through his/her Safeguards Officer on monthly basis to the GWL Supervising Consultant who will validate and forward these to the GWL Safeguards Specialists/Officers. All the reports should capture progress and status on implementation of the mitigation measures arising from the ESMP implementation, taking into account but not limited to the following:

- Contractors' performance on implementing environmental and social safeguards;
- Progress on mitigation measures in relation to identified impacts;
- Emerging impacts and proposed mitigation measures (if encountered);
- A presentation on parameters monitored in the reporting period;
- Activities to be taken in the following period;
- Capacity building needs that may be required; and
- Relevant pictures should be included in the report.

The GWL Safeguards Specialists/Officers and LICSD Officers will regularly conduct field visits to the construction sites to verify the reports presented by the contractor and the Supervising Consultant, make their own findings and provide guidance for any remedial actions where the need be to prevent non-compliance and recurrence of inaction on the part of the contractor. The monitoring results will be continuously evaluated by GWL as part of the project supervision and this will allow for corrective actions to be taken when needed. The GWL will compile a quarterly safeguard monitoring reports for submission to the AfDB.

7.2 EMERGENCY PREPAREDNESS AND RESPONSE PLANS

This section outlines the roles and methods for responding to major emergencies. These procedures are primarily designed to ensure that people can deal with any situation. Workplace risks are unavoidable events or scenarios that can occur during a project. It is critical to identify them, particularly those that pose a major threat, and to put in place practical measures to prevent their occurrence and re-occurrence. Emergencies and disasters can strike without notice at any time. Employee training, emergency equipment purchase, and efficient communication on where to go and how to maintain safety during an emergency are all necessary proactive efforts. As a result, it becomes a "need" for every worker to voluntarily avail themselves of and be familiar with the urgent activities they must take in an emergency to act quickly, calmly, and efficiently.

GWL values the safety and well-being of its customers, workers, and contractors. As a result, the emergency response plan has been developed to enable employees to quickly identify, evaluate, and respond to a wide range of crises, including injuries and illnesses, accidental leaks or spills of fuel or oil, road accidents, explosion of pipes and equipment failures.

7.2.1 Objectives

The emergency response plan addresses potential emergencies that may arise during the proposed project's pre-construction, construction, operation, and maintenance phases. The plan's goals are to make certain that:

- The safety of the public, all contractors, and employees during emergencies.
- Timely stabilization of emergency situations; and
- Assets belonging to the public, contractors, employees, and GWL are adequately protected.

7.2.2 Responsibilities

Table 7.2 summarises the responsibilities of all parties in ensuring a smooth implementation of the Emergency Preparedness and Response Plan (EPRP).

Table 7-2: Emergency preparedness and Response Plan (EPRP)

Designation	Responsibilities
Project Contractors	▪ Provide adequate resources needed to implement the EPRP during preconstruction and construction period. ▪ Employ a qualified Health, Safety and Environmental Manager to oversee implementation of the EPRP during construction. ▪ Ensure workers implement the ERP during construction. ▪ Establish communication with nearest emergency services ✓ Ghana National Fire Service, ✓ National Disaster Management Organization, ✓ National Ambulance Service, ✓ Ghana Police Service, and ✓ Health institutions ▪ Undertake emergency training (prior to construction/demolition) for workers including ERT on topics such as: ✓ Raising alarm and warning others ✓ First aid ✓ Calling for external help (through the ERT) ✓ Response protocols for fires ▪ Keep up-to-date records including incidents, complaints, monitoring results, non-conformance reports and corrective action instructions (with assistance from the ERT). ▪ Investigate all incidents or accidents and make appropriate recommendations to prevent re-occurrence of such incidents. ▪ Ensure the display of appropriate emergency and warning signs at vantage points.
Environmental and Social Safeguards Department (GWL)	***During Preconstruction and Construction Phase*** ▪ Ensure the project contractors implement requirements of this EPRP. ***During Operation and Maintenance Phase*** ▪ Review and update this plan, at least annually (if the need be) during operation phase. ▪ Receive suggestions, comments, or questions from all stakeholders regarding the EPRP. ▪ Ensure maintenance workers of GWL are trained on relevant emergency scenarios. ▪ Keep up-to-date records including incidents, complaints, monitoring results, non-conformance reports and corrective action instructions. ▪ Investigate all incidents or accidents and make appropriate recommendations to prevent re-occurrence of such incidents.
Emergency Response Team *(ERT)*	▪ Serve as principal contact persons to the emergency services. ▪ Assist in collecting information about incidents and accidents. ▪ Assist during environmental, health and safety incident investigations. ▪ Assist the Project Managers of each contractor and GWL in other tasks assigned.
All workers and public	▪ Report all incidents/ accidents to the Project Managers of each contractor during construction and GWL during operation & maintenance, with adequate information ▪ Follow all laid down emergency protocols ▪ GWL maintenance team are to respond swiftly to reports of pipe burst or water leakage.

7.2.3 Emergency Programmes

7.2.3.1 Induction and Training

Project contractors/ GWL will provide all relevant workers with induction on emergency arrangements and give specific instructions regarding basic personal health and safety.

First aid training will be provided to designated workers, preferably members of the ERT. Fire prevention and firefighting training will be conducted for all relevant workers.

7.2.4 Inspection and Testing

All emergency equipment and protective devices will be subjected to routine inspection and testing. Equipment such as firefighting and first-aid supplies will be included in the program. Through the following activities, organizational capacity will be established to respond adequately to any potential emergency:

- Fire marshal training (for welding operators); and
- First aid training.

7.2.4.1 Emergency Response Procedures

Clear renderings of the emergency response decision procedure have been developed for the following potential emergency conditions:

- Injuries and sudden illnesses (Figure 7-1);
- Accidental Fuel/oil leak or spill (**Error! Reference source not found.**2);
- Machine/Equipment Failure (**Error! Reference source not found.**);
- Explosion of pipes emergency (Figure 7-4); and
- Public agitation and confrontation (Figure7-5).

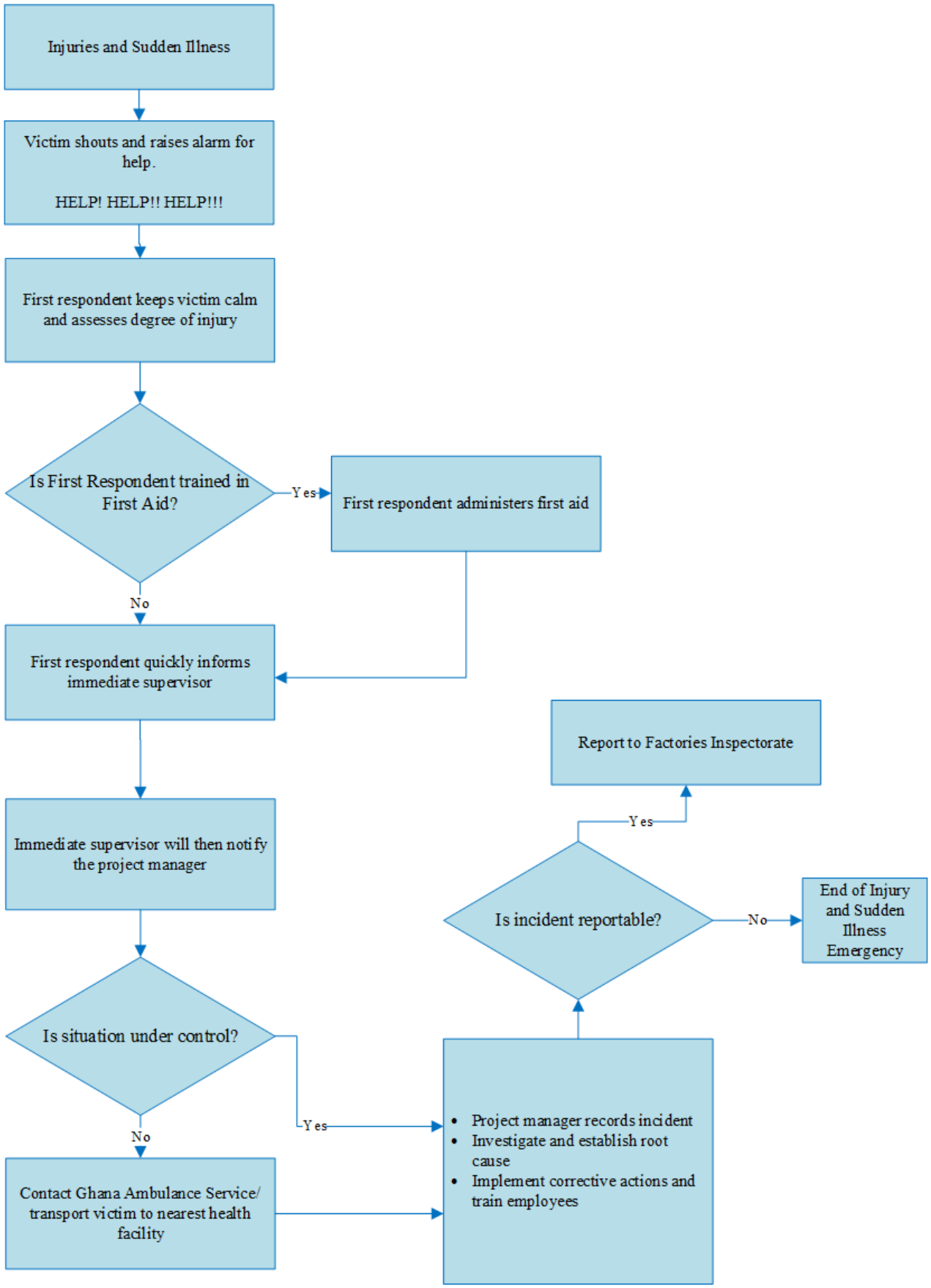


Figure 7-1: Injuries and Sudden illness emergency response procedure

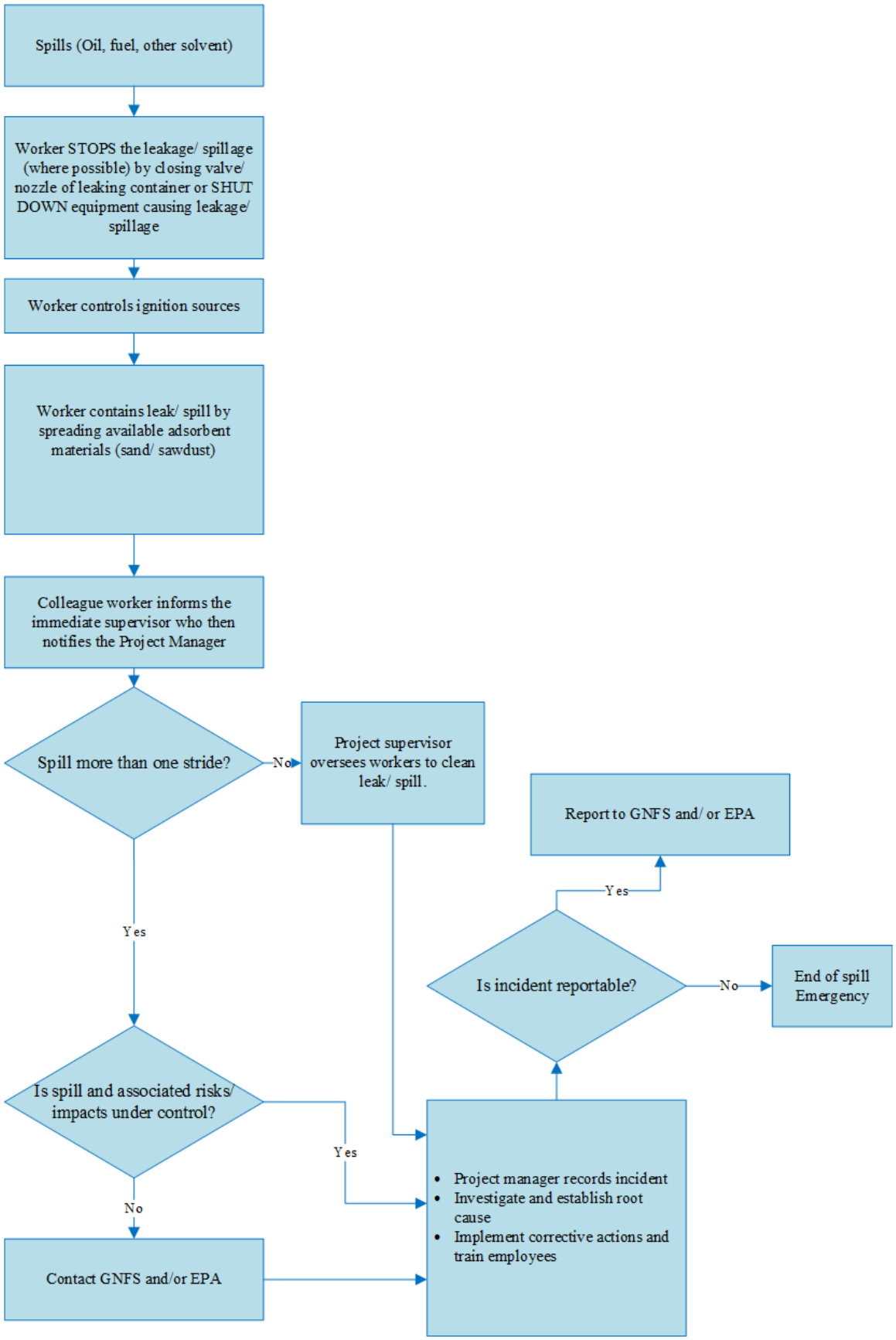


Figure 7-2: Accidental spills/fuel/oil leak emergency response procedure

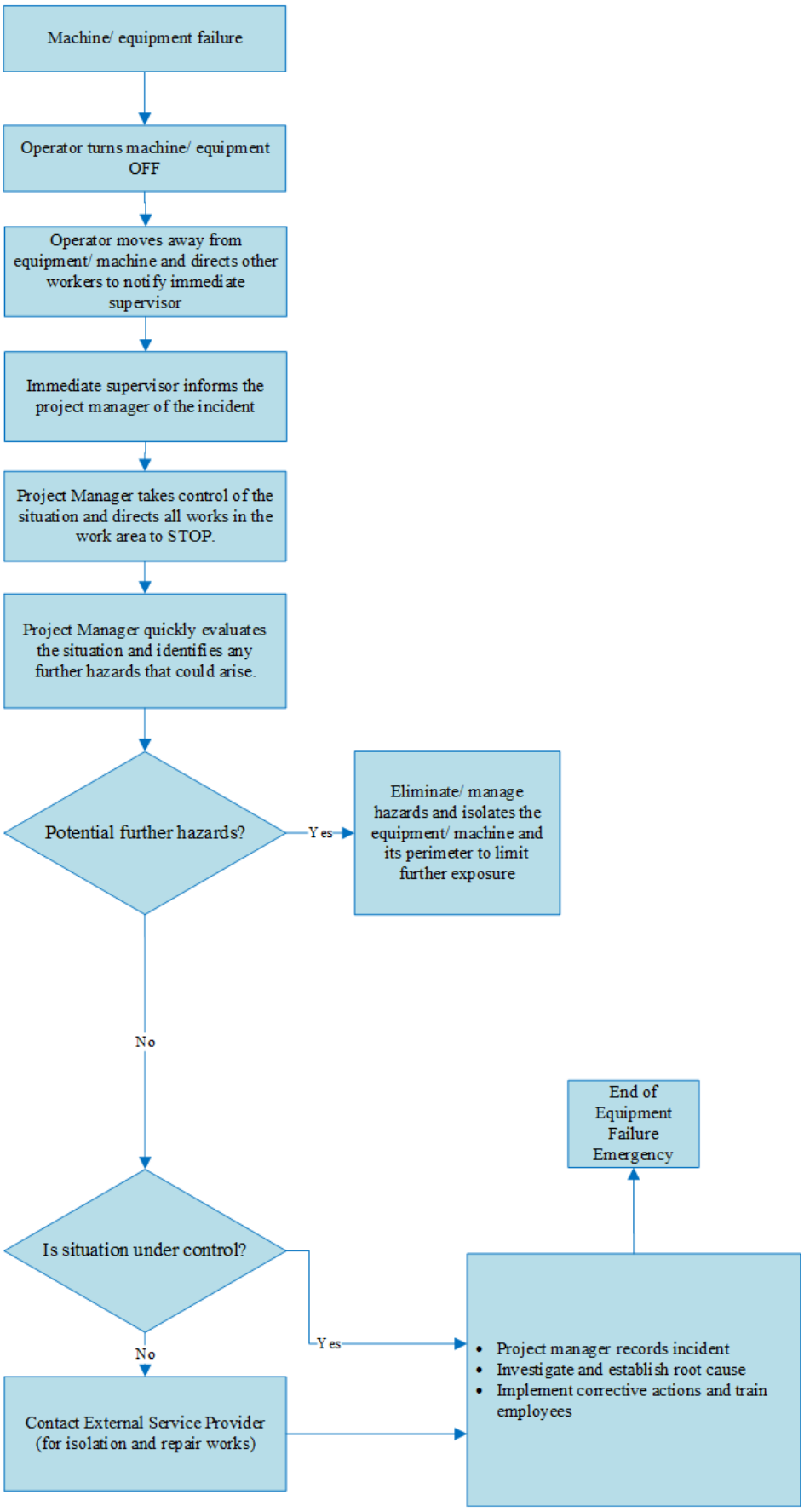


Figure 7-3: Machine/equipment failure emergency response procedure

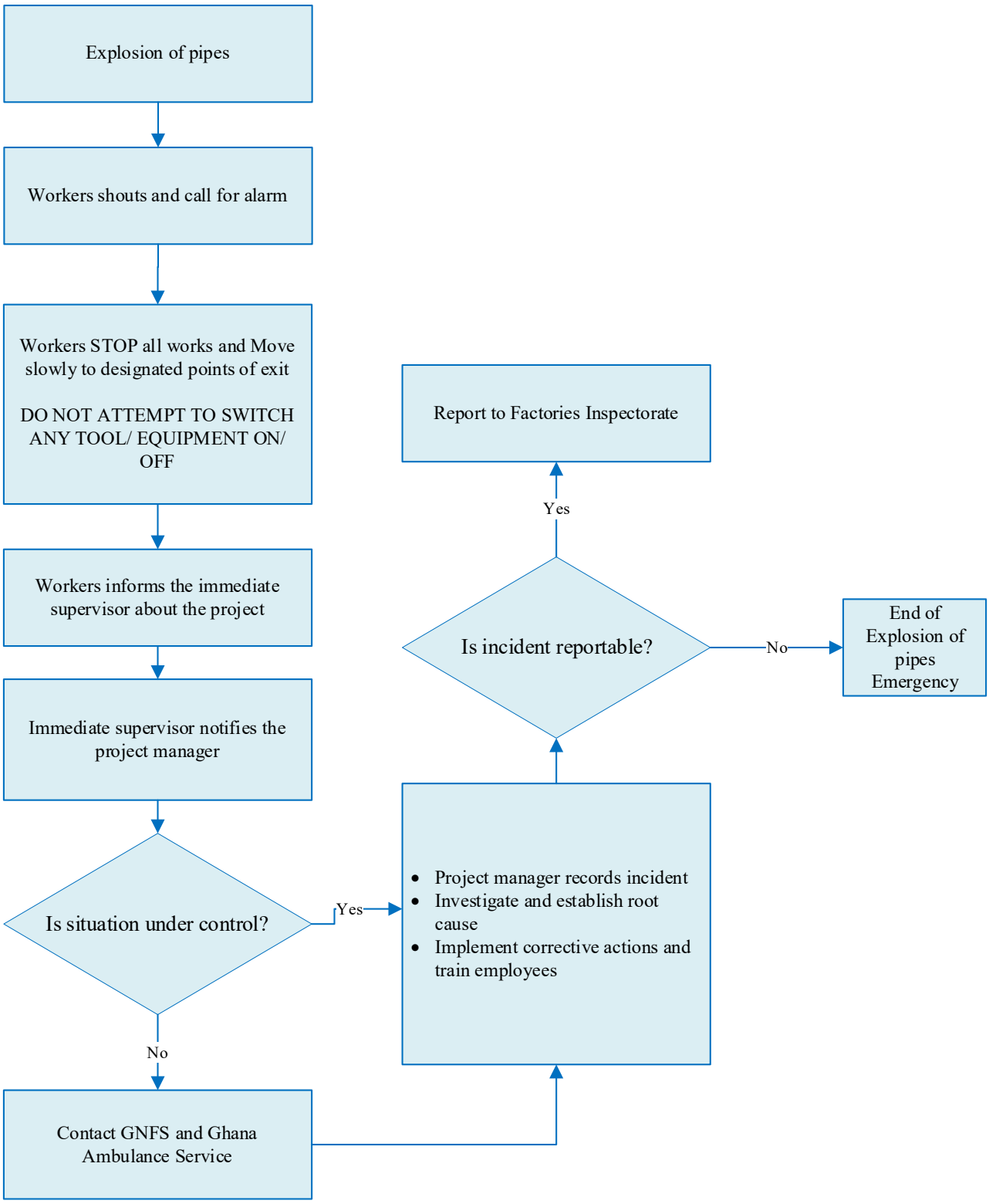


Figure 7-4: Explosion of pipes emergency response procedure

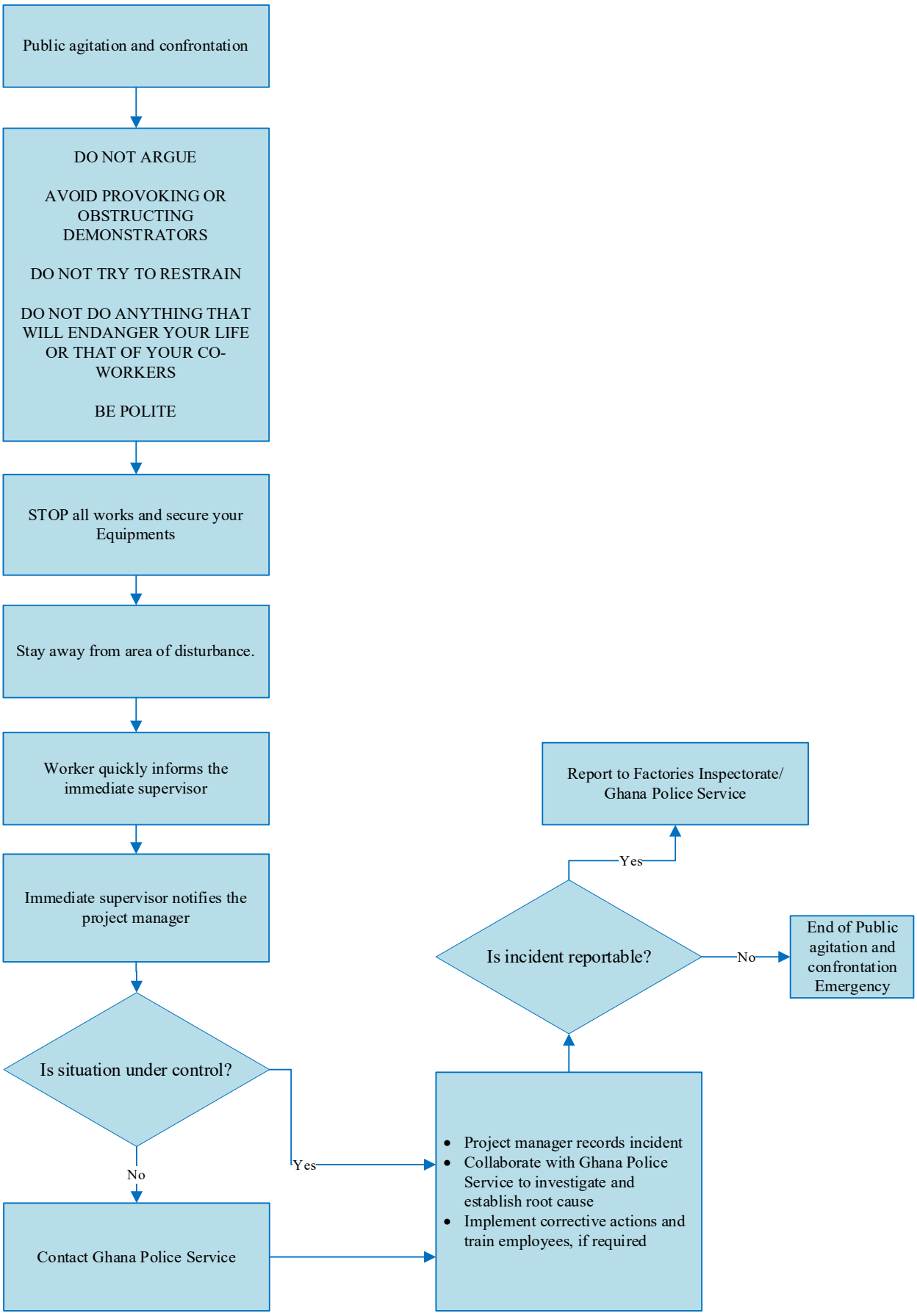


Figure 7-5: Public agitation and confrontation emergency response procedure

7.2.5 Reporting and Accident Investigation Procedures

Reporting will be done according to the following procedures, presented graphically in **Error! R eference source not found.**6.

Workers report all incidents/ accidents to their immediate supervisor who then notifies the Project Manager (during construction phase) and the Safeguards Department of GWL (during operation and maintenance phase).

The workers in collaboration with the immediate supervisor will investigate reported incidents/ accident and submit findings to Project Manager (during construction phase) and the Safeguards Department of GWL (during operation and maintenance phase).

The Project Manager/ the Safeguards Department of GWL will execute remedial actions as early as possible per the recommendations made.

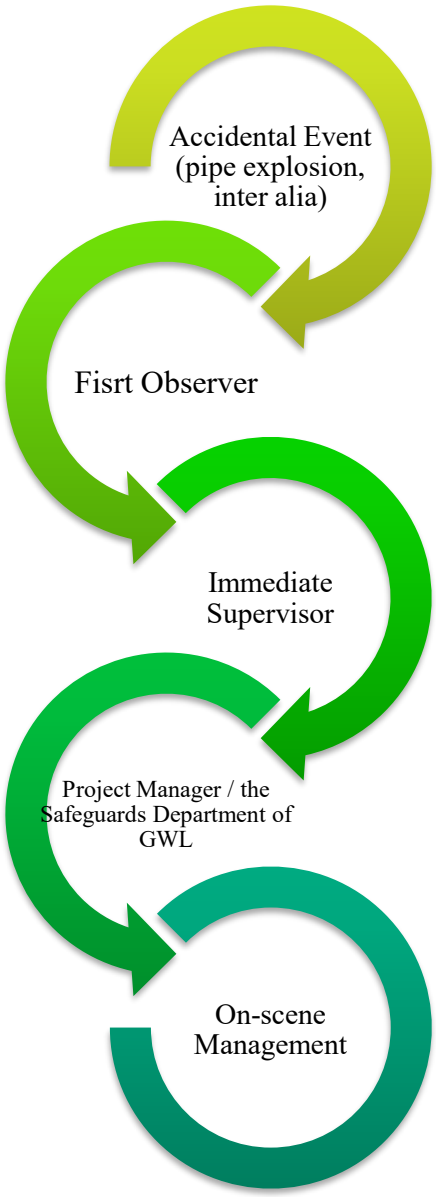


Figure 7-6: Emergency response reporting format

7.3 TRAINING AND CAPACITY BUILDING OF STAKEHOLDERS WHO WILL BE ENGAGED IN THE ESMP IMPLEMENTATION

To ensure effective implementation of the environmental and social measures of the proposed project, training will be undertaken to create understanding on the ESMP requirements for the project and provide skills required for the ESMP implementation. The training will target key stakeholders who will be engaged in the implementation and monitoring of the ESMP. They include the Contractor and his/her labour force, Contractor's safeguards Officer, Supervising Consultants, project beneficiary MMDA, Assembly Members and Community Opinion Leaders in the jurisdiction of the project communities, local transport officials, ECG and TELCOs.

7.3.1 Methodology for the Training

The methodology for the training will include workshops and meetings. The trainings will be conducted in such a time that will be convenient for all relevant stakeholders to participate.

7.3.2 Estimated Cost for the Training

It is estimated that GHC250, 000.00 will be required to undertake the training. The key issues for the training are provided in Table 7-3 below.

Table 7-3: ESMP Training Plan

Training Issues	Targeted participants	Training schedule	Estimated training cost (GHC)
Training on ESMP ▪ The Project's Potential Environmental and Social impacts ▪ Project's Occupational Health and Safety issues ▪ Project's Public Health and Safety issues ▪ Influx of non- local labour and related impacts ▪ Waste management issues ▪ Mitigation measures for the potential impacts and implementation arrangements ▪ Monitoring of mitigation measures implementation ▪ Reporting on mitigation measures implementation ▪ Grievance Redress Mechanism of the project ▪ Project's Code of Conduct for contractors and workers	**Contractors & Workforce:** i.e. Contractors' technical personnel (Safeguards Officer, Foreman, Site Engineer, Surveyor, Site Manager, Project Manager, Project Accountant, Security Officer, Construction Drivers). **Municipal Assembly Staff:** MMDA Project Coordinator, Urban Roads Engineer, Social Welfare Officer, Works Engineer, Municipal Health Officer. **Project Beneficiary Community:** Assembly Members, Unit Committee Chairmen/Representatives, Residents Association Representatives, Women group Representatves **Businesses:** TELCOs Representatives, Local Transport Union Representatives, ECG representatives **GWL** Safeguards Officers, Engineers, LICSD Officers	Two (2) days and prior to the commencement of the construction works	250 participants (from all the project regions) @GHC1000.00/ participant = 250,000.00

▪ Roles and responsibilities of stakeholders for the ESMP implementation			
TOTAL			**250,000.00**

7.4 STAKEHOLDER AND INSTITUTIONAL RESPONSIBILITIES IN THE ESMP IMPLEMENTATION

The Table 7-4 below gives the arrangement for stakeholder responsibilities and roles in the ESMP implementation for the proposed project in project beneficiary communities.

Table 7-4: Roles and Responsibilities of the ESMP Implementation

Name of Stakeholder	Roles and Responsibilities
AfDB	▪ The African Development Bank is the financier of the Project. ▪ Review of report and and subsequent approval. ▪ Disclosure of ESIA on the Bank's external website. ▪ Occasional environmental and social monitoring visits to the construction sites.
Ministry of Works, Housing and Water Resources	▪ The Ministry is the Government of Ghana lead Ministry with the overall responsibility for the Project and compliance with the ESMP.
GWL	▪ Overall responsibility for coordination, planning, and implementation of this project, including leading on project's grievance redress. ▪ Preparation of the ESIA and its disclosure at the country level. ▪ Training of stakeholders on the skills and knowledge required for successful implementation of the ESIA. **Safeguards Specialists and Officers:** ▪ Overall coordination of the safeguard's implementation of the project at all project beneficiary communities. ▪ Ensure integration of all environmental and social requirements into bidding documents and contractor's works contract. ▪ Supervision and ensuring compliance with the environmental and social provisions by the works contractor and supervisions. ▪ Monitoring and reporting on the environmental and social implementation to the AfDB on regular basis. ▪ Resolving project related grievances
Project Beneficiary MMDA	▪ Responsible for planning and development of infrastructure in their jurisdiction. ▪ Responsible for ensuring roads are properly maintained/ reinstated by projects in the municipality.

Name of Stakeholder	Roles and Responsibilities
	▪ Engagement in awareness raising in project beneficiary communities ▪ Engagement in monitoring of environmental and social compliance by contractors. ▪ Engagement in resolution of grievances related to the project.
Project Beneficiary communities	**Assembly Members:** ▪ Representative of the community people in their MMDA. ▪ Mobilisation of project communities for project awareness raising and environmental and social compliance. ▪ Liaising between the Municipal Assembly and the community for successful ESMP implementation. ▪ Facilitating grievance redress on the project **Residents and PAPs:** ▪ Partnering with project stakeholders on awareness creation, reporting illegal behaviour (i.e. stealing of construction materials and equipment, destruction of safety signage at construction sites) on the project and creating conducive construction atmosphere. ▪ Reporting grievances through the established GRM structures for the project.
Project Contractor	▪ Responsibility for the actual construction works. ▪ Responsibility for overall implementation and compliance with the ESMP component of this report. ▪ Recruitment of Safeguards Officers to implement and monitor compliance with the ESMP and reporting.
Contractor's Safeguards Officer	▪ He/she shall be the lead person in the contractor's team to ensure and supervise that the ESMP conditions and EPA permit requirements are complied with by the contractor during the construction phase. ▪ Monitor compliance with the ESMP including procedures for construction sites, management plans and reporting of the ESMP to the Client.

7.5 ESTIMATED COST OF THE ESMP IMPLEMENTATION

It is estimated that the cost for implementing environmental and social mitigation measures for pre-construction and construction phases of the proposed project excluding the works contract

price, is Seven Hundred and Forty-nine Thousand and Two Hundred Ghana Cedis. (GHC 749,200.00).

Furthermore, it is estimated that an amount of Two-Hundred and Sixty Hundred and five Hundred Ghana Cedis (GHC260, 500.00) will be required to implement the operational phase annually by the GWL. The breakdown of the budget is as shown in Table 7-5 below.

Table 7-5: Estimated Budget for the ESMP Implementation

Activity	Estimated Budget (GH₵)
PRE-CONSTRUCTION & CONSTRUCTION PHASE MITIGATION ACTION PLAN AND MONITORING MEASURES	
Pre-Construction & Construction Phase Action Plan	329, 200.00
Pre- Construction & Construction Phase Monitoring	-
Training	250, 000.00
GRM	170, 000.00
TOTALS	**749,200.00**
OPERATIONAL PHASE (ANNUAL) MITIGATION ACTION PLAN & MONITORING MEASURES	
Operational Phase Action Plan	260, 500.00
Operational Phase Monitoring	-
TOTALS	**260, 500.00**

8. GRIEVANCE REDRESS MECHANISMS

8.1 Introduction

Engagement of various stakeholders indicated that the project implementation may result in grievances, particularly during construction activities. Consequently, the establishment of Grievance Redress Mechanism to address grievances is key to the success of the project. There is no ideal model or one-size-fits-all approach to grievance resolution. The best solutions to conflicts are generally achieved through localized mechanisms that take account of the specific issues, cultural context, local customs, and project conditions and scale. GWL has in existence a Grievance Redress Mechanism Manual for similar projects and this will serve as a guide to the implementation of this project.

In its simplest form, GWL grievance mechanisms manual can be broken down into the following primary components:

- Receiving and registering a complaint.
- Screening the complaint.
- Acknowledgement and verifying the complaints.
- Selecting a resolution approach.
- Implementing the approach.
- Monitoring and evaluating the results.
- Provision of feedback to the involved parties.

8.2 Management of Reported Grievances

The procedure for managing grievances should be as follows:

- The affected person files his/ her grievance(s), relating to any issue associated with the project, in writing or via telephone to the Grievance Redress Committee formed by GWL.
- The committee member receiving the complaint either by phone or in-person will fill the grievance acknowledgement form or guide the aggrieved person to do so.
- A selected member of the Grievance Redress Committee (GRC) will act as the Project Liaison Officer who will ensure the resolution of the grievance and feedback provided accordingly.

8.3 Monitoring Complaints

The chairman of the GRC according to GWL manual will be responsible for:

- Providing the GRC with a weekly report detailing the number and status of complaints;
- Any outstanding issues to be addressed; and
- Monthly reports, including analysis of the type of complaints, levels of complaints, actions to reduce complaints and initiator of such action.

8.4 The Objectives of the Grievance Redress System

The objectives of the Grievance Redress Mechanism among others are to:

- Resolve grievances or complaints from affected persons, groups and institutions promptly, fairly and in a manner, that to extent possible acceptable to all parties;
- Provide affected persons with avenues for making a complaint or resolving any dispute that may arise during the implementation of the project;
- Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants; and
- Avoid the need to resort to judicial proceedings.

8.5 The 3-tier Grievance Redress System:

The GRM at the three levels comprise:

1. Local/Community Mediation Committee (Grievance Redress Team)
2. GWL District Office/Beneficiary MMDA Level Grievance Redress Committee and
3. GWL/PPD Level Grievance Redress Committee

Settlement of grievances at the Court of Law will be the last resort.

Aggrieved individuals, groups and institutions have the right to access any of the three tiers at all times and at no cost.

<u>First Tier: Local/Community Grievance Redress Committees</u>

The First - Tier redress system will be at the local community level and will use localized redress structures that consider specific project issues, cultural context and local customs that are accessible and cheaper for dispute resolution. The Local Level Grievance Redress Committees will be set up in the project beneficiary communities within the MMDA, and will be the first point of resolving project related grievances.

Second Tier: GWL District Office/ Beneficiary MMDA Grievance Redress Committees

This committee will comprise officials of the respective GWL District Office and MMDA under which the project beneficiary community lies. Complaints may be reported to the Company or MMDA or referred from the First - Tier redress process if resolution fails at that level.

Third Tier: GWL/Project Planning Department (PPD)

The Third-Tier redress process will be the GWL/PPD to address project specific complaints that may be referred by the First and Second -Tier redress processes.

The Court as the Last Resort

Where resolution of complaints or disputes fail at all the three tiers described above, then the complainant can take the matter to the court. However, it is expected that cases may not get to this level as the three levels above would be able to amicably resolve the conflicts.

8.6 Grievance Redress for Employees of the Contractor

Aggrieved workers are to first and foremost register their grievances with their immediate supervisors or site engineers. Grievances that are beyond the control of supervisors and unresolved grievances shall be escalated to the management level of the Construction Firm through a hot line. This contact number must be advertised so that workers are aware of it and encourage to use it without being intimidated or targeted for negative feedback. Alternatively, workers could resort to grievance boxes to be mounted at vantage places within the project communities or visit the District offices of GWL. In addition, a three-tier grievance redress mechanism is proposed to make the process more transparent and participatory.

These are as follows:

- A dedicated focal person (management level) receiving, investigating, and providing feedback to workers reporting grievances;
- Grievance Redress Team, made of a representative of the workers, a representative from management staff of the contractor and the Project Supervision Consultants; and
- When an aggrieved party is not satisfied with the outcome of the first and second tier processes, he/she/they can proceed to the law court. Similar processes and timelines for resolving community level grievances are proposed for the workers grievance.

8.7 Membership of the Grievance Redress Committees

The Grievance Redress Committees at each level will include the following:

First- Tier Grievance Redress Committee Members:

- The elected Assemblyman of the electoral area of the beneficiary community
- Two Unit Committee Members of the beneficiary committee
- Contractor's Safeguards Officer
- Supervising Consultant or Representative
- GWL Safeguards Officer/LICSD Officer

Second -Tier Grievance Redress Committee Members:

- GWL District Manager
- Coordinating Director (or Representative) of the Beneficiary MMDA
- Assembly Member of the project area
- GWL Safeguards Officers
- Representative of the Supervising Consultant

Third -Tier Grievance Redress Committee Members:

- Chief Manager of PPD, GWL Head Office
- Chief Manager, LICSD, GWL Head Office
- GWL Safeguards Officers/Specialist
- MMDA Project Coordinator
- GWL District Manager

8.8 Functions of the GRCs

- Receive and compile project related complaints.
- Ensures that the concerns of complainants are addressed amicably and suggestions are considered where feasible.
- Ensure that the grievances are resolved impartially and confidentially.

8.9 Steps of the Grievance Redress Process

The general steps of the grievance process comprise:

- Registration of complaints;
- Verifying of complaints;
- Determining and implementing the redress action;
- Verifying the redress action; and

- Monitoring and Evaluation.

8.9.1 Registration of Complaints

Complaints can be lodged verbally, face- to- face meetings and in writing to any of the Redress Committees. Also, complaints can be sent to the Head Office directly through the toll-free line (0800 40000), email (info@gwcl.com.gh), whatsapp (+233 555 123 393) and text messages (+233 207 385 089) for dissermination to the appropriate Redress Committee members.

The committees will be duly formed and trained prior to the commencement of the construction stage. Posters indicating relevant telephone lines of the committee members and the above contacts will be distributed and displayed in the pipeline construction communities. At the local community level, the elected Assembly Member for the area will receive complaints and log in a dedicated logbook/complaint form since the Assembly Member lives within the local community and is easily accessible. This will ensure simple and straightforward complaints process. At the GWL District Office as well as the District or Municipal Assembly level, the GWL District Engineer and a rep at the Assembly shall receive all complaints and shall officially log these complaints in dedicated logbook for that purpose and forwarded to the Redress Committees for redress.

First- Tier

The Assembly Member upon receipt of the complaints will acknowledge receipt of the complaint within 24 hours. He/ She will inform the complainant about the status of the grievances and if the grievance can be resolved by the Grievance Committee (i.e. if it necessitates no consultation with other organizations where relevant). The maximum time to get a corrective action to a complaint is within 5 days. Where it is possible that complaints can be resolved immediately upon receipt that should be done. The PAPs have the right to escalate complaints to the next level.

2nd Tier GRC

The 2nd tier GRC will be chaired by the GWL District Manager or designated representative. Grievances determined to be beyond the 1st Tier committee will be escalated to the 2nd level of resolution at the MMDA level. Consultations will be held with relevant authorities to determine solution for the complainant. In such cases, the time frame for the determination of possible corrective actions shall be 10 working days after the receipt and acknowledgement of the complaint or extended in consultation with the affected persons. After corrective actions are determined, the proposed solutions or corrective/preventive actions shall be communicated to

the complainant within the agreed timeframe. The corrective steps, timeframe within which they are to be completed, and the party responsible for implementing the corrective actions shall be recorded. Once an agreement has been reached between the applicant and the responsible party on the corrective actions, the applicant will sign off the grievance on the acceptance of resolution.

If the applicant remains dissatisfied with the outcome, additional corrective action will be agreed on and carried out by the responsible party. The Committee has a maximum of 20 days following the application within which to resolve any grievances properly lodged with it.

3rd Tier GRC

If complainant remains dissatisfied with the decision of the 2nd -Tier level Grievance Redress Team, the Grievance Redress Team should forward the issue to PPD of the GWL for further action. The Chief Manager of the PPD and Chief Director of LICSD in consultation with the relevant GWL District Manager and MMDAs will set up an appropriate mediation team to resolve the issue within 2 weeks from the date of receipt of such a decision. If such a timeline is not possible, the project would inform the complainant accordingly giving reasons and possible new date.

8.9.2 Verifying of Complaints

Once a complaint and/or suggestion / comment has been forwarded to the Committee, the Chairperson of the Committee will nominate a committee member to verify the issue prior to a thorough investigation, and to prepare a report based on findings for consideration of the Committee. The investigations will include collecting and review of relevant information, making site visits, consulting appropriate staff, contacting external stakeholders (if required) and interviewing the complainant as appropriate. Complaints that can be resolved immediately can be addressed immediately.

8.9.3 Determining and Implementing the Redress Action

When a grievance/dispute is recorded as per above-mentioned registration procedures, the grievance redress team will be called into action, and mediation meetings will be organized with interested parties. Minutes of meetings will be recorded. The grievance redress team will determine the redress action in consultation with the complainant, if necessary.

8.9.4 Verifying the Redress Action

The grievance redress team in company with the complainant, will visit the complaint area to verify if satisfactory redress action has been carried out. If the complainant is not satisfied with

the outcome of the redress action, additional steps will be taken to resolve the issue or reach an amicable agreement. Verification will be completed within 7 days of the execution of the redress action.

8.9.5 Redress Decision and Feedback

The Redress Committee will decide on all matters received, in consultation with the complainant, and provide feedback on the necessary actions taken. When the complainant is satisfied with the redress action, the complaint will be closed and logged in the grievance logbook.

8.9.6 Additional Steps and Court of Law

If the complainant remains dissatisfied with the mediation effort of the GWL, the complainant has the right to pursue other redress options or appropriate recourse via a competent court of jurisdiction of Ghana. The Constitution allows any aggrieved person the right of access to Court of law.

8.9.7 Financing of the GRM

An estimated amount of GHC 8,000.00 each will be used for the operation of Grievance Redress Teams in each beneficiary community to implement the grievance processes. The estimated total is therefore GHC296, 000.00. The GRM process will be financed by the project funds.

8.10 Community Representatives on the Grievance Redress Committee

During the ESIA preparation consultation with the community members, it was generally agreed that the three-tier redress system established by the project is the best way of resolving conflicts or complaints in a timely manner and in an amicable way rather than resorting to the court. Each community will appoint their representatives (male and female) to the Local Level Grievance Redress Committees.

The mediation process shall be confidential, transparent, and objective, as well as accountable, easy, fast, accurate and participatory.

GWL shall offer training for the committee members on their roles and responsibilities about the grievance redress system and the process to ensure respect for rights and anonymity of complainant, and also that the system is compliant with AfDB safeguard policy requirements.

8.11 Monitoring of GRM

The GWL Safeguards Officer, LICSU Officers, GWL District Managers and MMDAs Focal persons will jointly monitor the activities of the Grievance Redress Teams to ensure that complaints and grievances lodged by PAPs are properly logged, followed-up and resolved amicably. The Safeguards Officer will compile monthly grievance redress reports across the committees for presentation as part of the progress report of the project.

General monitoring indicators shall include:

- Public consultation;
- Grievance procedures in place and functioning;
- Timely resolution of grievance;
- Timely implementation of agreed redress actions including reinstatement of properties affected; and
- Amicable resolution of grievances

9. REMEDIATION PLAN

This chapter presents a proposed Remediation Plan for restoring environmental and social conditions after decommissioning and closure of the climate resilient water system utilization project.

Circumstances may arise in the near future when the proposed project may need to be decommissioned and closed. This could be due to heavy and widespread pollution of water running through the pipelines, operational cost burdens, technological obsolescence, or even natural disaster inter alia. In all these cases, there would be the need to decommission the proposed project infrastructure.

Irrespective of the fact that early decommissioning of the project is not foreseen, environmental and socio-economic considerations will be a priority in decommissioning and closure.

The Plan outlines the strategies, responsibilities, and monitoring framework necessary to ensure the safe restoration of the project area to its pre-construction or acceptable ecological condition. The plan aligns with Ghana's environmental legislation and the African Development Bank's Environmental and Social Safeguards to ensure sustainability, pollution prevention, and community well-being during post closure activities once the decision to decommission is taken.

The company shall pursue environmentally sustainable alternatives that will favour the protection of the environment and promote socio-economic development options of the proposed area.

9.1 Objectives of the Remediation Plan

The specific objectives are to:

- Restore disturbed areas to stable, safe, and productive conditions.
- Eliminate or control environmental contamination from project activities.
- Ensure proper decommissioning and disposal of residual materials and waste.
- Promote re-vegetation and ecological regeneration.
- Prevent erosion and protect water resources.
- Ensure that closure activities comply with legal and institutional requirements.
- Facilitate effective post-closure monitoring and community involvement

9.2 Identification of Major Considerations

The decommissioning of the project will involve a consideration of the following infrastructure:

- The entire pipeline route and associated trenches
- Valve chambers, and temporary work areas
- Decommissioned meters and supporting infrastructure

In addition to the physical facilities listed above, consideration will be given to:

- Waste (Solid and liquid) Management
- Re-vegetation and land-use
- Post-closure monitoring programme
- Socio-economic impact of project closure on employees
- Socio-economic impact of project closure on neighbouring communities
- Notification to, and discussion with stakeholders

Each of the above items will require individual consideration to develop the most acceptable remediation options.

9.3 Remediation Activities

9.3.1 Pipeline Corridor and Trench

- Backfill trenches using stockpiled soil and compact to natural contours.
- Remove all pipeline debris, supports, and materials.
- Restore ground profile to prevent water pooling and subsidence.

9.3.2 Soil Remediation

- Excavate and treat hydrocarbon contaminated soil via bioremediation or offsite disposal.
- Reapply topsoil (minimum depth: 15–30 cm) to promote vegetation recovery.
- Conduct soil testing to ensure contaminants are within EPA approved limits.

9.3.3 Vegetation Restoration

- Replant native grass, shrub, and tree species to stabilize soil.
- Protect restored vegetation from grazing for at least six (6) months.
- Involve local communities in replanting and maintenance.

9.3.4 Waste Management

- Collect and segregate all decommissioning waste (metal, plastic, concrete, etc.).
- Recycle reusable materials through approved recyclers.
- Dispose of hazardous waste (oil, chemicals) at licensed EPA facilities.

9.3.5 Drainage and Erosion Control

- Construct temporary silt traps and erosion barriers (e.g., silt fences, check dams) in areas where the pipeline RoW traverse drainage systems such as Owere River in Patriensa and Volta Lake at Kpando-Torkor.
- Monitor erosion-prone areas until vegetation is established.
- Restore any disturbed stream crossings or culverts to natural flow conditions.

9.3.6 Remediation of Socioeconomic impacts on workers and community

- Early notification of decommissioning and closure
- Alternative livelihood support for workers and clients who commercialise GWL water.
- Promote the use of alternative water supply system that are safe.

9.4 Post Remediation Monitoring and Evaluation

Table 9-1: Post Remediation Monitoring and Evaluation

Parameter	Indicator	Frequency	Responsibility
Soil Quality	▪ Hydrocarbon ▪ nutrients ▪ pH	Quarterly	Safeguard Specialist
Vegetation Cover	▪ % cover ▪ species count	Biannual	Safeguard Specialist
Water Quality	▪ Turbidity ▪ BOD ▪ COD ▪ pH	Quarterly	GWL Water Quality Specialist
Erosion Control	▪ Stability of slopes and gullies	Monthly	Site Engineer
Community Feedback	▪ Complaints ▪ Satisfaction level	Quarterly	Safeguard Specialist

9.5 Institutional Responsibilities

Table 9-2: Institutional Responsibilities

Institution / Stakeholder	Key Responsibilities
Ghana Water Limited	Lead implementation and financing of remediation plan.
Environmental Consultant	Supervise remediation, monitoring, and prepare reports.
EPA	Review, approve, and certify closure and remediation.
District Assembly	Support local monitoring and community participation.
Water Resources Commission	Ensure protection of watercourses and water quality.
Local Communities	Participate in replanting, monitoring, and feedback activities.

10. CONCLUSION

The GWL is committed to ensuring that the Proposed Project pipeline construction activities are carried out in a manner that is environmentally and socially sustainable, safeguarding the health and safety of the construction workers, the people living in the adjacent areas of the construction works and the general public. The ESIA was informed by the potential environmental and social impacts of the project on the project's areas of influence that have been identified. The mitigation measures outlined in the ESMP will also ensure a high level of health, safety and environmental management for the project.

A plan for monitoring the environmental and social impacts mitigation measures implementation has been integrated into the ESMP in order to ensure that all impact indicators for all the environmental and social components in every phase of the project are within limits throughout the life of the project. It is expected that through the implementation of this ESIA, the proposed project construction activities will not have any negative impacts on the environmental and social conditions of the area in any significant manner either locally or at the national level.

11. LIST OF APPENDICES

Appendix 1: EPA Letter

Appendix 2: Sample Maps with the Proposed Pipelines

Appendix 3: Detailed Reports on Community Engagements

Appendix 4: Evidence of Stakeholder Consultation

Appendix 5: Stakeholder Consultation Attendance Records

Appendix 6: Water Quality Results and Pictures

Appendix 7: Selected Ambient Air and Noise Quality Monitoring Pictures

Appendix 8: Calibration Records

Appendix 9: Flora and Fauna Screening of Selected Project Municipalities/Districts

Appendix 1: EPA Letter

GHANA WATER COMPANY LIMITED

Main Bankers: GCB Bank Limited
Societe Generale Ghana
National Investment Bank

My Ref. No.: DMD/OPS/GEA/V-1/115

Your Ref.

Head Office
Post Office Box MB 194
Accra - Ghana
West Africa

18 JUNE 2025

THE EXECUTIVE DIRECTOR
ENVIRONMENTAL PROTECTION AGENCY
P.O.BOX MB326 MINISTRIES
ACCRA, GHANA

CHIEF MANAGER (PPD)
GHANA WATER LTD.
(HEAD OFFICE)
26 JUN 2025
RECEIVED

ATTENTION: ANDRAINA NK NELSON (HEAD/EAA UNIT)

SUBMISSION OF REGISTRATION FORM EA1 FOR THE CLIMATE RESILIENT WATER SYSTEM UTILIZATION PROJECT.

The GWL intends to undertake the above-mentioned project to improve water services for vulnerable communities in Low-Income Urban Communities (LIUCs) across Ghana through a transition towards a more climate-resilient source of water.

The project is expected to lay over **100km** of distribution lines across the selected regions along the road corridors and reservations. The project is targeted at locations of the Ghana Water Limited where there is enough installed production capacity that is underproducing due to limited distribution networks to transport the water to the consumers. The selected regions for this intervention are the **Ashanti Region, Bono Region, Central Region, Eastern Region, Volta Region, Upper West Region, and the Upper East Region.**

We therefore submit for your attention and necessary action, the completed project registration form EA1 as part of the Environmental Assessment process to secure an Environmental Permit for this project.

For further information, do not hesitate to contact the under-mentioned persons for any assistance and clarification required.

Ing. Edward Agyekum by email: edagyekum@gwcl.com.gh and on phone: 0244262719

Abdul Fatawu Tambro by email: aftambro@gwcl.com.gh and on phone: 0247090918

Yours faithfully,

ING. MICHAEL DOTSE-BAIDOO
(AG. GENERAL MANAGER - OPERATIONS)

CC: AG. Managing Director, GWCL Head Office
AG. General Manager (Finance and Administration), GWCL Head Office
Chief Manager (PPD), GWCL Head office

Board of Directors: Hon. Patrick Yaw Boamah (Chairman), Ing. Dr. Clifford A. Braimah (Managing Director), Mr. Noah Tumfo, Mr. Michael Ayetu, Hon. Akwasi Kenadu, Chief Kalachewura Ewantomah Zakaria, Hon. Kwame Amporfo Twumasi Sars. Prof. Forster Kum-Ankomu Sarpong, Mrs. Vida Dutl, Mr. Joseph Acolatse, Ing. Hadisu Alhassan
Registered Office: 28th February Road, (Near Independence Square)
Telephone: 233-308-386-537

Tel: 050 669 9466, 050 669 4760
Fax: 233 (0302) 662690
Email: info@epa.gov.gh
Ghana Post (GPS): GA-107-1998

Environmental Protection Authority
P. O. Box MB 326
Ministries Post Office
Accra, Ghana
Website: http://www.epa.gov.gh

GHANA WATER LTD. GENERAL MANAGER 14 JUL 2025 (OPERATIONS) HE

Our Ref: CI/7128/01/02

9th July 2025

The General Manager
Ghana Water Company Limited
P.O Box MB 194
Accra

Dear Sir,

PRELIMINARY ENVIRONMENTAL ASSESSMENT (PEA) FOR THE PROPOSED CLIMATE RESILIENT WATER SYSTEM UTILIZATION PROJECT IN SELECTED REGIONS OF GHANA

We acknowledge receipt of the completed Environmental Assessment Registration Form (Form EA1) on the proposed Climate Resilient Water Systems Utilization Project submitted to the Authority for the purpose of obtaining environmental approval in accordance with the Environmental Assessment Regulations, 1999 (LI 1652).

The proposal falls in the category of undertakings for which a Preliminary Environmental Assessment (PEA) is required to help understand the likely implications of the proposal and the mitigation measures to consider in order to ensure sound decision-making and sustainable implementation of the project.

In line with Regulation 9 of LI 1652, you are advised to undertake a **Preliminary Environmental Assessment for *each of the 9 regions selected*** for the implementation of the project and submit **five (5) hard copies** of the Preliminary Environmental Report (PER) **per each region** to the Authority for review prior to environmental approval.

Please find attached a format to guide in the preparation of the PER.

Do not hesitate to contact the EPA Head Office **(Room 304/5)** or the undersigned on **0501301449** or **E-mail:** caa.dept@epa.gov.gh for any assistance or guidance you may require in this regard.

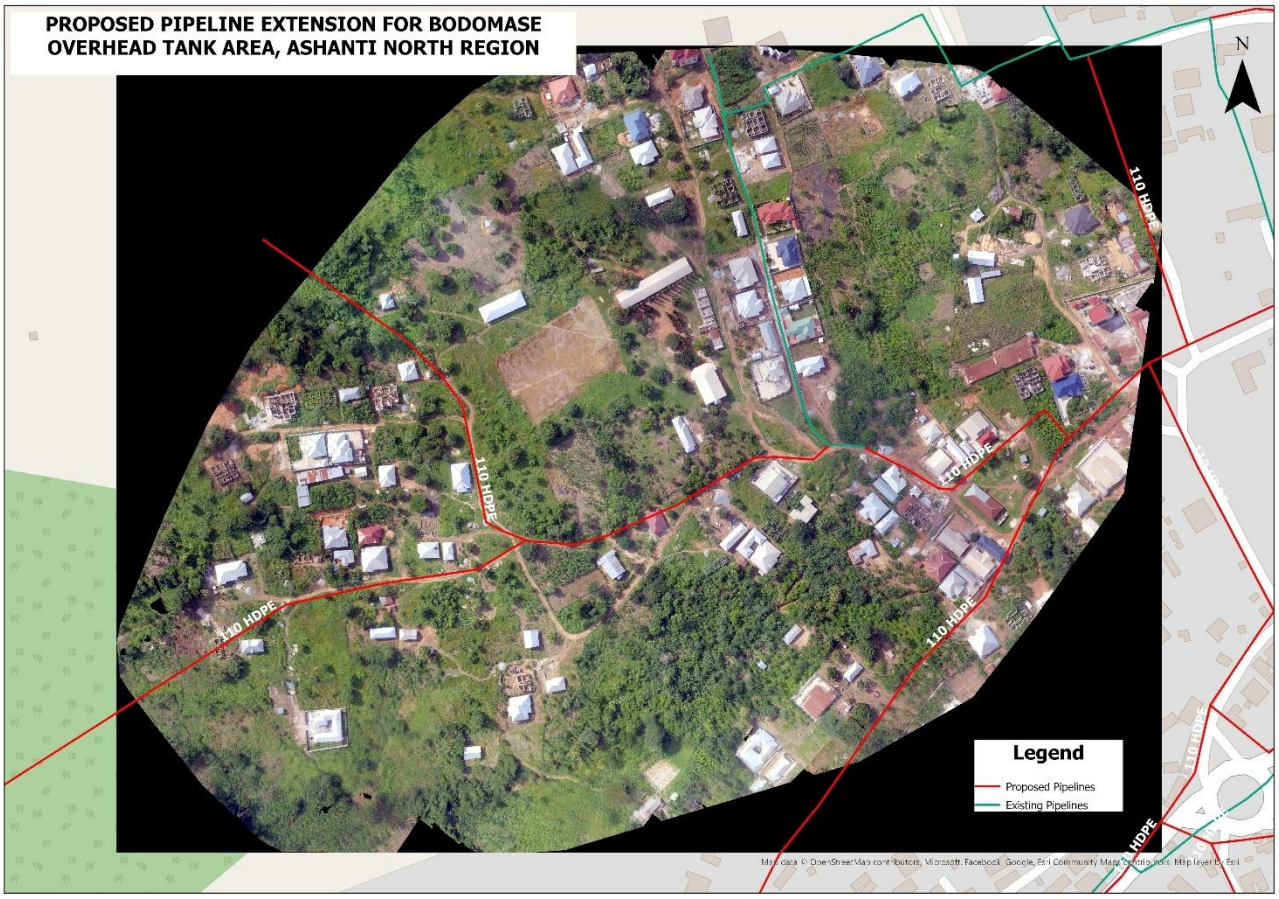
Yours faithfully,

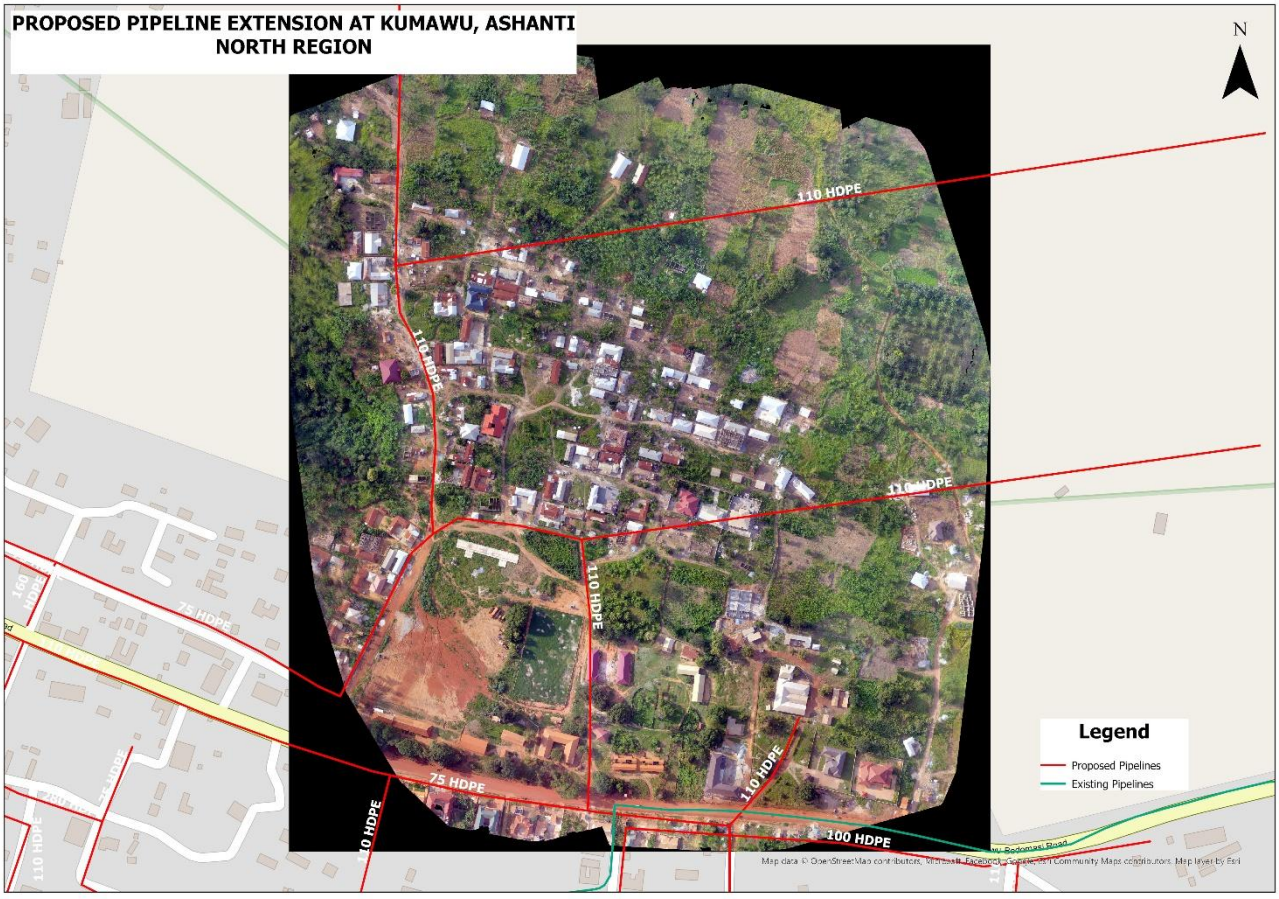
JOHN L. DOGHLE
DEPUTY DIRECTOR/EAA UNIT
FOR: Ag. CHIEF EXECUTIVE OFFICER

CC: *Director, EAAM Department, EPA Head Office, Accra*
Director, EPA Accra West Regional Office, Amasaman
Director, EPA Accra East Regional Office, Tema
Director, EPA Western Regional Office, Secondi
Director, EPA Central Regional Office, Cape Coast
Director, EPA Upper East Regional Office, Bolgatanga
Ag. Director, EPA Ashanti Regional Office, Kumasi
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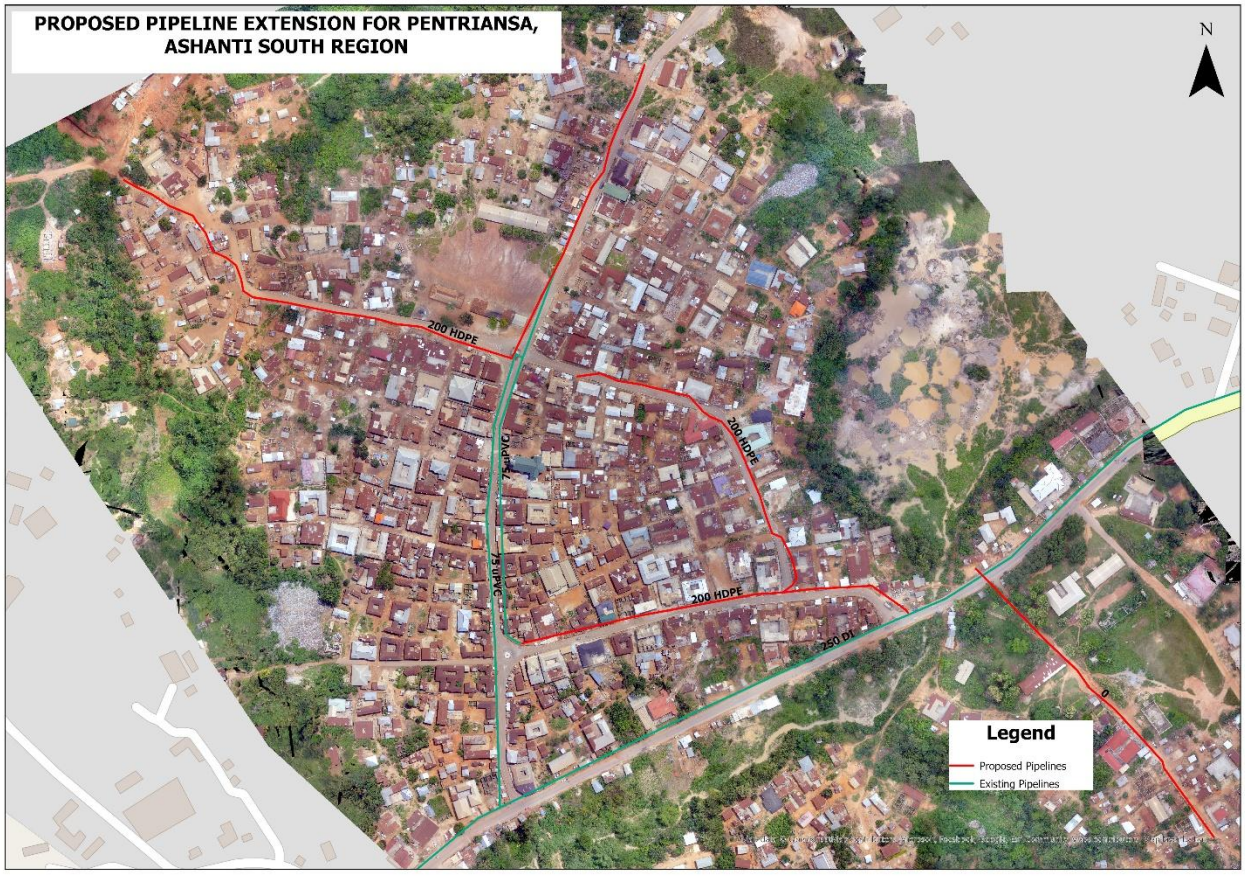
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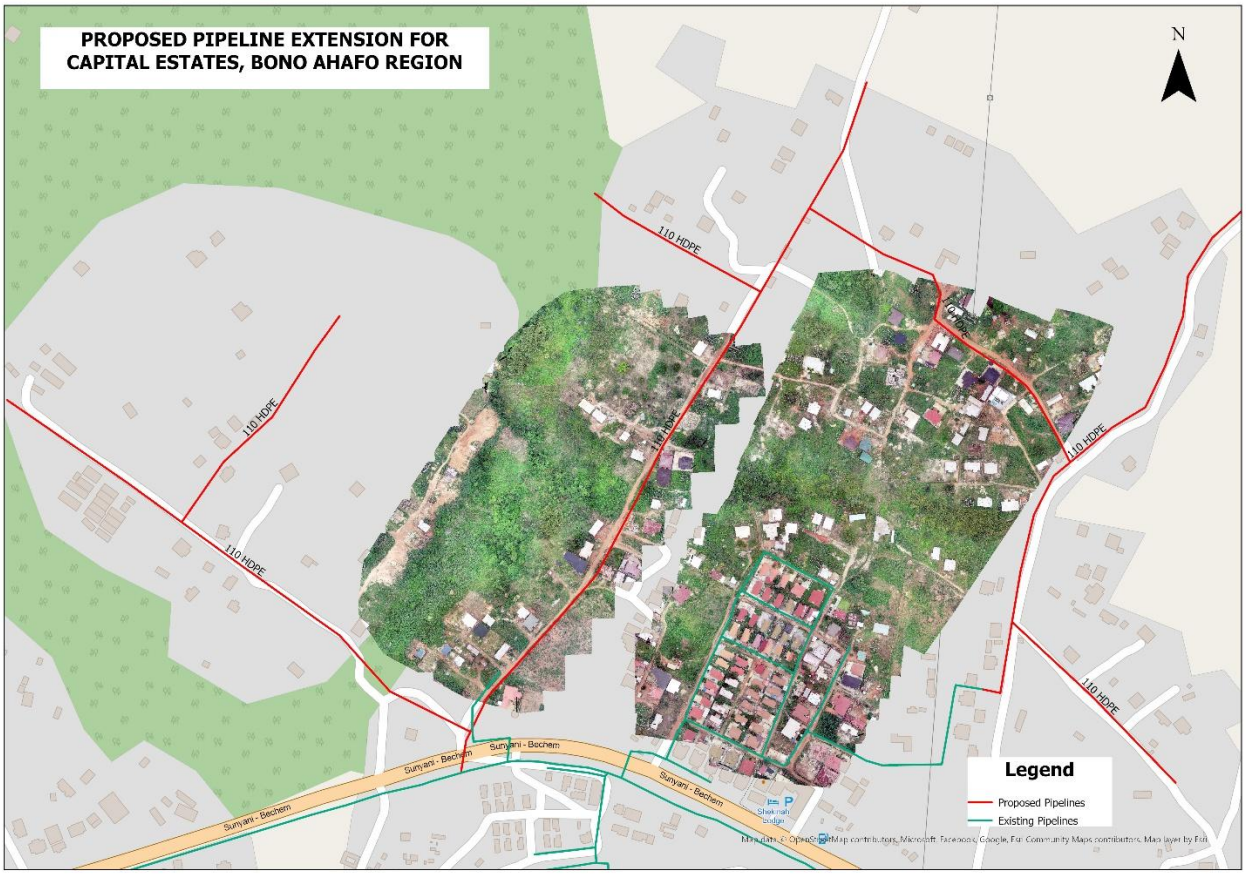
Appendix 2: Sample Maps for Proposed Pipelines in The Project Communities

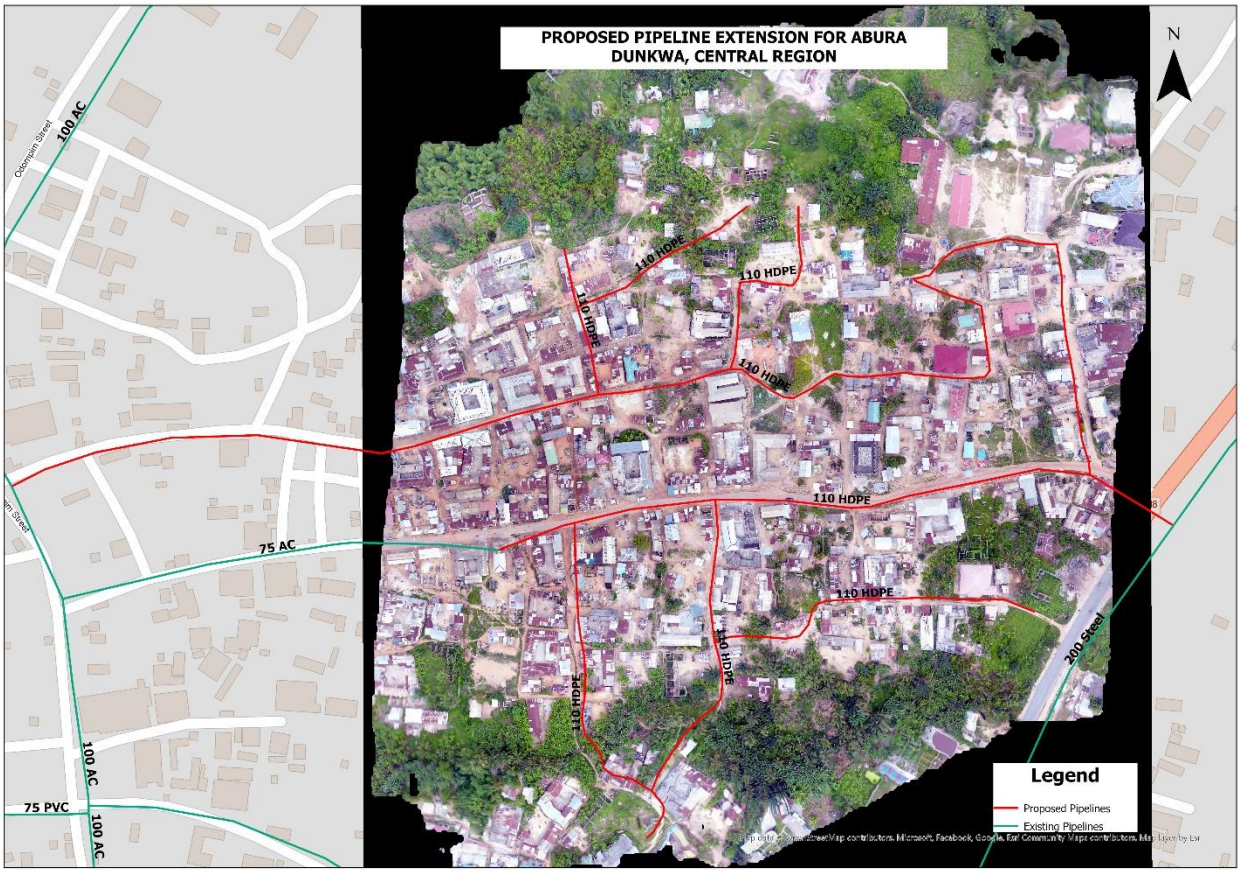

PROPOSED PIPELINE EXTENSION FOR BODOMASE OVERHEAD TANK AREA, ASHANTI NORTH REGION
N
110 HDPE
110 HDPE
110 HDPE
110 HDPE
110 HDPE
Legend
Proposed Pipelines
Existing Pipelines

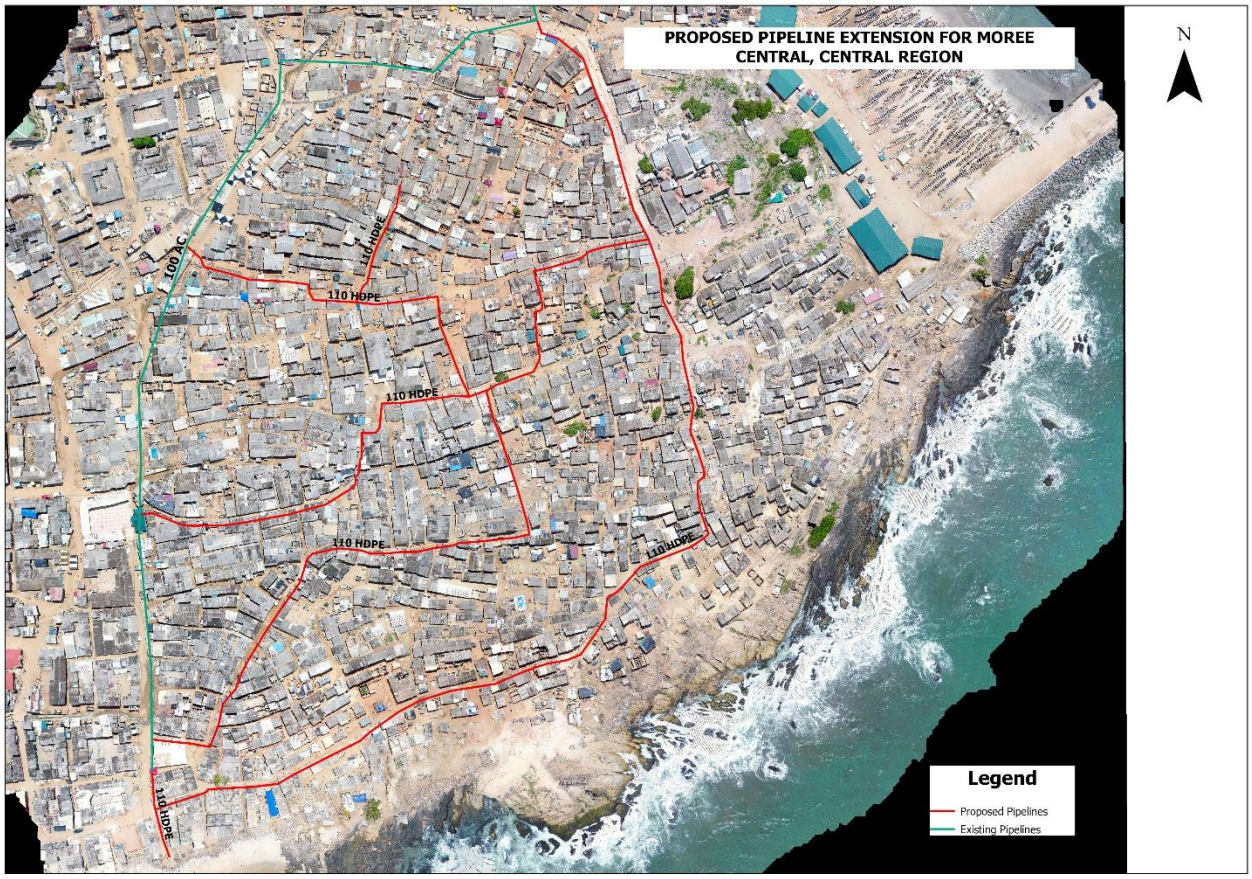

PROPOSED PIPELINE EXTENSION AT KUMAWU, ASHANTI NORTH REGION
N
110 HDPE
110 HDPE
110 HDPE
110 HDPE
75 HDPE
75 HDPE
100 HDPE
Legend
Proposed Pipelines
Existing Pipelines


PROPOSED PIPELINES EXTENSION FOR AHENBRONMU, ASHANTI SOUTH REGION
N
200 HDPE
Legend
Existing Pipelines
Proposed Pipeline
100 uPVC


PROPOSED PIPELINE EXTENSION FOR PENTRIANSA, ASHANTI SOUTH REGION
N
200 HDPE
200 HDPE
200 HDPE
250 DI
Legend
Proposed Pipelines
Existing Pipelines

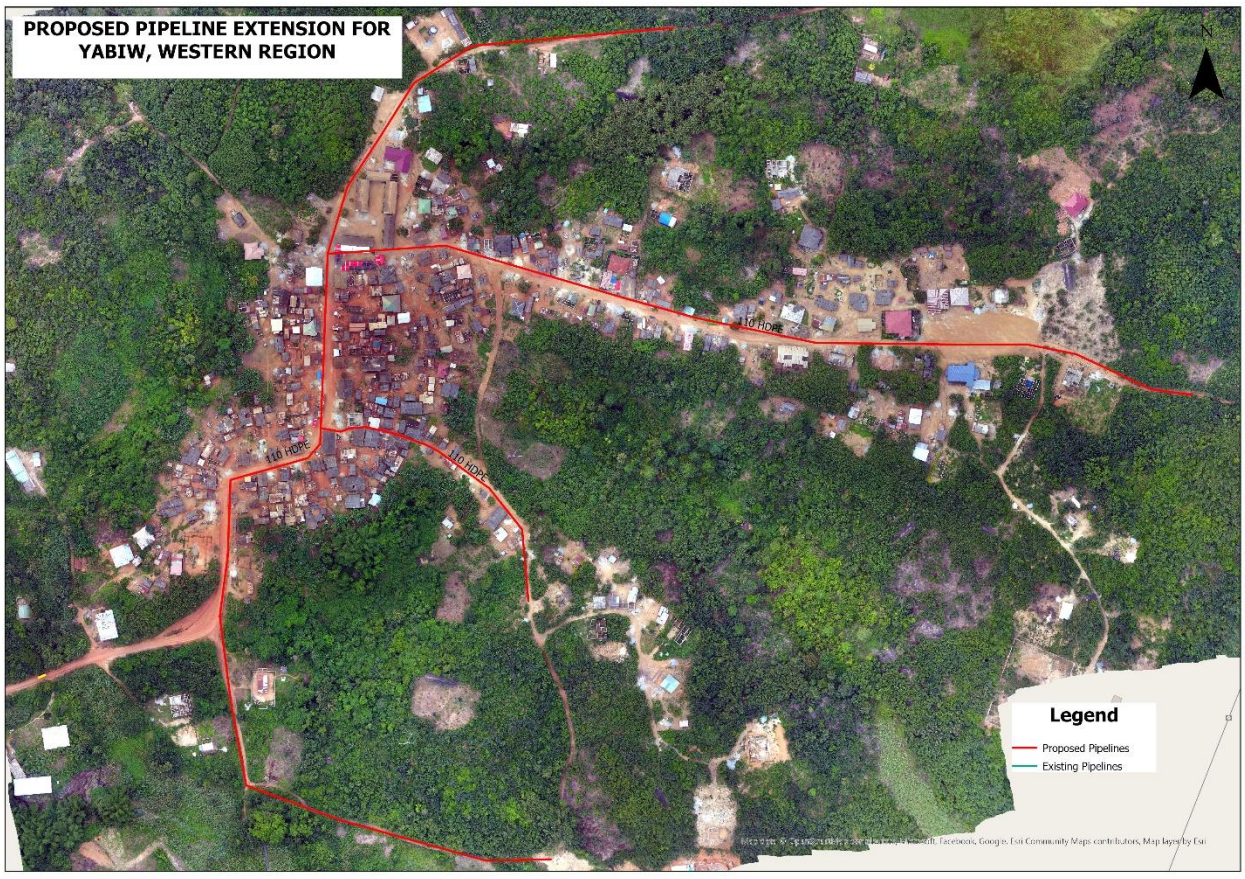

PROPOSED PIPELINE EXTENSION FOR CAPITAL ESTATES, BONO AHAFO REGION
N
110 HDPE
Sunyani - Bechem
Legend
Proposed Pipelines
Existing Pipelines


PROPOSED PIPELINE EXTENSION FOR ABURA DUNKWA, CENTRAL REGION
N
100 AC
75 AC
75 PVC
110 HDPE
200 Steel
Legend
Proposed Pipelines
Existing Pipelines


PROPOSED PIPELINE EXTENSION FOR MOREE CENTRAL, CENTRAL REGION
N
100 AC
110 HDPE
110 HDPE
110 HDPE
110 HDPE
110 HDPE
110 HDPE
Legend
Proposed Pipelines
Existing Pipelines


N
110HDPE
110HDPE
110HDPE
110HDPE
PROPOSED PIPELINES EXTENSION FOR KPANDO TORKOR


PROPOSED PIPELINE EXTENSION FOR NEW TAKORADI, WESTERN REGION
N
Legend
Proposed Pipelines
Existing pipelines
110 HDPE


PROPOSED PIPELINE EXTENSION FOR YABIW, WESTERN REGION
N
110 HDPE
110 HDPE
110 HDPE
Legend
Proposed Pipelines
Existing Pipelines

Appendix 3: Detailed Reports on Community Engagements (Opinion Leaders and Community Members)

CONSOLIDATED KEY INFORMANT INTERVIEW REPORT: CLIMATE RESILIENT WATER SYSTEM UTILIZATION PROJECT

This report synthesizes findings from a series of Key Informant Interviews (KIIs) conducted for the African Development Bank Climate Action Window project. It consolidates the perspectives of diverse community leaders and members across several operational regions of Ghana Water.

1. INTERVIEW SUMMARY

a) Context: Interviews were conducted with key informants from various communities, including Wurompo, Koase, Abura Dunkwa, Abakrampa, Kambali, Gadza, and Dzoanti. Respondents included Assembly Members, Chiefs, Community Elders, a Teacher, a Headmaster, a Health Worker, and a 68-year-old woman.

b) Key Messages:

- The project is overwhelmingly welcomed and seen as essential, frequently summarized by the sentiment, *"Water is life."*
- Access to reliable water is expected to bring significant health, economic, and educational benefits, reducing waterborne diseases, freeing up time for women and children, and boosting local businesses.
- Major concerns revolve around construction-related safety hazards, particularly the danger of unattended open trenches for children and vulnerable persons.
- There is a strong emphasis on the need for equity and affordability to ensure that low-income households and vulnerable groups are not excluded.
- Close collaboration with local leadership (Chiefs, Assembly Members, elders) is considered critical for project success.

c) Critical Recommendation: The single most critical recommendation is to ensure the project is implemented equitably and safely, with a focus on making water connections affordable for vulnerable populations and strictly managing construction hazards like open trenches to protect the community.

2. PARTICIPANT VOICE

a) Stand-out Quotes:

- *"He who gives water, gives life and hence, is doing the Lord's work."* (Assembly Man, Wurompo) - This quote captures the profound moral and social value placed on providing water to the community.
- *"When I cannot afford water, I have no choice but to fetch from the stream."* (Woman, 68, Abura Dunkwa) - This provides a direct, personal voice to the economic struggles and health risks faced by vulnerable residents.
- *"Without money, people fetch from the stream, and that brings disease."* (Elder 2, Abakrampa) - This concisely links the issues of poverty, water access, and public health.

- *"No water, no work- the laboratory comes to a standstill."* (Health Worker, Kambali) - This highlights the critical role of water in sustaining essential community institutions like health clinics.

b) Non-verbal Observations: Across the interviews, facilitators observed high levels of engagement. Informants often leaned forward, maintained strong eye contact, and used hand gestures to emphasize points. Emotions ranged from frustration and anxiety when discussing existing hardships (e.g., crime, lack of water) to eagerness and authority when discussing the project's potential and the need for proper implementation.

3. PROJECT PERSPECTIVES

3.1 Opportunities Identified

Informants consistently identified a wide range of benefits they anticipate from the project.

- Benefits to Institution/Community: The primary opportunity is the provision of safe, reliable, and accessible water, which is expected to fundamentally improve community life. This will reduce the time and effort women and children spend fetching water, allowing children to focus on education and women to engage in economic activities. Health workers anticipate a significant reduction in waterborne diseases (typhoid, cholera, diarrhea). For local leaders like Assembly Men, the project is expected to reduce water-related community disputes.
- Specific Improvements Anticipated: Key informants look forward to job creation for local youth during the construction phase. The increased availability of water is also expected to boost small-scale businesses and the overall local economy. The project is also seen as an opportunity to extend water lines to critical institutions like hospitals and schools and to improve community safety by installing fire hydrants.

3.2 Concerns Raised

While optimistic, the informants also expressed several concerns.

- Risks and Worries Expressed: The most frequently mentioned risk is the physical danger posed by construction activities, especially unattended open trenches, which are a hazard to children, the elderly, and persons with disabilities. Other environmental concerns include dust and noise pollution during construction. Some informants worried that the project might not be implemented equitably, expressing that *"beneficiaries should not be selective or given preferential treatment."*
- Implementation Challenges Foreseen: A key challenge is ensuring the affordability of the water connection for low-income households. A teacher in Koase noted a potential conflict between Ghana Water Limited (GWL) and private water vendors whose business may be impacted. Past negative experiences with other infrastructure projects, such as projects being started but not completed, have created some scepticism and a strong desire for timely completion of this project.

4. IMPACT CONSIDERATIONS

4.1 Social and Environmental Risks

- Main Risks Identified: Beyond the immediate construction risks, a major social risk is the continued reliance on unsafe water sources (like streams) if the new piped water is not affordable. This perpetuates a cycle of disease.
- Existing Community Challenges Mentioned: The project must be aware of several pre-existing challenges in the target communities. These include poor waste management (relying on single dump sites or having inadequate containers), choked or poor drainage systems, and settlements in waterlogged areas. Several informants also highlighted petty theft and crime as a significant community issue. In Kambali, poor sanitation and a lack of toilet facilities leading to open defecation were raised as related public health concerns.

4.2 Vulnerable Groups

- Specific Groups Requiring Special Attention: Across all interviews, the following groups were consistently identified as needing special consideration: the elderly/aged, children, persons with disabilities (with specific mention of the visually impaired), women and girls (including single mothers and widows), and low-income households.
- Suggested Protective Measures: To protect these groups, informants strongly recommended that the project reduce the connection cost for them to ensure they can afford access. They also reiterated the need for strict safety protocols during construction, such as placing visible warnings and covering all trenches in a timely manner.

5. IMPLEMENTATION INSIGHTS

5.1 Institutional Requirements

- Permits/Approvals Needed: Most informants, particularly Assembly Men and Chiefs, stated that no permits were required from them directly. However, they uniformly advised that the project contractors must secure all necessary permits and approvals from the relevant Municipal Assembly.
- Known Conflicts with Existing Infrastructure: For the most part, informants reported no known conflicts with existing infrastructure or development plans. However, a Headmaster in Kambali recounted a past negative experience where a school construction project was delayed after a contractor accidentally burst a GWL pipeline, leading to a dispute.
- Past Project Experiences: Experiences are mixed. Some communities reported positive experiences with donor-funded projects. However, others noted negative experiences with feasibility studies that led to no follow-up action or, more critically, infrastructure projects that were abandoned incomplete, leaving behind hazards like uncovered drains.

5.2 Collaboration Recommendations

- How to Coordinate with Local Institutions: The consensus was that project implementers must work in close, face-to-face collaboration with local institutions. Regular progress meetings were recommended to ensure transparency and clear communication.

- Key Stakeholders to Involve: A comprehensive list of essential stakeholders was provided:
  - Traditional Authorities: Chiefs and their elders.
  - Local Government: Assembly Members and unit committee members.
  - Community Leaders: Religious leaders (church leaders and imams), women leaders, and youth groups.
  - Institutions: Teachers (and the PTA) and local health workers.
  - Media: Local information centers to broadcast safety messages and updates.
- Support the Institution Can Provide: The informants offered significant support, including disseminating information to the community, facilitating stakeholder awareness and education, providing town plans, assisting with monitoring project activities, and helping to safeguard project materials and equipment.

6. FINAL CONSIDERATIONS

- Key Recommendations:
  1. Prioritize Affordability: Ensure connection fees are structured so that low-income and vulnerable households can afford to connect.
  2. Enforce Strict Safety Standards: Timely completion of works, especially the covering of excavated trenches, is paramount to prevent accidents.
  3. Ensure Comprehensive Coverage: Extend distribution lines to all parts of the communities, including newly developing areas and critical facilities like hospitals and schools.
  4. Engage Continuously: Maintain strong, transparent collaboration with the full spectrum of community leaders and stakeholders throughout the project lifecycle.
  5. Incorporate System Safeguards: Include necessary infrastructure like fire hydrants and air valves to ensure system safety and reliability.
- Additional Issues: Informants in Kambali requested that the project developers consider the community's broader challenges with sanitation and inadequate toilet facilities, which are closely linked to public health and water quality.
- Closing Emphasis: The final message from all key informants was a unified and enthusiastic endorsement of the project. They stressed that access to water is a fundamental need that will transform their communities for the better. Their final plea was for an implementation process that is inclusive, safe, and respectful of the community's needs and leadership.

INDIVIDUAL FOCAL GROUP DISCUSSION REPORT CLIMATE RESILIENT WATER SYSTEM UTILIZATION PROJECT

Ashanti North Region - Kumawu Community

1. SESSION OVERVIEW

This focal group discussion was conducted in Kumawu, located in the Ashanti North Region, as part of the African Development Bank Climate Action Window environmental and social impact assessment for Ghana Water's Low Income Customer Support water infrastructure project. The session brought together 34 participants from three distinct demographic groups: 11 girls aged 12-21 (32%), 11 women aged 18-49 (32%), and 12 men/community leaders (35%), resulting in a gender distribution of 65% female and 35% male participants.

The atmosphere was characterized by unanimous excitement and enthusiasm about the project, with 100% of participants expressing they were "very happy" about the news of water pipes coming to their community. Participants viewed this development as a long-awaited solution to their water access challenges, with many emphasizing their immediate need for household connections. The discussion revealed a community that has been struggling with water access issues, where residents have delayed applying for connections due to prohibitive costs. The participants actively engaged in all aspects of the discussion, providing detailed insights about their hopes, concerns, and specific recommendations for successful project implementation.

2. PARTICIPANT PROFILE

The 34 participants represented a cross-section of Kumawu community stakeholders, carefully selected to capture diverse perspectives on the water project's potential impacts. The group comprised:

- 11 Girls (32%): Young females aged 12-21 who shared their experiences of the burden of water collection and its impact on their daily lives
- 11 Women (32%): Adult females aged 18-49 who provided insights on household water management and family needs
- 12 Men/Community Leaders (35%): Male participants including traditional leaders who offered perspectives on community governance and economic impacts

The overall gender balance favoured female participation at 65%, ensuring strong representation of those traditionally most affected by water access challenges. Participants demonstrated deep knowledge of their community's water situation and previous development projects. The men/leaders group specifically noted that community members "have not applied yet due to the high cost of the new service connection," indicating economic constraints affecting the entire community.

3. COMMUNITY WATER SITUATION

The Kumawu community faces significant water access challenges that have created daily hardships for residents. As expressed by the women's group, the upcoming project will "ease their burden and help them secure water connections in their homes." The girls' group

particularly emphasized how the current situation causes "burden and stress" in their daily search for water.

The men/leaders articulated the economic dimension of the water crisis, stating explicitly that they "need household water connections but have not applied yet due to the high cost of the new service connection." This reveals a community where water infrastructure exists but remains inaccessible due to financial barriers. The current coping mechanisms involve time-consuming water collection activities that particularly burden women and girls, who must "search for water to fetch by themselves."

The emotional impact was evident in participants' expressions of gratitude and happiness about the project announcement, suggesting that water access has been a long-standing source of community stress. The immediate and enthusiastic reception of the project news, with participants expressing eagerness for it to "commence soon," underscores the urgency of the water situation in Kumawu.

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The community's response to the project announcement was overwhelmingly positive, with 34 participants (100%) indicating they were "very happy" about the news. This unanimous enthusiasm was reflected across all demographic groups, with no participants expressing uncertainty or opposition.

The women noted specifically that the project would "ease their burden," while the men/leaders group "expressed enthusiasm about the project and emphasized their eagerness for it to commence soon." The girls expressed "happiness and gratitude" toward the Low Income Customer Support Department of Ghana Water for initiating this project. This universal positive reception suggests strong community readiness for the intervention and highlights the critical nature of water access needs in Kumawu.

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will bring, with the following distribution of responses:

- More reliable piped water to homes/compounds: 31 participants (91%)
- Easier and cheaper house connections: 20 participants (59%)
- Better roads/drains after works: 7 participants (21%)
- Short-term jobs for local people: 6 participants (18%)
- More public taps/standpipes: 4 participants (12%)

The men/leaders group specifically articulated hopes for "more reliable piped water, additional public taps, subsidized household connections, short-term job opportunities for local residents, and improved roads and drainage after the project is completed."

Beyond water infrastructure, participants requested additional support:

- Give us clear information on a regular basis: 15 participants (44%)
- Flexible payment plan for the connection fee: 15 participants (44%)
- Build/repair public toilets (WASH) where needed: 14 participants (41%)

Additional specific requests included provision of water reservoirs (mentioned by multiple participants in open-ended responses), streetlights, refuse disposal containers, and road construction.

4.3 Concerns and Anticipated Impacts

While generally supportive, participants identified specific concerns about construction impacts:

Construction Period Worries:

- Roads/paths blocked; hard to move around: 17 participants (50%)
- Damage to houses/kiosks/walls or items: 12 participants (35%)
- Children's safety near open trenches: 12 participants (35%)
- No concerns or worries: 4 participants (12%)

Environmental Impacts:

- More dust in the air from digging: 28 participants (82%)
- Loud noise during the day/night: 11 participants (32%)
- Blocked gutters leading to flooding: 6 participants (18%)
- Soil erosion from trenches: 6 participants (18%)

Effects on Daily Activities:

Mixed responses emerged regarding daily life disruptions:

- No effect on daily life: 14 participants (41%)
- Children's route to school becomes hard/unsafe: 12 participants (35%)
- Harder to move around: 10 participants (29%)
- Shops lose customers/trading spot blocked: 10 participants (29%)

Vulnerable Groups Identified:

- Everyone equally affected: 21 participants (62%)
- School pupils, children & teachers: 16 participants (47%)
- Elderly people, people with disabilities, pregnant women: 11 participants (32%)

4.4 Livelihood and Property Impacts

The economic impact assessment revealed optimistic expectations:

- Better business later because of improved water supply: 20 participants (87%)
- Chance for short-term jobs with the project: 4 participants (17%)

Notably, no participants anticipated negative economic impacts such as business closures or customer losses.

For potential property impacts, participants emphasized fair treatment:

- Give timely notice before construction starts: 21 participants (91%)

- Help with transport/relocation or alternative site: 2 participants (9%)
- Involve Assembly and traditional leaders: 1 participant (4%)

4.5 Health, Safety, and Security Concerns

Primary safety worries included:

- Open trenches people could fall into: 25 participants (74%)
- Dust causing breathing/eye problems: 18 participants (53%)
- Accidents from big trucks and machines: 6 participants (18%)
- Risk of harassment for women and girls: 4 participants (12%)

Past construction experiences revealed mixed outcomes:

- Dust/noise was too much: 15 participants (44%)
- Property was damaged without payment: 12 participants (35%)
- No problems experienced: 12 participants (35%)

Safety measures recommended:

- Clear warning signs and barriers around trenches: 20 participants (59%)
- Announce work plan early: 14 participants (41%)
- Worker ID badges and code of conduct: 10 participants (29%)
- Regular meetings with community: 9 participants (26%)

4.6 Cultural and Community Considerations

A critical cultural consideration emerged: 23 participants (100% of those responding) identified a sacred tree called "Papase" that must not be disturbed during construction. This was consistently mentioned across all three discussion groups, indicating its significant importance to the community.

Community protocols emphasized:

- Respect chiefs, elders, and leaders; talk to them first: 23 participants (100%)
- Security concerns/night-time issues: 10 participants (43%)
- Best meeting times/days: 3 participants (13%)

4.7 Recommendations from Participants

Key advice for contractors:

- Timely inform everyone before starting: 14 participants (61%)
- Restore roads/drains quickly and clean site daily: 11 participants (48%)
- Hire local workers (include women and youth): 9 participants (39%)
- Control dust and noise: 5 participants (22%)

5. KEY QUOTES AND OBSERVATIONS

While specific verbatim quotes were limited in the documentation, several key expressions captured participant sentiments:

- On the project's importance: Participants stated they "need household water connections but have not applied yet due to the high cost of the new service connection"
- On current hardships: The project would "ease their burden and help them secure water connections in their homes"
- On urgency: Participants "expressed enthusiasm about the project and emphasized their eagerness for it to commence soon"
- On safety: Concerns about "children's safety near open trenches" during construction
- On cultural sensitivity: The "Papase" sacred tree "should not be disturbed during construction"

The facilitators noted consistent themes of gratitude and anticipation across all groups, with participants actively engaging in discussions about implementation details.

6. CRITICAL INSIGHTS FROM THIS GROUP

Most Pressing Concerns:

1. Immediate need for water connections - Multiple participants emphasized wanting "connection immediately" (mentioned 8 times in open responses)
2. Protection of the sacred Papase tree - Universal agreement on this cultural red line
3. Dust and safety management - 82% concerned about dust, 74% about open trenches
4. Cost barriers - Need for flexible payment plans or subsidized connections
5. Community engagement protocols - Strong emphasis on respecting traditional leadership

Unique Perspectives:

- The community shows remarkable unity in their response, with no dissenting voices about the project's value
- Economic constraints are the primary barrier to water access, not infrastructure absence
- Strong emphasis on leaving a positive legacy beyond just water infrastructure

Specific Conditions for Support:

- Proper consultation with chiefs and opinion leaders before project commencement
- Implementation of comprehensive safety measures
- Provision of additional infrastructure (reservoirs, street lights, public toilets)

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

The Kumawu community's primary message is one of urgent need coupled with enthusiastic support. Participants want the team to understand that:

- Water connection is an immediate priority for the community
- Traditional governance structures must be respected - "inform chiefs and opinion leaders before start of project"

- The project represents more than infrastructure - it's about dignity and reduced burden
- Safety measures are non-negotiable, particularly for vulnerable groups
- The sacred Papase tree is an absolute boundary that must not be crossed

7.2 Readiness and Conditions for Acceptance

The community demonstrates complete readiness for the project, with 100% expressing happiness about its announcement. Their acceptance is conditioned on:

- Respect for traditional leadership and proper consultation protocols
- Protection of cultural sites, specifically the Papase sacred tree
- Implementation of safety measures to protect children and vulnerable groups
- Provision of flexible payment options for connections

The repeated emphasis on wanting "water immediately" and "connections immediately" indicates not just readiness but impatience for implementation.

7.3 Open Questions and Additional Comments

In the final open-ended section, 34 participants provided additional input, with key themes including:

- Immediate water needs (10 mentions of immediate connection/water needs)
- Leadership consultation (11 mentions of informing/seeking permission from chiefs)
- Infrastructure legacy (7 mentions of reservoirs, streetlights, leaving a legacy)
- Project supervision (mentions of "continuous and joint supervision")

The community's final message emphasizes their desire for the project to commence quickly while respecting local protocols and leaving lasting positive impacts beyond just water connections. Their vision extends to comprehensive community development, including lighting, sanitation, and economic opportunities for youth.

CONCLUSION

The Kumawu community presents as an ideal candidate for this water infrastructure project, demonstrating unanimous support, clear articulation of needs, and constructive engagement with implementation planning. Their primary concerns centre on practical safety issues and respect for cultural heritage rather than opposition to the project itself. The community's readiness is evident in their immediate response: rather than questioning whether the project should proceed, they focus on how to implement it successfully while maximizing benefits and minimizing disruptions. The protection of the Papase sacred tree emerges as the single most critical cultural consideration that must be incorporated into project planning.

INDIVIDUAL FOCAL GROUP DISCUSSION REPORT

Compound/Shared Facilities Users Group - Konongo Mayanka Community
Ashanti South Region, Ghana

1. SESSION OVERVIEW

This focal group discussion was conducted with residents of compound houses and users of shared water facilities in Konongo Mayanka, a community within the Ashanti South Region of Ghana. Konongo is located approximately 53 kilometres from Kumasi, the Ashanti capital, and has historically been a gold and manganese mining area. The session brought together 12 participants representing households that currently rely on shared water facilities or live in compound housing arrangements where water access is communal.

The discussion revealed an overwhelmingly positive reception to the Ghana Water Low-Income Customer Support Department's pipeline extension project. All participants expressed strong enthusiasm and gratitude for the initiative, viewing it as a long-awaited solution to their water challenges. The atmosphere was notably hopeful, with participants actively engaging in discussions about both the opportunities and challenges the project might bring. The group demonstrated a clear understanding of their role as shared facility users and the unique perspectives this brings to water infrastructure planning.

2. PARTICIPANT PROFILE

The focal group consisted of 12 participants with the following demographic composition:

- 5 female participants (42%)
- 7 male participants (58%)
- All participants represented compound households or were users of shared water facilities (100%)

Participants were selected specifically as representatives of compound houses and shared facility arrangements, which are common residential configurations in the Konongo Mayanka community. This group composition provided unique insights into the challenges of communal water access and the complexities of managing water resources in multi-family living situations. The gender balance, while slightly male-dominated, allowed for diverse perspectives on water collection responsibilities and household water management strategies.

3. COMMUNITY WATER SITUATION

Based on the discussion notes, participants painted a picture of a community struggling with inadequate water access that significantly impacts daily life. The current water situation forces residents, particularly children, to spend considerable time fetching water from distant sources. This burden affects educational opportunities as children must often collect water before or after school hours.

Compound houses and shared facility users face particular challenges in water access, as multiple families must coordinate water collection and storage. The absence of reliable piped

water means residents depend on alternative sources that may be inconsistent in quality and availability. The facilitator noted that participants were "happy and thankful" when discussing the project, suggesting the current water situation has created significant hardship that residents are eager to see resolved.

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The response to news of the Ghana Water pipeline extension project was unanimously positive:

- 12 participants (100%) reported feeling "Very happy"
- 0 participants expressed any form of hesitation or opposition

This extraordinary level of enthusiasm reflects the acute need for improved water services in Konongo Mayanka. Participants expressed gratitude specifically to Ghana Water's Low-Income Customer Support Department, indicating awareness that this initiative targets communities like theirs that have historically struggled to afford water infrastructure improvements.

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will deliver:
Primary Infrastructure Benefits:

- More reliable piped water to homes/compounds: 12 participants (100%)
- Easier and cheaper house connections: 8 participants (67%)
- Short-term jobs for local people: 1 participant (8%)

The universal desire for reliable piped water underscores this as the community's primary need. The high interest in affordable connections (67%) reveals cost has been a significant barrier to water access.

Additional Support Requested:

Participants emphasized needs beyond basic infrastructure:

- Build/repair public toilets (WASH): 8 participants (67%)
- Clear information on a regular basis: 3 participants (25%)
- Flexible payment plan for connection fees: 3 participants (25%)
- Support for affected traders: 2 participants (17%)
- Support for schools/clinics: 1 participant (8%)

The strong emphasis on toilet facilities (67%) indicates significant sanitation challenges in the community. As noted in the open responses, participants repeatedly mentioned the need for "public toilet," "toilet facility," and "provision of toilet facilities and refuse dump."

4.3 Concerns and Anticipated Impacts

Construction Period Worries: Participants expressed multiple concerns about the construction phase:

- Children's safety near open trenches: 15 participants (95%)
- Roads/paths blocked: 3 participants (25%)

The predominant concern about property damage reflects the vulnerability of compound structures, which may have shared walls or foundations that could be affected by excavation work.

Environmental Impacts:

- Dust from digging: 12 participants (100%)
- Loud noise: 4 participants (33%)

Every participant anticipated dust problems, indicating either past experience with construction projects or recognition of their community's susceptibility to dust-related issues.

Impact on Daily Activities:

Notably, most participants were optimistic about minimal disruption:

- No significant effect on daily life: 10 participants (83%)
- Harder to move around: 1 participant (8%)
- Shops lose customers: 1 participant (8%)
- Children's routes affected: 1 participant (8%)

Vulnerable Groups:

Participants identified specific groups requiring special consideration:

- Elderly, disabled, and pregnant women: 12 participants (100%)
- School children and teachers: 4 participants (33%)

The universal concern for elderly, disabled, and pregnant residents demonstrates strong community solidarity and awareness of differential impacts.

4.4 Livelihood and Property Impacts

Economic Impacts:

Most participants anticipated minimal economic disruption:

- No effect on livelihoods: 10 participants (83%)
- Better business from improved water supply: 2 participants (17%)
- Fewer customers due to dust/noise: 1 participant (8%)

Compensation Preferences:

If property must be affected, participants prioritized:

- Timely notice before construction: 11 participants (92%)
- Involvement of Assembly and traditional leaders: 5 participants (42%)

The emphasis on advance notice (92%) indicates a strong desire for preparation time and respect for residents' planning needs.

4.5 Health, Safety, and Security Concerns

Primary Safety Worries:

- Dust causing breathing/eye problems: 11 participants (92%)
- Open trenches as falling hazards: 9 participants (75%)

Past Construction Experiences:

Participants recalled problems from previous projects:

- Excessive dust/noise: 9 participants (75%)
- Poor road/drain restoration: 1 participant (8%)
- Poor worker behaviour: 1 participant (8%)
- No problems experienced: 1 participant (8%)

These experiences clearly inform current concerns and expectations for the water project.

Safety Measures Requested:

- Announce work plan early: 12 participants (100%)
- Regular community meetings: 6 participants (50%)
- Clear warning signs and barriers: 2 participants (17%)

4.6 Cultural and Community Considerations

No participants identified sacred sites or culturally sensitive areas that would require special consideration during construction, simplifying project planning in this regard.

4.7 Recommendations from Participants

Advice for Contractors:

- Timely information before starting: 11 participants (92%)
- Control dust and noise: 3 participant (8%)

Community Knowledge to Consider:

- Respect chiefs, elders, and leaders: 12 participants (100%)
- Security concerns at night: 4 participants (33%)

The universal emphasis on respecting traditional leadership indicates this is non-negotiable for community acceptance.

5. KEY QUOTES AND OBSERVATIONS

According to the facilitator's notes, participants expressed that they were "happy and thankful that Ghana Water's low-income customer support department is bringing a major project to extend water pipes and improve water service in the community."

Participants specifically mentioned concerns about "children's safety around trenches, dust from digging, and possible damage to houses or kiosks." They emphasized that "schoolchildren, the elderly, people with disabilities, and pregnant women would suffer the most."

The group stressed that "everyone should be informed before pipe construction starts, and the chief and community leaders must be consulted first." This reflects the strong traditional governance structures that remain influential in the community.

While specific individual quotes were not captured verbatim in the notes, the facilitator observed genuine enthusiasm mixed with practical concerns about implementation. The

repeated mentions of toilet facilities in the open-ended responses (appearing in 11 of 12 responses) demonstrates this was a dominant discussion theme even beyond water supply.

6. CRITICAL INSIGHTS FROM THIS GROUP

Most Pressing Concerns:

1. Sanitation Infrastructure Gap: The overwhelming focus on toilet facilities indicates compound houses face severe sanitation challenges that water supply alone won't resolve.
2. Property Vulnerability: As compound house residents, participants showed heightened concern about structural damage, reflecting the interconnected nature of their living arrangements.
3. Dust Management: The 100% concern about dust, combined with 75% reporting past dust problems, makes this a critical issue requiring proactive management.
4. Traditional Authority Protocol: The universal insistence on respecting traditional leaders indicates project success depends on proper engagement with these authorities.
5. Information Flow: The strong desire for regular, clear communication suggests past projects may have suffered from poor community engagement.

Unique Perspectives from Compound/Shared Facility Users:

This group brings specific insights about communal living challenges. Their emphasis on equitable access, shared infrastructure needs, and coordination requirements reflects the complexity of serving multi-family residential arrangements. The high interest in both individual connections and public facilities suggests a mixed approach may be needed to serve different economic capacities within compound houses.

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

Participants conveyed several key messages for project implementation:

- The community has waited long for this improvement and views it as transformative for quality of life
- Proper consultation with traditional authorities is mandatory, not optional
- Advance notice and clear communication are essential for community cooperation
- The elderly, disabled, and pregnant women need special consideration during construction
- Sanitation improvements (toilets) are nearly as important as water supply
- Past construction projects have caused problems through poor communication and inadequate restoration
- Night-time security is a concern that contractors must address

7.2 Readiness and Conditions for Acceptance

The community demonstrates complete readiness to embrace the project, with 100% expressing happiness about the initiative. However, this enthusiasm comes with clear conditions:

- Traditional protocols must be followed - chiefs and elders consulted first
- Advance notice must be given before work begins in any area
- Property damage must be fairly compensated

- Dust control measures must be implemented
- Safety barriers must protect vulnerable residents

The absence of opposition suggests strong project support, contingent on respectful and professional implementation.

7.3 Open Questions and Additional Comments

The open-ended responses revealed a consistent theme beyond water supply: sanitation infrastructure. Eleven of twelve participants independently raised the need for toilet facilities and refuse dumps:

- "Construction of a toilet facility"
- "Provision of refuse dump"
- "Public Toilet, Market need"
- "Provision of public toilet and refuse dump"
- "Provision of toilet facilities and refuse dump"

This convergence on sanitation needs indicates the community views water and sanitation as interconnected challenges requiring integrated solutions. The repeated emphasis suggests this topic dominated the closing discussion and represents a critical community priority that extends beyond the current project scope but could significantly impact project acceptance and perceived success.

8. CONCLUSION

The Konongo Mayanka compound houses and shared facilities focal group presents a community eager for water infrastructure improvements while maintaining practical concerns about implementation. Their unanimous enthusiasm, combined with specific requests for communication, safety measures, and respect for traditional authorities, provides a clear roadmap for successful project execution. The overwhelming emphasis on sanitation infrastructure alongside water supply suggests an integrated WASH approach would maximize project impact and community satisfaction. With proper attention to the concerns raised—particularly dust control, property protection, and traditional protocols—this project appears to have strong community support and likelihood of success.

INDIVIDUAL FOCAL GROUP DISCUSSION REPORT

Eastern Region - Combined Sessions Report

1. SESSION OVERVIEW

This report documents three focal group discussions conducted in the Eastern Region of Ghana as part of the Environmental and Social Impact Assessment for the Ghana Water Climate Action Window Project, funded by the African Development Bank. The sessions comprised distinct demographic groups from three communities: Akim Oda Old Town (Shared Facilities and Compound Houses group), Ofoasekuma (Men and Community Leaders), and Akim Swedru (Women's group).

A total of 30 participants engaged in these discussions - 12 female participants (40%) and 18 male participants (60%). The sessions were structured to capture diverse perspectives: 10 participants from the Women's group (ages 18-49), 10 from the Men and Community Leaders group, and 10 from the Shared Facilities and Compound Houses group. The overall reception was notably positive, with participants expressing genuine excitement about the upcoming water infrastructure project. Non-verbal observations recorded participants as "happy," "interested," and "concerned" - indicating engaged and hopeful communities that have struggled with water access challenges for extended periods.

2. PARTICIPANT PROFILE

The 30 participants represented a cross-section of Eastern Region communities, with deliberate inclusion of groups often most affected by water infrastructure challenges. The Women's group from Akim Swedru consisted of 10 adult women aged 18-49, who displayed particular concern about practical water access issues and safety considerations. The Men and Community Leaders session in Ofoasekuma brought together 10 male participants who emphasized the developmental importance of improved water access, noting that *"the population is bigger than the quantity of water and number of taps they currently have."*

The Shared Facilities and Compound Houses group from Akim Oda Old Town included residents sharing water facilities, representing households with particular vulnerabilities to water service disruptions. This demographic composition ensured perspectives from those managing household water needs, community leaders responsible for broader welfare, and residents in shared living arrangements who face unique water access challenges.

3. COMMUNITY WATER SITUATION

Participants across all three sessions articulated significant water access challenges that have persisted for years. The Men's group in Ofoasekuma explicitly stated they *"have suffered for long,"* with inadequate water quantity and insufficient tap points for their growing population. Current coping mechanisms involve long queues at existing taps, with the Women's group in Akim Swedru specifically mentioning *"no more queues"* as a hoped-for benefit of the project.

A critical concern raised by the Men's group was the quality of existing tap water, described as "hard" and undrinkable, forcing residents to seek alternative water sources. This dual challenge of insufficient quantity and poor quality has created daily hardships, particularly for women who bear primary responsibility for household water collection. The excitement expressed across all groups - with one participant declaring *"Water is life"* - underscores the fundamental nature of this infrastructure gap in their daily existence.

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The community's response to news of the water infrastructure project was overwhelmingly positive. Twenty-eight participants (93%) expressed being "very happy" about the project, while 2 participants (7%) indicated they needed more information before forming an opinion. Notably, no participants expressed unhappiness or opposition to the project.

The facilitator notes emphasize that participants were "excited about the project" and "happy about the upcoming project because they have suffered for long." The Women's group was specifically noted as being "Happy to hear about the project because they will get water." This unanimous positive reception reflects the acute need for improved water infrastructure across these communities.

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will bring to their communities:

- More reliable piped water to homes/compounds: 27 participants (90%) - the highest priority
- Easier and cheaper house connections: 10 participants (33%)
- More public taps/standpipes: 6 participants (20%)
- Short-term jobs for local people: 4 participants (13%)

The Men's group emphasized that *"water would bring development to the community,"* viewing the project as catalytic for broader improvements. When asked about additional support beyond water infrastructure, participants prioritized:

- Build/repair public toilets (WASH): 16 participants (53%)
- Flexible payment plans for connection fees: 14 participants (47%)
- Public standpipes for households that cannot connect: 14 participants (47%)
- Regular information sharing: 12 participants (40%)
- Quick restoration of roads and gutters: 11 participants (37%)
- Support for affected traders: 10 participants (33%)

4.3 Concerns and Anticipated Impacts

While enthusiastic about the project, participants expressed specific concerns about the construction phase. Thirteen participants (43%) indicated they had no concerns, demonstrating significant trust in the project. However, others identified potential challenges:

Construction Period Worries:

- Children's safety near open trenches: 19 participants (67%)
- Roads/paths blocked: 8 participants (27%)
- Flooding from blocked drains: 7 participants (23%)
- Water supply cuts during works: 6 participants (20%)
- Loss of income for traders: 5 participants (17%)

Environmental Impacts Anticipated:

- Dust from digging: 12 participants (40%)
- Blocked gutters leading to flooding: 10 participants (33%)
- Tree cutting: 6 participants (20%)

Notably, 13 participants (43%) believed there would be "no or little effect" environmentally, and 22 participants (73%) didn't think construction would significantly affect their daily lives.

Vulnerable Groups Identified:

Participants showed particular concern for:

- Elderly people, people with disabilities, pregnant women: 12 participants (40%)
- School pupils, children, and teachers: 11 participants (37%)
- Traders/market women and roadside sellers: 4 participants (13%)

However, 13 participants (43%) believed no group would face particular hardship, indicating confidence in project management.

4.4 Livelihood and Property Impacts

Regarding economic impacts, 14 participants (47%) anticipated no effect on livelihoods, while others saw both opportunities and challenges:

Positive Economic Impacts:

- Better business from improved water supply: 7 participants (23%)
- Short-term job opportunities: 3 participants (10%)

Negative Economic Impacts:

- Blocked access to shops/markets: 5 participants (17%)
- Temporary closure of vending spaces: 3 participants (10%)
- Fewer customers due to dust/noise: 3 participants (10%)

For property relocation, participants emphasized fair and transparent processes:

- Timely notice before construction: 30 participants (80%)
- Involvement of Assembly and traditional leaders: 25 participants (43%)
- Rebuilding affected structures: 8 participants (27%)

The Men's group specifically requested "at least 3 months" advance notice, while the Women's group suggested "2 months ahead of time." Both groups emphasized involving district assemblies and traditional authorities in resolving disputes.

4.5 Health, Safety, and Security Concerns

Safety priorities focused on physical hazards:

- Open trenches as fall risks: 19 participants (63%)
- Dust causing breathing/eye problems: 12 participants (40%)
- Accidents from trucks and machines: 9 participants (30%)
- Risk of harassment for women and girls: 3 participants (10%)

Previous construction experiences were mixed. While 10 participants (33%) reported no problems from past projects and 8 participants (27%) had no previous projects in their area, others shared concerning experiences:

- Excessive dust/noise: 7 participants (23%)
- Poor road/drain restoration: 4 participants (13%)
- Damaged property without payment: 3 participants (10%)

The Men's group shared a particularly troubling account: *"There was a project that was done to construct a bridge and the contractor impregnated a lot of females."* This highlights serious concerns about worker conduct requiring strict codes of behaviour.

Participants recommended safety measures including:

- Early announcement of work plans: 25 participants (83%)
- Clear warning signs and barriers: 13 participants (43%)
- Regular community meetings: 12 participants (40%)
- Safety talks at schools/compounds: 7 participants (23%)

4.6 Cultural and Community Considerations

Sacred and protected sites identified:

- Sacred trees: 9 participants (30%)
- Churches/mosques: 7 participants (23%)
- School fields/playgrounds: 6 participants (20%)
- Cemetery/burial grounds: 5 participants (17%)

The Shared Facilities group specifically mentioned "a sacred stone and tree" requiring project diversion if affected. The Women's group identified "a sacred place on their roundabout that no one should touch, especially women" where "they bury their leaders on those grounds."

Fifteen participants (50%) indicated no special places requiring protection, but those identified demand careful consultation with traditional authorities.

4.7 Recommendations from Participants

Participants provided extensive advice for contractors:

- Hire local workers (include women and youth): 19 participants (63%)
- Timely information before starting each area: 19 participants (63%)

- Restore roads/drains quickly and clean sites daily: 14 participants (47%)
- Avoid market days/exam times: 8 participants (27%)
- Control dust and noise: 8 participants (27%)
- Keep drains clear: 6 participants (20%)

Regarding community protocols, 26 participants (100% of those responding) emphasized: *"Respect our chiefs, elders, and leaders; talk to them first."* Additional considerations included avoiding work on Sundays and market days.

5. KEY QUOTES AND OBSERVATIONS

Direct Quotes from Participants:

- *"Water is life"* - Shared Facilities participant, Akim Oda Old Town
- *"They have suffered for long"* - Men's group, Ofoasekuma
- *"The population is bigger than the quantity of water and number of taps they currently have"* - Men's group
- *"Water would bring development to the community"* - Men's group
- *"No more queues"* - Women's group, Akim Swedru

Non-Verbal Observations:

The facilitators documented consistent positive emotional responses across sessions. Participants were described as "Happy," "Interested," and "Concerned" - indicating engaged communities ready to participate constructively in the project. The excitement was palpable, particularly when discussing project benefits, though tempered with practical concerns about implementation.

6. CRITICAL INSIGHTS FROM THIS GROUP

Five critical insights emerge from these Eastern Region discussions:

1. **Water Quality Crisis**: Beyond quantity issues, existing tap water is "hard" and undrinkable, requiring the project to address both supply volume and water treatment to meet community needs.
2. **Strong Community Trust with Clear Conditions**: The 43% expressing no concerns demonstrates remarkable confidence, contingent on proper engagement with traditional authorities and adequate advance notice (2-3 months requested).
3. **Sacred Sites Require Careful Navigation**: Multiple sacred locations including trees, stones, and burial grounds demand detailed mapping and consultation to avoid cultural violations.
4. **Previous Construction Trauma**: The reported incident of contractor misconduct involving multiple pregnancies reveals deep-seated concerns about worker behaviour requiring strict codes of conduct and monitoring.
5. **Economic Vulnerability of Shared Facilities Users**: The compound house residents represent particularly vulnerable populations who cannot afford disruptions to water access and need special consideration for payment plans and temporary water provision during construction.

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

The communities convey several key messages:

- They have endured water hardships for years and view this project as transformative
- Respect for traditional leadership structures is non-negotiable - chiefs and elders must be engaged first
- Local employment, particularly for youth and women, is expected and will build community buy-in
- Past negative experiences with contractors create specific concerns about worker conduct
- Water quality improvement is as important as quantity increases

7.2 Readiness and Conditions for Acceptance

Communities demonstrate high readiness for the project with 93% expressing happiness about it. Their acceptance is conditional upon:

- Advance notice of 2-3 months before construction begins
- Regular updates through information centers and community meetings
- Protection of sacred sites through consultation and, if necessary, design modifications
- Inclusion of public standpipes for households unable to afford connections
- Institutional connections for schools to ensure educational continuity

7.3 Open Questions and Additional Comments

Final comments from participants emphasized:

- *"We need more support from Ghana Water"* - indicating desire for ongoing institutional presence
- *"Repair pipe grounds"* - highlighting maintenance concerns
- *"They don't want delays in the project"* - expressing urgency for implementation
- *"They hope any promise made will be fulfilled"* - revealing past disappointments
- *"Institutional connections should be considered especially for schools"*
- *"Existing tap water is hard and it needs to be improved"* - reiterating water quality concerns
- *"Contractors should look after themselves, should not engage in alcoholism and following the women"* - directly addressing behavioural expectations

The sessions concluded with communities expressing cautious optimism - eager for improved water access while seeking assurances that implementation will respect their social structures, protect vulnerable members, and deliver on promises made. Their message is clear: they welcome development but insist it comes with dignity, respect, and genuine community benefit.

INDIVIDUAL FOCAL GROUP DISCUSSION REPORT

Upper East Region Water Infrastructure Project

1. SESSION OVERVIEW

This report documents four focal group discussions conducted in the Upper East Region of Ghana as part of the African Development Bank Climate Action Window water infrastructure improvement project. The sessions comprised 38 participants across four distinct community groups: 10 girls aged 12-21 from Zaare community (26%), 9 female-headed households from Tindonmolgo (24%), 9 men and community leaders from Daporintindongo (24%), and 10 participants from shared/compound households in Yikene (26%). The gender distribution showed 25 female participants (66%) and 13 male participants (34%).

The overall reception to the proposed water project was overwhelmingly positive, with 97% of participants expressing they were "very happy" about the news. Participants demonstrated high levels of engagement throughout the discussions, though facilitators noted varying emotional states ranging from happiness and excitement to exhaustion and expressions of past grievances. The interactive nature of the sessions allowed participants to share detailed experiences about their current water challenges and hopes for the future.

2. PARTICIPANT PROFILE

The 38 participants represented diverse demographic segments critical to understanding community water needs. The girls' group from Zaare consisted of 10 young females who bear significant responsibility for water collection in their households. The 9 female household heads from Tindonmolgo represented families where women serve as primary decision-makers and breadwinners. The men and community leaders group from Daporintindongo included 9 influential male figures who shape community decisions. The shared facilities/compound houses group from Yikene comprised 10 individuals representing households with communal water arrangements.

Facilitators observed that participants were attentive and interactive throughout the sessions. The selection process for participants was not explicitly documented, though the diversity of locations (Yikene, Daporintindongo, Tindonmolgo, and Zaare) suggests intentional geographic representation within the Upper East Region.

3. COMMUNITY WATER SITUATION

Participants painted a stark picture of daily water access challenges that profoundly impact their quality of life. In Yikene, residents reported walking 10-15 minutes to access borehole water when taps aren't flowing, describing their typical day without water as "very tiring." The situation in Daporintindongo is considerably worse, with participants walking "30 minutes or more before they can access potable drinking water," sometimes resorting to "boreholes and unclean wells."

The female household heads in Tindonmolgo face particularly exhausting conditions, walking 30-50 minutes to access water sources, with only "a few piped connections" available. As one participant noted, *"Others also serve water so they do not have to suffer,"* indicating a reliance on community solidarity. The girls from Zaare described their water collection duties as "very exhausting," walking more than 30 minutes to reach water sources.

Current coping mechanisms include sharing water among neighbors, using multiple water sources including boreholes and wells, and organizing water collection around available flow times. One male participant from Daporintindongo mentioned, *"My wife pays when I am not around,"* highlighting household cooperation in managing water access. The inconsistent supply was emphasized: *"Flow isn't constant,"* and safety concerns were raised with participants noting *"They feel unsafe fetching water in the night."*

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The communities' response to the project announcement was remarkably unified, with 37 participants (97%) reporting feeling "very happy" and only 1 participant (3%) feeling "a little bit happy." No participants expressed uncertainty, unhappiness, or opposition to the project.

Discussion notes reveal deeper emotional context behind these statistics. In Yikene, participants "expressed so much joy because the project will improve hygiene and sanitation in the community." The girls from Zaare were particularly articulate about multiple benefits, expressing joy because "the project will improve their education, hygiene and sanitation, restore peace in their community." However, in Daporintindongo, while happiness dominated, some cautiousness emerged as "Others were not sure because they feel we can disappoint them," reflecting past experiences with unfulfilled promises.

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will bring. The most desired outcome was "more reliable piped water to homes/compounds" (35 participants, 92%), followed by "easier and cheaper house connections" (27 participants, 71%). Notably, 11 participants (29%) hoped for more public taps/standpipes, while 8 participants (21%) saw opportunities for short-term local employment. Only 7 participants (18%) mentioned hoping for better roads/drains after works.

Beyond basic infrastructure, participants requested comprehensive support. The highest priority was clear, regular information (29 participants, 76%), followed by flexible payment plans for connection fees (22 participants, 58%). Significant numbers also requested: building/repairing public toilets where needed (17 participants, 45%), restoring roads and gutters quickly (15 participants, 39%), and supporting schools/clinics during works (15 participants, 39%).

Discussion notes emphasized that "Extension pipelines is the most urgent need" across all communities, with specific requests for "more household connections and public/private

toilets." Regarding payment flexibility, communities converged on similar affordability thresholds: Yikene suggested "as low as 150 cedis monthly," while Daporintindongo and Tindonmolgo both requested "as low as fifty Ghana cedis only monthly." Tindonmolgo participants specifically requested "Connections should be 300 cedis."

4.3 Concerns and Anticipated Impacts

Construction period concerns varied significantly across groups. Children's safety near open trenches topped the list (16 participants, 42%), followed by roads/paths being blocked (15 participants, 39%). Notably, 11 participants (29%) expressed no concerns at all. Other worries included: damage to property (11 participants, 29%), flooding from blocked drains (9 participants, 24%), and water supply cuts during works (8 participants, 21%).

Environmental impacts were more evenly distributed in concern levels. While 18 participants (47%) believed there would be "no or little effect," others worried about dust from digging (13 participants, 34%), soil erosion from trenches (12 participants, 32%), and tree cutting (6 participants, 16%). The Yikene group specifically identified dust as "their biggest problem" that "pollutes the atmosphere."

Regarding daily activity disruption, an overwhelming 34 participants (89%) believed the project wouldn't affect their daily life much. This optimism contrasts with specific concerns raised about vulnerable groups. When asked who would face the biggest problems, responses were mixed: 20 participants (53%) said "none," while others identified elderly people, people with disabilities, and pregnant women (8 participants, 21%), everyone equally (8 participants, 21%), and school pupils and teachers (6 participants, 16%).

The Daporintindongo group provided a concrete example of vulnerability: *"A lot of elderly people in the Daporintindongo community have complained on falling into trenches and getting hurt,"* highlighting the real risks of inadequate safety measures.

4.4 Livelihood and Property Impacts

Economic impact perceptions were notably optimistic or neutral. The largest group (18 participants, 64%) anticipated no effect on livelihoods. Among those expecting impacts, 8 participants (29%) saw opportunities for short-term project jobs, while 6 participants (21%) anticipated better business later due to improved water supply. Only small numbers worried about negative impacts: temporary closure of vending spaces (2 participants, 7%), fewer customers due to dust/noise (2 participants, 7%), or sachet/water vendors losing sales (4 participants, 14%).

Regarding compensation preferences, participants showed strong consensus on key principles. Timely notice before construction topped priorities (26 participants, 93%), followed by fair compensation (17 participants, 61%) and involving Assembly and traditional leaders (11 participants, 39%). The definition of "fair compensation" was elaborated in discussion notes: participants wanted "giving affected people money and if possible help them rebuild their

business." For traders, "a one week quick notice will be fine," with emphasis on consulting "the Chief, Assemblyman and other opinion leaders in the community."

4.5 Health, Safety, and Security Concerns

Safety concerns showed interesting polarization: while 19 participants (50%) expressed no safety worries, those with concerns focused primarily on open trenches (13 participants, 34%), accidents from trucks on narrow roads (9 participants, 24%), and dust causing breathing/eye problems (9 participants, 24%). Notably, only 2 participants (5%) worried about harassment of women and girls, with the Daporintindongo group explaining that "Harassment of women and girls are not encountered because mostly workers are picked from the community."

Past construction experiences revealed mixed but concerning patterns. While 14 participants (37%) reported no problems from previous projects, others detailed specific issues: poor communication with no notice (11 participants, 29%), roads/drains not restored well (8 participants, 21%), property damaged without payment (7 participants, 18%), and excessive dust/noise (6 participants, 16%). The Zaare girls group notably reported "No previous projects," indicating this would be their first major construction experience.

Safety measure recommendations showed overwhelming consensus on communication needs: announcing work plans early (37 participants, 97%) and having regular community meetings (23 participants, 61%). Physical safety measures were also prioritized: clear warning signs and barriers (19 participants, 50%) and safety talks at schools/compounds (11 participants, 29%). The most emphasized safety action across all groups was to "cover trenches on a daily basis."

4.6 Cultural and Community Considerations

Cultural sensitivities emerged as a critical consideration. Sacred trees and cemetery/burial grounds were identified as the most important protected sites (16 participants, 57% and 18 participants, 64% respectively). Churches/mosques (4 participants, 14%) and school fields/playgrounds (7 participants, 25%) were also mentioned. Only 5 participants (18%) indicated there were no special places requiring protection.

The protocol for approaching these sensitive areas was consistent across all groups: "The workers must contact our Chiefs, Assemblyman and other opinion leaders before going to such areas." This reflects the strong traditional governance structures that must be respected for project success.

4.7 Recommendations from Participants

Participants provided extensive advice for contractors, with hiring local workers including women and youth receiving the strongest support (23 participants, 82%). Communication again emerged as crucial, with 19 participants (68%) emphasizing timely information before starting in each area. Infrastructure restoration was equally important to multiple groups, with participants requesting contractors "restore roads/drains quickly and clean the site daily" and "keep drains clear" (each 9 participants, 32%).

Community knowledge sharing emphasized respecting traditional leadership, with 26 participants (93%) stating contractors should "Respect our chiefs, elders, and leaders; talk to them first." Practical considerations included identifying "flood-prone spots/blocked drains to watch" (6 participants, 21%) and security concerns/night-time issues (7 participants, 25%).

5. KEY QUOTES AND OBSERVATIONS

Several quotes captured the daily reality of water challenges:

- *"My wife pays when I am not around"* (Participant 7, Daporintindongo) - illustrating household water management strategies
- *"We have an exposed piped line"* (Participant 1, Daporintindongo) - highlighting infrastructure deterioration
- *"They feel unsafe fetching water in the night"* (Participant 5, Daporintindongo) - revealing security concerns
- *"Flow isn't constant"* (Participant 1, Daporintindongo) - emphasizing supply reliability issues
- *"Please reduce the cost of water bills"* (Participant 06, Tindonmolgo) - expressing affordability concerns
- *"We need more water connections"* (Participant 1, Zaare) - stating infrastructure needs directly

Non-verbal observations documented varying emotional states across sessions. The Yikene group appeared "Happy," "Exhausted," and "Interactive." The Daporintindongo men were noted as "Expressing grievances and look sad" while remaining "Attentive." The female household heads showed positive engagement being "Happy," "Interactive," and "Excited." The girls from Zaare were "Very happy" and "Attentive" throughout their session.

6. CRITICAL INSIGHTS FROM THIS GROUP

Five critical insights emerge from these Upper East Region discussions:

1. **Infrastructure Urgency with Affordability Concerns**: While communities desperately need water infrastructure expansion, affordability remains paramount. The requested payment levels (50-150 cedis monthly, 300 cedis for connections) reflect economic constraints that must be addressed through flexible payment plans.
2. **Safety Through Daily Trench Closure**: The repeated emphasis on closing trenches daily, backed by specific examples of elderly people falling and getting hurt, indicates this is a non-negotiable safety requirement based on lived experience.
3. **Traditional Leadership Gateway**: The unanimous emphasis on engaging chiefs, assemblymen, and opinion leaders before any community entry or work near sacred sites reflects deep-rooted governance structures that cannot be bypassed.
4. **Gender-Differentiated Impacts**: While harassment concerns were minimal due to expected local hiring, the burden of water collection falls disproportionately on women and girls, who walk the farthest and feel unsafe during night-time water collection.

5. **Trust Deficit from Past Disappointments**: The comment "we can disappoint them" and requests like "We shouldn't promise and fail the community" reveal underlying scepticism that requires consistent, transparent communication to overcome.

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

Participants want the project team to understand their exhaustion from current water access challenges and their genuine excitement about improvements. They emphasize that this project represents more than infrastructure - it's about "improving education, hygiene and sanitation, restoring peace in their community." They stress the importance of deep trenching to prevent erosion exposure, comprehensive community engagement through traditional structures, and maintaining affordable access through flexible payment options.

The technical concern about trench depth was specifically articulated: "We should dig our trenches very deep so that erosion doesn't expose them," reflecting local knowledge about soil conditions. The plea "We shouldn't promise and fail the community" encapsulates the desire for reliable follow-through.

7.2 Readiness and Conditions for Acceptance

Communities demonstrate high readiness for the project, with 97% expressing happiness about it. However, this enthusiasm comes with clear conditions: respect for traditional leadership and sacred sites, daily safety measures especially trench covering, fair and timely compensation for any disruptions, local hiring including women and youth, and maintaining affordable water access post-construction. The request to "reduce our bills for us" and specific payment thresholds indicate that while communities welcome infrastructure, they need assurance that improved services won't price them out of access.

7.3 Open Questions and Additional Comments

Two participants provided additional comments in the open-ended section. One raised an implementation concern: "This project has not talked about how we use the pipes when they have been put in our houses," indicating need for user education on household connections. Another expressed urgency: "They should not delay in bringing the project," reflecting the immediate need for intervention.

Additional concerns from various discussions included technical requests for avoiding shallow trenching vulnerable to erosion, communication preferences about disconnection notices ("They should inform us before disconnecting us"), and a heartfelt appeal from the girls: "We really need water in our communities so donors should help bring our dream to live."

The communities of Upper East Region stand ready to embrace this project, bringing local knowledge, traditional governance structures, and clear communication about their needs and concerns. Their message is clear: implement quickly but carefully, respecting both the urgent need for water and the cultural and practical realities of their communities.

FOCAL GROUP DISCUSSION REPORT

Upper West Region - Kambali & Piisi/Konfabiala Communities

1. SESSION OVERVIEW

This report documents four focal group discussions conducted in the Upper West Region of Ghana as part of the African Development Bank Climate Action Window water infrastructure project. The sessions comprised 40 participants total across four distinct groups: Women (10 participants), Men & Community Leaders (10 participants), Female-Headed Households (10 participants), and Compound/Shared Facilities users (10 participants). The discussions were held in two communities - Kambali (Women and Compound groups) and Piisi/Konfabiala (Men and Female-Headed Household groups).

The overall reception to the water project announcement was overwhelmingly positive, with 100% of all participants across all groups expressing they were "very happy" about the news. The sessions revealed communities experiencing severe water access challenges, with participants demonstrating a mixture of hope, urgency, and cautious optimism about the project. Non-verbal observations noted "relieved hearts," "grateful smiles," and "renewed dignity" among participants, particularly female-headed households who face unique water access burdens. The discussions were characterized by constructive engagement, with participants offering detailed insights about their water struggles while maintaining strong support for the project's implementation.

2. PARTICIPANT PROFILE

The 40 participants represented diverse community perspectives across gender and household structures. The gender breakdown showed 30 female participants (75%) and 10 male participants (25%), reflecting the deliberate inclusion of women's voices given their primary responsibility for water collection and household water management.

The Women's group in Kambali consisted of 10 women aged 18-49 who shared daily experiences of water scarcity affecting their ability to perform basic household tasks. The Compound/Shared Facilities group, also in Kambali, included 10 participants who face particular challenges accessing water in multi-family living arrangements.

In Piisi/Konfabiala, the Men & Community Leaders group brought together 10 male participants including traditional leaders and household heads who provided perspectives on community-wide impacts and governance considerations. The Female-Headed Households group comprised 10 women who bear sole responsibility for water provision in their families, facing compounded challenges of limited resources and time constraints.

Participants appeared to represent a cross-section of occupations, with facilitator notes indicating "majority of them are farmers and petty traders" whose irregular incomes affect their ability to afford water services.

3. COMMUNITY WATER SITUATION

The current water situation in both communities is dire, with participants describing profound daily struggles. As one participant stated, *"A day without water is very difficult for us because we are unable to cook, wash, clean, bathe or even begin our daily activities."* Another emphasized, *"Water is our most urgent need."*

The water crisis particularly affects children's education, with participants noting *"Children miss school"* due to water collection duties and inability to bathe before school. Women described how *"Queues cause fights"* at water points, creating social tension, while the practice of buying water on credit creates financial stress - *"Credit create tension."*

Health facilities face critical shortages, with men reporting that when their wives deliver babies, they "will be asked to go home and bring water for them" at the health center. Business activities suffer as food vendors and Pito sellers lack adequate water supplies.
Female-headed households face particular hardship, with observations noting their need for "renewed dignity" through improved water access. The compound/shared facilities users described additional challenges of coordinating water access among multiple families. One participant poignantly stated, *"When there is no water at home, I often become sick, and life becomes very difficult."*

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The response was unanimous and enthusiastic - all 40 participants (100%) indicated they were "very happy" about the water project announcement. This exceptional uniformity reflects the severity of current water challenges.

Participants elaborated that the project "will improve our daily lifestyle and health," with specific benefits anticipated including children not being "late for school" and adults being able to "bathe with a full bucket of water before leaving for work." The men's group expressed that water provision "will bring them happiness when returning home knowing that water is available."

Multiple groups emphasized that hygiene will improve and "quarrels among our wives, daughters and sisters at the water point will stop bringing peace in the community." The overwhelming positivity was tempered with practical concerns about implementation, but no participants expressed opposition or skepticism about the project itself.

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will bring. All 40 participants (100%) anticipated "more reliable piped water to homes/compounds" and "more public taps/standpipes." Nearly all participants (39, or 98%) recognized potential for "short-term jobs for local people," with specific mentions that "the contractor can employ some of them to help in digging the trenches."

A majority (25 participants, 63%) hoped for "easier (less paperwork) and cheaper house connections," while 10 participants (25%) anticipated "better roads/drains after works."

Beyond infrastructure, participants requested comprehensive support. All 40 participants (100%) wanted "flexible payment plan for the connection fee" and "public standpipes for households that cannot connect." Nearly all (39 participants, 98%) emphasized the need to "give us clear information on a regular basis." A significant majority (37 participants, 93%) requested the project "build/repair public toilets (WASH) where needed," repeatedly emphasizing "urgent need for toilet facilities and refuse/waste containers."

As one participant explained about payment flexibility: "With this model they can save up in bits to meet the subsidized fee and the connection will be made for them after full payment and this will reduce the financial burden on them."

4.3 Concerns and Anticipated Impacts

Despite enthusiasm, participants expressed measured concerns about construction impacts. Primary worries focused on safety, particularly "children's safety near open trenches" (24 participants, 60%) and "damage to houses/kiosks/walls or items" (22 participants, 55%). Notably, 13 participants (33%) indicated "no concerns or worries," demonstrating remarkable acceptance of temporary disruption for long-term benefit.

Environmental impacts were seen as minimal, with 24 participants (60%) expecting "no or little effect." Those with concerns identified "more dust in the air from digging" (16 participants, 40%) and "loud noise during the day/night" (13 participants, 33%).

Regarding daily activities, an overwhelming 38 participants (95%) stated "I don't think it will affect my daily life much." The men's group explicitly stated they "are not really disturbed by issues such as dust, road blockage or loud noise during construction if they are given prior notice before work begins because the water comes before any other concern."

When identifying vulnerable groups needing special consideration, participants highlighted "elderly people, people with disabilities, pregnant women" (28 participants, 70%) and "school pupils, children & teachers" (22 participants, 55%). Eight participants (20%) felt none would face particular hardship.

Participants emphasized prevention measures: "To prevent kids from the danger of construction works, it is important that the community is informed before the work begins so they can educate their children to stay away from such areas."

4.4 Livelihood and Property Impacts

Economic impacts were viewed overwhelmingly positively. Nearly all participants (39 each, 98%) anticipated "better business later because of improved water supply" and "chance for short-term jobs with the project." Only one participant (3%) expected "no effect" on livelihoods.

Participants acknowledged that "relocation of kiosks will be a challenge however it is necessary for the community to access water." They emphasized fairness in handling property impacts, with all 40 participants (100%) demanding "timely notice before construction work starts." As stated: *"One month's notice show respect"* and *"Fairness begins with information."*

Nearly all (39 participants, 98%) wanted "fair compensation" for affected persons and involvement of "the Assembly and traditional leaders (chiefs)" in negotiations. A strong majority (34 participants, 85%) expected contractors to "rebuild affected structure (where agreed)."

The importance of proper protocol was emphasized: *"Inform leaders before the people"* and "It is important the Assemblyman and the community chief are notified first before any public announcement is made to ensure proper communication and transparency." Female-headed households specifically requested "two to three months" advance notice for any relocations.

4.5 Health, Safety, and Security Concerns

Safety concerns centered on physical hazards, with 35 participants (88%) worried about "open trenches people could fall into" and 26 participants (65%) concerned about "dust causing breathing/eye problems." The community insisted: *"Safety signs should protect site"* and expected "proper safety measures and warning signs put in place around the construction site so that the elderly and people with disabilities and everyone are protected."

Previous construction experiences were mixed. While 26 participants (65%) reported that in past projects "workers behaved respectfully," others recalled problems including "dust/noise was too much" (14 participants, 35%) and "property was damaged without payment" (10 participants, 25%). A concerning incident was shared about a NEDCO electricity project where "poles meant for the project went missing" and investigations revealed "the theft was carried out by one of the NEDCO team members themselves."

Social concerns emerged strongly across all groups. Multiple sessions noted "strong disapproval of the behavior of some laborers who have been approaching or attempting to date their daughters," stating "they do not like this practice at all." The men's group provided nuanced guidance: "they do not object if workers wish to engage with unmarried young women, but they advised that workers should act responsible and seek permission," warning that "workers are strongly advised not to flirt with married women as this might create serious conflict."

For safety measures, all 40 participants (100%) wanted contractors to "announce the work plan early" and "have regular meetings with the community." Additional requests included "spray water to control dust" (12 participants, 30%) and "clear warning signs and barriers around trenches" (10 participants, 25%).

4.6 Cultural and Community Considerations

Most participants (29, or 73%) indicated no special places requiring protection. However, important exceptions were noted. Nine participants (23%) identified "sacred trees" requiring protection, with the men's group specifically mentioning "a particular tree near the shrine that must not be cut down."

The men's group revealed deeper spiritual considerations: "there is a shrine that protects them, and it is not disturbed by loud noise or construction activities." They offered support through traditional means: "We will pour libation to help the contractors do their work safely and return home with any issues."

All groups emphasized respecting traditional governance structures. All 40 participants (100%) in the final recommendations section stated contractors must "respect our chiefs, elders, and leaders; talk to them first." This protocol was seen as essential: "Once they are informed the message or information will be relayed to the wider community."

4.7 Recommendations from Participants

Participants provided comprehensive advice for successful implementation. All 40 participants (100%) strongly recommended to "hire local workers (include women and youth)," explaining this "will bring cooperation ensuring that the project is carried out smoothly with local support."

Nearly all (39 participants, 98%) emphasized the need to "pay fair/quick compensation if someone is affected," with one stating simply: *"Compensation needs fairness."* A majority (27 participants, 68%) stressed the importance to "timely inform everyone before starting in each area."

Infrastructure restoration was important to 14 participants (35%) who wanted contractors to "restore roads/drains quickly and clean the site daily." Environmental controls were requested by 12 participants (30%) for "dust (spray water) and noise (limit late-night work)."

The urgent need for complementary infrastructure was repeatedly emphasized across all groups, particularly "toilet facilities and refuse/waste containers" to "improve sanitation, reduce open defecation and ensure proper waste management."

5. KEY QUOTES AND OBSERVATIONS

Multiple powerful statements captured the communities' relationship with water and their hopes for the project:

- *"Water makes life comfortable because water is life"* - expressing the fundamental nature of their need
- *"Getting drinking water is a problem"* - stating the current crisis simply
- *"Water brings health and livelihood"* - linking water to wellbeing and economic survival
- *"We will be responsible for our children"* - accepting community responsibility for safety
- *"Compensation we will agree"* - showing willingness to negotiate fairly

Non-verbal observations revealed deep emotional investment in the project. Facilitators noted "worried shop owners" concerned about business disruption, but also "relieved hearts" and "grateful smiles" at the prospect of water access. "Frustrated faces" appeared when discussing current hardships, while "renewed dignity" was observed among female-headed households anticipating improved conditions.

The men's group was characterized as "safety and conscious members" and "spiritual mindful," while showing "cautious owners" concerned about property. Women's groups demonstrated "hope and acceptance" alongside "worry and anxiety" about implementation, ultimately showing "trust and respect" for the process.

6. CRITICAL INSIGHTS FROM THIS GROUP

Five critical insights emerge from these Upper West Region discussions:

1. **Water as Existential Need**: These communities view water not as an amenity but as survival. The 100% "very happy" response and statements like "water is our most urgent need" reveal desperation that transcends typical development project enthusiasm.
2. **Acceptance of Disruption**: The remarkable finding that 95% believe construction won't significantly affect daily life, combined with statements like "water comes before any other concern," shows exceptional willingness to endure temporary hardship for permanent solutions.
3. **Protocol and Respect**: The unanimous insistence on respecting traditional leadership (*"Inform leaders before the people"*) and following proper channels reveals that successful implementation depends on honoring existing governance structures.
4. **Gendered Vulnerabilities**: Female-headed households and women generally face compounded challenges - from water collection fights to sole responsibility for family water. Their participation and specific needs require targeted attention.
5. **Beyond Water Infrastructure**: The persistent requests for toilets and waste management across all groups indicates water provision alone won't solve broader WASH challenges. The project's success may depend on addressing these complementary needs.

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

The communities want the project team to understand their desperation and readiness. As stated across groups: "We are happy and grateful already upon hearing the news of water coming into our community even though the project has not yet started."

Key messages include:

- Fair implementation is crucial: "It should be fair and not selective so that the vulnerable groups can also get access to water"
- Youth employment is expected and will ensure cooperation
- Respect for traditional authority is non-negotiable
- Flexible payment arrangements are essential given irregular incomes from farming and petty trading

- The project represents more than infrastructure - it offers dignity, health, education, and peace

7.2 Readiness and Conditions for Acceptance

Communities demonstrate exceptional readiness, with conditions focused on process rather than outcomes:

- Communication: One-month minimum notice, with two to three months preferred for major disruptions
- Employment: Local youth and women must be prioritized
- Safety: Clear signage and barriers, especially protecting vulnerable groups
- Social conduct: Workers must respect community values, particularly regarding interactions with women
- Traditional protocols: Chiefs and Assemblymen must be informed first

The men's group's offer to "pour libation to help the contractors do their work safely" demonstrates spiritual investment in project success.

7.3 Open Questions and Additional Comments

In response to open-ended questions, all 40 participants provided input, consistently returning to three themes:

1. **Complementary Infrastructure**: "We need more toilet facilities in our community" and "The community needs a container/bin for our refuse/waste" appeared as immediate action items across all groups.
2. **Affordability Concerns**: Despite enthusiasm, participants worry about connection costs. "Many families depend on farming and petty trading for their income, which is often irregular thus making the service affordable will ensure that everyone is included."
3. **Implementation Fairness**: Persistent emphasis that vulnerable groups - elderly, disabled, pregnant women, female-headed households - must not be excluded from benefits due to inability to pay or physical limitations.

The communities expressed no fundamental opposition or unresolvable concerns. Their message is clear: they desperately need this project, will cooperate fully with reasonable conditions, and trust that proper communication and respect for local structures will ensure success. As summarized by participants: *"Water makes life comfortable because water is life."*

INDIVIDUAL FOCAL GROUP DISCUSSION REPORT

Volta Region – Torkor, Dzoanti, Global City and Gadza Communities

1. SESSION OVERVIEW

This report documents five focal group discussions conducted in the Volta Region as part of the African Development Bank Climate Action Window water infrastructure project for Ghana Water. The discussions engaged 50 participants across five distinct demographic groups in the communities of Torkor, Dzoanti, Global City, and Gadza. All five sessions revealed overwhelming enthusiasm for the proposed water infrastructure project, with 49 out of 50 participants (98%) expressing they were "very happy" about the news of Ghana Water's planned improvements.

The sessions captured diverse perspectives from girls aged 12-21, women aged 18-49, female-headed households, men and community leaders, and residents of shared/compound housing facilities. Each group brought unique insights shaped by their daily water access challenges, with participants demonstrating remarkable unity in their support for the project while articulating specific concerns and recommendations relevant to their circumstances. The discussions were marked by visible emotions ranging from joy and relief at the prospect of reliable water access to frustration when describing current hardships.

2. PARTICIPANT PROFILE

The focal group discussions engaged exactly 50 participants from the Volta Region, comprising:

- 10 participants (20%) from the Girls group (Age 12-18/21)
- 10 participants (20%) from the Women group (Age 18-49)
- 10 participants (20%) from Female-Headed Households
- 10 participants (20%) from Men/Community Leaders
- 10 participants (20%) from Compound Households/Shared Facilities

The gender distribution showed 33 female participants (66%) and 17 male participants (34%), reflecting the deliberate focus on capturing women's and girls' perspectives given their central role in water collection. Notable observations about group composition included the presence of traditional chiefs and elders in the men's leadership session at Dzoanti, who arrived early and were "beaming with smiles," and the active participation of elderly women in several groups who spoke with "pained expressions" about their physical struggles fetching water.

3. COMMUNITY WATER SITUATION

The current water situation across these Volta Region communities is characterized by severe daily hardship and unreliability. As one participant powerfully stated, *"A day without reliable water disturbs every plan."* Communities report traveling up to 2 kilometers to access water from streams that are often turbid, particularly during dry seasons. In Global City, women described the desperate measure of *"digging holes in the mushy rice farm to fetch turbid water,"* with facilitators noting the "disgusted expressions" this practice evoked.

The burden falls disproportionately on women and children, with girls reporting they "miss classes because of the long walks to the riverside." One woman in Torkor expressed the community's exhaustion: *"We are tired, we need help."* The emotional toll is evident - participants described feeling "unsettled," "confused," and unable to plan their days without reliable water. As noted in Global City, *"Bathing is usually the first sacrifice"* when water is scarce. The intermittent nature of existing water points compounds frustration, with shared facility residents lamenting that *"The taps may flow today and be dry tomorrow."*

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The response to news of the water project was overwhelmingly positive, with 49 participants (98%) indicating they were "very happy" and only 1 participant (2%) wanting more information before deciding. The emotional intensity of this reaction was captured in multiple non-verbal observations: participants engaged in "clapping of hands," shouting "Hallelujah," and displaying visible excitement through laughter and animated body language.

As the men's group in Dzoanti exclaimed, *"Hallelujah! we would be very happy if water comes."* The girls from Torkor vividly expressed their anticipated joy: *"The day we are able to open a tap in our own house we would not even sleep out of excitement."* Even the single participant who selected "not sure yet/need more information" participated actively in subsequent discussions, suggesting cautious optimism rather than opposition.

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will bring, with 49 participants (98%) prioritizing "more reliable piped water to homes/compounds." Additionally, 27 participants (54%) hoped for "easier (less paperwork) and cheaper house connections," while 20 participants (40%) anticipated "short-term jobs for local people," and 17 participants (34%) wanted "more public taps/standpipes."

Beyond infrastructure, participants strongly emphasized the need for supportive measures. A significant 31 participants (62%) requested "flexible payment plans for the connection fee," with the women's group specifically suggesting they could "pay half the cost upfront and spread the remaining balance over about six months." Communication emerged as crucial, with 18 participants (36%) wanting "clear information on a regular basis" and 28 participants (56%) requesting "regular meetings with the community to give updates." Support for schools and clinics during construction was prioritized by 21 participants (42%).

4.3 Concerns and Anticipated Impacts

While enthusiasm dominated, participants expressed measured concerns about construction impacts. The primary worry for 24 participants (48%) was "children's safety near open trenches," followed by 20 participants (40%) concerned about "roads/paths blocked." However, 15 participants (30%) reported having "no concerns or worries," with many explicitly stating that water projects differ from road projects in their disruption level.

Environmental impacts were anticipated to be manageable, with 23 participants (46%) expecting "no or little effect." Where concerns existed, 16 participants (32%) worried about "more dust in the air from digging" and 11 participants (22%) about "soil erosion from trenches." Notably, 40 participants (80%) believed the work would not significantly affect their daily life, though specific vulnerable groups were identified as needing special attention.

4.4 Livelihood and Property Impacts

Economic perspectives were largely optimistic, with 26 participants (65%) anticipating "better business later because of improved water supply" and 13 participants (33%) seeing opportunities for "short-term jobs with the project." Only minimal negative impacts were anticipated, with just 5 participants (13%) worrying about "temporary closure or loss of vending space."

Regarding property impacts, participants showed remarkable pragmatism. As the men in Dzoanti stated: *"We don't mind if contractors touch our properties if that is where the water lines must pass."* The community's main requirements centered on fair process: 29 participants (73%) wanted "timely notice before construction work starts," 15 participants (38%) expected "fair compensation" if affected, and 12 participants (30%) emphasized involving "the Assembly and traditional leaders."

4.5 Health, Safety, and Security Concerns

Safety concerns focused primarily on physical hazards, with 27 participants (54%) worried about "open trenches people could fall into" and 20 participants (40%) concerned about "accidents from big trucks and machines on narrow roads." Security issues were less prominent, though 12 participants (24%) mentioned "theft or security issues at night around the site."

Past construction experiences were mixed but generally positive, with 24 participants (48%) reporting no problems from previous projects and 12 participants (24%) having no previous projects in their area. Where issues occurred, they involved poor restoration (5 participants, 10%) or excessive dust/noise (6 participants, 12%). Communities emphasized preventive measures: 33 participants (66%) wanted work plans announced early, 20 participants (40%) requested "clear warning signs and barriers around trenches," and 14 participants (28%) preferred work "mainly in daytime."

4.6 Cultural and Community Considerations

Cultural restrictions appear minimal across these communities. When asked about special places that must not be disturbed, 31 participants (78%) indicated "none," with only small numbers mentioning churches/mosques (5 participants, 13%) or festival routes (3 participants, 8%). Communities consistently emphasized there are "no sacred or restricted places" and contractors are "free to work every day without restrictions."

The primary cultural consideration involved respect for traditional governance structures. An overwhelming 35 participants (88%) advised contractors to "respect our chiefs, elders, and

leaders; talk to them first." Additionally, 12 participants (30%) raised security concerns requiring attention, while the community offered assurance: *"We are peaceful people"* and promised to "guide and support contractors if any unexpected issue arises."

4.7 Recommendations from Participants

Participants provided detailed guidance for successful implementation. The top recommendations included timely information for each area (28 participants, 70%) and hiring local workers including women and youth (23 participants, 58%). Communities specifically requested youth involvement in trenching work, with one group noting this would help "young people earn some savings."

Communication protocols were clearly defined, with multiple groups stating that "all information should be channelled through the assemblyman." Behavioural expectations were explicitly stated, particularly regarding interactions with women and girls. As one men's group firmly stated, contractors should "stay focused on their work and not disturb people's wives," while acknowledging that interest in "single ladies" was acceptable if handled responsibly.

5. KEY QUOTES AND OBSERVATIONS

The discussions produced powerful testimonies that captured both current suffering and future hope:

- *"Men are not supposed to queue at water points"* - This statement from Dzoanti revealed gendered dimensions of water access shame.
- *"We dig holes in the mushy rice farm to fetch turbid water"* - Spoken with visible disgust in Global City, highlighting desperation.
- *"Water is life"* - Repeated across multiple sessions with one elder in Gadza raising his hand repeatedly for emphasis.
- *"The hardship never ends"* - Expressed with deep frustration about the cyclical nature of water insecurity.
- *"Paying for water has never been the real problem - it is the access"* - A crucial insight from the girls' group distinguishing between affordability and availability.

Non-verbal observations enriched understanding: participants "leaned forward when speaking, showing eagerness to be heard," "folded their arms" indicating cautiousness while remaining engaged, and showed "serious expressions when the issue of contractors 'not taking our wives or girls' was raised, though their tone carried a mix of humour and concern."

6. CRITICAL INSIGHTS FROM THIS GROUP

Five critical insights emerged from these Volta Region discussions:

1. **Water access is fundamentally about time and dignity, not just physical availability.** The communities frame water scarcity primarily in terms of lost time, missed opportunities, and compromised dignity rather than absolute absence.

2. **Payment willingness is high when access is guaranteed.** Multiple groups explicitly stated that cost is not the primary barrier - they need reliable access first and are prepared to pay through flexible arrangements.
3. **The project is viewed as transformative for education.** Girls and parents repeatedly emphasized how water access would eliminate the primary cause of school absence and poor performance.
4. **Communities offer partnership, not just acceptance.** Rather than passive recipients, communities actively propose involvement through youth employment, elder guidance, and communication systems.
5. **Safety concerns focus on prevention, not prohibition.** Communities don't want work stopped or slowed but rather simple preventive measures like warning signs, barriers, and community notification.

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

The overarching message from all groups is one of urgent need coupled with enthusiastic support. Communities want the team to understand that *"We are already suffering, so we need the water badly"* but also that *"We are peaceful people"* who will welcome contractors "as friends, not treat them with hostility."

Participants emphasized their readiness to cooperate fully, with female household heads assuring that "we will support and guide contractors if any unexpected issue arises." The youth conveyed particular urgency: *"Madam, you have said it all - we are only waiting for that miracle to happen in Torkor."*

7.2 Readiness and Conditions for Acceptance

Communities demonstrate exceptional readiness for the project with minimal conditions. The primary requirements are:

- Respect for traditional leadership structures and proper introductions
- Clear communication through established channels (assemblymen)
- Protection of vulnerable groups, especially regarding worker behavior
- Involvement of local youth in employment opportunities

As stated emphatically: *"What matters most is finally having water."*

7.3 Open Questions and Additional Comments

In response to the final open-ended question, 15 participants provided additional input dominated by two themes: urgency and water reliability. Comments included "Early as possible," "Start the project early," "We need the water fast" (repeated multiple times), and concerns about continuous flow: "The water must flow always," "We need continuous flow of water."

One critical concern emerged about affordability: "Connection fees is expensive," suggesting that despite stated willingness to pay, actual costs may pose challenges for some households. Several participants closed with expressions of satisfaction and gratitude: "We are happy for

the project," "We are satisfied with the project," and "Great project and I hope it will go a long way to help in getting clean water."

The sessions concluded with communities reiterating their core message: they have shared everything needed for successful implementation and now await action. As powerfully summarized by one group: *"We have said everything we need to. Now, we are only waiting for the water to come into our homes. Please come back soon and begin the work."*

INDIVIDUAL FOCAL GROUP DISCUSSION REPORT

Western Region – Shama and Aboadze Communities

1. SESSION OVERVIEW

This report documents four focal group discussions conducted in the Western Region of Ghana as part of the African Development Bank Climate Action Window project for Ghana Water infrastructure improvements. The sessions comprised two women's groups and two men/community leaders' groups, with a total of 40 participants (20 women and 20 men) from the communities of Shama and Aboadze.

The discussions revealed overwhelming enthusiasm for the water project, with 98% of participants expressing they were "very happy" about the initiative. Participants demonstrated active engagement throughout the sessions, with visible emotions of happiness and hope for improved water access. The communities view this project as a long-awaited solution to their water challenges, though they expressed specific concerns about affordability and implementation that require careful consideration.

Both communities currently face significant water access challenges, relying heavily on private vendors who charge high prices, distant standpipes, and inadequate water storage solutions. The burden of water collection particularly affects women and children, disrupting daily routines and limiting time for productive activities. As one participant noted, *"having a connection would save them from traveling long distances to fetch water, giving them more time to focus on other activities."*

2. PARTICIPANT PROFILE

The focal group discussions engaged 40 community members across four sessions:

- Shama Community: One women's group and one men/leaders' group
- Aboadze Community: One women's group and one men/leaders' group
- Gender Distribution: 20 women (50%) and 20 men (50%)
- Category Breakdown:
  - Women aged 18-49: 20 participants (50%)
  - Men/Community Leaders: 20 participants (50%)

The facilitator noted that participants displayed visible happiness during discussions, particularly when discussing the potential benefits of the project. The men's groups included community elders and leaders who demonstrated readiness to collaborate with contractors and provide guidance on community protocols.

3. COMMUNITY WATER SITUATION

Participants described their current water situation as challenging and expensive. In Shama, residents explained that they *"worry that the price may be too high"* even as they welcome the project, highlighting their current dependence on *"private vendors, who often sell at very high prices."*

The Aboadze women's group emphasized that *"Without water, families struggle to wash, cook or clean,"* while the men from Shama noted that *"daily routines such as bathing and cleaning are difficult and labor intensive"* with *"water storage has become a priority and conservation is crucial."*

Currently, communities rely on:

- Purchasing water from standpipes located far from homes
- Private water vendors charging premium prices
- Water storage and conservation as daily priorities
- Significant household expenditure on water purchases

The men from Aboadze highlighted that the lack of reliable water affects productivity: *"Family will no longer need to spend extra time and effort fetching water, allowing them to focus on productive activities."*

4. DETAILED FINDINGS BY THEME

4.1 Initial Reaction to the Project

The communities demonstrated overwhelming support for the water project:

- 39 participants (98%) expressed being "very happy" about the project
- 1 participant (3%) indicated being "a little bit happy"
- No participants expressed uncertainty, unhappiness, or opposition

Participants in Shama celebrated that the project would *"improve hygiene in the community"* and bring *"drastic changes in household expenditure on water."* The Aboadze community viewed it as *"a good initiative that will not bring problems, but instead improved lives."* Men from Aboadze specifically noted: *"We are happy that at least water is coming into our community. This will bring significant financial relief as households will no longer need to spend heavily on purchasing water."*

4.2 Hoped-for Benefits and Opportunities

Participants identified multiple benefits they hope the project will bring:

Infrastructure Benefits:

- More reliable piped water to homes/compounds: 27 participants (68%)
- Easier and cheaper house connections: 19 participants (48%)
- More public taps/standpipes: 14 participants (35%)
- Short-term jobs for local people: 12 participants (30%)
- Better roads/drains after works: 4 participants (10%)

Additional Support Requested:

- Flexible payment plan for connection fee: 29 participants (73%)
- Give clear information on a regular basis: 19 participants (48%)
- Share water quality/test results: 17 participants (43%)

- Public standpipes for households that cannot connect: 14 participants (35%)
- Restore roads and gutters quickly: 14 participants (35%)
- Build/repair public toilets where needed: 14 participants (35%)

The Shama women specifically noted that *"One of the biggest barriers preventing us is the high cost of the connection fee"* and proposed that *"the connection fee be reduced to around 100-500GH, which would make it more affordable for families."* The Aboadze women echoed this, preferring that *"water connection fees be paid in installments to make them affordable."*

4.3 Concerns and Anticipated Impacts

Construction Period Worries: Participants identified multiple concerns about the construction phase:

- Roads/paths blocked; hard to move around: 22 participants (55%)
- Children's safety near open trenches: 20 participants (35%)
- Poor clean-up after works: 17 participants (30%)
- Water supply being cut during works: 15 participants (25%)
- Flooding from blocked drains: 10 participants (25%)

Environmental Impacts:

- More dust in the air from digging: 17 participants (43%)
- Blocked gutters leading to flooding: 17 participants (43%)
- Soil erosion from trenches: 9 participants (23%)
- Cutting of trees: 8 participants (20%)
- Waste/rubbish left after construction: 7 participants (18%)

The Shama women emphasized that *"the construction site be properly fenced and a signboard provided to indicate that work is ongoing"* and that *"after digging, the area should be properly restored to its original state to prevent accidents."*

Impact on Daily Activities: While 26 participants (65%) believed the project wouldn't affect their daily life much, others worried about:

- Children's route to school becoming unsafe: 13 participants (33%)
- Harder movement for work/market/worship: 5 participants (13%)
- Shops losing customers: 5 participants (13%)

Vulnerable Groups Identified:

- Elderly people, people with disabilities, pregnant women: 13 participants (33%)
- Everyone equally: 13 participants (33%)
- Traders/market women: 7 participants (18%)
- School pupils and teachers: 6 participants (15%)

The Aboadze women noted a specific challenge: *"Some areas are rocky, may make it difficult to lay the pipelines. In such places the community suggests providing poly tanks (overhead tanks) or standpipes as alternatives."*

4.4 Livelihood and Property Impacts

Economic Impacts:

- Better business later due to improved water supply: 18 participants (45%)
- Chance for short-term jobs: 16 participants (40%)
- No effect expected: 11 participants (28%)
- Sachet/water vendors lose sales: 10 participants (25%)

4.5 Health, Safety, and Security Concerns

Primary Safety Worries:

- Open trenches people could fall into: 22 participants (55%)
- Dust causing breathing/eye problems: 22 participants (55%)
- Accidents from trucks on narrow roads: 20 participants (50%)
- Theft or security issues at night: 11 participants (28%)
- Risk of harassment for women and girls: 10 participants (25%)

Past Project Experiences:

- No previous projects: 17 participants (43%)
- Dust/noise was excessive: 10 participants (25%)
- Property damaged without payment: 10 participants (25%)
- Roads/drains not restored well: 10 participants (25%)

The Aboadze women revealed that *"there was one incident where a contractor behaved inappropriately with a young woman,"* highlighting the need for worker conduct protocols.

Safety Measures Requested:

- Announce work plan early: 28 participants (70%)
- Regular community meetings: 24 participants (60%)
- Clear warning signs and barriers: 20 participants (50%)
- Safe crossings or footbridges: 18 participants (45%)
- Spray water to control dust: 17 participants (43%)

The Shama men raised specific health concerns: *"during digging, open holes and trenches should be properly covered or managed. If they are left open, rainwater will gather in them, leading to mosquito breeding and health issues like malaria."*

4.6 Cultural and Community Considerations

Sacred/Important Places:

- Churches/mosques: 16 participants (40%)
- School field/playground: 16 participants (40%)
- Cemetery/burial ground: 14 participants (35%)
- Sacred trees: 11 participants (28%)
- Market area: 10 participants (25%)

The Aboadze men emphasized that *"Some of these places hold ancestral heritage, and they preserve culture and history. Before any project starts near those important places, the leaders must be informed."* The Shama women suggested it would be *"appropriate to offer libation or perform the necessary traditional rites to ensure that the project proceeds smoothly and respectfully."*

4.7 Recommendations from Participants

Best Advice for Contractors:

- Hire local workers (include women and youth): 49 participants (70%)
- Timely inform everyone before starting: 19 participants (48%)
- Control dust and noise: 15 participants (38%)
- Restore roads/drains quickly: 14 participants (35%)

What Teams Should Know:

- Respect chiefs, elders, and leaders: 38 participants (95%)
- School exam dates and health facility peak times: 13 participants (33%)
- Don't work on Sundays or market days: 10 participants (25%)

The Shama men emphasized: *"As community elders, we are ready and willing to inform the contractor about places of importance to the community as soon as he arrives."*

5. KEY QUOTES AND OBSERVATIONS

Notable Quotes from Participants:

From Shama Women:

- *"Having a connection would save them from traveling long distances to fetch water, giving them more time to focus on other activities"*
- *"One of the biggest barriers preventing us is the high cost of the connection fee"*

From Shama Men:

- *"The development will bring drastic changes in household expenditure on water as we will no longer need to spend so much on buying water"*
- *"Water storage has become a priority and conservation is crucial"*

From Aboadze Women:

- *"Without water, families struggle to wash, cook or clean"*
- *"In Aboadze, we have elders and chiefs who must be respected"*

From Aboadze Men:

- *"The family's job and children's education will be safe since there will be no more lateness"*
- *"The contractor must ensure that his workers are here to work and nothing more"*

Non-Verbal Observations: The facilitator noted visible happiness among participants when discussing the project. The emotional tone was consistently positive, though concerns about affordability prompted more serious discussions.

6. CRITICAL INSIGHTS FROM THIS GROUP

Most Pressing Concerns:

1. **Connection Fee Affordability**: The overwhelming barrier is the high connection cost, with strong consensus for fees between 100-500 GH and installment payment options
2. **Safety During Construction**: Major concerns about open trenches, particularly for children, elderly, and disabled persons
3. **Rocky Terrain Challenges**: Specific to some areas requiring alternative solutions like overhead tanks
4. **Worker Conduct**: Past negative experiences highlight need for strict codes of conduct
5. **Traditional Protocol**: Absolute requirement to engage chiefs and elders before commencing work

Unique Perspectives:

- Strong emphasis on respecting traditional leadership and cultural protocols
- Recognition that both contractors and community have responsibilities for project success
- Specific concern about mosquito breeding in open trenches during rainy season
- Request for education on reporting pipe bursts and system maintenance

7. SUMMARY OF PARTICIPANT MESSAGES

7.1 What Participants Want the Project Team to Know

The communities want the project team to understand that while they are extremely happy about the water project, success depends on:

- Making connections affordable through reduced fees and payment plans
- Respecting traditional leadership by engaging chiefs and elders first
- Providing regular, clear communication through local FM stations and community information centers
- Ensuring worker discipline and professional conduct
- Properly managing construction sites with safety barriers and dust control
- Considering rocky terrain challenges in some areas

7.2 Readiness and Conditions for Acceptance

The communities demonstrate strong readiness to support the project, with 98% expressing happiness. Their acceptance is conditional on:

- Affordable connection fees with flexible payment options
- Proper engagement with traditional authorities
- Safety measures during construction
- Restoration of roads and drains after work
- Provision of alternative water sources for those unable to connect

The Shama men noted they are *"ready and willing to inform the contractor about places of importance,"* while Aboadze parents acknowledged their role: *"As parents, we also have a duty to advise our children that the contractors are here to work and should not be disturbed."*

7.3 Open Questions and Additional Comments

Two participants provided additional comments focusing on project duration. Both asked: *"How long will the project last?"* indicating concern about the timeline for completion.

The Shama men raised important long-term considerations: *"Ghana Water Limited is a large institution making a significant investment in this project. However, residents believe the company's focus should not only be on water provision."* They specifically requested:

- Education on reporting pipe bursts to avoid water waste
- Inclusion of decommissioning plans in the project
- Community involvement from start to finish for sustainability

The groups emphasized that successful implementation requires partnership between contractors, Ghana Water, traditional leaders, and community members, with each party fulfilling their responsibilities for the collective benefit of improved water access in the Western Region.

Appendix 4: Evidence of Stakeholder Consultation



Focus Group Discussion for Women at Koase



Focus Group Discussion for Women at Wenchi Town, Boaden



Focus Group Discussion for Men at Wurompo



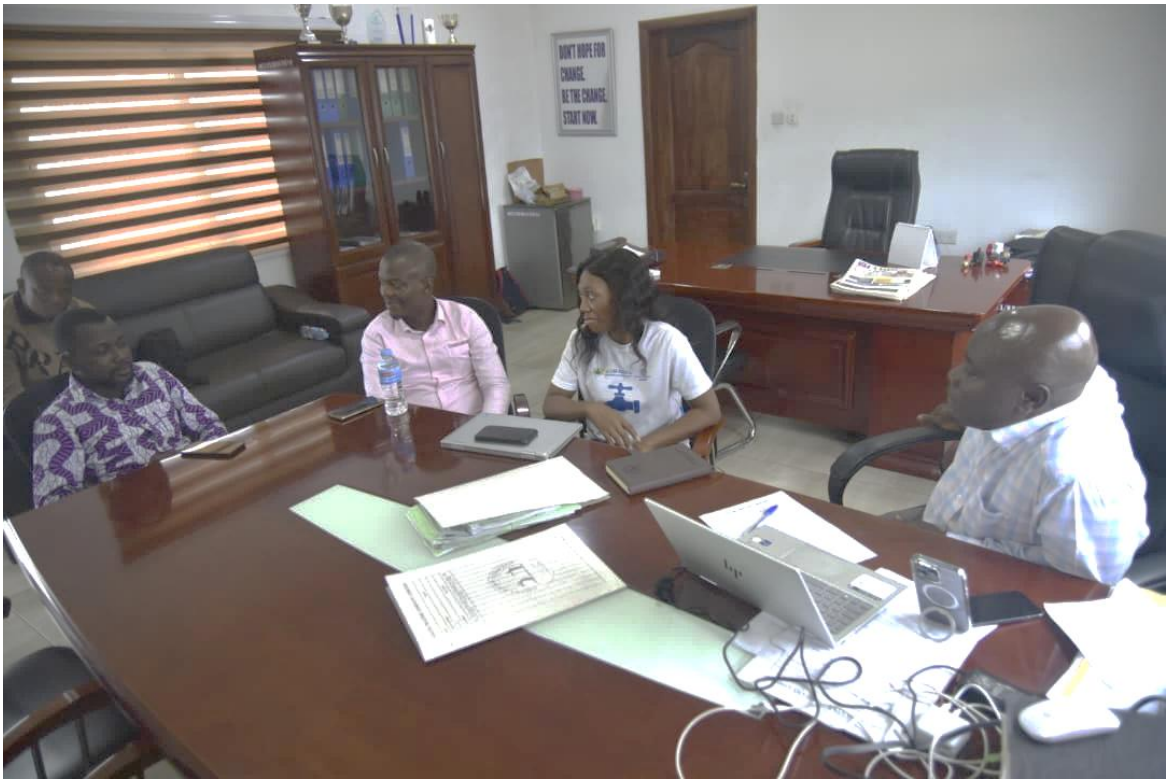
Focus Group Discussion for Women in the Upper West Region



Focus Group Discussion for Men in the Upper West Region



Focus Group Discussion for Women in the Western Region



Engagement with some Officials at Shama Municipal Assembly



Traditional Authorities Consultation in the Western Region



Institutional Engagement at Koase



Institutional Engagement at Kambali Health Centre, Upper West



GWL Staff Engaging a Head Master in Upper West Region



GWL Staff Engaging the Assembly Member for Kambali in the Upper West Region

Other Stakeholder Engagement Evidences

















Appendix 5: Stakeholder Consultation Attendance Records

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 23/08/25 TIME: 9:05am to 1:30pm LOCATION: Aburaa Dunkwa CODE:

FACILITATOR: [illegible] NOTETAKER: Josephine Turkson ASSISTANT: Theresa Welbeck

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Grace Tawiah.	Apprentice	20	0257625921	
2	Grace Obosu	Apprentice	20	0553969043	
3	Anaman Esther	Student	17	0543831034	
4	Alberta Asare	Faction Designer	20	0536091359	
5	Rebecca Arthur Afful	Student	20	0257698542	
6	Christiana Mensah	Faction Designer	20	0558376724	
7	Martha Hagan	Student	20	0555664150	
8	Grace Donkorh	Student	18	0558192941	
9	Sarah Eburow	Apprentice	18	0532667718	
10	Juliana Atta Livingstone	Student	18	0546433479	

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – KII GENDER

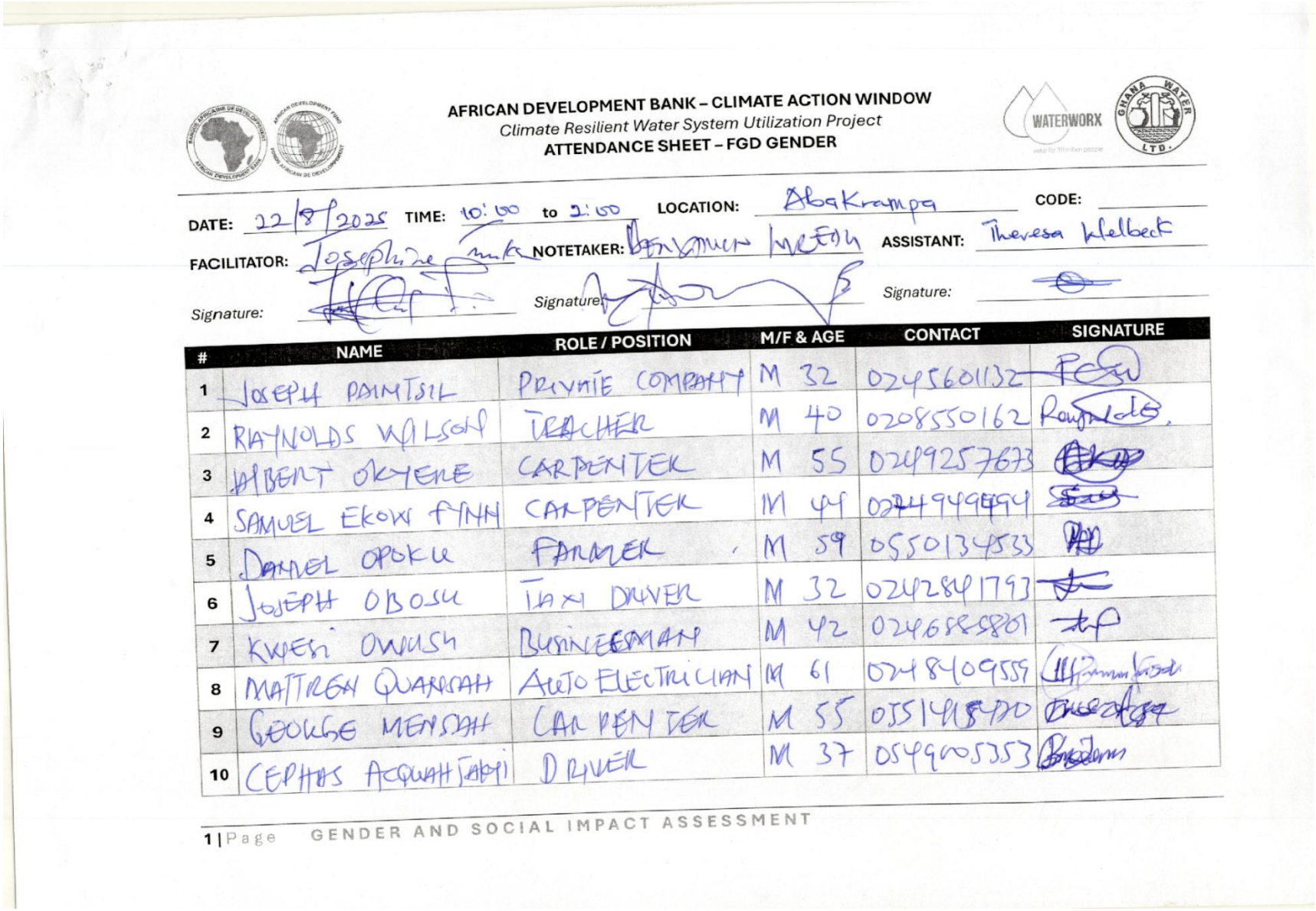
DATE: 22/8/2025 TIME: 9am to 1pm LOCATION: Abora Dunkwa CODE: _____

FACILITATOR: Josephine Mukasa NOTETAKER: Ebenezer ASSISTANT: _____

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	NANA DAMTEI	CHIEF	M	0557647332	
2	ADJOA KUMAWAA	ELDER WOMEN	F	0242507544	
3	NAPOLEON N. TAWIAH	ASSEMBLY MAN	M	0242711709	
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS



AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 22/8/2025 TIME: 10:00 to 2:00 LOCATION: Abakrampa CODE:

FACILITATOR: Josephine NOTETAKER: ASSISTANT: Theresa Helbert

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	JOSEPH PAINTSIL	PRIVATE COMPANY	M 32	0245601132	
2	RAYNOLDS WILSON	TEACHER	M 40	0208550162	
3	ALBERT OKYERE	CARPENTER	M 55	0249257673	
4	SAMUEL EKOW FINN	CARPENTER	M 44	0244949494	
5	DANIEL OPOKU	FARMER	M 59	0550134533	
6	JOSEPH OBOSU	TAXI DRIVER	M 32	0242841793	
7	KWESI OWUSU	BUSINESSMAN	M 42	0246585801	
8	MATTREW QUANSAH	AUTO ELECTRICIAN	M 61	0248409559	
9	GEORGE MENSAH	CARPENTER	M 55	0551485400	
10	CEPHAS ACQUAH JABBI	DRIVER	M 37	0549005353	

1 | Page GENDER AND SOCIAL IMPACT ASSESSMENT

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – KII GENDER

DATE: 22/08/2025 TIME: 9am to 1pm LOCATION: Abakrampa CODE:

FACILITATOR: Josephine Agyeiwaa NOTETAKER: Theresa Welbeck ASSISTANT:

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Augustine Osei Tawiah	Secretary Council of elders	m	0546132327	A. O. T
2	Kobina Amissah	Council member	m	0549909707	K. A
3	Abeiku Amsah	Council member	m	0273445731	A. A
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

1 | Page GENDER AND SOCIAL IMPACT ASSESSMENT

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 22/8/2025 TIME: 9:00 to 2:30pm LOCATION: Akakrampa CODE:

FACILITATOR: Josephine Tay Kesi NOTETAKER: [illegible] ASSISTANT: Theresa Welbeck

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Abena Takyiwaa	Trader	45	0257058752	
2	Comfort Youngson	11	51	0247727851	
3	Faustina Acquah	Trader	44	0249969518	
4	Cecilia Cudjoe	Cosmetology	33	0546968337	
5	Joana Takyi	Seamstress	54	0240149418	
6	Esther Guanson	Trader	53	0543502899	
7	Patrica Amoah	Farmer	55	0242228217	
8	Rita Amoah	Seamstress	54	0243744514	
9	Grace Adoo	Seamstress	36	0546623339	
10	Manko Christiana	Fashion Designer	23	0595275820	

1 | Page GENDER AND SOCIAL IMPACT ASSESSMENT

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 19-08-25 TIME: 9:00 to LOCATION: Abadaka Abuagi CODE:

FACILITATOR: Augustine Yeboah NOTETAKER: Josephine Owusu ASSISTANT: Theresa Welbeck

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Joseph Elijah Otchwan	Chairman	60yrs	0242937271	
2	Philip Kwame Deldo	Member	63yrs	0244072484	
3	Samuel K. Appiah	" "	61yrs	0246869095	
4	Enock Essilfie	" "	51yrs	0246587433	
5	Hon. Enock Arthur	Assemblyman-Abuagi	51yrs	0599102715	
6	Hon. Emmanuel Avevu	Assemblyman Abo.	53yrs	0206790934	
7	Benjamin Dadzie	Comm. Sec.	65yrs	0240904755	
8	Theophilus Armah	Unit Comm.	47yrs	0592557714	
9	Samuel K. Baidu	" "	37yrs	0538506412	
10	Francis Acquah	Unit Comm. Sec.	35yrs	0539070679	

1 | Page GENDER AND SOCIAL IMPACT ASSESSMENT

D. Men / Leaders

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 20/05/25 TIME: _____ to _____ LOCATION: Suzuma CODE: _____

FACILITATOR: Suanu Nte Clement NOTETAKER: _____ ASSISTANT: Josephine Gyasi

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Hon Godfred Egyir	Assembly Member		0242777085	
2	Joseph Gyasi	Unit Committee Chair			
3					
4					
5					
6					
7					
8					
9					
10					

ATTENDANCE SHEET FOR WESTERN REGION (FGD MEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 20/08/25 TIME: 9:50 to 2:30pm LOCATION: SHAMA CODE:

FACILITATOR: Augustine Yeboa NOTETAKER: Theresa Hellbert ASSISTANT: Josephine Tagoe

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Ebenezer Essiful	Linguist	32	0542795156	
2	Bernard Assifuah	Asafo Panin	53	0557514323	
3	Stephen A. Baidoo	"	68	0276772523	
4	Alexander Simons	Unit Committee	73	0240279675	
5	Osei Bernard	Unit Committee	26	0552988374	
6	Justice Gobbinah Jnr	Assemblyman Shama-Ettsiful	28	0240961962	
7	Peter Amissah	Unitee Commettee	42	0540660977	
8	Sagoben Beatrix Lwella	Ettsiful Paramouncy	66	0247761946	
9	Abraham Dontoh	Unite Commettee	32	0597865144	
10	FRANK DADZIE	YOUTH REP.	25	0557002317	

ATTENDANCE SHEET FOR WESTERN REGION (FGD WOMEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 19/08/25 TIME: to LOCATION: Abuadze Abuesi' CODE:

FACILITATOR: Augustina Tetteh NOTETAKER: Theresa Welbeck ASSISTANT: Benjamin N. Wireku

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Constance Dawson	Midwife	F	0242148664	
2	Florence Awofwe	Trader		0246694957	
3	Afuwa Anoe	Fishmonger		0243678804	
4	Mary Gyasi	Trader	F	0592151172	
5	Cecilia Nunoo	Fish monger		0548789162	
6	Sarah Abaekah	Trader	F	0536071959	
7	Anastasia Ansah	Fishmonger	F	0553887551	
8	Sarah Essel	Fishmonger	F	0551965805	
9	Grace Commey	Queenmother/ fishmonger	F	0552989017	
10	Rita Cudjoe	Nurse	F	0509237577	

ATTENDANCE SHEET FOR WESTERN REGION (FGD WOMEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 20/08/25 TIME: to LOCATION: SHAMA CODE:

FACILITATOR: Augustine Yaboah NOTETAKER: Theresa Welbeck ASSISTANT: Josephine Tuvie

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Sarah Essoun	Fish monger	F/46	025663211	
2	Glady Quason	Teacher	F/59	0246542755	
3	Florence Bassaw	Trader	F/46	0246965944	
4	Winnifred Bassaw	Trader	F/51	0555147124	
5	Doris Ackon	Trader	F/25	0246770571	
6	Ruth Frimpong	Trader	F/31	0559768621	
7	celestina Baidoo	Seamstress	F/35	0545537029	
8	Cynthia Mashaly	Trader	F/42	0547885083	
9	Veronica Sygoe	Trader	F/28	0591046153	
10	Patience Dumashie	Trader	F/50	0246461423	

ATTENDANCE SHEET FOR VOLTA REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – KII GENDER

DATE: 22/08/2025 TIME: _____ to _____ LOCATION: Dzoanti & Gadza CODE: _____

FACILITATOR: Nancy Godson NOTETAKER: Hajiyat Mallic ASSISTANT: Sharon Essien

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Togbe Adza - Lokkoju	Chief Dzoanti	M	0547380147	
2	Emm SENYO WORDEY	ASSEMBLY MEMBER	M	0242332806	
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR VOLTA REGION (FGD MEN)

D. Men Leaders

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 20/08/2025 TIME: ____ to ____ LOCATION: Kpando-Dzogmti CODE: ____

FACILITATOR: Nancy Godson NOTETAKER: Waliyat Malik ASSISTANT: Sharon Essien

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	TSORKOR DELALI	Participants	M	0240543532	
2	AGBO KOMLA	"	m	0541910343	
3	WILLIAM ADJEI	"	M	024789167	
4	EMIL SENYO WORDEY	"	m	0242332006	
5	RICHARD ASAMANY	"	M	0592667606	
6	ATTAH PHILIP SEMO	"	M	0249571114	
7	NOAH AGBEE	"	m	0241172678	
8	AMBROSE DASANA	"	m	0556805994	
9	ALEX TORNEY	"	m		
10	AMEKO Emma	"	m	0556 82422	

ATTENDANCE SHEET FOR VOLTA REGION (FGD SHARED)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 20/08/2025 TIME: _____ to _____ LOCATION: KPANDO GADZA CODE: _____

FACILITATOR: Nancy Godson NOTETAKER: Waliyat Malik ASSISTANT: Sharon Essien

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	JOHN AKOENSY	Participant	M	0547697387	
2	AVORNYOTSE RUBEN	"	M	0244145263	
3	PAUL BLUWEY	"	M	0547985096	
4	DOH GLORIA	"	F	0552154473	
5	AMEMAKUSE DIVINE	"	M	0545500863	
6	Gbeg Boris	"	F	0544718418	
7	SAMUEL	"	M	0537770284	
8	MAWUSE AMEMAKUSE	"	F	0544676721	
9	Agnes Assey	"	F		
10	Kenneth Osai	"	M	0537339952	

ATTENDANCE SHEET FOR VOLTA REGION (FGD WOMEN)

B. Women

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 22/08/2025 TIME: ____ to ____ LOCATION: Kpando - Global City CODE: ____

FACILITATOR: Nancy Godson NOTETAKER: [illegible] ASSISTANT: Sharon Essen

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	PARKU PERFECT	Participant	F	0546887779	
2	Adzadu Patience	"	F	0249867962	
3	Caroline Tregah	"	F	0595626552	
4	Dzorgbe Lucy	"	F	0546441501	
5	Nuatror Janet	"	F	0594901567	
6	Adzato Bernica	"	F	0245443[illegible]	
7	Baffio Agnes	"	F	0550314[illegible]	
8	Medeny Esther	"	F	0548285[illegible]	
9	Francisa Kabaka	"	F	0[illegible]916527[illegible]	
10	Grace Alor	"	F	0547100387	

ATTENDANCE SHEET FOR VOLTA REGION (FGD GIRLS)

A. Girls

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 21/08/2025 TIME: _____ to _____ LOCATION: Kpando-Torkor CODE: _____

FACILITATOR: Nancy Gadson NOTETAKER: Notetaker ASSISTANT: Sharon Essien

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Kudiewu Perpetual	Participants	f. 12yrs	0536920647	
2	Aganya Happy	"	F. 18yrs	0558778424	
3	Akofo Mavis	"	F. 21yrs	0541910127	
4	Ambalo Emmanuella	"	F. 16yrs	0208807413	A.L
5	Agbove Linda	"	F. 21yrs	0248395269	
6	Kumador Akos	"	F. 21yrs	0594441921	A.M
7	Adza Mansa	"	F. 21yrs	0556883619	G.K
8	Gadri Kafui	"	F. 18yrs	0541433445	
9	Amewugah Cynthia	"	F. 14yrs	0556758382	
10	Borgeh Irene	"	F. 19yrs	0542907470	

ATTENDANCE SHEET FOR VOLTA REGION (FGD HEMALE HEADS)

c. Household Heads - Female

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 21/08-25 TIME: ____ to ____ LOCATION: KPANDO-TORKOR CODE: ____

FACILITATOR: Nancy Godson NOTETAKER: Waliyat Malic ASSISTANT: Sharon Essien

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Fausty Apeti	Participants	(F) 38yrs	0548442739	
2	Klayi Comfort	"	(F) 39yrs		K.C
3	Dabla Mawufemor	"	(F)	0540812584	
4	Ama Zoka	"	(F)		
5	Afi Ketonakpor	"	(F)		
6	Adzinah Charity	"	(F)		
7	Georgina Amegashie	"	(F)		
8	Lewu Martha	"	(F)		
9	Favor Agbove	"	(F)	0594057180	F.A
10	Agbove Patience	"	(F)	0545939582	

ATTENDANCE SHEET FOR ASHANTI NORTH REGION (FGD GIRLS)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 18th August 2025 TIME: ____ to ____ LOCATION: Kumawu CODE: Girls

FACILITATOR: Justin Navelle NOTETAKER: Rosemary Abena Attah ASSISTANT: Emmanuella Mary Osei-Sarfo

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	TAKYI CLARA	Seamstress	F 21	0557023461	
2	MUSAH FADILA	Seamstress	F21	0559275853	
3	HAFSAT YUSSIF	Seamstress	F20	0506803385	
4	BOATEMAA SALOMEY	Student	~~F18~~ F 15	0203470364	
5	Portia Oppong	Student	F 19	0536191036	
6	BREFO PATIENCE	Cleaner	F 20	0594805930	
7	ACHEAMPONG JOLIANA	Trader	F19	0549806755	
8	Ntim Francisca	Student	F14	0544251421	
9	Ntim Patricia	Student	F13	0541154157	
10	Queenstalin Tawia	Student	F16	0249679817	
11	Macbach Eugenia	Student	F16	0533713459	

ATTENDANCE SHEET FOR ASHANTI NORTH REGION (FGD MEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 20th August 2025 TIME: ____ to ____ LOCATION: Kumawu CODE: Men

FACILITATOR: Justin Navelle NOTETAKER: Rosemary Abena Attah ASSISTANT: Emmanuella Mary Osei-Sarfo

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Mohammed Rabiu	DRiver	M 45	0243769747	
2	SEEDA ISSAH	TAILOR	M 55	0204113207	
3	Kofi Agyeman	Farmer	M 69	0242358983	
4	Kwame Asumadu	Farmer	M 49	0246047484	
5	John Ababio	Mason	M 33	0550410026	
6	Suleiman Zakariyya	Welder	M 35	0241136345	
7	MUNRITADA	LEDER, WORKS,	M38	0541851519	
8	Nana Duffour	Chief	M 80	0249689930	
9	Kwasi Ewuh	Shoemaker	M 50	0533049923	
10	KAMIL MASOUD	IMAM	M 59	0249465504	
11.	Ahmed Rufai	CHEF of Zongo-M	58	0242258527	
12.	Kofi Ampate	Farmer	M 70		

ATTENDANCE SHEET FOR ASHANTI NORTH REGION (FGD WOMEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

WATERWORX

DATE: 19th August 2025 TIME: to LOCATION: Kumawu CODE: Women

FACILITATOR: Justin Navelle NOTETAKER: Rosemary Abena Afful ASSISTANT: Emmanuella Mary Osei-Sarfo

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Martha Donkor	Trader	F 38	0554196171	
2	Amina Abdulla	Petty Trader	F 60	0240171197	
3	Mariatu Suweid	Trader	F 55	0240440785	
4	Akua Boatemaa	Trader	F 48	0546202630	
5	Abena Serwaa	Farmer	F 38	0553381782	
6	Grace Konadu A.	Trader	F 37	0548649775	
7	Diana Darko	Trader	F 37	0544251421	
8	Monica Donkor	Trader	F 40	054 782 3016	
9	Osei Charlotte	Trader	F 31	0205435787	
10	Akosua Addai	Farmer	F 60	—	
11.	Afia Badu	Farmer	F 50	0597802122	

ATTENDANCE SHEET FOR ASHANTI NORTH REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – KII GENDER

WATERWORX

DATE: 18/08/25 TIME: to LOCATION: Kumasi CODE:

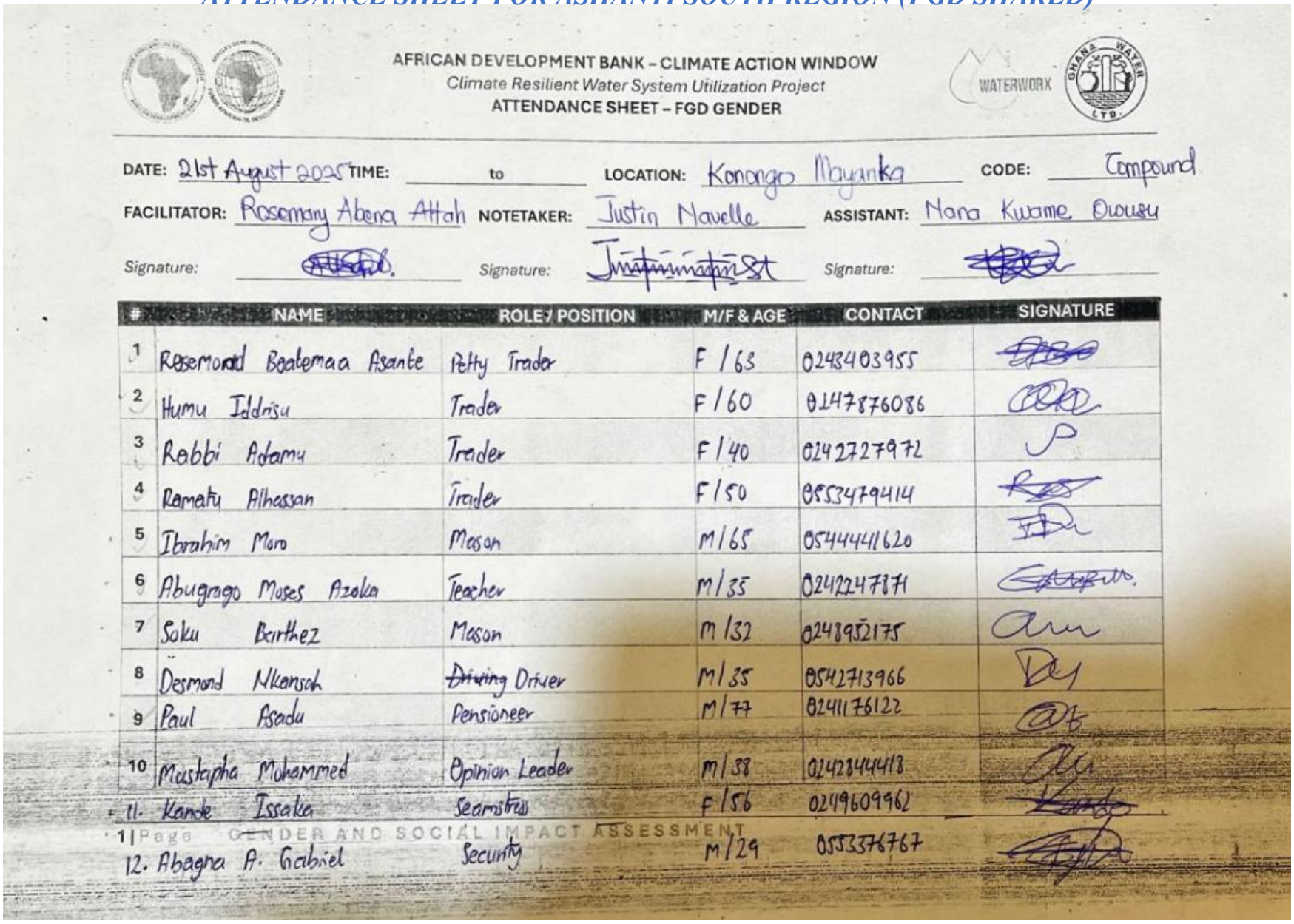
FACILITATOR: Justin Navelle NOTETAKER: Rosemary Abena Attah ASSISTANT: Emmanuelle Mary Osei-Sarfo

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Ps. J. T. Tenkorang	Pastor	M	0240888561	
2	Frederick Boateng M.	Assemblyman	M	0531366851	
3	Mutawakil Husein. M	ASSEMBLYMAN	M	0548281795	
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR ASHANTI SOUTH REGION (FGD SHARED)



AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

WATERWORX

DATE: 21st August 2025 TIME: _____ to _____ LOCATION: Konongo Mayanka CODE: Compound

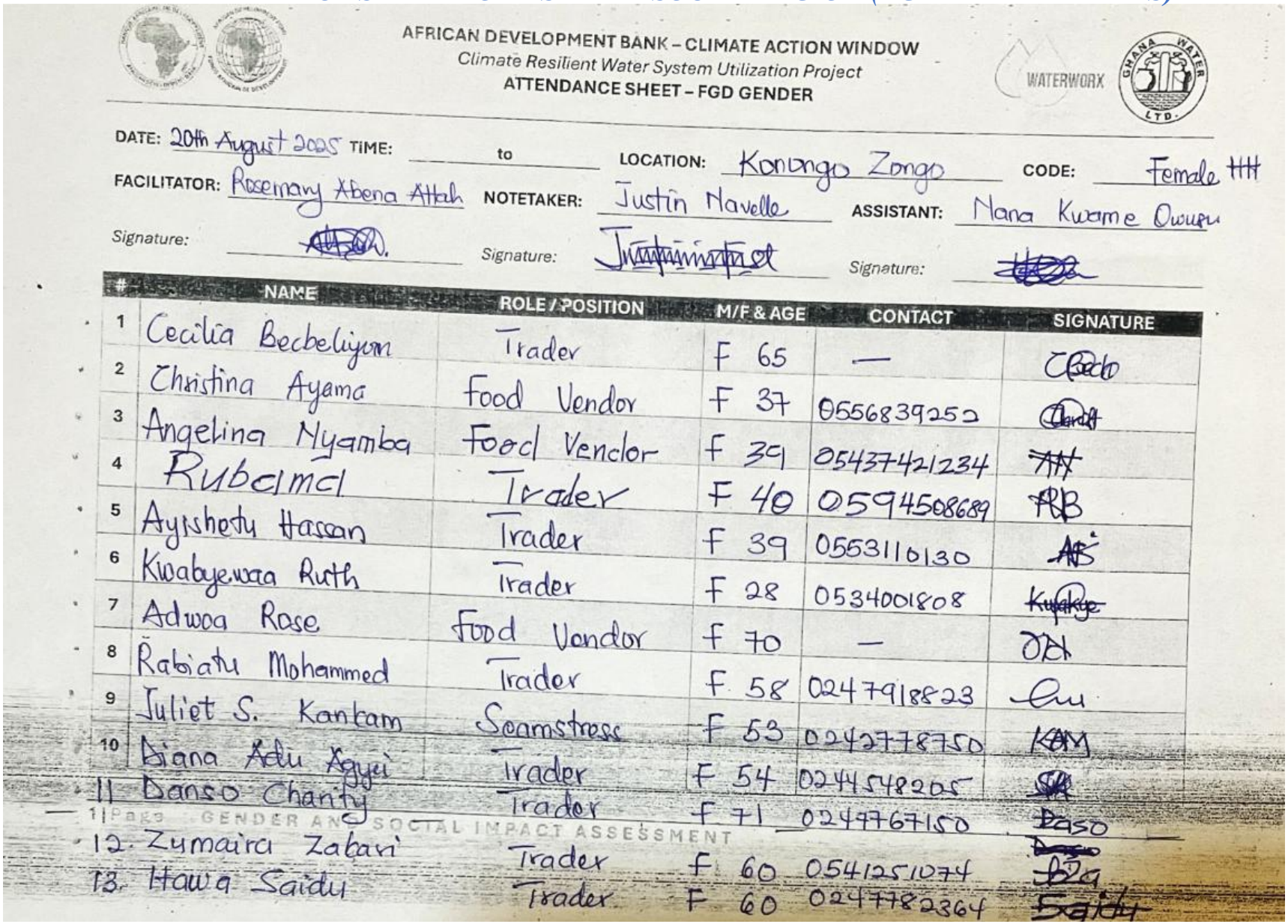
FACILITATOR: Rosemary Abena Attah NOTETAKER: Justin Mavelle ASSISTANT: Nana Kwame Owusu

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Rosemond Boatemaa Asante	Petty Trader	F / 63	0248403955	
2	Humu Iddrisu	Trader	F / 60	0247876086	
3	Rabbi Adamu	Trader	F / 40	0242727972	
4	Ramatu Alhassan	Trader	F / 50	0553479414	
5	Ibrahim Moro	Mason	M / 65	0544441620	
6	Abugrago Moses Azoka	Teacher	M / 35	0242247871	
7	Soku Berthez	Mason	M / 32	0248952175	
8	Desmond Nkansah	~~Driving~~ Driver	M / 35	0542713966	
9	Paul Asadu	Pensioneer	M / 77	0241176122	
10	Mustapha Mohammed	Opinion Leader	M / 38	0242844418	
11	Kande Issaka	Seamstress	F / 56	0249609962	
12	Abagna A. Gabriel	Security	M / 29	0553376767	

1 | Page GENDER AND SOCIAL IMPACT ASSESSMENT

ATTENDANCE SHEET FOR ASHANTI SOUTH REGION (FGD FEMALE HEADS)



AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

WATERWORX

DATE: 20th August 2025 TIME: ____ to ____ LOCATION: Konongo Zongo CODE: Female HH

FACILITATOR: Rosemary Abena Attah NOTETAKER: Justin Navelle ASSISTANT: Nana Kwame Owusu

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Cecilia Becheliyam	Trader	F 65	—	
2	Christina Ayama	Food Vendor	F 37	0556839252	
3	Angelina Nyamba	Food Vendor	F 39	0543742 1234	
4	Rubaimel	Trader	F 40	0594508689	
5	Ayishetu Hassan	Trader	F 39	0553110130	
6	Kwabenaa Ruth	Trader	F 28	0534001808	
7	Adwoa Rose	Food Vendor	f 70	—	
8	Rabiatu Mohammed	Trader	F 58	0247918823	
9	Juliet S. Kantam	Seamstress	F 53	0242778750	
10	Diana Adu Agyei	Trader	F 54	0244548205	
11	Danso Charity	Trader	f 71	0247767150	
12	Zymaira Zakari	Trader	F 60	0541251074	
13	Hawa Saidu	Trader	F 60	0247782364	

ATTENDANCE SHEET FOR ASHANTI SOUTH REGION (FGD GIRLS)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 22nd August, 2025 TIME: ____ to ____ LOCATION: Odumase Zongo - Konongo CODE: Girls.

FACILITATOR: Rosemary Abena Attah NOTETAKER: Justin Navelle ASSISTANT: Nana Kwame Owusu

Signature: ____ Signature: ____ Signature: ____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	RAMAT HAJIA	SEAMSTRES	F / 16	0546187746	
2	Naa Adomako	Fruit Vendor	F/21	0591334633	
3	MARIAMA MUSAH	Student	F/15	05H1966H3	
4	SARPONG ESITHER	Student	F/15	0551948523	
5	Ayshetu Suseini	Student	F/13	0599465148	
6	Fuzia Ayuba	student	F/14	02HH59[illegible]213	
7	Petra Adusei	student	F/15	0540765055	
8	Kubira Yahaya	Student	F/14	055[illegible]	
9	Nhyiraba Fredrica	Student	F/12	0531121050	
10	Adwoaboah Portia	Student	F/19	0536[illegible]	

ATTENDANCE SHEET FOR ASHANTI SOUTH REGION (FGD SHARED)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

WATERWORX

DATE: 21st August 2025 TIME: to LOCATION: Konongo Mayanka CODE: Compound

FACILITATOR: Rosemary Abena Attah NOTETAKER: Justin Navelle ASSISTANT: Nana Kwame Owusu

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Rosemond Boatemaa Asante	Petty Trader	F/63	0248403955	
2	Humu Iddrisu	Trader	F/60	0147876086	
3	Rabbi Adamu	Trader	F/40	0242727972	
4	Ramatu Alhassan	Trader	F/50	0553479414	
5	Ibrahim Moro	Mason	M/65	0544441620	
6	Abugnago Moses Azoka	Teacher	M/35	0242247871	
7	Soku Barthez	Mason	M/32	0248952175	
8	Desmond Nkansah	~~Driving~~ Driver	M/35	0542713966	
9	Paul Asadu	Pensioneer	M/77	0241176122	
10	Mustapha Mohammed	Opinion Leader	M/38	0242844418	
11.	Kande Issaka	Seamstress	F/56	0249609962	
12.	Abagna A. Gabriel	Security	M/29	0553376767	

ATTENDANCE SHEET FOR ASHANTI SOUTH REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – KII GENDER

DATE: 21/08/25 TIME: to LOCATION: Konongo CODE:

FACILITATOR: Rosemary Abena Affah NOTETAKER: Justin Navelle ASSISTANT: Nana Kwame Owusu

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Adam Ismaila	Assembly man	M	0245687464	
2	Hon Ade Oye	Opemian L	M	0262609	Ade
3	Mad. Gladys Opoku aa	Gender Advocate	F	0245029801	
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR EASTERN REGION (FGD MEN)

N. Tion

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 28/08/25 TIME: _____ to _____ LOCATION: Ofoasekuma CODE: _____

FACILITATOR: _____ NOTETAKER: Elaine H. Bawuoro ASSISTANT: Agnita S. Mogtari

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Nana Abusuapanyin Yaw Kumi	Abusuapanyin	M 54	0249604465	
2	Daniel Ofosu Duamena	Unit Cmttee Chairman	M 33	0241732776	
3	Offen Francis	Unit Cmttee Member	M 34	0548277242	
4	Mr. Anthony Karikari	Former Unit Cmttee Member	M 64	0245313102	
5	Mr. Daniel Ofori Kodie	Former Unit Cmttee Member	M 70	0245240511	
6	Mr. John Fokuo	Former Unit Cmttee Member	M 65	0245695121	
7	Mr. Rockson Danso	Opinion leader	M 61	0242178713	
8	Mr Ahenkorah Joseph	Opinion Leader	M 46	0249596234	
9	Mr. Kennedy Agbaglo	Opinion Leader	M 40	0530652283	
10	Mr. Simon Agbaglo	Opinion Leader	M 60	0533511835	

ATTENDANCE SHEET FOR EASTERN REGION (FGD WOMEN)

B. Women

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 27/08/2025 TIME: _____ to _____ LOCATION: Akim Swedru CODE: _____

FACILITATOR: _____ NOTETAKER: Elaine H. Bowuona ASSISTANT: Queenta S Mayfair

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Veronica Yeboah	Mother - 35	Female	0541124480	V.Y
2	Patricia Obeng	Mother - 40	Female	0554354890	
3	Agatha Mensah	Mother - 18	Female	0242266380	
4	Brakowa Elizabeth	Mother - 34	Female	0530039850	
5	Badasu Lydia	Mother - 36	Female	0249691479	
6	Afia Akeneaa Akoto	Mother - 50	Female	0245308507	
7	Comfort Gyamoah	Mother - 68	Female	0249710013	
8	Bargica Yeboah	Mother 40	Female	0245378924	
9	Josephine Appiah	Mother 46	Female	0240216136	
10	Kate Odei	Mother - 35	Female	0538697253	

ATTENDANCE SHEET FOR EASTERN REGION (FGD SHARED)

E. Shared

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 27/08/23 TIME: _____ to _____ LOCATION: Akim Oda Old Town CODE: _____

FACILITATOR: _____ NOTETAKER: Elaine Dowuona ASSISTANT: Qanita S. Mogtari

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Hon. Papa Yaw N. Amoah	Assemblymember	M-50	0243555211	
2	MENSAH ANTHONY	FORMER PRINCIPAL	M-70	0545360782	
3	AKOMEAH KWAME	SRC PENSIONER	M-69	0594421009	
4	Seth Odong Bonsrah	Unit committee Chairman	M-60	0245754030	
5	Justina Arthur	Trader	F-69	0591696253	
6	Josephine Bootemaa	Trader	F-22	0594387011	
7	Appiah Asante	Mason	M-48	0545604597	
8	Abusuapanin Kwasi Mensah	Driver	M 62	0244449132	
9	Godfred Ajitey	Retiree	M 61	0546439011	G.A
10	Alex Owusu Ashie	Tailor	M 43	0558631830	

ATTENDANCE SHEET FOR EASTERN REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – KII GENDER

DATE: 27/8/25 TIME: to LOCATION: AKIM ODA CODE: 01

FACILITATOR: Obed O. Frempong NOTETAKER: Elaine H. Boaweng ASSISTANT: Agnita S. Mogtari

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	AKOTO D. AFFAFUAH	BUDGET OFFICER	M	0244027388	
2	Delight Sowu Ena	Gender Specialist	F	0243383048	Ena
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR EASTERN REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – KII GENDER

DATE: 27/08/25 TIME: to LOCATION: AKIM OBUBOA CODE:

FACILITATOR: Obed O. Frempong NOTETAKER: Elaine H. Dowuona ASSISTANT: Gayita S Mogtari

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Doe Andrews	ASS. MEMBER	M	0573921147	
2					
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR UPPER EAST REGION (FGD SHARED)

E. Sharing

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: _____ **TIME:** _____ **to** _____ **LOCATION:** Pilcene **CODE:** _____

FACILITATOR: Obed Frempong **NOTETAKER:** Tamara Kennedy **ASSISTANT:** Hanan

Signature: _____ *Signature:* _____ *Signature:* _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Mary Abobe	House Head	F (90)		
2	Apike Clement	house head	M 39	0245407213	
3	RITA Dampya		30F	0245407213	
4	Vitus Apike		48M	0246034723	
5	Barongmah victoria	wife	F(29)	0541881837	
6	Apike Emmanuel Atoa	House head	M(60)	0506278342	
7	Doazie N Grace		F(30)	0553353691	
8	Nyaaba Raymond	Husband	M (30)	0554162684	
9	Anoka Evastina	wife	F (38)	0249935365	
10	Ayiolaana Rita	wife	F (27)	0593214647	

ATTENDANCE SHEET FOR UPPER EAST REGION (FGD FEMALE HEADS)

C. Household Heads

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: _____ TIME: _____ to _____ LOCATION: Tindanmolgo CODE: _____

FACILITATOR: Obed Frempong NOTETAKER: Tamara Kennedy ASSISTANT: Hanan

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	AKolgo Christiana		F HO	0547963349	
2	Adeeraa Diana		F/26	0591817425	
3	Ayaane Patricia		F/29	0596108652	
4	Abeene Meleni		F/35	0249049027	
5	AKure Jennifer		F/30	0594946697	
6	AKanyele Elizabeth		F 34	0245222581	
7	Atongo Nma		F 50	05450 1387	
8	Atongo Mary		F 29	0549199898	
9	Ayimbila Mercy		F 48	0550670993	
10					

ATTENDANCE SHEET FOR UPPER EAST REGION (FGD MEN)

D. Men / Leaders

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: _____ **TIME:** _____ **to** _____ **LOCATION:** Dapsoritindanga **CODE:** _____

FACILITATOR: Obed Frempong **NOTETAKER:** Tamon Kennedy **ASSISTANT:** Hanan

Signature: _____ *Signature:* _____ *Signature:* _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	FRANCIS BABA AKWEONGO		MALE	0203427256	
2	HARRY ANDO	DRIVER	MALE(45)	0595168055	
3	MOSES AGONGA	TEACHER	MALE(47)	0203142896	
4	OSMAN IBRAHIM	DRIVER	MALE(40)	0547447683	
5	CLEMENT DOMOLOGA	CRAFTMAN	MALE(33)	0550938260	C.D
6	AYAMGA AKOLGO	HOUSEHOLD HEAD	MALE(52)	0245716881	A.A
7	AMOAH ABAZELI	CRAFT MAN	MALE(50)	0539682936	
8	SIXTUS AKAPOSIBA	TEACHER	MALE(43)	0547036210	
9					
10					

ATTENDANCE SHEET FOR UPPER EAST REGION (FGD A. Girls)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: _____ TIME: _____ to _____ LOCATION: Zaar CODE: _____

FACILITATOR: Obed Frempong NOTETAKER: Tamara Kennedy ASSISTANT: Hanan.

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	AKolbila Ernestina	Student (SHS	F(29)	0552309791	
2	Ainyuure Yvonne	Student (J.HS	F(16)		
3	Atampugre Joyceline	Student	F(19)	0543619566	
4	ASomboya Patience Aneo	Student	F(20)	0596383866	
5	Aniah Dorcas	Student	F(22)		
6	AyinZelegoMercy	Student	F(23)	0536375[illegible]2	
7	Abdulai Salamatu	Student	F(17)		
8	Akabira Valentina	Student	F(18)		
9	Asobila Sylvia	Student	F(14)		
10	Anaba Emelia	Student	F(13)		

ATTENDANCE SHEET FOR UPPER EAST REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – KII GENDER

DATE: _____ **TIME:** _____ **to** _____ **LOCATION:** Zaare Tindonmolgo **CODE:** _____

FACILITATOR: _____ **NOTETAKER:** Tamara Kenealy **ASSISTANT:** Abdul-Hanan Yahaya

Signature: _____ *Signature:* _____ *Signature:* _____

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Hon. BALWA PIULE	ASSEMBLYMAN	M.	0243781868	
2	Ayine Nancy	Health worker	F	0540619741	
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR BRONG AHAFO REGION (FGD WOMEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 20/05/25 TIME: 9:00am to 12:00pm LOCATION: Techiman Town-Bordan CODE: 01

FACILITATOR: Mufied Addo NOTETAKER: Buah Bimpeh Ummol Kulsum ASSISTANT: Prince Feimpong

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Kubra Musah	Momo Vender	F/23	0202595327	
2	Owusuaa Barbara	Teacher	F/33	0243690535	
3	Ridwan Basira	Trader	F/30	0257646790	
4	Fati Ikililu	Nursery Operator	F/34	0542544922	
5	Aramata Awuni	Fashion Designer	F/18	0534066490	
6	Bajor Roseline	Fashion Designer	F/19	0533917998	
7	Dorcas Akugri	Fashion Designer	F/31	0248284807	
8	Adisatu Alhassan	—	F/43	0594972609	
9	Amposah Vida	Trader	F/38	-	
10	Issaka Aysha	Fashion Designer	F/32	-	

ATTENDANCE SHEET FOR BRONG AHAFO REGION (FGD MEN)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 21/08/25 TIME: 08:00am to 10:30am LOCATION: KUKOMPO CODE: 03

FACILITATOR: MILDRED ADJO NOTETAKER: Bugh Bimuka Ummul Kulsum ASSISTANT: FREDERICK AMOAH

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Nsiah Emmanuel	commte member	M-38	0268031432	
2	Besse Cosmos	Youth activists	M-25	0596209002	
3	Paul Kuligh	Youth activist	M-33	0248742969	
4	Okrah Isaac	Methodist Elder	M-56	0241563139	
5	Alexander Agiemah	commetee chairman	M 37	0531837906	
6	Okrah John	youth activist	M 53	0749972662	
7	Mensah A frank	Youth activist	M-81	0545732442	
8	Baffour Lawrence	Community leader	M-75	0541568585	
9	Nana Boakye Mensah	Korintihene	M-59	0553522891	
10	Kwabena Osei	Community leader	M-65	0257418727	

ATTENDANCE SHEET FOR BRONG AHAFO REGION (FGD SHARED)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – FGD GENDER

DATE: 20/08/25 TIME: 02:08pm to 4:30pm LOCATION: Koase CODE: 02

FACILITATOR: Mildred Naa Adda NOTETAKER: Buah Bimuna U. Kulsum ASSISTANT: FREDERICK ADDAH

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Owusuaa Jennifer	Trader	30/07/19??	0553199701	
2	Gariong A. Gifty	TRADER	F 18	0586062135	
3	Owusu Abigail	Market woman	F 28	0242851?0	
4	Acheampomaa Benedicta	Trader	F 19	0539543296	
5	Gladys Amoah	momo vendor	F 50	0246030057	
6	Acheampomaa Portia	fruits seller	F 26	0551435944	
7	ESTHER TWUMWAA	Unit committee chair	F 41	0247777464	
8	AGYEIWAA ADJEBEAH	TRADER	F 45	0204987544	
9	Joyce Misaa	FOOD VENDOR	F 43	0542834017	
10	Gladys Kansiyaa	TRADER	F 50	0257024689	

ATTENDANCE SHEET FOR BRONG AHAFO REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – KII GENDER

DATE: 21/08/2025 TIME: (1) 11:00am - 12:00pm (2) 02:00pm - 03:00pm LOCATION: (1) KUKUOMPO (2) KOASE CODE: 02 & 03

FACILITATOR: MILDRED ADDO NOTETAKER: Buah Bimuka U. Kulsum ASSISTANT: _____

Signature: _____ Signature: _____ Signature: _____

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Umar Osman	Assembly man	M-28	0593580326	
2	Mannak Abdbakari	Teacher	M-38	0200120097	
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR UPPER WEST REGION (FGD WOMEN)

B. Women

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 20/04/25 TIME: 9:00 to 12:05 LOCATION: Kambali CODE: 132

FACILITATOR: Brian Likpa NOTETAKER: Abigail Afrakoma ASSISTANT: Felicity Chentiwumi

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Osman Afisa		F 30	0553694631	
2	Samah Faustina		F 29	0599512253	
3	Abdullah Fati		F 35	0208662116	
4	Iddrissu Alimah		F 40	0554421666	
5	Barikisu Issah		F 48	0552329301	
6	Seidy Rafiatu		F 46	0242971661	
7	Mohammed Rahinatu		F 39	0557936854	
8	Awudu Yunu		F 24	0541080627	
9	Zakaria Tyweira		F 25	0241105224	
10	Rahinatu Seidu		F 36	0203315646	

ATTENDANCE SHEET FOR UPPER WEST REGION (FGD SHARED)

E. Sharing - Mixed Compound

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 20/05/25 TIME: 1:30 to 4:30 LOCATION: Kamsali CODE: 132

FACILITATOR: Brian Kipo NOTETAKER: Abigail Afrakoma ASSISTANT: Salifu Chentiwini

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Asata Musah		F 40	0241108224	
2	Habibata Abu		F 50	0594347115	
3	Bagel Martina		F 45	0540638829	
4	Alimata Kamaldeen		F 41	0554221628	
5	Karim Fuseina		F 51	0557765623	
6	Issahaku Farinatu		F. 39	0541246937	
7	Issahaku Barikisu		F 47	0241515616	
8	Seidu Teni		F 52	0548865171	
9	Barikisu Mohammed		F 43	0542393640	
10	Adiisa Inusha		F 40	0591648022	

ATTENDANCE SHEET FOR UPPER WEST REGION (FGD FEMALE HEADS)

C. Household Heads

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 21-08-25 TIME: 12:[illegible] to 3:05 LOCATION: Piisi Nkonfaakla CODE: 2

FACILITATOR: Brian Kipo NOTETAKER: Abigail Afaloma ASSISTANT: Salifu Chentiwuni

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Grace Kunbasoru		F	0553857995	
2	Kuunera dangi		F	0537817686	
3	Gladys Danaa		F	0597735255	
4	Gandaa Ernestina		F	0256873851	
5	Faustina Kuwei		F		
6	Clemencia Sori		F	0555148565	
7	Mary Manlaang.		F	0532818984	
8	Erapogra Ziniyeli		F	0532912527	
9	christiana Sori		F.	0546357407	
10	cheree danga.		F.	0558566629	

ATTENDANCE SHEET FOR UPPER WEST REGION (FGD MEN)

D. Men Heads

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – FGD GENDER

DATE: 22-05-25 TIME: 9:20 to 12:24 LOCATION: Piisi/Konfaslela CODE: 2

FACILITATOR: Bren Lipa NOTETAKER: Abigail Afatsonad ASSISTANT: Salifu Chatawnai

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F & AGE	CONTACT	SIGNATURE
1	Emmanuel Akurah		M	0243826743	
2	Baeire David		M	0247215141	
3	Ignatius Kunbasogra		M	0245905237	
4	Namong T. Alexander		M	0240139795	
5	Saabatagsarong		M	0533954706	
6	Sookuon London		M		
7	Tubo Akurah		M	0533364822	
8	Maang Nuoketaa		M	0595070611	
9	Daatire Kunvenzuma		M	0542545100	
10	Ourinaa Boyenaani		M		

ATTENDANCE SHEET FOR UPPER WEST REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW
Climate Resilient Water System Utilization Project
ATTENDANCE SHEET – INSTITUTIONAL ENGAGEMENT

WATERWORX

DATE: 19-OF-25 TIME: 12:00 to 1:30 LOCATION: Kambali CODE: 132

FACILITATOR: Brian Kipo NOTETAKER: Abigail Afualoma ASSISTANT: Sali Chentwuni

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	Denigtaa M. Gifty	Community nurse	F	0550658207	
2					
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR UPPER WEST REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – INSTITUTIONAL ENGAGEMENT

WATERWORX

DATE: 21/05/25 TIME: 9:00 to 11:00 LOCATION: Kamjeli CODE: 132

FACILITATOR: Brian Kipo NOTETAKER: ASigeil Afuelama ASSISTANT: Salifu Chatuwuni

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	HON. ADAM MASAHUDU	ASSEMBLY MEMBER	M	0248471884	
2					
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

ATTENDANCE SHEET FOR UPPER WEST REGION (KII)

AFRICAN DEVELOPMENT BANK – CLIMATE ACTION WINDOW

Climate Resilient Water System Utilization Project

ATTENDANCE SHEET – INSTITUTIONAL ENGAGEMENT

DATE: 19/09/25 TIME: 2:45 to 4:45 LOCATION: Kambali CODE: 132

FACILITATOR: Brian Kipo NOTETAKER: Abigail Afaklonu ASSISTANT: Salifu Chentuuni

Signature: Signature: Signature:

#	NAME	ROLE / POSITION	M/F	CONTACT	SIGNATURE
1	YUSSIF Y. SIITA	ASSISTANT HEADMASTER	MALE	0207413151	
2					
3					
4					
5					

ISSUES / CONCERNS / COMMENTS / RECOMMENDATIONS

Appendix 6: Water Quality Results and Pictures



Water Sample being taken from Upstream of Owere River at Konongo-Patriensa



Water Sample being taken from Downstream of Owere River at Konongo-Patriensa



Water Sample being taken from Upstream of Volta Lake at Kpando- Torkor



Water Sample being taken from Downstream of Volta Lake at Kpando- Torkor

Analysis Results

Water Research Institute, Environmental Chemistry Division
CSIR Premises, Airport Res. Area
P. O. Box M. 32
Accra, Ghana
Phone: (+233-0302) 775351/52 Fax: (+233-21) 777170 E-mail: info@csir-water.com

Order ID ***Company Name: Ghana Water Limited***

Contact First Name: ***Contact Last Name:***

Billing Address:

Postal Code ***City:***

Community: Owere Konongo Patriensa ***Site Name:***

Sample: Owere River Upstream ***Receipt date: 15/10/25***

Analysis start date: 15/10/25 ***Analysis end date: 20/10/25***

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Turbidity	3	NTU	426	5	5
Colour (apparent)	2	Hz	1500	5	15
Odour		-	-	Inoffensive	Inoffensive
pH	4	pH Units	6.82	6.5-8.5	6.5-8.5
Conductivity	1	µS/cm	377	-	-
Tot. Susp. Solids (SS)	5	mg/l	430	0	-
Tot. Dis. Solids (TDS)	6	mg/l	189	500	1000
Sodium	30	mg/l	11.8	200	200
Potassium	29	mg/l	7.20	30	30
Calcium	23	mg/l	2.97	200	200
Magnesium	28	mg/l	1.31	150	150
Total Iron	31	mg/l	10.5	0.3	0.3
Ammonia (NH_4-N)	13	mg/l	2.23	0.00 – 1.5	0.00 – 1.5
Chloride	24	mg/l	9.43	250	250
Sulphate (SO_4)	19	mg/l	17.4	250	250
Phosphate (PO_4-P)	17	mg/l	0.045	-	-
Manganese	26	mg/l	0.166	0.4	0.4
Nitrite (NO_2-N)	14	mg/l	0.036	1.0	1.0

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Nitrate (NO_3-N)	15	mg/l	0.323	10	10
Total Hardness (as $CaCO_3$)	25	mg/l	12.8	500	500
Total Alkalinity (as $CaCO_3$)	22	mg/l	21.6	-	-
Calcium Hardness (as $CaCO_3$)	23	mg/l	7.42	-	-
Mag. Hardness as $CaCO_3$)	26	mg/l	5.39	-	-
Fluoride	20	mg/l	<0.010	1.5	1.5
Bicarbonate (as $CaCO_3$)	22	mg/l	26.4	-	-
Carbonate	22	mg/l	0.00	-	-

Remarks: **Turbidity, Ammonia, Colour and Iron values exceeded the WHO guideline values. Total Suspended Solids value also exceeded the GSA standard value. Although the other physico-chemical constituents of the water sample are satisfactory, the water is not suitable for potable use without treatment.**

Approved by:

Dr. K. A. Asante (Head, ECSED)

HEAD-ECSED
21 OCT 2025

The report shall not be reproduced in part or in full, without the written approval of the test laboratory. The analytical results relate only to the samples analysed. The bracket (<) indicates value below detection limit.

Analysis Results

Water Research Institute, Environmental Chemistry Division
CSIR Premises, Airport Res. Area
P. O. Box M. 32
Accra, Ghana
Phone: (+233-0302) 775351/52 Fax: (+233-21) 777170 E-mail: info@csir-water.com

Order ID ***Company Name: Ghana Water Limited***
Contact First Name: ***Contact Last Name:***
Billing Address:
Postal Code ***City:***

Community: Owere Konongo Patriensa ***Site Name:***
Sample: Owere River Downstream ***Receipt date: 15/10/25***
Analysis start date: 15/10/25 ***Analysis end date: 20/10/25***

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Turbidity	3	NTU	120	5	5
Colour (apparent)	2	Hz	4500	5	15
Odour		-	-	Inoffensive	Inoffensive
pH	4	pH Units	6.26	6.5-8.5	6.5-8.5
Conductivity	1	µS/cm	67.1	-	-
Tot. Susp. Solids (SS)	5	mg/l	120	0	-
Tot. Dis. Solids (TDS)	6	mg/l	52.1	500	1000
Sodium	30	mg/l	7.40	200	200
Potassium	29	mg/l	3.80	30	30
Calcium	23	mg/l	3.53	200	200
Magnesium	26	mg/l	0.623	150	150
Total Iron	31	mg/l	14.5	0.3	0.3
Ammonia (NH_4-N)	13	mg/l	2.14	0.00 – 1.5	0.00 – 1.5
Chloride	24	mg/l	9.13	250	250
Sulphate (SO_4)	19	mg/l	1.90	250	250
Phosphate (PO_4-P)	17	mg/l	0.092	-	-
Manganese	26	mg/l	0.203	0.4	0.4
Nitrite (NO_2-N)	14	mg/l	0.023	1.0	1.0

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Nitrate (NO_3-N)	15	mg/l	0.331	10	10
Total Hardness (as $CaCO_3$)	25	mg/l	11.4	500	500
Total Alkalinity (as $CaCO_3$)	22	mg/l	20.8	-	-
Calcium Hardness (as $CaCO_3$)	23	mg/l	8.82	-	-
Mag. Hardness as $CaCO_3$)	26	mg/l	2.58	-	-
Fluoride	20	mg/l	<0.010	1.5	1.5
Bicarbonate (as $CaCO_3$)	22	mg/l	25.4	-	-
Carbonate	22	mg/l	0.00	-	-

Remarks: **pH value fell below the WHO guideline value. Turbidity, Ammonia, Colour and Iron values also exceeded the WHO guideline values. Furthermore, Total Suspended Solids value exceeded the GSA standard value. Although the other physico-chemical constituents of the water sample are satisfactory, the water is not suitable for potable use without treatment.**

Approved by:

Dr. K. A. Asante (Head, ECSED)

HEAD-ECSED 21 OCT 2025

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Analysis Results

Water Research Institute, Environmental Chemistry Division
CSIR Premises, Airport Res. Area
P. O. Box M. 32
Accra, Ghana
Phone: (+233-0302) 775351/52 Fax: (+233-21) 777170 E-mail: info@csir-water.com

Order ID ***Company Name: Ghana Water Limited***
Contact First Name: ***Contact Last Name:***
Billing Address:
Postal Code ***City:***

Community: Kpando-Torkor ***Site Name:***
Sample: Volta Lake Upstream ***Receipt date: 15/10/25***
Analysis start date: 15/10/25 ***Analysis end date: 20/10/25***

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Turbidity	3	NTU	2.49	5	5
Colour (apparent)	2	Hz	10.0	5	15
Odour		-	-	Inoffensive	Inoffensive
pH	4	pH Units	7.22	6.5-8.5	6.5-8.5
Conductivity	1	µS/cm	77.1	-	-
Tot. Susp. Solids (SS)	5	mg/l	2.50	0	-
Tot. Dis. Solids (TDS)	6	mg/l	66.0	500	1000
Sodium	30	mg/l	6.10	200	200
Potassium	29	mg/l	3.40	30	30
Calcium	23	mg/l	5.85	200	200
Magnesium	26	mg/l	3.10	150	150
Total Iron	31	mg/l	0.048	0.3	0.3
Ammonia (NH_4-N)	13	mg/l	0.478	0.00 – 1.5	0.00 – 1.5
Chloride	24	mg/l	4.37	250	250
Sulphate (SO_4)	19	mg/l	<1.00	250	250
Phosphate (PO_4-P)	17	mg/l	0.046	-	-
Manganese	28	mg/l	0.013	0.4	0.4
Nitrite (NO_2-N)	14	mg/l	0.004	1.0	1.0

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Nitrate (NO_3-N)	15	mg/l	0.120	10	10
Total Hardness (as $CaCO_3$)	25	mg/l	27.4	500	500
Total Alkalinity (as $CaCO_3$)	22	mg/l	36.0	-	-
Calcium Hardness (as $CaCO_3$)	23	mg/l	14.3	-	-
Mag. Hardness as $CaCO_3$)	26	mg/l	12.8	-	-
Fluoride	20	mg/l	0.270	1.5	1.5
Bicarbonate (as $CaCO_3$)	22	mg/l	43.9	-	-
Carbonate	22	mg/l	0.00	-	-

Remarks: **The physico-chemical constituents of the water sample are satisfactory. The water is therefore suitable for potable use.**

Approved by:



Dr. K. A. Asante (Head, ECSED)

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Analysis Results

Water Research Institute, Environmental Chemistry Division
CSIR Premises, Airport Res. Area
P. O. Box M. 32
Accra, Ghana
Phone: (+233-0302) 775351/52 Fax: (+233-21) 777170 E-mail: info@csir-water.com

Order ID ***Company Name: Ghana Water Limited***

Contact First Name: ***Contact Last Name:***

Billing Address:

Postal Code ***City:***

Community: Kpando-Torkor ***Site Name:***

Sample: Volta Lake Downstream ***Receipt date: 15/10/25***

Analysis start date: 15/10/25 ***Analysis end date: 20/10/25***

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Turbidity	3	NTU	6.51	5	5
Colour (apparent)	2	Hz	7.50	5	15
Odour		-	-	Inoffensive	Inoffensive
pH	4	pH Units	7.44	6.5-8.5	6.5-8.5
Conductivity	1	µS/cm	69.6	-	-
Tot. Susp. Solids (SS)	5	mg/l	6.50	0	-
Tot. Dis. Solids (TDS)	6	mg/l	61.5	500	1000
Sodium	30	mg/l	5.80	200	200
Potassium	29	mg/l	3.00	30	30
Calcium	23	mg/l	5.19	200	200
Magnesium	26	mg/l	1.79	150	150
Total Iron	31	mg/l	0.077	0.3	0.3
Ammonia (NH_4-N)	13	mg/l	0.208	0.00 – 1.5	0.00 – 1.5
Chloride	24	mg/l	3.47	250	250
Sulphate (SO_4)	19	mg/l	<1.00	250	250
Phosphate (PO_4-P)	17	mg/l	0.012	-	-
Manganese	28	mg/l	0.018	0.4	0.4
Nitrite (NO_2-N)	14	mg/l	0.006	1.0	1.0

Parameter	Method No.	Unit	Value	GS 175-6	WHO Guideline
Nitrate (NO_3-N)	15	mg/l	0.018	10	10
Total Hardness (as $CaCO_3$)	25	mg/l	22.2	500	500
Total Alkalinity (as $CaCO_3$)	22	mg/l	34.0	-	-
Calcium Hardness (as $CaCO_3$)	23	mg/l	14.8	-	-
Mag. Hardness as $CaCO_3$)	26	mg/l	7.37	-	-
Fluoride	20	mg/l	0.080	1.5	1.5
Bicarbonate (as $CaCO_3$)	22	mg/l	41.5	-	-
Carbonate	22	mg/l	0.00	-	-

Remarks: **Turbidity value exceeded the WHO guideline value. Total Suspended Solids value also exceeded the GSA standard value. Although the other physico-chemical constituents of the water sample are satisfactory, the water should be filtered before potable use.**

Approved by:

Dr. K. A. Asante (Head, ECSED)

HEAD-ECSED
21 OCT 2025

The report shall not be reproduced in part or in full, without the written approval of the test laboratory. The analytical results relate only to the samples analysed. The bracket (<) indicates value below detection limit.

Appendix 7: Selected Ambient Air and Noise Quality Monitoring Pictures



Air and Noise Quality Monitoring at Timante



Air and Noise Quality Monitoring at Atwima Boko



Air and Noise Quality Monitoring at Amanforom



Air and Noise Quality Monitoring at Yikene





Noise and Air Quality Monitoring at Aboadze Abuesi



Air and Noise Quality Monitoring at Woraso



Air and Noise Quality Monitoring at Wurompo

	
Daytime Air and Noise Quality Monitoring at Shama Junction	*Nighttime Air and Noise Quality Monitoring at Shama Junction*
	
Daytime Air and Noise Quality Monitoring at Wenchi Town	*Nighttime Air and Noise Quality Monitoring at Kpando Torkor*

	
Daytime Air and Noise Quality Monitoring at Siriyiri	*Nighttime Air and Noise Quality Monitoring at Siriyiri*
	
Daytime Air and Noise Quality Monitoring at Abura Dunkwa	*Nighttime Air and Noise Quality Monitoring at Abura Dunkwa*
	
Daytime Air and Noise Quality Monitoring at Akim Swedru	*Nighttime Air and Noise Quality Monitoring at Akim Swedru*

Appendix 8: Calibration Records

ARA N-FRM FACTORY FLOW CALIBRATION

Traceable Standard: CME-LFE 17242

Sampler : 16339 Client: Splytz

Date: 6-Jun-23

P_bar: 747.2 mm_Hg

Rel.Hum: 33 % Pump Hrs: 0.3

Calibration Equation:

Qa = (Kcal * (Del_P * (T + 273)/P_bar)^.5) + Bcal

Calculated Results:

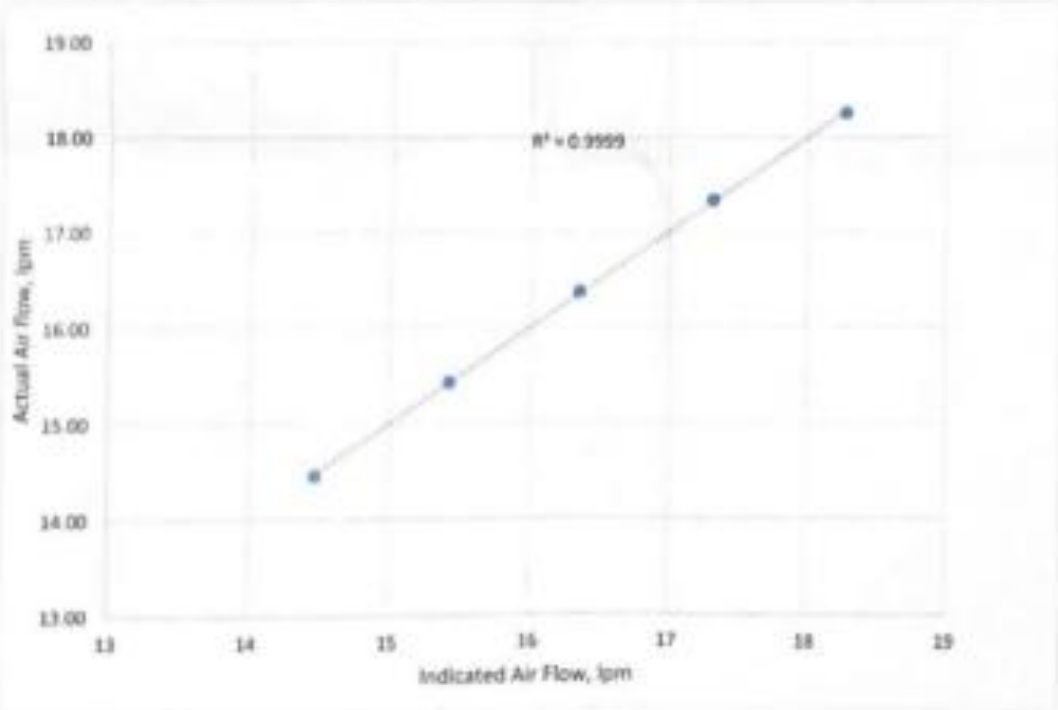
Kcal = 10.857

Bcal = 0.625

Flow Set lpm	Del_P mm_Hg	Temp Deg_C	"Y" Qa alpm	"X" Flow Factor	Calc Flow	% Diff	ABS % Diff
OFF	0.00	<<< ZERO Del_P SENSOR>>>					
14.5	7.66	23.3	14.45	1.275185	14.46973	0.122707	0.122707
15.5	8.75	23.2	15.43	1.362667	15.41955	-0.041793	0.041793
16.5	9.88	23.2	16.37	1.447985	16.34589	-0.128993	0.128993
17.5	11.14	23.2	17.33	1.537546	17.31829	-0.050275	0.050275
18.5	12.45	23.3	18.28	1.625712	18.27554	0.101533	0.101533
OFF	0.00	<<< FINAL ZERO CHECK>>>					

Notes: w/RTP
30JAN23 FW
TID=12

Efficiency: 3.924 Watts @ 16.7 LPM &30 cm.H2O



The calibration of this air sampler is in accordance with procedures outlined by US-EPA in published guidance documents 40 CFR Part 50, Appendix L, and EPA 454/B-16-001
The traceability of flow, pressure, and temperature of the reference standards used is achieved through calibrations performed by approved and accredited calibration facilities that maintain traceability to the National Institute of Standards and Technology (NIST).
Temperature and pressure sensors are confirmed to be within the US-EPA PM2.5 FRM specifications.

The uncertainty of the flow rate is +/- 2% of reading or better with 95% confidence.

16339_6JUN23_ Splytz

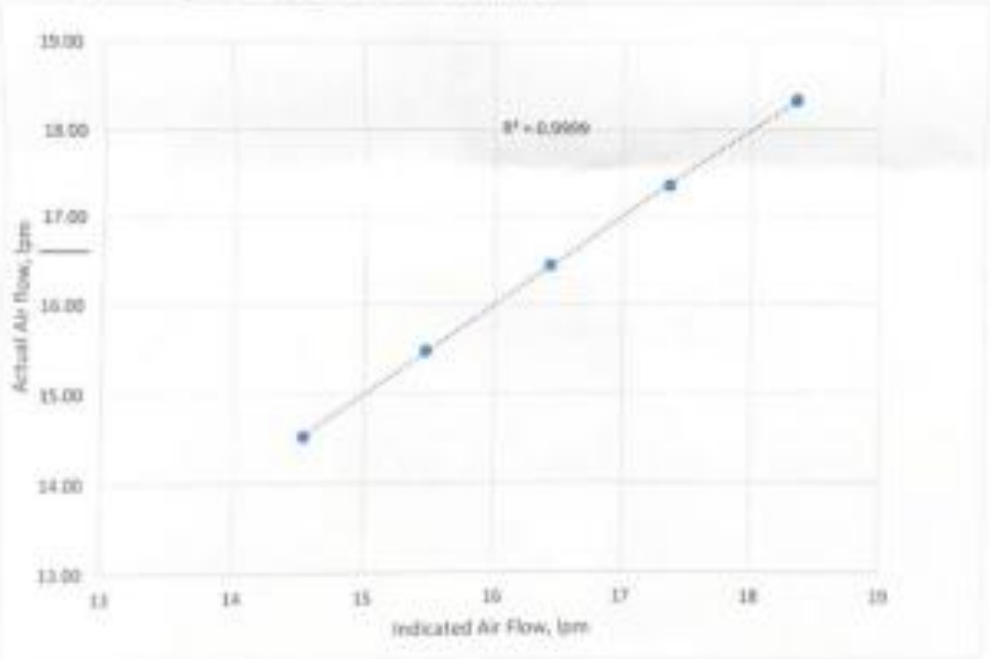
ARA N-FRM FACTORY FLOW CALIBRATION

Traceable Standard: CME-LFE 17242
Sampler : 16368 Client: Brannen
Date: 4-Jan-24
P_bar: 757.0 mm_Hg
Rel.Hum: 39 %
Pump Hrs: 0.9

Calibration Equation:
Qa = [Kcal * (Del_P * (T + 273)/P_bar]^.5) + Bcal
Calculated Results:
Kcal = 10.958
Bcal = 0.685

Flow Set lpm	Del_P mm_Hg	Temp Deg_C	"Y" Qa alpm	"X" Flow Factor	Calc Flow	% Diff	ABS % Diff
OFF	0.00	<<< ZERO Del_P SENSOR>>>					
14.5	7.62	23.5	14.52	1.264019	14.5357	0.087421	0.087421
15.5	8.68	23.5	15.48	1.349074	15.46771	-0.079366	0.079366
16.5	9.85	23.4	16.45	1.436881	16.42988	-0.098016	0.098016
17.5	11.05	23.5	17.35	1.522149	17.36422	0.10505	0.10505
18.5	12.38	23.5	18.34	1.611151	18.33949	-0.013698	0.013698
OFF	0.00	<<< FINAL ZERO CHECK>>>					

Notes:
FW_30JAN23
w/RTP
Efficiency: 3.582 Watts @ 16.7 LPM &30 cm.H2O



The calibration of this air sampler is in accordance with procedures outlined by US-EPA in published guidance documents 40 CFR Part 50, Appendix L, and EPA 454/B-16-001
The traceability of flow, pressure, and temperature of the reference standards used is achieved through calibrations performed by approved and accredited calibration facilities that maintain traceability to the National Institute of Standards and Technology (NIST).
Temperature and pressure sensors are confirmed to be within the US-EPA PM2.5 FRM specifications.

The uncertainty of the flow rate is +/- 2% of reading or better with 95% confidence.

16368_04JAN24_Brannen

NTi AUDIO

Manufacturer Calibration Certificate

The sound level meter submitted for testing successfully completed the periodic tests of IEC 61672-3. All tests are traceable in accordance with ISO/IEC 17025.

No pattern approval is available for this sound level meter configuration.

Sound Level Meter

Manufacturer	NTi Audio		
Type	XL2	S/N	A2A-23302-E1
Firmware	V4.68		
Reference Level Range	mid		
Microphone Model	M4261	S/N	5450
Performance class	Class 2		
Customer Inventory Nr.			

Customer

Nathan Ward
EnviroSafe
404 Madison St
Vidalia, GA 30474

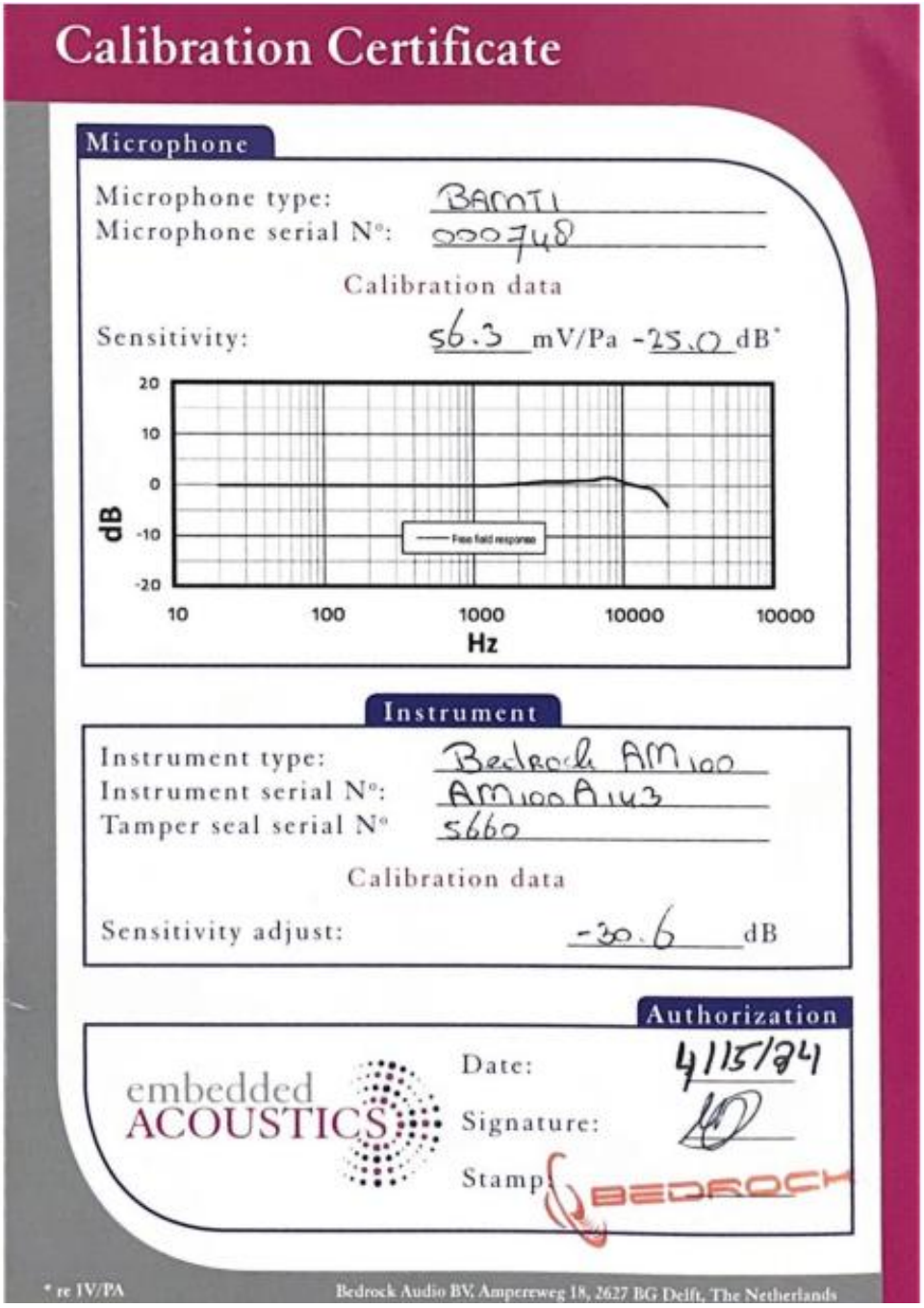
Date 23 January 2024

Certificate US-24-016

Results PASSED
(for detailed report see next pages)

Operator Matt Slaughter

NTi Audio Inc • P.O. Box 231209 • Tigard
Oregon, 97281 • United States



Calibration Certificate

Microphone

Microphone type: BAMTI

Microphone serial N°: 000748

Calibration data

Sensitivity: 56.3 mV/Pa -25.0 dB*

Instrument

Instrument type: Bedrock AM100

Instrument serial N°: AM100A143

Tamper seal serial N° 5660

Calibration data

Sensitivity adjust: -30.6 dB

Authorization

embedded ACOUSTICS

Date: 4/15/24

Signature:

Stamp: BEDROCK

* re 1V/PA

Bedrock Audio BV, Ampereweg 18, 2627 BG Delft, The Netherlands



aeroqual

Aeroqual Limited
460 Rosebank Road, Avondale, Auckland, New Zealand
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Calibration Certificate No. 71225

Calibration Date: 23 Jan 2024 08:16

Model: Nitrogen dioxide 0-1 ppm

Serial No: END-1506232-016

Environmental Conditions

Temperature 28.4 °C

Relative Humidity 59.5 %

Measurements

Calibration Standard /ppm	0.006	0.493	0.000	0.000
AQL Sensor (Mean) /ppm	0.003	0.492	0.000	0.000
AQL Sensor (Std. Dev) /ppm	0.001	0.001	0.000	0.000

*The Mean and Standard Deviation are calculated from three consecutive readings.

Calibration Standard

The Aeroqual sensor is calibrated against a chemiluminescence NOx analyser. The calibration of this analyser is traceable to primary standards.

QC Approval: Takao Yamasaki

Date: 23 Jan 2024

Appendix 9: Flora and Fauna Screening of Selected Project Municipalities/Districts

Ghana Water - Public

Scientific Name	Common Name	Category	WM	BM	WW	KNE	KM	ST	AK	OM	AE	AOB	AAK	STM	AM	UDE	SD	WEN	AAS	SH	MF	KPM	NT	DEN	KWB	TAL	SAP	AAC	AMM	EJ	KUM	OFM	ASK	JUA	BE
HERBACEOUS PLANTS & GRASSES																																			
Acroceras zizanioides	-	Grass																																	
Alternanthera pungens	Khaki Weed	Herb	O	O	O	O			O	O				O	O	O		O	O	O	O			O	O	O	O	O	O	O	O	O	O	O	O
Amaranthus spinosus	Spiny Amaranth	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Axonopus compressus	Broadleaf Carpet Grass	Grass	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Chromolaena odorata	Siam Weed	Shrub	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Commelina benghalensis	Bengal Dayflower	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Cynodon dactylon	Bermuda Grass	Grass	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Desmodium triflorum	Three-flower Beggarweed	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Dissotis rotundifolia	Pink Lady	Shrub							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Euphorbia hirta	Asthma Plant	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Ipomoea aquatica	Water Spinach	Climber					O	O			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
Oxalis corniculata	Creeping Woodsorrel	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Phyllanthus amarus	-	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Portulaca oleracea	Purslane	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Ricinus communis	Castor Oil Plant	Shrub	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Sida acuta	Common Wireweed	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Synedrella nodiflora	Synedrella	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Talinum triangulare	Waterleaf	Herb					O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Scientific Name	Common Name	Category	WM	BM	WW	KNE	KM	ST	AK	OM	AE	AOB	AAK	STM	AM	UDE	SD	WEN	AAS	SH	MF	KPM	NT	DEN	KWB	TAL	SAP	AAC	AMM	EJ	KUM	OFM	ASK	JUA	BE
Trianthema portulacastrum	Desert Horse Purslane	Herb	O	O	O	O			O	O				O	O	O		O	O	O	O			O	O	O	O	O	O	O	O	O	O	O	O
Tridax procumbens	Tridax Daisy	Herb	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
WOODY PLANTS & TREES																																			
Azadirachta indica	Neem Tree	Tree	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Calotropis procera	Sodom Apple	Shrub	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Cassia fistula	Golden Shower Tree	Tree							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Casuarina equisetifolia	She-Oak	Tree					O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Duranta erecta	Golden Dewdrop	Shrub							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Elaeis guineensis	African Oil Palm	Tree					O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	
Lagerstroemia speciosa	Pride of India	Tree							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Mangifera indica	Mango Tree	Tree	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Peltophorum pterocarpum	Copperpod	Tree							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Polyalthia longifolia	False Ashoka	Tree							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Roystonea regia	Royal Palm	Tree							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Solanum torvum	Turkey Berry	Shrub							O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Terminalia catappa	Indian Almond	Tree					O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Theobroma cacao	Cocoa Tree	Tree							O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
DOMESTIC MAMMALS																																			
Bos taurus	Cattle	Domestic Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Capra aegagrus hircus	Goat	Domestic Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Ovis aries	Sheep	Domestic Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Scientific Name	Common Name	Category	WM	BM	WW	KNE	KM	ST	AK	OM	AE	AOB	AAK	STM	AM	UDE	SD	WEN	AAS	SH	MF	KPM	NT	DEN	KWB	TAL	SAP	AAC	AMM	EJ	KUM	OFM	ASK	JUA	BE
Canis lupus familiaris	Dog	Domestic Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Felis catus	Cat	Domestic Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
WILD MAMMALS																																			
Cephalophus sp	Duiker	Mammal							O	O	O					O					O	O	O	O	O						O				
Cricetomys gambianus	Gambian Pouched Rat	Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Funambulus palmarum	Indian Palm Squirrel	Mammal							O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Mus musculus	House Mouse	Mammal	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Xerus erythropus	Striped Ground Squirrel	Mammal	O	O	O	O			O	O				O	O	O		O	O	O	O			O	O	O	O	O	O	O	O	O	O	O	O
DOMESTIC BIRDS																																			
Gallus gallus domesticus	Chicken	Domestic Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Meleagris gallopavo	Turkey	Domestic Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Numida meleagris	Helmeted Guineafowl	Domestic Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Anas platyrhynchos domesticus	Domestic Duck	Domestic Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Cairina moschata	Muscovy Duck	Domestic Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
WILD BIRDS																																			
Bubulcus ibis	Cattle Egret	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Centropus senegalensis	Senegal Coucal	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Corvus albus	Pied Crow	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Crinifer piscator	Western Plantain-eater	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Gallinula chloropus	Common Moorhen	Bird					O	O			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Lamprotornis purpureus	Purple Starling	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Milvus migrans	Black Kite	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Scientific Name	Common Name	Category	WM	BM	WW	KNE	KM	ST	AK	OM	AE	AOB	AAK	STM	AM	UDE	SD	WEN	AAS	SH	MF	KPM	NT	DEN	KWB	TAL	SAP	AAC	AMM	EJ	KUM	OFM	ASK	JUA	BE
Passer griseus	Northern Grey-headed Sparrow	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Ploceus cucullatus	Village Weaver	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Pycnonotus barbatus	Common Bulbul	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Streptopelia senegalensis	Laughing Dove	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Streptopelia semitorquata	Red-eyed Dove	Bird	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
REPTILES & AMPHIBIANS																																			
Agama agama	Red-headed Agama	Reptile	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Hemidactylus frenatus	Common House Gecko	Reptile	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Lithobates heckscheri	River Frog	Amphibian					O	O			O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Varanus exanthematicus	Savannah Monitor	Reptile	O	O	O	O			O	O				O	O	O		O	O	O	O			O	O	O	O	O	O	O	O	O	O	O	O
INVERTEBRATES																																			
Achatina achatina	Giant Ghana Snail	Invertebrate					O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Aedes aegypti	Yellowfever Mosquito	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Anaphe infracta	(Kentey Caterpillar)	Invertebrate							O	O			O	O	O	O	O	O	O	O	O	O		O	O	O	O	O	O	O	O	O	O	O	O
Apis mellifera	Western Honey Bee	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Dorylus sp	Driver Ant	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Drosophila melanogaster	Fruit Fly	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Mantis religiosa	European Mantis	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Musca domestica	Housefly	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Periplaneta americana	American Cockroach	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

Scientific Name	Common Name	Category	WM	BM	WW	KNE	KM	ST	AK	OM	AE	AOB	AAK	STM	AM	UDE	SD	WEN	AAS	SH	MF	KPM	NT	DEN	KWB	TAL	SAP	AAC	AMM	EJ	KUM	OFM	ASK	JUA	BE
Vespula vulgaris	Common Wasp	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O
Zonocerus variegatus	Variegated Grasshopper	Insect	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O	O

MMDA Key:

WM: Wa Municipal; BM: Bolgatanga Municipal; WW: Wa West; KNE: Kasena Nankana East; KM: Keta Municipal; ST: South Tongu; AK: Atwima Kwanwoma; OM: Offinso Municipal; AE: Agona East; AOB: Asikuma/Odoben/Brakwa; AAK: Abura/Asebu/Kwamankese; STM: Sekondi Takoradi; AM: Asuogyaman; UDE: Upper Denkyira East; SD: South Dayi; WEN: Wenchi; AAS: Asante Akim South; SH: Shama; MF: Mfantsiman; KPM: Kpando Municipal; NT: North Tongu; DEN: Denkyembour; KWB: Kwaebibirem; TAL: Talensi; SAP: Sekyere Afram Plains; AAC: Asante Akim Central Municipal; AMM: Asokore Mampong Municipal; EJ: Ejisu; KUM: Kumasi Metropolis; OFM: Oforikrom Municipal; ASK: Asokwa; JUA: Juaben; BE: Bolgatanga East