Republic of Ghana

MINISTRY OF LANDS AND NATURAL RESOURCES

GHANA FOREST INVESTMENT PROGRAMME- ENHANCING NATURAL FOREST AND AGROFOREST LANDSCAPES (ENFAL) PROJECT

REFERENCE NO.: MLNR/ENFAL/CS/01/2021

PILOT RECLAMATION OF MINED OUT AREAS IN SELECTED FOREST LANDSCAPES OF GHANA

BEKWAI FOREST DISTRICT

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT STUDY

REVISED FINAL REPORT

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EXECUTIVE SUMMARY

Introduction

The Ghana Forest Investment Programme (FIP) covers two main projects. They are:

1. Engaging Local Communities in Reducing (ELCIR+) Emissions from Deforestation and Forest Degradation (REDD+) Project - financed through the Strategic Climate Fund (SCF) of the Climate Investment Funds (CIF) with Additional Funding from the African Development Bank (AfDB).
2. Enhancing Natural Forests and Agroforestry Landscapes Project (ENFALP) financed through the SCF of the CIF and coordinated by the World Bank.

Given the recent spate of small-scale and illegal mining activities in forests, agricultural and cocoa landscapes, the Government of Ghana has prioritized actions to address illegal small-scale mining and the environmental destruction that it causes. The FIP Steering Committee approved the additional financing to augment existing Ghana FIP resources to assist in designing, testing, and implementing activities to address challenges posed by mining activities in forest and cocoa landscapes.

The Ghana FIP has four components: 1) Policy Reforms and Institutional Strengthening; 2) Pilot Investments for Improved Forest and Landscape Management with Communities; 3) Innovation, Capacity Building; and Communications; and 4) Project Management, Monitoring and Coordination. The Additional Financing (AF) follows the same structure and a full description is provided in the project paper for the ENFALP.

Project Description

This project falls under Component 2a: Pilot demonstration of clean up and reclamation practices with alternative livelihood support after forest and land degradation and loss due to Artisanal Small Scale Mining (ASM).

Mining activities in the Bekwai Forest District have encroached portions of Apramprama, Denyau, Supuma 1 and Supuma 2 Forest reserves at Kobro, Abuakwaa, Adamso and Kubi (Supuma 1 and Supuma 2) communities respectively. The pilot areas to be rehabilitated under this project comprise the sites listed in the table below:

Name of Site	Forest District	Area (Ha)	Area (SqM)
Apamprama	Bekwai	40.13	401,300
Denyau	Bekwai	69.70	697,000
Supuma-1	Bekwai	10.60	106,000
Supuma-2	Bekwai	12.20	122,000

The total land area to be worked on is 1,326,300m^2. The estimated volume of fill material required is about 519,325.50m^3 with an estimated volume of 132,630m^3 of topsoil.

The clean- up processes and physical rehabilitation activities to be employed will include:

1. *Remediation of contaminated sites*
2. *Rehabilitation works*: Consisting of backfilling of illegally mined areas. The main activities for the backfilling of the mined-degraded site will include:
   - Dewatering of pits where there are ponds;
   - Spreading of stockpile washed gravel and coarse sand into pits;
   - Haulage of additional material from adjacent hills to complete the backfilling of pits.
3. *Trimming & improving riverbanks with required boulders*. The main activities for the trimming and improvement will include:
   - Diversion of river courses; and
   - Stabilization of the riverbanks with boulders
4. *Restoration of biodiversity. This will consist of*
   - Preparation of reclaimed lands;
   - Re-vegetation/plantation of nutrient fixing trees/crops; and
   - Maintenance/Monitoring.
5. *Preparation of Reclaimed lands will involve*
   - Ripping and ploughing of hard bare surfaces where necessary;
   - Spreading of top loamy soil; and
   - Application of humus and fertilizer or organic material, if required.
6. *Re-vegetation/plantation:*
   - The Community's preferred economic trees such as Teak, Odum, Ofram, Rubber, Mahogany, Wawa, Sapele, Cedrela, Emre etc. and other nitrogen fixing trees including Leucaena, Gliricidia, and Acacia will be considered to expedite the successional progress.
7. *Maintenance/ Monitoring:* Maintenance of reclaimed lands and re-afforestation will primarily comprise the following:
   - Watering;
   - Replacement of dead plants/invasive weeds control
   - Controlling or warding off livestock, which come to feed on the seedlings.
   - Safeguarding the reclaimed lands from re-mining operations

Relevant Policies, Legal and Administrative Framework

Some of the national policies and regulations identified to be relevant to the proposed pilot project include the following:

- Forest and Wildlife Policy, 1994
  - *Forestry Commission Act of 1999 (Act 571)*
- Minerals and Mining Policy of Ghana, 2014;
  - *Mining and Minerals Act, 2006 (Act 703)*
- National Water Policy, 2007;
  - *Water Resources Commission (WRC) Act, 1996 (Act 522)*
- National Environment Policy, 2013;
  - *The Environmental Protection Agency (EPA) Act, 1994 (Act 490)*
- National Health Policy, 2007;

- National Land Policy, 1999;
  - *Lands Commission Act, 2008 (Act 767)*
  - *Lands Act 2020, Act 1036*
  - *Stool lands Act*
  - *Land Use and Spatial Planning Act, 2016 (Act 925)*
- Water Resources Commission Act
- Riparian Buffer Zone Policy, 2014;
- Climate Change Policy; 2013, and
- National Gender Policy, (2015).

The key institutions comprise:
- Ministry of Lands and Natural Resources
- Forestry Commission
- Minerals Commission
- Water Resources Commission
- Lands Commission
- Environmental Protection Agency

The project will ensure compliance with all applicable policies, national laws and regulations as well as the World Bank Safeguard Policies to ensure sustainable development. The applicable WB Safeguard Policies include:
- OP 4.01 Environmental Assessment;
- OP 4.04: Natural Habitats;
- OP 4.09: Pest Management;
- OP 4.11 Physical Cultural Resources;
- OP 4.12 Involuntary Resettlement; and
- OP 4.36 Forests

Project Alternatives

Alternatives considered were in respect of the selection of pilot areas as well as the choice of treatment technology for the contaminated sites.

The key considerations for the final selection of the project sites included the site to be completely mined out to avoid re- entry by galamsey workers and the commitment of the local community to safeguard the site after reclamation works have been carried. Based on these considerations, mined out sites in the Bekwai forest district were selected for the pilot study.

So far, the best available and cost-effective technology option without much complexity is the Phytotechnology (Phytoremediation) as opposed to the high-energy, high-cost conventional methods. This technology uses plant roots, shoots, tissue and leaves to remove, transfer, stabilize or destroy contaminants in soil, sediments and water. It is considered as a “Green Revolution” in the field of innovative cleanup technologies. Phytostabilization works best where the contamination is shallow and the level of contaminants is low as confirmed for the project sites.

Among other reasons, the no action option will mean maintaining the status quo and implies that the affected forest reserves will remain degraded and denied the opportunity for restoration and Ghana will not fully achieve its goals under the Forest Improvement Programme

Baseline environmental and Social Conditions

The project areas are within the Apramprama, Denyau and Supuma Forest Reserves which falls under the Bekwai Forest District. The political/ administrative authority is the Akrofuom and Amansie Central District Assemblies. The local project communities comprise Kobro, Abuakwaa, Adamso and Kubi.

Water environment

The water bodies draining the project areas were sampled to assess the level of elemental contamination especially due to the activities of illegal mining. The sampling locations were close to the local communities. Among the selected areas, it was only at Apamprama that a flowing stream or river was seen and sampled from, together with open pits. The rest were all sampled from open pits. Sediment and soil samples were also obtained for laboratory analysis.

The metal analysis in both water and soils indicated that the local water bodies in the forest reserves are not severely polluted chemically by the mining activities that had taken place in them.

The highest levels of Mercury and Arsenic in the soil samples are 31.7ppm and 15.4ppm at Apamprama. That for water samples is 6.1ppm and 4.2ppm from upstream of Soko river at Apamprama for arsenic and mercury respectively. The river is almost dried up. The least concentrations were below detectable limits.

The water quality results have been compared with the national specification for drinking water FDGS 175-1:2013 and WHO guidelines and the contamination levels are minimal. The “Dutchlist” for soil quality have also been referred to. From the results, the water resources within the deforested areas of the selected forest reserves are not polluted with chemicals from mining activities likewise the soils. The latter may probably be due to leaching away by the heavy rains. The heap of soil can be used to fill the open pits. It was seen that offspring of logged trees are springing up in some of the sites which suggests that the soil can support the growth of new plants.

Terrestrial ecology

Walk-over surveys were conducted in the selected mined-out areas. At site, all the species encountered in sweep circular quadrats of 20 m radius were recorded. Sites attributes such as GPS coordinates, elevation and habitat type were noted, and photographs taken. The Literature on the flora and fauna of the reserves were reviewed to obtain knowledge on the species that occurred in the areas affected by the illegal mining activities to enable recommendations on suitable species for the reclamation to be made. The life forms and ecological guilds of the species were analyzed. The conservation status of each species encountered was assessed using the Star Rating system adopted in the Forest Reserves of Ghana Geographic Information Exhibitor manual (Hawthorne, 1995).

Sample locations and habitat types

Sample	Lat N	Long W	Description
Forest Reserve			
Supuma *1*			
Sample 1	06º00.970	001º45.036	Mined-out area with secondary thicket
Sample 2	06º00.924	001º44.922	Wetland
Sample 3	06º00896	001º44.845	Secondary forest with broken canopy
Supuma 2	06º01.415	001º44.876	Mined area, Secondary thicket; fire damaged
Denyau A	06º03.025	001º48.071	Extensive bare ground
Denyau B	06º02.686	001º48.390	Extensive bare area; drained by Fena stream
Apamprama			
Sample 1	06º18.486	001º52.075	Open canopy secondary forest; extensive bare area
Sample 2	06º18.992	001º52.640	Secondary thicket; broken canopy secondary forest

General Vegetation of Supuma and Apramprama Forest Reserves

The Management Plan for the Supuma Forest Reserve notes that the reserve is relatively disturbed with some patches of closed canopy forest. It attributes the high level of disturbance to farming, hunting and illegal logging by forest edge communities. The preponderance of *Broussonetia papyrifera*, an Alien Invasive Species, in the reserve is also cause for concern. The Apapmprama Forest reserve seems to be in the same condition as the Supuma Forest Reserve. Illegal logging and poaching are rampant in the reserve. It is also highly disturbed, with widespread gaps and heavily degraded portions. Isolated pockets of forest in good condition however exist in portions of the reserve (Apamprama F.R management Plan, 2021-2040).
The Denyau shelter belt Forest Reserve is also an open forest with widespread degradation. Hunting poses significant threat to wildlife. Illegal logging and illegal mining are rampant in the reserve and are responsible for the poor condition of the reserve (Denyau Forest Reserve Management Plan, 2021-2040).

Habitat Description of Mined-Out Areas
The habitat of the mined-out areas of supuma 1 was heavily degraded at the time of the visit. The vegetation was a mosaic of secondary forest with open canopy, secondary thicket and wetlands created through the mining activities. The site had a preponderance of *Chromolaena odorata* in the secondary thicket. Tree species recorded in the secondary thicket included *Ceiba pentandra*, *Triplochiton scleroxylon*, *Vernonia colorata, Alchornea cordifolia, Morinda lucida, Trema orientalis* and *Rauvolfia vomitoria*. The wetlands had species such as *Typha domingensis, Rhyncospora corymbosa* and *Raphia hookeri*. The secondary forest had species such as *Musanga cecropioides, Cleistopholis patens, Zanthoxylum gillettii, Carapa procera, Trichillia prieureana, Myrianthus libericus, Sphenocentrum jollyanum* and *Acridocarpus smeathmannii*.

Floristic Analysis on the Apramprama, Denyau and Supuma sites

A total of 64 plant species in 62 Genera belonging to 33 families were recorded at the Three reserves visited during the survey. Pioneers constituted the dominant ecological guild (about 47%), this wasn't surprising because of the open, disturbed natures of the habitats. Primary species (non-Pioneer light demanders and Shade-bearers) formed a significant 34% of the flora.
Some of the species recorded are of significant commercial value as NTFPs or Timber species (Table 4). *Laccosperma opacum* is harvested in commercial quantities for the basket weaving industry. The others are commercial timbers.

Fauna of Denyau, Aprapama and Supuma Forest Reserves
A total of 62 species of birds belonging to 21 families in the Denyau Forest Reserve. The most common species encountered in the reserve is the Pied Hornbill. In the Apamprama Forest Reserve, a total of 81 species of birds in 31 families were recorded in the Apamprama Forest Reserve. The common species included the Green Hylia, Bronze Mannikin and Tambourine dove. No globally threatened species were recorded in the reserve. A total of 70 species of birds in 25 families were recorded in the Supuma Forest Reserve. Some of the common species of birds of the reserve include the Ahanta Francolin, Green fruit Pigeon, White-crested Hornbill, Green Turaco and Tambourine dove. The avian diversity is quite high in the reserve.

The most common species recorded in the reserve was the African Pied Hornbill (Lophoceros fasciatus). A checklist of the Mammals and birds of the Denyau, Apramprama and Supuma Forest Reserve is presented in the Annex.

Description of the Bekwai Forest District
The forest district lies in the Moist Semi-deciduous ecological zone and forms part of Ghana's high forest zone. It lies within latitudes 6^0 00"N and 6^0 03 "N and Longitudes 1^0 00 W and 1^0 35W. The Municipality's climate is semi-equatorial in nature. It has a reasonably high and consistent temperature, ranging from 32 degrees Celsius in March to 20 degrees Celsius in August. The annual rainfall averages between 1600 and 1800 millimeters.
The forest district has 16 Forest Management Units. The most common economic tree species include Mahogany (*Khaya spp*), Asanfina (*Aningeria spp*), Wawa (*Triplochiton scleroxylon*), and Ceiba (*Ceiba pentandra*).
The Bekwai Forest District office is in Bekwai in Ashanti Region of Ghana, but the forest reserve (see Figure 2.2) cut across 12 MDAs (2 municipalities and 10 districts).

Stakeholder Consultations
The engagement introduced the proposed project to stakeholders; allow stakeholders to provide comments and raise issues/concerns and to gather and record their initial concerns and recommendations. The outcome has consequently informed the design of the project and provided mitigation options for all potential adverse impacts and issues in the implementation of the project.

Key project stakeholders identified and engaged are categorized under the following headings:
1. Regulatory institutions
2. Local government authorities within the project area (Municipal and District assemblies);

3. Key Sector Agencies;
4. Traditional authorities with influence on the project lands;
5. Project affected persons or communities; and
6. Relevant Non-Governmental Organisations (NGOs).

The details of the engagement process and outcomes are presented in the main body of the report and the major issues discussed are summarized below. For completeness, the community social needs have also been presented in the report even though it was made clear to them that these fall outside the mandate of the current project.

The communities feel threatened by the influx of persons with various backgrounds to their communities to practice illegal mining. They had hitherto felt powerless in dealing with these people. Many community members out of necessity have also been involved in galamsey including activities in the forest reserves. They are mindful of the impact of these activities on their lives and do welcome the project to address some of their concerns. The community leaders are willing to lead the effort to ensure that mining in the forest reserves is avoided and would be satisfied with entering into formal agreements with the authorities to confirm their seriousness. The youth may be mobilized to assist with the policing effort. They wish the project would be designed to also improve their living conditions. Other concerns are listed as follows:

Political interferences
The community members and various institutions are wary of political interferences for such projects. They hope that adequate resources will be available to implement the project.
The Forestry Commission and other institutions including the District Assembly should be involved in project implementation and provided with resources where necessary.

Sensitization activities
Community members should be actively involved and informed of project in order to ensure that reclaimed lands are not destroyed by illegal mining ever again.

Socio-economic issues and environmental challenges
The project should have a positive impact on the local community livelihoods. The standard of living in the community is low. Farming is an important and vital economic activity within the communities. Provision of social amenities such as potable water, good roads and quality health service will improve the quality of life for the communities. Teenage pregnancies and bad habits among the youth such as smoking are of great concern. The influx of migrants into the community for mining purposes is a threat to socio- cultural standards.
Water bodies in the communities have been heavily polluted by the activities of galamsey and sanctions should be enforced to prevent the destruction of water bodies in the community.
It was explained to the communities that the project will not be able to provide all their needs as enumerated but it is expected that some job opportunities will be created during the construction phase. Also, some sections of the youth may be needed for the maintenance of the reclaimed area till its fully revegetated.

Security concerns
There is need to involve security personnel in the project, as illegal miners are usually armed with weapons. Moreover, the government should ensure that there is no political interference which may jeopardize the success of the project.

Community leadership
Key decision-makers include the chief and the elders, religious leaders, and the unit committee. The assembly member represents the government, and the communities are pleased with their crrent representation

Environmental and social resources and potential receptors
For this Project the following main resource / receptor types are identified:

- Geographical;
- Environment (physical and biological environment),
- Human/socioeconomic environment;
- Institutional/organizational

Geographical area of influence: The immediate geographical area of influence includes the forest reserve and local communities. The project mined out areas are found in the Apramprama, Denyau and Supuma forest reserve and the project communities comprise Kobro, Abuakwaa, Adamso and Kubi communities.

Physical and biological area of influence: The main environmental media to be impacted are water, ambient air at the project site, vegetation and fauna as well as their habitat and soil/land resources. Currently, the streams are extensively disturbed from the mining activities and therefore of minimal importance to the local communities. There may be further disturbance during the rehabilitation stage resulting in sediment transport which may impact water quality. Impact on aquatic life and fisheries may be significant.
The ambient air quality around the project area and local communities may also be affected by dust and emissions from project activities especially when excavations works are carried out in the dry season. Fumes and exhaust of equipment/machinery usage may also impact on ambient air quality. The rehabilitated mined out sites will result in an improvement in the flora and fauna and therefore biodiversity conditions within the forest reserves.

Human/ socioeconomic influence: The local communities are within 10km radius of the project sites. In most instances, access to the project sites will be through these communities. The movement of heavy trucks through the communities may pose safety challenges.

Institutional and organizational influence:
There are many institutions which will share interest in the proposed project in various capacities including promotional, regulatory and monitoring purposes, and which must be adequately informed and engaged in the entire life of the project. These include Forestry Commission/ Bekwai

Forest District; Environmental Protection Agency; Water Resources Commission; Bekwai Municipal Assembly;

Project activities of environmental and social concern

Preparatory phase activities of environmental and social concern include among others:

- Survey works and feasibility studies to determine the mined out areas to be rehabilitated
- Stakeholder consultations; and
- Statutory permitting activities from EPA.

Constructional phase activities to potentially impact on the environment include among others:

- Site preparation: vegetation clearing and topsoil removal;
- Construction of site office, work camp and storage facilities;
- Equipment/material/ transport to project site;
- Excavation works;
- Storage and disposal of construction spoil, including spare parts, waste oil, etc;
- Transportation of raw materials to project site; and
- Sanitation issues.

Operational phase activities to potentially impact on the environment consist of the maintenance of the rehabilitated mined out sites and monitoring.

Decommissioning activities to potentially impact on the environment include dismantling of constructional equipment and facilities.

Equipment and Materials

The equipment to be used will comprise basic construction equipment as listed below. Materials to be carted will be mostly soil.

Labour

It is expected that between 10 and 20 skilled workers will be required on site. The casual workers from the local communities will be few, about 10 to 15 workers.

Potential positive impacts

The potential positive impacts from the reclamation of the illegally mined out sites in the Apramprama, Denyau and Supuma forest reserves include:

- Removal of community safety hazards posed by the pits.
- Creation of employment for the youth groups to engage in tree planting.
- Increasing the skills and capacity of youths to secure employment in silviculture.
- Protection of traditional activities such as access to indigenous medicines and other related services from the forest.
- Improvement of the aesthetic beauty of the forest reserves.
- Free flow of local streams and rivers as their courses will be restored.
- Enhancement of the provision of habitat for fauna, promote biodiversity, and help expedite the restoration of ecosystems that were previously disrupted by the activities of the gold

mining operators at the site
- Climate change impact

Adverse impacts and proposed mitigation measures

At the preparatory and planning stage, these will include the following:
- Conflict with demarcation of reserve boundaries;
- Confirmation that projects sites are mined out
- Anxiety on the part project affected communities/ persons;
- Occupational Health and Safety Issues.

At the rehabilitation (construction) phase these will include:
- Air quality deterioration (Dust and gaseous emissions);
- Vibration and noise nuisance;
- Loss of vegetation and impact on local flora and fauna;
- Top soil mismanagement (over-exploitation/ over- use)
- Water pollution;
- Soil erosion and contamination;
- Disturbance of riparian and aquatic environment;
- Sanitation issues/waste generation concerns;
- Occupational, health and safety risks;
- Transport and traffic safety issues
- Community health and safety risks;
- Socio-economic disruptions (Loss of livelihood / access to land/property); and
- Visual Intrusion/attraction.

The social impact will include:
- Child labour concerns,
- Sexual exploitation and abuse and sexual harassment
- Labour influx;
- Spread of contagious diseases in beneficiary communities

At the operation (maintenance) phase, these will include:
- Sustainability of the rehabilitated areas
- Application of appropriate reclamation approaches/ strategies.

Mitigation measures for adverse impacts

Some key mitigation measures which are proposed for the identified adverse impacts are summarized below. The full list of measures is provided in **Table 22** in the main text.

A: Preparatory and Planning Phase

Community engagements
- The project will need to fully engage the communities to agree on the forest boundaries and to accept that the rehabilitated areas are within the reserve and should be left intact after the project

- The PCU to confirm by suitable documentation (MoU) with communities that the sites are actually mined out with no chance of illegal miners coming back to these sites. This formed the basis for the selection of the project sites.
- Seek commitment from the local communities through written agreements to assist to safeguard/ police the rehabilitated sites to ensure that the sites are not re-invaded by illegal miners.

Survey works and feasibility studies

- Provide and ensure the use of appropriate personal and protective equipment such as safety boots and gloves.

B: Rehabilitation and Reclamation works

Sourcing and storage of materials and setting up work camps

- As much as possible, materials will be obtained locally from the heaps piled up on sites from the mining activities and locally from adjacent hills.
- The design engineers have estimated the volumes of the total excavated troughs/pits and that of the excavated material heaps in each site and the difference arrived at between the total excavated troughs/pits and total volumes of heaped materials ranged between 0.5% and 3%. This marginal loss of excavated material may be due to sediments carried away by erosion because the washing of the excavated material was done in-situ and that, no material was carried away from the site.
- Workers would be adequately inducted and taken through orientation and regular training programmes to keep themselves safe as well as equipment
- Contractor will prepare a Construction Environmental Health and Safety Management Plan (CEHSMP) to be approved by Supervising Engineer and PCU
- Contractors to engage community in the selection of work camps.
- Work camps must be sited outside of the reserve.
- Fill materials must be tested to confirm pollutant free conditions before use especially, the heap of materials left behind at the mined-out areas. The soil tests seem to suggest a wide range of concentrations from zero (not detectable) to unacceptable levels of mercury and arsenic in some of the local materials depending on location. Specific materials to be used must be further tested.
- Contractor to provide adequate security on site. Local youth may be considered to perform the role of security guards.

Construction of site office, work camp and storage facilities;

- Regular scheduled maintenance of machines, generators, vehicles will be carried out on all vehicles to minimise exhaust emissions and ensure their roadworthiness.
- Regular air quality monitoring for dust emissions, exhaust gases and fumes onsite and offsite locations will be conducted to assess atmospheric pollution performance of the construction activities.
- Ensure vehicular speed limits of 30kmph over any unpaved landscape to minimise dust generation.
- Materials dumping will be regulated to reduce dust emissions
- All excavation activities would be closely planned, supervised and monitored closely to ensure minimal disturbance to surrounding land uses (forest reserve) and dust.
- Ensure that all construction personnel use approved PPE during construction activities
- Contractors must provide Code of Ethics for workers to be approved by the PCU

Haulage of equipment and materials to project sites and traffic management

- All the vehicles to be used for the project and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to hold the requisite driver's license as prescribed by the Drivers and Vehicles Licensing Authority (DVLA) and would be educated on public safety issues. Adequate traffic management measures will be instituted to caution the public and to create safety awareness.

- Some measures and conditions to be instituted by the contractor in the transport of materials include the following:
  - All trucks conveying materials will carry appropriate warning signals such as red flag and rotating amber lights;
  - Road worthy dump trucks will be used;
  - Very experienced drivers will be engaged;
  - Traffic wardens will monitor dump truck movements and ensure public and traffic safety;
  - Speed limits of between 20-30 km/hour will be allowed along the route for all trucks.
  - Carry out regular inspections of haulage roads. In the event truck failure along haulage routes, such trucks will be towed within 24 hours.
- Movement of construction materials to site or storage areas will be carried out in phases and properly regulated to control the number of haulage vehicles going through the community and coming into the project site at any given time to reduce the risk of accidents.

General works- filling with lateritic soil material, Compacting, Dewatering of pits, Spreading of stockpile into pits

- Ensure a rehabilitation and re-vegetation programme is effectively implemented
- Allow an appropriate buffer distance between any construction activity and remnant native vegetation, where practicable.
- Limit construction activities to only designated places and clearly mark out all vegetation, which will not be cleared, so that they are clearly visible as “no-go areas” to construction staff and vehicles.
- Dismantle and remove all equipment and machinery after construction from the site.
- Rehabilitate trenches and disturbed areas as soon as possible.
- Establish a monitoring program to include a site evaluation of overland flow and sedimentation in water courses as well as effectiveness of erosion control measures (i.e., netting and sand bags) will decrease the magnitude of the potential for increased soil erosion.
- Trenching and handling of materials, oil or waste will be done with utmost care to prevent discharge or cause major disturbance to the river
- Design and implement a Trenching Management Plan to reduce turbidity and spill
- The contractor must minimize the use of top-soil by applying the soil locally around the plants rather than spreading over large areas.
- To minimize erosion and sediment transport as a result of removal of vegetation, the necessary works to be carried out in the cleared locations will be done promptly.
- The period of exposure of excavated soils to weather conditions will be limited to minimize the possibility of sediment transport as a result of storm water/runoff. Heaps of excavated soils suitable for reuse will be utilized in the shortest possible time to minimize exposure
- Materials found to be unsuitable for backfilling will not be disturbed. It is expected that any residual contaminants will slowly leach out with time especially during heavy rainfall events, and therefore being diluted, will cause no critical damage to local water bodies.
- The contractor will establish and maintain high standards of occupational health, safety and environmental protection in line with this ESIA/ ESMP document, to prevent personal injury or illness, property damage, fires, security losses and environmental pollution.
- The contractor will be required to prepare and implement health, safety and environmental protection plans at the workplace to guide the construction activities in compliance with this ESIA/ ESMP. The responsibility for implementing this policy lies directly and personally with the contractor through its workers.
- The contractor will be required to develop an Occupational Health and Safety Plan to meet international standards, including requirements for PPE, task risk assessment, mandatory training, audit and monitoring, incident reporting etc.
- The Contractor will apply the hazard hierarchy when planning work to avoid /eliminate risks and reduce risk to as low as reasonably practicable.

- The contractors will educate workers on its health and safety policy. The adoption of the Health and Safety Policy at site will serve as a precautionary measure to prevent/ minimize the possibility of accidents and reduce health associated risks.
- The contractors will train selected workers as first aid givers and provide adequate first aid kits at the construction areas to treat minor ailments and cuts. However, major cases will be referred to the Bibiani Government Hospital.
- The contractor will ensure that workers are provided with the appropriate personal protective equipment such as safety boots and coats, hand gloves, earplugs and nose masks. Supervisors will be mandated to ensure the use of these protective devices and implement sanctions when necessary.

Use of Equipment

- All equipment to be used will be in good condition and scheduled regular maintenance will be ensured to reduce / minimize accidents.

Worker Rights and Wellbeing

- The Contractor will develop and implement a Labour Management Plan that adheres to national requirements as well as the WB Safeguard Policies, including requirements for workers to have contracts, Workers Grievance Mechanism and develop retrenchment plans if there is a requirement for collective dismissals.

Announcement and Notification of Work

- All close communities and the Municipal Assembly will be informed about the construction programme in advance and adhere to it. The PCU/ contractor will make announcements and give notices for work schedules through the Assemblymen and Unit Committee leaders.
- In case access roads have to be closed, local communities and road users will be informed in advance
- The contractor will provide adequate sanitation facilities for workers such as having an arrangement with the local communities for workers to have access to community facilities.

Planting of trees

- Project to plant indigenous species to assist the natural regeneration process. Species may be of high commercial value
- Adopt strategy to include application of suitable rooting medium to facilitate the survival and growth of the species
- Top-soil to be loosely graded and ground cover crops must be compatible with growing trees

Legumes and some grasses suitable for soil erosion will be used. Fertilisers may be applied where necessary.

Disposal of construction spoil, including spare parts, waste oil, etc.;

General Waste

- The contractor will appoint an HSE person. The HSE person, among other things, will prepare and implement a Waste Management Plan which specifies procedures and, incorporates the existing waste management plan for the project. This is to facilitate tracking of loads, and protocols for the maintenance of records of the quantities of wastes generated, recycled and disposed. The transparency is needed to assure the local community that this is a restoration and not a mining project
- Residual waste after implementation of the waste hierarchy measures will be collected by private waste management companies for onward disposal.
- The contractor should provide adequate waste bins at the temporary work camps to minimise littering and also littering at the work site. The collected refuse will then be transferred to the District Assembly's approved disposal site.
- Good site practices shall be implemented to avoid waste generation and promote waste minimisation

Construction Waste

- All scraps or other solid wastes will be disposed of at the approved disposal site of the District Assembly
- Excavated soils/concrete will be reused as much as possible for backfilling trenches dug during construction.
- Contaminated soil will be left undisturbed and isolated, and the contaminants allowed to leach out slowly with time into the external environment.
- Excavated material shall be used on site to the extent practical.

Hazardous Waste

All hazardous waste (e.g. oily waste) generated during construction/rehabilitation will be appropriately stored as per manufacturer's instructions. For onward recycling, treatment or disposal, EPA approved hazardous waste collectors will be invited for collection and disposal of all hazardous waste.

Use of Child Labour

- The PCU shall prepare and implement a labour management plan, including a labour grievance management procedure to facilitate resolution of labour related complaints and grievances.
- Contractors must provide Code of Ethics for workers to be approved by the PCU
- The contractor's Code of Ethics must expressly indicate zero tolerance for use of child labour, sexual exploitation and harassment.

Gender Based Violence

The contractor shall ensure that all staff and sub-contractor staff have been given orientation on gender-based violence (GBV), sexual exploitation and abuse (SEA), and sexual harassment (SH) prior to their starting work on the sites, and that adequate sanctions for infraction of these are included in the code of conduct for all staff.

C: Operation and maintenance Phase

Sustainability of the rehabilitated mined out sites

- The PCU will engage the Forestry Commission to select the right tree species and to agree/adopt appropriate reclamation approach/ strategy
- As part of the SEP, the Forest District will continually engage the local communities
- The local communities will commit to ensuring that the sites are not re- invaded by illegal miners.
- The communities fringing the reserves serve on the forest management committees established by the Forestry Commission and are therefore will be fully involved in the protection and sustenance of the reserves
- The 'Operation Halt' exercise involving the national security agencies will be operational in these areas
- The District Forest Managers have full responsibility to ensure that the reserves remain intact. The Ministry is resourcing them adequately with the required logistics including transport to ensure that they are able to carry out this function effectively

D: Decommissioning Phase after rehabilitation

Occupational/ public safety and traffic

- All construction facilities and remaining materials must be disposed of in a satisfactory manner at Assembly approved sites or reused if possible
- All waste must be transported off site in safe manner to avoid accidents/ incidents

Waste disposal

- All waste such as scraps metal, wood, concrete debris and garbage (pieces of plastic bags, food wrappers, etc.) will be sold to scrap dealers or if possible, donated to community members.

- The dismantling and removal of work camp facilities, equipment and materials at the site could generate waste which if reusable may go to the community or sent to Assembly approved for disposal.

Environmental and Social Management Plan

The Provisional Environmental and Social Management Plan (PEMP) developed for the project is in accordance with the Environmental Assessment Regulations of 1999, LI 1652 to assist the project to be carried out in an environmentally safe and sustainable, and socially acceptable manner. A budget of US$219,000 during the construction phase including the cost of mitigation measures, and US$183,000 for the operational phase, also including cost of the mitigation measures have been estimated. Hence a total budget of US$402,000 is provided.

The site-specific physical and biological conditions for all the selected pilot mined out sites within the Forest Reserves are very similar. The rehabilitation and reclamation methods to be utilized are the same, hence the recommended mitigation measures are applicable to all sites. The management plans therefore pertain to all the sites.

The implementation of the ESMP is expected to meet the following objectives:

- provide the platform to accommodate changes and uncertainties during project implementation;
- manage actual impacts during project implementation phase;
- ensure proper implementation of project permitting conditions;
- ensure satisfactory environmental performance; and
- serve as a source of background information for future projects.

A detailed Environmental and Social Management Plan (ESMP) will be prepared by the contractor and approved by the PCU to clearly set out steps and action plans to be taken to manage any significant environmental impacts from the operations. The FC forestry management procedures will be followed on completion of the rehabilitation work and the site handed over to the FC. The laid out management organisation and procedural and contingency measures to be put in place to ensure that the impacts are mitigated and managed appropriately are given in this report, including a monitoring plan.

Grievance redress

The GRM will consist of a five-tier resolution arrangement as follows:

- Local (project site) at community level;
- Complaint lodged at Bibiani Forest District Office;
- Bibiani Anhiawso Bekwai Municipal Assembly level grievance resolution;
- MLNR/PCU level; and
- Law courts

The general process is that a project affected person and/or other stakeholders should first raise a grievance at the contractor's project site office at the community level. If unresolved, it is referred to Bekwai Forest District Office. Beyond this level, the issue will be referred to the Municipal and

District Assemblies Grievance and Redress Office. If this proves unsuccessful in resolving the grievance, the complainant may escalate the issue by contacting the MLNR/ PCU office in Accra or if after the rehabilitation work may raise it with the FC. The complainant is free to seek legal redress at the law court to resolve the issue if these avenues fail to produce the desired result.

Conclusion

MLNR (PCU) is fully aware of the need for sound environmental practices and will undertake this project in compliance with both Ghanaian laws and the World Bank Safeguard Policies. The rehabilitation activities and subsequent maintenance of the reforested sites will satisfy the relevant local environmental protection laws and international conventions.

The implementation of the proposed project will enhance the forestry resources of the Apramprama, Denyau and Supuma Forest Reserve and will also minimize the threat of any future illegal mining activities in the reserve. Local communities will assist to protect the reserve and derive immense benefits from sustainably exploiting resources from the reserve under the framework of community resources management activities.

1.0 INTRODUCTION

1.1 Background

The Forest Investment Programme (FIP) of Ghana is part of an integrated financing package that aims to reduce deforestation and forest degradation, while also achieving livelihood and biodiversity co-benefits. The Program was designed in 2012, envisaged to use a programmatic, landscape level approach, managed by the Ministry of Lands and Natural Resources (MLNR). By supporting a range of interventions in the High Forest Zone, the FIP investments are aligned with national policies and priority development plans highlighted by the Ghana Shared Growth and Development Agenda (GSGDA), which among other things places emphasis on reducing deforestation through sustainable management practices for forests, agroforests and cocoa landscapes. The Programme also builds on efforts initiated by the Government of Ghana (GoG) to accelerate growth in the agriculture sector by transforming the capacities of smallholder producers and processors, particularly women, and help them take advantage of larger scales and market opportunities.

The overall objective therefore of the Programme is to reduce Green House Gas (GHG) emissions from deforestation and forest degradation while reducing poverty and conserving biodiversity.

The Ghana FIP Program specifically seeks to:

i. Ensure the integrity, restoration, and sustainable management of forest reserves by introducing more inclusive management and benefit sharing models, financial incentives, and investments;
ii. Restore forest cover in off-reserve areas by securing tree tenure and benefits, forest plantations and landscape restoration, and rehabilitation of degraded forest land;
iii. Increase trees and enhance carbon stocks in the farming system by promoting sustainable cocoa and agriculture practices; and
iv. Develop viable alternative livelihoods for local communities by addressing a broad range of technical, financial and market incentives, to reduce pressure on existing forests.

The Ghana FIP has two main projects. They are:

1. Engaging Local Communities in REDD+ Project(ELCIR+) financed through the Strategic Climate Fund (SCF)of the Climate Investment Funds (CIF) with Additional Funding from the African Development Bank
2. Enhancing Natural Forests and Agroforestry Landscapes Project (ENFALP) financed through the SCF of the CIF and coordinated by the World Bank.

However, given the recent spate of small -scale and illegal mining activities in forests, agricultural and cocoa landscapes, the Government of Ghana has prioritized actions to address illegal small-scale mining and the environmental destruction that it causes. The FIP Steering Committee approved additional financing to augment existing Ghana FIP resources to assist in designing, testing, and implementing activities to address challenges posed by mining activities in forest and cocoa landscapes.

This project involves reclamation and rehabilitation of selected mined out areas in forest reserves. The detailed designs and description of reclamation works have been described in later sections of this report.

1.2 Aim/Purpose of the EIA Study

The purpose of the EIA study is to identify and address possible direct, indirect and cumulative significant adverse environmental and social impacts to arise from the proposed project for acceptability and sustainability.

Four (4) mined out areas in the Apramprama, Denyau and Supuma Forest Reserves which are under the Bekwai Forest District of the Forestry Commission have been selected for the pilot study. The local communities of interest include Kobro, Abuakwaa, Adamso and Kubi.

The EIA will aid in decision making to achieve optimum project designs by considering the potential environmental and social costs in comparison with potential benefits.

The study also aims at satisfying both legal and institutional obligations specified under Environmental Protection Agency Act 1994 (Act 490), Environmental Assessment Regulations 1999 (LI 1652), and the relevant World Bank Safeguard Policies.

1.3 Objectives of the EIA Study

The specific objectives of the EIA study are to:

- Provide technical description of the project and identify activities of environmental/social concerns;
- Establish the baseline environmental conditions;
- Predict and examine all the significant environmental impacts on the surrounding communities and the general environment during implementation of the proposed project and advise on appropriate mitigation and abatement measures against potential adverse impacts;
- Assess the socio-economic and cultural benefits and disadvantages associated with the project for an informed decision to be made on the level of environmental compromise and permitting by relevant stakeholders; and
- Prescribe relevant monitoring/supervisory regime to ensure that prescribed mitigations are well implemented.

1.4 Scope of Works for the EIA Study

The scope of work for the EIA study is to among other things:

- Provide technical description of the proposed project and identify all activities of environmental/social concern;
- Establish the existing environmental and socio-economic baseline conditions of the project area of influence;
- Predict and examine all the significant environmental impacts on the surrounding communities and the general environment during implementation of the proposed project and advise on appropriate mitigation and abatement measures against potential adverse impacts;
- Provide a monitoring program for predicted impacts;
- Provide a costed Provisional Environmental Management Plan (PEMP);
- Document the socio-economic and cultural advantages and disadvantages associated with the proposed project for stakeholders and interested groups to make an informed decision on the level of environmental compromise and permitting.

- Provide framework to guide the development of an emergency response plan for the project;
- Provide guidelines to be followed in the unlikely event of decommissioning; and
- Carry out public consultations and include the outcome in the EIA report with arrangements to address stakeholder concerns.

1.5 Approach and Methodology for the EIA Study

The approach and methodology for the EIA study involved the following:

- Desktop study, review of project technical reports and literature reviews;
- Reconnaissance visits and site inspection,
- Public and Stakeholder consultations;
- Specialists studies for baseline information, covering:
    - Climatological/weather study;
    - Air quality and Noise monitoring;
    - Geology and Hydrogeology;
    - Land use study;
    - Topographic survey;
    - Terrestrial flora and fauna;
    - Aquatic flora and fauna;
    - Surface water and sediment monitoring
    - Socio-economic characteristics (demography, gender, employment, water and sanitation, industry).
- Impact analysis;
- Identification and assessment of environmental and social impacts; and
- Development of mitigation and monitoring measures as well as management plans.

1.5.1 Desktop study and Review of available Literature

The major documents reviewed comprise:

Policies and legal framework documents such as:

- Relevant sector policy/plan documents and regulations including:
    - Environmental Protection Agency Act, 1994 (Act 490);
    - Environmental Assessment Regulations, 1999 (LI 1652);
    - Water Resources Commission Act, 1996, (Act 522);
    - Lands Commission Act, 2008 (Act 767);
    - Lands Act 2020 Act 1036
    - Administrator of Stool Lands Act
    - Land Use and Spatial Planning Act, 2016 (Act 925)
    - Forestry Commission Act, 1999 (Act 571)
    - Minerals and Mining Act, 2006 (Act 703)
    - Ghana Investment Promotion Centre Act, 1994 (Act 478)
    - Local Governance Act, 2016 (Act 936).

- Relevant international conventions and safeguards.
    - World Bank Safeguard Policies;

- World Bank Group General Environmental, Health and Safety (EHS) Guidelines ;
- WBG Sector Specific Environmental, Health, and Safety Guidelines – General and Mining

Project related documents on project scope include:

- 1:50,000 topographical maps of the project areas;
- Preliminary designs and drawings for the reclamation of the mined out sites
- Project Appraisal Document (PAD)
- Project Environmental and Social Management Framework (ESMF) and Resettlement Policy Framework (RPF)

Other relevant documents/literature include:

- Draft Strategic Plan for pilot reclamation of mined out areas and supervision of reclamation in selected forest landscapes in Ghana, MLNR/ Biserkoms, 2022
- Scoping Study of the Potential for Reclamation of Mined-Out Areas in Forest Landscapes - Eastern and Western Region, Ghana FIP. MLNR/TEN, 2018
- Reclamation and Remediation Plans for Selected Old Mining Sites, Minerals Commission/ SAL Consult Ltd, 2016
- Medium Term Development Plans of the relevant District Assemblies; and
- Internet sources.

1.5.2 Reconnaissance visit and site inspections

Field visits to the proposed project site and surrounding/affected areas were carried out in February and March 2022 to assess potential environmental and social issues and conditions to be affected or are likely to develop from the implementation of the proposed project and to conduct baseline studies within the project area.

Plate 1: Mined out and degraded areas within the Bekwai Forest Reserve

1.5.3 Public/Stakeholder Identification and Consultations

The Design engineers preparing the Strategic Plans for the project were engaged severally to understand the project scope, design and implementation and to obtain relevant project documents. Key stakeholders

have also been consulted to obtain their comments and concerns on the proposed project with respect to the potential environmental and socio-economic issues by means of one-on-one interviews and stakeholder consultation meetings.

The stakeholder engagements also assisted in appreciating the role of the identified stakeholders for the successful implementation of the proposed project. Details of the stakeholder consultations are provided under **Chapter 6.**

The stakeholders consulted include the following:

1. Project proponent
    - Ministry of Lands and Natural Resources (MLNR), Project Coordinating Unit

2. Regulatory/Government Institutions
    - Environmental Protection Agency, Accra Head office;
    - Forestry Commission, Head office and Bekwai Forestry District Office
    - Minerals Commission, Head office
    - Water Resources Commission, Accra Head office;

3. Other Government Institutions
    - Lands Commission, Accra;
        - Office of the Administrator of Stool lands), Accra; and
        - Land Valuation Division of the Lands Commission, Accra.

4. Local Government Authorities
    - Akrofuom and Amansie Central District Assemblies

5. Representatives of Neigbouring communities and settlements
    - Traditional Authorities
        - Local Chiefs and Elders /Opinion Leaders
    - Project affected persons (subsistence farmers and galamsey workers)
    - Assembly members
    - Main local community (on the fringes of the forest reserve)
        - Kobro,
        - Abuakwaa,
        - Adamso, and
        - Kubi

1.5.4 Land Use Studies

Methods employed include:

- Field observations of existing conditions at the project area; and
- Use of the 1:50,000 topographical maps and satellite images of the project area to demarcate the project area of influence.

1.5.5 Socio-economic Studies

The methodology used for the studies include:

- Observational studies;
- Discussions with District Forest Officers,
- Interviews with traditional leaders, Assembly members of local communities;
- Interviews with the Municipal and District Assemblies;
- Review of District Profiles for the relevant District Assembly; and
- Review of district information from the 2010 Population and Housing Census.

1.5.6 Data Analysis and Reporting

The relevant data and information obtained from the desktop study/literature reviews, stakeholder consultations and field visits were collated, analysed where necessary and have been presented in this ESIA. The ESIA presentation is in line with the EPA format and consistent with the provisions of the WB OP4.01 as spelt out in the ESMF. The major headings of the report are:

i. Non-Technical Executive summary
ii. Introduction
iii. Policy, Legislative and Administrative Requirements
iv. Description of project and alternatives
v. Description of existing environment and social baseline
vi. Stakeholder consultations
vii. Potential Environmental and Social impacts identification and Evaluation
viii. Impact Mitigation and enhancement measures
ix. Provisional Environmental and Social Management Plan
x. Decommissioning
xi. Conclusion
xii. Annexes

2.0 RELEVANT POLICIES, LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

The EIA process is undertaken in line with the national regulations and international standards, including those of the World Bank. The relevant national and sector policies and plans, legal and institutional frameworks, international conventions and World Bank Safeguard Policies, as well as national environmental standards to guide the rehabilitation work are briefly described in this chapter.

The acts, regulations, guidelines, and policies stated in this document are relevant to the small-scale mining sub-sector. They are relevant in the sense that if provisions under them are strictly enforced, it will prevent galamsey from being undertaken in the country, including within forest reserves. The processes for the acquisition of legal small-scale mining license, the exploitation of the gold, the reclamation/rehabilitation of the mined-out areas and the decommissioning processes are found in the various legislations and policies. Eliminating galamsey in the project areas will require prospective small-scale miners to use the requisite provisions to carry out proper small- scale mining.

2.1 National and Sector Legal and Policy Framework

2.1.1 The 1992 Constitution of Ghana

The Constitution is the supreme law of Ghana, and all others must be consistent with any provision therein. One of its core mandates is *Safeguarding the national environment for posterity.*

Article 36 (9) states that The State shall take appropriate measures needed to protect and safeguard the national environment for posterity; and shall seek co-operation with other states and bodies for purposes of protecting the wider international environment for mankind*. The project should work to ensure that the natural environment is protected and preserved for posterity.*

Lands and Natural Resources

- Article 258 establishes a Lands Commission and prescribes the functions of the Commission.
- OASL: Article 267(2): Establishes the Office of Administrator of Stool Lands and prescribes its functions.
- Protecting natural resources: Articles 268 and 269 make provision for the protection of natural resources of the country. It gives power to Parliament under Article 269 (1) to provide for the establishment of a Minerals Commission, a Forestry Commission, Fisheries Commission and such other Commissions as Parliament may determine, which shall be responsible for the regulation and management of the utilization of the natural resources concerned and the co-ordination of the policies in relation to them.

The Lands Commission shall be consulted as a major agency in all land acquisition processes of the project within the country.

Chieftaincy

Article 270(1) recognizes the institution of chieftaincy, together with its traditional councils as established by customary law and usage. *The traditional authority will be engaged on the correct processes to follow in each community with respect to land acquisition and use.*

2.1.2 Land Policies and Regulations

Land Act, 2020 (Act 1036)
The Act addresses the defects in the land administration system in Ghana which had been characterised by a lack of comprehensive land policy framework, reliance on inadequate and outdated legislation, lack of adequate functional and coordinated geographic information systems, among others.

It complements the Lands Commission Act, 2008 (Act 767), the Administration of Stool Lands Act, 1998 (Act 481) and the Land Use and Spatial Planning Act, 2016 (Act 925), with the view to providing a comprehensive legal regime for the land sector in Ghana and also support decentralised land service delivery to bring about efficiency, cost-effectiveness and enhanced accessibility to land.

National Land Policy, 1999
Land Policy aims to ensure 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 utilized 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.
- Instill 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

Lands Commission Act, 2008 (Act 767)
The Lands Commission Act 2008 establishes the Lands Commission to integrate the operations of public service land institutions in order to secure effective and efficient land administration to provide for related matters. The objectives of the Commission include among others to:

- Promote the judicious use of land by the society and ensure that land use is in accordance with sustainable management principles and the maintenance of a sound eco-system; and
- Ensure that land development is effected in conformity with the nation's development goals.

Land Use and Spatial Planning Act, 2016 (Act 925)
An Act to revise and consolidate the laws on land use and spatial planning, to provide for sustainable development of land and human settlements through a decentralized planning system, to ensure judicious use of land in order to improve quality of life, to promote health and safety in respect of human settlements and to regulate national, regional, district and local spatial planning, and generally to provide for spatial aspects of socio-economic development and for related matters.

Office of the Administrator of Stool Lands Act 1994, Act 481
The OASL Act 1994, Act 481 establishes the Office of the Administrator of Stool Lands as enshrined in Article 267 (2) of the 1992 Constitution and it is responsible for establishment of stool land account for

each stool, collection of rents and the disbursement of such revenues. The Administrator is charged with the management of stool lands and in accordance with the provisions in the 1992 Constitution, 10% of the gross revenue goes to the Administrator of Stool Lands for administrative expenses whilst the remainder is disbursed as follows:

- 25% to the stool through the traditional authority for the maintenance of the stool;
- 20% to the traditional authority; and
- 55% to the District Assembly, within the area of authority of which the stool lands are situated.

The project sites are located in Forest reserves which have been gazetted for the purpose. The relevant land policies and regulations will be adhered to during this project. No land acquisition is required.

2.1.3 Forest Policies and Regulations

The 1994 Forest and Wildlife Policy (FWP), revised in 2011, and the 1996 Forestry Development Master Plan (FDMP) serve as guiding policies for the sector. Others are presented in this section and have been expatiated below.

Forest Development Master Plan (FDMP), 2016

The vision, goal, and objectives of the Forestry Development Master Plan (FDMP) reflect the national development agenda, the National Climate Change Action Plan, Sustainable Development Goals of the United Nations, and the on-going sector activities. The plan seeks to contribute to reducing Green House Gas (GHG) emissions from deforestation and forest degradation, climate and temperature regulation, sustainable supply of timber and woodfuels, reducing poverty and helping to conserve biodiversity.

2012 Forest and Wildlife Policy

The 1994 Forest and Wildlife Policy was revised in 2011 and subsequently approved in 2012. The policy aims at the conservation and sustainable development of forest and wildlife resources for the maintenance of environmental stability and continuous flow of optimum benefits from the socio-cultural and economic goods and services that the forest environment provides to the present and future generations, whilst fulfilling Ghana's commitments under international agreements and conventions.

Ghana's Forest and Plantation Strategy, 2016

The goal of this strategy is to achieve sustainable supply of planted forest goods and services to deliver a range of economic, social and environmental benefits. The purpose of the strategy is to optimize the productivity of planted forests by identifying suitable tree species and improving their propagation, management, utilization and marketing.

Forestry Commission Act of 1999 (Act 571)

Forestry Commission Act, 1999 (Act, 571) – This Act repealed Act 453 and re-establish the Forestry Commission as a semi-autonomous corporate body and also brought under the Commission, the forestry sector agencies implementing the functions of protection, development, management and regulation of forest and wildlife resources. Section 2 (1) states *The Commission shall be responsible for the regulation of the utilization of forest and wildlife resources, the conservation and management of those resources and the co-ordination of policies related to them.*

Forest Ordinance of 1927 (Cap 157)

This is the principal statute governing the constitution and management of forest reserves in Ghana. The ordinance vests in the central government the power to create forest and protected area reserves. Forests Ordinance (Cap 157) – This Act provided guidelines for constitution of forest reserves and the protection of forests and other related matters.

The project in demarcating designated areas for Artisanal Small-scale Mining (ASM) should take into consideration the ordinances and decrees surrounding the forestry resources. It should also work to ensure that mining is not done in forest reserves or protected areas.

2.1.4 Mining Policies and Regulations

Minerals and Mining Policy of Ghana, 2014

The mining policy has a section on environmental regulation which seeks to achieve a socially acceptable balance, between mining and the physical and human environment and to ensure that internationally accepted standards of health, mining safety and environmental protection are observed by all participants in the mining sector.

It also mentions that procedures for the assessment of applications will take into consideration inter-agency consultation; and establishes arrangements under which the Minerals Commission will consult with the EPA, the Forestry Commission, District Assemblies and other relevant departments and agencies during the evaluation of applications for mineral rights.

Minerals and Mining Act, 2006 (Act 703)

(*Repeals and replaces Minerals and Mining Law 1986, Minerals and Mining (Amendment) Act of 1994 among others*).

It vests the ownership of all minerals in its natural state in, under or upon land in Ghana, rivers, streams, water courses throughout the country, the exclusive economic zone in the President in trust for the people of Ghana.

The Minerals and Mining Act represents the central pieces of legislation for the exploitation of minerals. The Act establishes detailed rules regarding the ownership of minerals, mineral rights, various licenses required, royalties/rentals/fees, surface rights and compensation issues among others.

Minerals and Mining (Amendment) Act, 2015 (Act 900)

This act was formulated to amend the Minerals and Mining Act,2006 (Act 703) to provide for regulations to be made to prescribe the manner for the payment of royalties, the confiscation of equipment used for illegal small-scale mining and for related matters. The Act also stipulates the offences and penalties under Act 703.

Mining in Production Forest Reserves

The guidelines provide a framework to guide mining operations in production areas of forest reserves. Specifically, they provide uniform criteria to establish environmental constraints for all parties involved in operations within a Forest Reserve. They identify the aspects of 'best practice' mining and environmental management, and then set a framework within which to elaborate best practice principles on a case-by-case basis. The guidelines focus on Mining Practices and Environmental Management Practice throughout

6 phases of the life of a mine: exploration, pre-construction, construction, operation, closure, and post-closure.

The guidelines clarify that the majority of forest reserves are divided into conversion (areas which have been targeted for replanting), production (where timber extraction is permitted) and protection (untouchable) areas. They establish a 2% limit on exploration and mining in production areas of forest reserves. Only the actual mines themselves (mine pits or underground access) can be located within reserve areas and that all other mine support facilities need to be located outside the Forest Reserve boundary.

Minerals and Mining (General) Regulations, 2012 (L.I. 2173)
The 2012 minerals and mining regulations provide guidelines for: recruitment of expatriates, training of Ghanaians and preference for local products, exportation, sale and disposal of minerals, general provisions concerning mineral rights, reconnaissance operations, prospecting operations, mining operations, small scale mining operations, among others.

Minerals and Mining (Mineral operations- tracking of earth moving and mining equipment) Regulations, 2020 (L.I 2404)
The purpose of these regulations is to provide for the registration and tracking of earth moving and mining equipment used in mineral operations and ensure that the earth moving and mining equipment are used only in the specific mineral right area that the earth moving and mining equipment is registered for.

These Regulations apply to holders of mineral rights, mine support service providers specific in the Minerals and Mining (Support Services) Regulations, 2012 (L.I. 2174) including dealers in earth moving and mining equipment and any other person who uses earth moving and mining equipment in mineral operation.
The project will work hand in hand with the MC to follow all the policies and regulations for all project activities.

2.1.5 Water Policies and Regulations

National Water Policy, 2007
The National Water Policy, approved in June 2007, is to provide the framework for the sustainable development of water resources in Ghana. The overall goal of the 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."
The relevant principles for climate variability and change include: (i) recognizing water as a finite and vulnerable resource, given its multiple uses; (ii) coordinating water resources planning with land use planning; and (iii) adopting the river basin (or sub-basin) as a planning unit. The policy objectives are: (i) to minimize the effects of climate variability and change; and (ii) to institute measures to mitigate the effects of, and prevent damage caused by extreme hydrological occurrences (floods and droughts).

Water Resources Commission (WRC Act 1996, Act 522)
The Water Resources Commission Act, 1996 (Act 522) establishes and mandates the Water Resources Commission (WRC) as the sole agency responsible for the regulation and management of the utilization of water resources and for the co-ordination of any policy in relation to them.

Section 13 prohibits the use of water (divert, dam, store, abstract or use water resources or construct or maintain any works for the use of water resources) without authority. Section 16 empowers the Commission to grant Water Rights (water use permits) to prospective users. The Act states under Section 24 that any person who pollutes or fouls a water resource beyond the level that the EPA may prescribe, commits an offence and is liable on conviction to a fine or a term of imprisonment or both.

Water Use Regulations, 2001 (LI 1692)
The Water Use Regulations, 2001 (LI 1692) list such activities for which water use permit is required and this includes domestic, commercial, municipal, industrial water use among others. The Regulations also prescribe the raw water charges and processing fees to be paid by prospective water users with respect to the water use permits.

Buffer Zone Policy, 2014
The Water Resources Commission (WRC) launched a national policy document on Riparian Buffer Zone Protection for managing freshwater bodies in the country in May 2014. It aims at providing comprehensive measures and actions that would guide the creation of vegetative buffers for the preservation and functioning of the nation's water bodies and vital ecosystems.

Recommended buffer widths for water bodies are municipal reservoir shoreline protective areas such as Weija Dam and Lake Bosomtwe covering 60 to 90 metres; major perennial rivers/streams such as the Volta, Offin and Tano, 10 to 60 metres and streams within forest reserves, 10 to 50 metres.
The project will work with the Water Resources Commission, the regulatory agency to ensure that reclamation efforts do not compromise on local hydrology and water use.

2.1.6 Environmental Protection Policies and Regulations

The Environmental Protection Agency (EPA) Act, 1994 (Act 490)
This Act establishes and mandates the EPA to seek and request information on any undertaking that in the opinion of the Agency can have adverse environmental effects and to instruct the proponent to take necessary measures to prevent the adverse impacts. The EPA Act, 1994 (Act 490) gave mandate to the Agency 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.

Part II of the Act 490 deals with pesticides control and management and this was formally an Act on its own (Pesticides Control and Management Act of 1996, Act 528). This section of Act 490 provides the rules for registration, pesticides classification, approval, clearance, using, disposing of and non-disclosure of confidential information, the granting of license, labeling and pesticides inspections.

The Environmental Assessment Regulations of 1999 (LI 1652)
The Environmental Assessment Regulations of 1999, LI 1652 enjoins any proponent or person to register an undertaking with the Agency and obtain an Environmental Permit prior to commencement of the project. It indicates the EIA process and provides list of environmentally sensitive areas as well as possible undertakings requiring EIA.

National Environmental Policy (NEP), 2013
The NEP presents a road map to address major environmental threats jeopardizing the natural and common resource base of the country and has integrated the most urgent environmental concerns of present time to provide clear strategies for overcoming existing hurdles. It validates the Strategic Environmental and Social Assessment (SESA) process as a tool for mainstreaming environment into all government policies, programmes and projects.

National Climate Change Policy (NCCP), 2013
The Policy is built on five systematic pillars: Governance and Co-ordination, Science, Technology and Innovation, Finance, International Cooperation, Information Communication and Education and Monitoring and Reporting. The objective of the Policy is to mitigate and ensure an effective adaptation in key sectors of the economy, such as agriculture and food security, natural resources management, energy, industry and infrastructure among others. The National Climate Change Policy Framework has three objectives: low carbon growth, effective adaptation to climate change, and social development.
The project will be duly registered under LI 1652 with the EPA and will work within all guidelines stipulated in the permit acquired.

2.1.7 Employment, Labour, Safety, Gender, Local Government, Chieftaincy Policies and Regulations

National Employment Policy, 2012-2016
The policy states that the key source of demand for labour emanates from the productive sectors of the economy, namely, agriculture, industry and service. One of the key strategies of the employment policy is to promote farm and non-farm rural employment through modernisation of agriculture, improving the productivity of farmers and contract farming arrangements, promoting effective linkages between farm and non-farm activities among others.

National Gender Policy (2015)
The goal of the new Gender policy is to mainstream gender equality, women empowerment concerns into national development processes for equitable livelihoods for women and men, boys and girls.

This is expected to be done through women empowerment & livelihood improvement, promoting women's leadership and Accountable Governance, promoting women's Right and Access to justice and creation of Economic Opportunities for women. The policy was formulated to accelerate efforts and commitments of government in empowering women (including women with disability) to have safe and secure livelihood, access to economic opportunities, decent work to improve earnings while addressing disparities in education, socio-economic and cultural issues, health and agriculture, trade and related matters. *Project activities will provide equal employment opportunities for both males and females and create opportunities for women.*

Child and Family Welfare Policy (2014)
The Child and Family Welfare Policy seeks to establish a well-structured and coordinated Child and Family Welfare system that promotes the wellbeing of children, prevents abuse and protect children from harm. The overall goal of the Policy is to help formulate child and family welfare programmes and activities to more effectively prevent and protect children from all forms of violence, abuse, neglect and exploitation. The Policy also prioritises three areas of concern, namely: Child Protection issues stemming out of family-

related challenges; Child maltreatment; and other protection issues concerning children, especially older children, that are not brought about by a third party but as a result of the child's risk-taking behaviour.

The Children's Act 1998 (Act 560)

The Act spells out the rights of the child, quasi-judicial/judicial child adjudication, parentage / custody / access / maintenance, fosterage / adoption and employment of children issues. The Act defines a child as a person below the age of 18 years. The minimum age for admission of a child to employment is fifteen years and the minimum age for the engagement of a person in hazardous work is eighteen years. No person shall engage a child in exploitative labour i.e. labour which deprives the child of its health, education or development. *The project will ensure that children are not employed or used in any activity that will pose a threat to their health, education and wellbeing. The project will include age verification criteria to ensure no child under 18 years is employed to undertake any aspects of the works.*

Local Government Act, 2016, Act 936

This Act replaces the Local Government Act, 1993, Act 462 which establishes and regulates the local government system and gives authority to the Regional Coordinating Council and the District Assembly to exercise political and administrative power in the Regions and District, provide guidance, give direction to, and supervise all other administrative authorities in the regions and district respectively. The Assembly is mandated to initiate programmes for the development of basic infrastructure and provide municipal works and services as well as be responsible for the development, improvement and management of human settlements and the environment in the district.

Local Government Service Act, 2003 (Act 656)

This Act establishes a Local Government Service to secure the effective administration and management of local government in the country. The Service is to among other things:

(a) provide technical assistance to District Assemblies, and Regional Coordinating Councils to enable the District Assemblies and the Regional Co-ordinating Councils effectively perform their functions and discharge their duties in accordance with the Constitution and the Local Government Act, 1993 (Act 462) (which has been replaced by the Local Governance Act, 2016 (Act 936)).

The Bibiani Anhwiaso Bekwai Municipal Assembly, which is the representative of the government at the local level will be consulted at all times during the project to work for improvement and development of lives of people in the community.

Chieftaincy Act, 2008 (Act 759)

The Chieftaincy Law (Act 759) of 2008, replaces the old Chieftaincy Law (Act 370) of 1971. It provides for the composition, membership and functions of the National House of Chiefs, Regional House of Chiefs, Traditional and Divisional Councils, chieftaincy matters among other things.

Chiefs are usually custodians of stool land and responsible for dispute resolution. Traditional authorities will be actively consulted during land acquisition and reclamation planning activities.

The Labour Act, 2003 (Act 651)

The Act amends and consolidates laws relating to labour, employers, trade unions and industrial relations, and to the establishment of a National Labour Commission. The law spells out clearly the rights and responsibilities of workers and employers thereby seeking to prevent industrial conflicts. The law promotes collective bargaining and makes adequate provision for tripartism. The problem however is the poor compliance and enforcement that has characterized Ghana's labour legislation. Section 118(1) of

the Labour Act 2003 (Act 651) stipulates that it is the duty of an employer to ensure that every worker employed works under satisfactory, safe and healthy conditions. *The labour law will be employed to establish rights and responsibilities of workers throughout the lifespan of the project.*

Alternative Dispute Resolution Act, 2010 (Act 798)
The purpose of the Act is to "……provide for the settlement of disputes by arbitration, mediation and customary arbitration, to establish an Alternative Dispute Resolution Centre and to provide for related matters." The Act further defines Alternative Dispute Resolution "as the collective description of methods of resolving disputes otherwise than through the normal trial process" (Section 135). The ADR Act covers both domestic and international arbitration in Ghana and the enforcement of both domestic and foreign arbitral awards within the jurisdiction. *The project will foremost consider alternative dispute resolution before resorting to the use of the law courts.*

2.2 Institutional Framework

The major institutions with mandate to implement the policies and regulations and therefore ensure the environmental and social sustainability of the project are as described below:

Ministry of Lands and Natural Resources (MLNR)
The Ministry has the oversight responsibility for the land and natural resources sector and its functions include Policy formulation, Coordination, Monitoring and Evaluation, Validation of Policies, Programmes and Projects, Supervision of Sector Departments and Agencies and Negotiations with Development Partners.

MLNR is the sector Ministry to which the Minerals Commission reports. It is also responsible for promoting Ghana's minerals and mining sector. MNLR will serve on the Program's Coordination and Management Committee to ensure integration with small scale mining projects and related activities and are therefore the host of the project.

Minerals Commission
In broad terms, the responsibility vested with the Mineral Commission (MC) is to oversee regulation and management of the utilization of the mineral resources of Ghana, and to co-ordinate the policies in relation to them. The main functions of the MC include the following:

- formulate recommendations of national mining policies and monitor their implementation.
- monitor the operations of all bodies or establishments with responsibility for minerals and report to the Minister.
- receive and assess development agreements relating to minerals and report to Parliament.
- secure comprehensive data collection on national mineral resources; and
- perform such other functions as the Minister may assign to it.

A foremost responsibility of the MC is the administration of minerals rights. For this purpose, the MC maintains a cadastral system and a register of mineral rights. The various mining and mineral permits include reconnaissance license, prospecting license, and mining lease. Actual decisions in matters of mineral rights are taken by the Minister of Mining, but only after recommendation of the MC.

For the promotion and administration of Small-Scale Mining, the MC maintains District Offices. The control of illegal small scale mining activities popularly known as Galamsey is a national security issue. The nation has been overwhelmed by these Galamsey activities and successive governments have not been able to bring it under control or get rid of it. The recent Inter- Ministerial Committee Against Illegal Mining (IMCIM) has however, brought some success to the control of Galamsey activities since 2017. The effective control of Illegal mining activities will require the involvement and collaboration of all stakeholders especially the traditional authorities and district assemblies.

Forestry Commission

The Forestry Commission of Ghana is responsible for the regulation of utilization of forest and wildlife resources, the conservation and management of those resources and the coordination of policies related to them. The Commission embodies the various public bodies and agencies that were individually implementing the functions of protection, management, the regulation of forest and wildlife resources. These agencies currently form the divisions of the Commission:

- Forest Services Division (FSD).
- Wildlife Division.
- Timber Industry Development Division (TIDD).
- Wood Industries Training Centre (Forestry Commission Training School) and
- Resource Management Support Centre (RMSC).

The Climate Change Unit, established in 2007 as a unit of the Commission has a mandate to manage forestry-sector initiatives related to climate change mitigation, including REDD+. It hosts the National REDD+ Secretariat and serves as the National REDD+ focal point.

It is the aim of the Commission to be a corporate body of excellence in the sustainable development management and utilization of Ghana's forest and wildlife resources meeting both national and global standards for forest and wildlife resource conservation and development. The FC is a major stakeholder in the project and will work hand in hand with the PCU to ensure that the necessary protocols regarding forest reserves are observed and all regulations are adhered to.

Lands Commission

The Lands Commission, under the MLNR, 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 Commission 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 Commission formulates and submits to Government recommendations on national policy with respect to land use and capability; advice on, and assist in the execution of, a comprehensive programme for the registration of title to land throughout the Republic. Currently, the Commission has the following divisions:

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

As the Land Commission falls under the MLNR, it will also work with the PCU on project activities that fall within its scope of work.

Office of the Administrator of Stool Lands (OASL)

The functions of the Office of the Administrator of Stool Lands as provided for under Article 267(2) of the 1992 Constitution and Sections 2, 9 and 10 of Act 481 of 1994 are:

- Establishment of a Stool Lands account for each stool into which shall be paid all rents, dues, royalties, revenue or other payments whether in the nature of income or capital from stool lands.
- Collection of stool lands revenue and accounting for same to the beneficiaries.
- Disbursement of stool land revenue to beneficiaries in the proportion of 25% to the Stool through the traditional authority, 20% percent to the traditional authority and 55% to the district assembly within the area of authority of which the stool land is situated.
- Consultation with stools and other traditional authorities on matters relating to the administration and development of stool lands.
- Co-ordination with Lands Commission and other relevant Public Agencies and other stakeholders in preparing policy framework for the rational and productive development of stool lands.
- Facilitation of the establishment of Land Secretariats for traditional authorities; and
- Research into stool land issues and collection and storage of relevant information and data on stool lands and making same available.

Ministry of Finance

The Ministry is responsible for:

- mobilization of external and internal resources.
- allocation of resources to all sectors of the economy.
- ensuring sustainability of public debt.
- preparation and implementation of the annual budget and economic and financial statement of Government.
- management of public expenditure and
- development and implementation of financial sector policies.

Ministry of Environment, Science, Technology and Innovation

The overall objective of the ministry is to ensure accelerated socio-economic development of the nation through the formulation of sound policies and a regulatory framework to promote the use of appropriate environmentally friendly, scientific and technological practices and techniques.

The PCU will collaborate with MESTI on project activities that require the use of technology and will lead to accelerated socio-economic development in communities.

Environmental Protection Agency

As the law stipulates, the EPA, under the MESTI, is statutorily mandated to ensure that the implementation of all undertakings do not harm the environment. The Agency has seventeen (17) regional and fourteen (14) Area offices, which are accessible and staffed and equipped to perform its functions. It is expected that sub-projects that will require the preparation of ESIA will abide by statutory requirements and the implementing institutions will liaise sufficiently with the Agency to ensure compliance. The EPA is the National Focal Point for Climate Change and is responsible for all national communications to the

UNFCCC. The PCU will work with the EPA to ensure that all project activities do minimal harm to the environment.

Forestry Research Institute of Ghana

Forestry Research Institute of Ghana (FORIG) is one of the 13 institutes of the Council for Scientific and Industrial Research (CSIR). By Act of Parliament of 1980 (Act 405) the Institute was transferred from the CSIR to the Forestry Commission. The goals of the Institute include to:

1. conduct high quality user-focused forestry research that generates scientific knowledge and appropriate technologies.
2. disseminate forestry related information for the improvement of the social, economic and environmental well-being of the Ghanaian people.
3. enhance the sustainable development, conservation and efficient utilisation of Ghana's forest resources.
4. foster stronger linkages through collaborative research across disciplines among its scientists, stakeholders and external Institutions.

Water Resources Commission

The Water Resources Commission (WRC) was established by an Act of Parliament (Act 522 of 1996) with the mandate to regulate and manage Ghana's Water Resources and co-ordinate government policies in relation to them. The Act stipulates that ownership and control of all water resources are vested in the President on behalf of the people. The functions of the WRC as established under Act 522 among other things are to:

- Formulate and enforce policies in water resources conservation, development and management in the country.
- Coordinate the activities of the various agencies (public and private) in the development and conservation of water resources.
- Enforce, in collaboration with relevant agencies, measures to control water pollution; and
- Be responsible for appraising water resources development project proposals, both public and private, before implementation.

The PCU will work with the WRC to develop means to protect water basins and prevent mining in buffer zones.

Local Government Service

The Local Government Service was established to Support Local Government to deliver value for money services through the mobilization, harmonization and utilization of quality human capacity and material resources to promote local and national development under the Local Government (Departments of District Assemblies) (Commencement) Instrument, 2009 (L.I. 1961).

The Regional Coordinating Council (RCC) and the District Assembly (DA) are responsible for the overall development of the region and district respectively and their functions include: to prepare and submit development plans and budgets to superior institutions for approval and implementation. These institutions were set up by an Act of Parliament, to serve as the planning authority for the region and district respectively.

The current local government structure or the district assembly system is established by two main Acts, namely Act 936 and Act 480. Both Act 936 and Act 480 designate the District/Municipal/Metropolitan Assembly as the planning authority, charged with the overall development of the district. Both Acts provide that local people (communities) must participate in the formulation of the District Development Plan.

A key feature of this Assembly System is the involvement of communities or zones or whole villages who elect their representatives (Assemblymen) to the Assembly. The structure of the Assembly comprises Unit Committees which are usually formed at the community levels, and the Urban/Town/Area Councils.

With regard to environmental management at the local level, the District (also Municipal and Metropolitan) Environmental Management Committees (DEMC) has been set up by law (Act 936) to among other things:

- promote and provide guidelines for the establishment of community level environmental committees to put into effect the environmental programmes of the Assembly in the community.
- Plan and recommend to the DA, strategies and activities for the improvement and protection of the environment with emphasis on fragile and sensitive areas, river courses etc.

The PCU will work with the district and municipal assemblies in all pilot districts to develop the most suitable strategies to be used in mining for community development.

Traditional Authorities/ National House of Chiefs

Traditional authorities encompass chiefs or traditional rulers, and traditional councils. In Ghana, the traditional authority system comprises:

- Chiefs.
- Queen Mothers.
- Linguists.
- Family/lineage/clan heads.
- Head of 'asafo' companies; and
- Priests and priestesses.

In pre-colonial times, traditional authorities constituted the axis for the exercise of executive, legislative and judicial powers. Traditional authorities are now largely the custodians of the traditions and customs of their subjects. Chiefs (or other traditional rulers) have important role as custodians of communal land and exercise traditional authority over people living within their areas.

Forestry has had diverse impacts on traditional authority systems, especially as they relate to authority over land. The regulation, allocation and management of land have been a responsibility and right of traditional authority and structures. Chiefs are recipients of part of royalties from the forestry sector and land rent payable in private tree plantation operations. Traditional councils, who assist the chiefs, also receive a share of royalties. Traditional authorities are key players in decision-making. Traditional authorities sit on important boards such as the Forestry Commission board and the National REDD Working Group.

The 1992 constitution under Article 270(1) and the Chieftaincy Act 2008 guarantees the institution of chieftaincy together with its traditional councils as established by customary law and usage. The Constitution also makes provision for an elaborate system of House of Chiefs. This includes several traditional and divisional councils, each of which elects members to one of ten Regional Houses of Chiefs (RHCs), and then five members from each RHCs to the National House of Chiefs. The project areas are under the jurisdiction of the Sefwi Bekwai and Sefwi Anhiawso Traditional Councils.

Private Sector

Ghana National Association of Small-Scale Miners

The Association started as a small group for small- scale miners which was formally launched nationwide in 2011 to cater for the needs of Small-Scale Miners in the country. Membership is open to any person or group of persons who are registered with the Minerals Commission as small-scale miner(s) and possess the relevant licenses.

Currently, there is a National Executive Committee and also District Committees in all the ten (10) mining districts located at Wa, Bole, Asankragua, Tarkwa, Bibiani, Dunkwa, Konongo, Bolgatanga, Oda and Assin Fosu. At the community level, there are zonal chairpersons who serve four to five communities.

The Association welcomes this initiative to formalize ASM but is concerned about political interferences in the sector especially if medium scale mining is to be promoted. The Ghana Geological Survey Authority should be supported to identify new mining sites and these areas allocated to prospective miners based on merit and not on political affiliation. There are social concerns which should be strategically mapped out and all stakeholders must show commitment in addressing these concerns.

NGO/ Civil Society

Even though it appears that no particular NGO has specific interest in the project areas, quite a number of NGOs/Civil society groups both national and international in Ghana operate in all the sixteen regions of the country in one way or the other. Their activities cut across exploitation of natural resources (forestry, mining), agriculture especially the cocoa subsector, protection of water bodies to climate change issues. These NGOs or civil society groups have advocated for good governance in the natural resource sector, transparency, respect for human rights, fairness, accountability etc.

Some relevant international NGOs operating within the forestry sector and or on climate change related issues include IUCN, TBI, SNV, Solidaridad, Conservation Alliance, Oxfam, and Nature Conservation Research Center (NCRC). At the community level, one can identify such informal groups as local forest users, traditional authorities (chiefs/landowners), women's groups, hunters and minor forest products' collectors such as herbalists whose livelihoods depend on forests.

Several civil society coalitions and platforms are also emerging. A key example is the Forest Watch Ghana, which claims a representation of civil society interests in ensuring good governance in the forestry sector. For example, under the Forest Law, Enforcement, Governance and Trade (FLEGT) Voluntary Partnership Agreement (VPA) process, the Forest Watch Ghana represents the civil society stakeholders in the VPA Steering committee and is consulted regularly on developments with respect to implementation of the VPA (Marfo, E., E. Danso and S.K. Nketiah. 2013).

Other groups that can be classified under CSOs include research and academic institutions such as the Kwame Nkrumah University of Science and Technology (KNUST), Forestry Research Institute of Ghana (FORIG), University of Energy and Natural Resources (UENR); professional bodies such as Ghana Institute of Foresters; religious associations, trade unions among others.

Community Resource Management Areas (CREMA)

The Wildlife Division of the Forestry Commission is currently utilising CREMAs as the primary institutional mechanism for implementing collaborative sustainable natural resource management outside protected areas in Ghana. The CREMA is regulated through the development of a constitution, bylaws and natural resource management plan which are created by the CREMA committees composed of elected community members, who work with the Wildlife Division and District Assembly to formulate the CREMA constitution, bylaws and natural resource management plan for each area. Following approval, the communities will receive a Certificate of Devolution, giving them the authority to sustainably manage their land and to apprehend illegal miners, bushmeat hunters and chainsaw operators. The Commission is yet to establish a CREMA within the project area.

A Rocha Ghana

Established in 1999, as Eden Conservation Society, A Rocha Ghana (ARG) has emerged as a committed environmental NGO providing practical conservation interventions aimed at contributing to the sustainable management of important ecological habitats and initiating programmes aimed at facilitating target community's ability to adapt to current trends in climate change and the impacts of a changing natural environment. In 2003 Eden officially became part of the A Rocha family (network). A Rocha works to contribute to the effective management of the earth's resources through sustainable and innovative actions. It also works to inspire and empower people to care for nature through advocacy livelihood improvement and inter-faith dialogue that hinges on research and education. In its project to preserve the Atewa forest reserve, A Rocha supports communities to restore degraded lands on both farms and old abandoned illegal mine and in addition engages farmers through the introduction of agricultural best practices such as conservation agriculture to enhance their yields. Some farmers are then supported to pilot these best practices as a form of demonstration on their farms. This is expected to later serve as a learning point for other farmers within the landscape.

Wassa Association of Communities Affected by Mining (WACAM)

WACAM is a premier community based human rights and environmental mining advocacy NGO in Ghana with a community-based focus. Formed in 1998, WACAM has worked to respond to the social, environmental and economic problems that had resulted from the increased mining investment of the third gold rush. It is focused on community mobilisation, organisation and rights-based education for empowerment, at the local, national, sub regional and international levels to influence practices changes.

Currently, WACAM is working in over ninety mining affected communities in Ghana. WACAM has worked to share its experiences with CSOs, community groups and intellectuals worldwide. WACAM employs the use of court room litigation, representation and negotiations for affected communities. WACAM has made several submissions to regulators as their contribution for policy change and have served on a number of organisations including the Extractive Industry Transparency Initiative (EITI) at the national and international levels.

Third World Network-Africa (TWN-Africa)

TWN-Africa is a Pan-African research and advocacy organization which works for economic and social equity within Africa and for an equitable place for Africa in the global order. Founded in 1994, TWN-Africa focuses on strategic development issues facing Africa in the age of globalization, especially from the perspectives of the vulnerable and marginalized. It also facilitates the organization and expression of African civil society at the supranational (regional, continental and global) levels on these issues.

TWN-Africa's programme of work for equitable policies and improvements in economic governance has been focused around several issues including Mining and Development. TWN-Africa uses various instruments like lobby, capacity building, research and generation of knowledge, communication, networking, constituency building and public mobilization in its work. To efficiently carry out its mandate across the continent, TWN-Africa works with partner organizations in Africa such as the Africa Trade Network (ATN) and the African Initiative on Mining, Environment and Society (AIMES). At the national level, TWN-Africa hosts the National Coalition on Mining (NCOM) and the Economic Justice Network (EJN).

African Initiative on Mining, Environment and Society (AIMES)
Established in 1999, AIMES is a Pan-African grouping of civil society organizations from 13 mineral-endowed African countries. Key among AIMES' objectives are providing a common front for advocates working towards improving the governance of Africa's mineral economy, ensuring a more equitable and sustainable exploitation and contribution of the mineral sector to Africa's development. Thus, AIMES has been at the forefront of various African civil society initiatives aimed at optimising the minimal returns that mineral-endowed African countries make from their rich mineral resources. This has involved offering alternate policies through calls for changes in mining codes across the continent, working with institutions such as the African Union and the United Nations Economic Commission for Africa (UNECA) to fashion out a new continental mining framework, the African Mining Vision that demands a mining regime aimed at putting mining at the centre of Africa's industrial development. AIMES holds annual strategic meetings that are also used for capacity building and solidarity purposes and are hosted by members in turn.

The CSOs and NGOs mentioned above have an aim to protect the environment and support communities in mining and also have the expertise/ capacity to implement the required actions. They will be consulted by the PCU and involved in decision making for project activities, as and when required.

2.3 International Standards and Policies

World Bank's Safeguard Policies
The World Bank (WB) has published policies/procedures to guide the safe development of projects it is funding. The applicable WB safeguards policies and a summary of their core requirements are provided in the **Table 1** below.

Table 1:WB safeguards policies and a summary of their core requirements

OP/BP	Safeguard	Summary of core requirements	Relevance	Remarks or recommendation for proposed project
4.01	Environmental Assessment	Help ensure the environmental and social soundness and sustainability of investment projects.	Triggered	The proposed project is classified as Category B because its potential adverse environmental impacts on the biophysical and socio-cultural environment is minimal, site-specific,

		Support integration of environmental and social aspects of projects in the decision-making process.		mostly reversible with designed mitigation measures.
4.04	Natural Habitats	Promote environmentally sustainable development by supporting the protection, conservation, maintenance, and rehabilitation of natural habitats and their functions.	Triggered	Project implementation will be carried out in a forest reserve and may affect natural habitats
4.09	Pest Management	Minimize and manage the environmental and health risks associated with pesticide use and promote and support safe, effective, and environmentally sound pest management.	Not triggered	The project implementation will not include pesticide application.
4.10	Indigenous Peoples	Design and implement projects in a way that fosters full respect for indigenous peoples' dignity, human rights, and cultural uniqueness and so that they (1) receive culturally compatible social and economic benefits, and (2) do not suffer adverse effects during the development process.	Not triggered	There are no indigenous people on the project site or within the project communities of influence
4.11	Physical Cultural Resources (PCR)	Assist in preserving PCR and in avoiding their destruction or damage. PCR includes resources of archaeological, paleontological, historical, architectural, religious (including graveyards and burial sites), aesthetic, or other cultural significance.	Triggered	There is no cultural site of historical, archaeological, religious, or other cultural significance in the project's physical area of influence. However, there could impact on ecosystem services eg. medicinal plants accessed by the local community
4.12	Involuntary Resettlement	Avoid or minimize involuntary resettlement and, where this is not feasible, assist displaced persons in improving or at least restoring their livelihoods and standards of living in real terms relative to pre-displacement levels or to levels prevailing prior to the beginning of project implementation, whichever is higher.	Not triggered	There is no land acquisition as project will be within the forest reserve.
4.36	Forests	Realize the potential of forests to reduce poverty in a sustainable manner, integrate forests effectively into sustainable economic development, and protect the vital local and global environmental services and values of forests.	Triggered	Project implementation will affect forests. The distinction between the natural fauna and the invasive species will be identified for assessment purposes.

7.50	Projects on International Waterways	Ensure that the international aspects of a project on an international waterway are dealt with at the earliest possible opportunity and that riparians are notified of the proposed project and its details.	Not triggered	The project is not on any international waterway.
7.60	Projects in Disputed Areas	Ensure that other claimants to the disputed area have no objection to the project, or that the special circumstances of the case warrant the Bank's support of the project notwithstanding any objection or lack of approval by the other claimants.	Not triggered	The project area is not disputed.

WBG Environmental, Health and Safety Guidelines, Mining Sector

The Guidelines advocate that closure and post-closure activities should be considered as early in the planning and design stages as possible. Mine sponsors are required to prepare a Mine Reclamation and Closure Plan (MRCP) in draft form prior to the start of production, clearly identifying allocated and sustainable funding sources to implement the plan.

For this project, the mining activities have been illegal hence unplanned. The reclamation plans must therefore be suitably designed to fit the existing deplorable state of the mined out areas.

A mine closure plan usually incorporates both physical rehabilitation and socio-economic considerations which are integral parts of the project life cycle and designed so that:

- Future public health and safety are not compromised;
- The after-use of the site is beneficial and sustainable to the affected communities in the long term;
- Adverse socio-economic impacts are minimized and socio- economic benefits are maximized.

UNFCCC Safeguards for REDD+ and Cancun Safeguards

The safeguards included in the UNFCCC guidance related to REDD+, commonly referred to as Cancun Safeguards are provided in Paragraph 2 in the Appendix I of Decision 1/CP16 include the following:

a) That actions complement or are consistent with the objectives of national forest programs and relevant international conventions and agreements.
b) Transparent and effective national forest governance structures, taking into account national legislation and sovereignty.
c) Respect for the knowledge and rights of indigenous peoples and members of local communities, by taking into account relevant international obligations, national circumstances and laws, and noting that the United Nations General Assembly has adopted the United Nations Declaration on the Rights of Indigenous Peoples;
d) The full and effective participation of relevant stakeholders, in particular indigenous peoples and local communities, in the actions referred to in paragraphs 70 and 72 of this decision.
e) That actions are consistent with the conservation of natural forests and biological diversity, ensuring that the actions referred to in paragraph 70 of this decision are not used for the conversion of natural forests, but are instead used to incentivize the protection and conservation

of natural forests and their ecosystem services, and to enhance other social and environmental benefits.

f) Actions to address the risks of reversals; and
g) Actions to reduce displacement of emissions.

Decision 1/ CP 16 also requests, developing country Parties aiming to undertake REDD+ activities, in the context of the provision of adequate and predictable support, to develop a system for providing information on how the safeguards referred to in appendix I to this decision are being addressed and respected throughout the implementation of these activities.

The development of these safeguards information systems should take into account national circumstances and the respective capabilities of developing countries, whereas acknowledging national sovereignty, the relevant international obligations and agreements, and respecting gender considerations.

Extractive industries Transparency Initiative

The Extractive Industries Transparency Initiative (EITI) is the global standard to promote the open and accountable management of oil, gas and mineral resources. As a multi-stakeholder organization, the EITI builds trust between governments, companies and civil society. The EITI requires the disclosure of information along the extractive industry value chain, from licensing to extraction, to how revenue makes its way through to government, to how it contributes to the economy and wider society. In doing so, the EITI strengthens public and corporate governance, promotes transparent and accountable natural resource management, and provides data that informs debate and reform in the extractive sector.

2.4 Environmental Assessment in Ghana

EIA Procedures and Activities

Part 1 of the Environmental Assessment Regulations, 1999 (LI 1652) on Environmental Permit describes undertakings requiring registration and issuance of environmental permit, as:

(1). No person shall commence any of the undertakings specified in Schedule 1 to these Regulations or any undertaking to which a matter in the Schedule relates, unless prior to the commencement, the undertaking has been registered by the Agency and an environmental permit has been issued by the Agency in respect of the undertaking.

(2). No person shall commence activities in respect of any undertaking which in the opinion of the Agency has or is likely to have adverse effect on the environment or public health unless, prior to the commencement, the undertaking has been registered by the Agency in respect of the undertaking.'

The procedures establish an EIA process to among others, provide enough relevant information to enable the EPA to set an appropriate level of assessment of any proposed undertaking, investment or programme for the necessary review and to facilitate the decision-making process for the EIA approval. The procedures comprise activities such as project Registration, Screening, Scoping, EIS preparation, and public hearing. The procedures are statutorily recognised under the EPA Act 1994 (Act 490).

Upon submission of the completed Forms, the EPA will screen the project to determine what level of environment and social assessment is required. There are three main levels of assessment/reporting and these are:

- No assessment/reporting or permitting required.
- Preliminary environmental assessment/report required and
- Full environmental impact assessment report required.

In the simplest case, that is where impacts are minor and negligible, no environmental reporting is required after registration of the project with the EPA. The second level of assessment is where the impacts are considered minimal, and the EPA may then require a Preliminary Environmental Report (PER) to be produced.

With the third level where detailed studies are needed to appreciate impacts, a full-scale EIA is required. The detailed EIA studies in this case are preceded with the preparation of a Scoping Report to the EPA outlining the terms of reference for the EIA study.

The EPA has a list of development projects for which full EIAs are mandatory (Schedule 2). Small-scale mining projects of 10ha and below are identified with the list. In all cases, the EPA grants the environmental permit to the proponent after payment of the appropriate processing and permit fees. The EPA will notify the proponent on the amount to be paid as processing and or permit fees.

2.5 National Environmental Quality Standards (Ghana Standards –GS)

The EPA National Environmental Quality Standards now known as Ghana Standards, provides for permissible levels for ambient air quality, noise levels and effluent quality guidelines for discharge into natural water bodies. The environmental standards issued in 2019 include:

- **The Ghana Standard for Environmental Protection-Requirements for effluent discharge (GS 1212,2019)** specifies requirements for sector specific effluent quality and also gives guideline discharge into the environment. **Annex 2-1.**
- **The Ghana Standard for Environment and Health Protection –Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236, 2019)** specifies the requirements and methods of analysis for ambient air. It also specifies the requirements and test methods for point source or stack emissions based on the sources of energy. **Annex 2-1.**
- **The Ghana Standard for Health Protection –Requirements for Ambient Noise Control (GS 1222,2018)** specifies the requirements for acceptable ambient noise levels within categorized locations. According to the Standards, the test method should be in accordance with the relevant test methods given in GS 1253:2018 (Acoustics- Guide for the measurement of outdoor A-weighted sound levels
- **The Ghana Standard for Environment and Health Protection-Requirements for Motor Vehicle Emissions (GS 1219,2018)** specifies the requirements for exhaust emissions of motor vehicles as well as tractors, farm equipment (such as combine harvester, etc.), mobile industrial / construction machines (such as excavators).
- **Water Quality – Specification for drinking water FDGS 175-1:2013 The** Ghana Standard specifies the requirements for drinking water obtained from “prepared waters5 ”or “waters defined by origin6 ”. The standard also applies to packaged/bottled drinking water but not packaged/bottled natural mineral water.

3.0 PROJECT DESCRIPTION

The Ghana FIP Program specifically seeks to:

v. Ensure the integrity, restoration, and sustainable management of forest reserves by introducing more inclusive management and benefit sharing models, financial incentives, and investments;
vi. Restore forest cover in off-reserve areas by securing tree tenure and benefits, forest plantations and landscape restoration, and rehabilitation of degraded forest land;
vii. Increase trees and enhance carbon stocks in the farming system by promoting sustainable cocoa and agriculture practices; and
viii. Develop viable alternative livelihoods for local communities by addressing a broad range of technical, financial and market incentives, to reduce pressure on existing forests.

The Ghana FIP has two main projects. These are:

1. Engaging Local Communities in REDD+ Project (ELCIR+) financed through the Strategic Climate Fund (SCF)of the Climate Investment Funds (CIF) with Additional Funding from the African Development Bank.
2. Enhancing Natural Forests and Agroforestry Landscapes Project (ENFALP) financed through the SCF of the CIF and coordinated by the World Bank.

The four components of the FIP comprise the following: 1) Policy Reforms and Institutional Strengthening; 2) Pilot Investments for Improved Forest and Landscape Management with Communities; 3) Innovation, Capacity Building; and Communications; and 4) Project Management, Monitoring and Coordination. The Additional Financing (AF) follows the same structure and a full description is provided in the project paper for the ENFALP.

This project falls under Component 2a: Pilot demonstration of clean up and reclamation practices with alternative livelihood support after forest and land degradation and loss due to Artisanal Small Scale Mining (ASM).

3.1 Project Forest District

The project areas fall under the Bekwai Forest District is in the Western North Region of Ghana, **Figure 1**, and particularly in the Apramprama, Denyau and Supuma Forest Reserve.

The forest district lies in the Moist Semi-deciduous ecological zone and forms part of Ghana's high forest zone. It lies within latitudes 6^0 00"N and 6^0 03 "N and Longitudes 1^0 00 W and 1^0 35W.
The climate is semi-equatorial in nature. It has a reasonably high and consistent temperature, ranging from 32 degrees Celsius in March to 20 degrees Celsius in August. The annual rainfall averages between 1600 and 1800 millimeters.

The forest district manages the following Reserves:

- Apamprama Forest Reserve
- Bosomtwe Range Forest Reserve Catchment
- Dampia Range Forest Reserve

- Denyau Shelterbelt
- Fum Headwaters Forest Reserve
- Geni River Forest Reserve Greenbelt
- Nkrabea Forest Reserve
- Oda River Forest Reserve
- Pompo Headwaters
- Subin Shelterbelt Forest Reserve
- Supuma Forest Reserve

The forest district has 16 Forest Management Units. The most common economic tree species include Mahogany (*Khaya spp*), Asanfina (*Aningeria spp*), Wawa (*Triplochiton scleroxylon*), and Ceiba (*Ceiba pentandra*).

The Bekwai Forest District office is in Bekwai in Ashanti Region of Ghana, but the forest reserve (see Figure 2.2) cut across 12 MDAs (2 municipalities and 10 districts).

The Bekwai Forest reserve is underlain by three geological formations namely the Birimian, Tarkwain and Granitic rocks, which are rich in mineral deposits. The Birimian and the granitic rocks have been identified to have great potentials since they contain such minerals such as gold. The Bekwai-Forest District lies within the moist – semi- deciduous forest zone. Some of the tree species commonly found are Odum, Wawa, Edinam and Mahogany. The reserve is in the southern part of Ashanti Region. The climate of the district is the semi-equatorial type. It is characterized by double maxima rainfall. The first major rainfall season starts from March and ends in July. The second rainfall starts from September and ends in November. The mean annual rainfall is between 1600m – 1800mm. It has a high and uniform temperature ranging between 32°C in March and 20° C in August. Relative humidity is moderate but high during the rainy season. It ranges between 70 and 80 percent in the dry season. The temperature regime and rainfall pattern enhance the cultivation of many food crops throughout the region of the forest reserve district.

Apart from the ecosystem and biodiversity support for the surrounding communities and beyond, the flora and fauna all play an important role in combating climate change by reducing the amount of greenhouse gasses in the atmosphere. The forest reserve is also a major carbon sequestration & sink and evergreen rain forest contributing to the rain feed agriculture in the region.

There is high level of mining activities within the forest reserve and off the forest reserve as result of the undelaying rock formation. The above benefits derived from the forest reserve has been threatened by illegal and small-scale mining activities which are ripping off the forest vegetation cover thereby increasing the carbon footprint, endangering biodiversity and ecosystem of this forest reserves.

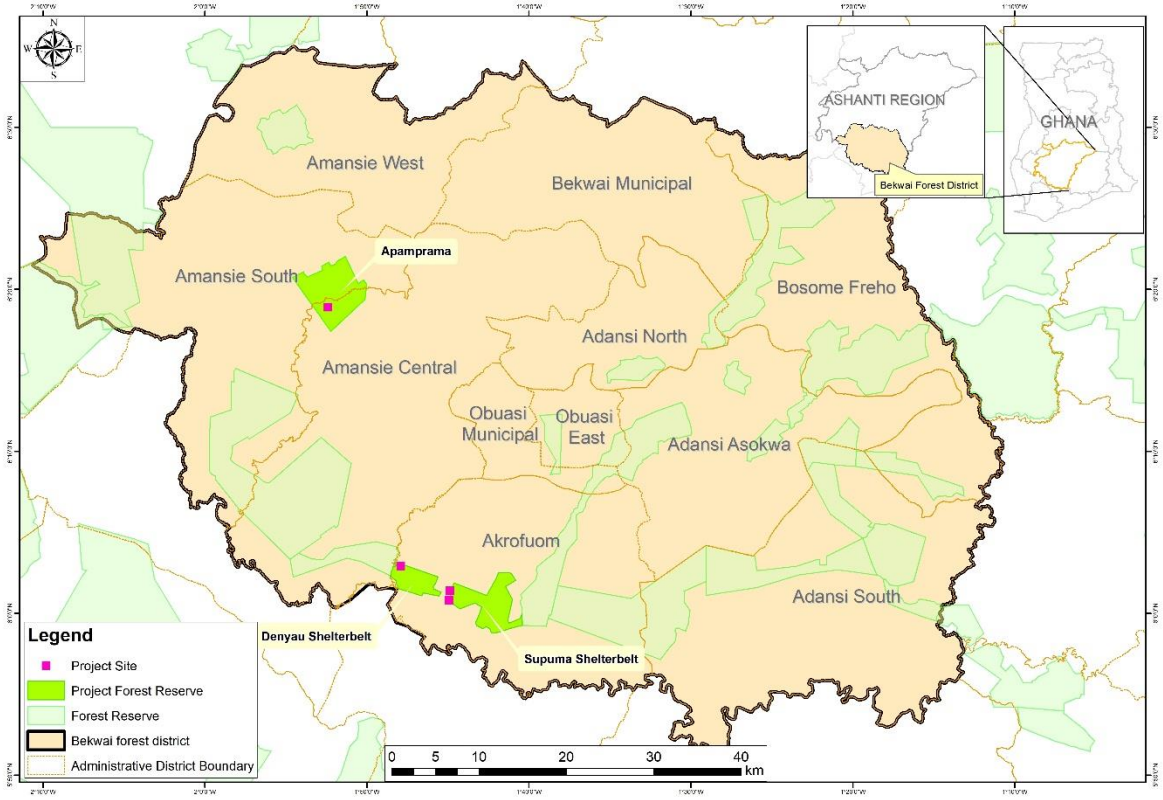


Figure 1: Forest reserves and political/administrative districts in the Bekwai Forest District

3.2 Project Location

Mining activities in the Bekwai Forest District have encroached portions of Apramprama, Denyau, and Supuma Forest reserves at Kobro, Abuakwaa, Adamso and Kubi communities. A satellite image showing the extent of mine sites in the forest district is given in **Figure 2.**

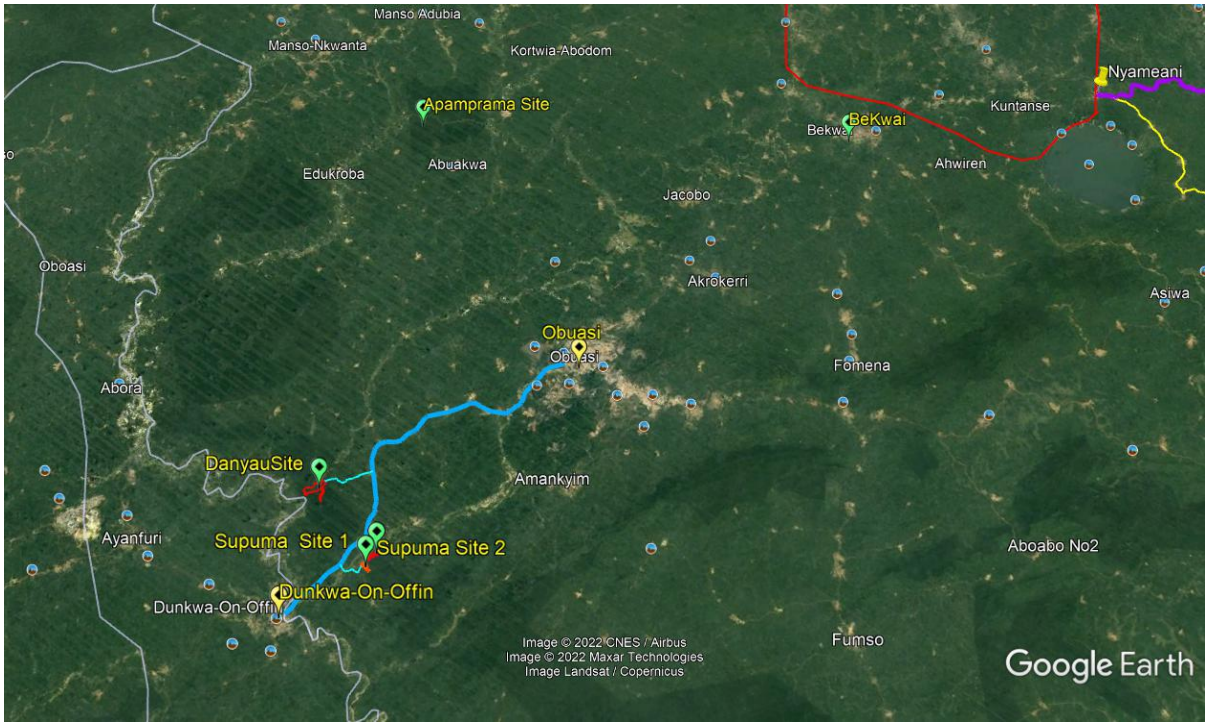


Figure 2:Satellite image showing the extent of mine sites of Bekwai Forest District

3.2.1 Pilot project locations and estimated areas

The four (4) mined out pilot project sites in the Bekwai Forest District earmarked for rehabilitation are located close to the following communities: Kobro, Abuakwaa, Adamso and Kubi communities. These sites are shown in the **Figures 3 to 5** below.

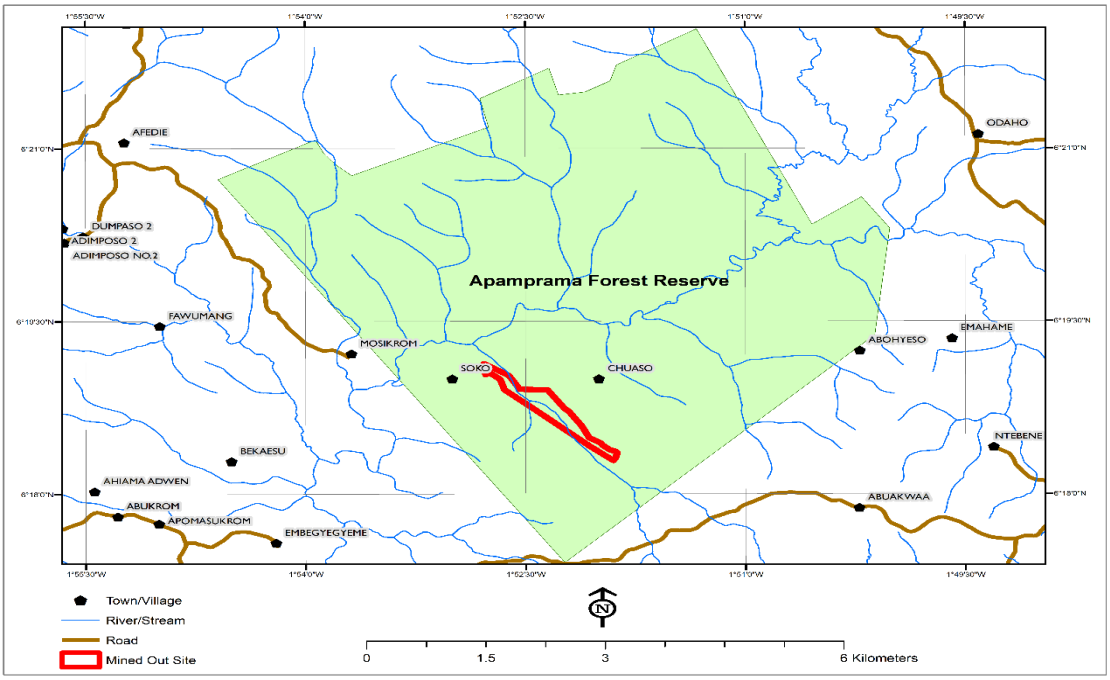


Figure 3: Location of pilot project area in Apramprama close to Kobro community

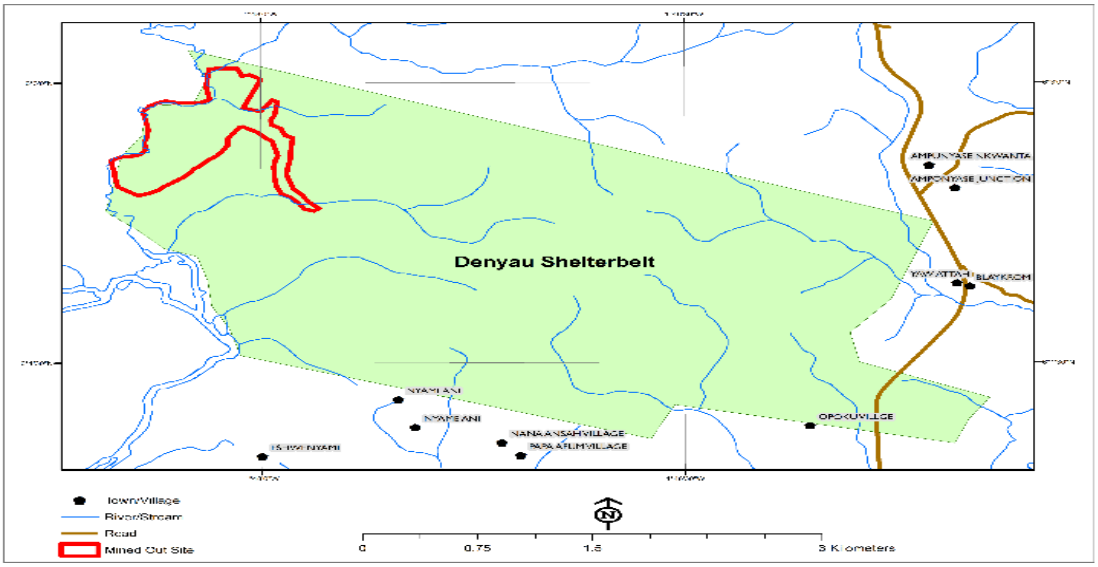


Figure 4: Location of pilot project area in Denyau close to Adamso community

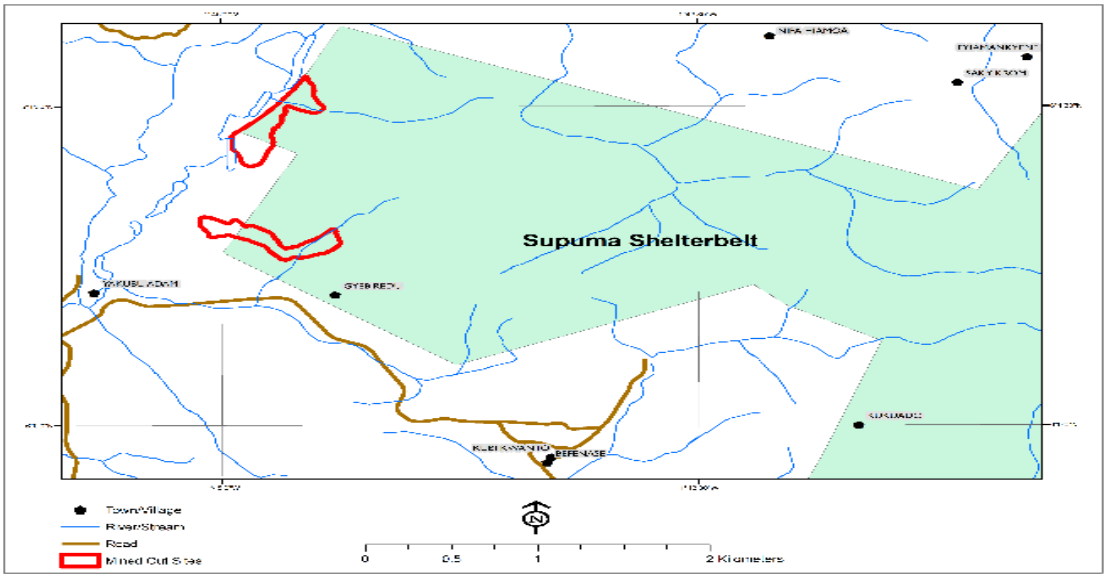


Figure 5: Location of pilot project area in Supuma close to Kubi community

The project areas are summarized in the **Table 2**:

Table 2: Estimated Project Pilot Areas in Bekwai Forest District

Name of Site	Forest District	Area (Ha)	Area (SqM)
Apamprama	Bekwai	40.13	401,300
Denyau	Bekwai	69.70	697,000
Supuma-1	Bekwai	10.60	106,000
Supuma-2	Bekwai	12.20	122,000
Total		**132.63**	**1,326,300**

The clean- up processes and physical rehabilitation activities to be employed are described in the following sections.

3.3 Project Activities

3.3.1 Remediation or clean-up of contaminated sites

Soil, sediments and surface water remediation technologies are developed and applied to eliminate historical and current contaminated sites. Contamination may cause loss of land as a resource and is a potential health hazard to humans. A variety of methods are proposed for soil, sediment, surface and groundwater remediation ranging from biological to advanced and complicated engineering techniques that may be specific to the site and dependent on the contaminant or contaminant class. It is proposed to use the Phytotechnology approach.

Phytotechnology is a set of technologies using plants (roots, shoots, tissues, and leaves) to remove, transfer, stabilize, or destroy contaminants in soil sediments and groundwater. Phytoremediation applies to all biological, chemical, and physical processes that are influenced by plants that aid the cleanup of contaminated substances. The specific phytotechnology is chosen based on the type of contaminated media that are affected and the remediation goals. Remediation goals include areas such as containment, stabilization, sequestration, assimilation, reduction, detoxification, degradation, mobilization, and /or mineralization.

This appears to be the best available and cost-effective technology option without much complexity as opposed to the high-energy, high-cost conventional methods. This technology uses plant roots, shoots, tissue and leaves to remove, transfer, stabilize or destroy contaminants in soil, sediments and water. It is considered as a “Green Revolution” in the field of innovative cleanup technologies.

Potential plants to be used which may also provide phytostabilization of mercury include willow trees, grasses, and the rush *Juncus maritimus*.

3.3.2 Rehabilitation Works

<u>Backfilling of illegally mined areas</u>

The current pilot project will cover only about 132.63ha. There are stockpile of washed gravel and coarse sand close to the pits, which could be used for the initial backfilling if quality testing permits. However, if these are not adequate, an additional volume of about 30-50% of the total volume of voids will be required as fill materials to be hauled from neighbouring sites or adjacent hills to complete the filling to an appreciable level.

The main activities for the backfilling of the mined-degraded site will include:

- Dewatering of pits where there are ponds;
- Spreading of stockpile washed gravel and coarse sand into pits;
- Haulage of additional material from adjacent hills to complete the backfilling of pits.

<u>Trimming & improving riverbanks with required boulders</u>

Main rivers traversing the degraded sites will require rehabilitation along the banks. The rehabilitation activity will include redefining river/stream courses and stabilising the riverbanks.

The main activities for the trimming and improvement will include:

- Diversion of river courses; and
- Stabilization of the riverbanks with boulders

The proposed reclamation areas, estimated working surface areas, estimated volume of fill materials required, and importation of topsoil requirement are presented in the table below:

Table 3: Estimated volumes of fill material and top soil required

Name of Site	Forest District	Estimated working land area (Ha)	Estimated working land area (m^2)	Estimated Volume of fill material required ($m^{3)}$	Estimated Volume of topsoil required ($m^{3)}$
Apamprama	Bekwai	40.13	401,300	126,409.50	40,130
Denyau	Bekwai	69.70	697,000	313,650.00	69,700
Supuma-1	Bekwai	10.60	106,000	34,980.00	10,600
Supuma-2	Bekwai	12.20	122,000	44,286.00	12,200

3.3.3 Remediation of Rehabilitated Lands

The restoration of biodiversity will include the following activities:

- Preparation of reclaimed lands;
- Re-vegetation/plantation of nutrient fixing trees/crops; and
- Maintenance/Monitoring.

Restoration of biodiversity will be achieved through application of appropriate land restoration techniques and re-vegetating rehabilitated sites with mostly local plant species, which may be of economic value in the communities.

<u>Preparation of Reclaimed lands</u>

This will involve:

- Ripping and ploughing of hard bare surfaces where necessary;
- Spreading of top loamy soil; and
- Application of humus and fertilizer or organic material, if required.

Prior to any establishment of vegetation, reclaimed areas would have been adequately compacted, reshaped and prepared or naturally allowed to settle within three to six months.

<u>Re-vegetation/plantation</u>

This will involve procurement of Non-edible tree species from commercial nurseries in the forest district and elsewhere. Trees are usually preferred for reclamation because of their wider adaptation to various soil types and high survival rate (Asiedu, 2013).

The Community's preferred economic trees such Teak, Odum, Ofram, Rubber, Mahogany, Wawa, Sapele, Cedrela, Emre etc. and other nitrogen fixing trees including Leucaena, Gliricidia, and Acacia will be considered to expedite the successional progress.

The selected tree seedlings would have qualities like nitrogen fixing, extensive leafy biomass production and should be planted to a minimum of 450 seedlings per acre (Asiedu, 2013). The re-vegetation of disturbed areas will involve the following procedure:

- Manual planting of seedlings/nursery, or transplanting;
- Manual dispersion of seeds; and
- Re-establishment of natural vegetation cover.

To enhance or broaden community participation, it may be necessary to encourage communities to establish community nurseries or private nurseries located in affected communities. While this creates employment for the communities it will also provide opportunity for them to partake in the success or otherwise of the reclamation programme.

Maintenance/ Monitoring

Maintenance of reclaimed lands and re-afforestation will primarily comprise the following:

- Watering;
- Replacement of dead plants/invasive weeds control
- Controlling or warding off livestock, which come to feed on the seedlings.
- Safeguarding the reclaimed lands from re-mining operations

The maintenance activities will be undertaken between one to three months' period after planting during which the seedlings may have been well established in the soil. The Growth rate of planted seedlings and all re-vegetated sites will be monitored to achieve the needed success to enhance return of fauna.

In all these, we envisage that community participation will play a critical role in the maintenance and monitoring of the rehabilitation mechanisms proposed above. These may be achieved by establishing youth farmer groups who will be responsible for the afforestation, community task force/committees who will be responsible for monitoring of reclaimed lands to prevent illegal lumbering and mining of the forested/reclaimed areas. These will ensure a sustainable reclamation exercise and safeguard the investments to be made on the proposed reclamation project by the Government.

4.0 ALTERNATIVE CONSIDERATIONS/ PROJECT DEVELOPMENT OPTIONS

A number of options were considered in the selection of the pilot project areas as well as the method for reclamation. These options were considered according to their suitability to meet the project objectives.

4.1 Assessment of Options for Selection of Project Sites

During the Scoping phase, mined-out areas in four (4) forest districts namely, Begoro and Kade Forest Districts in the Eastern Region, and Tarkwa and Bibiani Forest Districts in the Western Region were assessed. These are listed in the **Table 4** together with their respective administrative districts.

Table 4: Alternative Forest Districts Identified for the Pilot Study

No.	Region	Forest District	Political/ Administrative Districts
1.	Western Region	Bibiani Forest District	Sefwi Wiawso Municipal Upper Denkyira West Bibiani-Anhwiaso-Bekwai Municipal
2.		Tarkwa Forest District	Tarkwa Nsuaem Municipal Prestea Huni-Valley Municipal Jomoro Municipal Nzema East Municipal Ellembelle District
3.	Eastern Region	Begoro Forest District	East Akim Municipal Atewa District Suhum District Kraboa Kotaa District New Juaben Municipal Fanteakwa District
4.		Kade Forest District	Kwaebibirem Municipal West Akim Municipal Birim North District Akyemansa District Denkyembour District

Consequently, the MLNR

- Undertook the assessment to map out (spatial and non-spatial) illegally mined areas in Begoro and Kade Forest Districts in the Eastern Region and Tarkwa and Bibiani Forest Districts in the Western Regions in terms of location, legal status, physical conditions, status of current mining operations and reclamation cost effectiveness.
- Undertook socio-economic assessment of fringe communities within the mapped out mined areas to ascertain their inclination to participate in reclamation of the mined-out areas and their subsequent monitoring and protection through community enforcement mechanisms.

- Proposed cost-effective systems for monitoring and maintaining sensitive forest areas vulnerable to galamsey, as well as degraded landscapes.
- Facilitated one workshop bringing together all key stakeholders to discuss interim findings and recommendations.

The key considerations for the final selection of the project sites included:

- The site must be completely mined out to avoid re-entry by galamsey workers,
- The commitment of the local community to safeguard the site after reclamation works have been carried out,
- Budgetary considerations since the report suggested about US$6,500 to reclaim an hectare of mined out site; and
- The mined-out site should be located within the forest reserve

Based on these considerations, mined out sites in the Apramprama, Denyau and Supuma Forest Reserve which are under the Bekwai forest district were selected for the pilot study.

4.2 Assessment of Options for Remedial Technologies

The following are the general remedial technologies used in solving contaminated site problems and which may also be applicable to a contaminated pilot site:

Solidification/Stabilization Technology

This technology physically binds or encloses contaminants within a stabilized mass and chemically reduces the hazard potential of a waste by converting the contaminants into less soluble, mobile, or toxic forms. In-situ or ex-situ method is the most frequently used technology for soil and waste contaminations. The studies show that this technology has been used to meet regulatory cleanup levels, is commercially available to treat both soil and waste, and generates a residual that typically does not require further treatment prior to disposal. Other technologies for soil and waste are typically used for specific soil types.

Soil Washing/Acid Extraction Technology

This technology uses the principle that some contaminants preferentially adsorb onto the fines fraction of soil. The soil is suspended in a wash solution and the fines are separated from the suspension, thereby reducing the contaminant concentrations in the remaining soil. Acid extraction uses an extracting chemical, such as hydrochloric acid or sulfuric acid. It is an *ex-situ* method which is used primarily to treat soils with relatively low clay content because these soils tend to be separable into a highly contaminated fines fraction and a less contaminated sand fraction. It is also less effective for soils with high organic content because organic compounds tend to interfere with contaminant desorption

Thermal Desorption/Retorting Technology

Application of heat and reduced pressure to volatilize mercury from the contaminated medium, followed by conversion of the mercury vapors into liquid elemental mercury by condensation. Off-gases may require further treatment through additional air pollution control devices such as carbon units. Thermal treatment such as thermal desorption or retorting, is routinely used to treat industrial

and medical wastes that contain mercury, but is also generally not suitable for soils with high clay or organic content and typically requires an air pollution control (APC) unit to treat mercury off-gas.

Vitrification Technology

Vitrification uses high-temperature for treatment that reduces the mobility of metals by incorporating them into a chemically durable, leach-resistant, vitreous mass. The process may cause contaminants to volatilize, thereby reducing their concentration in the soil and waste. Either *in-situ* or *ex-situ* methods may be used when a combination of contaminants is present that cannot be treated using only solidification/stabilization. It is used for wastes with high organic content because combustion of the organic content liberates heat, reducing the external energy requirements

Precipitation/Co-precipitation Technology

Precipitation uses chemical additives to: (i) transform dissolved contaminants into an insoluble solid, or (ii) form insoluble solids onto which dissolved contaminants are adsorbed. The insoluble solids are then removed from the liquid phase by clarification or filtration. This is the most frequently used technology for water contamination in general. The effectiveness of the technology is less likely to be reduced by characteristics or contaminants that may affect other technologies, such as hardness or other heavy metals. Systems that use this technology generally require skilled operators; therefore, precipitation/coprecipitation is more cost-effective at a large scale where labor costs can be spread over a larger amount of treated water produced.

Adsorption Technology

Adsorption concentrates solutes at the surface of a sorbent, thereby reducing their concentration in the bulk liquid phase. The adsorption media is usually packed into a column. Contaminants are adsorbed as contaminated water is passed through the column. This technology when used for mercury treatment is more likely to be affected by media characteristics and contaminants other than mercury when compared with precipitation/coprecipitation. Small-capacity systems using these technologies tend to have lower operating and maintenance costs and require less operator expertise. Adsorption tends to be used more often when mercury is the only contaminant to be treated, for relatively smaller systems, and as a polishing technology for the effluent from larger systems.

Membrane Filtration Technology

Membrane filtration separates contaminants from water by passing the water through a semi-permeable barrier or membrane. The membrane allows some constituents to pass, while it blocks others. It is effective for the treatment of mercury but is used less frequently because its costs tend to be higher and it produces a larger volume of residuals than other mercury treatment technologies. In addition, it is sensitive to a variety of contaminants and characteristics in the untreated water. Suspended solids, organic compounds, colloids, and other contaminants can cause membrane entangling.

Biological Treatment Technology

This technology involves the use of microorganisms that act directly on contaminant species or create ambient conditions that cause the contaminant to leach from soil or precipitate/coprecipitate from water. It has been shown to be effective in several pilot-scale studies and research. The mechanisms that enable bioremediation to reduce the concentration of contaminants are not fully understood yet. Mechanisms that have been suggested include converting contaminant to species that are retained in

the biomass or converting it to species that are more easily removed from water by another technology, such as precipitation or adsorption. Bench-scale and additional pilot-scale studies are being conducted to assess the effectiveness of bioremediation technologies for contaminant removal at full scale.

Phytotechnology

Phytotechnology is a set of technologies using plants (roots, shoots, tissues, and leaves) to remove, transfer, stabilize, or destroy contaminants in soil sediments and groundwater. Phytoremediation applies to all biological, chemical, and physical processes that are influenced by plants that aid the cleanup of contaminated substances. The specific phytotechnology is chosen based on the type of contaminated media that are affected and the remediation goals. Remediation goals include areas such as containment, stabilization, sequestration, assimilation, reduction, detoxification, degradation, mobilization, and /or mineralization.

Containment (Capping) Technology

In-situ capping refers to the placement of a subaqueous covering or cap of clean material over contaminated sediment that remains in place. Caps are generally constructed of clean sediment, sand, or gravel, but can also include geotextiles, liners, or the addition of material, such as organic carbon, to attenuate the flux of contaminants. *In situ* treatment caps perform remediation of contaminated media due to the nature of the interaction of the capping material with the subaqueous sediments. These chemical interactions either destroy the contamination or sequester contaminants through a combination of adsorption, absorption, ion exchange, and precipitation.

Electrokinetic treatment technology

This treatment is an in-situ technology intended to be applicable to soil, waste and water. This technology is most applicable to fine-grained soils and is based on the theory that a low-density current applied to soil will mobilize contaminants in the form of charged species. A current passed between electrodes inserted into the subsurface is intended to cause water, ions, and particulates to move through the soil. Contaminants arriving at the electrodes can be removed by means of electroplating or electrodeposition, precipitation or coprecipitation, adsorption, complexing with ion exchange resins, or by pumping of water (or other fluid) near the electrode.

Excavation and landfilling (removal) technology

This technology physically removes contaminated soil and waste from the site and sent for offsite disposal or treatment at an appropriate facility. Waste segregation and reduction (e.g., by field screening) may be possible.

The decision on appropriate technological choice is based on the following criteria:

- Short-term and/or long-term effectiveness;
- Effectiveness of contaminant reduction at the site;
- Reduction of contaminant toxicity; and
- Cost effectiveness of remediation.

Choice of technology

So far, the best available and cost-effective technology option without much complexity is the **Phytotechnology (Phytoremediation**) as opposed to the high-energy, high-cost conventional

methods. This technology uses plant roots, shoots, tissue and leaves to remove, transfer, stabilize or destroy contaminants in soil, sediments and water. It is considered as a "Green Revolution" in the field of innovative cleanup technologies.

Phytostabilization works best where the contamination is shallow and the level of contaminants is low as confirmed for all the project sites.

Plants that have been researched or successfully used for phytostabilization of mercury throughout the world include willow trees, grasses, and the rush Juncus maritimus. Phytostabilization is estimated to cost $125 to $629 dollars per acre (USEPA 2000).

Species such as *Ceiba pentandra, Pycnanthus angolensis*, *Celtis mildbraedii,* and *Musanga cecropioides* were recorded in the mined-out sites during the survey. The preferred species-mix for the reclamation exercise are *Terminalia superba, Triplochiton scleroxylon, Khaya spp, Mansonia* and *Entandrophragma spp.*

4.3 No Action Option

The no action option will mean maintaining the status quo and implies that:

- The affected forest reserves will remain degraded and denied the opportunity for restoration.
- The communal spirit among the local communities for developmental projects will not be evidenced. The project will train and rely on local communities to be conscious of the need to preserve their local forest resources and to become champions in safeguarding these forests. This will enhance the communal spirit which may spill over to other environmental and developmental projects within the communities.
- Ghana will not fully achieve its goals under the Forest Improvement Programme.
- Other aspects of the proposed project including employment opportunities and improved local / national / institutional / national revenues will be denied.

5.0 BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

This chapter provides a description of the environmental and socio-economic baseline within the project sites and surrounding areas where both direct and indirect impacts of the project are likely to occur. These cover the mined out areas earmarked for reclamation and also the adjoining communities.

In addition to the primary data collected through site specific sampling, and baseline assessments, information available from secondary sources have also been used to fully describe conditions at the project areas. The baseline information is useful to predict and monitor any residual impacts to be associated with the proposed reclamation project.

5.1 Description of thePhysical Characteristics of the Project Communities

5.1.1 Ambient Air Quality at Pilot Project Areas

The aim of this monitoring is to gather relevant environmental quality data with respect to Ambient Air and Noise Levels to describe baseline conditions at the mined-out areas and nearest communities. The data gathered will provide useful information to help monitor its operational impacts on the environment, health and safety of its employees and surrounding neighbors.

The objectives of the monitoring are to:

- Measure the concentration of particulate matter ($PM_{2.5}$ & PM_{10}) and gases ($N0_2$ and SO_2) at selected locations within the project catchment area
- Measure ambient noise levels at selected locations within the project catchment and neighboring community.

Compliance criteria

In this report, ambient air quality results are compared with the GSA Standard, Environmental and Health Protection Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236:2019). Noise data is compared with the Health Protection- Requirements for Ambient Noise Control of the Ghana Standards Authority (GS 1222:2018). These standards are provided in the **Table 5.**

Table 5: Environment and Health Protection- Requirements for Ambient Air Quality and Point Sources/Stack Emissions (GS 1236:2019).

#	Air Quality Parameter	Maximum Limits	Averaging Time
1	Carbon Monoxide, µg/m^3	100 60 30 10	15 minutes 30 minutes 1 hour 8 hours
2	Sulphur Dioxide (SO_2), µg/m^3	150	24hours
3	Nitrogen Oxides (measured as NO_2), µg/m^3	150	24hours

4	Total Suspended Particulate, µg/m^3	150 100	24hours 1 year
5	PM_{10}, µg/m^3	70 70	24hours 1 year
6	$PM_{2.5}$, µg/m^3	35	24hours
Shaded rows show applicable guidelines to this study			

Sampling locations

A total of Seven (7) sampling locations were selected within the Bekwai Forest district comprising were four (4) mined out sites and three (3) communities. The same locations were used for the sampling of air quality and noise levels.

These locations were selected based on either or all of the following criteria;

- Accessibility to unrestricted air flow to the sampling units;
- Suitability of location as a collection point of representative samples for baseline air quality and noise levels, Potential future air quality and noise levels impacting on the employees and the neighboring environment
- Sensitivity of the area to the impact of construction activities (e.g. residence)

Table 6 below shows the details of the weather conditions and GPS locations of the sampling locations

Table 6: Details of Air and Noise sampling locations and weather conditions.

FOREST RESERVE	COMMUNITY	SITE/SAMPLE CODE	PARAMETER	DATE	LATITUDE.	LONGITUDE	TEMP (^{O}C)	RH(%)	AC	WD AND SPEED
Supuma	ATTAKWAME	Compartment 10 SITE 1 (AK001)	PM_{10}	7/04/22	6.014948	-1.748785	30^{0}	64	Cloudy	SW 10 km/h
			$PM_{2.5}$	7/04/22						
			NOISE ASSESSMENT Daytime	7/04/22						
			Gases(SO2 and NO2)	7/04/22						
		Compartment 8 SITE 2 (AK002)	PM_{10}	7/04/22	6.025361	-1.746553	30^{0}	64	Cloudy	SW 10 km/h
			$PM_{2.5}$	7/04/22						
			NOISE ASSESSMENT Daytime	7/04/22						
			Gases(SO2 and NO2)	7/04/22						
		COMMUNITY (AK003)	PM_{10}	7/04/22	6.013909	-1.751005	30^{0}	64	Cloudy	SW 10 km/h
			$PM_{2.5}$	7/04/22						
			NOISE ASSESSMENT Daytime	7/04/22						
			NOISE ASSESSMENT Nighttime	7/04/22						
			Gases(SO2 and NO2)	7/04/22						
Denyau Site	ADAMSO	SITE (AD001)	PM_{10}	8/04/22	6.264494	-2.249968	32	58	Hot	SW 10 km/h
			$PM_{2.5}$	8/04/22						
			NOISE ASSESSMENT Daytime	8/04/22						
			Gases(SO2 and NO2)	8/04/22						
		COMMUNITY (AD002)	PM_{10}	8/04/22	6.250406	-2.242919	32	58	Cloudy	SW 10 km/h
			$PM_{2.5}$	8/04/22						
			NOISE ASSESSMENT Daytime	8/04/22						
			NOISE ASSESSMENT Nighttime	8/04/22						
			Gases(SO2 and NO2)	8/04/22						
Apampram a (Oda River		SITE	PM_{10}	9/04/22	6.314989	-1.876516	32	68		SW 4km/h
			$PM_{2.5}$	9/04/22						

FOREST RESERVE	COMMUNITY	SITE/SAMPLE CODE	PARAMETER	DATE	LATITUDE.	LONGITUDE	TEMP (^{O}C)	RH(%)	AC	WD AND SPEED
	KOBRO	(KB001)	NOISE ASSESSMENT Daytime	9/04/22					Mostly Cloudy	
			Gases(SO2 and NO2)	9/04/22						
		COMMUNITY (KB002)	PM_{10}	9/04/22	6.290170	-1.883365	32	68	Mostly Cloudy	SW 4km/h
			$PM_{2.5}$	9/04/22						
			NOISE ASSESSMENT Daytime	9/04/22						
			NOISE ASSESSMENT Nighttime	9/04/22						
			Gases (SO2 and NO2)	9/04/22						
Temp=Temperature, **RH**=Relative Humidity, **AC**=Atmospheric Condition, **WD**=Wind Direction										

Results

Particulate Matter

Particulate matter (PM) in the air is divided into different size fractions. PM10 (≤ 10 microns) is a criterion pollutant that poses a major health risk because of its ability to penetrate the lungs. PM2.5 (≤ 2.5 microns) is another criterion pollutant with a higher health impact due to the danger of deeper penetration into the respiratory system. Large particles (PM10 and above) come from natural sources that are agitated by wind or human activities. PM10 can be found in nature as sea salt, dust (airborne soil), or pollen. Although dirt particles in the air are naturally occurring, they are also created by man-made processes such as construction and industrial activity. Natural particulates can make up a large portion of PM10 in some areas. Small particles (generally PM2.5 and below) are by-products of combustion, e.g. emissions from vehicles and power stations. Particles from these sources react with other gases in the atmosphere to create particles of various chemical compositions.

The Concentrations of Particulate matter (2.5 and 10) were sampled using the ARA N-FRM Air Sampler and Aeroqual's Portable Air Quality Monitor 500 (a-500). The ARA NFRM sampler was used mainly in the communities whereas the Aeroqual Portable Air quality monitor was used at the project sites
Photos of equipment at the selected locations for PM_{10} and $PM_{2.5}$ sampling is provided in the Plates below:

Plate 2: ARA-NFRM mounted for PM_{10} and $PM_{2.5}$

Plate 3: Monitoring with Aeroqual Series 500 (AS-500) with PM_{10} and $PM_{2.5}$ Sensor head

The $PM_{2.5}$ concentrations ranged from 7 to 10 µg/m^3 and PM_{10} concentrations ranged from 27 µg/m^3 to 31 µg/m^3. These values are within the Ghana Standard and WHO guideline values as shown in the **Figure 6.**

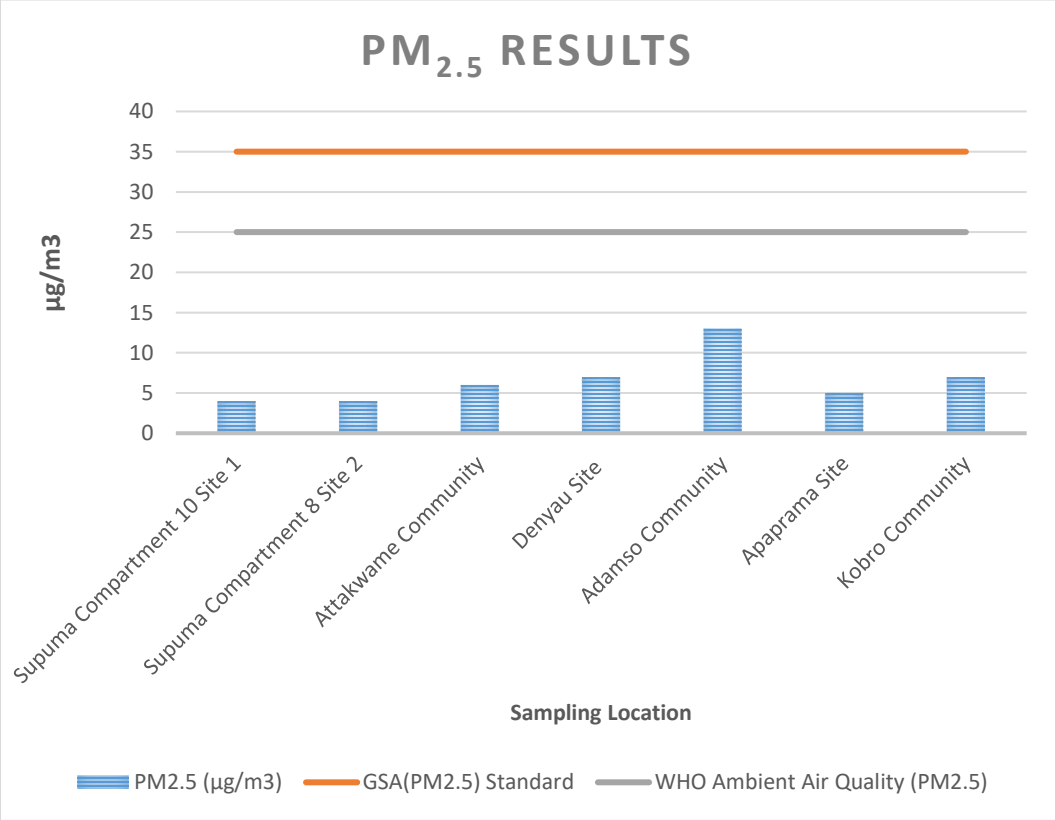


Figure 6: PM_{10} Concentrations measured at the various sites compared to GSA and WHO standards

- The concentrations of $PM_{2.5}$ and PM_{10} values are within the Ghana Standards (GS 1236:2019) and WHO Ambient Air Quality Guidelines for 24-hour for PM_{10} and $PM_{2.5}$ guideline values.
- Thus, the ambient air quality at the selected sites and neighboring communities within the Bekwai forest district complied with the GSA standard and WHO Ambient Air Quality Guidelines. The slight rain showers experienced during the monitoring period may have seemingly resulted in the low values recorded.

Gases (NO_2 and SO_2)

Inhalation of Nitrogen dioxide (NO2) can impair lung function and increase susceptibility to infection, particularly in children. It can also aggravate asthmatic conditions. Nitrogen dioxide is not only a toxic gas but it is also a precursor to several harmful secondary air pollutants. It also plays a role in the formation of acid rain and photochemical smog. Nitrogen dioxide is not usually released directly into the air. It is formed when nitric oxide (NO) and other nitric oxides (NOx) react with other chemicals in the air. However, some NO2 could be formed naturally in the atmosphere by lightning and from plants and soil. The major contributor of nitrogen dioxide in the urban environments and industrial areas is the burning of fossil fuels, particularly diesel powered engines and industrial boilers.

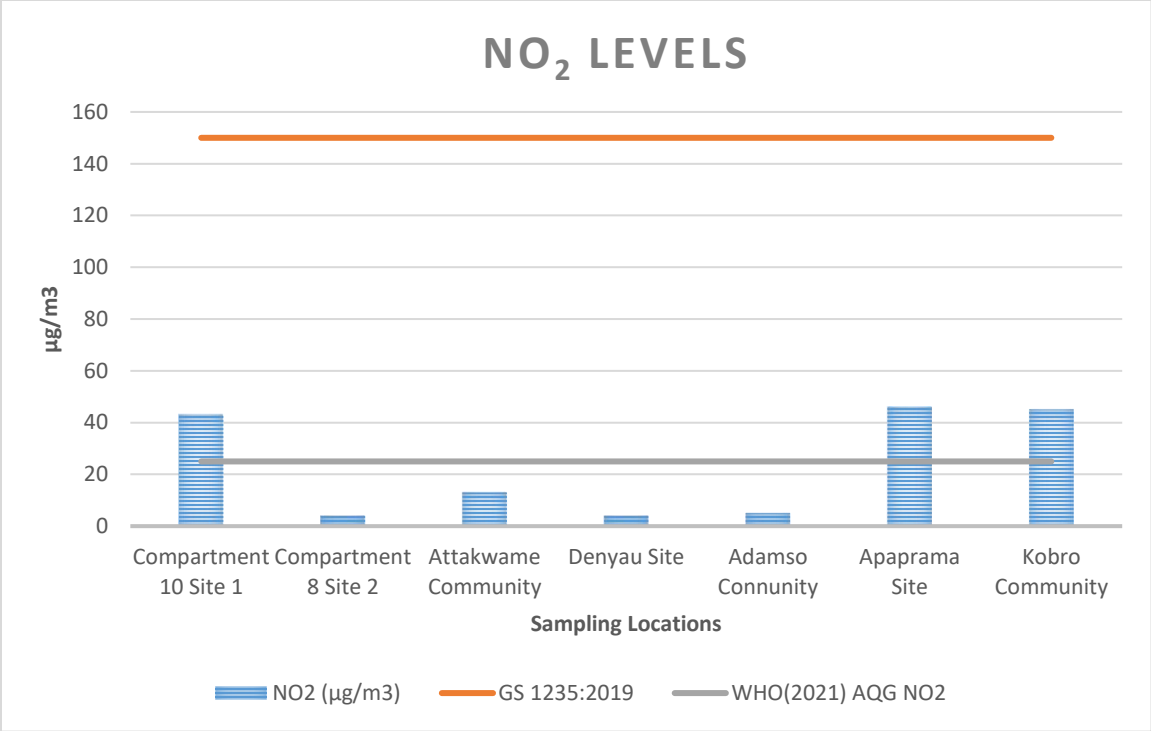
Sulphur dioxide (SO2) is a toxic gas with a strong irritating smell. Inhaling Sulphur dioxide has been associated with respiratory disease and difficulty breathing. It is also a precursor to acid rain and atmospheric particulates. Sulphur dioxide is present at very low concentrations in the atmosphere and is naturally emitted during volcanic eruptions, as well as at geothermal sites. Fossil fuel combustion at power plants is the largest emission source of SO_2 into the atmosphere. Other sources include extracting metal from ore and the burning of high Sulphur containing fuels by ships in machines.

Aeroqual Series 500(A-S500) Gas Meter was used to determine the concentration levels of NO_2 and SO2. The A-S500 Gas Meter is a high rated device that enables accurate real time surveying of common indoor and outdoor air pollutants, all in an ultra-portable air quality monitor

Some photos of equipment being used at the selected locations for NO_2 and SO_2 sampling is provided in Plates below:

Plate 4: Aeroqual Series 500 (AS-500) with NO2 and SO2 Sensor head being used for monitoring

The NO_2 concentrations recorded ranged from 4 to 46 (µg/m^3). The SO_2 concentrations ranged from 1 to 9 (µg/m^3) as shown in the Figure below.



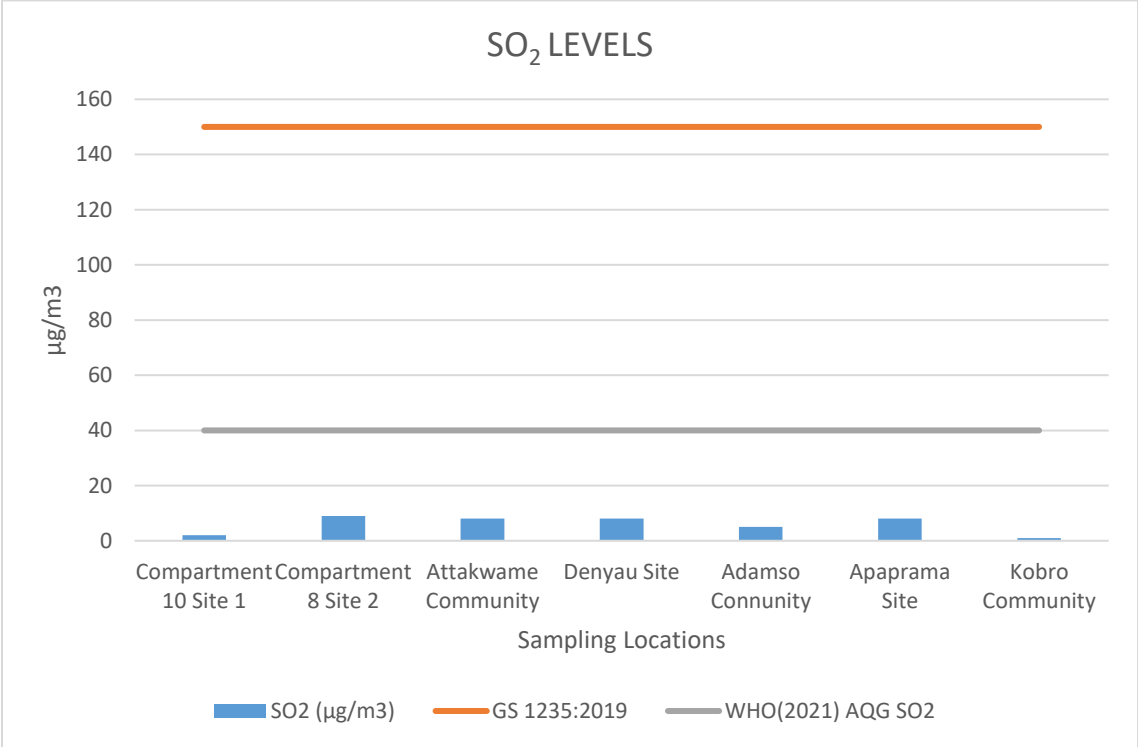


Figure 7: NO_2 and SO_2 Concentrations measured at the various sites compared to GSA and WHO

- The concentrations of NO_2 recorded at all sites for the monitoring period were below the GSA standards of 150 µg/m^3 however, for compartment 10 site 1, Apraprama and Kobro communities, the levels measured were higher than the WHO AQG levels of 25µg/m^3
- The concentrations of SO_2 recorded at all sites for the monitoring period were below the GSA standards of 150 µg/m^3 and WHO AQG levels of 40 µg/m^3

Conclusion

The Particulate Matter ($PM_{2.5}$ & PM_{10}) concentrations monitored at sites selected within the Bekwai forest district was found to be within the Ghana Standard (GS 1239:2019) permissible values of 35 and 70 (µg/m^3).

The concentration of gases (NO_2 and SO_2) recorded for the monitoring period were below the GSA Standard value of 150 µg/m^3 for both gases. The monitoring team observed that there were some rain showers during the monitoring period which could influence the air quality at the time of the assessment.

5.1.2 Noise levels at Project Sites

Noise measurements/recordings were taken with a High Precision TSI Quest Sound Level Meter, Model Type 1. The sound level meter has an in-built calibrator, and was calibrated before each measurement/recordings were taken at each site. The noise meter was calibrated at 114 dB (A) prior to the measurement.

The following statistical indices was computed: Lmax, Lmin, LAeq, L10, L50, L90

Photo of equipment mounted at the selected locations for noise monitoring is provided in Plate below:

Plate 5: TSI Quest Sound Level Meter mounted for noise assessment

Table 7: Health Protection-Requirements for Ambient Noise Control (GS 1222:2018)

Zone	Description Area of Noise Reception	Noise Level, dB(A)	
		Day (06:00-22:00)	Night (22:00-06:00)
A	Residential Areas	55	48
B	Educational (School) and health(hospital, clinic) facilities, office and law courts	55	50
C	Mixed used (Residential areas with some commercial or light industrial activities)	60	55
D	Areas with some light industry, places of entertainment or public assembly and places of worship	65	60
E	Commercial areas	75	65
F	Light industrial areas	70	60
G	Heavy industrial areas	70	70
Shaded row shows applicable guidelines to this study			

Daytime Ambient Noise Level Results and Discussion

The daytime ambient noise levels (LEQ) recorded at the selected sites and communities ranged from 44.0 to 55.0 (dBA). **Figure 8** shows the results from all sites.

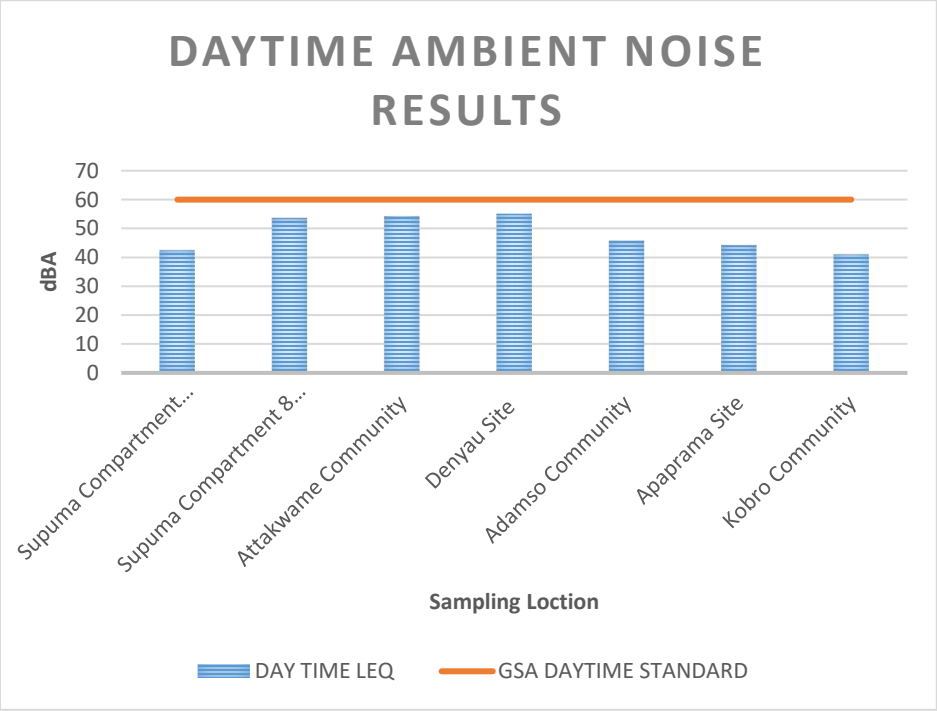


Figure 8: Daytime Ambient noise levels measured at the various sites compared to GSA Standards

Nighttime Ambient Noise Levels Results and Discussion

The nighttime ambient noise levels (LEQ) recorded at the selected sites and communities ranged from 30.0 to 39.7 (dBA). Figure 9 below shows the results from all sites that were accessible for night monitoring.

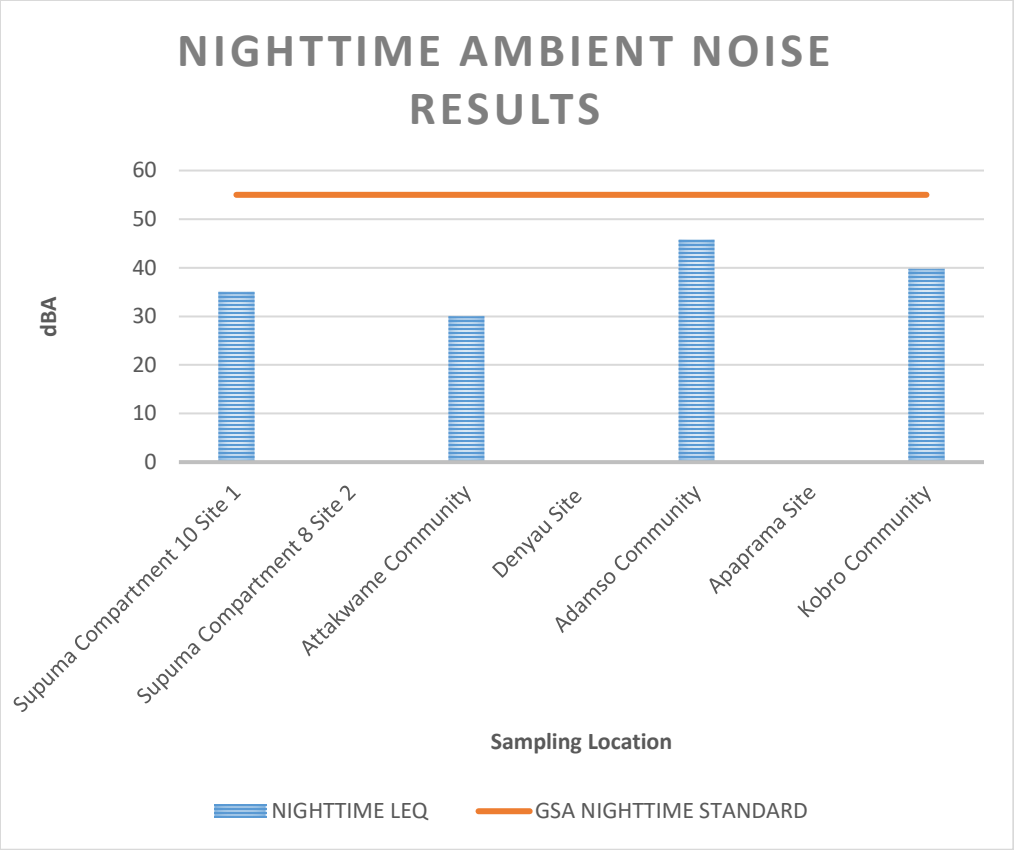


Figure 9:Nighttime Ambient noise levels measured at the various sites compared to GSA Standards

From **Figures 8 and 9** above, the ambient noise levels were below the GSA standards at all sites for both daytime and nighttime.

During the monitoring, the observed sources of noise within the project sites were from rustling of leaves, birds chirping, frogs croaking and distant noise from excavator engines and chainsaws in operation. The observed sources within the communities were from intermittent passing of motorbikes, cars and chatter from community members passing by.

Noise assessment conclusions

The ambient noise levels (LEQ values) recorded were compared to their respective Ghana Standard (GS 1222:2018). The daytime and nighttime ambient noise levels (dBA) for all sites and neighbouring communities were below the GSA standards.

5.1.3 Water Environment

The water bodies draining the project areas were sampled to assess the level of elemental contamination especially due to the activities of illegal mining. The sampling locations were close to the local communities namely, Kobro, Abuakwaa, Adamso and Kubi.

Among the selected areas, it was only at Apamprama that a flowing stream or river was seen and sampled from, together with open pits. The rest were all sampled from open pits.

Sampling programme
The sampling campaign commenced from 2nd to 5th February 2022 and 25th of March, 2022. Before the sampling, the sample bottles (amber) for water samples were soaked in 10% nitric acid for about 12 hours and then rinsed several times with deionized water, dried, and well labeled. Ziplock bags and black polyethylene bags were also prepared for soil samples.

Water sampling
A total of twenty-three water samples were taken, and some samples from the pits were combined to form a composite sample, bringing the total laboratory samples to seventeen (17). Eighteen (18) surface water from open pits and three (3) from the river with two (2) of them having downstream and upstream samples were sampled at the selected sites with a plastic bucket tied with a rope.

The bucket was thrown about 10 meters from the bank of the pit and river. At each sampling point, two samples were collected into 1liter polyethylene bottles. In-situ physical parameters of the water namely pH, temperature, electrical conductivity (EC), and total dissolved solids (TDS) were measured. One of the samples was acidified with nitric acid to a pH of less than 2 to preserve the metals in them for elemental analysis in the laboratory. The other that is not acidified will be used for the analysis of anions. Samples were kept in an ice chest with ice blocks around it and transported to Accra for analysis. Coordinates of all sample sites were taken.

The downstream samples were generally about 1.5km downstream of the mined out pits. The samples were combined for a number of pits found within the same locality for water and mostly soils.

Sediment sampling
Only one sediment sample was sampled from Denyau compartment 10A in one of the pits using a shovel and placed into a well-labeled zip lock sample polyethylene bag.

Soil sampling
A total of fifty-two (52) soil samples were sampled from various selected sites, with some combined to form a composite sample bringing the total number of samples to the laboratory to twenty-one (21). Random sampling was done at each sampling point. Composite samples were made at each site, and from these samples were drawn to form a final composite sample and a laboratory sample taken from it. Holes of a diameter of about 50cm and a depth of 20cm to 50cm each were dug out and the soils from these

holes were combined, sampling points were about 0.3km apart. The bulk soil was mixed, coned, and halved till a sample size of about 1kg was obtained. Samples were kept in labeled zipper-lock polyethylene bags.

Sampling preparation and analysis

Soil and Sediment samples

Soil and sediment samples were dried in the laboratory for three days, and stones and foreign matters were picked from them. Samples were ground into powder in a porcelain mortar and pistol, sieved with a 180mm sieve. 1.0g of the samples were digested with 5mL of concentrated nitric acid and 3mL of hydrogen peroxide using the microwave digester for one hour thirty minutes (1:30hr). The digest was cooled and diluted with distilled deionized water and analyzed for cadmium, copper, sodium, and potassium using the Atomic Absorption Spectrometer (AAS) with the graphite unit and mercury and arsenic with the vapour kit unit. Certified reference material was prepared the same way as the samples as a way of ensuring quality control of the analyses. Nitrates and chlorides were also determined.

Water analyses

Photometric methods were used for the analysis of cations and anions. For the trace elements analysis, water was acidified, digested, filtered, and analyzed for cadmium, copper, sodium, potassium and magnesium, using the Atomic Absorption Spectrometer (AAS) with the graphite unit and mercury and arsenic with the vapour kit unit. Acidified surface water was also analyzed to ensure quality control of the analyses.

Alkalinity: HT1000 photometer was used for the detection of alkalinity. According to the manufacturer's standard operating procedures with its reagents, this was done with its reagents.

Total dissolved solids (TDS): Jenway 45000 conductive meter was used for the analysis of TDS. According to the manufacturer's standard operating procedures with its reagents, this was done with its reagents. The meter was calibrated before usage, using three calibration standards 12880µs, 1413 µs, and 84µs in descending order.

Sulphate (SO_4^{-2}): HT1000 photometer was used for the detection of alkalinity. According to the manufacturer's standard operating procedures (P355), This was done with its reagents.

Nitrate (NO_3^{-1}): HT1000 photometer was used for the detection of alkalinity. According to the manufacturer's standard operating procedures (P260) with its reagents, this was done with its reagents.

Total hardness (TH): HT1000 photometer was used for the detection of alkalinity. This was done according to the manufacturer's standard operating procedures (P200) with its reagents.

Total suspended solids (TSS): HT1000 photometer was used for the detection of alkalinity. According to the manufacturer's standard operating procedures (P384), This was done with its reagents.

Biochemical oxygen demand (BOD): 100ml of the water was added to a BOD bottle and covered with its cover that has a sensor within it and then incubated for 40 minutes at 20^{O}C. sample was cooled down and a base (KOH) was added to it and incubated for five days at 20^{O} C.

COD and DO: COD and DO analyses were done on only the samples sampled from flowing streams or rivers since all the opened pits will be covered.

Results

The results of the analyses are presented in the table below:

Table 8: Results of metallic analysis in the water samples (in mg/l)

Sample name	Ca	K	Mg	Na	Zn	Cu	Ni	As	Hg	Cr
WHO, 2017 Standards for drinking water	**75.0**	**12.0**	**50.0**	**50.0**	**3.0**	**2.0**	**0.07**	**0.01**	**0.006**	**0.05**
National water quality standard (FDGS 175-1:2013)	-	-	-	-	-	2.0	0.02	0.01	0.001	-
Supuma site 1 Composite pit sample	146.9	-	314.0	-	0.8	1.0	ND	ND	0.1	ND
Supuma site 2 Composite pit sample	171.7	-	489	-	0.5	0.5	ND	2.1	0.2	ND
Denyau 10A pit	33.9	38.9	19.6	-	0.7	0.5	ND	ND	ND	ND
Denyau 10A Composite pit	67.0	-	249.5	-	0.7	1.4	ND	1.6	0.2	ND
Denyau 10B Composite pit	320.5	159.2	117.5	-	1.8	0.5	ND	ND	ND	ND
Apamprama PT 1	2.0	1.0	45.7	2.0	8.9	ND	ND	3.7	4.2	6.4
Apaprampa (Soko river DS) PT 2	2.0	1.0	16.2	-	5.8	ND	ND	3.5	1.0	4.2
Apaprampa (Soko river ups) PT 3	2.0	101.0	47.1	-	17.0	ND	ND	6.1	1.7	6.4
Apaprampa PT 4	110.7	155.1	68.0	-	0.9	ND	ND	0.5	0.2	ND

Table 9: Results of physicochemical analysis in the water samples (all parameters in mg/l except ph and conductivity)

Sample name	pH	EC (µS/cm)	TDS	TSS	T. ALK	T. HARD	DO	BOD	COD	HCO_3	SO_4	NO_3	Cl^-
WHO 2017 Standard	**6.5-8.56**	**1500**	**1000**	**75.05**	**100**	**500**	**4.0-6.0**	**3-5**	**4.0**		**250**	**50.0**	**250**
FDGS 175-1:2013	6.5-8.5	1500	1000	-	100	500	-	-	-	-	250	50	250
Supuma site 1 composite pit sample	6.88	282.0	189.8	191	170	165.9	-	-	-	35.0	25.0	0.58	6.1
Supuma site 2 composite pit sample	6.47	74.5	47.2	287	35	24.4	-	-	-	72.0	11.0	0	6
Denyau 10A pit	7.15	38.8	5.2	7	0	1.7	-	-	-	0	13.0	0.72	2.1
Denyau 10A composite pit	5.76	68.7	45.1	521	19	11.9	-	-	-	19.0	31.0	0.29	6.7
Denyau 10B composite pit	6.22	25.9	16.5	41	20	12.8	-	-	-	20.0	15.0	0.42	1.8
Apamprama PT 1	6.21	83.5	53.5	206	22	1.9	-	-	-	23.0	55.0	42	10.0
Apamprama Soko river DS PT2	6.25	78.8	50.4	341	12	0.7	3.25	5.0	123.0	13.0	29.0	8	13.2
Apamprama Soko river UPS PT3	6.09	121.2	77.7	900	16	2.0	6.18	21.0	221.0	17.0	38.0	32	9.0
Apamprama PT 4	7.32	46.9	30.0	0	0	5.6	-	-	-	4.0	10.0	14	6.7

Table 10: Results of metallic analysis in the soil samples

Sample Name	pH	Cond.	Cl	SO_4	NO_3	K	Na	Cu	As	Hg	Cd
"Dutchlist" for polluted soils	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**500**	**50**	**10**	**20**
SUPUMAN Site 1	6.27	156.0	15.80	44.0	11.3	188.9	4.9	12.1	5.2	0.7	4.9
SUPUMAN Site 2	5.78	90.7	6.60	12.0	10.8	441.0	10.0	14.1	7.0	1.0	10.0
DENYUA BLANK Compartment 10B	5.93	60.1	17.40	19.0	11.6	729.6	5.3	8.3	1.3	2.6	5.0
DENYAU Compartment 10B SEDIMENT	6.10	45.8	5.30	24.0	10.2	203.2	3.8	3.9	0.9	0.3	3.5
DENYAU Compartment 10B COMPOSITE Soil	5.32	81.2	11.20	10.0	12.0	492.8	5.9	5.8	1.6	0.2	5.6
DENYAU Compartment 10A (1)	4.50	51.3	8.70	11.0	8.4	396.6	4.6	4.9	1.7	0.2	4.3
DENYAU Compartment 10A (2)	4.05	64.5	11.50	11.0	9.3	463.2	7.1	7.8	2.4	0.1	6.8
Apamprama Composite 1	4.41	52.7	440.0	310.0	nd	79.8	-	6.7	4.9	31.7	ND
Apamprama Composite 2	5.23	30.1	23.0	75.0	16.00	96.7	-	6.7	4.6	17.2	ND
Apamprama Composite 3	4.41	31.6	19.0	95.0	22.10	83.5	208.3	5.4	8.4	18.7	ND
Apamprama Composite 4	5.24	26.1	19.5	65.0	6.45	158.2	-	9.3	15.4	28.6	ND
Apamprama One Point Sample 1	6.7	58.4	455.0	60.0	20.45	79.46	-	3.4	0.9	4.5	ND

Sample Name	pH	Cond.	Cl	SO_4	NO_3	K	Na	Cu	As	Hg	Cd
"Dutchlist" for polluted soils	**-**	**-**	**-**	**-**	**-**	**-**	**-**	**500**	**50**	**10**	**20**
Apamprama One Point Sample 2	5.21	52.4	65.0	55.0	1.90	59.1	-	8.0	5.3	14.1	ND

A certified copy of the results is attached in the Annex**.**

Discussion

Metal analysis of soil and water

From the above results, it appears the water bodies in the forest reserves are not polluted chemically by the mining activities that had taken place in them. Since the gold in Ghana is associated with sulphur mineralization, particularly arsenopyrite (FeAsS), it is expected that if the ore mined was processed at the site of mining, the soil and waters from the pits and rivers sampled should be polluted or contaminated with **arsenic** and **iron**, and **mercury** which is normally used for the extraction of the gold metal after it the ore is crushed and milled. The highest levels of these metals in the soil samples are 31.7mg**/l** and 15.4mg/l for mercury and arsenic and this was at Apamprama in composite sample 1 and 4 respectively. That for water samples is 6.1mg/l and 4.2mg/l from upstream of Soko river at Apamprama for arsenic and mercury respectively which are below the permissible levels in drinking water. The river is almost dried up. There will be no need for decontaminating the soil before the reclamation of the destroyed forest reserves.
There are no national standards for soil quality. The results are compared with the "Dutchlist" which is an authoritative and best researched regulation applicable for soils for Mercury, Arsenic, and Cadmium contamination. The levels are all comparatively low.

pH analysis on soil and water

Soil: The pH values for the analyzed soils range from 4.10 at Apamprama to 7.08 at Ntakam. pH 4.1 is strongly acidic in soil and possible ions to be present is aluminum three (Al^{3+}). A pH range of 4.0 to 5.0 is suitable for mineral soils in humid regions. With increasing acidity, exchangeable aluminum increases to toxic levels, cadmium, and heavy metals become available and molybdenum becomes increasingly unavailable (McKenzie et al. 2004), but from the results, this is not the trend found. A pH of 6.0 to 7.0 is slightly acidic and 7.0 to 8.0 is slightly alkaline in soil. The slightly acidic pH is common for mineral soils in arid regions. The soil pH affects the availability of various nutrients, toxic elements, and chemical species to plant roots. The pH is therefore a very good guide to some expected nutrient deficiencies and toxic effects (Brady 1984; McKenzie et al. 2004, p. 16).

Water: The pH values for the water samples range from 5.72 at Ntakam (pit 1) to 7.32 at Apamprama (pit 4). Most of the water in pits is slightly acidic and is in the same range as the soil, this means that water in the pits will not affect or alter the pH of the soil when it pumped out to soil or cover with the heap of soil at the site.

Nutrients (NO_3, SO_4, K, Na) analysis on soil and water

Nitrate (NO_3)

Nitrate is a form of inorganic nitrogen naturally occurring in soils. The nitrogen that is readily available to plants is generally measured as nitrate. Nitrate concentration can be highly variable in soils. The nitrate values for the soils samples range from 0-22.1ppm, the low values are a result of the acidic nature of the soils. Nitrate is usually deficient in acidic soils. Low soils pH (<5.5) reduces nitrification. Nitrification ceases at pH <4.5, and optimum pH is between 6 and 8 (USDA). The required soil nitrate-nitrogen (NO_3-N) for

specific crops varies from crop to crop, but in general, a concentration range of 10 –50mg/kg is desired (Laqua Horiba). Nitrate concentration decreases with depth due to leaching. In addition to the acidic nature of the soil, the low concentrations of nitrate may be due to the excavation of the soil during the mining activities thereby making it more leachable.

Sulphate (SO_4)

Acid sulphate soil is safe and harmless when not disturbed. If acid sulphate soils are dug up or drained, they come into contact with oxygen. The pyrite is oxidized when it comes into contact with oxygen. The sulphate content in the soil might have given to the slightly acidic nature of the soil. The presence of sulphate decreases the strength of lime stabilized soils. High concentrations of sulphate in soil may decrease the concentration of calcium, magnesium, and phosphorus in the leaves of a plant (Lopez et al, 1996),

BOD, COD and DO

DO: The results for dissolve oxygen (DO) in the rivers sampled ranges from 6.08 – 6.18mg/L for the upstream and 3.13 – 3.25mg/L for the downstream. The following requirements for DO concentration are endorsed: 6 mg/L for drinking water, 4 –5mg/L for entertainment, 4 – 6mg/L for fish and domesticated animals, and 5 mg/L for industrial applications (WHO, 2017a, 2017b). This means that only the upstream waters from these rivers will be safe for consumption using DO as an indicator for safe water. The reasons for the differences between the upstream and downstream DO values may be due to the activities carried out in or around these rivers and also due to the movement of the water.

BOD: The biochemical oxygen demand (BOD) results in a range from 0 – 21mg/L for the upstream and 5—63mg/L. With lower DO concentrations downstream of the rivers, BOD_5 at 20^OC is high due to the high oxygen demand by microorganisms. The BOD_5 upstream was good except that at Apamprama (Soko river) which was also dried up and was full of suspensions in it and corresponds to the total suspended solids (TSS) of 900mg/L. The high BOD_5 level indicates the presence of excessive bacteria/microorganisms in the water, which might come from industrial and domestic wastewater that consumed the dissolved oxygen with increased biochemical oxygen demand in the river water (Whitehead et al., 2009; Hasan et al., 2019).

COD: The chemical oxygen demand (COD) for rivers in the selected sites ranges from 49—221mg/L for the upstream and 96—123mg/L for the downstream. They were all above the permissible level of 4mg/L for drinking water (WHO, 2017b). This high level may be due to mining activities within the site.

Total Suspended Solids (TSS)

The water bodies in the project area are mostly stagnant and therefore high values of TSS were not expected. However, value up to 900mg/l was recorded in the Apamprama Soko river. This indicates that some of the water bodies are highly turbid from the disturbances caused by the illegal mining activities.

Conclusion

From the analytical results, the water resources within the deforested areas of the selected forest reserves had not been excessively polluted with chemicals from mining activities. The heap of soil can be used to fill the opened pits. Observations made from the field trip show that Soko river will be lost in the process

of the reclamation because it seems to be more of a storm water drain than a river. Also, it was seen that offspring of logged trees are springing up in some of the sites which suggests that the soil can support the growth of new plants.

Supuma			
Supuma			
Denyau			

Plate 6: Soil and water sampling locations

5.2 Biological Environment

5.2.1 Terrestrial Ecology

Walk-over surveys were conducted in the selected mined-out areas. At site, all the species encountered in sweep circular quadrats of 20 m radius were recorded. Sites attributes such as GPS coordinates, elevation and habitat type were noted, and photographs taken. The sample locations and their profiles are presented in the Table below. The Literature on the flora and fauna of the reserves were reviewed to obtain knowledge on the species that occurred in the areas affected by the illegal mining activities to enable recommendations on suitable species for the reclamation to be made. The life forms and ecological guilds of the species were analyzed. The conservation status of each species encountered was assessed using the Star Rating system adopted in the Forest Reserves of Ghana Geographic Information Exhibitor manual (Hawthorne, 1995) as shown in Table below.

Table 11: Sample locations and habitat types

Sample	Lat N	Long W	Description
Forest Reserve			
Supuma *1*			
Sample 1	06º00.970	001º45.036	Mined-out area with secondary thicket
Sample 2	06º00.924	001º44.922	Wetland
Sample 3	06º00896	001º44.845	Secondary forest with broken canopy
Supuma 2	06º01.415	001º44.876	Mined area, Secondary thicket; fire damaged
Denyau A	06º03.025	001º48.071	Extensive bare ground
Denyau B	06º02.686	001º48.390	Extensive bare area; drained by Fena stream
Apamprama			
Sample 1	06º18.486	001º52.075	Open canopy secondary forest; extensive bare area
Sample 2	06º18.992	001º52.640	Secondary thicket; broken canopy secondary forest

Table 12: Star Rating system

Rating	Description
Black Star species	Species rare internationally and at least uncommon in Ghana; urgent attention to conservation of populations needed
Gold Star species	Fairly rare internationally and/or locally
Blue star species	Widespread internationally but rare in Ghana or vice-versa
Scarlet star species	Common, but under serious pressure from heavy exploitation
Red Star species	Common, but under pressure from exploitation
Pink Star species	Common and moderately exploited. Also, non-abundant species of high potential value
Green Star species	No particular conservation concern, common in Ghana

Results

General Vegetation of the Bekwai District Forest Reserves

Two of the selected Forest Reserves (Supuma and Apamprama) lie in the Moist Semi-deciduous Southeast subtype Forest zone of the Ghana (Hall and Swaine, 1981). The reserve had earlier been placed within the Celtis-Triplochiton Association (Taylor, 1960). This forest type is characterized by Turraeanthus *africanus, Daniellia ogea, Khaya ivorensis, Illigera pentaphylla, Pteris togoensis, Chytranthus macrobotyrs and Cola nitida* (Hall and Swaine, 1981). The Denyau Shelter belt, on the other hand, lies within the Moist Evergreen Forest type of the forest zone of Ghana (Hall and Swaine, 1981). The reserve had earlier been placed within the Celtis-Triplochiton Association (Taylor, 1960). Administratively, it falls under the Bekwai forest district. The characteristic species (Hall and Swaine, 1981) are *Placodiscus bancoensis, Rinorea breviracemosa, Petersianthus macrocarpus, Diospyros gabunensis, Dichapetalum toxicarum, Airyantha schweinfurthii subsp. confusa, Maranthes glabra, Angylocalyx ologophyllus, Acridocarpus smeathmannii* and *Rinorea oblongifolia*.

The Management Plan for the Supuma Forest Reserve notes that the reserve is relatively disturbed with some patches of closed canopy forest. It attributes the high level of disturbance to farming, hunting and illegal logging by forest edge communities. The preponderance of *Broussonetia papyrifera*, an Alien Invasive Species, in the reserve is also cause for concern. The Apapmprama Forest reserve seems to be in the same condition as the Supuma Forest Reserve. Illegal logging and poaching are rampant in the reserve. It is also highly disturbed, with widespread gaps and heavily degraded portions. Isolated pockets of forest in good condition however exist in portions of the reserve (Apamprama F.R management Plan, 2021-2040).

The Denyau shelter belt Forest Reserve is also an open forest with widespread degradation. Hunting poses significant threat to wildlife. Illegal logging and illegal mining are rampant in the reserve and are responsible for the poor condition of the reserve (Denyau Forest Reserve Management Plan, 2021-2040).

Habitat Description of Mined-Out Areas

Supuma Site 1

The habitat of the mined-out areas of supuma 1 was heavily degraded at the time of the visit (Plates 1 - 3). The vegetation was a mosaic of secondary forest with open canopy, secondary thicket and wetlands created through the mining activities. The site had a preponderance of *Chromolaena odorata* in the secondary thicket. Tree species recorded in the secondary thicket included *Ceiba pentandra*,*Triplochiton scleroxylon*, *Vernonia colorata, Alchornea cordifolia, Morinda lucida, Trema orientalis* and *Rauvolfia vomitoria*. The wetlands had species such as *Typha domingensis, Rhyncospora corymbosa* and *Raphia hookeri*. The secondary forest had species such as *Musanga cecropioides, Cleistopholis patens, Zanthoxylum gillettii, Carapa procera, Trichillia prieureana, Myrianthus libericus, Sphenocentrum jollyanum* and *Acridocarpus smeathmannii*.

Plate 7: Gravels and Pits with water and patchy vegetation (L) and Mixed crop farm (Cassava and Plantain) (R)

Supuma Site 2

The Ntakam site was characterized by patchy vegetation, bare areas and pits with stagnant water Plate 7). *Musanga cecropioides, Celtis mildbraedii, Alchornea cordifolia, Trema orientalis, Cecropia peltate, Pycnanthus angolensis* and *Newbouldia laevis* were among the tree species recorded at this site. The shrubs and climbers included *Chromolaena odorata, Piper umbellatum, Solanum torvum* and *Manniophyton fulvum*. Taungya was being practiced on the encroached hill slopes with *Cedrela odorata* and *Terminalia superba* in admixture with plantain (Plate 8).

Plate 8: Mine-out pit with stagnant water surrounded by gravels with patchy re-growth

Plate 9: Taungya with plantain, *Cedrela odorata* and *Terminalia superba*.

Supuma

The Supuma mined-out area is an admixture of secondary forest, food crop farm (plantain and cassava), large pits with pools of water and small pits created by the illegal mining activity. Patchy re-growth of the vegetation is evident at the site. Tree species common at the site were *Ceiba pentandra, Celtis mildbraedii, Cecropia peltata, Triplochiton scleroxylon, Broussonetia papyrifera, Ficus exasperata* and *Alstonia boonei*. Shrubs and Climbers recorded at the site included *Chromolaena odorata, Griffonia simplicifolia, Acacia kamerunensis, Pueraria phaseoloides* and *Hypselodelphys poggeana*. The wetland/pools of water are dominated by *Typha domingensis***.**

Plate 9: Pool of water with clumps of *Typha domingensis* (background)

Plate 10: Small pits, about 4 m deep, left by miners

Apramprama Site

The Apramprama site is a mosaic of mined-out pits, degraded secondary forest/thickets or re-growth and wetlands dominated by *Typha domingensis*. It also has some encroached areas by farmers under taungya. Tree species that were recorded include *Piptadeniastrum africanum, Alstonia boonei, Pycnanthus angolensis, Celtis mildbraedii, Cecropia peltata, Musanga cecropioides, Anthocleista djalonensis, Baphia nitida, Albizia zygia and Trema orientalis. Solanum torvum, Chromolaena odorata, Hyselodelphys*

poggeana, and Dalbergia spp are some of the shrubs and climbers recorded at the site. The wetlands are dominated by *Typha domingensis and Alchornea cordifolia*

Plate 11: Wetland (centre) with Typha domingensis

Plate 12: Secondary thicket developing over mine waste (foreground)

Plate 13: Mine pit on hill slope: note development of *Musanga cecropioides* (left)and *Cecropia peltata* (right) in disturbed area around pit

Floristic Analysis on the Apramprama, Denyau and Supuma sites

A total of 64 plant species in 62 Genera belonging to 33 families were recorded at the Three reserves visited during the survey. Pioneers constituted the dominant ecological guild (about 47%), this wasn't surprising because of the open, disturbed natures of the habitats. Primary species (non-Pioneer light demanders and Shade-bearers) formed a significant 34% of the flora.

Some of the species recorded are of significant commercial value as NTFPs or Timber species (**Table 13**). *Laccosperma opacum* is harvested in commercial quantities for the basket weaving industry. The others are commercial timbers.

Table 13: Species of Significant Commercial Value recorded at the study sites

Species	Family	Life form	Ecological Guild	Star Rating
Laccosperma opacum	Arecaceae	Climber	NPLD	Pink
Distemonanthus benthamianus	Fabaceae	Tree	NPLD	Pink
Piptadeniastrum africanum	Fabaceae	Tree	NPLD	Pink
Antiaris toxicaria	Moraceae	Tree	NPLD	Pink
Elaeis guineensis	Arecaceae	Tree	Pioneer	Pink
Terminalia superba	Combretaceae	Tree	Pioneer	Pink
Entandrophragma angolense	Meliaceae	Tree	NPLD	Red
Triplochiton scleroxylon	Malvaceae	Tree	Pioneer	Scarlet

5.2.2 Fauna of Denyau, Apraprama and Supuma Forest Reserves

A total of 62 species of birds belonging to 21 families in the Denyau Forest Reserve. The most common species encountered in the reserve is the Pied Hornbill. In the Apamprama Forest Reserve, a total of 81 species of birds in 31 families were recorded in the Apamprama Forest Reserve. The common species included the Green Hylia, Bronze Mannikin and Tambourine dove. No globally threatened species were recorded in the reserve. A total of 70 species of birds in 25 families were recorded in the Supuma Forest Reserve. Some of the common species of birds of the reserve include the Ahanta Francolin, Green fruit Pigeon, White-crested Hornbill, Green Turaco and Tambourine dove. The avian diversity is quite high in the reserve.

The most common species recorded in the reserve was the African Pied Hornbill (Lophoceros fasciatus). A checklist of the Mammals and birds of the Denyau, Apramprama and Supuma Forest Reserve is presented in the Annex.

5.3 Description of the Political/ Administrative Districts- Amansie Central and Akrofuom Districts

Administratively, the project mined out sites which lie in the Apramprama, Denyau and Supuma Forest Reserves are located in the Amansie Central and Akrofuom Districts of the Ashanti Region and these districts are described as follows as per their respective Medium Term Development Plans (MTDP).

Amansie Central District

The Amansie Central District Assembly is one of the thirty (30) Administrative Districts in the Ashanti Region. It was carved out of the erstwhile Bekwai Municipal. The district has a total population of 90,741 (National Population and Housing Census 2010) and has about 206 settlements. Jacobu is the Administrative Capital. The district location is given **Figure 10**.

The district shares common boundaries with Bekwai Municipal Assembly to the north east, Amansie West to the west, Obuasi Municipal Assembly to the south east, Adansi North to the east, Adansi South to the south and Upper Denkyira in the Central Region to the south. The Amansie Central District is geographically positioned within Latitude 60 00N and 60 30N and Longitudes 10 00W and 20 00W. It covers a total surface area of about 710 square kilometers (275.4 sq miles) and forms about 2.5 percent of the total land-area of the Ashanti Region, (Amansie Central, MTDP).

Climate

The district experiences semi-equatorial type of climate. This is characterized by double maxima rainfall. The major rainfall season begins in March and ends in July, whilst the minor season starts from September and ends in November. The annual rainfall is between 1,600mm – 1800mm. It has a fairly high and uniform temperature ranging between 200C and 320C with a mean of 280C. The relative humidity however ranges between 70 and 80 percent in the dry season, (Amansie Central, MTDP).

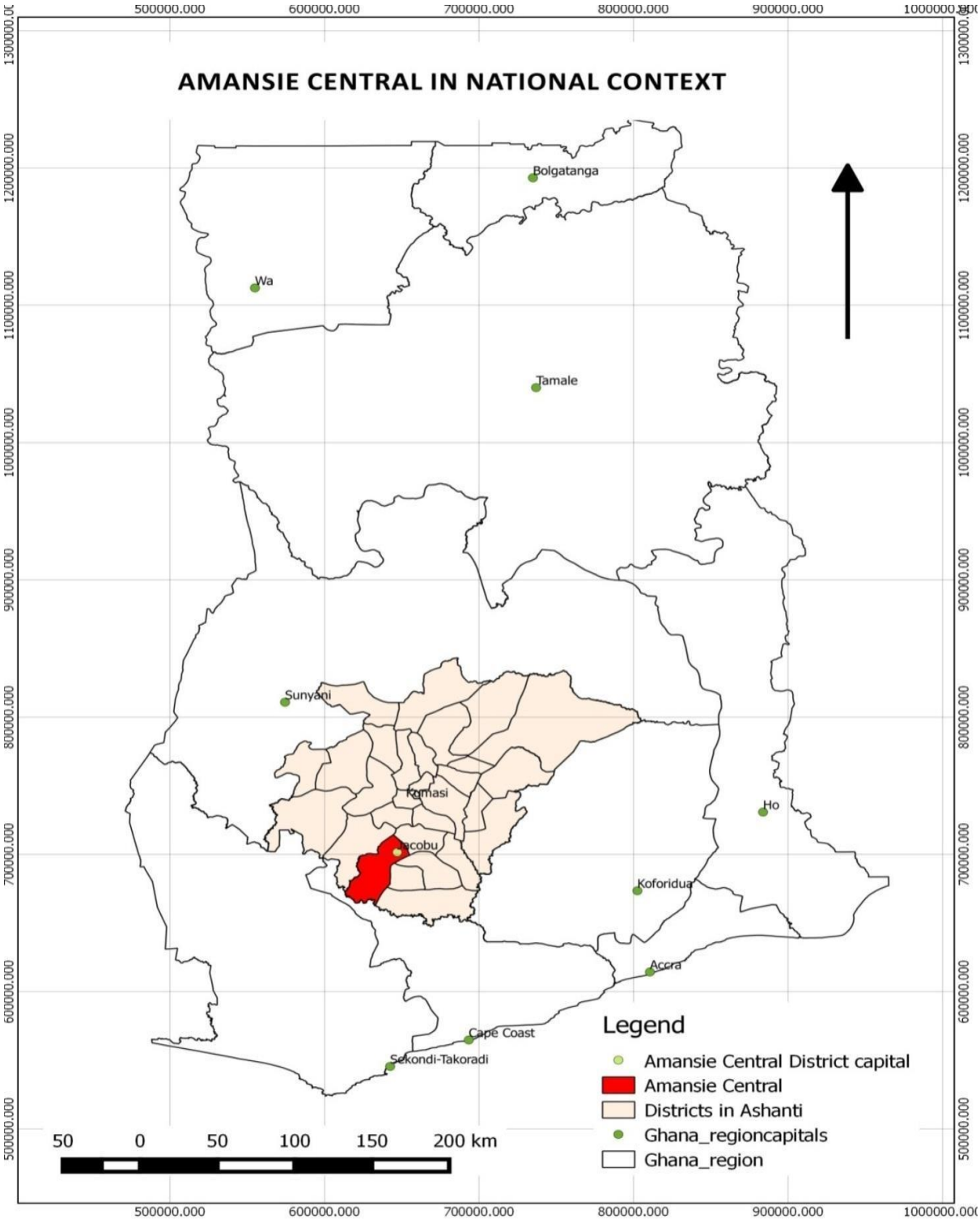


Figure 10:Location map of the Amansie Central District

Vegetation

The main vegetation in Amansie Central District is semi-deciduous forest. Some of the tree species found in this area areOdum, Wawa, Obeche, Edinam, Mahogany and Sapele. There are two main forest reserves

in the district and these are Oda and Subin. The vegetation has been seriously disturbed as a result of human activities such as poor farming systems, bush fires and indiscriminate lumbering. The result is that primary/virgin forest is found in pockets in few areas with secondary forest widespread.

Geology

The district is underlain by three geological formations. These are the Birimian, Tarkwaian and Granite rocks which are rich in mineral deposits. Gold is abundant in the district and mostly located at Apitisu, Amamom, Anyankyiremu, Adubrim, Fiankoma, Jacobu and Aketechieso. In addition, there are sand and gravel deposits at Patase, Afoako, Esreso, Asikasu, Nkoduasi and Amponya.

Relief and Drainage

There are three main rivers in the district, namely Oda, Offin and Fena. Additionally, there are a number of perennial and seasonal streams in the district. River Offin flows along the south eastern border and also forms the boundary between the Ashanti and Central Region. Human activities such as dredging in these rivers for gold and other such activities along most of these water bodies are reducing their size which affects farming activities. The district is located within the forest dissected plateau region with an average height between 150 metres and 300 metres above sea level. The relief of the district is generally undulating with few hilly areas. The elevation of the low-lying areas adjacent to the hills is between 240 and 300 metres above sea level and areas with this topography are Numereso, Apitisu, Tweapease and Abuakwaa.

The relief and drainage support farmers in irrigating their food crops during the dry seasons. The existence of several streams/water bodies in the district enhances irrigation and will therefore promote all year-round farming making food available in the district. The beautiful natural nature of the hills is a potential for development therefore there's the need for value addition to improve tourism and add to revenue, thus improving on the general development of the district. Furthermore, streams found in the district provide sources of water for domestic use.

Soils

The district has five main soils. These are Bekwai-Oda, Mim-Oda, AsikumaAtewa-Ansum/Oda, Kumasi-Asuansi/Nsuta-Offin and Birim-Awaham/ Chichiwere compound associations:

The Bekwai-Oda Compound Association: These soils are developed over lower Birrimian rocks which are moderately drained and are good for the cultivation of food crops such as maize, cassava, cocoyam, plantain and banana. Low-land and valley bottom soils are also recommended for vegetables and require nitrogen and phosphorous usage. These soils are found around Tweapease, Manfo, Odahu, Mile 14 and 9, Jacobu and Patase.

Mim-Oda Compound Association: These soils are developed over lower Birrimian rocks, which are well drained and are suitable for tree crops such as cocoa, coffee, oil palm, avocado pear and citrus. These soils are found in the southern part of the district around Subima, Mile 14, Apitisu and Fenaso.

Asikuma-Atewa-Ansum/Oda Compound Association: These soils are developed over upper Birrimian rocks. They are well drained and suitable for tree crops such as cocoa, coffee, oil palm, avocado pear, citrus and forestry. These soils are found around Suhyenso, Wrowroso and Aboo.

Kumasi-Adansi/Nsuta -Offin Compound Association: These are developed over Cape Coast granite rocks, which are well drained. They are suitable for the cultivation of tree crops such as cocoa, coffee, oil palm, and avocado pear, citrus as well as food crops such as maize, cassava, cocoyam and plantain. The lowland and valley bottom soils are suitable for rice, sugar cane and vegetables. These soils are found around Akrofrom, Begroase and Amponya.

Birim-Awaham/Chichiwere Compound Association: These soils are developed over alluvial deposits, which are very deep, loose and excessively drained. They are suitable for the cultivation of rice, sugar cane and vegetables. They are found around Kobro, Woromanso and Nkyesedaho.

Built Environment

The activities of the populace living within and outside the district do not only affect the natural environment but also manifest in the built environment, that is, the portion of the district where the populaces live. More importantly, it is an undeniable fact that, the natural environment is affected by the activities from the built environment and vice versa. The built environment highlights on the way of life of the people in terms of shelter, living conditions and practices that have direct bearing on the environment (i.e. both the built and the natural environment).

The predominant type of housing in the 206 communities within the district can be described as compound houses. However, there are few self-contained houses mostly in the big settlements. About 80% of the houses are built with mud. The housing environment in the district is characterized by poor drains. About 73.7% of houses have structural defects. The average household size of the district is 7.1 which is higher than the national average of 5.2 persons and room occupancy of 5.0 persons, the housing problem is both qualitative and quantitative. Most of the houses in the district lack facilities such as water, electricity, telephone and toilets.

The drainage system is generally poor in all communities in the district. The nature of drains in the district is mostly trenches which are found behind houses and u-shape drains of which most of them are choked and cracked. This has resulted in excessive erosion and exposed foundations of houses. The situation is more pronounced in areas like Jacobu, Tweapease, Fiankoma and Abuakwaa.

Natural and Man- made Disasters

The district experiences some forms of disaster which are caused by:

Bush burning: Bush fires are caused by farming, hunting as well as palm wine tapping. Bush fires destroy not only the forest, game and wildlife but also tracks of cocoa farms, food and cash crops.

Mining pollution: Mining activities affect the quality of air in the atmosphere, destroys the vegetation and habitat of wildlife, and also pollutes river bodies. Mining activities have created large numbers of uncovered pits at Adubirem, Anyankyirem, Amamon and Akatekyieso etc. Mining blasts have caused cracks and collapse of buildings at Adubirem, Anyamkyirem, Amamom, Akatakyieso, Krodua and Hemang. Similarly, heavy blasting and water pollution by mining have led to resettlement of communities such as Kronko, Badukrom and Attakrom. Stone quarrying and sand weaning have impoverished arable lands at Afoako, Nkoduase and Esereso.

Rain storms: The high elevation in most parts of the district and deforestation in such places often lead to destruction of buildings during rainstorms. Such rainstorms usually rip off roofs leading to the collapse of buildings. Presently, there are over 40 households that have been displaced by rainstorms at Fenaso No. 3, Akrofrom, Amponya and Hia. There are also some communities such as Atabrakoso and Huu that experience occasional flooding.

Socio-Economic

Governance Structure

The local government system currently has a three (3) tier structure at the district level, which constitutes the District Assembly, the Town/Area Councils and Unit Committees. The Assembly is made up of the District Chief Executive, Assembly Members of whom 16 or two-thirds are elected by universal adult suffrage and 7 or one-third are appointed by the President in consultation with chiefs and interest groups in the district. The only Member of Parliament in the area is an Ex-officio member. The Assembly is chaired by the Presiding Member, who is elected from among the members of the Assembly.

The Assembly performs its functions through the Executive Committee and a network of sub-committees. As the Executive committee exercises executive and co-ordinating functions, the sub-committees collate and deliberate on issues pertaining to their functional areas

Demography

According to the 2021 Population Housing Census, the population of the district was 93,052 which is an increase of 2.55% from the previous census population of 90,741. The district's share of the total population of the Ashanti Region is 1.7 percent. The fertility rate of the district is 4.7 whiles the crude death rate is 9.4 death per 1000 population. Males form 52.0 percent (48,393) of the total population as against 48.0 percent (44,659) for females.

The district has majority of the settlements being rural with 81,022 (87.1%) with the remaining 12,030 (12.9%). The population density for the district is 109.1 persons per square km., with a land area of 853 square km. the district has an average household size of 3.1 persons per household which is higher than the regional average of 3.3, there are 29,351 different households including 92,241 (99.1%) involved in the households with just 811 (0.9%) people not part of households.

In terms of religion, Christianity dominates; constituting 78.4% of the population followed by 15% of people without religious affiliation, Islam is 4.2% of the population whilst Traditional Religion takes 2.0% of the population and others is 1.0%

Education

The district has 104 Pre-schools, 102 Primary schools, 45 Junior High Schools, 2 Senior High Schools and 1Vocational/Technical School. Accessibility to the Senior High School is very limited due to the limitation to some boarding facilities in the school

Health

The district has only one hospital located at the district capital, Jacobu and 6 clinics located at Tweapease, Mile 14, Numereso, Abuakwaa, Fenaso No.1 and Hia No.1. 14 trained Traditional Birth Attendants (TBAs)

and 5 CHPS compounds which complement the services of the Hospital. The key personnel in the District's Health Delivery System include Seven (7) Medical Officer comprises of four (4) Specialist and three (3) Physician Assistants, one (1) Pharmacist, fifty (50) General Nurses, ninety-six (96) Enrolled Nurses, thirty-five (35) Midwife and eighty-one (81) Community Health Nurse.

The doctor-population ratio of 1:14,065 and nurse-population ratio of 1:674 put too much burden on Doctors and Nurses. The high ratios coupled with inadequate logistical support have negative impacts on the health delivery system in the district. The situation is very alarming and therefore the District Health Directorate and the District Assembly is putting in measures to increase the number of doctors and nurses and other vital health personnel as well as increase infrastructure, equipment and other medical supplies.

Sanitation

Access to a clean environment is a pre-requisite for quality life. Unfortunately, the sanitation situation in the district is deplorable. Refuse disposal is indiscriminately done through the open dumping system. In addition to this the drainage system is very poor. These have resulted in excessive erosion leading to erosive settlements. However, sanitation situation in the smaller communities is relatively better due to their small population sizes. On the other hand, relatively larger communities like Jacobu, Tweapease and Fiankoma have peculiar problems due to rapid increase in their population and small number of facilities available. Lack of motor bikes to monitor environmental situation in the district has led to poor supervision and monitoring of the situation in the district. The poor environmental situation arising from improper waste disposal has therefore led to the prevalence of diseases like diarrhoea, cholera and malaria.

Type of Toilet Facility	No. of facility	Total No. of seaters	User per seater	No. Population served	Percentage (%)
Aqua Privy (12seater)	37	444	50	22200	92
WC(8 seater)	1	8	50	400	2
WC(10 seater)	2	20	50	1000	4
Vault chamber (8 seater)	1	8	50	400	2
TOTAL	**742**	**480**		**24,000**	**100**

Toilet Facilities in the District *Source: DWST, Jacobu 2017*

Water Supply

Small town water system, borehole, hand dug wells and rivers/streams constitute the main sources of water for both industrial and domestic purposes in the district. Among these sources, the small-town water system at Jacobu and bore holes scatted at length and breadths are considered as the sources deemed most potable.

About 89% of the communities have access to safe drinking water. This comprises 1 small town water supply system at Jacobu, 257 boreholes and56 hand-dug wells district wide. Jacobu is the only community in the district that has access to small town water system. There are 257 boreholes in 122 communities

and 56 hand-dug wells in 42 communities. A sizable number of thecommunities have more than one borehole. Apart from the 89% of the communities that have access to potable water, a significant proportion of the households continue to draw water from rivers and streams due to inadequacy and unreliability of facilities.

Type Of Source	Facilities	No. Of Outlet	Communities		
	No. Of facilities		No. Of people served	Total No. Of people that have access to Water	%
Small town water system	1	23	100	2,300	2.5%
Borehole	257	257	300	77,100	88%
Hand dug well	56	56	150	8,400	9.5%
Total	**314**	**336**	**550**	**87,800**	**100**

Source: DWST, Jacobu 2017

Economic Activities

The district has an economically active population of 76.6% and an economically inactive population of 23.4%. Out of the economically active population, those who are employed constitute about 95.9% of the population. Out of those who are employed about 80% are engaged in agriculture, 0.5% in industry and 19.5% in the service sector.

The Local economy is dominated by the agriculture sector. It employs about 78% of the Labour force in the district. However, due to relatively small farm sizes and low yields, poverty level among the farmers is very high. Farmers in the District are predominantly peasant, cultivating food crops and few cash crops. The food crops include cassava, plantain, cocoyam, yam, rice and maize. The cash crops are cocoa, oil palm and citrus. A major problem of Agriculture in the district is poor storage facilities and poor road conditions resulting in high post-harvest losses.

Transportation

Transport serves as a vital utility which has direct impact on the socio economic and the political aspects of the people. Most parts of the district lack tarred roads. The road densities are low, meaning and that roads are not connecting many communities. This sparseness of the roads contributes to poor supply of food and other farm produce such as cocoa, cassava, and timber from production centres resulting in high post-harvest losses. Accessibility to services could therefore be described as poor.

Culture

The Amansie District is made up of people with a homogeneous culture. Majority of the people are Akans with Ashanti origin and they hold strong beliefs in Ashanti tradition and customs. The people have diverse cultures which accounts for their values and practices. They have strong beliefs in certain taboos, for

instance, in “Ampomanka” stream the mud fish from it is not eaten else a bad omen will befall the person. Farming activities are forbidden on certain days; such days are called “Dabone” (bad days).

Traditionally, the communities are ruled by local chiefs (Adikrofoɔ) supported by their elders including family heads. Queen Mothers also play a major role in decision making in the community, in fact they are the king makers. The Highest Traditional Authority in the District is the Bekwai Traditional Council headed by the “Omanhene” of Bekwai. All the chiefs owe allegiance to the Paramount Chief of Bekwai. The traditional authorities collaborate with the unit committees to make decisions for the development of the various communities. Both parties jointly help in the implementation of projects through organization of communal labour and other support. The chiefs serve as the custodian of the stool lands within the communities and also ensure peace and order.

Akrofuom District

The Akrofuom District Assembly, with Capital at Akrofuom was created by a Legislative Instrument (LI 2329) through an Act of parliament (Act 936, 2016) and was inaugurated on 15th March, 2018, (Akrofuom District, MTDP).

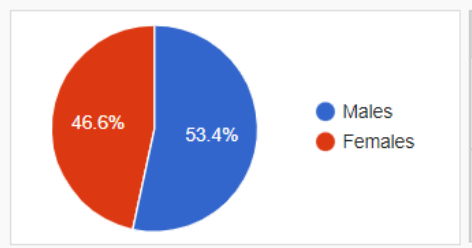
The Assembly consists of the General Assembly of 2/3 (11) elected and 1/3 (5) appointed members. The District has Two Area Councils namely: Akrofuom Area Council and Ampunyase Area Council. It has one constituency with one Member of Parliament and one District Chief Executive at the administrational capital of Akrofuom.

Population and Location of the District

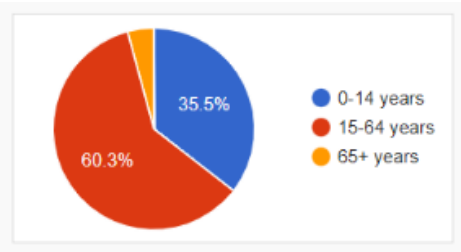
The population of the District according to 2021 population and housing census stands at 49,291 with 26,315 males with 22,976 females.

About 2.9% of the population is estimated to have some form of physical disability.

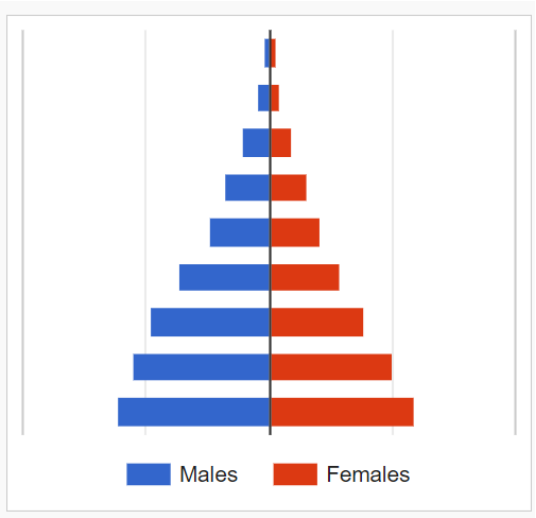
Gender	Population	Percentage(%)
Males	26,315.00	53.4%
Females	22,976.00	46.6%
Total	49,291.00	100%



Age Groups (2021)	Population	Percentage (%)
0-14 years	17,491	60.3%
15-64 years	29,718	35.5%
65+ years	2,082	4.2%



Age Distribution (2021)	Population	Male	Female
0-9 years	12,104	6,178	5,926
10-19 years	10,620	5,595	5,025
20-29 years	8,734	4,855	3,879
30-39 years	6,586	3,683	2,903
40-49 years	4,535	2,447	2,088
50-59 years	3,355	1,800	1,555
60-69 years	2,031	1,087	944
70-79 years	845	449	396
80+ years	481	221	260



The District lies within Latitude 40" North and 6 degrees 22" North and Longitude 1 degree West and 1 degree 38" West. It shares boundaries with Obuasi East to the North, Adansi Asokwa to the North East, Adansi South to the South, Amansie Central to the North West and Upper Denkyira East Municipality to the South West of the District. The District has a total land area of 899sq.km. About 24% (334.5sq km) of this total land area is made up of forest reserves.

Agriculture

The Akrofuom District is mainly rural and major economic activities in the District are primarily agriculture. Farming is the main stay of the people and major cash crops under production are cocoa and oil palm. Food crops generally produced on subsistence base are maize, cassava and plantain. There are also few individuals who engage in aquaculture.

Manufacturing is virtually non-existent except for some few individuals who engage in gari processing and palm oil production.

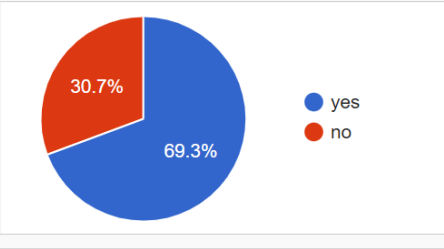
Health

The level of service delivery in the District is very low apparently due to the rural nature of the area. There is no Hospital in the District, there are Two (2) Health Centres (Akrofuom and Ampunyase) and four (4) CHP Compounds in the District. Currently, there is no doctor in the District.

Education

Access to education in the District is high. There are 35 Public KGs with 3,160 pupils. Females (1,612) are slightly higher than males (1,578). Thirty 35 public Primary schools in the District with total enrolment of 6,439, females (3,092) and males (3,347). On the part of JHS access is equally high. There are 23 public JHS in the District. Out of 2,525 students in the JHS level, 1,341 are males whereas 1,183 are females. There is only one (1) SHS in the District.

Literacy (2021)	
yes	24,930
no	11,036



Security

The District is fairly peaceful with three (3) Police Stations and only twelve (12) police personnel who ensure the safety of the people, property and law and order. There is no District Court that administers justice in the district. The District thus relies on the adjourning Districts of Obuasi West for judiciary services.

Transportation

Road transportation is the dominant network in the district. It is mainly feeder road with only about 35 kilometers of tarred roads unevenly spread across the district. The rest are in a very bad state. However, they play an important role by facilitating the transportation of agriculture produce and people to and from the communities.

Financial institutions

There is only one Banking institutions in the District which also serves as the Headquarters to three branches at Kumasi, Tutuka, Obuasi and New Edubiase. Mobile money operators are dominant in the district and few individuals also embark on 'Susu' collection but this is done mainly on non-formal basis.

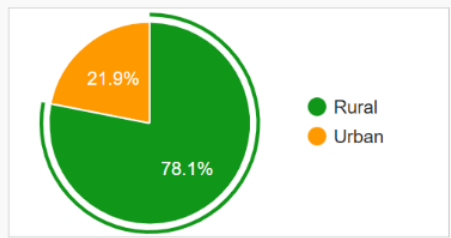
Water and Sanitation

A greater proportion (50.8%) of the household use Borehole/Pump/Tube well as their main source of drinking water. Furthermore, households also derive their drinking water from River/Stream (16.0%) and protected well (15.3%). These followed Bore-hole/Pump/Tube well in highest order. Only few of

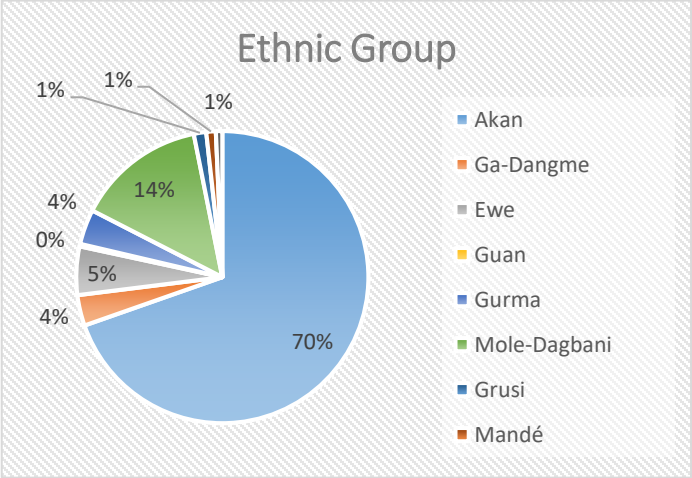
the households have access to pipe-borne water inside dwelling units (0.8%) and outside dwelling units (4.2%).

A number of households (about 31.6%) does not have access to any toilet facility and therefore resort to the use of bush, field. A Larger proportion of household (about 56.2%), in the rural localities use pit latrines. Only few (about 12%) uses decent WC or VIP toilets. Crude dumping of refuse is a common practice in the district

Urbanization (2021)	
Rural	38,492
Urban	10,799



Ethnic Group (2021)	
Akan	33,977
Ga-Dangme	1,658
Ewe	2,616
Guan	133
Gurma	1,893
Mole-Dagbani	6,988
Grusi	671
Mandé	514
Other Ethnic Group	347



5.4 Description of the Affected Project Communities

The four (4) mined out pilot project areas in the Bekwai Forest District are located close to the Kobro, Abuakwaa, Adamso, and Kubi communities. These forest reserves are shown in the **Figure 11**. The socio-economic profile of the affected communities based on engagement with some community members are summarised in **Table 14.**

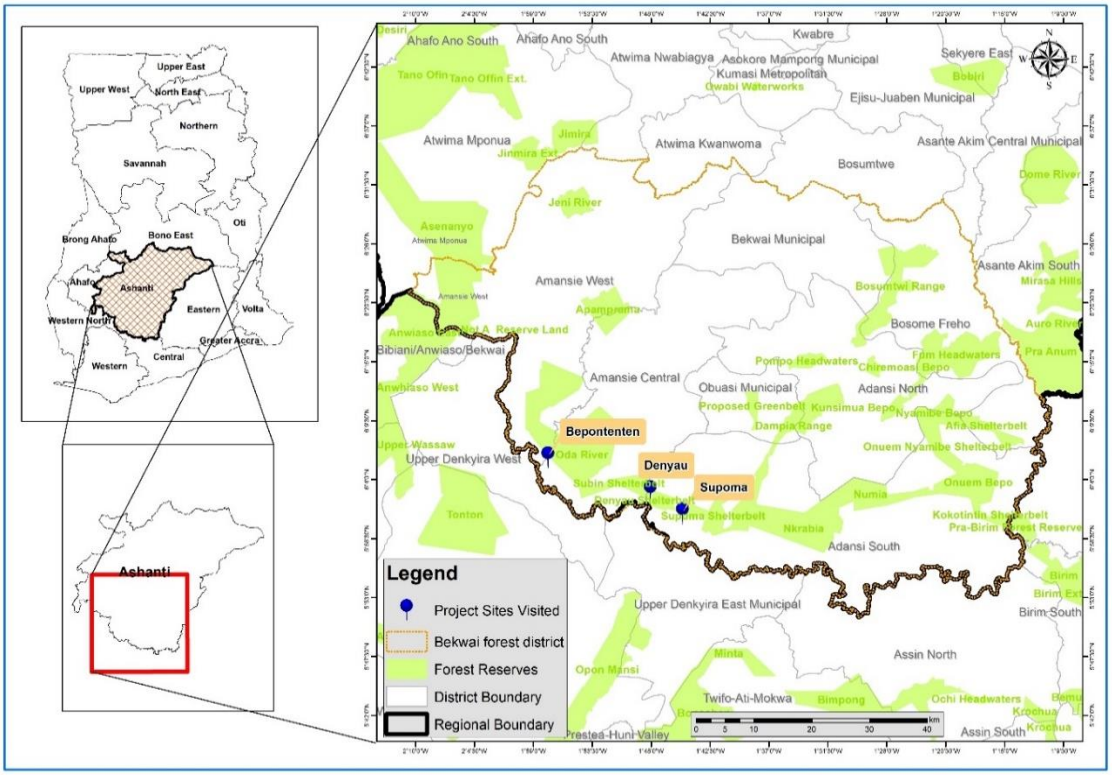


Figure 11: Location of Project Forest Reserves in the Bekwai Forest District

Table 14: Socio economic profile obtained from surveys and stakeholder meetings

Community name	Contact Person(s)	Position/ Role	Contact No.	Concerns Raised/ Information Received
Abuakwaa, Bekwai Forest district	Nana Adu Aning	Chief of Abuakwaa	0243314650	• **Household size –** There are usually 8- 10 members in a household. • **Land Ownership –** The community land is mainly stool land (60%) with only the forest reserves belonging to the government (40%). • **Land use –** The land is mainly used for farming (cocoa). • **Land right and access –** The land is accessed through the chief. • **Land-related conflict –** Community has not experienced any land-related conflicts. • **Livelihood activities –** The main livelihood activity is farming, from which all income is obtained. Women are involved in petty trading • **Livelihood challenges/social problems –** Some social problems resulting from the activities of galamsey in the community includes: teenage pregnancy, changes in the pattern of rainfall, lack of interest in education among the youth. Moreover, road networks in the community are also bad. • **Household members involved in illegal mining –** Few household members are engaged in illegal mining (galamsey) • **Unemployment –** About 30% of people in the community are unemployed; this include: the youth, graduates, as well as both men and women. The lack of lands for farming is the main reason for unemployment in the community. • **Ethnic groups –** The people in the community are predominantly Ashantis and some Dagombas. • **Migrant population –** There are no migrants in the community. • **Vulnerable groups –** There are vulnerable groups like the disabled in the community. • **Religion –** The community's major religions are Christianity (94%), Islam (5%), and Traditional (1%). • **Support for the less privileged –** There is no support for the less privileged in the community. People in need of social support in the community include: single mothers, the disabled, and low-income earners. • **Key decision-makers –** The key decision-makers in the community are the chief and elders, unit committee, the assembly man and the MCE. The community is represented in government by the assembly man and MCE, of which the community is satisfied with their representation. • **Local groups –** There are no local groups present in the community. • **Existing traditional/Cultural groups –** There are no traditional or cultural groups in the community.
	Emmanuel	Farmer	0591912733	
	Kwadwo Boakye	Farmer	0553211293	
	Abukari Muarmar	Farmer	0249512217	
	Thomas Dickson Owusu	Farmer	-	
	Stephen Anohene Dapaa	Farmer	-	
	Elvis Robert Twumasi	Assembly man	-	
	Hon. Francis Berko	Farmer	0559530292	
	Kwasi Soko	Farmer	0599294021	

Community name	Contact Person(s)	Position/ Role	Contact No.	Concerns Raised/ Information Received
				• **Cultural and sacred events/sites–** There are no cultural or sacred sites in the community. • **Natural/ human disasters –** The community has not experienced any natural disaster. Loss of lives from mining activities (galamsey). • **Health care –** The community has a clinic/CHPS compound which may not be sufficient for the entire community. Moreover, malaria is on the rise due to open pits created by mining activities serving as breeding grounds for mosquitoes. • **Education –** The highest level of education in the household is secondary education. • **Water and sanitation –** The community has a borehole and a standpipe. There is a toilet facility present in the household. • **Utility services –** Electricity is available in the household. • **Quality of life –** The quality of life is moderate and community members enjoy a peaceful existence with one another. The provision of a hospital and good roads will help to improve the quality of life in the community. • **Community needs/priorities –** The needs of the community include: creation of job avenues for the community.
Kobro, Bekwai Forest district (Amansie Central)	Osei Agyemang Christian Esther Owusu Boadu Kwame Adansie Noah Mensah	Galamsey committee member Household head Farmer Farmer	0554406231 0553698845 0596724434 -	• **Household size –** There may be up to 15 members in a household. • **Land Ownership –** The community land is made up of stool land (45%), and government land (55%). • **Land use –** The land is mainly used for farming (cocoa). • **Land right and access –** The land is accessed through the chief, individual landowners, and the unit committee. • **Land-related conflict –** Community has experienced land-related conflicts, which was a land ownership issue. The conflict was resolved through the chief. However, these conflicts are rare. • **Livelihood activities –** The main livelihood activities in the household is farming, and galamsey from which all income is obtained. • **Livelihood challenges/social problems –** Livelihood challenges include: lack of employment opportunities in the community. • **Household members involved in illegal mining –** Some community members are engaged directly and indirectly in galamsey through petty trading at galamsey sites. • **Unemployment –** About 65% of people in the community are unemployed; this include: the youth, graduates, as well as both men and women. Lack of jobs is the main reason identified as the reason for the unemployment condition in the community. • **Ethnic groups –** The people in the community are predominantly Ashantis and Dagombas.

Community name	Contact Person(s)	Position/ Role	Contact No.	Concerns Raised/ Information Received
				• **Migrant population –** There are migrants in the community from the Volta and Northern region. • **Vulnerable groups –** There are vulnerable groups like the disabled in the community. • **Religion –** The community's major religions are Christianity (70%), Islam (20%), and Traditional (10%). • **Support for the less privileged –** There is no support for the less privileged in the community. People in need of social support in the community include: single mothers, the disabled, and the aged. • **Key decision-makers –** The key decision-makers in the community are the chief and elders, unit committee, the assembly man and the MCE. The community is represented in government by the assembly man and MCE, of which the community is satisfied with their representation. • **Local groups –** There are no local groups present in the community. • **Existing traditional/Cultural groups –** There are no traditional or cultural groups in the community. • **Cultural and sacred events/sites–** There are no cultural/sacred sites in the community. • **Natural disasters –** Heavy wind removing several roofs from houses. • **Health care –** The community has no health facility. • **Education –** The highest level of education in the household is Secondary education. • **Water and sanitation –** The community has a borehole for its water provision. There is a toilet facility present in the household. • **Utility services –** Electricity is available in most households. • **Quality of life –** The quality of life is moderate and community members enjoy a peaceful existence with one another. The provision of a hospital, and employment opportunities will help to improve the quality of life in the community. The community dreads the loss of the forest. • **Community needs/priorities –** Community needs/ priorities include: provision of a hospital, and employment opportunities.
Kubi, Bekwai Forest district	Abraham Sam Nana Antwiwaa Maame Ama	Unit Committee member Queen mother Household head		• **Household size –** There are up to 15 members in a household. • **Land Ownership –** The community land is made up of stool land (60%), and government land (40%). • **Land use –** The land is mainly used for farming, mining, and for building infrastructure. • **Land right and access –** The land is accessed through the chief, and individual landowners. • **Land-related conflict –** Community has not experienced any land-related conflicts.

Community name	Contact Person(s)	Position/ Role	Contact No.	Concerns Raised/ Information Received
(Amansie Central)				• **Livelihood activities –** The main livelihood activity in the household is farming, from which all income is obtained. • **Livelihood challenges/social problems –** The following livelihood challenges exist in the community: change in rainfall pattern, lack of health facilities, and a lack of job opportunities**.** One challenge which needs immediate solution is the open pits created by the activities of galamsey, as this has led to increase in malaria cases. • **Household members involved in illegal mining –** One household member is engaged directly in illegal mining (galamsey) • **Unemployment –** About 45% of people in the community are unemployed; this include: the youth, graduates, as well as both men and women. Lack of capital, and lack of job opportunities are the main reasons for the unemployment condition in the community. • **Ethnic groups –** The people in the community are predominantly Ashantis, Adansi, Dagombas and Fante. • **Migrant population –** There are no migrants in the community. • **Vulnerable groups –** There are vulnerable groups like the disabled in the community. • **Religion –** The community's major religions are Christianity (85%), Islam (10%), and Traditional (5%). • **Support for the less privileged –** There is no support for the less privileged in the community. People in need of social support in the community include: single mothers, the disabled, and the aged. • **Key decision-makers –** The key decision-makers in the community are the chief and elders, unit committee, the assembly man and the MCE. The community is represented in government by the assembly man and MCE, of which the community is satisfied with their representation. • **Local groups –** There are no local groups present in the community. • **Existing traditional/Cultural groups –** There are no traditional or cultural groups in the community. • **Cultural and sacred events/sites–** The 'Kubi' totem is a sacred site in the community. • **Natural and man- made disasters –** Drought due to destruction of forest, and people falling in pits left uncovered by galamsey activities. • **Health care –** The community has no health facility. The nearest hospital is located in Dunkwa. • **Education –** The highest level of education in the household is secondary education. • **Water and sanitation –** The community has a standpipe for its water provision. There is no toilet facility present in the household. • **Utility services –** Electricity is not available in the household. The community has a bad telecommunication network.

Community name	Contact Person(s)	Position/ Role	Contact No.	Concerns Raised/ Information Received
				• **Quality of life –** The quality of life is moderate and community members enjoy a peaceful existence with one another. The provision of a hospital, and employment opportunities will help to improve the quality of life in the community. The community dreads the loss of the forest, which may lead to famine in the future. • **Community needs/priorities –** Community needs/ priorities include: reclamation of destroyed farmlands, leasing of some reclaimed forests to community for farming, and the provision of a health facility.
Adamso, Bekwai Forest district (Amansie Central)	Clinton Amagavie George Amoaten Kwadwo Manu	Farmer Chainsaw operatr and farmer Farmer	0243916398	• **Household size –** There are up to 10 members in the household. • **Land Ownership –** The community land is made up of stool land (70%), and government land (30%). • **Land use –** The land is mainly used for farming, and mining. • **Land right and access –** The land is accessed through the chief, and individual landowners. • **Land-related conflict –** Community has experienced land-related conflicts, which was resolved through the chief. Conflicts are not frequent. • **Livelihood activities –** The main livelihood activity in the household is farming, from which all income is obtained. • **Livelihood challenges/social problems –** The following livelihood/social challenges exist in the community: destruction of water bodies, increase in school drop-out rate among the youth, teenage pregnancy, increase in water-borne diseases such as bilharzia, and increase in malaria cases due to uncovered pits from mining activities. • **Household members involved in illegal mining –** One household member of school-going age is engaged directly in illegal mining (galamsey) • **Unemployment –** About 90% of people in the community are unemployed; this include: the youth, graduates, as well as both men and women. Lack of technical expertise, low literacy level, and lack of job opportunities are the main reasons for the unemployment condition in the community. • **Ethnic groups –** The people in the community are predominantly Ashantis. • **Migrant population –** There are migrants in the community from Togo and the Northern region. • **Vulnerable groups –** There are vulnerable groups like the disabled in the community. • **Religion –** The community's major religions are Christianity (90%), and Islam (10%). • **Support for the less privileged –** There is no support for the less privileged in the community. People in need of social support in the community include: single mothers, the disabled, and the aged.

Community name	Contact Person(s)	Position/ Role	Contact No.	Concerns Raised/ Information Received
				• **Key decision-makers –** The key decision-makers in the community are the chief and elders, unit committee, the assembly man and the MCE. The community is represented in government by the assembly man and MCE, of which the community is satisfied with their representation. • **Local groups –** There are no local groups present in the community. • **Existing traditional/Cultural groups –** The 'Gwantere' group exists to pass laws to prevent farming during festivals. • **Cultural and sacred events/sites–** There are no cultural sites in the community. • **Natural and man- made disasters –** People falling in pits left uncovered by galamsey activities. • **Health care –** The community has no health facility. The nearest hospital is located in Twapease. • **Education –** The highest level of education in the household is secondary education. • **Water and sanitation –** The community has a standpipe, and a stream as its water sources. There is no toilet facility present in the household. • **Utility services –** Electricity is available in the household. The community has a bad telecommunication network. • **Quality of life –** The quality of life is moderate and community members enjoy a peaceful existence with one another. The provision of adequate potable water, and employment opportunities will help to improve the quality of life in the community. The community dreads the loss of life as a result of galamsey. • **Community needs/priorities –** Community needs/ priorities include: provision of a clinic, reclamation of destroyed farmlands, and the provision of adequate potable water.

6.0 PUBLIC PARTICIPATION/STAKEHOLDER CONSULTATIONS

Stakeholder participation during project planning, design and implementation is widely recognized as an integral part of environmental and social impact assessment process. Local communities, their representatives, government, and nongovernmental organisations (NGOs) may all be able to contribute to and benefit from dialogue directed at identifying and resolving key project-related issues. It is a two-way flow of information and dialogue between project proponents and stakeholders, which is specifically aimed at developing ideas that can help shape project design, resolve conflicts at an early stage, and assist in implementing solutions and monitor ongoing activities.

Stakeholder consultation is a process and would continue through project implementation to provide information to identified stakeholders.

6.1 Objectives of Stakeholder Engagement

The main objective of the consultations with stakeholders is to discuss the proposed project environmental and social implications and to identify alternatives for consideration. Specifically, the stakeholder engagement seeks to achieve the following objectives:

- Identify and categorize the stakeholders of the Project based on their level of interest and influence, and extent to which they are impacted by the project;
- To provide information about the proposed reclamation project to stakeholders;
- To educate stakeholders on the need for the proposed project;
- To provide opportunities for stakeholders to discuss their opinions and concerns;
- To enhance the project designs and implementation by learning from, and incorporating the expertise of individuals, professionals, communities and organisations
- To provide and discuss with stakeholders the alternatives considered to reduce anticipated impacts and risks;
- To manage expectations and misconceptions regarding the project;
- To discuss the significance of environmental, social and health impacts and risks identified;
- To inform the process of developing appropriate mitigation, monitoring and management measures; and
- To facilitate and maintain dialogue with key stakeholders throughout the project implementation phase.

6.2 Guiding Principles of the Stakeholder Engagement Plan

The stakeholder engagement plan for the Project is in accordance with the requirements of the World Bank's basic principles of good practice in stakeholder consultation which states that a good consultation process should be:

- Targeted at those most likely to be affected by the project;
- Early enough to scope key issues and have an effect on the project decisions to which they relate;
- Informed as a result of relevant information being disseminated in advance;

- Meaningful to those consulted because the content is presented in a readily understandable format and the techniques used are culturally appropriate;
- Two-way so that both sides have the opportunity to exchange views and information, to listen, and to have their issues addressed;
- Gender-inclusive through awareness that men and women often have differing views and needs;
- Localized to reflect appropriate timeframes, context, and local languages;
- Free from manipulation or coercion;
- Documented to keep track of who has been consulted and the key issues raised;
- Reported back in a timely way to those consulted, with clarification of next steps; and
- Ongoing as required during the life of the project.

6.3 Regulatory and other Requirements for Stakeholder Consultation

Some relevant provisions are summarized as follows:

- *Ghana Environmental Assessment Regulation LI 1652 (1999***)** requires effective public consultation and participation as an integral component of Environmental Impact Assessment (EIA) procedures. Project proponents are required by law to effectively and continuously engage potential project affected persons and communities and other stakeholders to ensure issues of concern to them are addressed in project design and implementation. This helps in obtaining local knowledge, addresses public views, concerns and values that can influence the project design, which in turn increases public confidence and minimize conflicts. Public participation is core in achieving an efficient and effective EIA practice and implementation.

6.4 Stakeholder Identification

The stakeholder identification process for the project is based on an appreciation of the interest and influence of various organizations/institutions/ communities/persons in relation to the project. The main approach included reference to project documents and interactions with various groups/ persons categorized as follows (**Table 15**):

Regulatory agencies / institutions: These are government agencies responsible for exercising autonomous authority in a regulatory or supervisory capacity. They are set up to enforce safety and standards, and/or to protect the public. They provide efficient processes to implement good regulatory practice and tools to monitor the actual implementation of projects. e.g. Permitting by EPA, Forestry Commission, Water Resource Commission etc

Administrative and local government authorities within the project area (District assembly): These are public officials, bodies, commissions or institutions which are concerned with the Implementation of government policies; and/or b) Enforcement of duly enacted laws eg local assemblies.

Key Sector Agencies /Government institutions which may be involved or have direct interest: These are key governmental agencies that develop policies for implementation for the various national sectors eg. Forestry Commission, Minerals Commission.

Traditional authorities and local communities' / mining communities: These are traditional leaders with influence on the project lands as well as host communities and surrounding communities within the project catchment.

These groups were consulted to provide information on the project from the planning phase to provide an opportunity for concerns to be raised and addressed. Early engagements assist in establishing strong relationships between the proponent and the community and continues throughout the implementation and operational stages of projects for sustainability of the project.

Project Affected Persons: These are individuals who are likely to be affected due to project activities. This could be through loss of part or all of their assets whether temporarily or permanently including land, houses, other structures, businesses, crops/trees, or other types of assets.

Degree of Impact on stakeholder

***Low*:** Based on an interaction with the stakeholder as well as a review of institutional mandates, the project is assessed to have low positive or negative impact on the stakeholder/ institution. For stakeholder institutions, positive impacts may include the institutional knowledge and experience to be gained from the implementation of the project and negative impacts may include possible losses and damage (e.g. financial, reputation) from the failure of the project.

Medium: The project will have measurable positive or negative impacts on the stakeholder/institution.

High: The project will have significant positive or negative impacts on the stakeholder/institution.

Degree of stakeholder influence on project outcome

Low: The stakeholder has minimal capability to positively or negatively influence the outcome of the project.

Medium: The stakeholder has measurable capability to positively or negatively influence the outcome of the project.

High: The stakeholder has significant capability to positively or negatively influence the outcome of the project.

The stakeholders identified for the project are listed below and in the Table**,** which additionally provides for their roles and level of influence/impact.

The stakeholders identified for consultations are as follows:

Project Proponent/Beneficiary

- Ministry of Lands and Natural Resources
- Project Coordinating Unit

Regulatory Institution

- Environmental Protection Agency
- Forestry Commission
- Water Resources Commission
- Minerals Commission

Other Government Institutions

- Regional Coordinating Council
- Amansie central and Akrofuom District Assemblies

Other stakeholders

- Unit Committee
- Chiefs and elders of Kubi/ Attakwame, Kobro and Adamso communities
- Women heads
- Assembly men
- Galamsey workers
- Farmers

Table 15:Stakeholder identification and analysis

No.	Groups of stakeholders	Stakeholder(s)	Role of Stakeholder/ Relation to the Project	Degree of project impact on stakeholder	Level of influence on project outcome
1.	Project Proponent	Ministry of Lands and Natural Resources/ PCU	• Accountable entity responsible for successful implementation of the project including design, construction and operation of the project.	High	High
2.	Regulatory Agencies	Environmental Protection Agency (EPA)	• EPA is responsible for regulating the environment. The Agency will issue a permit for the construction and operation of the facility and will monitor the project to ensure compliance to the permit conditions and adherence to the Environmental Assessment Regulations, 1999.	Low	High
		Forestry Commission	• Agency responsible for management of the nation's forest resources • Will provide support in the identification of project areas and confirmation of forest regeneration methods consistent with national requirements	High	High
		Minerals Commission	• Mandated to ensure responsible mining and for best returns for the country • Confirmation of mined out areas and advise on community engagements and statutory requirements	High	High
		Water Resource Commission	• Responsible for the regulation, management and utilisation of surface water resources. • To provide guidance for use and collaborate with the proponent in the protection and conservation of water resources, both surface and ground.	High	High
3	Key Sector Agencies/Relevant Government Institutions	Lands Commission /Office of the Administrator of Stool Lands Accra	Advise on land ownership matters Since work will be in already gazetted forest reserves, contention on land ownership is not expected.	High	High

No.	Groups of stakeholders	Stakeholder(s)	Role of Stakeholder/ Relation to the Project	Degree of project impact on stakeholder	Level of influence on project outcome
			Registration of lease for project lands- The Project land, is a stool land and the management of such stool acquired lands is under the jurisdiction of the Stool Lands Management Division of the Lands Commission. The project proponent (Southern Utilities), upon acquisition of the land from the traditional authorities, will register the lease for the land for the project. The OASL executes its mandates as the Stool Land Rent Collector- Southern Utilities will actively engage the Office in signing of the rent payment agreement between OASL-Accra and Sothern Utilities in respect of the proposed project		
	Project affected persons (PAPs)	Subsistence farmers/ Galamsey workers	Farmlands encroaching forest reserves Illegal miners in the forest reserves	High	High
6	Administrative/Local Government Authorities	Bekwai Forest District	• The project sites are within the Apramprama, Denyau and Supuma Forest Reserves. • The Bekwai Forest District is responsible for the management of both forest reserves.	High	High
		Amansie Central and Akrofuom District Assemblies.	• The Bekwai Forest District encompasses about five (5) political/ administrative districts. However, the project sites are all located in the Akrofuom and Amansie Central Districts. • The Assembly is responsible for the planning and development of the district and oversees all such activities within the district. It works closely with communities through Assembly persons.	Medium	Low

No.	Groups of stakeholders	Stakeholder(s)	Role of Stakeholder/ Relation to the Project	Degree of project impact on stakeholder	Level of influence on project outcome
7	Traditional Authority and local communities and artisanal mining community	Traditional Authorities with Kubi/ Attakwame, Kobro and Adamso communities	• The Traditional Councils are the original traditional land owners and have traditional/ cultural oversight of local communities. • Traditional Council facilitates development and resolution of conflicts/ disputes among community members.	Medium	High

6.5 Stakeholder Engagement and Communication Strategy

The Stakeholder process begins at the preliminary stages and would continue through to its implementation. **Table 16** summarizes the proposed approach for stakeholder engagement.

Table 16: Stakeholder Engagement and Communication Strategy

No.	Activity	Identified Stakeholders	Focus of Consultation/ Information to be shared	Timelines/ Frequency	Forms of communication/ method of engagement	Facilitator/ Responsibility
1.	Consultations for the preparation of EIA/ Project design	• Water Resource Commission • Environmental Protection Agency(EPA) • Project affected persons • Akrofuom and Amansie Central District Assemblies • Nearby Local Communities • Mining Communities	• Potential environmental and social issues of concern from the proposed project's implementation • Compliance with World Bank, Water Resource Commission and EPA requirements for Project • Strategies for mitigating the potential impacts and successful maintenance of the reclaimed sites • Public and occupational health and safety at construction stage	Throughout the project design and ESIA study period	• Formal consultative meetings • One on one Interviews • Field visitation • Sharing and review of relevant reports • Email and phone calls	SAL Consult Ltd/ MLNR PCU/ Bekwai Forest District
2.	Draft EIA Consultations	• Chiefs, Opinion Leaders from Local community /Project Affected Persons (PAPs) • Key institutional stakeholders engaged during the preparation of the EIA • Forestry Commission • Minerals Commission • Galamsey Community	• Feedback on issues and concerns raised during the EIA preparatory phase • Presentations on findings from the EIA study including proposed mitigation measures, community grievance redress arrangements • Receiving of comments from participants and potentially affected people and responding to comments.	After Submission of draft EIS to EPA	• Draft EIS notification in a national daily newspaper • Public engagement forum	MLNR PCU/ SAL Consult Ltd
3.	Disclosure of the EIA report.	• Bekwai Forest District • Forestry Commission • Minerals Commission • Water Resource Commission • Akrofuom and Amansie Central District Assemblies	• Make available copies of the approved EIS	After Issuance of the environmental permit for the Project by the EPA	• Publication of the approved EIS to inform the public where they can access the documents (websites)	MLNR PCU

No.	Activity	Identified Stakeholders	Focus of Consultation/ Information to be shared	Timelines/ Frequency	Forms of communication/ method of engagement	Facilitator/ Responsibility
					• Deliver hard and/or soft copy of the approved EIS to relevant stakeholders	
4.	Pre –mobilization/ Site preparation prior to construction	• Bekwai Forest District • Forestry Commission • Minerals Commission • Water Resource Commission • Akrofuom and Amansie Central Assemblies	• Information on schedule of preparation and construction works • Awareness creation on the potential impacts and remedial measures to the communities • Integration of the EIA into planning for construction (impacts and mitigation measures) • Grievance redress procedures • Capacity building for stakeholders for the implementation of the EIA (impacts and mitigation measures) • Community consultation and identification of any affected assets	At least 1 month prior to construction	• Sharing of relevant reports • Institutional /Community notifications.	MLNR PCU/ Contractor
5.	Start of construction	• Water Resource Commission • Local Communities/ Assembly members • Akrofuom and Amansie Central Assemblies • Galamsey Community	• Information on Schedule of construction works, activities and progress of construction • Awareness creation on the potential impacts and remedial measures to community • Training o PEMP Implementation (impacts and mitigation measures) o Code of Conduct • Grievance redress mechanism	Throughout the construction period	• General stakeholder meetings for Consultants, and contractor • Community notification.	MLNR PCU/ Contractor

No.	**Activity**	**Identified Stakeholders**	**Focus of Consultation/ Information to be shared**	**Timelines/ Frequency**	**Forms of communication/ method of engagement**	**Facilitator/ Responsibility**
6.	End of construction / Decommissioning of construction equipment and machinery	• EPA • Water Resource Commission • Community/Assembly members • Akrofuom and Amansie Central Assemblies	• Information on Schedule of decommissioning works, activities and progress of decommissioning • Awareness creation on the potential impacts and remedial measures to stakeholders • Training o PEMP Implementation (impacts and mitigation measures) o Code of Conduct • Grievance redress mechanism	Decommissioning phase	• General stakeholder meetings for Contractor, • Community/ Institutional notification.	MLNR PCU/ Contractor
7.	Commissioning and handing over of mined out sites	• Contractor • MLNR/ PCU • Forestry Commission/ Bekwai Forest District • Local communities • District Assembly • Media practitioner/ journalist	• Roles and responsibilities for management	Prior to commissioning	• General meeting with relevant authorities/stakeholders • Community Notification. • Training workshop • Media notification	MLNR PCU/ Contractor
8.	Operation and maintenance of reclaimed sites	• Bekwai Forest District • Nearby Local Communities • Galamsey Community	• Community awareness creation/sensitization on need to avoid unwanted access and activities within the forest reserve • Review of grievance	During operation and maintenance period	• Community meetings and interviews • Field investigations • Training Workshops	MLNR PCU/ Contractor

6.6 Outcome of Stakeholder Consultations Carried Out

Series of stakeholder consultations were carried out by SAL Consult Limited on the project at the local, district, regional and national levels to inform and discuss the proposed project, selection of project sites, and preparation of this EIS.

The project was discussed with the various stakeholders and their opinions/ concerns were sought and discussed. The key community concerns captured from the engagements are summarized below. For completeness, the community social needs have also been presented in the report even though it was made clear to them that these fall outside the mandate of the current project.

Interest/ Potential Role of the community in the project

The communities feel threatened by the influx of persons with various backgrounds to their communities to practice illegal mining. They had hitherto felt powerless in dealing with these people. Many community members out of necessity have also been involved in galamsey including activities in the forest reserves. They are mindful of the impact of these activities on their lives and do welcome the project to address some of their concerns. The community leaders are willing to lead the effort to ensure that mining in the forest reserves is avoided and would be satisfied with entering into formal agreements with the authorities to confirm their seriousness. The youth may be mobilized to assist with the policing effort. They wish the project would be designed to also improve their livelihoods.

Political interferences

The community members and various institutions are wary of political interferences for such projects. They hope that adequate resources will be available to implement the project.

The Forestry Commission and other institutions including the District Assembly should be involved in project implementation and provided with resources where necessary.

Sensitization activities

Community members should be actively involved and informed of project in order to ensure that reclaimed lands are not destroyed by illegal mining ever again.

Socio-economic issues and environmental challenges

The project should have a positive impact on the local community livelihoods. The standard of living in the community is low. Farming is an important and vital economic activity within the communities. Provision of social amenities such as potable water, good roads and quality health service will improve the quality of life for the communities. Teenage pregnancies and bad habits among the youth such as smoking are of great concern. The influx of migrants into the community for mining purposes is a threat to socio- cultural standards.

Water bodies in the communities have been heavily polluted by the activities of galamsey and sanctions should be enforced to prevent the destruction of water bodies in the community.

It was explained to the communities that the project will not be able to provide all their needs as enumerated but it is expected that some job opportunities will be created during the construction phase.

Also, some sections of the youth may be needed for the maintenance of the reclaimed area till its fully revegetated.

Security concerns

There is need to involve security personnel in the project, as illegal miners are usually armed with weapons. Moreover, the government should ensure that there is no political interference which may jeopardize the success of the project.

Community leadership

Key decision-makers include the chief and elders, religious leaders, and the unit committee. The assembly member represents the government, and the communities are pleased with their current representation

Plate 14: Engagement involving Elders, Unit Committee members, Women and some farmers at Kubi (up) and Adamso (down)

7.0 POTENTIAL IMPACTS IDENTIFICATION AND ASSESSMENT

The EIA serves principally to identify those impacts most likely to be significant and therefore needs to be addressed. In undertaking the EIA, the team has drawn upon:

- its knowledge of sources of potential impacts associated with the water treatment process and pipeline developments;
- an identification of the main environmental and social resources and receptors from the preliminary baseline data collection work; and
- the results of the initial scoping stakeholder engagement.

7.1 Impact Analysis Approach and Methodology

This chapter presents the methodology used to assess the significance of impacts that may result from the water supply project. It outlines general assessment methods and presents the criteria for determining receptor sensitivity, impact magnitude and impact significance.
The impact assessment for this study includes;

- Identification of Potential Environmental and Social Issues and Impacts;
- Evaluation and interpretation of impacts; and
- Impact Mitigation and Control.

7.1.1 Identification of Potential Environmental and Social Issues and Impacts

The potential environmental and social impacts of the proposed project have been identified and assessed as positive/beneficial or negative/adverse. The potential impacts of the Project have been identified and described for the various phases of the Project including impacts resulting from:

1. Preparatory/planning phase activities;
2. Construction phase activities;
3. Operational phase activities; and
4. Decommissioning phase activities.

7.1.2 Evaluation and Interpretation of Impacts

The significance of each impact has been evaluated and compared with national, international as well as applicable industry standards. The methodology for evaluating an impact is outlined below:

7.1.2.1 Impact Identification and Characterisation

Impacts are described in terms of their characteristics, including the impact's type and the impact's spatial and temporal features (namely extent, duration, scale and frequency). The definitions of the terms used are described in **Table 17**.

Table 17: Impact Characteristics

Characteristic	Definition	Terms
Type	A descriptor indicating the relationship of the impact to the Project (in terms of cause and effect).	**Direct** - Impacts that result from a direct interaction between the Project and a resource/receptor (e.g., between occupation of a plot of land and the habitats which are affected). **Indirect** - Impacts that follow on from the direct interactions between the Project and its environment as a result of subsequent interactions within the environment (e.g., viability of a species population resulting from loss of part of a habitat as a result of the Project occupying a plot of land). **Induced** - Impacts that result from other activities (which are not part of the Project) that happen because of the Project. **Cumulative** - Impacts that arise because of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect.
Duration	The time period over which a resource / receptor is affected.	**Temporary** - (period of less than 3 years - negligible/associated with the notion of reversibility) **Short term** - (period of less than 5 years i.e. production ramp up period) **Long term** - (period of more than 5 years and less than 15 years i.e. life of plant) **Permanent** - (a period that exceeds the life of plant – i.e. irreversible. Or may last for a very long time)
Extent	The reach of the impact (i.e. physical distance an impact will extend to)	**On-site** - impacts that are limited to the Project site. **Local** - impacts that are limited to the Project site and adjacent properties. **Regional** - impacts that are experienced at a regional scale, i.e. beyond adjacent properties, covering the metropolis and beyond **National** - impacts that are experienced at a national scale. **Trans-boundary/International** - impacts that are experienced outside of Ghana
Scale	Quantitative measure of the impact (e.g. the size of the area damaged or impacted, the fraction of a resource that is lost or affected, etc.). or the professional viewpoint of the measure of impact	Quantitative measures as applicable for the feature or resources affects/ professional viewpoint of expert as applicable for the feature or resource in terms of severity of impact measure (i.e. minor, moderate, severe)

Characteristic	Definition	Terms
Frequency	Measure of the constancy or periodicity of the impact.	No fixed designations; intended to be a numerical value or a qualitative description.
Likelihood	Characteristic that pertains to unplanned events determined either qualitatively or quantitatively estimated on the basis of experience and/or evidence that such an outcome has previously occurred.	**Unlikely** – The event is unlikely but may occur at some time during normal operating conditions. **Possible** – The event is likely to occur at some time during normal operating conditions. **Likely** - The event will occur during normal operating conditions (i.e., it is essentially inevitable).

7.1.2.2 Determining Impact Magnitude

Once an impact's characteristics are defined, the next step in the impact assessment phase is to assign each impact a 'magnitude'. Magnitude is typically a function of some combination (depending on the resource/receptor in question) of the following impact characteristics:

1. extent;
2. duration;
3. scale; and
4. frequency.

Magnitude (from small to large) is in practice a continuum, and evaluation along the spectrum requires the exercise of professional judgement and experience. Each impact is evaluated on a case-by-case basis, and the rationale for each determination is noted. The universal magnitude designations, for negative effects, are: negligible, small, medium and large. The magnitude designations themselves are universally consistent, but the definition for the designations varies by issue. In the case of a positive impact, no magnitude designation has been assigned as it is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact.

7.1.2.3 Determining Receptor Sensitivity

The other principal step necessary to assign significance for a given impact is to define the sensitivity of the receptor. There are a range of factors to be taken into account when defining the sensitivity of the receptor, which may be physical, biological, cultural or human. As in the case of magnitude, the sensitivity designations themselves are universally consistent, but the definitions for these designations will vary on a resource/receptor basis. The sensitivity of receptor used is low, medium and high as shown in **Table 18**.

Table 18: Sensitivity Criteria

Value / Sensitivity	Low	Medium	High
Biological and Species Value / Sensitivity Criteria			
Criteria	Not protected or listed as common / abundant; or not critical to other ecosystem functions (e.g. key prey species to other species).	Not protected or listed but may be a species common globally but rare in Ghana with little resilience to ecosystem changes, important to ecosystem functions, or one under threat or population decline.	Specifically protected under Ghana legislation and/or international conventions e.g. CITIES Listed as rare, threatened or endangered e.g. IUCN
Socio-Economic Sensitivity Criteria			
Criteria	Those affected are able to adapt with relative ease and maintain pre-impact status.	Able to adapt with some difficulty and maintain pre-impact status but only with a degree of support.	Those affected will not be able to adapt to changes and continue to maintain-pre impact status.
Physical Sensitivity Criteria			
Criteria	The resource remains unaffected and maintains pre-impact status.	Pre-impact status is temporarily altered. May be restored over time naturally or through specific interventions.	Pre impact status is permanently altered by the development. Receptor or resource is held in high-esteem by stakeholders

7.1.2.4 Assessing Impact Significance

Once magnitude of impact and sensitivity of a receptor have been characterised, the significance can be determined for each impact. The impact significance rating was determined, using the matrix provided in Table 24**.**

The impact ratings are categorised as follows:

- Minor significance;
- Moderate significance; and
- Major significance.

Minor Significance

An impact of minor significance, hereafter referred to as a 'minor impact' is one where an effect will be experienced, but the impact magnitude is sufficiently small and well within accepted standards, and/or the receptor is of low sensitivity/value. The repercussions on the environment are not significant and may or may not require the application of mitigation measures.

Moderate Significance

An impact of moderate significance hereafter referred to as a 'moderate impact', will be within accepted limits and standards. Moderate impacts may cover a broad range, from a threshold below which the impact is minor, up to a level that might be just short of breaching an established (legal) limit. The repercussions on the environment are substantial but can be reduced through specific measures.

Major Significance

An impact of major significance, hereafter referred to as a 'major impact' is one where an accepted limit or standard may be exceeded, or large magnitude impacts occur to highly valued/sensitive resource/receptors. The repercussions on the environment are very strong and cannot easily be reduced.

Table 19: Impact Significance

		Sensitivity / Vulnerablity of Resource / Receptor		
		Low	**Medium**	**High**
Magnitude of Impact	**Negligible**	**Negligible**	**Negligible**	**Negligible**
	Small	**Negligible**	**Minor**	**Moderate**
	Medium	**Minor**	**Moderate**	**Major**
	Large	**Moderate**	**Major**	**Major**

7.1.3 Mitigation and Control

All significant impacts identified have been considered for mitigation and control through preventive, reductive/enhancement and curative strategies and control measures. Measures have been identified, described and recommendations incorporated into the proposed development to minimise or avoid the key impacts. Where the effectiveness of mitigation measures is uncertain, or depends on assumptions about operational procedures, monitoring programmes and/or operations/management procedures will define the required practice.

A provisional environmental management plan (PEMP) has been developed for the project and its facilities in accordance with the Environmental Assessment Regulations 1999, LI 1652. An Environmental Monitoring Plan section of the PEMP presents detailed plans to monitor the implementation of mitigating measures and the identified impacts of the project during the construction and operation phases. The plan includes an estimate of capital and operating costs.

7.2 Environmental and Social Resources and Potential Receptors

For this Project the following main resource / receptor types are identified:

- Geographical;
- Environment (physical and biological environment),
- Human/socioeconomic environment;
- Institutional/organizational

7.2.1 Geographical Area of Influence

The immediate geographical area of influence includes the forest reserve and local communities. The project mined out areas are found in the Apramprama, Denyau and Supuma forest reserves and the project communities comprise Kobro, Abuakwaa, Adamso and Kubi communities.

7.2.2 Physical and Biological Environment

The main environmental media to be impacted are water, ambient air at the project site, vegetation and fauna as well as their habitat and soil/land resources.

Currently, the streams are extensively disturbed from the mining activities and therefore of minimal importance to the local communities. There may be further disturbance during the rehabilitation stage resulting in sediment transport which may impact water quality. Impact on aquatic life and fisheries may be significant.

The ambient air quality around the project area and local communities may also be affected by dust and emissions from project activities especially when excavations works are carried out in the dry season. Fumes and exhaust of equipment/machinery usage may also impact on ambient air quality.

The rehabilitated mined out sites will result in an improvement in the flora and fauna and therefore biodiversity conditions within the forest reserves.

7.2.3 Human/Socioeconomic Environment

The local communities are within 10km radius of the project sites. In most instances, access to the project sites will be through these communities. The movement of heavy trucks through the communities may pose safety challenges.

7.2.4 Institutional and organizational influence

There are many institutions which will share interest in the proposed project in various capacities including promotional, regulatory and monitoring purposes, and which must be adequately informed and engaged in the entire life of the project. These include:

- Forestry Commission/ Bekwai Forest District
- Environmental Protection Agency;
- Water Resources Commission;
- Bekwai Municipal and Akrofuom and Amansie Central District Assemblies;

- Lands Commission;
    - Office of the Administrator of Stool Lands
- Traditional Council.

7.3 Project Activities of Environmental and Social Concern

The project activities are grouped into three phases as follows:

- Preparatory phase;
- Constructional phase; and
- Operational and maintenance phase

7.3.1 Preparatory Phase Activities

Preparatory phase activities of environmental concern include among others:

- Survey works and feasibility studies to determine the mined out areas to be rehabilitated
- Stakeholder consultations; and
- Statutory permitting activities from EPA.

7.3.2 Construction Phase Activities

Constructional phase activities to potentially impact on the environment include among others:

- Site preparation: vegetation clearing and topsoil removal;
- Construction of site office, work camp and storage facilities;
- Equipment/material/ transport to project site;
- Excavation works;
- Storage and disposal of construction spoil, including spare parts, waste oil, etc;
- Transportation of raw materials to project site; and
- Sanitation issues.

7.3.3 Operational and Maintenance Phase Activities

Operational phase activities to potentially impact on the environment consist of the maintenance of the rehabilitated mined out sites and monitoring.

7.3.4 Decommissioning Phase Activities

Decommissioning activities to potentially impact on the environment include dismantling of constructional equipment and facilities.

7.4 Evaluation of Potential Positive Impacts

The potential positive impacts from the reclamation of the illegally mined out sites in the Apramprama, Denyau and Supuma forest reserves include:

- Removal of community safety hazards posed by the pits.
- Creation of employment for the youth groups.
- Increasing the skills and capacity of youths to secure employment.
- Protection of traditional activities such as access to indigenous medicines and other related services from the forest.
- Improvement of the aesthetic beauty of the forest reserves.
- Free flow of local streams and rivers as their courses will be restored.
- Enhancement of the provision of habitat for fauna, promote biodiversity, and help expedite the restoration of ecosystems that were previously disrupted by the activities of the gold mining operators at the site
- Climate change impact

7.4.1 Removal of community hazards posed by pits

Even though the pits are not directly located within the communities, some persons especially children may stray to these areas for variety of reasons and may stand the risk of falling in these pits. Persons may enter the reserves to harvest medicinal plants and become exposed to these dangers. The project will cover all these pits and render these sites safe for the local communities. In any case, entry into these reserves will remain restricted.

7.4.2 Creation of employment opportunities

Casual labour will be sourced locally during the construction activities. This will give opportunity to the youth to earn some income to take better care of their families. The local womenfolk will also provide basic services to workers by hawking around construction areas and will also make some money.

7.4.3 Increasing the skills and capacity of youth to secure employment

It is expected that the contractor will require the services of the local communities to assist with the maintenance of the plants to be planted as part of the remediation effort. This will be under the supervision of the Forest managers. Through this process, the youth may be employed and trained in simple silviculture activities. The training may empower them to seek further opportunities with the Forest Districts in the management of the reserves.

7.4.4 Access to forest resource services

The communities rely on the forest for various requirements including their traditional medicinal needs and also firewood for cooking purposes. These activities will be preserved by the project.

7.4.5 Aesthetic quality of forests

The current state of the degraded sections of the reserve is deplorable. The project will restore all these areas and make the reserve attractive to both humans and wildlife. The habitat of wildlife will be preserved.

7.4.6 Preservation of local water bodies

Currently, the streams through the mined out areas are contaminated with silt and aesthetically poor. The baseline sampling results suggest that chemical contamination is very low. The stream channels are highly disturbed and unstable. The local communities have very little use of these streams. The project will clearly demarcate stream boundaries and limit the movement of sediments to the streams. The quality of local streams will improve including its importance as aquatic habitat and for fisheries.

7.4.7 Climate change impacts

The restoration project is consistent with national objectives to protect our forest reserves and for the management of greenhouse gas emissions and to mitigate climate change impacts.

7.5 Adverse Impacts from the Proposed Project

The adverse environmental and social issues which could possibly arise from the implementation of the proposed project are described in Table 25 and covers the planning/preparatory phase activities, constructional phase activities, and operational phases as well as decommissioning activities after construction.

This is essentially an environmental restoration project hence the adverse impacts are envisaged during the rehabilitation phase mainly. Generally, the potential adverse impacts will include:

- Access of trucks and construction equipment into the reserve during construction will temporarily open up the reserve for unwanted access by persons
- Destruction of the re-colonising pioneer vegetation while accessing the site.
- Destruction of habitat of the few hardy animals while accessing the site.
- Destruction of animals living in burrows as well as those on the surface of the earth during the rehabilitation work;
- Noise pollution emanating from vehicular movement likely to scare away animals.
- Dusty environs as a result of deployment of heavy-duty vehicles.

7.5.1 Adverse preparatory and planning phase impacts

These will include the following:

- Conflict with demarcation of reserve boundaries;
- Confirmation that projects sites are mined out
- Anxiety on the part project affected communities/ persons;
- Occupational Health and Safety Issues.

7.5.2 Adverse construction phase impacts

The potential environmental impacts may include the following:

- Air quality deterioration (Dust and gaseous emissions);
- Vibration and noise nuisance;
- Loss of vegetation and impact on local flora and fauna;
- Water pollution;
- Soil erosion and contamination;
- Disturbance of riparian and aquatic environment;
- Sanitation issues/waste generation concerns;
- Occupational, health and safety issues;
- Visual intrusion/attraction; and
- Transport and traffic safety issues,
- Poor management of any quarries/borrow pits that may provide the necessary materials for the construction works etc.

The potential social impacts may include the following:

- Child labour abuses,
- Sexual exploitation and abuse and sexual harassment
- Labour influx if workers are not recruited from the local communities;
- Spread of contagious diseases in beneficiary communities since establishment of work camps is envisaged;
- Community health and safety issues;
- Socio-economic disruptions (Loss of livelihood / access to land/property;
- Political influence; and
- Poor communication/ messaging from implementing agencies.

7.5.3 Adverse operational and maintenance phase impacts

These will include the following:

- Sustainability of the rehabilitated areas
- Application of appropriate reclamation approaches/ strategies.

7.5.4 Evaluation of adverse decommissioning phase impacts

These will include the following:

- Occupational/ public safety; and
- Waste disposal.

Table 20: Potential Impact Identification

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
Preparatory and Planning Phase							
1a	Community engagements	• Assessment of project sites for pilot study • Conflicts regarding demarcation of reserve boundaries	Local communities/ Forestry Commission (Bekwai Forest District)/ MLNR (PCU)	• The project mined out sites are located within forest reserves • The reserve boundaries have been demarcated and gazetted as the Bibiani Forest District • The likely significant issue is the reconciliation of the forest reserve boundaries which must be consistent with the local community perception of where these boundaries must lie. • Though the local community are happy with the project, they also seem to think that part of their lands have been encroached by the forest reserve. The anticipated impacts are major and direct, and likely to be long term. The extent is local as it will be limited to the adjacent communities.	Large	Medium	Major
1b		Anxiety/ agitation on the part of the project affected communities	Local communities/ Forestry Commission (Bekwai Forest District)	• Community may misinterpret rehabilitation exercise as a guise for mining and challenge the presence of field survey teams/ contractors. • Inadequate dissemination of information with regards to the scope, schedule and impact of the proposed project, as well as measures in place to safeguard the interests of nearby communities and potentially affected institutions could result in strong resistance to the implementation of the project. This could be expressed in terms of obstruction of	Medium	Medium	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				workers from carrying out their respective services, possible vandalisation of equipment by community members when their interests/concerns are side-lined/not considered, public demonstration and violent behaviour. • Bad publicity on the project can be detrimental to its success as it would slow down necessary permit acquisition and hamper access to funding • Failure to reach an amicable agreement with the project affected communities could hinder project implementation. The impact is moderate, direct, and national in nature.			
1c		Confirmation that projects sites are mined out	Project sites	• Physical observation that the sites are actually mined out with no chance of illegal miners coming back to these sites • Level of commitment from the local communities that they will assist to safeguard/ police the rehabilitated sites to ensure that the sites are not re- invaded by illegal miners. The impact is moderate, direct and local in nature.	Medium	Medium	Moderate
2.	Survey works and feasibility studies	Occupational Health & Safety	Survey teams	• Field survey teams carrying out pre-constructional activities such as topographical survey works and environmental baseline studies may be exposed to fall hazards, injury and bites from insects and dangerous reptiles including snakes, scorpions, bees, ants, etc. The impact is direct and indirect, temporary in duration lasting for the survey period.	Small	High	Moderate
Reclamation and Rehabilitation Works							

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
3a	Sourcing and storage of materials and setting up work camps	Unsustainable sourcing and use of materials including laterite, aggregates and boulders	Land environment	• Materials sourced from inappropriate/ unsustainable sites may create environmental and social challenges at these sites The impact is moderate	Medium	Medium	Moderate
3b		Accidents & Incidents (Personal injuries from manual handling, trips, falls etc.)	Workers	• Poor handling of materials by inadequately trained workers may cause frequent accidents and slow down the progress of work. The impact is moderate	Medium	Medium	Moderate
3c		Inappropriate siting of work camp sites	Contractor/ Communities/ workers	• If the community is poorly engaged, such sites may be chosen which may incur the disfavour of the local community. • Communities are within 0.5 to 2km radius from the project sites • Work camps will be sited outside of the reserve. The impact is minor	Small	Low	Minor
3d		Poor storage of materials at the work camp (e.g. sand, gravel, cement, concrete mixers, etc.) could create inconvenience to access and use of the space by the local community.			Small	Low	Minor
3e		Sediment/leachate of trace metals (Fe, Na, K, Ca etc.) and pollutants from mining contained in fill materials and transport into water bodies	Water bodies	• The test results suggest a wide range of metal concentrations. The values are however predominantly low. Nevertheless, the material identified for use at any particular location may be further tested to confirm suitability for filling • If tested, and found to contain excessive levels of pollutants e.g. Hg, these should be sufficiently reclaimed as required by the project before use.	Medium	Medium	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				• The chances of sediments being washed into water bodies must be minimized to avoid excessive turbidity/ TSS levels. The impact is moderate			
3f		Injuries from poor manual handling, falling objects, improperly stacked materials & equipment.	Workers	• Workers may suffer injuries from poor housekeeping conditions at the site • Poorly trained and inexperienced workers may also be hurt and will slow down the progress of work The impact is moderate	Medium	Medium	Moderate
3g		Denial of use and access to hoarded areas where material and equipment have been packed hence causing agitation/protest from some affected local residents	Community	• In the event where work sites and camps have been poorly located and therefore interfere with access to community facilities like water or sanitation facilities may cause agitations. • Such situations may arise from poor communication and engagements with the communities. This impact is moderate	Medium	Medium	Moderate
3h		Poor security leading to theft of materials and equipment	Contractor Local community	• Theft cases in small communities pose minor challenges • The contractor should however not be careless about security regarding storage and use of materials The impact is minor	Low	Small	Minor
4a	Construction of site office, work camp and storage facilities;	Air quality deterioration (Dust and gaseous emissions)	Project Affected Communities Construction workers Forest reserves	• Loose and exposed soils from construction activities such as excavation works and movement of vehicles on untarred surfaces may result in the deterioration of ambient air quality through the increase of airborne particulates. These are expected to be intermittent and short term. • Exhaust fumes /gaseous emissions and greenhouse emissions from combustion of diesel engines, machinery, vehicles and	Medium	Medium	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				generators will also impact on the air quality. The most significant pollutant emissions to air will be combustion products (nitrogen dioxide (NO_2), sulphur dioxide (SO_2) and carbon monoxide (CO) from vehicles, machinery and equipment at site. Inhalation of fumes and gaseous emissions can affect the health of persons exposed to these gases for prolonged periods • Pollutant emissions will be temporary and minor but dust levels on the laterite road could be a nuisance to commuters on the affected routes during the constructional phase. • The impact is direct, temporary in duration and likely, lasting during the constructional phase; the impact is also local in extent			
4b		Labour influx	Community Workers	• The project construction activities will require specialist skills and different artisanal workers which may not be available locally, therefore labour from distant communities will be required (10-20 workers estimated). The impact is minor	Small	Low	Minor
4c		Use of child labour, sexual exploitation and abuse, and sexual harassment.	Community	• Due to the economic deprivation experienced within the communities, parents may be tempted to allow their children to seek for jobs at the construction sites to earn some money for upkeep of the family • Women may be exposed to the taunts of migrant workers who will offer them money for sexual favours.	Medium	High	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				• There was little evidence of gender based violence within the communities from the engagements carried out during the study. This is seriously frowned on in the communities The impact is moderate			
4d		Vibration and noise nuisance	Community Fauna	• Potential sources of noise will be through the movement and operation of machines, trucks and equipment. The operation of heavy construction equipment may also result in minor vibration at the immediate project area. • Excessive noise will scare away wildlife The impact is direct, temporary and likely, moderate in scale; the impact is also local in extent i.e., limited to the project site	Medium	Medium	Moderate
5	Haulage of equipment and materials to project sites and traffic management	Traffic safety	Community Workers	• The transportation of construction materials and the movement of heavy equipment to the project site may pose a risk to other road users along the affected routes. Any mechanical breakdown of such haulage trucks on narrow community roads can engender accidents. • The roads leading into the nearby communities accessing the project sites are mostly untarred and already in a deplorable state and may be worsened by the frequent movement of haulage trucks transporting equipment to the project site. The impact is of moderate significance	Medium	Medium	Moderate
6a	General works-filling with lateritic soil material, Compacting,	Loss of vegetation and impacts on flora and fauna	Flora/ Fauna	• Removal of vegetation may lead to potential habitat loss and its associated fauna.	Low	Medium	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
	dewatering of pits, Spreading of stockpile into pits			• The vegetation within and around the project site is highly disturbed and modified through mining activities. • The project site lacks significant fauna largely due to the degradation of the original habitat as a result of mining activities and therefore impact on terrestrial fauna will be limited. • Disturbed fauna can migrate to nearby bushes. The impact is direct, temporary and likely, lasting during the constructional phase; the impact will occur on-site i.e. limited to the project site, and minor in scale.			
6b		Water pollution	Local water bodies	• Water pollution may result from: i) dewatering of mined out pits ii) accidental spillage of fuels, lubricants and other chemicals, iii) siltation of water courses from runoff laden with sediment and dust, and iv) high suspended solids from soil eroded from trenches. • The project areas have local streams which could be polluted and lead to deterioration of water quality and aquatic life forms. The impact is direct, moderate, local in extent and temporary	Medium	High	Moderate
6c		Topsoil mismanagement- over exploitation/ overuse	Soils	• The project requires topsoil to be spread over the areas earmarked for rehabilitation • The topsoil will have to be sourced locally within the reserve or imported from elsewhere • Sourcing for this volume of topsoil may create challenges for the project as the	High	High	Major

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				areas to be harvested for the soil may suffer soil imbalances. The impact is direct and long term and may go beyond the construction period			
6d		Disturbance to riparian and aquatic environment	Local water bodies	• Site preparation, comprising clearance of vegetation would result in some disturbance to the already degraded riparian vegetation The impact is direct, temporary and likely, lasting during the constructional phase; the impact is also local in extent i.e. limited to the project site and nearby river, and moderate in scale.	Medium	Medium	Moderate
6e		Soil erosion and contamination	Soils, Water bodies	• Site clearance of vegetation and construction activities involving earthworks, excavations, site grading and civil works using equipment may lead to the exposure of soil surfaces and induce / accelerate soil erosion and siltation of water courses. • Contamination may occur as a result of accidental or structural spillage of fuels, lubricant chemicals, sanitary wastewater, etc., as well as from leakage from inadequately protected solid waste storage facilities and sites. The soil can undergo a range of impacts including i) soil erosion sediment release to land and water; ii) soil mixing; and iii) compaction • Disturbance to soil cannot be altogether avoided. Therefore, it is important to manage the impacts such that the potential for mitigation and restoration is maximized.	Medium	Medium	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				The impact is direct, moderate, local in extent and temporary.			
6f		Visual intrusion/ attraction	Local community	• Construction activities involving vegetation clearance (mostly patchy re- growth, movement of materials and equipment/machines to and from Project sites and presence of vehicles, trucks, construction / earth-moving machinery and equipment, and construction workers will attract the attention of local community members. Spoils that will be dumped along the trenches will be aesthetically (visually) unpleasant However, these facilities are isolated from community view and will not create any major visual intrusion. The impact is direct, likely, temporary and local in extent. The scale is minor as the construction sites are within forest reserves. .	Medium	Medium	Moderate
6g		Occupational Health and Safety	Workers	• Risks to safety and health of workers during construction will arise from the operation of machinery/ equipment, transportation of construction materials, inhalation of dust and fumes, accidents from falling objects etc. • Accidents and hazards from construction work include slips, falls, collision, accidental fires • Unhygienic working conditions, discriminatory practices, engagement of child labour could bring about social and labour conflicts and may trigger labour rights concerns. • Poor housekeeping including management of waste at the work camp and the general	Medium	Medium	Moderate

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				work environment could also significantly affect health and safety in the workplace • Site preparatory activities such as vegetation clearance exposes workers to dangerous reptiles such as snakes and other animals. • The impact is direct, temporary and likely, lasting during the constructional phase; the impact is local. In terms of number of people to engage (ranging from 10 to 20), the scale could range from minor to severe.			
6i		Community health and safety	Community	• The project will directly attract 10 to 20 workers but a lot more may be attracted indirectly who may offer services to these workers. The influx of people in the area may cause alteration of culture and introduce behavioural changes. Migration, short term or long term, increases the probability to have sexual relationship with multiple partners, thus becoming a critical factor in the propagation of HIV/AIDS and other STDs. The more affluent migration workers are susceptible to irresponsible sexual behavior and thus encourage prostitution in these communities. They could also have a negative influence on especially the youth and lead to the spread of HIV/AIDS and increase in teenage and unwanted pregnancies. • There is the possibility of migrant workers spreading the COVID- 19 virus at work camps and in the local community. National and WHO protocols will have to be observed to avoid the spread. The contractor will be expected to provide its	Medium	High	Major

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
				own site specific measures for review and approval by the Supervising Engineer. • Pools of stagnant water may be a source of water borne diseases especially if the trenches are left open (not back filled) over a long period of time. This will enhance the already existing deplorable situation. • Unsecured excavations may compromise public safety. • This impact on community health and safety is long term and severe but probability of occurrence depends on the number of workers expected for the construction stage. • The impact is likely, direct and indirect, temporary and permanent depending upon injury/hazard, lasting during or beyond the constructional phase; the impact is local and the impact scale from moderate to major.			
6j		Sanitation challenges	Workers Local water bodies	• Open defecation may be rampant if adequate toilet facilities are not provided during construction. Poor sanitation conditions may further pollute local water bodies.	Medium	Medium	Moderate
7	Planting of trees	Non restoration of natural forest habitat	Forest reserve	• The project will require strategies and processes to ensure that the reclamation effort is successful, • The right choices of plants and adoption of a maintenance regime will be required to ensure survival of the plants and subsequent restoration of the forest habitat	High	High	Major

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
8	Disposal of construction spoil, including spare parts, waste oil, etc;	Sanitation issues/solid waste generation concerns	Land environment	• Excavated soil from earthworks will form the bulk of waste produced. Servicing and maintenance of vehicles and equipment during construction will generate some amount of pieces of metal scrap; worn tyres and spent lubricating oil, empty lubricant containers, rubber seals, concrete debris, packaging materials, waste plastic etc. which need to be disposed of properly to avoid adverse impact on the environment. Construction period is however short, less than 3 months • Other wastes to be generated include domestic waste i.e. plastic waste; food wastes, polythene bags, used water sachets and bottles. Indiscriminate disposal of wastes at site will create unsightly conditions at the project area. • The impact is direct, temporary and likely, lasting during the constructional phase; the impact is also local in extent i.e., limited to the project site, and minor in scale	Low	Small	Minor
Operation and Maintenance Phase							
9a	Sustainability of the rehabilitated mined out sites	Selection of appropriate plant species	Forest reserve	• The project will require that appropriate reclamation approach/ strategy is adopted to ensure success	Major	Major	Major
9b		Maintenance of the forest and ensure protection of the rehabilitated mined out sites	Forest reserve	• There rehabilitated sites may be re-invaded by illegal miners if adequate measures are not put in place to avoid such a situation. This impact is moderate.	Major	Major	Major
Decommissioning Phase after rehabilitation works							

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Evaluation of Impact	Magnitude	Sensitivity	Rating
10	Occupational/ public safety and traffic	Post–construction activities (dismantling of construction work camps); and Operational and post operational phase activities (dismantling of infrastructure and replacement of dysfunctional equipment and installations)	Workers, community	• The relocation of all construction facilities and remaining materials could result in accident and injury to workers. • The replacement of dysfunctional equipment and installations places the respective workers at risk of injury and accidents. • The transportation of such equipment and materials could also pose traffic risks and public safety concerns. • The duration of the impact is temporary. The impact is possible, direct, temporary or permanent, will occur on-site, and the scale could be minor to severe depending on injuries and fatalities.	Medium	Medium	Moderate
11	Waste disposal	Post–construction activities (dismantling of construction work camps); and Operational and post operational phase activities (dismantling of infrastructure and replacement of dysfunctional equipment and installations)	Soil /surface water	• The dismantling and removal of work camp facilities, equipment and materials at the site could generate waste such as scraps metal, wood, concrete debris and garbage (pieces of plastic bags, food wrappers, etc.). • The impact is direct, temporary and likely, lasting during the demobilisation/post-constructional phase; the impact is also local in extent i.e. limited to the project site and adjacent properties and disposal site, and minor in scale.	Small	Medium	Minor

8.0 IMPACT MITIGATION AND MANAGEMENT

The anticipated impacts from the proposed project have been evaluated in the previous chapter in line with the objectives of this environmental and social study. Mitigation and management measures have been proposed as part of the ESIA study to ensure that the project impacts are managed within reasonable and acceptable limits.

The general rules followed in designing the mitigation measures are:

a. Avoidance of major impacts: major impacts are generally considered unacceptable, impacts that would endure into the long-term or extend over a large area;
b. Reduction of major and moderate impacts to as low as reasonably practicable (ALARP) by planning, designing and controlling mitigation measures. This implies that mitigation measures will be applied until the limitations of cost effectiveness and practical applications are reached. The limitations are established by best international practice; and
c. Implementation of good contractor practices for impacts rated as minor, in order to ensure that impacts are managed within good reasonable time.

8.1 Type of Mitigation Measures

The mitigation measures adopted may be grouped under three major types which comprise:

- Preventive measures;
- Control measures; and
- Compensatory measures

8.1.1 Preventive Measures

These are measures adopted during the design and pre-construction phase. The measures are aimed at avoiding or minimising potential major impacts at source. Avoiding or reducing an impact at source is essentially 'designing' the project so that a feature causing an impact is designed out (e.g. project site selection) or altered (e.g. rehabilitation works method) or avoided (e.g. community sensitisation programmes to avoid conflicts or confrontations).

8.1.2 Control Measures

These are measures adopted to abate or remedy the impacts occurring during construction and operation/ maintenance phases. Impacts can be abated on site or at receptor end. Repair or remedy of impacts involves unavoidable damage to a resource, e.g. community road during construction. In this case repair essentially involves restoration and reinstatement of damaged portions of road.

8.1.3 Compensatory Measures

Where other mitigation measures are not possible or fully effective, then compensation in some measure for loss, damage or general intrusion might be appropriate. This will mainly be 'in cash'. Monetary compensations will be paid to individuals whose legal properties or legal occupancy of a place will be affected by the project.

Table 21: Mitigation measures

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
Preparatory and Planning Phase							
1a	Community engagements	• Assessment of project sites for pilot study • Conflicts regarding demarcation of reserve boundaries	Local communities/ Forestry Commission (Bekwai Forest District)/ MLNR (PCU)	• The project will need to fully engage the communities to agree on the forest boundaries and to accept that the rehabilitated areas are within the reserve and should be left intact after the project • The project will institute and operationalize a grievance redress mechanism (GRM) at each of the pilot project sites throughout the project implementation in collaboration with the municipal assembly and chiefs and affected local communities.	Moderate	PCU	8,000
1b		Anxiety/ agitation on the part of the project affected communities	Local communities/ Forestry Commission (Bekwai Forest District)	• Design and implement a Stakeholder Engagement Plan (SEP) • The project will institute and operationalize a grievance redress mechanism (GRM) at each of the pilot project sites throughout the project implementation in collaboration with the municipal assembly and chiefs and affected local communities.	Moderate	PCU/ Consultant	10,000
1c		Confirmation that projects sites are mined out	Project sites	• The PCU to confirm that the sites are actually mined out with no chance of illegal miners coming back to these sites • Seek commitment from the local communities through written agreements to assist to safeguard the rehabilitated sites to ensure that the sites are not re- invaded by illegal miners.	Moderate	PCU	-

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				• Ensure stakeholder engagement addresses these concerns and will be duly implemented.			
2.	Survey works and feasibility studies	Occupational Health & Safety	Field survey teams	• Provide and ensure the use of appropriate personal and protective equipment such as safety boots and gloves.	Minor	Contractor/ Consultants	10,000
Rehabilitation and Reclamation Works							
3a	Sourcing and storage of materials and setting up work camps	Unsustainable sourcing and use of materials including laterite, aggregates and boulders	Land	• Materials including boulders should be sourced from approved sites, by both Assemblies and EPA	Moderate	Contractor	-
3b		Accidents & Incidents (Personal injuries from manual handling, trips, falls etc.)	Workers	• Workers should be adequately inducted and taken through orientation and regular training programmes to keep themselves safe as well as equipment • Contractor to prepare a Construction Environmental Health and Safety Management Plan (CEHSMP) to be approved by Supervising Engineer and PCU. This will include accident/ incident reporting procedures. A sample form is provided in the **Annex.**	Moderate	Contractor Supervising Engineer PCU	8,000
3c		Inappropriate siting of work camp sites	Contractor/ Communities	• Contractors to engage community in the selection of work camps. • Work camps must be sited outside of the reserve.	Minor Moderate	Contractor	5,000
3d		Poor storage of materials at the work camp (e.g., sand, gravel, cement, concrete mixers, etc.) could create inconvenience to access and use of the space by the local community.					

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
3e		Sediment/leachate of trace metals (Fe, Na, K, Ca etc.) and pollutants from mining contained in fill materials and transport into water bodies	Water bodies	• A wide range of metal concentrations were measured in the soil. Re- testing will be required to ensure that the material used as fill material is suitable. • If tested, and found to contain excessive levels of pollutants e.g. Hg, these should be avoided as much as possible. Material from neighbouring hills may be cut to fill the pits. The contractor should avoid importing materials from quarry sites or any such 'far away' locations.	Moderate	Contractor Supervising engineer PCU	8,000
3f		Injuries from poor manual handling, falling objects, improperly stacked materials & equipment.	Workers	• Workers to be adequately trained for their respective roles • Experienced persons to be allowed to use specialized equipment	Moderate	Contractors	5,000
3g		Denial of community access and use of hoarded areas where material and equipment have been packed hence causing agitation/ protest from some affected local residents	Community	• Contractor must ensure continuous engagement with community leaders who must be given due respect and recognition during the implementation of the project • Prepare and Implement a stakeholder engagement plan (SEP)	Minor	Contractor	5,000
3h		Poor security leading to theft of materials and equipment	Contractor Local community	• Contractor to provide adequate security on site. • Local youth may be considered to perform the role of security guards.	Minor	Contractor	6,000
4a	Construction of site office, work camp and storage facilities;	Air quality deterioration (Dust and gaseous emissions)	Project Affected Communities Construction workers Forest reserves	• Regular scheduled maintenance (based on the manufacturer's manual) of machines, generators, vehicles will be carried out on all vehicles to minimise exhaust emissions and ensure their roadworthiness.	Moderate	Contractor Supervising Engineer	10,000 2,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				• Periodic (monthly) air quality monitoring for dust emissions, exhaust gases and fumes onsite and offsite locations will be conducted to assess atmospheric pollution performance of the construction activities. • The Project will implement dust emissions control program e.g. dampening of unpaved surfaces to minimize atmospheric dust from constructional activities. • Ensure vehicular speed limits of 20 to 30mph over any unpaved landscape to minimise dust generation. Material dumping will be regulated to reduce dust emissions • All excavation activities would be closely supervised to ensure minimal disturbance to surrounding land uses (forest reserve) and dust. • Ensure that all construction personnel use approved PPE during construction activities • Materials in haulage trucks should be covered to reduce being blown out.			
4b 4c		Labour influx Use of child labour, sexual exploitation and abuse, and sexual harassment.	Community	• The PCU will prepare and implement a labour management plan, including a labour grievance management procedure to facilitate resolution of labour related complaints and grievances. • Contractors must provide Code of Ethics for workers to be approved by the PCU • The contractor's Code of Ethics must expressly indicate zero tolerance for	Moderate	Contractor PCU	8,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				child labour, sexual exploitation and harassment.			
4d		Vibration and noise nuisance	Community Fauna	• The contractor will employ standard noise abatement measures and engineering best practices to ensure that the impacts are minimized to acceptable limits. • The contractor will ensure that earthworks and other construction activities will be phased out or controlled to reduce noise generation during construction. Measures will include: o All equipment will be operated and maintained in accordance with appropriate industry and equipment standards including specifications for noise levels and manufacturer's specifications (including regular checks and maintenance). o Machines in intermittent use to be shut down in the intervening periods between works or throttled down to a minimum. • Provide ear plugs or earmuff to workers who undertake noisy activities • Carefully plan work activities such that noisy activities are carried out within a short period and not during the night or community resting period.	Moderate	Contractor	8,000
5a	Haulage of equipment and materials to project sites	Traffic safety	Contractor	• All the vehicles to be used for the project and especially in transporting equipment and materials will be serviced regularly and all the drivers to be engaged/ assigned would be required to	Moderate	Contractor	8,500

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
	and traffic management			hold the requisite driver's license as prescribed by the Drivers and Vehicles Licensing Authority (DVLA) and would be educated on public safety issues. • Adequate traffic management measures especially use of Flagmen will be employed to caution the public and to create safety awareness. Some adequate measures and conditions to be instituted by the contractor in the transport of materials include the following: • Haulage of materials will be limited to off-peak hours; • All trucks conveying materials will carry appropriate warning signals such as red flag and rotating amber lights; • Road worthy dump trucks will be used; • Very experienced drivers will be engaged; • Traffic wardens will monitor dump truck movements and ensure public and traffic safety; • Speed limits of between 20-30 km/hour will be allowed along the route for all trucks. • Carry out regular inspections of haulage roads. In the event truck failure along haulage routes, such trucks will be towed within 24 hours. Phasing out of Material Movements/ Scheduling Material Movements: movement of construction materials to site or storage areas will be carried out in phases and properly regulated to			

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				control the number of haulage vehicles coming into the project site at any given time to reduce the risk of accidents.			
6a	General works-filling with lateritic soil material, Compacting, Dewatering of pits, Spreading of stockpile into pits	Loss of vegetation and impacts on flora and fauna	Flora Fauna Local water bodies	• Ensure a rehabilitation and re-vegetation programme is effectively implemented • Allow an appropriate buffer distance between any construction activity and remnant native vegetation, where practicable. • Limit construction activities to only designated places and clearly mark out all vegetation, which will not be cleared, so that they are clearly visible as “no-go areas” to construction staff and vehicles. • Dismantle and remove all equipment and machinery after construction from site. • Rehabilitate trenches and disturbed areas as soon as possible.	Moderate	Contractor	-
6b		Water pollution	Local water bodies	• A monitoring program shall be established to include a site evaluation of overland flow or surface run-off and sedimentation in water courses as well as effectiveness of erosion control measures (i.e. netting and sand bags) will decrease the magnitude of the potential for increased soil erosion. • Trenching and handling of materials, oil or waste will be done with utmost care to prevent discharge or cause major disturbance to the river	Moderate	Contractor	12,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				• To reduce turbidity and spill, design and implement a trenching management plan • Install appropriate silt curtains during in-water works and at the riverbank by surrounding work areas or water intake structure • The contractor to apply simple spill control measures including traps n to minimize increased turbidity and surface pollution through oil spills. Monitoring and spill prevention drills will be required to ensure impacts are avoided to the maximum extent practical. The estimates for quantities of oils and fuels will be provided in the contractor's CESMP to be approved by the supervising engineer			
6c		Topsoil mismanagement (overexploitation/ overuse)	Soil	• The contractor must minimize the use of topsoil by applying the soil locally around the plants rather than spreading over large areas. This should be planned to speed up the regrowth in erosion-sensitive areas	Major	Contractor	-
6d		Disturbance to riparian and aquatic environment	Local water bodies	The existing riparian vegetation is degraded and will have little impact on aquatic biodiversity during construction hence requiring no major mitigation measure. However, the following catchment management measures will be employed to reduce ecological destruction in accordance with the objective of the project: • A re-vegetation plan would be developed prior to construction and implemented.	Moderate	Contractor	-

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				• Restore disturbed natural sites through establishment of revegetation in exposed areas.			
6e		Soil erosion and contamination	Soils, Water bodies	• To minimize erosion and sediment transport as a result of removal of vegetation, the necessary works to be carried out in the cleared locations will be done promptly. • The period of exposure of excavated soils to weather conditions will be limited to minimize the possibility of sediment transport as a result of storm water/runoff. Heaps of excavated soils suitable for reuse will be utilized in the shortest possible time to minimize exposure • Materials found to be unsuitable for backfilling will also be disposed of promptly.	Moderate	Contractor	15,000
6f		Visual intrusion/ attraction	Local community	• Construction activities involving vegetation clearance, movement of materials and equipment/machines to and from Project sites and presence of vehicles, trucks, construction / earthmoving machinery and equipment, and construction workers will as much as possible be limited to areas within the forest reserve in order not to attract the attention of local communities and also create visual intrusion.	Moderate	Contractor	-
6g		Occupational Health and Safety	Workers	• Conduct activities in accordance with relevant national and international laws and regulations on occupational health and safety. This includes Labour Act, 2003 (Act 651), the Factory, Offices and	Moderate	Contractor	12,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				Shops Act, 1970 (Act 328), ILO Convention 155 and Recommendation 164 ○ In accordance with the Ghana Labour Act 2003 (Act 651) persons under 18 years old will not be employed. Employment of a young person must be suitable for his or her physical, emotional and developmental capacity. ○ Workplace should be free from discrimination of any kind (gender, race, ethnicity, religion etc.) in employment or working conditions working conditions, and social benefits; ○ All work will be carried out under conditions with appropriate work safety standards <u>Adoption of Health and Safety Policies</u> • The contractor will establish and maintain high standards of occupational health, safety and environmental protection in line with project requirements, to prevent personal injury or illness, property damage, fires, security losses and environmental pollution. • The contractor will be required to prepare and implement health, safety and environmental protection plan at the workplace as per the C-ESMP to guide the construction activities in compliance with national policy. The responsibility for implementing this			

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				policy lies directly and personally with the contractor through its workers. <u>The Contractors OHSP</u> • The contractor will be required to develop an Occupational Health and Safety Plan to international standards, including requirements for PPE, task risk assessment, mandatory training, audit and monitoring, incident reporting etc. • The Contractor will apply the hazard hierarchy when planning work to avoid / eliminate risks and reduce risk to as low as reasonably practical. • The contractors will educate workers on its health and safety policy. The adoption of the health and safety policy at site will serve as a precautionary measure to prevent/ minimize the possibility of accidents and reduce health associated risks. • The contractors will train selected workers as first aid givers and provide adequate first aid kits at the construction areas to treat minor ailments and cuts. However, major cases will be referred to the Bibiani Government Hospital. <u>Use of Experienced Personnel</u> • The contractors will ensure that well-trained workers are engaged for the various construction roles. Only drivers with the requisite licenses will be allowed to handle vehicles and earth-			

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				moving equipment. Initial training and testing in machine/ equipment handling and safe working procedures will be given to all new drivers, operators and other field workers to help minimize the occurrence of accidents on site. • The contractors will ensure that regular defensive driving training sessions are organized for the drivers to ensure their safety and the safety of the general public. <u>Provision of Personal Protective Equipment (PPE)</u> The contractor will ensure that workers are provided with the appropriate personal protective equipment such as safety boots and coats, hand gloves, earplugs and nose masks. Supervisors will be mandated to ensure the use of these protective devices and implement sanctions when necessary. <u>Use of Equipment</u> All equipment's to be used will be in good condition and scheduled regular maintenance will be ensured to reduce/minimize of accidents. <u>Worker Rights and Wellbeing</u> • The Contractor will develop and implement a Human Resource Policy and plan that adheres to national requirements as well as the WB Safeguard Policies, including requirements for workers to have contracts, Workers Grievance			

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				Mechanism and develop retrenchment plans if there is a requirement for collective dismissals.			
6i		Community health and safety	Community	<u>Restriction of Access</u> • The contractor will maintain well trained security (including WB safeguards requirements) at the project sites to ensure that only authorised persons are allowed into the construction area. <u>Use of warning signs</u> • On possession of the sites, ensure that work sites (especially excavation works), have proper protection with clear marking of safety borders and signages and fence off all dangerous areas • Uncovered trenches or deep excavations will be protected using indicator linings or illustrative warning notices or wire mesh (whichever best suits the situation) to prevent fall hazards. All trenches and excavation will be covered as soon as possible. Also, appropriate signages should be provided. • As much as possible the contractor will adopt progressive opening of trenches to reduce risks to as low as reasonably practicable. <u>Scheduling of Work</u> The contractor will analyse traffic flows and ensure that the transport of equipment is carried out during low peak periods. <u>Announcement and Notification of Work</u>	Moderate	Contractor	12,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				• All close communities and the district assembly will be informed about the construction programme in advance and adhere to it. The PCU/ contractor will make announcements and give notices for work schedule through the Assemblymen and Unit Committee leaders. • In case access roads have to be closed, inform local communities and road users in advance *Spread of HIV/AIDS and other Sexually Transmitted Diseases (STDs)* • Prepare and implement the HIV/AIDS impact mitigation plan prepared by the contractor and approved by the PCU • Sensitize all workers to ensure awareness of and sensitivity to the local customs • Rigorous awareness-raising and campaigning against HIV/AIDS and other Sexually Transmitted Diseases (STIs/HIV/AIDS) which may go high as a result of the presence of migrant workers and increased income that tends to encourage liberal sexual behaviour. Provide and encourage the use of condoms among workers for prevention of STIs. *COVID-19 mitigation plan* • As part of the measures against the spread of the Corona Virus, PCU may partner the District Assembly to			

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				implement appropriate measures as specified by the WHO and national guidelines to educate the community as well as assist in providing facilities to deal with the introduction/ spread of the virus. • All workers will be checked for high temperature before being allowed access to work sites. Veronica buckets with soap will be provided to wash hands and sanitizers will be available for use. • Nose masks will be provided • Provide handwashing and sanitizing facilities at workplace and educate workers to use them • Conduct health screening and provide referral services to workers • Observe adequate social distance among workers at workplace; • As much as practicable, use virtual meetings and non-physical contact communication tools.			
6j		Sanitation challenges	Workers	• The contractor will provide adequate sanitation facilities for workers including the use of mobile toilets on site. The sanitation facilities should be gender-sensitive (i.e., separate enclosures for male and females and at appropriate distance from each other). • This may include having an arrangement with the local communities for workers to have access to community facilities.	Moderate	Contractor	8,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
7	Planting of trees	Non restoration of natural forest habitat	Forest reserve	• Project to plant indigenous species to assist the natural regeneration process. Species may be of high commercial value • Adopt strategy to include application of suitable rooting medium to facilitate the survival and growth of the species • Topsoil to be loosely graded and ground cover crops must be compatible with growing trees • Legumes and some grasses suitable for soil erosion to be used. Fertilisers may be applied where necessary.	Major	Contractor	-
8	Disposal of construction spoil, including spare parts, waste oil, etc;	Sanitation issues/solid waste generation concerns	Environment	<u>General Waste</u> • Residual waste after implementation of the waste hierarchy measures will be collected by private waste management companies for onward disposal. • The contractor should provide adequate labelled waste bins at the temporary work camps to minimise littering and littering at the work site. The collected refuse/ litter will then be transferred to the district assembly's approved disposal site. • Good site/housekeeping practices shall be implemented to avoid waste generation and promote waste minimisation. <u>Construction Waste</u> • All scraps or other solid wastes will be sold to scrap dealers or given to the community for reuse. Remnants (if any) will be disposed of at the approved disposal site of the District Assembly	Minor	Contractor	12,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
				• Excavated soils/concrete will be reused as much as possible for backfilling trenches dug during construction. • Contaminated soil will be considered as waste material and to be isolated in enclosures. The discharge of leachates will be regulated to ensure acceptable flows to the environment. <u>Hazardous Waste</u> • All hazardous waste (e.g. oily waste) generated during construction / rehabilitation will be appropriately stored as per manufacturer's instructions. For onward recycling, treatment or disposal, EPA approved hazardous waste collectors will be invited for collection and disposal of all hazardous waste. The contractor will provide evidence of an agreement with such collectors in his CESMP.			
Operation and Maintenance Phase							
9a	Sustainability of the rehabilitated mined out sites	Selection of appropriate plant species	Forest reserve	• The PCU to engage the Forestry Commission to select the right tree species and to agree/adopt appropriate reclamation approach/ strategy. • The Community's preferred economic trees such Teak, Odum, Ofram, Rubber, Mahogany, Wawa, Sapele, Cedrela, Emre etc. and other nitrogen fixing trees including Leucaena, Gliricidia, and Acacia will be considered to expedite the successional progress.	Major	Forestry Commission PCU	-

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
9b		Maintenance of the forest and ensure protection of the rehabilitated mined out sites	Forest reserve	• As part of the SEP, the Forest District to continually engage the local communities • The local communities to commit to ensuring that the sites are not re-invaded by illegal miners. Traditional authority may be required to sign MoUs to that effect. • The communities fringing the reserves serve on the forest management committees established by the Forestry Commission and are therefore will be fully involved in the protection and sustenance of the reserves • The 'Operation Halt' exercise involving the national security agencies will be operational in these areas • The District Forest Managers have full responsibility to ensure that the reserves remain intact. The Ministry is resourcing them adequately with the required logistics including transport to ensure that they are able to carry out this function effectively.	Major	Forestry Commission PCU	60,000
Decommissioning Phase after rehabilitation works							
10	Occupational/ public safety and traffic	Post–construction activities (dismantling of construction work camps); and Operational and post operational phase activities (dismantling of infrastructure and	Workers, community	• All construction facilities and remaining materials must be disposed of in a satisfactory manner at Assembly approved sites or reused if possible • All waste must be transported off site in safe manner to avoid accidents/ incidents	Minor	Contractor	25,000

No.	Project activity	Potential impacts/ issues	Key Receptor(s)	Mitigation measures	Impact	Responsibility	Estimated cost, USD
		replacement of dysfunctional equipment and installations)					
11	Waste disposal	Post–construction activities (dismantling of construction work camps); and Operational and post operational phase activities (dismantling of infrastructure and replacement of dysfunctional equipment and installations)	Soil /surface water	• All waste such as scraps metal, wood, concrete debris and garbage (pieces of plastic bags, food wrappers, etc.) to be sold to scrap dealers or if possible, donated to community members. • The dismantling and removal of work camp facilities, equipment and materials at the site could generate waste which if reusable may go to the community or sent to Assembly's approved site for disposal.	Moderate	Contractor	-

9.0 PROVISIONAL ENVIRONMENTAL MANAGEMENT PLAN (PEMP)

A Provisional Environmental Management Plan (PEMP) is developed for the project in accordance with the Environmental Assessment Regulations of 1999 (LI 1652) to assist the project to be carried out in an environmentally safe and sustainable manner. The provisional ESMP outlines management commitment and the required training programmes for the sustainable implementation of the proposed project. An estimated budget for the PESMP is also included in this section.

The implementation of the PEMP is expected to meet the following objectives:

- provide the platform to accommodate changes and uncertainties during project implementation;
- manage actual impacts during project implementation phase;
- ensure proper implementation of project permitting conditions;
- ensure satisfactory environmental performance; and
- serve as a source of background information for future projects.

A detailed Environmental and Social Management Plan (ESMP) will be prepared by the contractor and approved by the PCU to clearly set out steps and action plans to be taken to manage any significant environmental and social risks and impacts from the operations. The FC forestry management procedures will be followed on completion of the rehabilitation work and the site handed over to the FC. The laid-out management organisation and procedural and contingency measures to be put in place to ensure that the impacts are mitigated and managed appropriately are discussed below.

9.1 Programme to meet Requirements

The programmes proposed to meet mitigation measures and monitoring programmes will include the following:

- Adoption of Environmental and Social Management System;
- Establishment of Environment, Health and Safety (EHS) Unit;
- HSE management structure;
- Workers Information and training;
- Public and community participation;
- Environmental and social monitoring programmes;
- Audits and reviews;
- Social responsibility;
- Environmental reporting;
- Document control and tracking;
- Emergency response planning; and
- Environmental and social management budgeting.

9.1.1 Environmental and Social Action Plan

The Environmental and Social Action Plan (ESAP) presents opportunities for eliminating and/ or mitigating the identified risks to ensure an environmentally and socially friendly project and also to provide safe working conditions.

The ESAP sets out specific objectives and targets defining the way various identified issues are to be addressed during pre-construction, construction and operational phases. The Action Plans for EHS issues associated with this project have been presented in the Annex and it provides the work activities and associated hazards for the rehabilitation and reclamation of the mined-out areas in the forest reserves.

9.1.2 Adoption of Environmental and Social Management System

The MLNR/PCU recognizes that protecting the environment during the rehabilitation work is critical to the sustenance of the Project. It is therefore committed to engaging environmentally and socially conscious practices in its operations. The FC/ Bekwai Forest District will be generally responsible for the operational phase mitigation and monitoring measures.

The MLNR/PCU shall use the ESIA report as the basis to guide the sustainable implementation of the project. It will formulate standard procedures for all project activities especially during the construction phase to the different operational phase activities. The standard operational procedures will serve to guide the workers in their daily activities and serve as a training manual for employees and will ensure compliance with all relevant environmental conventions and legislations aimed at avoiding or minimizing adverse impacts to water, air and soil, and ensuring worker health and safety as well as community health safety and security.

9.1.3 Establishment of Environmental, Social, Health and Safety (ESHS) Committee

MLNR/PCU will work with the relevant units within the FC to draw up programs and procedures to manage the ESHS requirements of the project. The PCU will set up a small ESHS implementation committee comprising representatives of the PCU, FC, contractor and the supervising engineering consultant as well as representatives from affected Assemblies and Traditional Council and the local communities.

The committee will meet monthly or as agreed among the parties to review the performance of the contractor with regard to implementation of the construction phase mitigation and monitoring measures, identify gaps and challenges and propose remedial actions going forward.

The functions of the Committee will among other things include:

- Implement the safeguards described in this environmental and social document;
- Spearheading the implementation of the environmental permit conditions and mitigation, monitoring and management measures in the ESIA report;

- Ensuring collaboration among all supervisors to co-ordinate activities with bearing on the environment, social, and occupational health and safety of workers;
- Process and share environmental, social, health and safety data generated with workers, the public and stakeholders;
- Liaise with other relevant departments/offices and attend to complaints and grievances from the communities on all such matters of environmental, social, health and safety concern arising from the operations; and
- Consult with the PCU to decide on the role of consultants/experts in assisting with the environmental management activities including monitoring.

The contractor and sub-contractors of the project will implement the action plans during the construction phase of the project and will be supervised by the Bekwai Forest District Office through the Supervising Engineer.

The Bekwai Forest District will be responsible for the implementation of environmental management and monitoring programmes during the operation phase.

9.1.4 Workers Information and Training

The objective of the ESMP will only be achieved if every worker is adequately informed of the effects of the various construction and operational activities on the local environment and on community/worker's health and safety.

The PCU is aware that a well-informed and trained staff will contribute greatly towards environmental and social management through the judicious use of resources and the prevention of accidents and incidents that might adversely affect the community and/or damage equipment, personnel and the environment.

The Contractor will disseminate the ESMP to all workers. The document will be made available or accessible to all employees including casual or sub-contract workers. The various field supervisors will be tasked to ensure that all workers adhere to the requirements of the ESMP.

Circulars and early morning meetings for task assignments will form the main means of communicating all environmental issues arising from its operations and activities and assignments to supervisors and workers in general. Periodic on the job training programs for staff will be organised for workers who use equipment and earth moving machines like excavators and bulldozers to prevent or minimise the occurrence of accidents on the job. Workers will also be oriented on the potential adverse impacts and threats of the operations on the affected communities and measures to avert such adverse impact and threats.

9.1.5 Public and Community Participation

It is the desire of the Project that the communities appreciate the environmental and social changes associated with the forest restoration project. The PCU/ FC will consider suggestions, advice from all stakeholders, its contractors, subcontractors, visitors, and the public/local communities, which will help improve its operations and the reclamation project, to minimise impact on the environment, the public and worker health and safety.

The PCU will prepare and implement a stakeholder engagement plan to periodically share project information with the local communities and relevant stakeholders. The Contractor will ensure that information is available to the public and affected communities in particular.

The project will elaborate and operationalize a site-specific complaints and grievance redress mechanism for the reclamation activities. This will include appropriate channels for complaints reporting, grievance redressal and provide avenues for feedback of suggestions.

The PCU will ensure the Contractor/ Supervising Engineer will welcome any complaints, constructive suggestions and advice on environmental, social, health and safety issues of concern during construction stage.

On completion, the FC/ Bekwai Forest District will lead the effort to address relevant operational concerns.

9.1.6 Environmental and social monitoring programmes

Comprehensive monitoring programmes will be developed based on the monitoring plan provided in **Table 23** and **Table 24** for relevant environmental and social monitoring parameters which will serve as indicators of pollution on environmental media such as land, water and air. The monitoring programme shall also be in accordance with the directives of the EPA in the environmental permit conditions.

The objective of the monitoring programme is to:

- Ensure that all mitigation and control measures are implemented effectively and with designed effect;
- Provide information to develop improved practices and procedures for environmental and social protection and worker safety;
- Detect changes in the receiving environment and enable analysis of their causes; and
- Enable effective liaison with stakeholders including addressing complaints and concerns.

9.1.6.1 Responsibility for Environmental and Social Monitoring Programme

The responsibility for implementation of the Environmental and Social Monitoring Programme during the Construction Phase lies with the Contractor. The PCU will ensure the monitoring activities are carried out to acceptable standards through the appointed project's engineering consultant/ supervisor. The Contractor will be required to assign an officer responsible for implementation of the Health, Social, Safety and Environmental considerations, including the ESMP.

The FC/ Bekwai Forest District have the primary responsibility for environmental and social monitoring during the project operational phase. The Ghana EPA will provide technical support. The WB may also monitor through supervision missions throughout the project implementation.

The contractor shall be required to prepare a Site Construction Management Plan (CMP). The Contractor's CMP shall describe the resources allocated to and the responsible personnel for the execution of each task and requirement contained therein and shall describe how roles and responsibilities are communicated to the Engineering Consultant and the PCU.

9.1.6.2 Summary of Environmental Monitoring Programme

The environmental and social monitoring programme proposed for the rehabilitation/ restoration of the mined-out areas in the forest reserves are presented in the table below**.**

Table 22: Environmental Monitoring Plan-Construction Phase

Environmental component/Action to monitor	Parameters to be monitored	Monitoring /Sampling Sites	Methodology/ standards	Frequency/ time	Goal	Responsibility for monitoring	Estimated cost/site US$
Water Quality of the Local water bodies	• Observable change in turbidity and oil sheen of the local water bodies • In situ measurements of selected water quality parameters (pH, turbidity, TSS, conductivity, DO), • Laboratory analyses of BOD, Suspended solids, trace metals • Solid waste management monitoring	Upstream and downstream locations on local streams	• Visual observations • Sampling and laboratory analysis/ WHO guidelines	• Monthly during construction period	Ensure water quality maintenance and avoid pollution of the local streams	Contractor	4,000.00
Waste generation and disposal	• Garbage • Waste oil • Hazardous waste • Construction spoils • Excavation spoil	• The surroundings of construction camp and construction sites; • Waste storage areas	• Visual observation and Inspection of the site • Monitoring the quantity and type of waste generated; • Availability and condition of waste bins; • Record keeping of time and place of final disposal	Regularly/daily especially in the immediate aftermath of harsh weather conditions of strong winds and storms.	Maintaining the quality of soil and water	Contractor	3,000.00
Occupational health and safety hazards	• Adherence to health and safety procedures • Records on type and frequency of illness/injuries /accidents and incidents	Project work areas	Observation, audits, complaint/ incident records /ESMP	Daily	• Ensure compliance with health safety standards and	Contractor and Supervising Engineer	2,500.00

Environmental component/Action to monitor	Parameters to be monitored	Monitoring /Sampling Sites	Methodology/ standards	Frequency/ time	Goal	Responsibility for monitoring	Estimated cost/site US$
	• Regular check for availability and usability of Personal protective equipment (Life jackets, Safety boots, gloves, earplug, Helmet etc)	Project work areas	Inspections and Audits		requirements of the ESMP		2,500.00
	• Number and scope of occupational health and safety training • Worker grievance mechanism records • Records of worker contracts and payments ensuring no child is employed	Project work areas	• Induction training • Daily safety briefing • Training workshops • Workers' contracts	Daily/ Quarterly			2,500.00
	• Ensure good housekeeping and personal hygiene • Provision of waste bins and ensuring its use /avoiding littering • Availability of well stocked First Aid kit • Availability of fire extinguishers and fire safety monitoring	Construction work camp site /project work areas	Health & Safety inspection, audit and reviews Record keeping	Daily			2,500.00
Community Health, Safety and security	• Monitoring of accident occurrence • Public complaints and grievances mechanism records • Number of HIV/AIDS awareness sensitization and education meetings • Number of awareness creation meetings and	Project work area/Local communities within the project footprint	• Observations • Complaints/incident records • Records of grievances and implemented actions • Monthly stakeholder meetings (see	Daily	Ensuring safety of local communities and the general public	Contractor	2,500.00

Environmental component/Action to monitor	Parameters to be monitored	Monitoring /Sampling Sites	Methodology/ standards	Frequency/ time	Goal	Responsibility for monitoring	Estimated cost/site US$
	training on sexual violence and child abuse within communities • Records of education on Covid-19 protocols • Contract records to indicate any situation regarding child labour in the recruitment process • Records of human rights abuses • Record of sexual harassment and GBV		schedule in **Table 16)**				
Traffic Impact and Public Safety and security	• Maintenance records of security at the work area & prohibition of unauthorized persons at construction site • Designation of access routes and road safety programmes • Availability and use of warning signs and cautionary tapes around excavations/trenches • Human and vehicular traffic and related road accidents/ incidents reports	Project area, access roads and local communities	• Visual observations of warning signs and use of flagmen etc daily • Monthly complaints/incidents records • Weekly grievance and implemented actions • Monthly stakeholder meetings	Daily Monthly Weekly Monthly	Ensuring safety of local communities and the general public	Contractor	2,000.00
Air Quality	• Emissions (NOx, COx, SOx) • Dust (PM10 and PM2.5)	• Construction site access roads • Local communities	• Visual observation of dust emissions daily • Measurement	• Quarterly during construction • If necessary	• Ensuring the compliance of ambient air quality to the GSA	Contractor	7,000.00

Environmental component/Action to monitor	Parameters to be monitored	Monitoring /Sampling Sites	Methodology/ standards	Frequency/ time	Goal	Responsibility for monitoring	Estimated cost/site US$
			(portable surface mounted air particulate matter concentration meters and gases detectors	(after receiving a grievance)	Standards • Minimum public disturbance • Ensuring personnel safety • Minimal effect on vegetation cover/flora and fauna.		
Noise Levels	Sound levels in dBA	• Construction site access roads • Local communities	Noise measuring equipment	• Quarterly during construction • If necessary (after receiving a grievance)	• Ensuring compliance with GSA Standards for ambient noise quality and the health and safety standards • Ensuring personnel comfort and safety • Minimal disturbance on fauna populations.	Contractor	
Loss of vegetation and impacts on flora and fauna	• Supervision over the area of land cleared or disturbed • Monitoring related to avoidance of the spread of invasive alien species	Project construction sites	• Visual observations • Inspection/ Supervision of workers'	Regularly during and after construction	• Preventing excess damage to vegetation cover	Contractor & Supervising Engineer	-

Environmental component/Action to monitor	Parameters to be monitored	Monitoring /Sampling Sites	Methodology/ standards	Frequency/ time	Goal	Responsibility for monitoring	Estimated cost/site US$
	• Reinstatement and rehabilitation monitoring records • Supervision and record of workers engaging in hunting, fishing or wildlife collection activities		activities		• Evaluating the effectiveness of mitigation measures		
Soil Impacts	Observation of rills/gullies	• Project sites • Material and waste storage area	Field observations	Regular check-up during and after construction	Maintaining the soil stability and quality	Contractor	-
Community complaints /grievances	Type and nature of complaints and concerns	Project area and local communities	• Complaint records • Records of grievance and implemented actions • Stakeholder meetings	Daily	Minimize conflicts	Contractor and supervising engineer	1,500
		Total					**28,000**

Environmental Monitoring Plan-Operation Phase

Environmental component/Action to monitor	Parameters to be monitored	Monitoring /Sampling Sites	Methodology/ standards	Frequency/ time	Goal	Responsibility for monitoring	Estimated cost/ annum US$
Sustainability of the rehabilitated mined out sites	• No of visits to project sites • No of community engagements • Presence of security provided by community	Rehabilitated mined out sites	Inspection of records Observations	Quarterly	Rehabilitated mined out sites adequately maintained	FC/ Bibiani Forest District	5,000
Selection of appropriate plant species for reforestation	• Species planted	Rehabilitated mined out sites	Observations	Quarterly	Appropriate plant species planted	FC/ Bibiani Forest District Manager	2,500
Accumulation of heavy metals in the root zone and aerial parts of planted tree species	• Heavy metals especially Mercury (Hg)	Rehabilitated mined out sites	Design of study following best practices Sampling of plant tissues Laboratory analyses	Biannual	Determination of heavy metals in plant species	FC/ Crops Research Institute	25,000
	Total						**32,500**

9.1.7 Mined out sites Rehabilitation Monitoring and Management

Rehabilitation Phase

During the rehabilitation and remediation phase, the EPA and the WRC may be involved in the periodic monitoring of the site activities to ensure that the mitigation measures are complied with. The Contractor will be directly supervised by the Engineering Consultant. The Contractor will be required to organize monthly meeting, in which the above key stakeholders will be invited.

Operation Phase

The rehabilitated sites fall within the Bekwai Forest District and will continue to be managed by the Bekwai Forest District Office as per their mandate.

9.1.8 Audits and Reviews after rehabilitation

The FC may engage environmental consultants to conduct annual audits and reviews to assess the environmental, health, safety and security performances of the project. The findings and recommendations of the audits will assist in correcting any lapses detected. A routine monitoring programme to be carried out by the Bekwai Forest District will form the basis for effective auditing and reviews and will inform the schedule for auditing and reviews.

9.1.9 Environmental Reporting

In order to comply with internal, statutory as well as international reporting obligations, periodic reporting will be done. Reports to be prepared to serve as sources of environmental and safety information for stakeholders will include:

- Quarterly Environmental Monitoring Returns – statutory requirement to EPA;
- Annual Environmental Reports – statutory requirement to EPA;
- Annual Environmental Audit Report – for in-house reporting;
- Environmental Management Plan will be submitted within 24 months of completion of the rehabilitation/ restoration work and thereafter after every three years in line with the legislative instrument.

9.1.10 Document control and tracking

Documentation

The Bekwai Forest District Manager will keep records on all environmental and community health/safety data including, complaints. Environmental data will be kept in both electronic and hard copy formats. A format for documentation of information in electronic form will be developed to capture daily/weekly information on environmental sampling/monitoring results, training and awareness creation programmes such as workshops, seminars and meetings.

9.1.11 Document Tracking and Control

The PCU will prompt the FC/ Bekwai Forest District to establish and maintain procedures to control all documents and permits that are required to ensure compliance and to make sure that:

- All documents and permits are easily traceable;
- All statutory documents are periodically reviewed, revised as necessary and approved as adequate by the relevant regulatory agency;
- All permits and approvals are renewed as and when necessary;
- Current versions of relevant documents or literature for worker's use are available on site; and
- Any obsolete document or part of a document retained for legal and/or information preservation purposes is correctly labelled and identified.

Documentation will be legible, dated (with dates of revision) and readily identifiable, maintained in an orderly manner and retained for specified periods.

9.1.12 Provisional Grievance Redress Mechanism

The objective of the Grievance Redress Mechanism (GRM) is to provide an effective, transparent and timely system that would give aggrieved persons' redress, minimize bad publicity, avoid/minimizes delays and avoid litigation in execution of the water supply project. This ensures public health and safety, and sustainability of the project. The GRM will provide all affected stakeholders avenues through which they can express their concerns and receive the needed corrective actions in an appropriate and timely manner.

The PCU will publicize the GRM through community sensitization, particularly to the project affected persons and communities. This will be done in collaboration with the Bekwai Forest District and the Akrofuom and Amansie Central District Assemblies. The sensitization on the GRM will be done in the local languages of the area in addition to English Language to enable all stakeholders understand the content. This will ensure that approaches, ways and contact information for all stages of the GRM are clearly spelt out.

The GRM will consist of a five-tier resolution arrangement as follows:

- Local (project site) at community level;
- Complaint lodged at Bibiani Forest District Office;
- Bibiani Anhwiaso Bekwai Municipal Assembly level grievance resolution;
- MLNR/PCU level; and
- National level

The general process is that a project affected person and/or other stakeholders should first raise a grievance at the contractor's project site office at the community level. If unresolved, it is referred to Bekwai Forest District Office. Beyond this level, the issue will be referred to the District Assembly Grievance and Redress Office. If this proves unsuccessful in resolving the grievance, the complainant may escalate the issue by contacting the MLNR/ PCU office in Accra or if after the rehabilitation work may raise it with the FC. The complainant is free to seek legal redress at the law court to resolve the issue if these avenues fail to produce the desired result.

The levels of the GRM are explained as follows and summarized in Figure 12.

Local (project site) level

A complaint made to the contractor's project site office shall be received by an assigned officer from the Supervising engineer. The procedure shall be as follows:

- A complaint form shall be filled, dated and signed, a copy of the same shall be deposited in the Supervising engineer's office and a copy sent to the contractor.
- An acknowledgement of complaint form shall also be filled, signed and given to the complainant by the contractor.

The contractor shall resolve the grievance or rectify the anomaly within two (2) weeks of receipt of complaint. The Contractor's monthly project report will contain the complaint, the solution proffered, and the results of follow-up to determine whether the complainant is satisfied with the outcome. The location shall also be listed as a site to be inspected during the next site inspection that precedes monthly site meeting etc.

Complaint Lodged at Bekwai Forest District

A written, email, or verbal complaint shall be delivered to the Bekwai Forest District Manager. This shall be recorded, dated and signed to acknowledge receipt. An acknowledgement of complaint form shall be delivered to the complainant within one (1) week. Within this time the District Manager shall liaise with the Supervising Engineer to have the issue(s) resolved within one (1) week. When a solution is reached, the complainant shall be informed verbally and/or in writing within three (3) days thereafter. A written record of the proposed resolution shall be made. The solution proffered shall be recorded and dated. The District Manager will follow up to find out whether the complainant is satisfied, and the results of the follow-up will be recorded.

During the rehabilitation phase, the contractor shall investigate the issue with the Supervising engineer and ensure that the proffered solution is communicated to the complainant through a site instruction. The monthly site report shall include a report on the complaint and what has been done to remedy the situation. A visit to the location of the problems shall be included in areas to be visited during the monthly site inspections that precedes the monthly site meeting. The site inspection shall be attended by Forest District staff to verify confirmation of the resolution of the issue(s).

District Assembly-level Grievance Resolution

For issues that could not be resolved either directly with the Contractor on-site or through lodging of complaint at the Bekwai District Office, the Assembly's Grievance Committee (GC) chaired by the Presiding Member will handle such cases. The Forest District Manager will escalate the complaints/grievance to the Assembly's PRCC for redress within a week of failing to resolve the complaint. The meetings will be held in the Assembly so that stakeholders do not have to travel long distances to attend committee meetings. The Assembly's may invite the following to assist with the resolution of the issue:

- A representative of the Municipal Assembly;
- Local Assembly Member for the affected communities;

- Representative of Bekwai Forest District and/or MLNR/PCU; and
- Representative of affected community member

The representative of Bekwai Forest District/ MLNR (PCU) will chair the GC. Membership of the GC will be made known to the public/stakeholders as part of the sensitization on the GRM. The GC shall provide a response within three (3) weeks of receiving formal notification of a grievance. In cases where further site visits, investigations or discussions with the aggrieved stakeholder are deemed necessary in order to arrive at an amicable resolution, a date shall be planned with the complainant for the follow-up visit which will fall within the mandated three (3) weeks. This will be facilitated by the Bekwai Forest District Manager.

National legal level

If the aggrieved stakeholder is not satisfied with the outcome of the GC's intervention in resolving the grievance, the stakeholder will be advised to seek redress through the appropriate legal system/law court.

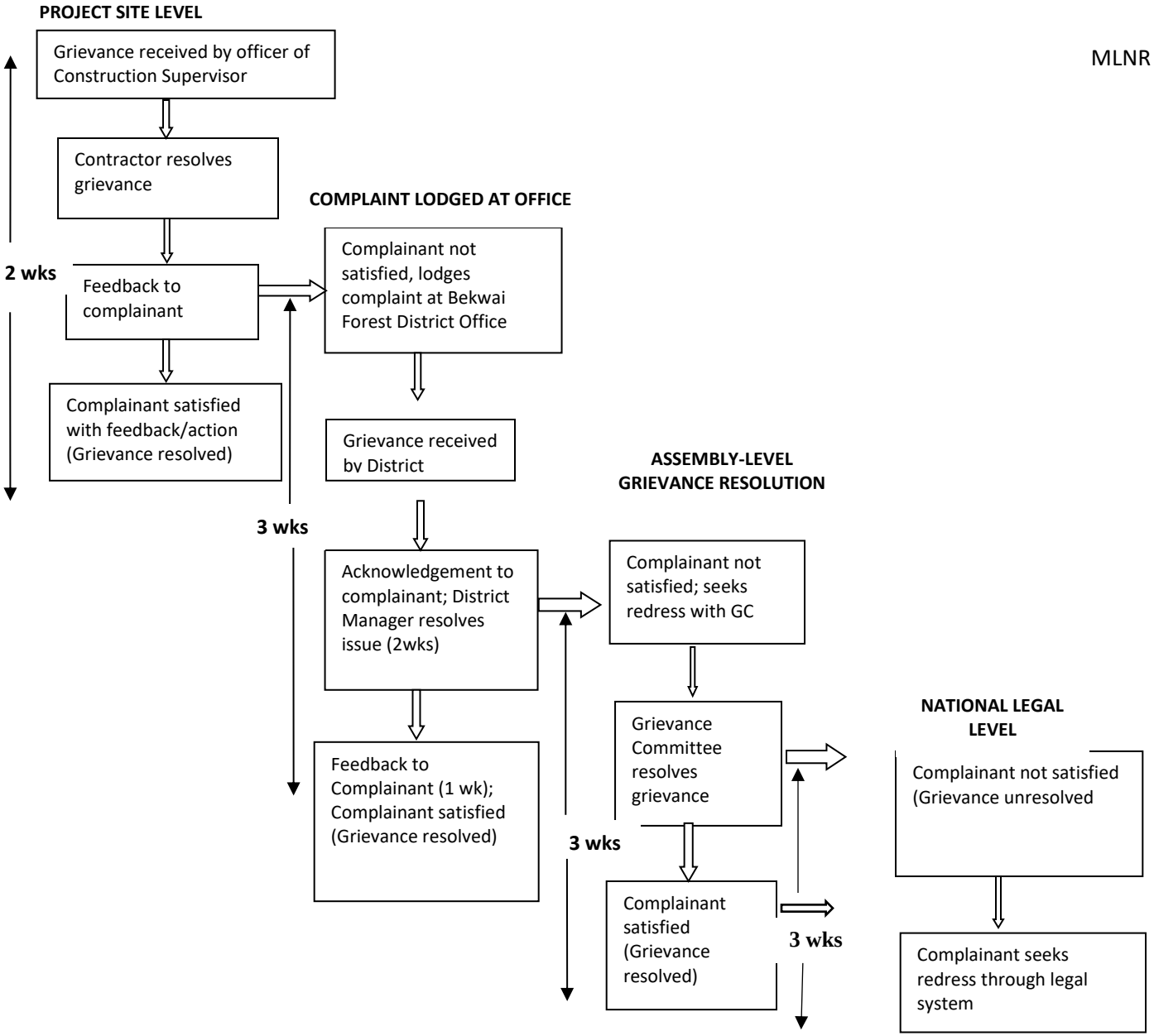


Figure 12: Proposed Grievance redress Mechanism Levels

9.1.13 GRM response to SEA/SH Issues

The Grievance Redress Mechanism (GRM) should provide an effective, transparent and timely arrangement to address any sexual related challenges during the implementation of the project. The involvement of women in the direct project execution is minimal. However, some women are expected on site during the period selling food and other items to the workers and may then become exposed to some level of harassment.

In this wise, the local (project site) level intervention should be mostly sufficient. As earlier indicated, a complaint made to the contractor's project site office shall be received by an assigned officer from the Supervising engineer. The assigned officer will ensure adequate privacy and decorum to manage the situation effectively. The procedure shall be as follows:

- A complaint form shall be filled, dated and signed, a copy of the same shall be deposited in the Supervising Engineer's office and a copy sent to the contractor.
- An acknowledgement of complaint form shall also be filled, signed and given to the complainant by the contractor.

The contractor shall resolve the grievance within one (1) week of receipt of complaint. The Contractor's monthly project report will contain the complaint, the solution proffered, and the results of follow-up to determine whether the complainant is satisfied with the outcome.

Where the contractor and supervising engineer are unable to resolve a complaint or grievance within the stipulated one week timeframe, the complaint shall be escalated immediately to the PCU for resolution and appropriate action. This may include reporting the incident to the law enforcement agencies and organizing counseling sessions for the affected person.

As indicated earlier, the PCU will publicize the GRM through community sensitization, particularly to the project affected persons and communities. This will be done in collaboration with the Bibiani Forest District and the Bibiani Anhwiaso Bekwai Municipal Assembly. The sensitization on the GRM will be done in the local languages (mostly Akan) in addition to English Language to enable all stakeholders understand the content. This will ensure that approaches, ways and contact information are clearly spelt out.

9.1.14 Environmental and social management budgeting

The environmental management and monitoring programmes earmarked for implementation require detailed cost analysis to determine the actual budget needed. A budget of US$219,000 during the construction phase including the cost of mitigation measures, and US$183,000 for the operational phase, also including cost of the mitigation measures have been estimated. Hence a total budget of US$402,000 is provided. The recommended actions to mitigate the rehabilitation and maintenance phase impacts are

generally standard best practices for the proposed project activities. Provisional cost estimates are provided in **Table 23**.

Table 23: Provisional Implementation Budget

NO	ITEM	COST (USD)/ YEAR/ SITE
Rehabilitation Phase Costs		
1.	Environmental Monitoring Plan	28,000.00
2.	Cost of implementing mitigation measures during the construction phase as imbedded in the BoQ for the rehabilitation works	152,000.00
3.	Annual Environmental and Safety Auditing	6,000.00
4.	Annual Environmental Reporting	5,000.00
5.	Capacity Building and training for staff	8,000.00
6.	Implementation of Stakeholder engagement	10,000.00
7.	Implementation of Grievance Redress Mechanism	10,000.00
	Sub-total (Construction)	**219,000.00**
Operational Phase Costs		
8.	Environmental Monitoring Plan	45,000.00
9.	Cost of implementing mitigation measures as provided in the regular budget for the maintenance of rehabilitated forest area	85,000.00
10.	Annual Environmental and Safety Auditing	7,000.00
11.	Annual Environmental Reporting	5,000.00
12.	Capacity Building and training for Bekwai Forest District staff	6,000.00
13.	Implementation of Stakeholder Engagement Plans	10,000.00
14.	Implementation of Grievance Redress Mechanism	10,000.00
15.	Preparation of ESMP to EPA	10,000.00
16.	Preparation and implementation of Emergency Response Plan	5,000.00
	Sub-total (Operation and maintenance)	**183,000.00**
Grand Total		**402,000.00**

10.0 DECOMMISSIONING

10.1 Work Camp Facilities and Equipment

The work camp facilities will be dismantled and relocated for use at other new project sites. Waste generated will be disposed of at the District Assembly's approved waste dumpsites.

Bulldozer, hydraulic excavator, pumps, generator, vehicles and other equipment and machinery used for the project will be relocated to new or other project sites in the country and managed by the contractor.

11.0 CONCLUSION

MLNR (PCU) is fully aware of the need for sound environmental practices, and will undertake this project in compliance with both Ghanaian laws and the World Bank Safeguard Policies. The rehabilitation activities and subsequent maintenance of the reforested sites will satisfy the relevant local environmental protection laws and international conventions.

The key potential environmental and social risks and impacts associated with the proposed project have been identified and duly assessed in this EIA Report. The major environmental, safety risks and impacts associated with the Project during both the rehabilitation and maintenance stages include confirmation of forest reserve boundaries, management of community expectations, protection of environmental media including local water resources and air quality, occupational health/safety risks, traffic impacts/public safety concerns, community security risks and sustainability of the reforestation programmes.

Mitigation and management measures for the identified impacts have been proposed for all stages of the project and will be implemented in order to minimize significant adverse effects. An environmental monitoring programme to help detect changes arising from the predicted adverse impacts and to help maintain environmental quality within acceptable guidelines has also been prepared and presented in the report together with a provisional environmental management plan (PEMP) for implementation. A stakeholder engagement program and grievance redress mechanism will be implemented to ensure that stakeholder concerns and grievances are managed effectively to minimize potential conflicts during project implementation.

The implementation of the proposed project will enhance the forestry resources of the Afao Hills Forest Reserve and will also minimize the threat of any future illegal mining activities in the reserve. Local communities will assist to protect the reserve and derive immense benefits from sustainably exploiting resources from the reserve under the framework of community resources management activities.

Generally, the local communities are willing to participate in project where necessary to help ensure that the project is implemented in a socially acceptable manner to the benefit of the country. They expect that appropriate measures will be put in place to address the potential project risks, and to maximize project benefits.

ANNEXES

Annex: National Environmental Quality Standards (Ghana Standards –GS)

The Ghana Standard for Environment and Health Protection –Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236,2019).

Substance	Time Weighted Average (TWA)		Averaging Time
Sulphur Dioxide (SO_2)	900 µg/m³	Industrial	1 hr
	700 µg/m³	Residential	1 hr
	150 µg/m³	Industrial	24 hr
	100 µg/m³	Residential	24 hr
	80 µg/m³	Industrial	1 yr
	50 µg/m³	Residential	1 yr
Nitrogen Oxides (measured as $N0_2$)	400 µg/m³	Industrial	1 hr.
	200 µg/m³	Residential	1 hr.
	150 µg/m³	Industrial	24 hr
	60 µg/m³	Residential	24 hr
Total Suspended Particulate	230 µg/m³	Industrial	24 hr
	150 µg/m³	Residential	24 hr
	75 µg/m³	Industrial	1 yr
	60 µg/m³	Residential	1 yr
PM_{10}	70 µg/m³		24 hr
Smoke	150 µg/m³	Industrial	24 hr
	100 µg/m³	Residential	24 hr
	50 µg/m³	Industrial	1 yr
	30 mg/m³	Residential	1 yr
Carbon Monoxide	100 mg/m³		15 min
	60 mg/m³		30 min
	30 mg/m³		1 hr
	10 mg/m³		8 hr
Hydrogen Sulphide	150 µg/m³		24 hr
Mercury	1 µg/m³		1 yr
Lead	2.5 µg/m³		1 yr
Cadmium	10 - 20 ng/m³		1 yr
Manganese	1 µg/m³		24 hr
Dichloromethane (Methylene Chloride)	3 mg/m³		24 hr
1,2-Dichloroethane	0.7 mg/m³		24 hr
Trichloroethane	1 mg/m³		24 hr
Tetrachloroethene	5 mg/m³		24 hr
Toluene	8 mg/m³		24 hr
Arsenic	30 ng/m³	Industrial	24 hr
	15 ng/m³	Residential	24 hr

Substance	Time Weighted Average (TWA)		Averaging Time
Flouride	10 µg/l		24 hr

The Ghana Standard for Health Protection –Requirements for Ambient Noise Control (GS 1222,2018).

ZONE	DESCRIPTION OF AREA OF NOISE RECEPTION	PERMISSIBLE NOISE LEVEL IN dB(A)	
		DAY 0600 – 2200	NIGHT 2200 - 0600
A	Residential areas with low or infrequent transportation	55	48
B1	Educational (school) and health (hospital, clinic) facilities	55	50
B2	Areas with some commercial or light industry	60	55
C1	Areas with some light industry, places of entertainment or public assembly, and places of worship located in this zone	65	60
C2	Predominantly commercial areas	75	65
D	Light industrial areas	70	60
E	Predominantly heavy industrial areas	70	70

The Ghana Standard for Environmental Protection-Requirements for effluent discharge (GS 1212,2019)

Parameter	EPA Recommended Guideline Value
pH	6 – 9
Temperature Increase	<3°C above ambient
Colour	200 TCU
Turbidity	75 NTU
Conductivity	1500 uS/cm
Total Suspended Solids	50 mg/l
Total Dissolved Solids	1000 mg/l
Oil/Grease	5.0 mg/l
Sulphide	1.5 mg/l
Total Phosphorus	2.0 mg/l
Biochemical Oxygen Demand (BOD_5)	50 mg/l
Chemical Oxygen Demand (COD)	250 mg/l
Nitrate	50 mg/l
Ammonia as N	1.0 mg/l
Alkalinity as $CaCO_3$	150 mg/l
Phenol	2.0 mg/l
Mercury	0.005 mg/l
Total Arsenic	1.0 mg/l
Soluble Arsenic	0.1 mg/l
Lead	0.1 mg/l
Total Pesticides	0.5 mg/l
Fluoride	10 mg/l
Chloride	250 mg/l
Sulphate	200 mg/l
Total Coliforms	400 MPN/100ml
E. coli	0 MPN/100ml
Cadmium	0.1 mg/l
Chromium (+6)	0.1 mg/l
Total Chromium	0.5 mg/l
Copper	5.0 mg/l
Nickel	0.5 mg/l
Selenium	1.0 mg/l
Zinc	10.0 mg/l
Silver	5.0 mg/l
Tin	5.0 mg/l
Aluminum	5.0 mg/l
Antimony	5.0 mg/l
Benzo (a) pyrene	0.05 mg/l

(Source: Environmental Protection Agency, Accra 1997)

Checklist of the Mammal and Avifauna of the Denyau, Apamprama and Supuma Forest Reserves

Fauna checklist of Denyau Forest Reserve

FAMILY	COMMON NAME	SCIENTIFIC NAME
AVES		
ACCIPITRIDAE	African Goshawk	Accipeter tachiro
ALCEDINIDAE	Woodland Kingfisher	Halcyon senegalensis
APODIDAE	Common Swift	Apus apus
BUCEROTIDAE	White-crested Hornbill	Tropicranus albocristatus
	African Pied Hornbill	Tockus fasciatus
CAMPEPHAGIDAE	Purple-throated cuckoo shrike	Campephaga quiscalina
CAPITONIDAE	Naked-faced Barbet	Gymnobucco calvus
	Red-rumped Tinkerbird	Pogoniulus atroflavus
	Yellow-throated Tinkerbird	Pogoniulus subsulphureus
	Yellow-rumped Tinkerbird	Pogoniulus bilineatus
	Yellow-fronted Tinkerbird	Pogoniulus chrysoconus
	Hairy-breasted Barbet	Tricholaema hirsute
CISTOCOLIDAE	Red-faced Cisticola	Cisticola erythropus
	Whistling Cisticola	Cisticola lateralis
	Tawny-flanked Prinia	Prinia subflava
	Black-capped Apalis	Apalis nigriceps
	Grey-backed Camaroptera	Camaroptera brachyuran
	Sharpe's Apalis	Apalis sharpie
COLUMBIDAE	Bruce's Green Pigeon	Treron waalia
	Tambourine Dove	Turtur tympanistria
	Red-eyed Dove	Streptopelia semitorquata
CORACIIDAE	Broad-billed Roller	Eurystomus glaucurus
CUCULIDAE	Yellowbill	Ceuthmochares aereus
	Black Coucal	Centropus grillii
DICRUIRIDAE	Fork-tailed Drongo	Dicrurus adsimilis
	Velvet-mantled Drongo	Dicrurus modestus
ESTRILDIDAE	Grey-headed Negrofinch	Nigrita canicapillus
	Magpie Mannikin	Spermestes fringilloides
INDICATONIDAE	Willock's Honeyguide	Indicator willcocksi
MALACOTINIDAE	Black-crowned Tchagra	Tchagra senegalus
MONARCHIDAE	African Paradise Flycatcher	Terpsiphone virdis
	Red-bellied Paradise Flycatcher	Terpsiphone rufiventer
MUSOPHAGIDAE	Green Turaco	Tauraco persa
NECTERINIDAE	Green Sunbird	Anthreptes rectirostris
	Fraser's Sunbird	Deleornis fraseri

	Olive Sunbird	Cyanomitra olivacea
	Collared Sunbird	Hedydipna collaris
	Olive-bellied Sunbird	Cinnyris chloropygius
	Superb Sunbird	Cinnyris superbus
	Splendid Sunbird	Cinnyris coccinigastrus
ORIOLIDAE	Black-winged Oriole	Oriolus nigripennis
PHASIANIDAE	Ahanta Francolin	Francolinus ahantensis
PHOENICULIDAE	Green Wood-hoopoe	Phoeniculus purpureus
PICIDAE	Fire-bellied Woodpecker	Dendropicus pyrrhogaster
PSITTACIDAE	Red-fronted Parrot	Poicephalus gulielmi
PYCNONOTIDAE	Little Greenbul	Andropadus virens
	Simple Leaflove	Chlorocichla simplex
	Swamp Palm Bulbul	Thescelocichla leucopleura
	Leaflove	Pyrrhurus scandens
	Icterine Greenbul	Phyllastrephus icterinus
	White-throated Greenbul	Phyllastrephus albigularis
	Common bulbul	Pycnonotus barbatus
	Western Nicator	Nicator chloris
RALLIDAE	Nkulengu Rail	Himantornis haematopus
	White-spotted Flufftail	Sarothrura pulchra
STRIGIDAE	African Wood Owl	Strix woodfordii
SYLVIDAE	Grey long bill	Macrosphenus concolor
	Green Hylia	Hyliota prasina
	Green crombec	Sylvietta virens
TROGONIDAE	Narina's Trogon	Apaloderma narina
TURDIDAE	Forest Robin	Stiphronis erythrothoras
ZOSTEROPIDAE	Yellow-White eye	Zosterops senegalensis
MAMMALIA		
ARTIODACTYLA	Bushbuck	Tragelaphus scriptus
	Maxwell’s Duiker	Cephalophus maxwelli
	Black Duiker	Cephalophus nigra
	Red river hog	Potamochoerus porcus
CARNIVORA	African civet	Civettictis civetta
	Common genet	Genetta genetta
	Cusimanse Mongoose	Crossarchus obscurus
	Marsh Mongoose	Artilax paludinosus
PHOLIDOTA	Tree Pangolin	Manis tricuspis
PRIMATA	Bossman Potto	Perodicticus potto
RODENTIA	Giant Forest Squirrel	Protoxerus stangeri
	Pel's scaly-tailed squirrel	Anomalurus pelii

	Fire-footed rope squirrel	Funisciurus pyrropus
	Western Tree Hyrax	Dendrohyrax dorsalis

Fauna checklist of the Apamprama Forest Reserve

FAMILY	COMMON NAME	SCIENTIFIC NAME
AVES		
ACCIPITRIDAE	Western Banded snake eagle	Circaetus cinerascens
	African Harrier Hawk	Polyboroides typus
	Dark chanting Goshawk	Melierax metabates
	Shikra	Acciprter badius
ALCEDINIDAE	Woodland Kingfisher	Halcyon senegalensis
	African Dwarf Kingfisher	Ceyx lecontei
	Malachite Kingfisher	Alcedo cristata
APODIDAE	Common Swift	Apus apus
BUCEROTIDAE	White-crested Hornbill	Tropicranus albocristatus
	African Pied Hornbill	Tockus fasciatus
	Piping Hornbill	Bycanistes fistulator
CAPITONIDAE	Bristle-nosed Barbet	Gymnobucco peli
	Naked-faced Barbet	Gymnobucco calvus
	Speckled Tinkerbird	Pogoniulus scolopaceus
	Red-rumped Tinkerbird	Pogoniulus atroflavus
	Yellow-throated Tinkerbird	Pogoniulus subsulphureus
	Yellow-rumped Tinkerbird	Pogoniulus bilineatus
	Yellow-fronted Tinkerbird	Pogoniulus chrysoconus
	Hairy-breasted Barbet	Tricholaema hirsuta
	Double-toothed Barbet	Lybius bidentatus
CISTOCOLIDAE	Whistling Cisticola	Cisticola lateralis
	Short-winged Cisticola	Cisticola brachypterus
	Tawny-flanked Prinia	Prinia subflava
	Black-capped Apalis	Apalis nigriceps
	Grey-backed Camaroptera	Camaroptera brachyura
	Sharpe's Apalis	Apalis sharpii
COLUMBIDAE	Tambourine Dove	Turtur tympanistria
	Blue-spotted Wood Dove	Turtur afer
	African Green Pigeon	Treron calvus
	Western Bronze-naped Pigeon	Columba iriditorques
	Red-eyed Dove	Streptopelia semitorquata
	Laughing Dove	streptopelia senegalensis
CORVIDAE	Pied Crow	Corvus albus
CUCULIDAE	Levaillant's Cuckoo	Oxylophus levailantii
	Klaas's Cuckoo	Chrysococcyx klass

	Yellowbill	Ceuthmochares aereus
	Senegal Coucal	Centropus senegalensis
DICRURIDAE	Fork-tailed Drongo	Dicrurus adsimilis
ESTRILDIDAE	Grey-headed Negrofinch	Nigrita canicapillus
	Green Twinspot	Mandingoa nitidula
	Bronze Mannikin	Spermestes cucullatus
	Magpie Mannikin	Spermestes fringilloides
FRINGILLIDAE	Yellow-fronted Canary	Serinus mozambicus
HIRUNDINIDAE	Rufous-chested Swallow	Cecropis semirufa
MEROPIDAE	Little Bee-eater	Merops pusillus
	White-throated Bee-eater	Merops albicollis
MONOARCHIDAE	Red-bellied Paradise Flycatcher	Terpsiphone rufiventer
MOTACILLIDAE	Africa Pied Wagtail	Motacilla aguimp
MUSCICAPIDAE	Pale Flycatcher	Melaenornis pallidus
NECTARINIIDAE	Olive Sunbird	Cyanomitra olivacea
	Buff-throated Sunbird	Chalcomitra abelberti
	Collared Sunbird	Hedydipna collaris
	Olive-bellied Sunbird	Cinnyris chloropygius
	Superb Sunbird	Cinnyris superbus
	Splendid Sunbird	Cinnyris coccinigastrus
ORIOLIDAE	Black-winged Oriole	Oriolus nigripennis
PASSERIDAE	Northern Grey-headed Sparrow	Passer griseus
PHASIANIDAE	Ahanta Francolin	Francolinus ahantensis
PHOENICULIDAE	Forest Wood-hoopoe	Phoeniculus castaneiceps
PICIDAE	Fine-spotted Woodpecker	Campethera punctuligera
PLATYSTEIRIDAE	Red-cheeked Wattle eye	Dyaphorophyia blisseti
PRIONOPIDAE	Red-billed Helmetshrike	Prionops caniceps
PYCNONOTIDAE	Little Greenbul	Andropadus virens
	Little Grey Greenbul	Andropadus gracilis
	Simple Leaflove	Chlorocichla simplrx
	Swamp Palm Bulbul	Thescelocichla leucopleura
	Common bulbul	Pycnonotus barbatus
	Western Nicator	Nicator chloris
STURNIDAE	Copper-tailed Glossy Starling	Lamprotornis cupreocauda
	Splendid Glossy Starling	Lamprotornis splendidus
SYLVIIDAE	Grey long bill	Macrosphenus concolor
	Senegal Eremomela	Macrosphenus pusilla
	Green Hylia	Hyliota prasina
	Green crombec	Sylvietta virens
TIMALIIDAE	Brown Illadopsis	Illadopsis fulvescens
TURDIDAE	Forest Robin	Stiphronis erythrothoras

	White-tailed Alethe	Alethe diademata
	Brown-chested Alethe	Alethe poliocephala
	Forest Scrub Robin	Cercotrichas leucosticta
	African Thrush	Turdus pelios
ZOSTEROPIDAE	Yellow-White eye	Zosterops senegalensis
MAMMALS		
ARTIODACTYLA	Bushbuck	Tragelaphus scriptus
	Royal Antelope	Neotragus pygmaeus
	Maxwell's Duiker	Cephalophus maxwelli
CARNIVORA	Cusimanse Mongoose	Artilax paludinosus
RODENTIA	Brush-tailed Porcupine	Artherurus africanus
	Giant Pouched Rat	Cricetomya gambianus
	Pel's scaly-tailed squirrel	Anomalurus pelii

Fauna checklist for the Supuma forest reserve.

FAMILY	**COMMON NAME**	**SCIENTIFIC NAME**
AVES		
ACCIPITRIDAE	African Goshawk	Accipeter tachiro
	Red necked	
	Buzzard	Buteo auguralis
	African Palm	
APODIDAE	Swift	Cypsiurus parvus
	Green-backed	
ARDEIDAE	Heron	Butorides striata
	White-crested	
BUCEROTIDAE	Hornbill	Tropicranus albocristatus
	African Pied	
	Hornbill	Tockus fasciatus
	Bristle-nosed	
CAPITONIDAE	Barbet	Gymnobucco peli
	Naked-faced	
	Barbet	Gymnobucco calvus
	Speckled	
	Tinkerbird	Pogoniulus scolopaceus
	Red-	
	rumpedTinkerbird	Pogoniulus atroflavus
	Yellow-throated	
	Tinkerbird	Pogoniulus subsulphureus
	Yellow-	
	rumbedTinkerbird	Pogoniulus bilineatus

	Yellow-spotted	
	Tinkerbird	Buccanodon duchaillui
	Hairy-breasted	
	Barbet	Tricholaema hirsuta
	Vieillot's Barbet	Lybius vieilloti
	Yellow-billed	
	Barbet	Trachylaemus purpuratus
	Tawny-flanked	
CISTOCOLIDAE	Prinia	Prinia subflava
	Grey-backed	
	Camaroptera	Camaroptera brachyura
	Yellow-browned	
	Camaroptera	Camaroptera superciliaris
	Blue-headed	
COLUMBIDAE	Wood Dove	Treron brehmeri
	Tambourine	
	Dove	Turtur tympanistria
	African Green	
	Pigeon	Treron calvus
	Western Bronze-	
	naped Pigeon	Columba iriditorques
	Red-eyed Dove	Streptopelia semitorquata
	Blue-throated	
CORACIIDAE	Roller	Eurystomus gularis
	Red-chested	
CUCULIDAE	Cuckoo	Cuculus solitarius
	Yellowbill	Ceuthmochares aereus
DICRURIDAE	Shining Drongo	Dicrurus atripennis
	Velvet -mantled	
	Drongo	Dicrurus modestus
	Grey-headed	
ESTRILDIDAE	Negrofinch	Nigrita canicapillus
	Chestnut- breasted	
	Negrofinch	Nigrita bicolor
	Rufous-sided	
EURYLAIMIDAE	Broadbill	Smithornis rufolateralis
	Brown-crowned	
MALACONOTIDAE	Tchagra	Tchagra australis
MEROPIDAE	Black Bee-eater	Merops gularis
	White-throated	

	Bee-eater	Merops albicollis
	Red-bellied	
	Paradise Flycatcher	
MONOARCHIDAE		Terpsiphone rufiventer
MUSOPHAGIDAE	Green Turaco	Tauraco persa
	Yellow-billed	
	Turaco	Tauraco macrorhynchus
NECTARINIIDAE	Green Sunbird	Anthreptes rectirostris
	Blue-throated	
	Brown Sunbird	Cyanomitra cyanolaema
	Olive Sunbird	Cyanomitra olivacea
	Buff-throated	
	Sunbird	Chalcomitraabelberti
	Olive-bellied	
	Sunbird	Cinnyris chloropygius
	Black-winged	
ORIOLIDAE	Oriole	Oriolus nigripennis
	Western Black -	
	headed Oriole	Oriolus brachyrhynchus
	Latham's Forest	
PHASIANIDAE	Francolin	Francolinu slathami
	Fire-bellied	
PICIDAE	Woodpecker	Dendropicus pyrrhogaster
PLATYSTEIRIDAE	Chestnut Wattle eye	Dyaphorophyia castanea
PLOCEIDAE	Red-headed Malimbe	Malimbus rubricollis
	Village Weaver	Ploceus cucullatus
	Maxwell's Black	
	Weaver	Ploceus albinucha
	Red-billed	
PRIONOPIDAE	Helmetshrike	Prionops caniceps
	Red-fronted	
PSITTACIDAE	Parrot	Poicephalus gulielmi
PYCNONOTIDAE	Little Greenbul	Andropadus virens
	Slender-billed Greenbul	Andropadus grcilirostris
	Honeyguide Greenbull	Baeopogon indicator
	Swamp Palm Bulbul	Thescelocichla leucopleura
	Icterine Greenbul	Phyllastrephus icterinus
	Grey-headed Bristlebill	Bledacani capillus
	Common bulbul	Pycnonotus barbatus
	Western Nicator	Nicator chloris

	Forest Chestnut-	
STURNIDAE	winged Starling	Onychognathus fulgidus
	Splendid Glossy	
	Starling	Lamprotornis splendidus
SYLVIIDAE	Kemp's longbill	Macrosphenus kempi
	Grey longbill	Macrosphenus concolor
	Green Hylia	Hylio taprasina
	Green crombec	Sylvietta virens
TIMALIIDAE	Brown Illadopsis	Illadopsis fulvescens
ZOSTEROPIDAE	Yellow-White eye	Zosterops senegalensis
MAMMALS		
ARTIODACTYLA	Bushbuck	Tragelaphus scriptus
	Maxwell's Duiker	Cephalophus maxwelli
	Bay Duiker	Cephalophus dorsalis
CARNIVORA	African Civet	civetta civetta
	Cusimanse Mongoose	Artilax paludinosus
PHOLIDOTA	Tree Pangolin	Manis tricuspis
RODENTIA	Brush-tailed Porcupine	Artherurus africanus
	Giant Pouched Rat	Cricetomys gambianus
	Grasscutter	Thryonomys swinderianus
	Fire footed squirrel	Funiciurus pyrropus

Mammallia		
FAMILY	**COMMON NAME**	**SCIENTIFIC NAME**
ARTIODACTYLA	Royal Antelope	*Neotragus pygmaeus*
	Bushbuck	*Tragelaphus scriptus*
	Maxwell's Duiker	*Cephalophus maxwelli*
	Black Duiker	*Cephalophus niger*
	Bay Duiker	*Cephalophus dorsalis*
CARNIVORA	African civet	*Civettictis civetta*
	Kusimanse Mongoose	*Crossarchus obscurus*
	Marsh Mongoose	*Artilax paludinosus*
PHOLIDOTA	Tree Pangolin	*Manis tricuspis*
PRIMATA	Mona Monkey	*Cercopithecus mona*
	Lesser spot-nosed monkey	*Cercopithecus petaurista*
	Ursine Colobus (Black and white)	*Colobus vellerosus*
	Senegal Bushbaby	*Galago senegalensis*
RODENTIA	Brush-tailed Porcupine	*Artherurus africanus*
	Giant Forest Squirrel	*Protoxerus stangeri*
	Giant Pouched Rat	*Cricetomya gambianus*

	Grasscutter (Giant cane rat)	*Thryonomys swinderianus*
	Ground Squirrel	*Xerus rutilus*
	Pel's scaly-tailed squirrel	*Anomalurus pelii*
	Red-cheeked rope squirrel	*Funisciurus leucogenys*
	Fire-footed rope squirrel	*Funisciurus pyrropus*
HYRACOIDEA	Western Tree Hyrax	*Dendrohyrax dorsalis*
AVES		
ACCIPITRIDAE	Congo Serpent Eagle	*Dryotriorchis spectabilis*
	Casin's Hawk Eagle	*Spizaetus africanus*
	Shikra	*Acciprter badius*
ALCEDINIDAE	Woodland Kingfisher	*Halcyon senegalensis*
	Blue-breasted Kingfisher	*Halcyon malimbica*
	Malachite Kingfisher	*Alcedo cristata*
	Giant Kingfisher	*Megaceryle maxima*
BUCEROTIDAE	Black-and-white-casqued Hornbill	*Bycanistes subcylindricus*
	White-crested Hornbill	*Tropicranus albocristatus*
	African Pied Hornbill	*Tockus fasciatus*
CAMPEPHAGIDAE	Red-shouldered cuckooshrike	*Campephaga phoenicea*
CAPITONIDAE	Bristle-nosed Barbet	*Gymnobucco peli*
	Naked-faced Barbet	*Gymnobucco calvus*
	Bearded Barbet	*Lybius dubius*
	Red-rumped Tinkerbird	*Pogoniulus atroflavus*
	Double-toothed Barbet	*Lybius bidentatus*
	Yellow-throated Tinkerbird	*Pogoniulus subsulphureus*
	Hairy-breasted Barbet	*Tricholaema hirsuta*
	Yellow-billed Barbet	*Trachylaemus purpuratus*
CISTOCOLIDAE	Olive-green Camaroptera	*Camaroptera chloeronota*
	Yellow-browned Camaroptera	*Camaroptera superciliaris*
	Oriole Warbler	*Hypergerus atriceps*
	Sharpe's Apalis	*Apalis sharpii*
COLUMBIDAE	Blue-spotted Wood Dove	*Turtur afer*
	African Green Pigeon	*Treron calvus*
	Tambourine Dove	*Turtur tympanistria*
	Western Bronze-naped Pigeon	*Columba iriditorques*
	Afep Pigeon	*Columba unicincta*
	Red-eyed Dove	*Streptopelia semitorquata*
CORVIDAE	Pied Crow	*Corvus albus*
CUCULIDAE	African Emerald Cuckoo	*Chrysococcyx cupreus*
	Klaas's Cuckoo	*Chrysococcyx klass*

	Didric Cuckoo	*Chrysococcyx caprius*
	Yellowbill	*Ceuthmochares aereus*
	Black-throated Coucal	*Centropus leucogaster*
	Senegal Coucal	*Centropus senegalensis*
DICRURIDAE	Velvet-mantled Drongo	*Dicrurus modestus*
EURYLAIMIDAE	Rufous-sided Broadbill	*Smithornis rufolateralis*
ESTRILDIDAE	Grey-headed Negrofinch	*Nigrita canicapillus*
INDICATORIDAE	Spotted Honeyguide	*Indicator maculatus*
MALACONOTIDAE	Sabine's Puffback	*Dryoscopus sabini*
	Many-coloured Bush-shrike	*Chlorophoneus multicolor*
	Brown-crowned Tchagra	*Tchagra australis*
MONARCHIDAE	African Paradise Flycatcher	*Terpsiphone virdis*
	Red-bellied Paradise Flycatcher	*Terpsiphone rufiventer*
MUSCICAPIDAE	Fraser's Forest Flycatcher	*Fraseria ocreata*
	Dusky blue Flycatcher	*Muscicapa comitata*
	Ussher's Flycatcher	*Muscicapa ussheri*
	Olivaceous Flycatcher	*Muscicapa olivascens*
MUSOPHAGIDAE	Green Turaco	*Tauraco persa*
NECTARINIIDAE	Fraser's Sunbird	*Deleornis fraseri*
	Collared Sunbird	*Hedydipna collaris*
	Olive Sunbird	*Cyanomitra olivacea*
	Johanna's Sunbird	*Cinnyris johannae*
	Olive-bellied Sunbird	*Cinnyris chloropygius*
	Superb Sunbird	*Cinnyris superbus*
ORIOLIDAE	Black-winged Oriole	*Oriolus nigripennis*
PHASIANIDAE	Ahanta Francolin	*Francolinus ahantensis*
	Latham's Forest Francolin	*Francolinus lathami*
	Stone patridge	*Ptilopachus petrosus*
PICIDAE	Fire-bellied Woodpecker	*Dendropicus pyrrhogaster*
PLOCEIDAE	Blue-billed Malimbe	*Malimbus nitens*
PSITTACIDAE	Red-fronted Parrot	*Poicephalus gulielmi*
PYCNONOTIDAE	Little Greenbul	*Andropadus virens*
	Cameroon Sombre Greenbul	*Andropadus curvirostris*
	Golden Greenbul	*Calyptocichla serina*
	Honeyguide Greenbul	*Baeopogon indicator*
	Icterine Greenbul	*Phyllastrephus icterinus*
	Simple Leaflove	*Chlorocichla simplrx*
	Swamp Palm Bulbul	*Thescelocichla leucopleura*
	Red-tailed Bristlebill	*Bleda syndactylus*
	Grey-headed Bristlebill	*Bleda canicapillus*

	Common bulbul	*Pycnonotus barbatus*
	Western Nicator	*Nicator chloris*
RALLIDAE	Nkulengu Rail	*Himantornis haematopus*
	White-spotted Flufftail	*Sarothrura pulchra*
STURNIDAE	Forest Chestnut-winged Starling	*Onychognathus fulgidus*
SYLVIIDAE	Grey longbill	*Macrosphenus concolor*
	Lemon-bellied Crombec	*Sylveietta denti*
	Green crombec	*Sylvietta virens*
	Rufous-crowned Eremomela	*Eremomela badiceps*
	Green Hylia	*Hyliota prasina*
TURDIDAE	Forest Robin	*Stiphronis erythrothoras*
ZOSTEROPIDAE	Yellow-White eye	*Zosterops senegalensis*

Annex 5: Incident Report Form

A. DETAILS OF INCIDENT

1. Date: Time:
2. Location of incident (Zone/Area/Building):
3. Name of company/ companies involved:
4. Name of person reported the incident:
5. Name of the person whom reported to:
6. Name of witness(es) :

B. DESCRIPTION OF INCIDENT: (if lengthy, prepare as an attachment)

1. Name of the responsible Supervisor/ Engineer for this job:
2. Name of the other persons involved in the job:
3. What is the category of the incident?

☐ Incident only ☐ First Aid ☐ Medical Treatment ☐ Minor Treatment ☐ Major Injury
☐ Damage to Plant / Equipment/Property ☐ Vehicle Accident ☐ Near Miss ☐ Security (Theft/Violence)

C. SUBSTANDARD ACT(S) / CONDITION(S):

1.
2.
3.
4.

D. IMMEDIATE CAUSE(S)

1.
2.
3.
4.

E. ROOT / UNDERLYING CAUSE(S)

1.
2.
3.
4.
5.

F. CORRECTIVE ACTION(S) TAKEN

1.
2.
3.
4.
5.

G. PREVENTATIVE ACTION(S) TAKEN

1.

2.

3.

4.

5.

H. FURTHER ACTIONS

1.	Is a detailed investigation required :	☐ Yes	☐ No : If No, state why:
2.	Does Risk Assessment need to be reviewed:	☐ Yes	☐ No
3.	Issue of Form 'A' :	☐ Yes	☐ No
4.	Issue of Violation notices:	☐ Yes	☐ No
5.	Issue of Admin Levy :	☐ Yes	☐ No
6.	Is it included in KPI analysis: :	☐ Yes	☐ No
7.	Trainings recommended and for whom:		

I. ATTACHMENTS

☐ **Photos of incident** ☐ **Witness Statement(s)** ☐ **Photos of corrective actions** ☐ **Issue of evidences of (H)**

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Name and Sign	Name and Sign	Name and Sign
Contractor Project Manager	Contractor HSE Staff	SAL HSE Manager
Date:	Date:	Date:

Note:

1. *This form is to be completed by Contractor and a copy sent to Supervising Engineer within 24 hours of the Incident.*
2. *Contractor, Supervisor Engineer and affected worker are to investigate the incident, complete the form of detail investigation and forward it to PCU within 72 hrs. of the incident.*
3. *The Contractor shall verbally notify to Supervising Engineer within thirty (30) minutes of the occurrence of a Days Away From Work Case, Medical Treatment Case, Major Property Damage, or Major Environmental Incident.*
4. *The Contractor shall verbally notify to Supervising Engineer within twenty-four (24) hours of the occurrence of a Restricted Work Day Case, Near Miss Incident, Minor Property Damage, or Minor Environment Incident.*

Annex 6: Incident/Accident Record Form

Company or contractor employee?	Total workdays lost	Description of injury	Cause of accident	Corrective measures to prevent reoccurrence

Incident Data Summary									
No.	**Incident Summary**	**Date**	**Incident Type**	**Status**	**Occupation/Role of victim**	**Part of Body affected**	**Injury**	**Days Absent**	**Reportable to DFI (Yes/No)**
1.									
2.									

Annex 7: Sample Code of Conduct

All the employees of the Contractor and support staff of Supervising Consultant shall adhere to the following Code of Conduct during the execution of the project:

1. **Compliance with Applicable Laws, Rules and Regulations**
    a. All employees shall perform their duties in accordance with the Labour Act, 2003 and other applicable labour laws in Ghana.
    b. Employees/key experts will enjoy freedom of association and expression as defined in the Constitution of Ghana and expressed in Labour Act, 2003 (Act 651) and other labour laws in Ghana.
    c. The Organization will not condone the activities of employees who achieve results through violation of the law or unethical business dealings. This includes any payments for illegal acts, indirect contributions, rebates, and bribery.
    d. The Organization shall not permit any activity that fails to stand the closest possible public scrutiny.
    e. Employees uncertain about the application or interpretation of any legal requirements should refer the matter to appropriate line supervisor
    f. Workers/employees who falsify their ages will be summarily dismissed as the company does not tolerate child and forced labour.
    g. The company will not tolerate any form of child or forced labour from any sub-contractor/employee who practice forced or child labour
    h. Employees are required to report suspected cases of child or forced labour on site to GASSLIP Environmental and Social Specialist, DOVVSU or Municipal/ Metropolitan Assembly

2. **Compliance with Applicable Health and Safety Requirements**
    a. All employees' have the right and duty to ensure safe working conditions to the extent of exercising control over tools, equipment, machinery and processes and to express their views on working conditions that may affect their safety and health. Sub-contractors will do same for their employees
    b. Employees of the Contractor shall be responsible for removing themselves from danger as much as possible whenever they have good reason to believe that there is an imminent and serious danger to their safety or health. They should have the duty so to inform their supervisor immediately.
    c. Employees/key experts will be provided with the appropriate protective gear for the operations or activities and request for same before engaging in any activity associated with the works.
    d. No worker shall be allowed to undertake any work without wearing approved protective clothing/gear.
    e. Workers shall use and take care of personal protective equipment, protective clothing and facilities placed at their disposal and not misuse anything provided for their own protection or the protection of others
    f. First time offenders who are not in the appropriate protective gear will receive a verbal caution, second time offenders will receive a formal written caution, while multiple offenders will receive sanctions ranging from suspensions to dismissal.

g. Except in an emergency, employees, unless duly authorised, should not interfere with, remove, alter or displace any safety device or other appliance furnished for their protection or the protection of others, or interfere with any method or process adopted with a view to avoiding accidents and injury to health.
h. Every employee shall take reasonable care for their own safety and health and that of other persons who may be affected by their acts or omissions at work;
i. Workers shall report to their immediate supervisor, and Health and Safety Officer, any situation which they believe presents a risk and which they cannot properly deal with themselves;
j. Damaged or faulty electrical equipment such as power sockets, leads and appliances are removed from service.
k. Damaged or faulty equipment should be replaced, or repaired by a qualified person as soon as possible.
l. Power points should be protected by safety-shutters, or all vacant power points be covered by plastic plug protectors.
m. Electrical appliances and leads should be kept away from water.
n. All machines and vehicles should be turned off when not in use
o. All employees shall comply with all the safety and health measures prescribed by the employer. Employees should not operate or interfere with plant and equipment that they have not been duly authorised to operate, maintain or use.
p. Employees should not sleep or rest in dangerous places such as scaffolds, railway tracks, garages, or in the vicinity of fires, dangerous or toxic substances, running machines or vehicles and heavy equipment.
q. Supervisors should not assign employees to undertake activities that the later do not have necessary competence, training or certification or that has not been stated in their contract with the Company.
r. Employees should not undertake any assigned activity for which you do not have necessary competence, training or certification or that has not been stated in their contract with the Company.
s. Every employee is encouraged to contribute by integrating environmental sustainability issues as they relate to our industry into our business planning, strategies and decision-making.
t. Employees shall avail themselves for all OHS, HIV/AIDS Gender Based Violence, Emergency Preparedness Training/Sensitization Programmes organized under the project.
u. All Company employees should strive to conserve resources and reduce waste through re-use and other energy conservation measures.

3. Use of Illegal Substances

a. No employee/key expert/sub-contractor shall report to work under the influence of alcohol or any substance considered as illegal under the laws of Ghana including marijuana.
b. No employee shall smoke, consume alcohol or illegal substances while on duty, including lunches and during overtime meals, or on company property.
a. Officers and directors *may* authorize, in advance, the consumption of alcohol for special occasions or for certain business meetings as long as such use is limited and does not violate other legal requirements.

b. No employee shall under any circumstance engage in any work related to the organization under the influence of Alcohol or illegal substances even if consumption is permitted under the exception described above.
c. Employees who violate this smoking and alcohol conduct standard may have their contract terminated.

4. Non- Discrimination

a. Discrimination against any job applicant or employee on the grounds of colour, race, religion, age, nationality, sex, marital or family status, ethnic affiliation, pregnancy, sexual orientation, disability or other reason is prohibited.
b. In certain cases, however, the requirements of safety regulations relating to specific positions/activities within a construction business will take precedence over clause 4(a).
c. We do not employ any person below the legal minimum age (18 years) and will require commitments from suppliers and subcontractors to refrain from such practices
d. Workers are not to undertake any assigned activity for which they do not have necessary competence, training or certification or that has not been stated in their contract with the Company.
e. Recruitment, job transfer and progression, remuneration and training and award of discretionary bonuses when applicable are determined solely by the application of objective criteria, fair and unprejudiced opinion, personal performance and merit.
d. Recruitments, transfers, training, maternity leave and standard terms and conditions will be done in accordance within line Ghana Labour laws.
e. Employees who perceive that they have been discriminated against can seek redress through their supervisor, Environmental, Health and Safety Officer, management and/or the Ministry of Labour and Social Welfare

5. Interaction with Community

a. The Company strives to cultivate a local identity in each of its host communities by setting good corporate citizenship standards, while respecting local sensitivities.
b. The Company will regularly contribute to the economic and social development of communities, and expects all employees to promote human rights and respectful community involvement anywhere it operates.
c. Employees should comply with the norms, laws, rules and regulations applicable to the host communities except in cases where they are in conflict with that of Ghanaan laws.
d. In a case where an employee perceives that the laws, rules and regulations of host communities are in conflict with that of the company, employees are to refer such cases to their supervisor, Environment, Health and Safety Officer or manager for further clarification at the Ministry of Labour and Social Security

6. Sexual Harassment

Sexual Harassment would be considered as unwelcome conduct of a sexual nature which makes a person feel offended, humiliated and/or intimidated. It includes situations where a person is asked to engage in sexual activity as a condition of that person's employment, as well as situations which create an environment which is hostile, intimidating or humiliating for the survivor

a. Sexual harassment is unlawful.
b. This company does not tolerate sexual harassment in any form.
c. Every employee has a responsibility to ensure that sexual harassment does not occur.
d. No employee shall under any circumstance sexually engage another either by the use of words or actions. Some acts that may be considered as sexual include;
    - *an unwelcome sexual advance*
    - *a request for sexual favours*
    - *unwelcome comments about someone's sex life or physical appearance*
    - *sexually offensive comments, stories or jokes*
    - *displaying sexually offensive photos, pinups or calendars, reading matter or objects*
    - *sexual propositions or continued requests for dates*
    - *physical contact such as touching or fondling, or unnecessary brushing up against someone*
    - *Indecent assault, defilement or rape (these are criminal offences).*

e. Any employee who believes he or she has been a target/survivor of sexual harassment is encouraged to inform the offending person orally or in writing that such conduct is unwelcome and offensive and must stop or to report the unwelcome conduct as soon as possible to a supervisor, management or the environmental and social officer of GASSLP representative on the Project Grievance Redress Committee or the nearest DOVVSU or Police Station
f. Reports of sexual harassment will be treated promptly, seriously and confidentially.
g. Complainants have the right to determine how a complaint will be treated and knowledge of the outcome of investigations.
h. Anyone found to have sexually harassed another person will be handed over to the Family Support Unit of the Ghana Police Force.
i. No employee will be treated unfairly as a result of making a complaint of sexual harassment. Immediate disciplinary action will be taken against anyone who victimizes or retaliates against someone who has made a complaint of sexual harassment.
j. For the purposes of reporting and dealing with sexual harassment and crimes, the Company will provide a hot line to a management level personnel for reporting cases of sexual abuse and harassment.
k. Rape, defilement and assault cases shall be reported to FSU of the Ghana Police Force by survivor or other employees'

7. Violence or Exploitation

a. No employee shall bear any weapon on site unless he/she has been authorized and have a legitimate business reason to do so. Even so, this will have to be with the permission of the appropriate supervisor, manager and conformity with the laws of Ghana.
b. The company is committed to maintaining a safe and secure workplace and working environment. Acts or threats of physical violence, intimidation, harassment or coercion, stalking, sabotage, and similar activities are not tolerated.
c. Employees who engage in acts or threats of violence, outside of self-defense, shall be dismissed and handed over to the Police Station.
d. Employees are expected to treat all individuals with respect, tolerance, dignity and without prejudice to create a mutually respectful and positive working environment.

8. Protection of Children

a. As much as possible, employees' are to avoid bringing any person under 18 to work on the project site) unless with permission from Environment, Health and Safety Officer.
b. Every employee shall himself be responsible for the safety and wellbeing of any person under age 18 years brought to work by them. *Physical contact with children can be misconstrued both by the recipient and by those who observe it, and should occur only when completely nonsexual and* otherwise appropriate, and never in private.
c. One-on-one meetings with a child or young person are best held in a public area; in a room where the interaction can be (or is being) observed; or in a room with the door left open, and another employee or supervisor is notified about the meeting.
d. Avoid any covert or overt sexual behaviors with children on site. This includes seductive speech or gestures as well as physical contact that exploits, abuses, or harasses.
e. Employees are to provide safe environments for children and youth at all times on site

9. Sanitation Requirement

a. The company shall provide and maintain sanitary facilities (according to building regulations) for all employees to ensure their total health and safety. All such facilities shall be labelled with inscription in English for the understanding of every employee.
b. Every employee/key expert shall be responsible for the appropriate use of sanitary facilities including toilets, bathrooms and refuse bins/skip containers where provided.
c. No employee shall resort to other inappropriate means of defecation or urination (open defecation or indiscriminate disposal of refuse or urination on the company's compound or project site) apart from what has been prescribed by the company.
d. Any act of indecency with respect to the use of sanitary facilities shall attract punitive actions including suspensions or even dismissals.

10. Avoidance of Conflict of Interest

a. The Company expects that employees will perform their duties conscientiously, honestly, and in accordance with the best interests of the Organization.
b. Employees/key experts must not use their positions or the knowledge gained as a result of their positions for private or personal advantage.
c. Regardless of the circumstances, if employees sense that a course of action they have been pursued, or are presently pursuing, or are contemplating pursuing may make it difficult to perform the work objectively, they should immediately communicate all the facts to their supervisor.
d. An Employee or a member of his or her immediate family shall not receive improper personal benefits as a result of his or her position in the Company.
e. Any situation that involves, or may reasonably be expected to involve, a conflict of interest with the Company should be disclosed promptly to supervisors/ managers.

11. Protection and Proper Use of Property

a. All employees unless otherwise directed are responsible for the proper acquisition, use, maintenance and disposal of company assets (e.g., materials, equipment, tools, real property, information, data, intellectual property and funds) and services. Acquisition of assets should be in compliance with procurement standards of the company.
b. Any act of theft, carelessness, and waste on the part of an employee shall attract sanctions including the termination of one's work contract.

c. Every employee shall do their part to protect the company's assets and ensure their efficient use.
d. Unless otherwise permitted by management, Company guidelines and procedures, the appropriation of Company property by employees for personal use, or for resale is strictly prohibited.
e. Similarly, you are not permitted to use your authority over other employees to use Company resources for personal benefit.
f. On termination of and at any other time during your employment when requested you must hand over Company's assets and records stored in whatever format or medium.
g. The Company strictly prohibits any access, usage or disclosure of employees' personal data without legitimate authorization. Employees should note that the Company reserves the right to retrieve their e-mails transmitted via the Company e-mail accounts and to monitor your use of the Internet.
h. Every employee shall use company assets only for legal and ethical activities.

12. Report of Violation of Code of Conduct

a. Employees should promote ethical behavior and encourage other employees to talk to supervisors, managers or other appropriate personnel when in doubt about the best course of action in a particular situation.
b. In order to protect our organization from unethical or illegal activity, it is your duty and obligation at all times to be watchful of the practices that you see occurring around you, to take reasonable steps to prevent or detect improper conduct, and to report any suspicion of fraudulent, abusive, unethical or illegal activity.
c. All reports of misconduct or unethical behavior, conflict of interest, or illegal activity are to be handled as confidential and be treated seriously and discreetly.
d. Employees may report anonymously should that be their preference.
e. In the event of a grievance being raised to a manager relating to discriminatory behaviour or harassment, the manager must notify Human Resources immediately, irrespective of how trivial the complaint may appear.

13. Non-Retaliation

a. The company will not tolerate any act of retaliation against anyone who, in good faith, reports known or suspected unethical or illegal misconduct, seeks advice, raises a concern, or provides information in an internal or external investigation or legal proceeding pertaining to the company.
b. Allegations of retaliation will be investigated, as appropriate.
c. Acts of retaliation (which may include firing or laying off, demoting, denying overtime or promotion, disciplining, denying benefits, failing to hire or rehire, intimidation or making threats) may lead to disciplinary action against the person responsible for the retaliation, up to and including termination of contract.
d. Any employee who believes he/she has experienced retaliation, should report to his/her supervisor, manager or the Environmental and Social Officer GASSLIP.
e. Any false accusation of retaliation would attract disciplinary actions even to the extent of termination of contract.

Implementation of Code of Conduct

a. The Environment, Health and Safety Officer of the Contractor will be responsible for implementing and enforcing the Code of Conduct, while monitoring
b. The following measures will be adopted to implement the Code of Conduct:
    - The Consultant will ensure that all employees/key experts and sub-contractors are given copies of the Code of Conduct for reference.
    - All employees on the assignment will be made to sign the Code of Conduct.