



MINISTRY OF FOOD AND AGRICULTURE

West African Food System Resilience Project (FSRP2)

**UPDATED ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR
THE REHABILITATION AND MODERNISATION OF THE KPONG IRRIGATION
SCHEME (KIS)**

ESIA REPORT

January 2024

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CHPS	Community Health Planning Services
CILSS	Permanent Interstate Committee for Drought Control in the Sahel
CLTS	Community-Led Total Sanitation
CSIR	Council for Scientific and Industrial Research
CWR	Crop Water Requirement
DA	District Assembly
DDSWCD	District Department of the Social Welfare and Community Development
DOVVSU	Domestic Violence and Victim Support Unit
DWQG	Drinking Water Quality Guideline
EA	Environmental Assessment
EAR	Environmental Assessment Regulation
EHS	Environmental, Health, and Safety
EHSR	Environmental, Health and Safety Representative
EHSO	Environmental, Health and Safety Officer
EHSSO	Environmental, Health, Safety and Security Officer
EIA	Environmental Impact Assessment
EPA	Environmental Protection Agency
ESF	Environmental and Social Framework
ESIA	Environmental and Social Impact Assessment
ESIS	Environmental and Social Impact Statement
ESMF	Environmental and Social Management Framework
ESMP	Environmental and Social Management Plan
ESS	Environmental and Social Standard
FAO	Food and Agriculture Organization
FASDEP	Food and Agriculture Sector Development Plan
FSRP	Food System Resilience Project
FSSM	Farmer Support Services Manager
GAP	Gender Action Plan
GCAP	Ghana Commercial Agricultural Project
GEL	Golden Exotics Limited
GIDA	Ghana Irrigation Development Authority
GPS	Ghana Police Service
GNFS	Ghana National Fire Service
GS	Ghana Standard
HDPE	High Density Polyethylene
IFC	International Finance Corporation
ISO	International Organization for Standardization
JHS	Junior High School
KIS	Kpong Irrigation Scheme
KVIP	Kumasi Ventilated Improved Pit

LC	Lands Commission
LI	Legislative Instrument
LMKMA	Lower Manya Krobo Municipal Assembly
LUSPA	Land Use and Spatial Planning Authority
MC	Main Canal
METASIP	Medium Term Agriculture Sector Investment Plan
MoFA	Ministry of Food and Agriculture
MOM	Management Operation and Maintenance
MPA	Multi-phase Programmatic Approach
NAAQG	National Ambient Air Quality Guidelines
NANLG	National Ambient Noise Level Guidelines
NCCP	National Climate Change Policy
NEQG	National Environmental Quality Guidelines
NLCD	National Land Cover Database
NRSC	National Road Safety Commission
NSR	Night Storage Reservoirs
OACS	Osudoku Agricultural Co-operative Society
PHC	Population and Housing Census
PNDC	Provisional National Defence Council
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
RoW	Right of Way
SEA	Sexual Exploitation and Abuse
SDG	Sustainable Development Goals
SGB	Stakeholder Governing Board
SH	Sexual Harassment
SME	Scheme Management Entity
SRI	Soil Research Institute
SODA	Shai Osudoku District Assembly
UNFCCC	United Nations Framework Convention on Climate Change
VIS	Vea Irrigation Scheme
VRA	Volta River Authority
VREL	Volta River Estates Limited
WB	World Bank
WHO	World Health Organization
WRI	Water Research Institute
WRC	Water Resources Commission
WSC	Western Supply Canal
WUA	Water Users Association

EXECUTIVE SUMMARY

The Government of Ghana (GoG) has secured funding from the World Bank to undertake the Food System Resilience Project (FSRP2) under the World Bank Multi-phase Programmatic Approach (MPA) for Investment Project Financing Instrument. The FSRP2 is expected to be implemented over a 5-year period and aims to boost preparedness against food insecurity and improve the resilience of food systems in Ghana. The program will be implemented in collaboration with the Economic Community of West African States (ECOWAS), the Permanent Interstate Committee for Drought Control in the Sahel (*Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel*, CILSS) and the West and Central African Council for Agricultural Research and Development (*Conseil ouest et centre africain pour la recherche et le développement agricoles*, CORAF).

Under the FSRP2, Ministry of Food and Agriculture (MoFA) intends to complete some outstanding activities started under the Ghana Commercial Agriculture Project (GCAP; P114264, P162525), specifically to complete the rehabilitation of Kpong Irrigation Scheme (KIS) located in the Greater Accra and Eastern Regions of Ghana.

Given that the ESIA for the KIS under the Ghana Commercial Agriculture Project (GCAP) was prepared under the World Bank Operational Policies (OPs) and since the FSRP2 was prepared under the World Bank Environmental and Social Framework (ESF), there is a need to revise the ESIA to comply with the requirements of the relevant World Bank Environmental and Social Standards (ESSs). This ESIA also seek to understand the concerns of stakeholders during the initial rehabilitation phase and to improve the process where necessary.

Policy, Regulatory and Institutional Framework

In line with the Environmental Assessment (EA) Regulations, 1999 (LI 1652) the Environmental Protection Agency (EPA), was duly informed about the update of the ESIA studies. The ESIA, in general is intended to assess and mitigate potential adverse environmental and social risks and impacts, while enhancing the project benefits, as the basis for consideration for the required environmental approval for the proposed project.

The key policy, regulatory and institutional requirements reviewed and applied in the assessment, mitigation and management plans included the following broad themes: it would have been useful to add dates for the various policies because some of them are more than one

1. National environmental policy and requirements;
 - a. Ghana's National Environmental Policy, 2012 · National Climate Change Policy, 2013
 - b. Environmental Protection Agency Act, 1994 (Act 490)
 - c. Plants and Fertilizer Act, 2010 (Act 803)
 - d. Environmental Assessment Regulations, 1999 (LI 1652)
 - e. Fees and Charges (Amendment) Instrument, 2019 (LI 2386)
 - f. Ghana National Climate Change Master Plan Action Programmes for Implementation (2015–2020)

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- g. Ghana Standard on Health Protection - Requirements for Ambient Noise Controls (GS 1222:2018)
 - h. Ghana Standard on Environment and Health Protection - Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236:2019)
 - i. Ghana Standards for Environment Protection-Requirements for Effluent Discharge (GS 1212:2019)
2. Water and irrigation sector policy and requirements;
 - a. National Irrigation Policy, Strategies and Regulatory Measures, 2011
 - b. National Water Policy, 2007
 - c. Water Resources Commission Act, 1996 (Act 522)
 - d. Dam Safety Regulations, 2016 (LI 2236)
 - e. Water Use Regulations, 2001 (LI 1692)
 - f. Irrigation Development Authority (Irrigation Water Users Association) Regulations, 2016 (LI 2230)
 - g. The Irrigation Development Authority Regulations, 1987 (L.I. 1350)
 3. Framework for national planning and development;
 - a. Food and Agriculture Sector Development Policy (FASDEP II)
 - b. Land Use and Spatial Planning Act, 2016 (Act 925)
 - c. Local Governance Act, 2016 (Act 936)
 - d. Ghana Investment Promotion Centre Act, 2013 (Act 865)
 - e. Renewable Energy Act, 2011 (Act 832)
 - f. New Ghana Building Code, (GhBC; GS 1207), 2018
 4. Land requirements;
 - a. The National Land Policy, 1999
 - b. The Land Act, 2020 (Act 1036);
 - c. Lands Commission Act, 2008 (Act 767);
 5. National labour, safety and health requirements;
 - a. National Workplace HIV/AIDS Policy, 2004
 - b. National HIV and AIDS, STI Policy, 2013
 - c. Factories, Offices and Shops Act, 1970 (Act 328)
 - d. Labour Act, 2003 (Act 651)
 - e. The Children's Act 1998, Act 560
 - f. Ghana National Fire Service Act, 1997 (Act 537)
 - g. Control and Prevention of Bushfires Act, 1990 (PNDCL 229)
 - h. Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)
 - i. Public Health Act 2012, Act 851
 - j. Persons with Disability Act, 2006 (Act 715)
 - k. Fire Precaution (Premises) Regulations 2003, LI 1724
 - l. Hazardous, Electronic and Other Wastes, Control and Management Regulations, 2016 (LI 2250);
 - m. Workmen's Compensation Law 1987 (PNDCL 187);
 - n. Gender Policy, 2015;
 - o. Child and Family Welfare Policy, 2015
 6. International requirements and Risk Management policies;
 - a. World Bank Group Environmental and Social Framework;

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- b. World Bank Group General Environmental, Health and Safety Guidelines;
 - c. Sustainable Development Goals (SDGs);
 - d. United Nations Framework Convention on Climate Change;
 - e. Basel Convention;
 - f. Rotterdam Convention;
7. Relevant institutions
 - a. Water Resources Commission;
 - b. Ghana Irrigation Development Authority;
 - c. Ministry of Food and Agriculture; and
 - d. Plant Protection and Regulatory Services Directorate.
 - 8.

Project Description

The KIS scheme comprises Sections A, B, and C with a farming area of about 4,052 ha out of which 4,040 ha is currently under predominantly small holder rice and large-scale banana cultivation. The main beneficiary communities are Akuse and Amedeka in the Lower Manya Krobo Municipality of the Eastern Region and Asutsuare, Klebuse, Natriku, Dzogbodzi, Lubuse, Volivo, Osuwem, and Dormeliem in the Shai Osudoku District of the Greater Accra Region.

The planned scope of work under GCAP covered the rehabilitation and modernization of the major irrigation and drainage structures in Sections A and B; and the rehabilitation of the Re-lift pump station, which lifts water from a branch canal for irrigation in Section C. The modernisation aspect involves the installation of instrumentation and automated gates. However, the planned scope of works was not attained due to reduced project funding for KIS. Part of the funds initially earmarked for KIS rehabilitation was released to fund emergency works at Tono Irrigation Scheme (TIS) in the Upper East Region involving the repairs of the broken Tono Dam Spillway, which was not initially planned.

The summary of the proposed works at KIS to be carried out under FSRP2 will include:

- Main canal (Akuse Main Canal) - Lining of 4.7km out of 16km; and clearing/ desilting of the remaining length.
- Branch (secondary) Canals:
 - Section A: Complete Branch canal lining (AK/C1, AK/C2 & AK/C3, length – 10.5km)
 - Section B: Lining of the unlined (earthen) sections of the branch canals to transform them from sectional/partial concrete lining to continuous into full-lined sections (length – 9km)
- Infield channels/laterals: Complete conversion of open unlined channels to pipe canals (Semi California System, Length of pipe - 62km)
- Rehabilitation of Kpong farms 105 ha (works include land development)
- Main/Access Roads and In-field farm roads/tracks: Complete the rehabilitation of Main roads (length – 30km) and farm roads (length –148km)

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

- Automation and instrumentation of the irrigation system
- Completing the rehabilitation of drainage works and protective dyke in Section B
- Ancillary works; road and drainage structures

The project is scheduled to be completed within thirty (30) months, made up of eighteen (18) months construction period and twelve (12) months defects notification period (DNP), using the most appropriate equipment and human resources with an estimated 250 construction workforce.

Analysis of Alternatives

Several options were considered throughout the project design stages to present the most feasible alternatives. These alternatives were considered according to their suitability to meet the project objectives. The alternatives were based on technology, water sources and conveyance, and materials to be used among others. The alternatives under consideration are as follows:

- Agriculture development scheme;
- Water supply options; and
- No action option.

The alternative consideration and the associated preferred option have been captured in the Table below

Alternative Considerations

No	Alternative Consideration	Category of Options	Preferred Option
1.	Solely large-scale commercial agriculture	Agriculture development scheme	A combination of large scale commercial and smallholder farming systems will be utilised to bring enhanced benefits to the neighbouring communities.
	Smallholder Farming System with support from investor		
	Combination of large scale commercial and smallholder farming systems		
2.	Rain-fed	Water Supply	Combination of rain-fed and irrigation has been considered as the preferred option to ensure all year-round cultivation, reduce production cost associated with full dependence on irrigation and to take advantage of the benefits of both options and reduce the negative effects
	Irrigation		
3.	No Action	-	This option is not preferred due to the negative impacts on food security, livelihoods and the general social and

No	Alternative Consideration	Category of Options	Preferred Option
			economic impacts on the local and national economy. The existing GIDA irrigation facilities at the project site will remain underutilised.

Baseline Conditions

A description of the existing environment and social conditions, comprising the bio-physical and socio-economic conditions of the project areas. (i.e., Shai Osudoku and the Lower Manaya Krobo Municipalities. The baseline information includes:

1) Physical Environment -

- Climatic conditions;
- Geology and soil;
- Drainage and surface water resources;
- Water quality;
- Ambient air quality; and
- Noise levels.

2) Biological Environment -

- Aquatic ecology; and
- Terrestrial flora.

3) Social Environment -

- Demographic characteristics;
- Education;
- Employment and industry;
- Ethnicity and religion;
- Agriculture;
- Water supply;
- Health and sanitation;
- Gender
- Tourism; and
- Cultural heritage.

Stakeholder Engagement

The Environmental Assessment (EA) Regulations, 1999 (LI 1652) underscore the need for stakeholder consultations in the EA process. Regulation 12(k) enjoins proponents to consult with people likely to be affected by the operations of their undertaking. The World Bank Environmental and Social Standard 10 (ESS 10) requires the borrower to engage with stakeholders throughout the project life cycle. ESS 10 also recognises the importance of effective community engagement through disclosure of project-related information and

consultation with local communities on matters that directly affect them. The institutions and communities engaged were:

a) Institutions: -

- Environmental Protection Agency (EPA);
- Ghana National Fire Service (GNFS);
- Domestic Violence and Victim Support Unit (DOVVSU) of the Ghana Police Service;
- Ghana Irrigation Development Authority (GIDA); and
- Water Resources Commission (WRC);

b) Local Government Institutions: -

- Shai Osudoku Municipal Assembly (SODA);
- Lower Manya Krobo Municipal Assembly (LMKMA);
- Shai Osudoku Municipal Health Directorate;
- Lower Manya Krobo Municipal Health Directorate;
- Shai Osudoku Municipal Directorate of Ministry of Food and Agriculture;
- Lower Manya Krobo Municipal Directorate of Ministry of Food and Agriculture;
- Shai Osudoku Municipal Social Welfare Department; and
- Lower Manya Krobo Municipal Social Welfare Department.

c) Project Communities: -

- Asutuare farming community;
- Kasunya farming community;
- Lubuse farming community;
- Volivo farming community;
- Dzogbedzi farming community;
- Baba Edey farming community;
- Atlorbinya Farming community; and
- Akuse farming community.

d) Farmer Based Organisations: -

- Kpong Farms;
- Scheme Management Entity of KIS; and
- Water User Associations (WUAs) of KIS.

e) Other Institutions: -

- Traditional Authority.

The highlights of the engagement outcomes are listed below:

1) *Environmental Protection Agency*

- A technical committee meeting on the update of the ESIA and ESMPs for KIS concluded that given that the existing ESIA and ESMP prepared under GCAP

is less than 5 years (2018) and that projects activities would not change much, it is expected that baseline conditions and relevant stakeholders would not change much. However, to satisfy funding requirement, 5 copies of the updated ESIA Report should be submitted to the Agency for the renewal of the KIS Environmental Permit.

2) *Ghana Irrigation Development Authority*

- More watering troughs should be provided on the schemes at designated watering points along the main canal for cattle grazing within the project area of influence.
- Designated crossing points for cattle should be provided across the canal to prevent using farm roads by the cattle.
- Toilet facilities should be constructed on the scheme. The Water User Associations should be engaged on where to site the toilet facilities.
- Closing the scheme entirely during rehabilitation would disrupt the livelihoods of farmers with implications on their financial conditions. This could be mitigated by phasing the rehabilitation work so that not all farm plots are shut at the same time”.

3) *Domestic Violence and Victim Support Unit of the Ghana Police Service*

- Cases of Gender-based Violence exist in the Shai Osudoku District, however, the incidence is low from cases reported. Sensitisation is key to encourage reporting and prevent the practise; and
- The DOVVSU and the Social Welfare and Community Development Departments of SODA and LMKMA could help with sensitisation if the project calls upon them.

4) *Agric Directorate (SODA and LMKMA)*

- The District MoFA provides support services for the farmers on the scheme by way of training in the areas of agro-chemical application, cultural practices, post-harvest handling of farm produce, through extension officers. The regularity and frequency of such trainings are hampered by limited funds and the inadequate number of extension officers for predominantly farming population of the two administrative districts;
- Increasing capacity of the department with more extension personnel and providing funds for training activities would increase efficiency of the department; and
- Non-availability of farm machinery makes it difficult for farmers to get the assistance needed. The Directorates have made some progress in assisting farmers get machinery from private individuals and organisations outside the district.

5) *Ghana National Fire Service – Shai Osudoku*

- Incidents of bush fire are not common in the Project Area. Rice farming which dominates the area is done in the swamps, hence less fire prone.
- The district fire service station is always ready to combat any issue of bush fire.
- Training of fire brigades in the various communities is a necessity as the number of fire stations in the district is woefully inadequate.

6) *Shai Osudoku District and Lower Manya Krobo Municipal Assemblies*

- There are concerns of the length of the rehabilitation period as it has implication on the livelihood of the farmers, as experienced in the rehabilitation of phase 1 under GCAP. Farming communities on the scheme should be notified well in advance of commencement of construction works;
- The delay in the rehabilitation work on section A has really affected farmers the current condition under which they farm increases the cost of farming; and
- The municipalities have the architecture to sufficiently manage the influx of migrant workers during the construction works, as has been demonstrated during the rehabilitation works in phase 1 under GCAP.

7) *Project Communities*

- Concerns were raised about the open defecation along the canals which are washed into main drains or canals whenever it rains. This contaminates the source of drinking water for some communities.
- Extension officers give training on chemical application and post-harvest losses. However, most farmers do not comply, forcing the WUA heads to institute sanctions by way of fines against defaulting farmers.
- Cattle invasion is mainly the result of lack of and the inadequate number of cattle crossing points and drinking troughs respectively at designated areas. Members complained of the consistent invasion of the cattle on their farms which usually result in conflicts between farmers and herdsman. Farmers usually commit additional resource to employ people to protect their farms from the invasion of the cattle.
- The inadequate number of drinking troughs has resulted in cattle drinking water at the community water collection points, contaminating the water with faecal matter.
- Grievances from farmers are channelled through the WUA executives to management of the KIS scheme. Each WUA has a Dispute Settlement Committee that settles disputes among farmers. In the case of inter-farmer disputes from different WUA sections, the Federation Dispute Settlement Committee resolves the conflicts.
- The rehabilitation of the scheme should be phased so that not all farmers would have to halt farming at the same time. During the rehabilitation, farmers who would have to halt farming should be compensated and considered for roles in the workforce.

Potential Impact, Mitigation and Monitoring Measures

The project impacts are grouped into beneficial and adverse impacts. The potential benefits include:

1. Enhance agriculture production;
2. Local employment opportunity;
3. Economic benefits to the project area;
4. Increased climate change adaptation; and
5. Improvement in revenue base of institutions and regulatory bodies.

The adverse impacts include:

1. Livelihood disruption (temporal);
2. Impacts on surface and ground water resources;
3. Waste handling and disposal impacts;
4. Greenhouse gas emission and climate change impacts;
5. Occupational health and safety risks;
6. Community health and safety impacts;
7. Noise and vibration impacts;
8. Impacts of cattle invasion on project infrastructure;
9. Biodiversity impacts;
10. Infringement on labour rights;
11. Potential use of child labour;
12. Gender-Based Violence and Sexual Exploitation;
13. Socio-cultural impacts; and
14. HIV AIDS and other STI Transmission.

Environmental impact/risk:-

1. Impacts on surface and ground water resources;
2. Waste handling and disposal impacts;
3. Greenhouse gas emission and climate change impacts;
4. Biodiversity impacts;
5. Noise and vibration impacts

Social impacts: -

6. Livelihood disruption;
7. Occupational health and safety risks;
8. Community health and safety risks;
9. Impacts of cattle invasion on project infrastructure;
10. Infringement on labour rights;
11. Potential use of child labour;
12. Gender-based violence and sexual exploitation and abuse;
13. Socio-cultural impacts; and
14. HIV AIDS and other STI transmission.

Livelihood Disruption

The closure of the portions of the scheme, mainly the Section A command area and portions of Section B will lead to the disruption of livelihoods for the duration of the construction/rehabilitation period. The key groups of persons/entities to be impacted by the closure of the scheme for rehabilitation works include farmers of Section A command area, Kpong Farms, private entities/individual vegetable farmers who are serviced by pumping water from the closest canal, and communities close to the section A command area who rely on water from the canal for potable purposes.

Closing the Section A command area for the 18-months construction period will deny 1,028 farmers, of which 332 are females, the opportunity to farm for three seasons. This is expected to result in the serious loss of revenue and the attendant ability to take care of their dependents as farming is their main source of livelihood. Closure of Section A will also result in the loss of job to farmhands who earn their living working on these farms. Businesses that are involved in the value chain including rice millers, marketers would also be affected as quantities of rice harvested in the scheme reduce. The situation would be exacerbated in the event of extension of the construction period as a result of any delay.

The private entities and individuals who rely on the canal water for vegetable farming would also be deprived of their usufructuary rights. The vegetable farming economy in the project area will also be heavily impacted with implication on loss of livelihoods as a result of the unavailability of water.

It is certain that the canals in section A and parts of section B will be closed to accommodate construction activities. This closure poses a high likelihood of disrupting livelihoods and denying access to usufructuary rights. Furthermore, due to the medium-term duration (18 months) of the construction activities, the impact is ranked high.

Impacts on Surface and Ground Water Resources

The main water resource that could be impacted by the rehabilitation and modernisation and operation of KIS is the Volta River and its tributary, the four (4) drainage lagoons (Kasu, Klebwe, Lupu & Nyapie) and groundwater. The potential sources of impacts on the Volta River and its tributaries and the four lagoons as a result of the rehabilitation and operation of the scheme will include:

Construction Phase: -

1. Clearing and excavation work for the construction of irrigation structures;
2. Construction of irrigation and drainage infrastructure;
3. Servicing of machinery and equipment on-site; and
4. Leakages of fuel in storage.

Loose soil particles on the cleared land surface and stockpiled excavated spoil could be eroded and washed in runoff into the drainage channels during rainfall. The drainage channels and groundwater contamination could also result from spilled waste oil during vehicle and equipment servicing or from accidental spill or leakage of fuel during fuelling.

Furthermore, poorly managed construction site camps and indiscriminate disposal of waste will create unsightly conditions. Open defecation may be promoted if adequate toilet facilities are not provided at camps and the project site during construction. Faecal matter from open defecation by construction workers, may be washed in run off into nearby waterbodies and ultimately the Volta River, thus affecting the water quality. The likelihood of the occurrence of the impact of construction activities on water resources is moderate, medium-term and of moderate significance lasting for 18 months of the construction phase.

The following are the sources of impact to the water resources during the operations phase:

- Erosion from farmlands may result in the transport of soil sediments into canals which may further travel into nearby streams and rivers;
- Pollution of surface water sources through the transport of agrochemicals in runoff;
- Eutrophication of surrounding water bodies through transport of nutrient rich sediments; and
- Possible pollution of groundwater through the percolation of agrochemicals through the soil.

The likelihood of impact is high and the duration may be long-term lasting throughout the lifespan of the project, therefore the significance is ranked high.

Waste Handling and Disposal Impacts

The development of the KIS project will generate different types of waste at both the construction and operation phases. Major waste types to be generated during the construction phase could include:

- Vegetative waste, excavated soil and topsoil removal from land clearing and preparation activities;
- Packaging materials, pieces of wood, bricks, cables, glass, metals, concrete and other construction wastes from the construction and rehabilitation works of roads, drains, canals, etc.;
- Domestic solid waste – food packaging materials, plastics, papers, leftover food, cans, bottles, etc. from construction workers.;
- Silt, etc. from clearing and preparation of the lateral canals for reconstruction or rehabilitation and the lagoons;
- Pieces of pipes and damaged fittings from the upgrading lateral and sub lateral canals;
- Liquid wastes – faecal matter and urine from construction workers;
- Spent oils and lubricants from the maintenance and repairs of construction equipment maintenance; and
- Scrap wastes – discarded engine components, batteries, and worn-out tyres, etc. from maintenance of construction vehicles.

The effect of improper disposal of vegetative waste, excavated spoil, construction, domestic and liquid wastes as well as spent oils and other waste would be expected to be localised and

temporal lasting over the 18 months construction period. The potential siltation of the drains, susceptible fires (from dried vegetative waste) and contamination of water resources could result in public health issues, hence, the significance of improper waste handling and disposal at the construction phase is ranked moderate.

The anticipated waste types to be generated during the operation phase of the project are:

- Domestic solid waste - food packaging materials, plastics, papers, leftover food, food scraps, cans, bottles, etc.;
- Liquid waste – Faecal matter, urine, wastewater from farmers;
- Crop residue (stalks, stems, leaves, roots, husks, seeds, branch etc.) from harvesting and post harvesting activities;
- Agrochemical waste – containers and bags from used pesticides by farmers; and
- Silt from periodic desilting of drains, canals and lagoons.

Given the small quantity of domestic and crop residue to be generated, the effects of improper waste disposal may be minimal, however, given the health effects of inappropriate disposal of liquid and agrochemical wastes, the significance of waste handling and disposal impact at the operation phase is ranked moderate.

Greenhouse Gas Emissions and Climate Change Impact

Agriculture contributes to climate change and is affected by climate change. Agricultural related emissions of carbon dioxide account for around 24% of global greenhouse gas emissions. The greenhouse gases with the largest contribution to rising temperature are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). CO₂ emissions come from activities such as tilling of fields, planting of crops, and even the shipment of crops or food cultivated to markets for revenue (USDA, 2022).

Farming in particular releases significant amounts of CH₄ and N₂O, two significant greenhouse gases. CH₄ is produced by the cultivation of paddy rice and can also escape from stored manure. N₂O emissions are an indirect product of organic and mineral nitrogen fertilisers (European Environmental Agency 2021).

Factors that will contribute to GHG emissions and Climate Change associated with the project have been listed below:

Construction Phase

- Haulage of construction materials

Operation Phase

- Transportation of agriculture produce
- Cultivation of paddy rice
- Burning of crop wastes

With the rehabilitation works, construction and excavation activities will be short term since some works have already been done and only needs some form of rehabilitation for the full operationalization of the KIS. Thus, the use of machinery and other equipment will be limited to the construction phase, and the haulage of construction materials would make a low general contribution to GHG emissions, in spite of the 18-month construction period. The significance of the carbon footprint from these emission sources at the construction phase to the nationally determined contribution of GHG emission is assessed to be low.

Although transportation, agriculture (rice production) and burning of crop wastes contribute significantly to climate change, Ghana's contribution to global climate change is negligible. Moreover, the project is a climate change adaptation project making available water delivery for all year rice production. The contribution of the project to climate change at the operations phase is ranked moderate in terms of significance.

Occupational Health and Safety Risks

Hazards arising from the rehabilitation of the Kpong irrigation scheme could impair the health and well-being of workers. These could be in a form of falls, burns, loud machinery noise, traffic collisions or knockdowns, animal bites, etc. Some of these are usually unexpected. The occupational health and safety risks at both the construction and operation phases could be associated with the following sources:

- Noise and vibration;
- Air quality;
- Accidents and injury from the use of machinery;
- General accidents (trips, falls, abrasion); and
- Attack or bite from snakes, scorpions and insects within the site.

Potential sources at the operation and maintenance phase could arise from:

- Exposure to agrochemicals (through storage, handling, application, etc.);
- Poor maintenance of open canals; and
- Operations at the farm areas.

The likelihood of occurrence of accidents from the use of construction machinery and attacks from reptiles due to the clearing activities is considered moderate as the land is already being cultivated. However, given the 18-month construction phase the significance of the impact is ranked moderate.

The long-term exposure of workers to persistent organic pollutants from the inappropriate usage of agrochemicals in the operations phase could pose several health implications. The likelihood of occurrence is moderate. The significance of the impact on endangering the lives of workers throughout the project life cycle is ranked high.

Community Health and Safety Impacts

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

The rehabilitation and modernization of the irrigation scheme will pose health and safety risks to the community at the construction, operation, and maintenance phases.

The potential sources of community health and safety risks during the construction phase could include:

- Noise and vibration;
- Impacts on air quality;
- Movement of haulage trucks along communities;
- Risk of drowning from unsecured excavations (i.e., canals, laterals and drains) and abandoned borrow pits; and
- Proliferation of disease-borne vectors
- Excessive spillage of dam water and dam failure.

Malaria, knockdowns by haulage trucks and drowning could be on the rise during the construction phase of the project. The likelihood of occurrence of the impact is moderate and the significance of impact also ranked moderate.

The potential source of public health and safety risks at the operation and maintenance phase could arise from inappropriate post-harvest management practices. Exposing agricultural produce to certain poor conditions can affect its quality and pose health risks to the public, both in the short and long term. The likelihood of such occurrences is considered moderate, and the significance also ranked moderate.

In the event of excessive spillage or unlikely dam break, an estimated 30,000 people would be potentially affected with the likely outcome being the loss of lives and displacement of communities. Dam break could be the result of physical and hydrological pressure from excessive water flow above the design capacity of the dam walls. Excessive spillage on the other hand could arise from uncontrolled released of water in the reservoir. To ensure dam safety, the Volta River Authority (VRA) has instrumentation on the dams to measure physical and hydrological data daily, weekly and monthly. There is in place an early warning system which monitors the inflows into Akosombo reservoir so that they could know in advance if there would be potential spill to be able to advise the necessary stakeholders ahead of time.

Noise and Vibration

The potential sources of noise and vibration during the construction phase could arise from:

- Use of construction machinery
 - Land preparation;
 - Rehabilitation of access roads and drains;
 - Excavation of drains, etc.; and
- Movement and honking of haulage trucks along communities.

Potential sources at the operation and maintenance phase could emanate from operations at the farmlands.

The simultaneous use of machines in the same area during construction works could result in cumulative noise levels that could exceed the prescribed limits. Workers will be exposed to noise levels ranging from 33.5dB to 73.5dB within a 15m working radius from these sources. Exposure of workers to such noise levels could cause stress, interfere with communication and concentration, and contribute to workplace accidents and injuries by making it difficult to hear warning signals.

Increased noise from civil works often goes along with vibration effects. The exposure duration of noise and vibration would be short-term and intermittent. However, the sensitive receptors could be adversely affected by the noise therefore, the significance of the noise impact is ranked moderate. For vibration, although the intensity to the public will be minimal, they could still experience annoyance and stress due to their proximity. Hence, the significance of the vibration impact is ranked moderate.

The impact of noise from the operation at the farms will largely be localized and (short term) and experienced by the workers mostly, therefore the significance of the impact is ranked low.

Impacts of Cattle Invasion on Project Infrastructure

The inadequate number of cattle watering troughs and the lack of designated areas for cattle crossings to the only available watering trough on the scheme has resulted in the uncontrolled movement of cattle to the command areas often leading to:

- The destruction of key project infrastructure such as bank of canals and laterals;
- Destruction of crops leading to conflict; and
- Contamination of canal water.

The likelihood and significance of the impact of the cattle invasion of the project and project infrastructure is ranked high.

Biodiversity Impacts

The rehabilitation works will involve clearing of vegetation (aquatic weeds, shrubs, grass and trees) from the canals and drains prior to the commencement of the civil works and earthworks. The construction activities are also expected to create borrow pits from which aggregates will be extracted, thereby leading to vegetation loss and related issues.

Vegetation loss is certain, but will only be localised as the vegetation forms part of a homogeneous vegetation cover in the larger area of which the project site is only a fraction. Thus, the vegetation is not endemic to the site. Moreover, farming and other anthropogenic factors have reduced plant species' richness and abundance considerably, while fauna species are rarely encountered. The animals on the project site, including snakes, grasscutters, and squirrels, among other rodents will migrate to nearby bushes during project implementation.

Since much of the vegetation on the project site has been highly modified, attributable to farming activities, biodiversity impacts induced by this project is expected to be low in significant.

Infringement on Labour Rights

The activities associated with the implementation of the project will require both formal and informal workers, the latter usually having no form of agreement or condition of employment, making them susceptible to infringement on their rights. The main sources of infringement of labour rights during the project implementation at both the construction and operation phase could include:

- Non-issuance of employment contracts to workers;
- Unfair compensation for workers;
- Inability of workers to organize; and
- Marginalisation of women and Persons Living with Disability (PLWD).

Informal workers stand the greater risk of labour rights infringement compared to their formal counterparts, due to the informal nature of their work and its inherent precarious characteristics. Again, women and PLWDs may be discriminated against in any employment opportunities that could be suitable to them on the grounds of male preference in the industry. Although the Labour Act exists to protect the rights of all categories of workers, informal employers do not usually adhere to its provisions and are rarely sanctioned for any breeches. Therefore, the likelihood and significance of infringement on labour rights is ranked high.

Farmers on the scheme sometimes engage farmhands in an informal basis to support them on their farms. Any informal worker hired could be subjected to the labour rights infringements due to the casual nature of their employment. The nature of work is such that contracts of farmhands come to an end at each planting season. The likelihood and significance of infringement on labour rights at the operation and maintenance phase are both ranked moderate given the transient nature of the contract.

Potential Use of Child Labour

The potential source of use of child labour at the construction phase could be children being engaged in menial activities such as carrying loads, pushing wheelbarrows, stone pitching etc. during the construction of irrigation and drainage structures, etc.

At the operation phase children could be employed or made to:

- Engage in farming activities such as planting, harvesting, etc.; and
- Sell the produce of farms at the market centres.

Due to poverty, children could be prodded by their parents/guardians to seek employment during the construction phase as a means of getting some money to fend for themselves and their family. However, the employment of children on formalised construction projects that involve the use of heavy equipment are generally low, hence the likelihood of children being

employed is very low. The significance of the impact is ranked moderate considering the health and developmental effects (including deformities and cutting them off school) on victims of the child labour.

On the basis of the allotted 30-day period for land preparation and planting activities under the KIS cropping plan, much labour would be needed during these activities, particularly for the planting activities which requires about 25 to 30 persons per hectare (ha)/day. To adhere to the schedule of the KIS cropping pattern, farmers could engage the services of the minors in Akuse, Asutsuare and other neighbouring communities including their own children. They could also engage the services of these children during harvesting periods, which would require about 30 workforce per hectare.

Although some parents of the project communities may coerce their children into labour activities such as farming and selling of foodstuffs at market centres during school hours, the formal management of KIS by a SME and WUA makes the likelihood of child labour occurring during the operation phase low, however, the significance of impact is also ranked moderate as the effects are detrimental with far-reaching and long-term consequences.

Gender-Based Violence and Sexual Harassment

The potential sources of gender-based violence and sexual harassment at the construction and operation phase could include:

- Employers soliciting for sexual favours from female job seekers;
- Supervisors/workers sexually harassing/abusing female colleagues; and
- Male workers sexually harassing/abusing women and girls in the community.

Women who are employed as part of the project's labour force may be at risk of gender-based violence and sexual exploitation from their colleagues/supervisors, especially where the workforce is likely to be male dominated as the agricultural sector has more males than females. Where women are employed, they are usually few and often have to endure or capitulate to sexual abuse by colleague workers and superiors. Sexual favours may be solicited for employment and the rejection of such favours by women usually results in denial of employment opportunities. Hence, women who are in dire need of employment may succumb to such advances.

The presence of migrant workers in the community could also attract local women and girls who would want to cook, clean and provide other services which can place them at risk of GBV and SEA/SH. Close interactions between workers on the project and local communities may result in cases where some workers could commit sexual abuse or have sexual intercourse with women and underage community girls resulting in pregnancies, single parenthood and economic hardship for the women and girls.

The likelihood of occurrence of gender-based violence during the construction phase is moderate and the significance ranked high considering the long-term consequential effects.

Since women in male-dominated sectors and informal work are more at risk of GBV, women who may seek employment as farmhands during planting and harvesting could be faced with solicitations of sexual favours by the employer before they are hired. Women who deny such advances are likely to miss out on an employment opportunity. Where women are employed, they may have to endure or capitulate to sexual abuse/harassment by colleague workers and superiors. The likelihood of occurrence of GBV at the operations phase is low considering the number of workers likely to be employed, however, the significance is ranked high, as victims may suffer serious physical health and emotional problems, in the long term.

Socio-cultural Impacts

Mondays are regarded as scared days for the gods and ancestors in the project area, and farming and other activities in the project area on Monday is prohibited. The observance of the sacred day is a cultural value upheld in the project communities. Construction schedule will be carried out throughout the week (including Mondays) in order to meet the construction timelines. Some of the construction workers (mostly the skilled workforce) are likely to migrate from urban centres, such as Accra, Tema and Koforidua to the project community during the construction period. The migrant workers may not be aware of the cultural beliefs, norms and practices of the host communities and could flout or disregard the cultural beliefs, norms and practices of the project communities.

Breaking of local cultural norms and taboos could offend the sensibilities of the inhabitants of the project communities. This could lead to a potential conflict between residents and workers; the situation could result in community agitations and further result in the delay of the project implementation schedule. The formalised nature of contractors to be engaged for the construction works make the likelihood of breaking cultural norms low, thus the significance is ranked moderate given the consequences that could arise as a result of impact occurrence.

At the operational phase, most of the beneficiary farmers would come from the two project districts and would be accustomed to the local cultural norms and values, hence, a low likelihood of the farm workers breaking local cultural norms and values and thus the significance is ranked low.

HIV/AIDS Transmission Risks

The HIV prevalence rate for the Eastern Region is 2.4%, which is much higher than the national prevalence rate of 1.69% (National HIV Fact Sheet, 2019). In comparison, the prevalence rate for the Shai Osudoku and Lower Manya Krobo Districts are high at 1.57% and 5.68% respectively (National HIV Fact Sheet, 2019). The prevalence rate of the Shai Osudoku District and Lower Manya Krobo Municipality could go even higher than the current rate with the likely increased prevalence of the project communities. For fear of stigmatisation, workers who may be HIV positive may hide their status and could engage in unprotected sexual acts, contributing to the spread of infection. Workers who contract HIV could increase the risk of spread, as they can travel elsewhere and possibly engage in sexual relations.

Thus, any occurrence of HIV transmission could potentially spread regionally and even nationally, with long term effects. The likelihood of transmission occurrence is moderate although the migrant population likely to settle in the project communities is expected to be few. However, the significance of the risk is high due to the national epidemic status of HIV/AIDS.

Table 1 below provides the sources or causes of impact, the mitigation and monitoring measures to the assessed impacts.

Table 1: Impacts, Mitigation and Monitoring Measures

Source of Risk/Impact	Mitigation Measures	Monitoring Measures
Livelihood Disruption and Denial of Usufructuary Rights		
<ul style="list-style-type: none"> Closure of the irrigation scheme (shutting the canal to water delivery) to make way for rehabilitation works Denial of usufructuary rights to locals 	<ul style="list-style-type: none"> Notification of farmers and project communities well in advance of rehabilitation works Creation of a bye pass for water delivery Phasing the rehabilitation works to allow farming to go on Grievances/concerns by local communities, traditional authorities, livestock owners and cattle herders would be resolved prior to and during construction works. 	<ul style="list-style-type: none"> Review records of minutes of engagement with farmers on commencement of construction works Impromptu check on field for water availability Review effectiveness of phased construction works Review records for complaints made, those resolved and those unresolved and follow-up action.
Impacts on Surface and Ground Water Resources		
<ul style="list-style-type: none"> Clearing and excavation work for the construction of irrigation structures; Construction of irrigation and drainage infrastructure; Servicing of machinery and equipment on-site Leakages of fuel in storage Erosion with associated sedimentation Use of agro chemicals 	<ul style="list-style-type: none"> Excavated material to be stockpiled and covered with tarpaulin to be used for backfilling Periodic water quality monitoring Maintenance and fuelling activities to be restricted to a designated area, which would be concreted and provided with collection sump Plot layout pattern would follow soil conservation measures and will include field drains along the least slope within the field. Use of approved agrochemicals at the recommended application rate Proper disposal of chemical containers 	<p>Inspect the schedule of work and integrity of tarpaulin</p> <p>Review results of water quality monitoring and compare results with baseline values</p> <p>Check containers of chemicals for adherence. Check for oil spillage on site</p> <p>Inspect drain for adequacy.</p> <p>Check for the disposal of agrochemicals</p>
Waste Handling and Disposal Impacts		
<p><i>Construction Phase</i></p> <ul style="list-style-type: none"> Land clearing and excavation works. 	<p><i>Vegetative Waste and Excavated Spoil</i></p> <ul style="list-style-type: none"> Vegetative waste will be made available to the communities for use as fuelwoods and fencing materials. 	<ul style="list-style-type: none"> One time review of distribution records

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<ul style="list-style-type: none"> • Indiscriminate handling and disposal of waste generated at the construction phase. • Inappropriate disposal of oily waste • Indiscriminate disposal of liquid waste 	<ul style="list-style-type: none"> • Excavated material will be used for reclamation, backfilling of roads canals, embankments, etc. • Covering of stockpiled materials with tarpaulin <p>Segregated Waste</p> <ul style="list-style-type: none"> • Domestic waste will be segregated into appropriate colour coded waste bins. • Recyclable materials will be collected by accredited recycling companies. • Special waste containers will be transferred to a designated and accredited waste handling companies. • Green Bin will be collected by an accredited waste management company. <p>Oily Waste</p> <ul style="list-style-type: none"> • Development and designation of an impervious platform as maintenance area for machinery and equipment servicing. • Provision of temporary oil waste tanks. <p>Liquid Waste</p> <ul style="list-style-type: none"> • Provision of mobile toilet units for construction workers • Sanction will be applied to workers who engage in open defecation practices 	<ul style="list-style-type: none"> • Monthly inspection of records of quantities of material used. • Impromptu inspection of use of tarpaulin and its effectiveness • Impromptu checks on availability of bins and adherence to waste segregation • Monthly review of records of waste collected. • Quarterly review of records of special waste collected. • Monthly review of records of waste transferred. • One time inspection of availability of maintenance area • Impromptu inspection of adherence to use restricted area. • Monthly review of records of waste oil stored <p>Quarterly review of -</p> <ul style="list-style-type: none"> • Adequacy of toilet facility provided. • Records of offenders and sanctions applied
<p>Operation Phase</p> <ul style="list-style-type: none"> • Indiscriminate handling and disposal of waste generated at the operation phase. 	<p>Segregated Waste</p> <ul style="list-style-type: none"> • Provision of two-coloured waste bins for the farmers • Recyclable materials will be collected by accredited recycling companies. • Green Bin will be collected by an accredited waste management company. <p>Oily Waste</p>	<ul style="list-style-type: none"> • Impromptu checks on availability of bins and adherence to waste segregation • Weekly review of records of collected waste.

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<ul style="list-style-type: none"> • Indiscriminate disposal of liquid waste • Indiscriminate disposal of agrochemical containers • Indiscriminate disposal of waste from crop residue • Silt from periodic desilting of drains, canals and lagoons 	<ul style="list-style-type: none"> • Provision of designated maintenance area with impervious surface as workshop • Waste oil tank will hold spent oils and will be returned to the suppliers as and when the tanks are full. <p>Liquid Waste</p> <ul style="list-style-type: none"> • Use of existing septic tank facilities at offices by staff of SME • Periodic dislodging of septic tank <p>Agrochemical Waste</p> <ul style="list-style-type: none"> • Farmers to be educated and trained on the management of agrochemical waste such as triple rinsing and perforation of used chemical containers • Containers will be collected and stored for disposal accredited waste management company <p>Crop Residue</p> <ul style="list-style-type: none"> • Crop residues will be tilled into the soil to improve the soil structure and organic matter content <p>Silt</p> <ul style="list-style-type: none"> • Desilted material to be dumped directly into carriages and transported for disposal by an accredited waste management company 	<ul style="list-style-type: none"> • One time inspection of availability of maintenance area • Impromptu inspection of adherence to use restricted area. • Monthly review of waste oil stored and collected. <p>Quarterly -</p> <ul style="list-style-type: none"> • Inspection of hygienic state of toilets and location • Review of records of dislodge and state of tanks. <p>Review of records of -</p> <ul style="list-style-type: none"> • Training programmes mounted for farmers on management of agrochemical waste and containers. • Quantities of waste containers collected and disposed of <ul style="list-style-type: none"> • Impromptu inspection of crop residue tilled into the soil <ul style="list-style-type: none"> • Impromptu checks on direct dumping • Review of records of waste collected for disposal
Greenhouse Gas Emission and Climate Change Impacts		
<p>Construction Phase</p> <ul style="list-style-type: none"> • Vegetation clearing • Haulage of construction materials 	<ul style="list-style-type: none"> • Support to Forestry Commission (FC) to protect and improve degraded condition of a Forest Reserve in the Eastern or Greater Accra Region Days as a bio-offset approach 	<ul style="list-style-type: none"> • Review of record for support given to Forestry Commission • Review maintenance records of machinery and equipment for adherence to maintenance schedule to date maintenance records

<p>Operation Phase</p> <ul style="list-style-type: none"> • Haulage of agricultural produce • Greenhouse gas emission from paddy rice cultivation • Burning of crop wastes 	<ul style="list-style-type: none"> • Scheduled maintenance of construction machinery and equipment • Cultivation of improve rice varieties that produces less methane gas due to their low rates of organic matter decomposition. • Alternative wetting and drying for rice production 	<ul style="list-style-type: none"> • Review of quantities of improved rice varieties cultivated. • Review the adequacy of the alternative wetting and drying method for rice production in terms of yield produced
<p>Occupational Health and Safety Impacts</p>		
<p>Construction Phase Accidents/injury as a result of human- machine interface</p> <ul style="list-style-type: none"> • Attacks/bite from snakebites and insects within the site • Exposure to dust, other emissions and noise 	<ul style="list-style-type: none"> • Installation of a rollover/protection system on machinery • Cautioning operators of machinery to always wear seat belts. • Training of operators on defensive driving • Provision and usage of PPE e.g., helmets, safety boots • Provision of First Aid Box • Training of workers on First Aid • All accidents/injuries/near misses and training to be reported, recorded and documented. • Use of banksmen on-site to supervise the movement of trucks. • Installation of caution notices onsite • Anti-snake venom made available at the nearest hospital to protect workers. • All trucks/equipment to follow scheduled maintenance regime. • Daily toolbox meeting for safety orientation for all workers • Appropriate PPE supplied and used - nose masks, safety goggles, safety overalls. • Haulage trucks to be covered with tarpaulin 	<ul style="list-style-type: none"> • Weekly checks on availability and effective use of installed rollover/protection system on machinery • Impromptu checks on use of seat belts by operators • Monthly review of training records • Impromptu checks on provision and use of PPE • Monthly checks on the provision of a fully equipped First Aid Box • Monthly review of training records • Monthly review of records on accidents/near misses and trainings organized • Impromptu checks on the use of banksmen onsite • Weekly checks on availability of caution notices • Monthly checks on the availability of anti-venom at the nearest hospitals • Monthly review of records of snakebites/injuries • Review the effectiveness of toolbox meetings quarterly • Inspect records for quantities of PPEs supplied to workers monthly • Impromptu checks on haulage trucks on adherence to the use of tarpaulin • Impromptu checks on the use of earplugs and hand gloves

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	<ul style="list-style-type: none"> • Use of earplugs/earmuffs and high dexterity hand gloves • Operators of machinery and vehicles will be required to switch off idling engines. • Padded seats will be fitted in mobile equipment and worn-out pads promptly replaced to limit the effect of vibration transmission to drivers. • Operators of heavy-duty machinery and equipment such as bulldozers, compactors, and backhoes to take intermittent breaks after every 4-hour operation 	<ul style="list-style-type: none"> • Impromptu checks on machine operators for idling engines • Checks on use and records of replacement of padded seats • Records of schedules of machine operators operators
<p>Operation Phase</p> <ul style="list-style-type: none"> • Exposure to agrochemicals and malaria • Operations at farm areas 	<ul style="list-style-type: none"> • Training on the importance of the use of PPE e.g., hand gloves • Practice of regular handwashing to avoid ingestion of agrochemicals. • Posting readable and pictorial fire safety signs like “No Smoking”, “Switch-off Engines”, “Mobile Phones Off”, emergency hotlines, etc. conspicuously at the fuel storage and fuelling areas • Ensuring prompt cleaning of accidental spills and fixing leakages • Securing a fire certificate from the GNFS • Provision of fire assembly points 	<ul style="list-style-type: none"> • Review records forfarmer training on PPE usage • Impromptu checks on provision and use of PPE • Quarterly review of records of agrochemical poisoning • Monthly inspection of legibility and adequacy of caution signages • Impromptu inspection of storage area and conditions of fuel containers • Annual inspection of availability of GNFS fire permits for each site • One time check on availability of Fire Assembly Point
<p>Community Health and Safety Impacts</p>		

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<p>Construction Phase</p> <ul style="list-style-type: none"> • Movement of haulage trucks along communities • Risk of drowning from unsecured excavations (i.e., canals, laterals • Improperly covered trenches <p>Operation Phase</p> <ul style="list-style-type: none"> • Inappropriate post-harvest management practices 	<ul style="list-style-type: none"> • Erection of road signs before commencement of construction works. • Adherence to the 30km/hr speed limits in the community • Training of truck drivers on defensive driving • Provision and use of communication devices (handheld transceivers/cell phones) to report on accidents/anomaly in the vehicle. • Installation of perimeter fences to prevent falls into excavated pits. • Geo-reference and map borrow pits created and progressive reclamation of borrow pits using a well-developed plan. • Installation of pictorial warning signages prohibiting swimming in irrigation canals • Work with, Scheme management, traditional authorities and security to enforce by-laws. • Enforcement of security at the site to prevent unauthorized entries. • Education of farmers on the proper application of agro chemicals and storage of farm produce 	<ul style="list-style-type: none"> • One-time check on availability and visibility of road signs • Monthly check on the adherence to the 30km/hr speed limit • Monthly review of training records • Monthly check on the provision and use of communication devices for drivers • Impromptu checks on integrity of the perimeter fence • Impromptu checks on adherence to reclamation of borrow pit • Quarterly checks on the availability of warning notices • Monthly review of records of security breaches • Review records for training mounted for farmers. <p>Review of storage records</p>
<p>Noise and Vibration</p>		
<p>Construction Phase</p> <ul style="list-style-type: none"> • Use of construction machinery 	<ul style="list-style-type: none"> • Idle machinery to be switched off • Scheduled maintenance of machinery • Provision of PPE including earplugs for workers • Vibration reduction gloves to be provided for handheld equipment operators. • Padded seats will be fitted in mobile equipment and worn-out pads replaced. 	<ul style="list-style-type: none"> • Daily checks that idle engines are off • One-time review of records of servicing • Impromptu checks on provision and use of PPE • Weekly review of records of provision and use of vibration reduction gloves • Monthly check of seats for padding

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<ul style="list-style-type: none"> • Movement and honking of haulage trucks along communities. 	<ul style="list-style-type: none"> • Four-hour shift system for operators of noisy and vibratory equipment • Haulage truck drivers to avoid unnecessary honking when moving within the community. • Scheduling of truck movements to avoid continuous exposure to noise. • Unnecessary operation of construction machinery to be avoided 	<ul style="list-style-type: none"> • Daily review of records of operators' shifts • Weekly review of haulage records • Weekly engagement with residents to find out if drivers comply. • Monthly review of records of construction schedule
Impact of Cattle Invasion on irrigation Infrastructure		
<p>Inadequate number of cattle watering troughs</p> <p>Lack of designated crossing points</p>	<ul style="list-style-type: none"> • Establish 4 sites as cattle watering points at designated points. • Provide designated crossing points in consultation with herders. • Continuous engagement of herders on adherence to staying out of the command areas • Sanctions in the form of fines to herders who stray to the command areas. 	<ul style="list-style-type: none"> • Review adequacy of watering troughs • Review adequacy of designated crossing point • Review engagement records with cattle herders on staying out of the command area. • Review records of grievances filed and resolved
Impacts on Biodiversity		
<p>Vegetation clearing</p> <p>Raw materials extraction</p>	<p>Biodiversity offset discussed under Greenhouse gas emission.</p> <p>Aggregates and raw materials to be extracted from approved areas</p>	<p>Discussed under greenhouse gas emissions.</p> <p>Checking for Environmental Permit of quarry and borrow pit for aggregates extracted</p>
Infringement of Labour Rights (Construction and Operation Phase)		
<ul style="list-style-type: none"> • Non-issuance of employment contracts to workers • Unfair compensation to workers • Inability of workers to organise. 	<ul style="list-style-type: none"> • Issuance of employment contracts to all categories of workers to indicate. <ul style="list-style-type: none"> ○ Worker compensation equal to or above the national minimum wage ○ Equal compensation for both male and female workers on same schedule ○ Clauses to promote formation of workers' union and collective bargaining. 	<ul style="list-style-type: none"> • Review of employment contract of employees • Review of payment records for the payment of social security

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<ul style="list-style-type: none"> • Marginalisation of women and PWD 	<ul style="list-style-type: none"> • Prohibition of unsanctioned overtime work and compensation for sanctioned overtime work • Employment of women and PLWDs where feasible • Provision of adequate and suitable PPEs for workers with disability • Provision of adequate access aids for workers with disability • Provision of adequate separate sanitary facilities for women and workers with disability 	<ul style="list-style-type: none"> • Impromptu checks after working hours compulsory overtime. • Review records of workers for the number women and PLWD • Review incidences register for accidents and near misses. <p>Review of records for supply of PPE and working amenities</p>
Potential Use of Child Labour		
<p>Construction and Operation Phases</p> <ul style="list-style-type: none"> • Children engaged in menial activities such as carrying loads, pushing wheelbarrows and stone pitching. 	<ul style="list-style-type: none"> • Undertake community and farmer education against child labour. • Undertake impromptu monitoring of construction activities to eliminate all forms of child labour. • Ensure children are withdrawn from the site immediately. • Grievance Mechanism for child labour issues is established and matter taken through the process. • Refer case to appropriate authorities within the area (DDSWCD of MoGCSP or DOVVSU of the Ghana Police Service) • Provide support to parents through job to cater for children. • Undertake sensitisation of local communities on the grievance mechanism developed for the project and the need to resort to the grievance mechanism developed where children are concerned. 	<ul style="list-style-type: none"> • Review records of education programmes mounted, content and participants. • Regular checks of contracts of workers • Impromptu checks of project site for the presence of child labour • Review records for cases involving child labour, those withdrawn and reported and follow up action. • Check regularly at hazardous sites of the workplace for the presence of children. • Check hours of work for light work activities Ensure contractors supplies know the requirements of the project. • Review of content, participants and methodology and frequency of sensitization of local communities on Project Grievance Mechanism
Gender-Based Violence and Sexual Harassment (Construction and Operation Phase)		
<ul style="list-style-type: none"> • Employers soliciting for sexual favours from female job seekers. • Supervisors/workers sexually harassing/abusing female colleagues. 	<ul style="list-style-type: none"> • Workers will be provided with extensive education on human rights, while ensuring each worker signs onto a code of conduct developed by the contractor that incorporate human right clauses. 	<ul style="list-style-type: none"> • Review of content, participants and methodology and frequency of sensitization of local communities on Project Grievance Mechanism • Yearly review of records of code of conduct signed.

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<ul style="list-style-type: none"> Workers sexually harassing or abusing women and girls 	<ul style="list-style-type: none"> A grievance mechanism (GM) to report sexual harassment and abuse, and other human rights violations will be implemented for the prevention of gender-based violence (Section 9.7). Sensitization of the project communities as part of stakeholder consultation, on the need to resort to the GM to address issues that may come up The contractor will dismiss all perpetrators of GBV and SEA/SH and incidences of GBV and SEA/SH are reported. Victims will be advised and referred to a desk that handles related issues at the Ministry of Gender, Children and Social Protection (MoGCSP) for counselling and further guidance or a third-party service such as NGOs, or CBO working on GBV issues where available in the community 	<ul style="list-style-type: none"> Review of grievances received, and number of issues resolved and follow up action taken Review of records of culpable workers dismissed and follow up action taken. Review of records of victims aided in accessing support from identified bodies.
<p>Socio Cultural Impacts</p>		
<ul style="list-style-type: none"> Breaking of cultural norms, taboos and practices leading to potential conflicts 	<ul style="list-style-type: none"> Ground truthing of the project site to be conducted for the presence of any cultural heritage. FSRP to bear the full cost of pacification rites to be performed to make up for the working on sacred days Prioritisation of locals and people in the SODA and Lower Manya Krobo Municipality for employment Migrant construction workers will be sensitised on the cultural norms and values of the project communities. Representatives of the project contractor will participate in cultural rites and festivals of the project communities. 	<ul style="list-style-type: none"> Review records for cultural heritage sites on the project Inspection of records of items presented and money paid for pacification rites Review of employee records for percentage of locals recruited. Review records of breaches to cultural practices/norms Inspection of records of cash and money presented for festivals of project communities
<p>Risks of Transmission of HIV /AIDS and other STIs</p>		

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<ul style="list-style-type: none"> • Potential migrants settling in the project communities. • Increase in commercial sex workers and prostitution leading to potential risk of HIV spread • Refusal to test for HIV due to fear of stigmatisation 	<ul style="list-style-type: none"> • Awareness creation among workers on HIV/AIDS prevention programmes • Provision of condoms at accessible and convenient locations for workers; • Incorporation of the workplace HIV/AIDS policy into working conditions to prevent discrimination or stigmatisation. • Refusal of employment or dismissal would not be based on HIV status; • Testing for HIV to be encouraged to know one's status • Due care and confidentiality will be exercised in handling information on HIV status of workers 	<ul style="list-style-type: none"> • Review types and number of awareness programmes organised and records of attendance. • Checks for availability and supply of condoms to workers • Review policy implementation • Review number of educational campaigns organised. • Review the number of leaflets distributed
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Grievance Mechanism

The Grievance Mechanism (GM) of FSRP was adopted for the rehabilitation and modernisation of the KIS. This GM provides special attention to accessibility of the GM to the disadvantaged and vulnerable individuals or groups who may have issues/grievances about the project or be affected by rehabilitation activities during implementation. The prime objectives of the grievance process are to ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants by using Alternative Dispute Resolution (ADR) approach and avoid the need to resort to judicial proceedings at the courts. Specifically, the GM:

- Provides affected people with avenues for making a complaint and/ or resolving any dispute that may arise during the course of the implementation of the project;
- Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants;
- Helps community members build relationship of trust with the project staff and reduces social risk, and enables more responsive and responsible management;
- Ensures transparency in dealings amongst stakeholders including affected parties through a proper communication system; and
- Provide avenue for vulnerable groups and victims of SEA/SH to have equal access to grievance redress process and support.

Grievance Committee Structure

The Grievance Committees will be established to operate at two levels, namely. the Regional and MMDAs levels, that is the Regional Grievance Committee (RGC) and the District Grievance Committee (DGC). These will be assisted by Focal Person, the Agriculture Extension Agent (AEA). The RGCs will serve as a referral point where issues that are not resolved at the DGC level are referred to for settlement. Individual complainants who do not obtain satisfactory outcomes would have the opportunity to proceed to the Court of Law.

Mode of Making and Receiving Complaints

A person or group of persons that are affected or have concerns with the Project activity will have access to initiate a complaint with the designated offices/officers at the community level or with the DGC. Where the complainant cannot write, the issue can be narrated to the receiving officer who will write the issues out. It will be read to the complainant to accept the content before recorded in the Complaints Logbook. Apart from direct submission of complaint/grievance to a designated office/ officer, the complainant can have the issue of concern written and submitted through any of the receiving avenues listed as follows:

- Referral pathway – Online Form;
- Contact numbers;
- E-mail system – separate email address for grievance mechanism;
- Bulletin Boards/Notice Boards; and
- Complaint boxes at the site.

Grievance Process

The GM implementation will follow clearly defined steps/processes. Individuals will bring forward grievances and disputes related to the project through the provided channels or in

person to the GC that have been established in the project Districts and Focal Persons. The general steps of the grievance process comprise:

1. Receipt & recording of complaints;
2. Assessment & classification of complaint;
3. Investigation of causes;
4. Generation of options for solving the matter;
5. Dialogue with the parties involved in the complaint/ claim;
6. Resolutions of complaint;
7. Drafting of report and follow-up; and
8. Alternative actions for unresolved complaints.

Environmental and Social Management Budget

The PESMP described above requires detailed cost analysis after project development to determine the budget needed for implementation. Management has however earmarked One Hundred and Four Thousand One Hundred United States Dollars (USD 104,100) annually on environmental monitoring and training and awareness creation programme as well as reporting as shown in Table 9.29. This figure is subject to be reviewed following confirmation from cost studies to be carried out after the project development phase.

Decommissioning Measures

A separate Environmental Assessment would be prepared to guide the Environmental and Social Risk Management implementation during the decommissioning of the irrigation scheme after its end of life.

The cost estimate for implementation of Environmental and Social Risk Management during decommissioning of the construction site following the rehabilitation work would be US\$3,500. This amount has been incorporated in project cost.

1.0 INTRODUCTION

1.1 Background

The Government of Ghana (GoG) (WB) has secured funding from the World Bank to undertake the Food System Resilience Program (FSRP2) under the World Bank Multi-phase Programmatic Approach (MPA) for Investment Project Financing Instrument. The FSRP2 is expected to be implemented over a 5-year period and aims to boost preparedness against food insecurity and improve the resilience of food systems in Ghana. The program will be implemented in collaboration with the Economic Community of West African States (ECOWAS), the Permanent Interstate Committee for Drought Control in the Sahel (*Comité permanent Inter-Etats de Lutte contre la Sécheresse dans le Sahel*, CILSS) and the West and Central African Council for Agricultural Research and Development (*Conseil ouest et centre africain pour la recherche et le développement agricoles*, CORAF).

Under the FSRP2, the Ministry of Food and Agriculture (MoFA) intends to complete some outstanding activities started under the Ghana Commercial Agriculture Project (GCAP - P114264 and P162525), specifically to complete rehabilitation of Kpong Irrigation Scheme (KIS) located in the Greater Accra and Eastern Regions of Ghana.

GCAP prepared Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan (ESMP) for the rehabilitation and modernisation of the KIS in 2018. However, due to inadequate funds to complete works at the KIS, the ESIA and ESMP of KIS must be updated to account for any significant changes including baseline conditions, new stakeholders etc., which might have changed the potential risks and impacts associated with these works.

The KIS is located within the Lower Volta Basin in the Eastern and Greater Accra Regions of Ghana. The initial scope of work under GCAP was a full rehabilitation and modernization of the scheme covering structures in Sections A and B and the Re-lift pump station at section C of the Scheme. However, the full scope of works was not attained due to reduced project funding as a result of the need to fund the rehabilitation of the Tono Dam Spillway in the Upper East Region due to an emergency situation which was not initially planned. The WB approved changes in output deliverables and the scope of work was varied. Although the proposed full scope of work was not completed, the functionality of KIS was achieved. The scope reduction has become a limiting factor to the full operationalization of the KIS and its impacts include:

- Further deterioration of sections of the canal embankment of the main water conveyance system (Akuse Main Canal).
- Increased water use and efficiency challenges for the 600ha farming areas where the pipe works were not carried out.
- Transport challenges of farm produce due to the bad road network for some areas where road rehabilitation could not be carried out.
- Increased agitation and social conflict from farmers whose canals were not lined.

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The proposed works at KIS under this phase will include:

- Lining of the Akuse Main Canal;
- Completing the pipe works for 600ha farming area in section A;
- Automation of the irrigation system; and
- Completing the rehabilitation of farm roads.

Objective of the Update of ESIA

The Environmental and Social Management Framework (ESMF) prepared for the FSRP 2 requires that site specific Environmental and Social Impact Assessments (ESIA) and Environmental and Social Management Plan (ESMP) be prepared for each irrigation scheme. The aim of the ESIA studies is to assess the environmental and social risks and impacts associated with the design, construction and operation of the rehabilitation and modernisation of the Kpong Irrigation Schemes. The ESIA proposes practical and effective measures to prevent or mitigate any potential negative impacts of the subprojects. In addition, an ESMP has been developed to ensure best environmental and social performance.

Given that the ESIA for the KIS under the GCAP was prepared under the WB Operational Policies (OPs) and since the FSRP2 was prepared under the WB Environmental and Social Framework (ESF), there is a need to revise the ESIA to comply with the requirements of the relevant WB Environmental and Social Standards (ESSs). Moreover, the baseline conditions could have changed in the last four (4) years (2018) since the ESIA was prepared, hence the need to update the ESIA to account for any significant changes in baseline conditions, new stakeholders etc., which might have changed the potential risks and impacts associated with the subproject.

The update of the existing ESIA now aligns with the requirements of the ESF and includes measures to prevent child labour and forced labour, community health and safety as well as Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). This is because even though these are carry-over works from the GCAP, they are being funded and implemented under FSRP2 which is guided by the ESF, and not the Operational Policies (OPs) under which the existing ESIA was prepared.

1.2 Scope of Work for the ESIA Study

The general scope of assignment involves the preparation of site specific ESIA studies and Environmental and Social Management Plan for the rehabilitation and the modernisation of the KIS.

The ESIA update process was guided by the existing ESIA of the proposed scheme and involve but not limited to the following:

- Specialized studies to establish relevant baseline conditions;
- Description of proposed project;
- Review of legal and institutional framework;
- Description of biophysical and human environment baseline conditions;

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- Analysis of project alternatives;
- Stakeholder consultation and engagement activities;
- Assessment of potential beneficial and adverse impacts;
- Provision of mitigation measures;
- Preparation of environmental management and monitoring plans; and
- Review of institutional capacity to implement the Provisional Environmental and Social Management Plan (PESMP).

1.3 Methodology

The key activities for the ESIA processes involved site visits, stakeholder engagements (through both face-to-face interactions and virtual meetings), as well as document review. Stakeholders involved in the ESIA processes were:

- Environmental Protection Agency (EPA) Head Office
- Lower Manya Krobo Municipal Assembly (LMKMA);
- Shai Osudoku District Assembly (SODA);
- Ghana Irrigation Development Authority (GIDA);
- Kpong Irrigation Scheme Management;
- Shai Osudoku Agricultural Department, Shai Osudoku;
- Water Resources Commission (WRC);
- Ghana National Fire Service (GNFS)– Shai Osudoku District;
- Water Research Institute (CSIR – WRI);
- Soil Research Institute (CSIR- SRI);
- Shai Osudoku Traditional Council;
- Agric Extension Officers on the Scheme;
- Water Users Associations (WUAs) on the Scheme;
- Farmers on the schemes; and
- Project communities (Asutuare, Kasunya, Lubuse, Volivo, Dzogbedzi, Papa Edey, Atlorbinya, Akuse Quarters, Klebuse Communities).

Some documents reviewed included the following:

- Environmental and Social Impact Assessment for Kpong Irrigation Scheme (KIS) prepared under GCAP;
- FSRP2 Environmental and Social Management Framework (ESMF);
- FSRP2 Integrated Pest Management Plan (IPMP);
- FSRP2 Labour Management Procedures (LMP);
- FSRP2 Stakeholder Engagement Plan (SEP); and
- FSRP2 Gender Action Plan (GAP).
- Draft Conditional Assessment Report of KIS Phase 1 (2022);
- Shai Osudoku District Composite Budget (2020);
- Population and Housing Census, 2020 District;
- Analytical Reports (Shai Osudoku and Lower Manya Krobo Districts);

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- Shai Osudoku District Medium-Term Development Plan (2018 – 2021);
- Lower Manya Municipal Medium-Term Development Plan (2018 – 2021); and
- World Bank Groups Environmental and Social Framework, 2018.

Environmental media surveys and analysis covered the following areas:

- Ambient air quality in the project area;
- Noise level in the project area;
- Surface water quality of the canal water; and
- Ground water quality of the project community.

1.4 Report Organisation

This ESIA is organised into twelve (12) main chapters, preceded by an Executive Summary, as follows:

- Executive Summary;
- Chapter 1: Introduction;
- Chapter 2: Policy, Regulatory and Institutional Framework;
- Chapter 3: Description of the Project;
- Chapter 4: Analysis of Project Alternatives;
- Chapter 5: Environmental and Social Baseline Conditions;
- Chapter 6: Outcome of Stakeholder Consultations;
- Chapter 7: Assessment of Potential Environmental and Social Risks and Impacts;
- Chapter 8: Mitigation of Potential Impacts;
- Chapter 9: Provisional Environmental and Social Management Plan;
- Chapter 10: Emergency Response Procedures;
- Chapter 11: Decommissioning;
- Chapter 12: Conclusion;
- References; and
- Appendices.

2.0 POLICY, REGULATORY AND INSTITUTIONAL FRAMEWORK

The Ministry of Food and Agriculture through the Food System Resilience Project is committed to adhering to the requirements of all applicable policies and laws associated with the rehabilitation and modernization of the Kpong Irrigation Scheme (KIS). The key policy, regulatory and institutional frameworks relevant to irrigation, as well as institutional procedures for Environmental Assessment (EA), have been highlighted in this section. These requirements and their relevance, which have been reviewed and applied in the assessment, have been grouped under the following broad themes:

1. National environmental policy and requirements;
2. Water and irrigation sector policy and requirements;
3. Framework for national planning and development;
4. Land requirements;
5. National labour, safety and health requirements;
6. Applicable international risks management policies and guidelines; and
7. Relevant institutions.

A comparison between the WB ESSs and national policies and regulations has been outlined in (Table 2.4) and specific measures to bridge these gaps have been provided.

2.1 National Environmental Policy and Other Requirements

The identified policy and regulatory areas that have been reviewed in compliance with national requirements is given in Table 2.1

Table 2.1 National Environmental Policy and other Requirements

Policies	<ul style="list-style-type: none"> • Ghana's National Environmental Policy, 2012 • National Climate Change Policy, 2013
Acts	<ul style="list-style-type: none"> • Environmental Protection Agency Act, 1994 (Act 490) • Plants and Fertilizer Act, 2010 (Act 803)
Regulations	<ul style="list-style-type: none"> • Environmental Assessment Regulations, 1999 (LI 1652) • Fees and Charges (Amendment) Instrument, 2019 (LI 2386)
Action Plans	<ul style="list-style-type: none"> • Ghana National Climate Change Master Plan Action Programmes for Implementation (2015–2020)
Standards	<ul style="list-style-type: none"> • Ghana Standard on Health Protection - Requirements for Ambient Noise Controls (GS 1222:2018) • Ghana Standard on Environment and Health Protection - Requirements for Ambient Air Quality and Point Source/Stack Emissions (GS 1236:2019) • Ghana Standards for Environment Protection-Requirements for Effluent Discharge (GS 1212:2019)

2.1.1 Ghana's National Environmental Policy (2012)

The policy is based on a holistic management of the environment, where people have access to wholesome food, clean air and water, decent housing and other necessities of life. The policy supports a new paradigm of sustainable development, based on coordinated environmental management to ensure the quality of life of citizens and their living and working environments, as well as participation in decision-making and environmental governance.

2.1.2 Environmental Protection Agency Act, 1994 (Act 490)

The EPA is vested with the power to ensure compliance with the laid down procedures and regulations by this Act, which mandates the Agency to ensure among others compliance with the Ghana Environmental Impact Assessment (EIA) procedures, and it is the parent law to the Environmental Assessment Regulations, 1999 (LI 1652). The Agency is also required to control and monitor the generation and disposal of waste, and management of hazardous substances as well as apply the environmental quality standards. The Agency is accordingly vested with the power to require EIAs for 'undertakings' and to serve an Enforcement Notice for any offending or non-complying undertakings. The FSRP2, in compliance with the EIA procedures, held engagement sessions with the EPA on the proposed subproject, with the Agency providing the necessary guidance on the process, in order to ensure a credible EIA.

2.1.3 Environmental Assessment Regulations 1999 (LI 1652)

The Regulations require that proposed undertakings are registered with EPA and an environmental permit secured prior to commencing the undertaking. The LI groups undertakings into schedules to facilitate screening. Schedule 1 undertakings require registration (by filling in the Registration Form EA1), as the basis for consideration for an environmental permit. The Schedule 2 undertakings are the EIA mandatory undertakings, which are considered to have potentially significant impacts and therefore require detailed assessment. The LI 1652 and its parent Act 490, grants the EPA environmental enforcement and standard setting-powers. The Agency is vested with the power to determine what constitutes an adverse effect on the environment or an activity posing a serious threat to the environment or public health.

The KIS project falls under Schedule 2 undertakings. The LI 1652 has been complied with, by following the prescribed steps to obtain the required environmental permit prior to commencing the project. The LI also mandates the Agency to request Environmental and Social Management Plans (ESMPs), and Annual Environmental Reports (AERs) for approved projects during implementation. After obtaining approval for the project, GIDA - the managers of the scheme, will be committed to satisfying all the post-EIA requirements of LI 1652, including AER and ESMP, etc. as required by the schedule of permit conditions.

2.1.4 Fees and Charges (Amendment) Instrument 2019 (LI 2386)

The Fees and Charges (Amendment) Instrument sets out the fee regime for processing and environmental permits, associated with the EA Regulations. The Fees and Charges (Amendment) Instrument, 2015 (LI 2228) has been replaced by this new instrument. In

accordance with LI 2386, FSRP will be required to pay processing and permit fee for the issuance of the Environmental Permit by EPA.

2.1.5 Ghana National Climate Change Policy (2013)

The National Climate Change Policy (NCCP) is Ghana's integrated response to climate change. The policy aims to ensure a climate-resilient and climate-compatible economy while achieving sustainable development through equitable low-carbon economic growth for Ghana. The NCCP provides a clearly defined pathway for dealing with the challenges of climate change. This project will utilise solar energy, a renewable energy source, as power generation for irrigation, and therefore has the potential to reduce carbon emission. The electric power generated from this source could compensate for carbon emissions otherwise generated from fossil (thermal generating) sources.

2.1.6 Ghana National Climate Change Master Plan Action Programmes for Implementation (2015–2020)

The NCCP Action Programme for Implementation includes the details of initiatives and programmes to achieve the objectives of each policy focus area. The policy focus area "Develop Climate-resilient Agriculture and Food Security Systems" involves planning for the development of agriculture in Ghana, focused on increasing productivity and production. The plan has a programme to support water conservation and irrigation systems, to ensure availability of water for multiple uses in a changing climate while reducing the risk of flood-related disasters in rural communities, which the KIS project aligns with.

2.1.7 Plants and Fertilizer Act 2010 (Act 803)

The Act provides for the efficient conduct of plant protection to prevent the introduction and spread of pests and diseases, to regulate imports and exports of plants and planting materials; the regulation and monitoring of the exports, imports and commercial transaction in seeds and related matters; and control and regulation of fertilizer trade. FSRP and GIDA in collaboration with the Plant Protection Regulatory Services Directorate will ensure that all seeds/plant materials are safe and also put in monitoring mechanism to prevent the spread of pests and diseases from the project site to other parts of the country.

2.1.8 Ghana Standard on Health Protection – Requirements for Ambient Noise Controls

The Standard provides for maximum permissible levels of noise based on categorised zones as shown in Table 2.2. The standard also provides noise requirement for a construction site which includes erecting an acoustic barrier around the construction site. Measures such as turning off all idle machinery and vehicles will be put in place to ensure that noise generated on the project site does not exceed the permissible limits.

Table 2.2 Requirements for Ambient Noise Control

Zone	Permissible Noise Level in dB(A)	
	Day (6:00am–10:00pm)	Night (10:00pm–6:00am)

Residential Area	55	48
Educational and health facilities, offices and law courts	55	50
Mixed used	60	55
Areas with some light industry	65	60
Commercial areas	75	65
Light industrial areas	70	60
Heavy industrial areas	70	70

Source: Ghana Standards Authority, 2019

2.1.9 Ghana Standard – Requirements for Ambient Air Quality

The Standard provides the maximum limit for ambient air pollutants (Table 2.3). Measures such as dousing will be implemented to ensure that the air quality of the project area is within permissible limits.

Table 2.3 Requirements for Ambient Air Quality – Maximum Limit for 24 Hours

Substance	Maximum Limit ($\mu\text{g}/\text{m}^3$)
Sulphur Dioxide (SO_2)	50
Nitrogen Oxide (NO_2)	250
Total Suspended Particulate Matter (TSP)	150
PM_{10}	70
$\text{PM}_{2.5}$	35
Black Carbon	5

Source: Ghana Standards Authority, 2019

2.2 Water and Irrigation Policy Sector and Requirements

The identified policy and relevant requirements) reviewed for irrigation to protect water resources and the natural environment is given in Table 2.4.

Table 2.4 Water and Irrigation Policies, Acts and Regulations

Policies	<ul style="list-style-type: none"> National Irrigation Policy, Strategies and Regulatory Measures, 2010 National Water Policy, 2007
Acts	<ul style="list-style-type: none"> Water Resources Commission Act, 1996 (Act 522)
Regulations	<ul style="list-style-type: none"> Dam Safety Regulations, 2016 (LI 2236) Water Use Regulations, 2001 (LI 1692) Irrigation Development Authority (Irrigation Water Users Association) Regulations, 2016 (LI 2230) The Irrigation Development Authority Regulations, 1987 (L.I. 1350)

2.2.1 National Irrigation Policy, Strategies and Regulatory Measures, 2010

The Policy's objective is to achieve sustainable growth and enhanced performance of irrigation to support agricultural sector development. The Policy contributes to the reduction of rural poverty in Ghana through its application in the rural regions of the country. The targets of the Policy are to attain national food security; increase livelihood options; intensify and diversify production of agricultural commodities; optimise natural resource use; reduce negative environmental impacts and expand investment space for irrigated production. The proposed irrigation project will utilise concrete canals to ensure adequate water supply, providing the beneficiary farmers year-round water supply to their farms to increase their productivity and enhance their livelihoods.

2.2.2 National Water Policy, 2007

The Policy's overall goal 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 objective of Section 2.2.3 Focus Area 3 – Water for Food Security is to ensure availability of water in sufficient quantity and quality for the cultivation of food crops, watering of livestock and sustainable freshwater fisheries to achieve sustainable food security for the country. The proposed project will ensure efficient use of water by using canals to reduce transmission losses.

2.2.3 Dam Safety Regulations, 2016 (LI 2236)

The Regulations apply to an existing dam, or a proposed dam determined by the Water Resources Commission (WRC) to have a safety risk. The Regulations provide for the registration and licensing of dams. The Regulations also provide with respect to construction, operation and maintenance of dams, an inspection of a dam by the Commission, emergency preparedness and response, and decommissioning of a dam. FSRP2 will liaise with WRC to ensure that regulations and safety measures to guide the proper functioning and safety of the dam are adhered to, for the sustainability of the KIS project.

2.2.4 Water Resources Commission Act, 1996 (Act 522)

The Act guides the management of water resources in Ghana. Section 12 of the Act implies that, there is no private ownership of water resources in Ghana, but that the President, or anyone so authorised, may grant rights for water use. The WRC is the agency authorised under the Act to regulate and control the use of water resources, through granting of water rights and water use permits. Under the Act, individuals, institutions, NGO's, agencies, and authorities are required to apply for and be granted a permit to use water before engaging in water abstraction for domestic, commercial, industrial and agricultural use. FSRP and GIDA will continue to consult the WRC on the sustainability of the use of the Volta River for irrigation purposes.

2.2.5 Water Use Regulations, 2001 (LI 1692)

The Regulations set out guidelines for the issuance of water use permits or grant of water rights for various water uses. The provisions of LI 1692 include the various water uses that should be permitted; application procedure; public hearing; priority of water use in cases of conflict; exemptions in terms of mode of abstraction and given thresholds; registration of water uses

that do not need permits and the role of district assemblies; grant; appeals; cessation of permit; non-transferability of permits; among others. FSRP will provide a copy of this ESIA, after approval to WRC as mandated.

2.2.6 Irrigation Development Authority (Irrigation Water Users Association) Regulations 2016, (LI 2230)

The Regulations propose that persons who use irrigation water and are not less than fifteen in number may form an association; after those persons have set up a provisional initiative team to identify the service area of the proposed association and a founders' committee, which may not exceed twelve potential members of the association. Persons who qualify to form the association are those who possess land based on the landholding system and use the land with water supplied from the irrigation infrastructure. The KIS project proposes to continue working with the interim Water Users Associations (WUA) formed as mandated by LI 2230.

2.2.7 Irrigation Development Authority Regulations 1987, (LI 1350)

The regulations provide procedures for managing irrigation projects including water management within such projects. Ghana Irrigation Development Authority's (GIDA) Technical Guidelines for Irrigated Agriculture, 2004, gives further details on how to effectively manage water for irrigated agriculture including water supply, distribution and application management.

The SME and GIDA will be guided by the procedures outlined in the regulations.

2.3 Framework for National Planning and Development

The relevant legislation and guidelines identified in order to facilitate sound planning and waste management associated with this project is given in Table 2.5.

Table 2.5 Planning and Development Policies, Acts and Codes

Policies	<ul style="list-style-type: none"> • Food and Agriculture Sector Development Policy (FASDEP II)
Acts	<ul style="list-style-type: none"> • Land Use and Spatial Planning Act, 2016 (Act 925) • Local Governance Act, 2016 (Act 936) • Ghana Investment Promotion Centre Act, 2013 (Act 865) • Renewable Energy Act, 2011 (Act 832)
Codes	<ul style="list-style-type: none"> • New Ghana Building Code, (GhBC; GS 1207), 2018

2.3.1 Land Use and Spatial Planning Act, 2016 (Act 925)

The Act revises and consolidates the laws on land use and spatial planning. It also provides for sustainable development of land and human settlements, ensures judicious use of land in order to improve the quality of life, and promotes health and safety in respect of human settlements. The proposed project will ensure efficient use of the land, in accordance with the Act.

2.3.2 Local Governance Act, 2016 (Act 936)

In accordance with the Act, the Ministry of Local Government and Rural Development (MLGRD) is responsible for the sixteen administrative regions of Ghana. These regions are subdivided into 261 Metropolitan, Municipal and District Assemblies (MMDAs). The Act mandates the MMDAs to take charge of the overall development of their respective areas, making them representatives of the central Government at the local level. The MMDAs are responsible for physical/spatial planning of their areas; approval of all planning schemes in the districts; and development control through the grant of permit for development. FSRP will work closely with the Shai Osudoku and Lower Manya Krobo Municipal Assemblies in the development of the proposed subproject.

2.3.3 Ghana Investment Promotion Centre Act, 2013 (Act 865)

The Act provides for the Ghana Investment Promotion Centre as the agency of Government responsible for the encouragement and promotion of investments in Ghana, to provide for the creation of an attractive incentive framework and a transparent, predictable, and facilitating environment for investments in Ghana and related matters.

2.3.4 Ghana Building Code (GhBC; GS 1207), 2018

The Ghana Building Code sets out the requirements, recommendations, planning, management and practices that will lead to a smooth operation and construction of residential and non-residential buildings in the country. The FSRP will comply with the procedures laid down in the building code particularly during the construction of auxiliary facilities.

2.3.5 Food and Agriculture Sector Development Policy, 2007

The Food and Agriculture Sector Development Policy (FASDEP II) is developed as a Policy of the Government of Ghana to guide development and interventions in the agriculture sector. This policy emphasises the sustainable utilisation of all resources and commercialisation of activities in the sector with market-driven growth in mind. FASDEP II seeks to enhance the environment for all categories of farmers, while targeting poor and risk-prone and risk-averse producers. The project will significantly advance the achievement of the FASDEP II objectives through improved efficiency and management of the scheme. The project will ensure sustainable utilisation of resources and sustainable land and environmental management through the use of an efficient irrigation system.

2.3.6 Renewable Energy Act, 2011 (Act 832)

The Act seeks to create favourable regulatory and fiscal regimes as well as attractive pricing incentives for the development and use of its renewable energy resources. Its provisions support the development, utilisation and efficient management of renewable energy sources in the country. It also provides for the utilisation, sustainability and adequate supply of renewable energy for electricity. The FSRP intends to utilize renewable energy sources such as solar energy to power irrigation facilities which will contribute to its carbon footprint and ultimately aid in reducing greenhouse emissions (GHGs).

2.4 Land Requirements

The relevant national land requirements is given in Table 2.6 below.

Table 2.6 Land Policy and Acts

Policies	<ul style="list-style-type: none"> The National Land Policy, 1999
Acts	<ul style="list-style-type: none"> The Land Act, 2020 (Act 1036) Lands Commission Act, 2008 (Act 767)

2.4.1 The National Land Policy, 1999

The Policy sets out a broad framework and policy guidelines for land administration and utilisation. The objectives of the policy are to ensure socio-economic activities conform to the principles of sustainable land use; equity and security of tenure to both indigenous and foreign investors; protection of the rights of landowners and their descendants from becoming landless or tenants on their own lands; and provision of a mechanism for minimisation and resolution of land disputes. The subproject site is not a protected area, forest or wildlife estate and has been zoned for agricultural purposes. The implementation of the project will conform to the environmental laws of the country, which include registration with EPA and obtaining an environmental permit prior to commencement. This ESIA is prepared in compliance with the environmental laws of Ghana.

2.4.2 The Lands Act, 2020 (Act 1036)

The current Land Act, 2020 (Act 1036) was enacted among other things to revise, harmonize, and consolidate the laws on land to ensure sustainable land administration and management, effective and efficient land tenure and to provide for related matters, and is the manifestation of reforms in the land sector that began with the implementation of the 1999 National Land Policy (NLP). The Act provides for the acquisition of land in the national interest mandates a person claiming a right to land, or whose land has been affected in any manner, to submit in writing to the Minister within three months, details of land ownership, any damages suffered and amount of compensation claimed. The Ministry of Finance through the MoFA and in consultations with the Lands Commission will guarantee compensation is paid in full to respective landowners of acquired lands in line with the Act.

2.4.3 Lands Commission Act, 2008 (Act 767)

The Act establishes the Lands Commission, defines the functions of and assigns powers to the Commission and makes provision for its composition and administration and the qualification and appointment of members of the Commission. The objectives of the Commission are 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 achieved in conformity with the nation's development goals. Sections 20, 21, 22 and 23 of the Act clearly establish the functions of the four (4) divisions of the Lands Commission: Survey and Mapping Division (SMD), Land Registration Division (LRD), Land Valuation Division (LVD), and the Public and Vested Lands Management Division (PVLMD) respectively. The proposed undertaking is in line with the objectives of the Commission for sustainable development of land.

2.5 National Labour, Safety and Health Requirements

The identified requirements and provisions for the protection of workers, as well as for the promotion of health and safety and the general well-being of the subproject workforce and the public within the area of influence of the subproject is captured Table 2.7.

Table 2.7 Labour, Safety and Health Policies, Acts, and Regulations

Policies	<ul style="list-style-type: none"> • National Workplace HIV/AIDS Policy, 2004 • National HIV and AIDS, STI Policy, 2013
Acts	<ul style="list-style-type: none"> • Factories, Offices and Shops Act, 1970 (Act 328) • Labour Act, 2003 (Act 651) • The Children’s Act 1998, Act 560 • Ghana National Fire Service Act, 1997 (Act 537) • Control and Prevention of Bushfires Act, 1990 (PNDCL 229) • Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917) • Public Health Act 2012, Act 851 • Persons with Disability Act, 2006 (Act 715)
Regulations	<ul style="list-style-type: none"> • Fire Precaution (Premises) Regulations 2003, LI 1724 • Hazardous, Electronic and Other Wastes, Control and Management Regulations, 2016 (LI 2250)
Laws	<ul style="list-style-type: none"> • Workmen’s Compensation Law 1987 (PNDCL 187)

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

The Act spells out the responsibilities of an employer in ensuring a safe and healthy work environment for employees. It defines a factory to include any premises (whether in or not in a building), in which one or more persons are employed in manual labour in any process. The Act mandates the Factories Inspectorate Department to register such activities and ensure that internationally accepted standards of providing safety, health and welfare of persons are adhered to. The Act also requires work-related accidents, and dangerous occurrences such as an explosion, fire, damage to plants likely to cause the risk of bodily injury to employees to be reported to the Chief Inspector. In line with the Act, FSRP will ensure that the project is registered with the Factories Inspectorate Department, and notify the Chief Inspector of any accidents, dangerous occurrences and industrial diseases.

2.5.2 National Workplace HIV/AIDS Policy, 2004

The broad objectives of the Policy among others, are to provide protection from discrimination in the workplace to people living with HIV and AIDS; prevent HIV and AIDS spread among workers; and provide care, support and counselling for those infected and affected. Provision has been made under mitigation measures and also in the management plan section of this report to prevent HIV/AIDS spread through a workplace policy implementation and awareness creation both for workers and in the nearby community.

2.5.3 *The Labour Act, 2003 (Act 651)*

The purpose of the Act is to amend and consolidate existing laws relating to labour, employers, trade unions and industrial relations. The Act provides for the rights and duties of employers and workers; legal or illegal strike; guarantees trade unions and freedom of associations and establishes the Labour Commission to mediate and act in respect of all labour issues. The provisions in the Act that explicitly prescribes the duty of an employer to ensure that every worker works under satisfactory, safe and healthy conditions, is relied on extensively to cater for workers at both construction and operation phase of the project. The FSRP will ensure that workers' safety, health and welfare is protected through the provision of a safe working environment and use of appropriate personal protective equipment.

2.5.4 *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 and labour is exploitative of a child if it deprives the child of its health, education or development.

The implementation of the KIS Project will be guided by this Act in the employment of labour for the proposed project and will ensure all labour engaged by the Contractors are not below the minimum age.

2.5.5 *Workmen's Compensation Law, 1987 (PNDCL 187)*

The Law holds employers responsible for the payment of compensation to workmen for personal injuries caused by accidents arising out and in the course of their employment. Where an employee sustains a personal injury by accident arising out of, and in the course of employment, the employer is liable, subject to this Act, to pay compensation in accordance with this Act. Provision has been made in the management plan section of the report for the employer to comply with the Workmen's Compensation Law by taking the required insurance for workers.

2.5.6 *National HIV and AIDS, STI Policy, 2013*

The overall goal of the revised Policy is to create a favourable environment for every aspect of HIV and AIDS, sexually transmitted infection (STI) prevention, care and support. The policy provides that discrimination against a person infected or affected by HIV or AIDS is prohibited. This extends to the workplace; public and private institutions are to have workplace HIV and AIDS policies. The right to privacy and confidentiality is safeguarded in the policy, subject to certain exceptions. The consent of an individual is required for a medical or behaviour change intervention.

2.5.7 *Ghana National Fire Service Act, 1997 (Act 537)*

The Act re-establishes the National Fire Service to provide for the prevention and management of undesired fires and to make provision for related matters. To achieve its objective, the

Service is required to organise public fire education programmes to create and sustain awareness of the hazards of fire, heighten the role of the individual in the prevention of fire and provide technical advice for machinery and building plans in respect of structural layouts to facilitate escape from fire, rescue operations and fire management. The GNFS has been consulted and will be called upon to create awareness and sensitisation programmes on fire prevention and control and provide services in the management of all fire outbreaks.

2.5. 8 Fire Precaution (Premises) Regulations, 2003 (LI 1724)

The Ghana National Fire Service Act, 1997 (Act 537) states that, a fire certificate shall be required for premises used as a public place or place of work. This requirement is reinforced by these Regulations. It is incumbent on any project developer to ensure that adequate provision and measures are introduced to minimise or prevent fire outbreaks. A fire certificate, in addition to firefighting equipment, will be obtained on site.

2.5. 9 Control and Prevention of Bushfires Act, 1990 (PNDCL 229)

The Act prohibits the starting of bushfires by any person for any purpose. A bushfire is described as an action of a person that results in the uncontrolled burning of a farm, forest or grassland. The Act provides for the establishment of a fire volunteer squad in every town, area or unit. The FSRP will support by providing resources to the fire volunteer squads in the nearby communities.

2.5.10 Hazardous and Electronic Waste Control and Management Act, 2016 (Act 917)

This Act provides for the control, management and disposal of hazardous, electrical and electronic waste and related purposes. Under the Act, a person shall not deposit hazardous waste or other wastes on any land in the country. The Act also states that, a person involved in the management of hazardous wastes or other wastes shall take the steps that are necessary to prevent pollution from hazardous wastes and other wastes arising from the management; and minimize the consequences of the pollution on human health and the environment. In line with the Act, FSRP will ensure all hazardous and electronic wastes are disposed of in accordance with the procedures in the Act.

2.5. 11 Hazardous, Electronic and Other Wastes (Classification) and Management Regulations, 2016

The Regulations are derived from the parent Act 917 and applies principally to waste generators, waste transporters and waste managers, but not to the generation of domestic waste. Hazardous and electronic waste including damaged solar modules, degenerated/damaged lithium batteries, less efficient/damaged computers, air conditioners, fluorescent bulbs, etc. will be outsourced to accredited e-waste companies for proper handling and disposal in accordance with Ghana Technical Guidelines for the Environmentally Sound E-waste Management protocols.

2.5. 12 Public Health Act, 2012 (Act 851)

The Act was passed to prevent disease, promote safeguard, maintain and protect the health of humans and animals, and provide for related matters. The Act has various groupings that deal

with the many aspects of Public Health. The policy also outlines the role of the Health Minister, health officials and individuals involved, as well as regulations, penalties and measures to take to contain and control public health emergency. Provisions have been made in the mitigation section to protect the health of the public.

2.5. 13 Persons with Disability Act, 2006 (Act 715)

The Act provides for the rights of disabled persons, and to establish a National Council on Disabled Persons to attend to the interests of disabled persons and to provide for related matters. It covers areas such as rights, accessibility, employment, education, transportation and health-care for persons with disabilities. The Act makes disability discrimination unlawful and promotes equal rights, equal opportunity and equal access for people with disabilities. In line with the Act, FSRP will ensure that persons seeking employment are not discriminated against because of their disability.

2.6 Applicable International Risks Management Policies and Guidelines

The applicable international policies and guidelines that ensure that relevant environmental, social and health issues and concerns are taken into account in the development and operations of the proposed project is given in Table 2.8.

Table 2.8 International Risk Management Standards, Goals and Treaties

Standards	<ul style="list-style-type: none"> • World Bank Group Environmental and Social Framework • World Bank Group General Environmental, Health and Safety Guidelines
Goals	<ul style="list-style-type: none"> • Sustainable Development Goals (SDGs)
Treaties and Conventions	<ul style="list-style-type: none"> • United Nations Framework Convention on Climate Change • Basel Convention • Rotterdam Convention

2.6.1 World Bank Group Environmental and Social Framework

The 10 Environmental and Social Standards (ESSs) for sustainable development in the ESF and their relationship with the rehabilitation and modernization of the KIS is summarised in Table 2.9 below.

Table 2.9 Summary of Environmental and Social Standards of the ESF

Policy	Summary of Core Requirements	Relevant
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	ESS1 sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with all stages of a project supported by the Bank	Yes All project activities must be assessed for E&S risks and impacts and appropriate risk management measures

Policy	Summary of Core Requirements	Relevant
		proposed for the management of such risks and impacts
ESS2: Labour and Working Conditions	ESS 2 recognizes how Borrowers can promote sound worker-management relationships and enhance the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.	Yes Particularly relevant for physical works involving the use of contractors and production activities requiring substantial number of workers
ESS3: Resource Efficiency and Pollution Prevention and Management	ESS 3 sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle since construction activities often generate pollution to air, water, and land, and consume finite resources that may threaten people and ecosystem services.	Yes Relevant to project activities requiring the use of natural resources (aggregates, wood, etc.) from the environment and activities such as use of pesticides and fertilisers with the potential to pollute environmental media
ESS4: Community Health and Safety	ESS4 address the health, safety, and security risks and impacts on project-affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.	Yes Project activities including construction works could pose potential health and safety risks and impact to inhabitants of communities within the project area.
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	This ESS emphasizes that involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving displaced persons) will be carefully planned and implemented.	No The proposed rehabilitation and modernisation activities would not involve additional land acquisition as the land for the project has already been acquired by GIDA
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	This ESS recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. It addresses sustainable management of primary production and harvesting of living natural resources and recognizes the	Yes Although the scheme area is an active agricultural field and there are no forests and/or critical ecosystems, the irrigation scheme will involve primary agric production and

Policy	Summary of Core Requirements	Relevant
	need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of, biodiversity or living natural resources may be affected by a project.	harvesting of living natural resources e.g., rice
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities.	This ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	No There are currently no groups of persons that fit into the definition of indigenous people in the project areas
ESS8: Cultural Heritage	This recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. It sets out measures designed to protect cultural heritage throughout the project life-cycle.	Yes There is a probability of encountering cultural heritage issues in the project areas since Ghana is a country with rich culture
ESS9: Financial Intermediaries (FIs)	FIs are required to monitor and manage the environmental and social risks and impacts of their portfolio and FI subprojects, and monitor portfolio risk, as appropriate to the nature of intermediated financing. The way in which the FI will manage its portfolio will take various forms, depending on a number of considerations, including the capacity of the FI and the nature and scope of the funding to be provided by the FI.	No The subproject design does not include the need for a financial intermediary for the implementation of this project
ESS10: Stakeholder Engagement and Information Disclosure	This recognizes the importance of open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.	Yes The project does have many stakeholders with various interests which ought to be managed using a stakeholder engagement plan

2.6.2 World Bank Group General Environmental, Health and Safety Guidelines

The Environmental, Health, and Safety (EHS) Guidelines are technical reference documents with general and industry-specific examples of Good International Industry Practice. The areas covered are:

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

- Environmental standards, which are related to emissions and air quality, wastewater and water quality, noise, energy and water conservation principles, management of hazardous materials, waste, contaminated sites and soils.
- Occupational health and safety.
- Community health and safety.
- Management of the construction and decommissioning phases, in in terms of environmental management, occupational health and safety and community health and safety.
- EHS Guidelines for annual crop production

2.6.3 Sustainable Development Goals

The Sustainable Development Goals (SDGs), a new global development framework set up to address global challenges. The applicable goals identified include:

- **No Poverty (Goal 1)** aims to eradicate extreme poverty for all people everywhere. Livelihoods in farming communities have been greatly affected by the lack of irrigation schemes across the country to ensure all year-round farming. This project seeks to help address such challenges in the project district;
- **Zero Hunger (Goal 2)** aims to end hunger and ensure access by all people to safe, nutritious and sufficient food all year round;
- **Decent Work and Economic Growth (Goal 8)** aims to promote inclusive and sustainable economic growth, employment and decent work for all. A properly run and viable irrigation scheme will help protect jobs and guarantee economic growth for all farmers;
- **Industry, Innovation and Infrastructure (Goal 9)** aims to build resilient infrastructure, promote sustainable industrialization and foster innovation. Modernizing the irrigation infrastructure at KIS will ensure that members of the WUA and farmers in general;

2.6.4 United Nations Framework Convention on Climate Change

The United Nations Framework Convention on Climate Change (UNFCCC) is an international environmental treaty negotiated at the Earth Summit in Rio de Janeiro from 3 to 14 June 1992, then entered into force on 21 March 1994. The UNFCCC's objective is to "stabilise greenhouse gas concentrations in the atmosphere at a level that would prevent dangerous anthropogenic interference with the climate system". The framework sets no binding limits on greenhouse gas emissions for individual countries and contains no enforcement mechanisms. Instead, it outlines how specific international treaties (called "Protocols" or "Agreements") may be negotiated to set binding limits on greenhouse gases. The FSRP2 will ensure that the impacts of climate change on the project and the contribution of the project to climate change is duly assessed and the appropriate mitigation measures proposed to address these impacts.

2.6.5 The Basel Convention

The Basel Convention on the Control of Transboundary Movements of Hazardous Wastes and their Disposal, usually known as the Basel Convention, is an international treaty that was designed to reduce the movements of hazardous waste between nations, and specifically to prevent transfer of hazardous waste from developed to less developed countries. The

convention is also intended to minimize the rate and toxicity of wastes generated, to ensure their environmentally sound management as closely as possible to the source of generation, and to assist developing countries in environmentally sound management of the hazardous and other wastes they generate. The convention was opened for signature on 21 March 1989, and entered into force on 5 May 1992. As of June 2023, there are 191 parties to the convention.

2.6.6 The Rotterdam Convention

The Rotterdam Convention (formally, the Rotterdam Convention on the Prior Informed Consent Procedure for Certain Hazardous Chemicals and Pesticides in International Trade) is a multilateral treaty to promote shared responsibilities in relation to importation of hazardous chemicals. The convention promotes open exchange of information and calls on exporters of hazardous chemicals to use proper labeling, include directions on safe handling, and inform purchasers of any known restrictions or bans. Signatory nations can decide whether to allow or ban the importation of chemicals listed in the treaty, and exporting countries are obliged to make sure that producers within their jurisdiction comply.

Pesticide misuse, misapplication, contamination of the environment and human exposure still continue, and may not be an uncommon phenomenon in the project area. Engagement with the Chemicals Control and Management Centre of the EPA will be sustained to ensure that only approved chemicals are used by farmers within this irrigation scheme. The IPMP developed for the FSRP2 will be used to guide the management of pests and diseases during operations.

2.7 World Bank Environmental and Social Framework vs Ghanaian Environmental Assessment Policies

Comparison between the World Bank Environmental and Social Standards and the Ghanaian environmental assessment and social protection (SP) policies and regulations and measures to bridge identified gaps is given in Table 2.10

Table 2. 10 Measures to bridge Gap between WB and Ghana EA and SP Policies

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
ESS1: Assessment and Management of Environmental and Social Risks and Impacts	ESS1 sets out the Borrower's responsibilities for assessing, managing and monitoring environmental and social risks and impacts associated with all stages of a project supported by the Bank	The Environmental Protection Agency Act, 1994 (Act 490) and Environmental Assessment Regulations, 1999 (LI 1652). These require assessment of all projects with potential environmental and social impacts	The Bank's EA policy and the Ghanaian EA system are equivalent in most respects, The main differences are: (a) the absence of a requirement for preparation of the EIS on complex projects by an independent entity; (b) no requirements that an EIS include an assessment of the applicable legal and institutional framework, including applicable international conventions, and that projects contravening international conventions not be supported; (c) the lack of explicit arrangements for projects implemented by financial intermediaries	EPA will clarify the requirements for disclosure, consultations and public hearings, so that it is clear that full EIS documents are made publicly available at draft and final stages, disclosure is in form and language understandable to key stakeholders, and consultations and hearings include presentations in local language and opportunities for non-English speakers to be heard. EPA will add the requirement for assessment of legal and institutional framework including international conventions in the ToR for the assignment.
ESS2: Labour and Working Conditions	ESS 2 recognizes how Borrowers can promote sound worker-management relationships and enhance	Labour Act, Act 651 (2003): Part XV, Section 118 (1) and (2a-h) of the Act requires employers to ensure that	The informal sector has virtually no formally recognized unions and developing potentials to extend unions to the sector will help them	There is a need to strengthen Workers organization to ensure that grievance mechanism systems are set up. More focus

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
	the development benefits of a project by treating workers in the project fairly and providing safe and healthy working conditions.	every worker employed by him or her works under satisfactory safe and healthy conditions, and is further obliged to provide necessary information, instructions, training and supervision to ensure the health and safety at work of those other. Workmen Compensation Act (1987); Factories, Offices and Shops Act, Act 328 (1970) Children's Act	have some form of representation and protection. The General Agricultural Workers Union through its Rural Workers Organizations Division has been organizing workers in the informal sector since 1970. Some efforts are being made by the TUC to bring employees in the informal sector on board. Most of the beneficiary farmers under the KIS are in the informal sector and would require support for their Water User Associations. Ghana's EA Regulations do not adequately address issues of workers' rights, child/forced labour and women rights to work, equal opportunities and conditions of work.	should be given to industry standards for occupational health and safety of workers as well as issues of child labor and forced labor. The Trade Union Congress (TUC) in its medium-term policies for 2004 - 2008 recognized the importance of organizing workers as well as the difficulty involved in organizing the informal sector and have developed strategies to deal with the situation. Currently, almost all the 17 national unions have desk officers responsible for the informal sector.
ESS3: Resource Efficiency and Pollution Prevention and Management	This ESS sets out the requirements to address resource efficiency and pollution prevention and management throughout the project life-cycle since economic activity and	The Environmental Protection Act 1994 (Act 490), Part I of the Act include the environmental permits and pollution abatement notices and the prescription of	Despite the abundance of laws and policies, air pollution is Ghana's number one environmental risk to public health and the country's sixth-ranked overall risk (out of 19) for death. 100% of Ghana's population is exposed to PM _{2.5} levels exceeding	While there are policies in Ghana to address waste and pollution issues, there are challenges in the effective implementation of these policies. More focus must be put on effective waste

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
	urbanization often generate pollution to air, water, and land, and consume finite resources that may threaten people and ecosystem services.	standards and guidelines. Part II of the Act sets out provisions for enforcement and control. The Act empowers the EPA to appoint “Environmental Protection Inspectors” and any other employees necessary to provide the functions of the Act Water and Sewerage Corporation Act, Act 310 (1965) & Environmental Sanitation Policy (1999): These policies cover both solid waste management and sewage. Pesticides Control and Management (regulated under Part II of the EPA Act 490 (1994))	WHO guidelines. This is primarily due to the impacts caused by household air pollution (causing about 8,800 premature deaths), and secondarily by ambient air pollution (about 7,200 premature deaths) in rural and urban areas. Air pollution’s disease burden is disproportionately borne by infants and the elderly (most of whom are involved in the irrigation scheme). Ghana’s challenges with air pollution, and waste management is largely as a result of infrastructural, implementation and enforcement deficits / gaps.	management and efficient use of natural resources. These have informed the measures that have been designed for this Project.
ESS4:	ESS4 address the health, safety, and security risks and impacts on project-	The Environmental Protection Agency Act, 1994 (Act 490) and	At the project level, there are no clear guidelines or requirements for SEA/SH avoidance and management.	On this project, clear guideline would be provided for managing sexual exploitation

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
Community Health and Safety	affected communities and the corresponding responsibility of Borrowers to avoid or minimize such risks and impacts, with particular attention to people who, because of their particular circumstances, may be vulnerable.	Environmental Assessment Regulations, 1999 (LI 1652) require that the public and community members are consulted during project development and implementation to enhance proposed mitigation measures put in place to safeguard public health. Labour Act, 2003 (Act 651) addresses issues of safe working environment	<p>There are also no requirements for conducting timely and effective consultation and establishing a Grievance Mechanisms.</p> <p>There are also no requirements for conducting labour influx assessments for proposed undertakings, and the need for community development plans to forestall such incidents.</p> <p>Although the Ghana Dam Safety Policy LI 2236, (2016) exist, its implementation is challenging as most dams are constructed and managed without recourse to the legislation.</p>	<p>and abuse and sexual harassment (SEA/SH), vulnerability, people with disability, inclusiveness, the need for timely and effective consultation, timely and responsive grievance mechanism and adequate consideration of project affected persons and communities in stakeholder engagement</p> <p>Dam safety assessments would be conducted for dams under FSRP2 sub-projects activities</p>
ESS5: Land Acquisition, Restrictions on Land Use and Involuntary Resettlement	This ESS emphasizes that involuntary resettlement should be avoided. Where involuntary resettlement is unavoidable, it will be minimized and appropriate measures to mitigate adverse impacts on displaced persons (and on host communities receiving	The Lands Act, 2020 (Act 1036); Lands Commission (LC) Act 2008, Act 767; The Lands (Statutory Wayleaves) Act, 1963, Act 186; Land Use and Spatial Planning Act, 2016 (Act 925)	The Land Valuation Division of the Lands Commission is responsible for the computation of compensation on the basis of market value in the case of land and replacement value for houses and other properties damaged or destroyed as a result of the acquisition. However, resettlement can be claimed as a right only by persons with proprietary interests in the acquired	Not required as there are no land acquisition issues involved in this Project. However, the rights of squatters as recognised by the ESS5 will be applied in the unlikely event that it happens. More attention would be given to the protection of livelihood sources for project affected

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
	displaced persons) will be carefully planned and implemented.		lands. Ghanaian jurisprudence does not vest in squatters the right to be resettled except in instances where the Limitations Decree applies. ¹	parties during the implementation of project activities.
ESS6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	This ESS recognizes that protecting and conserving biodiversity and sustainably managing living natural resources are fundamental to sustainable development. It addresses sustainable management of primary production and harvesting of living natural resources and recognizes the need to consider the livelihood of project-affected parties, including Indigenous Peoples, whose access to, or use of biodiversity or living natural resources may be affected by a project.	The Wild Animals Preservation Act 235 (1964) enforced by the Wetland Management (Ramsar Sites) Regulation, (1999); The Wild Reserves Regulations LI 740 (1971); Forestry Commission Act, 571 (1999); Fisheries Commission Act, 457 (1993); Fisheries Act, 625 (2002)	The LI 1652 does encompass the principles that underpin the World Bank ESS6, however the prohibition on conversion of critical natural habitat and the requirement that conversion of other significant natural habitat will not be supported unless there is no feasible alternative and that the benefits outweigh the environmental costs is not provided for.	The project area has been largely modified by intensive agricultural activities and human settlement development. The original vegetation types outside the farmed areas have been largely replaced by open, derived savannah with isolated tall trees and thicket clumps. The vegetation is thus mostly secondary to tertiary in development.

¹ Under the Limitations Decree, 1975, 12 years adverse possession by squatters could grant them proprietary rights necessitating resettlement as a right in the event of such acquisitions. As to whether or not a person has been in adverse possession is a question of fact based on the evidentiary circumstances of each particular case.

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
ESS7: Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	This ensures that the development process fosters full respect for the human rights, dignity, aspirations, identity, culture, and natural resource-based livelihoods of Indigenous Peoples/Sub-Saharan African Historically Underserved Traditional Local Communities	No provisions for indigenous people	Not Applicable	Not required as there are no identified indigenous people in the project area
ESS8: Cultural Heritage	This recognizes that cultural heritage provides continuity in tangible and intangible forms between the past, present and future. It sets out measures designed to protect cultural heritage throughout the project life-cycle.	Under LI 1652, potential impacts on Physical Cultural Resources (PCR) are to be taken into account at several stages in the EA process – in screening proposed undertakings and scoping, preparing, consulting on and reviewing EIS reports. Various types of PCR are included in Schedule 5 of LI 1652, which lists environmentally sensitive sites for which EIS is always	There are no significant differences. The Ghanaian EA system requires that attention be paid to cultural resources, and Section 10 of the <i>National Museum Decree</i> establishes a statutory requirement for reporting of chance finds. Together, these are sufficient to meet the principles of ESS8 for PCR. Under the 2004 Cultural Policy of Ghana, the National Commission on Culture (NCC), in collaboration with the EPA, the Forestry Commission and other relevant agencies, is required to identify sacred forests and	This Report provides a number of measures to address the protection of intangible cultural heritage during the construction phase, in line with the requirements of ESS8

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
		required. In addition to the EA requirements, there is specific legislation in Ghana for protection of PCR. The following laws require that PCRs are protected from neglect, desecration and/or destruction. Environmental Assessment Regulations, 1999) (LI 1652); Ghana National Museum Act, 1969 (NLCD 387)	other heritage sites of Ghana and collect, collate and store indigenous beliefs and practices associated with them with the aim of conserving the nation’s biodiversity and ecosystems and exploring their use as tourist attractions and sustainable sources of rare medicinal plants, animals and minerals. However, the policy does not totally cover the full scope of intangible cultural resources provided under ESS8.	
ESS10: Stakeholder Engagement and Information Disclosure	This requires open and transparent engagement between the Borrower and project stakeholders as an essential element of good international practice.	Environmental Assessment Regulations, 1999 (LI 1652) Sections 15 and 17 require a proponent to initiate a public information and consultation program for the area likely to be affected by the undertaking	There are some inconsistencies within the <i>EA Regulations</i> governing disclosure. Regulation 16(1)1 requires EPA to publish a public notice for 21 days beginning with receipt of a draft EIS, in accordance with a form specified in Schedule 4 of the <i>Regulations</i> , and to “post at appropriate places such parts of the environmental impact statement as it considers necessary.” However, the form in Schedule 4 does not indicate that only portions of the draft EIS will be disclosed; its language is “Copies	The use of the Stakeholder Engagement Plan is an add on to the public information and consultation program which should be focused on. The absence of any local requirement that relevant documents be disclosed in form and language understandable to key stakeholders is an actual gap that has been addressed in this report as far as the Project is concerned. The report also addresses the need for

E&S Standard	Summary of Core Requirements	Ghana Environmental Assessment Policy	Gaps Identified	Measures to Bridge Gap
			of the EIS are available at the EPA library, EPA... Regional Office and District / Municipal / Metropolitan Assembly.”	consultations and public hearings to be held in local languages.

2.5 Relevant Institutions

Additional institutions whose involvement (Scoping and EIA processes) will be relevant to the subproject approval and implementation include:

1. Water Resources Commission;
2. Ghana Irrigation Development Authority;
3. Ministry of Food and Agriculture; and
4. Plant Protection and Regulatory Services Directorate.

2.5.1 Water Resources Commission

The mandate of the Water Resources Commission (WRC) is to formulate a comprehensive national policy on water resources management; to plan, coordinate and monitor water resources development, conservation and management; as well as control and regulate the utilization of Ghana's water resources. The responsibilities of WRC, can be categorized as:

- Processing of water rights and permits (which is required for this subproject);
- Planning for water resources development and management;
- Collating, storing and disseminating data and information on water resources in Ghana;
- Monitoring and assessing activities and programmes for the utilisation and conservation of water resources.

2.5.2 Ghana Irrigation Development Authority

Ghana Irrigation Development Authority (GIDA) is a semi-autonomous agency of the Ministry of Food and Agriculture (MoFA). It is established to explore all water resources for livelihood options in agriculture at appropriate scales for all communities. Its functions include formulating, developing and implementing irrigation and drainage plans for year-round agriculture production, livestock and fish culture in Ghana.

2.5.3 Ministry of Food and Agriculture

The ministry is responsible for developing and executing policies and strategies for the agriculture sector within the context of a coordinated national socio-economic growth and development agenda. MoFA's mission is to promote sustainable agriculture and thriving agribusiness through research and technology development, effective extension and other support services to farmers, processors and traders for improved livelihood.

2.5.4 Plant Protection and Regulatory Services Directorate

The Directorate is the national institution with the mandate and capacity to organise, regulate, implement and coordinate the plant protection services needed for the country in support of sustainable growth and development of agriculture. The goal of the directorate is to contribute to the sustainable reduction of crop losses caused by pests and diseases, currently estimated at 30-50%, to about 10-15%, with substantially reduced use of hazardous chemicals.

3.0 PROJECT DESCRIPTION

3.1 Background

The Kpong Irrigation Scheme is located within the Lower Volta Basin in the Eastern and Greater Accra Regions of Ghana. KIS falls within Latitude 6° 5' 37" and 6° 2' 21" Northings and Longitude 0° 7' 25" and 0° 18' 5" Eastings. The Kpong Dam reservoir on the Volta River serves as the main water source for the scheme. The scheme extends along the right bank of the Volta River from the Kpong Hydro-Electric Power Station at Akuse to its confluence, which is about 20km downstream at Asutsuare and finally ends in Kasunya.

The KIS scheme comprises Sections A, B, and C as shown in Figure 3.1 below. A brief data on KIS is captured in Table 3.1. The scheme has a farming area of about 4,091 ha and is currently under predominantly small holder rice and large-scale banana cultivation. The main beneficiary communities are Akuse and Amedeka, in the Lower Manya Krobo District of the Eastern Region and Asutsuare, Klebuse, Dzogbodzi, Natriku, Lubuse, Volivo, Osuwem, and Dormeliem in the Shai Osudoku District of the Greater Accra Region.

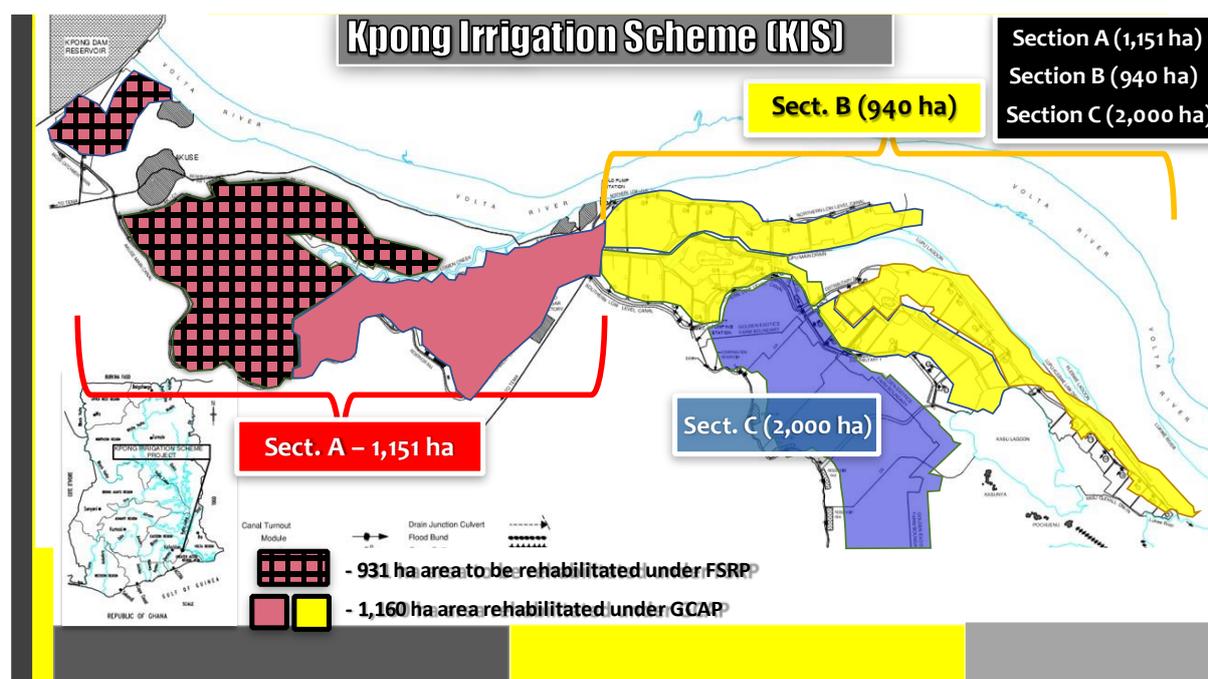


Figure 3.1 Layout of Kpong Irrigation Scheme Showing Completed and Planned Works
(Source: Draft KIS Design Report, 2023)

Table 3.1 Brief Data on KIS

Item	Description	Unit	Before GCAP Rehabilitation
1.	Sections within Irrigation Scheme		
	Sections A & B	Ha	2,091.0
	Section C	Ha	2,000.0
2.	Dam Type		Earth with rock facing
3.	Dam Height	m	14

Item	Description	Unit	Before GCAP Rehabilitation
4.	Dam Capacity	m ³	148 million
5.	Dam Length	m	5,748
6.	Main Canal (Akuse Main Canal) - Lined	km	-
	- Unlined	km	16.4
7.	Branch Canal - Lined	km	-
	- Unlined	km	38.9
8.	Lateral (Open earth channels)	km	162.0
9.	Main & Field Farm Roads (excluding section c)	km	132.0
10.	Drainage works (Main drain, branch drain, field drain, lagoon, and grass waterways,	km	160.0
11.	Pump stations		
	Old pumps	no	-
	Re-lift Pumps	no	3

3.2 Rehabilitation of Kpong Irrigation Scheme under GCAP

The irrigation system of KIS consists of a gravity system comprising the Main Canal (MC) delivering water from the Kpong dam to the field. From the earth-lined Main Canal, water is distributed through the branch canals (also earth-lined) and open channel/lateral to the farmers' fields. The scheme is one of the three (3) irrigation schemes rehabilitated under the Ghana Commercial Agriculture Project (GCAP).

The planned scope of work under GCAP covered the rehabilitation and modernization of the major irrigation and drainage structures in Sections A and B; and the rehabilitation of the Re-lift pump station, which lifts water from a branch canal for irrigation in Section C. The modernisation aspect involves the installation of instrumentation and automated gates. The contract for physical construction works was awarded to Top International Engineering Corporation (TIEC). The planned scope of work covered the following aspects:

- Removal of vegetation, desilting, reshaping and sectional concrete lining of Main Canal (Akuse Main Canal, Length – lining 1.6 km out of 16.4 km earth canal);
- Desilting, reshaping and sectional concrete lining of the Branch Canal in Sections A and B (concrete lining 6.2 km out of 39 km earth canal)
- Removal of vegetation and reshaping of Night Storage reservoirs (4 no.)
- Replacing the lateral canals and the Sub-lateral canals with buried pipes (Semi-California System) to improve water use efficiency (length – 157km covering an irrigable area of 2,400 ha)
- Establishment of temporal by-pass water supply systems to deliver water to farmers during the rehabilitation of the Main and Branch canals (this includes installation of two (2) pumps at the Old Pump Station)
- Rehabilitation of roads (Main/Access roads, length – 40km; Branch & in-field roads – 248km)

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

- Removal of spoiled material and reshaping of the drains channel (main, branch and in-field – 220km), clearing of aquatic weeds in the lagoons (area – 714 ha) and grass waterways (area - 448 ha)
- Rehabilitation and provision of hydraulic structures
- Replacement of pumps (4 no.) at the Re-lift pump station
- Automation and instrumentation of works

However, the planned scope of works was not completely attained due to reduced project funding for KIS. Part of the funds initially earmarked for KIS rehabilitation was released to fund emergency works at Tono Irrigation Scheme (TIS) involving the repairs of the broken Tono Dam Spillway, which was not initially planned. Based on the reduced funding for KIS rehabilitation, GCAP proposed a revision in scope which was duly approved by the World Bank. Although the planned scope of work was not completed, the functionality of KIS for the rehabilitated sections was achieved.

Figure 3.1 shows the areas that received full rehabilitation under GCAP and the approved changes in output deliverables and the scope of work is captured in Table 3.2 below.

Table 3.2 Work Done under GCAP and List of planned Works under FSRP2

Item	Description	Unit	Existing Condition	Planned Improvement	Total Completed /Remarks	Outstanding works proposed for FSRP
1.	Areas to be provided with improved Irrigation	Ha				931 (including Kpong Farms' additional area of 55 ha)
	Section A & B		2,091.0	2,091.0	1,160	
	Section C		2,000.0	2,000.0	2,000	
2.	Main Canals - Lined	km	-	1.6	0.30km completed	Additional 4.7km to be lined
3.	- Unlined	km	16.4	14.8	16.1km cleared and desilted	-
4.	Branch Canal - Lined	km	-	6.2	19.4km completed	Propose to complete concrete lining for 19.5km clay-lined section
	- Unlined	km	38.9	32.7	19.5km lined with clay	
5.	Laterals (Open earth channels)	km	162.0	To cover 162km of open channel to pipe system (Semi California System)	100km of pipes laid	62km of pipe laterals are outstanding. The outstanding laterals command an area of 655 ha

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6.	Length of Field Roads (excluding Section C ²)	km	88	248.0	100km of road rehabilitated	148km length of road
7.	Length of Project Main Roads (excluding Section C)	km	44.0	34.0	10.0km rehabilitated	30km of Main Road
8.	Length of Drainage works	km	200.0	220.0 (including new drains)	145km of drains desilted	75km of drain
9.	Installation of Pumps	unit	- 3 units	2 units – Old PS 4 units – Re-lift PS	2 pumps installed 4 pumps installed @ Re-lift PS	
10.	Automation & Instrumentation –	unit	-	Installation of instrumentation and automated gates	-	Installation of instrumentation and automated gates

The phase 1 rehabilitation works notwithstanding, the scope reduction has become a limiting factor to the full operationalization of the KIS and its impacts include:

- Further deterioration of sections of the canal embankment of the main water conveyance system (Akuse Main Canal).
- Improved water usage and efficiency challenges for the 931 ha farming areas where the rehabilitation works were not completed.
- Inaccessibility of section of the scheme due to the bad road network where road rehabilitation could not be carried out.
- Potential for agitation and social conflict from farmers whose canals were not lined.

3.3 List of planned works under FSRP2

The project aims to rehabilitate and automate the existing irrigation system to reduce operational cost, improve productivity and net returns as well as promote sustainability of the environment. The portion of the scheme to be rehabilitated covers an area of 931 hectares including part of unrehabilitated parts of KIS and Kpong Farms. The detailed project design is captured in the standalone Design/Contract Update and Construction Supervision for Completion of the Rehabilitation and Modernisation of the Kpong Irrigation Scheme (KIS) Report, 2023. The summary of the proposed Works at KIS to be carried out under FSRP2 will include:

- Main canal (Akuse Main Canal) - Lining of 4.7km out of 16km; and clearing/desilting of the remaining length.

² KIS Project and the main beneficiary of Section C (Golden Exotic Limited-GEL) agreed to execute only works that would have minimal disruption to the farming operations of GEL. The rehabilitation of the road and the main canal works within section C could cause significant disruption to the operations of GEL.

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- Branch (secondary) Canals:
 - Section A: Complete Branch canal lining (AK/C1, AK/C2 & AK/C3, length – 10.5km)
 - Section B: Lining of the unlined (earthen) sections of the branch canals to transform them from sectional/partial concrete lining to continuous into full-lined sections (length – 9km)
- Infield channels/laterals: Complete conversion of open unlined channels to pipe canals (Semi California System, Length of pipe - 62km)
- Rehabilitation of Kpong farms 55 ha (works include land development)
- Main/Access Roads and In-field farm roads/tracks: Complete the rehabilitation of Main roads (length – 30km) and farm roads (length –148km)
- Automation and instrumentation of the irrigation system
- Completing the rehabilitation of drainage works and protective dyke in Section B
- Ancillary works; road and drainage structures.

The updated engineering Scope of work (SOW) to be carried out to ensure complete rehabilitation and modernisation of KIS is detailed in Tables 3.3 and 3.4.

Table 3.3 Updated Scope of Works under FSRP

No	Design Engineer Proposal (Phase 1)	Review Proposal Update (For Phase 2)	Remarks
i	Rehabilitation of the Intake Gate at the Kpong Reservoir with Automatic Trash Screen	Rehabilitation of the Intake Gate at the Kpong Reservoir without Automatic Trash Screen	No automatic trash rack will be installed but the intake will be automated. Works for installation of the automatic screen which involves building of coffer dam in 14 m water depth in the reservoir is considered not prudent and the future maintenance of the trash rack is not economical compared to the service expected from the trash rack
ii	Rehabilitation of the Main Canal using the concrete filled Geocell Lining;	Rehabilitation of the Main Canal using plain concrete without geocell	The concrete lining will be backed by adequate Cohesive non swelling (CNS) material to

No	Design Engineer Proposal (Phase 1)	Review Proposal Update (For Phase 2)	Remarks
		Introduction of Sleepers and Expansion joint	prevent cracks in the lining. Sleepers to form pad and expansion joints will be provided. These are captured in the revised bill
iii	Replacement of the Flat Sliding Gates on the Main Canal at the inlet to the six (6) Siphons on the MC with Automatic Gates, Weir/Flume Gates.	Proposed design is maintained	-
iv	The MC Off-take Gates to the M0 to M9 Lateral Canals will be equipped with ultrasonic piped flowmeter for flow measurement.	Proposed design is maintained	No change
v	Installation of Automatic Gates at the outlet gate of the NSRs operating on a 24-hour basis for refilling with the Branch Canal off-taking from the NSR (Section A) operating on a 12-hour basis.	Proposed design is maintained	No change
vi	Automatic operation will also be provided where discharge shall be controlled for billing; Section A (inlets to Kpong Farms, AK/C1, WSC and AK/C6) and Section B (inlets to Distributary Y and Distributary Z);	Proposed design is maintained.	No change
vii	Turnouts to Lateral Blocks using existing Neyrtec Baffle Module Gate (Section A and Distributary Y and Distributary Z) or Gated Piped Regulators (WSC, and NLLC and SLLC command areas). These types of outlets ensure an almost constant flow when upstream water level varies within a small range, and locking them to a selected design or	Proposed design is maintained	No change but the gated piped Regulators for NLLC and SLLC have already been replaced and those of WSC refurbished under Phase 1. Distributary Y and Distributary Z Neyrtec Baffle module Gates

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No	Design Engineer Proposal (Phase 1)	Review Proposal Update (For Phase 2)	Remarks
	required discharge is possible. Only damaged and undersized lateral turnouts will be repaired and/or replaced.		have ALL been replaced/refurbished. Section A Neyrtec Gates repairs are outstanding and would be carried out
viii	Rehabilitation of the Lateral Blocks with the Semi-Californian System. With this system, the Lateral Canal and the Sub-lateral Canals are replaced with buried pipes.	Proposed design is maintained	Areas in section A (AK/C1, AK/C2, AK/C3, AK/C4 and M0-M5) and Kpong Farms laterals and sub laterals are yet to be replaced with pipes
ix	Rehabilitation of the Branch Canals using the concrete filled Geocell Lining.	Rehabilitation of the Branch Canals without geo cell lining Unlined sections in Branch canals at section B and the Kpong Farms would be fully lined with concrete	
x	Refurbishment of the Re-lift Pumping Station with Automatic Operation.	Proposed design is maintained	Installation of automation system on Re-lift pumping station
xi	Rehabilitation of the Drainage System and Infield Roads;	Proposed design is maintained	The remaining drains and infield roads would be rehabilitated under phase 2.
xii	Installation of the Automation System;	Proposed design is maintained	No change

Table 3. 4 SOW for MC and BCs under FSRP

No.	Element	Engineer's Proposal (Phase 1)	Review Proposal Update (For Phase 2)	Remarks
1	Akuse Main Canal, 16.4 km	1.Only partial concrete lining with Hyson Cells (or equivalent) Geocell;	1.Only partial concrete lining without Hyson Cells	Out of the 30.5% (5000m) to be lined,

		some 12% of the canal alignment	geocell. Some 30.5% (5000m) of the canal alignment <i>2.Reference: Drawing No.– KIS/PH 2/23 - 29“Tabulated Works Locations for Concrete Lining for Main Canal</i>	only 1.56% (250m) have been lined.
2	Branch Canals: <i>(some 11.55 km approximately)</i>	1.Only partial concrete lining with Hyson Cells (or equivalent) Geocell; some 12% of the canal alignment 2. Only partial earthworks of the canal through the general repair of embankments and bed, where deemed necessary and minimal reshaping but general excavation and clearing and cleaning.	1.Full concrete lining without Hyson Cells Geocell; 2. The proposal not applicable. 3. Reference: Drawing Nos. KIS/PH 2/39 - 42 “Tabulated Works Locations for Concrete Lining – Branch Canals	Full/complete Concrete lining of the unlined sections in section B and Kpong farms Full/complete Concrete lining of the unlined sections in section B and Kpong farms

3.4 Construction Staff Mobilisation

To ensure quality assurance/quality control, the contractor to win the bid for the construction and rehabilitation works would be required to recruit a competent Project Manager for the project execution. The contractor will be required to prioritise recruitment of workers from the project area.

The offices used during the rehabilitation works under GCAP will be used as the site camp. Works such as site possession, mobilisation of construction equipment, and setting up of the construction site office will be completed under the staff mobilisation stage. The preparation works mainly include the installation of construction plant, water supply, and electricity. The expected labour types and estimated numbers are shown in Table 3.5.

Table 3.5 Key Roles and Estimated Manpower

No.	Position	Min. Req.
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1.	Project Manager	1
2.	Senior Irrigation Design Engineer	1
3.	Quantity Surveyor	1
4.	Civil Construction Engineer	2
5.	Concrete Works Technician Engineer	2
6.	Earthworks Technician Engineer	2
7.	Plant Engineer	1
8.	Material Engineer	1
9.	Laboratory Technician	2
10.	Geodetic Engineer	1
11.	Land Surveyor	4
12.	Social Officer	1
13.	Environmental, Health and Safety (EHS) Specialist	1
14.	First Aid Officer	1
15.	AutoCAD Technicians	1
16.	Electro-mechanical Engineer	1
17.	Instrumentation Engineer	1
	Sub-total	24
	Skilled Labour	40
	Semi-skilled labour	60
	Unskilled Labour	150
	Total Employees (workers) on Site	250

3.6 Equipment Mobilisation and Raw Material Sourcing

The materials required for construction would be procured from nearby market centres. Some of these materials include wood, pipes, cement, and steel. The major natural construction materials required for the construction of the subproject include gravel, CSN, coarse aggregates (chippings), and fine aggregates (sand). Sand, CSN and gravel would be purchased from borrow pits to be created around the project site while the coarse aggregates would be procured from nearby quarries that have satisfied relevant statutory requirement including operating under a valid Environmental Permit. All borrow pits created will be reclaimed before the completion of rehabilitation works.

Water for construction would be sourced from nearby dam and transported to the site using water tankers/bowsers. The on-site national electricity grid would be tapped for constructional use. A list of machinery and equipment that may be used in the construction phase is provided in Table 3. 6.

Table 3. 6 Machinery and Equipment

NO.	Name of Equipment	Min. No. Required
1.	Excavators	8

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2.	Bulldozers	6
3.	Grader	4
4.	Static Steel Roller	3
5.	Vibrating Steel Roller	3
6.	Pedestrian Vibrating Roller	4
7.	Plate Compactor (Vibrating)	10
8	Dump Trucks	24
9	Front End Loader	3
10	Well Point Equipment System	6
11	Water Pump sets	15
12	Compressor including rock breaking Tools	2
13	Ready mix Concrete Trucks	3
14	Concrete Pump	3
15	Concrete Vibrator	10
16	Concrete Batching Machine	1
17	Telescopic crane or Equipment	2
18	GNSS RTK base (with long range radio)	1
19	Total Station & Ranging Rod	2
20	Handheld GPS sets	5
21	Fabric Measuring Tape (30m/50m)	6
22	Portable Welding Machine	2
23	Portable Water tanks minimum 500 lit. capacity	12
24	Generator, 5KVA or more	4
25	De-watering Pump (minimum 100 mm dia.	8
	Total	150

3.7. Management Arrangement

The scheme is currently managed by the Scheme Management Entity (SME) put together by GIDA which will continue to manage the facility in collaboration with the existing Federation of Water Users Association (WUA), made up of 15 WUAs. GIDA, the Supervising Authority (SA) will continue to facilitate the development of the WUAs. GIDA will remain owner of all irrigation and drainage infrastructure associated with the KIS. These are main canals, laterals, sub-laterals, and office blocks. GIDA as the owner of the infrastructure will carry out major investments (for improvements) in the scheme which is not considered as replacement investments or repairs and hence are not part of the Irrigation Service Charge (ISC) price farmers have to pay. GIDA will also supervise and monitor the operations of the SME and will be responsible for the governance functions.

The SME will continue to operate, maintain and manage the irrigation scheme, particularly headworks, main canals and all related structures and will calculate and update the ISC, collect the fees from the farmers on lateral committee level and maintain the structures according to best practices. The ISC to be paid by the farmers cover all O&M costs, repairs, replacement investments and the remuneration of the staff of the SME.

The SME will also provide agricultural extension service to manage laterals and sub- laterals. The SME will also provide training and capacity building functions to the WUAs. Within this arrangement, farmers still have to rely on external service providers (government or private) for machinery services, marketing and processing of agricultural produce. Figure 3.3 gives the organisational structure of the SME.

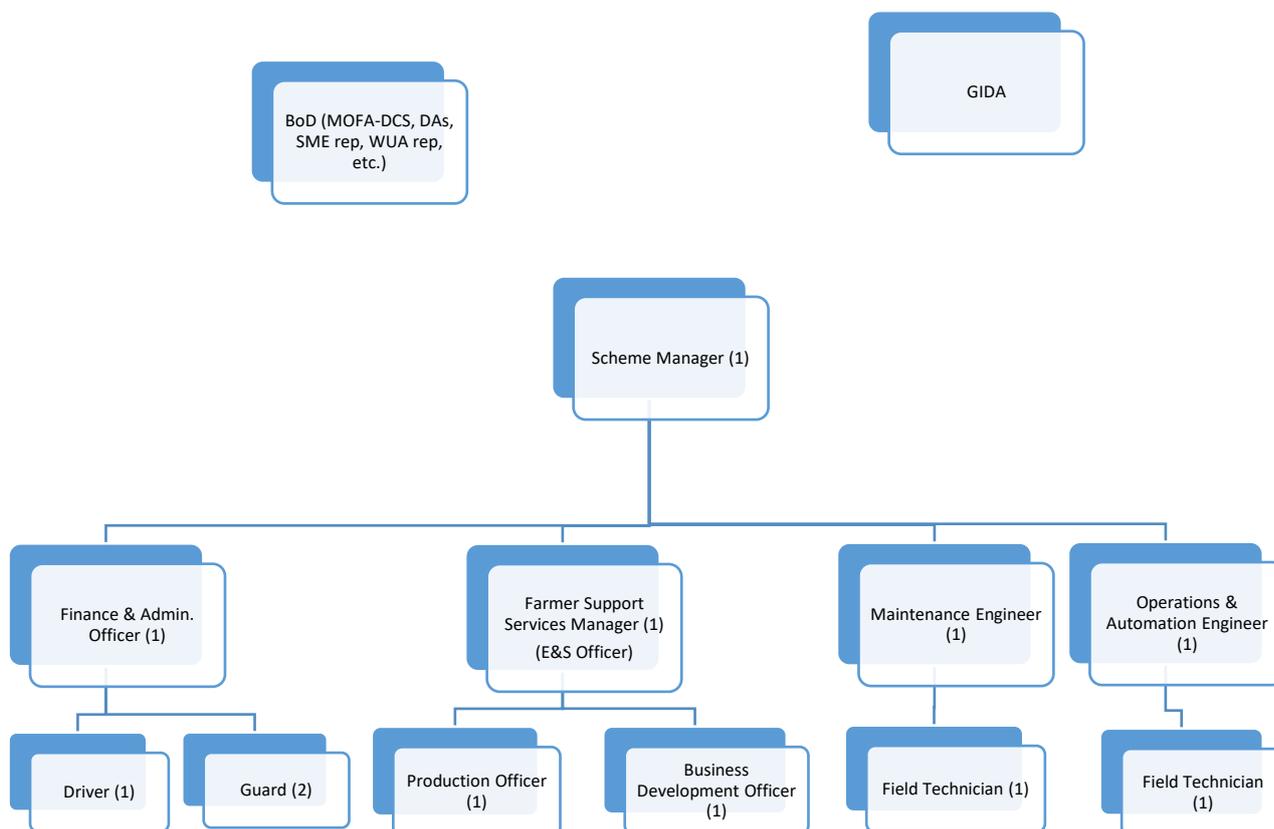


Figure 3.2 Organisational Structure of the SME

(Source: Updated Design Report, 2023)

The institutional arrangement for the management of the KIS is captured in Table 3.7

Table 3.7 Institutional Arrangement for the Management of KIS Irrigation Schemes

Issues	Arrangements
Scheme Management Entity	The scheme will continue to be managed by the existing GIDA Scheme Management Entity (SME) and the existing Water Users Associations (WUAs). GIDA, the Supervising Authority (SA) will continue with its responsibility of developing the WUAs until it is fully established.
Legal form of operation	GIDA will in the interim continue to engage the current SME which happen to be subsidiary of GIDA. However, in the long term, there will be a contractual arrangement between the MoFA/GIDA and the Private Sector Entity (SME) to manage the scheme.

Issues	Arrangements
Owner of assets	GIDA will remain owner of all irrigation and drainage infrastructure associated with the KIS. These are main canals, laterals, sub-laterals, office blocks and operational machinery. As far as non-irrigation related assets are concerned, all residential houses, and offices will remain in the ownership of GIDA and can be rented to the SME and its staff members. Alternatively, GIDA can sell all non-irrigation and drainage infrastructure.
Responsibilities Contracting Authority (CA)	GIDA as Supervising Authority will supervise and monitor the scheme management entity. GIDA as the owner of the infrastructure will carry out major investments (for improvements) in the scheme which is not considered as replacement investments or repairs and hence are not part of the Irrigation Service Charge (ISC) price farmers have to pay. GIDA will be responsible for the governance functions which includes the regulation and control functions such as water resource allocation, water resource monitoring, and supervision of irrigation management.
SME Responsibilities	The SME will continue to operate, maintain and manage the irrigation schemes, particularly headworks, main canals and all related structures. SME will calculate and update the ISC, collect the fees from the farmers on lateral committee level and maintain the structures according to best practices. The ISC to be paid by the farmers cover all O&M costs, repairs, replacement investments and the remuneration of the SME.
Optional tasks	Given the currently limited availability of agricultural extension service and insufficient capacity of farmer organisations, to manage laterals and sub- laterals, the SME might be tasked to provide basic training and capacity building functions until the private sector has fully taken over this role. Within this arrangement, farmers still have to rely on external service providers (government or private) for machinery services, marketing and processing of agricultural produce. However, the SME can be tasked to assist in the facilitation of setting down agro-industry.

Water Users Association

The management of the operation and maintenance (O&M) of the KIS Branch Canal and Lateral Canal command areas' (I&D) infrastructure will be the responsibility of the Water User Associations (WUAs), established at the Branch and Lateral Canals which off-take from the Main Canal. The I &D infrastructure to be managed include:

- Branch, Lateral and Sub-Lateral Canals & Drains;
- Collector Drains;
- All I&D Hydraulic Structures;
- All In-field and link roads; and
- All Maintenance and all Inspection Roads on the Branch Canals.

The roles and responsibilities of the institutions for the operation of WUA are presented in Table 3.8.

Table 3.8 Roles and Responsibilities for the operation of the WUAs

Actors / WUA Components	Tasks to be performed
Supervisory Authority (GIDA)	<ul style="list-style-type: none"> • Provide training and create awareness in connection with the establishment and operation of associations; • Provide technical assistance and support to associations related to water management, accounting, financial planning, irrigation techniques and practices, maintenance and gender issues; • Assist in the formation of new associations; • Establish and maintain the Register of Irrigation Water Users' Associations; • Conduct legal and financial supervision.
General Assembly (Central Committee)	<ul style="list-style-type: none"> • Set the amount of membership fees and fines payable by the members; • Approve the annual income and expenditure statement and balance sheet and the annual report of the association; • Make decisions on the re-organisation or liquidation of the associations; • Set a limit on the sale, purchase, mortgaging or pledging of any asset owned by the association, investment or conclusion of loans, overdrafts or the financial liabilities of the association; • Approve contracts above a certain value or of high significance to the association as may be specified in the by-laws; • Election of members for the management committee and the dispute solving committee; • Final decision making on any drastic change in financial policies; • Election and removal of committee members for just cause; • Adaptation and amendment of articles of incorporation and by-laws of the association.
Management Committee	<ul style="list-style-type: none"> • Implement decisions by the General Assembly; • Prepare annual work plans and budget of the association and implement them upon approval; • Be responsible for the operations, maintenance and management of the command area/ service area; • Organise General Assembly meetings, prepare minutes and disseminate to the members; • Collect water levies from the lateral committees, undertake the accounting and hand over the money to the operator; • In close collaboration with the supervising authority and the operator, calculate and agree on the annual water levy farmers have to pay; • Proper operation and maintenance of the irrigation system;

Actors / WUA Components	Tasks to be performed
	<ul style="list-style-type: none"> • Coordinate irrigation activities in the area including cropping patterns, irrigation scheduling and water distribution; • Formulate and implement rules and regulations for the management of the affairs of the Association and for the guidance of the Associations officers and members; • Ensure true and accurate records of all transactions of the Association are kept by the Treasurer and Audited annually; • Appoint employees who are not members of the Association and fix their remuneration; • Provide the audited financial statement of the Association to all members; • Ensure safe custody of the Association property; • Enter into contracts on behalf of the Association; • Ensure that safe health and hygiene practices within the scheme are followed; • Responsible for fee collection in timely manner and remitting the funds to the Treasurer of the Association; • Evaluate the overall performance of the irrigation system; • Ensure equal water access to all legal members.
Agric Committee	<ul style="list-style-type: none"> • Serve as a liaison between the FSSM and farmers on matters relating to agronomic practices • Advise farmers on agronomic practices including post-harvest management, agro-chemical application, management of agro chemical waste, varieties of rice to cultivate, water needs for crops etc.
Sanitation Committee	<ul style="list-style-type: none"> • Responsible for waste management and housekeeping issues on the scheme • Responsible for security issues on the scheme
Task Force	<ul style="list-style-type: none"> • Enforces the decision of all the committees including decisions on waste management, management of
Dispute Settlement Committee	<ul style="list-style-type: none"> • Resolving disputes related to water use and distribution of water between members of the association; • Resolving disputes related to the provision of irrigation services; • Resolving matters related to contravention of the by-laws of an association; • Resolving of matters related to non-observance of the watering schedule of an association; • Decision on fines to members who do not pay the water levies; • Resolving disputes related to land allocation

The management of the operation and maintenance (O&M) of the KIS Branch Canal and Lateral Canal command areas' (I&D) infrastructure will be the responsibility of the Water User Association (WUAs), established at the Branch and Lateral Canals which off-take from the

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Main Canal. The irrigation and drainage (I &D) infrastructure to be managed by the WUAs include:

- Branch, Lateral and Sub-Lateral Canals & Drains;
- Collector Drains;
- All I&D Hydraulic Structures;
- All In-field and link roads; and
- All Maintenance and all Inspection Roads on the Branch Canals.

3.8 Maintenance of the Scheme

The principal objective of the maintenance system is to ensure that the irrigation and drainage system operates as designed, both now and in the future, so that optimal water distribution is achieved at all times.

To achieve this objective, regular inspection and maintenance will be conducted to prevent deterioration in:

- Canals, drains and reservoirs;
- structures including gates, weirs and turnouts;
- Inspection and access roads;
- Grass spillways and flood protection embankments; and
- Ancillary facilities such as offices, housing, vehicles and equipment.

The types of maintenance to be undertaken on the scheme by the SME and WUAs include:

- Routine maintenance;
- Periodic maintenance; and
- Emergency maintenance.

4.0 ALTERNATIVE CONSIDERATIONS

The KIS is currently being used although the scheme needs major rehabilitation and modernization work to improve production yields. The existing surface irrigation system allows canals to carry water to some irrigation fields. Alternative options under the rehabilitation work is limited however, a number of options have been considered to present the most feasible alternatives. These options have been analysed according to their suitability to meet the subproject objectives. The options were analysed according to the following categories and summarised in Table 4.1:

- Agriculture development scheme;
- Water supply options; and
- No action option.

Additionally, the type of irrigation system and cropping systems have also been analysed as sub-alternatives in Table 4.1. These sub-alternatives are as follows:

- Type of irrigation system (Drip Irrigation, Centre Pivot Irrigation, Sprinkler irrigation and Surface irrigation (flood and furrow irrigation methods).
- Cropping System (Mono-cropping, Mixed Cropping and Crop Rotation).

Table 4.1 Analysis of Alternatives

No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
1.	Solely large-scale commercial agriculture	Agriculture development scheme	<ul style="list-style-type: none"> - Limited employment opportunities for neighbouring communities. - All 3,000ha gross area (potential) is developed into commercial farms. - Easier to manage as investor has full control over entire land. - Investor can make higher returns from the venture. - No smallholder farms involved in the project as there will be high social costs. - No provision of support services for smallholder farmers in neighbouring communities. - Limited employment opportunities for neighbouring communities 	A combination of large scale commercial and smallholder farming systems will be utilised to bring enhanced benefits to the neighbouring communities. The provision of support services and transfer of knowledge to the smallholder farmers will increase their agricultural productivity, increase their income levels and improve their livelihoods.
	Smallholder Farming System with Support from Investor		<ul style="list-style-type: none"> - Smallholder farming system in the project area is improved. - Scheme Manager as an investor provides support services for smallholder farmers (provision of inputs, land preparation, irrigation, etc.) in the form of loan or at a fee. - Smallholder farmers can increase their productivity and improve their livelihoods through the support received. - Smallholder farmers secure their own lands. - Community members without lands may not benefit from the scheme. - Possibility of some smallholder farmers defaulting in payment of loans or fees charged for service may affect project sustainability. 	
	Combination of large scale commercial and		<ul style="list-style-type: none"> - Portions of project land is allocated to large farming enterprises. - Portions of land is allocated to smallholder farmers in neighbouring communities. 	

No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
	smallholder farming systems		<ul style="list-style-type: none"> - Large farming enterprises have substantial technical, managerial and financial expertise and working capital. - Large farming enterprises act as “anchor farmers” and provide support to smallholder farmers through contract farming/outgrower arrangements. - Anchor farmer provides training and extension services for smallholder farmers. - Increased productivity on smallholder farms. - Produce from smallholder farms maybe purchased by anchor farmer. - Employment opportunities and enhanced livelihood for smallholder farmers and community members who are employed on farms 	
2.	Rain-fed	Water Supply	<ul style="list-style-type: none"> - Less costly. - Avoidance of conflict with other water users by not depending on surface and groundwater sources. - No infrastructure required to distribute water to all sections of the farm. - Existing GIDA irrigation facility will be underutilized. - Cropping period limited to raining season. - Higher risk of crop failure due to drought. - Unpredictability of rainfall pattern. - Quantity of water received by crops cannot be regulated. - Less productivity during periods of low rainfall. - Higher vulnerability to climate change. 	Combination of rain-fed and irrigation has been considered as the preferred option to ensure all year-round cultivation, reduce production cost associated with full dependence on irrigation and to take advantage of the benefits of both options and reduce the negative effects. Some irrigation facilities by GIDA already exist on site, which would be
Irrigation	<ul style="list-style-type: none"> - Existing irrigation facilities by GIDA will be utilized. - Cropping can be done all year round. - Quantity of water to crops can be regulated. 			

No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
			<ul style="list-style-type: none"> - Increased crop productivity due to availability of water. - Higher cost of irrigation. - Potential conflict with other water users downstream. - Potential impacts on aquatic ecosystem downstream of abstraction point. 	rehabilitated, modernised and extended for use.
3.	No Action	-	<ul style="list-style-type: none"> - The impacts on vegetation and fauna will be avoided. - Effects from the use of agrochemicals and fertilizers on the soil and water resources will be limited. - The aesthetic view of the area will not be changed. - Investment opportunity made by GIDA under the existing scheme will be lost. - Existing GIDA irrigation facilities at the site will remain underutilized/dilapidated. - Job and economic opportunities for neighbouring communities and the country will be lost. - Ghana's land and water resources will continue to be underutilized. - The inhabitants of the area will continue to indulge in poor farming practices at the project area amidst erratic climatic conditions, either drought or floods for cultivating crops, with very limited sources of income. - The local economy will continue to be weak. - The youth in the proposed project area will continue to migrate to the district, regional and national capitals in search of non-existing jobs, and many may eventually resort to crime and other socially unacceptable lifestyles. 	This option is not preferred due to the negative impacts on food security, livelihoods and the general social and economic impacts on the local and national economy. The existing GIDA irrigation facilities at the project site will remain underutilised. This ESIA has proposed measures to mitigate or reduce the negative impacts on the environment.

No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
Sub-alternatives				
1a.	Open canals	Pumped or gravity irrigation facilities	<ul style="list-style-type: none"> - The open canals are exposed to the atmosphere which increases evapotranspiration. - Open canals are relatively less expensive as compared to closed canals. - Maintenance on open canal channels is easier as compared to closed canal channels. - Poses safety threats to nearby communities/persons and animals. - Nearby communities can easily dump waste into canals and also access the water for domestic usage. 	<p>The most preferred option is to improve upon the existing open canal system as the most technically/ financially viable option. This would however require the incorporation of additional safety measures.</p> <p>The existing canals have most sections open except where the canals cross streams/rivers. However, the project proposes to replace lateral canals by the piped system similar to the Semi-Californian System of PVC piped laterals to each farm blocks. The proposed option maximizes the efficiency of the existing system.</p>
	Closed canals		<ul style="list-style-type: none"> - The closed canals are covered, and the water not exposed reducing evapotranspiration. - Closed canals are expensive in their construction. - The channels of closed canals are not easy to access for desilting when choked with obstacles. - It's covered and does not pose any safety threat to nearby communities/persons and animals. - Not easy for nearby communities to dump wastes into canals and fetch the water for domestic usage. 	

No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
	Laying of pipes (semi-Californian system)		<ul style="list-style-type: none"> - This involves placement of pipes in structures as pipelines to deliver water to the lateral farm blocks as Semi-Californian piped laterals. - More expensive compared to open canals. - It's covered and does not pose any safety threat to nearby communities/persons and animals. - Communities cannot dump wastes into canals and fetch the water for domestic usage. 	
1b.	Lined canals	Nature of canal	<ul style="list-style-type: none"> - Lined canals have a more secure, stable channel with no soil erosion influence and does not encourage vegetation growth within the channel. - Properly constructed lined canals have less maintenance cost due to infrequent vegetation removal as well as infrequent collapse of side walls. - Ensures optimal transmission of water to irrigation fields due to less water loss from seepages. 	<p>The most preferred option will be the lined canals, this will ensure that maximum water is retained for irrigation while reducing water loss due to seepage.</p> <p>Even though lined canals are preferred, it is not possible to line all canals in the irrigation scheme due to huge financial cost. The current rehabilitation will line only critical areas on the main canals</p>
	Unlined or earth canals		<ul style="list-style-type: none"> - Earth canals usually have unstable channels with soil erosion influence and encourages vegetation growth. - Maintenance cost is usually high due to frequent vegetation removal and collapse or cave in of side walls. - Increased water loss from transmission due to seepage. 	

No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
2.	Monocropping	Cropping System	<ul style="list-style-type: none"> - Growing one type of crop all year round on the same land. - Allows large expanses of land to be cropped and harvested at the same time. - Easier to be mechanized. - Less types of equipment and machinery required. - Higher risk of crop failure due to pest and disease infestation or drought. - Higher risk of investment loss due to crop failure. - Higher rate of nutrient depletion due to the same nutrient requirement. 	<p>Monocropping has been considered as the preferred option to meet market demand, maximise land use and return on investment.</p> <p>The scheme with the climatic and soil conditions is well suited for rice production, hence monocropping is the preferred option. With the provision adequate water, rice would be cultivated all year round. This will contribute to a reduction in rice imports in the country and also promote food security. Also, the cultivation of rice alone on the scheme allows for agronomic control as irrigated rice cultivation would allow for precise control of water and</p>
	Mixed Cropping		<ul style="list-style-type: none"> - Growing of two or more crops on different portions of the same land. - Spreads risk of crop failure. - Diversifies sources of income. - Different maturity periods of crops affect planning. - Different requirements of plants require different types of equipment, fertilizers and other farm inputs. 	
	Crop Rotation		<ul style="list-style-type: none"> - Allows large expanses of land to be cropped with one type of crop at a time which is followed in rotation with a different crop on the same piece of land. - Easier to be mechanized. - Less types of equipment and machinery required. - Spreads risk of crop/farm failure within the year. - Diversifies sources of income. - Maximizes land use and return on investment due to different maturity periods 	

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No	Alternative Consideration	Category of Option	Analysis of options	Preferred Option and Justification
				nutrient management, which can be challenging in a crop rotation system that involves multiple crops with different water and nutrient requirements.

5.0 ENVIRONMENTAL AND SOCIAL BASELINE CONDITIONS

This section presents a description of the existing environment and social conditions, comprising the bio-physical and socio-economic conditions of the project areas. The Kpong Irrigation Scheme (KIS) is located around Akuse in the Lower Manya Krobo Municipality of the Eastern Region and Asutsuare in the Shai Osudoku District of the Greater Accra Region. Climatic data including rainfall, sunshine, wind, relative humidity and temperature in the area were obtained from the Ghana Meteorological Authority (GMA).

5.1 Physical Environment

5.1.1 Climatic Conditions

Rainfall

The climate of the project area is characterized by humid conditions and a bimodal rainfall pattern. Figure 5.1 shows the average monthly rainfall data for the Akuse synoptic station (nearest synoptic station to the project site) over the period 2017 – 2020. The major rainfall season occurs between March and June peaking in May with an average of 217 mm of rain. The minor rainfall season starts from September to October. On the average, the driest month is January while the wettest month is May. The average annual rainfall varies between 950 mm and 1,300 mm. There is not much significant difference in the data obtained for the 2018 and 2023. However, June was recorded as the wettest month for the former and May for the latter.

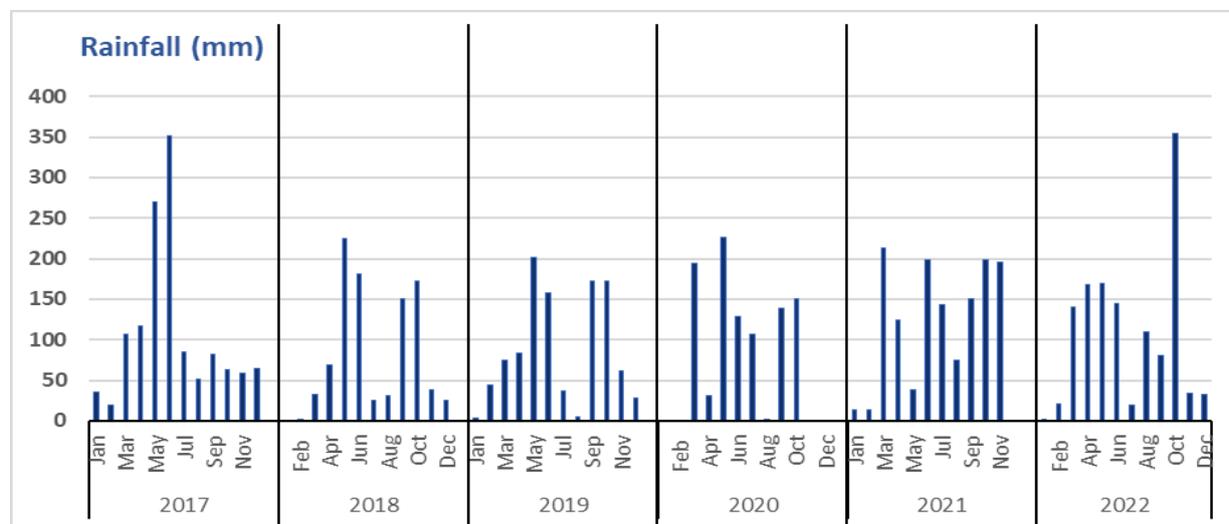


Figure 5.1 Average monthly rainfall data at the Akuse Synoptic Station (GMA, 2023)

Further analysis of the data indicated a strong positive relationship between rainfall and humidity implying that high level of rainfall may signal high humidity. The bimodal pattern of rainfall influences the cropping pattern in the district, giving rise to two cropping seasons – the major and minor cropping seasons. Rainfall duration is generally inadequate even during the major season, which affects crop production in the district.

Sunshine

On the average, the sun shined for approximately 5-6 hours a day from 2017 – 2020 at the project area, as recorded at Akuse (nearest synoptic station). The shortest daily sunshine time is usually recorded between July and September, with the least daily sunshine hours in Sept 2018, with a record of less than an hour. Figure 5.2 shows the graphical representation of the sunshine in the project area. Further analysis revealed a strong positive relationship between sunshine hours and maximum temperature, suggesting that longer sunshine hours will result in higher temperatures.

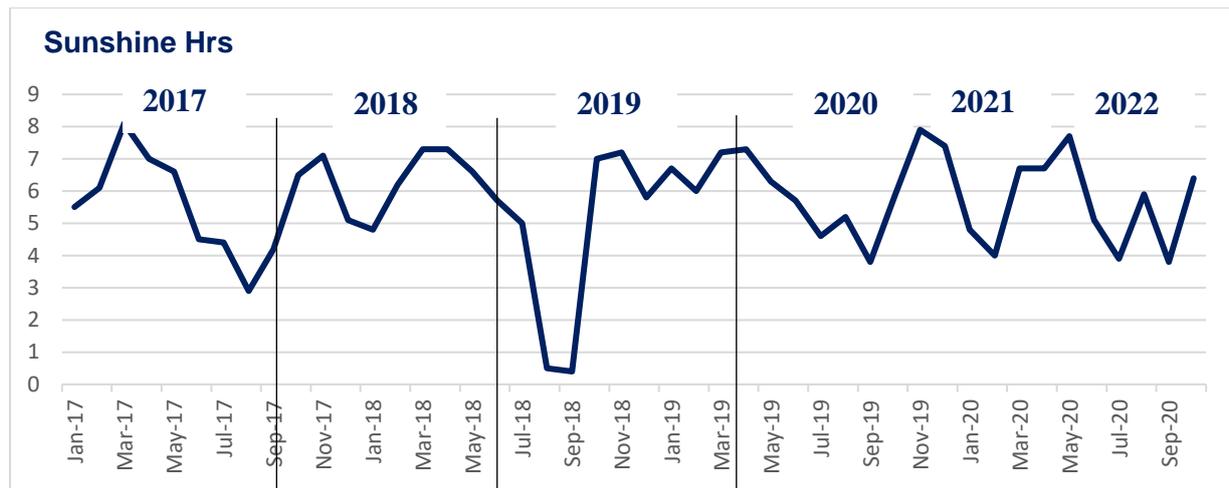


Figure 5.2 Average sunshine in KIS (GMA, 2023)

Wind

The monthly wind speed recorded within the project site was 1 m/s – 3 m/s from 2017 to 2020 with wind speed fluctuations observed month on month. Low wind speeds are usually recorded in January, May and June with maximum wind speed of 2 m/s recorded in February, March, June and September. During the early part of the dry season, the harmattan winds from the Sahara regions blow across the district, drying up seasonal streams and ponds and exposing the vegetation to bushfires. Figure 5.3 shows the average wind speed at the project site from 2017-2020.

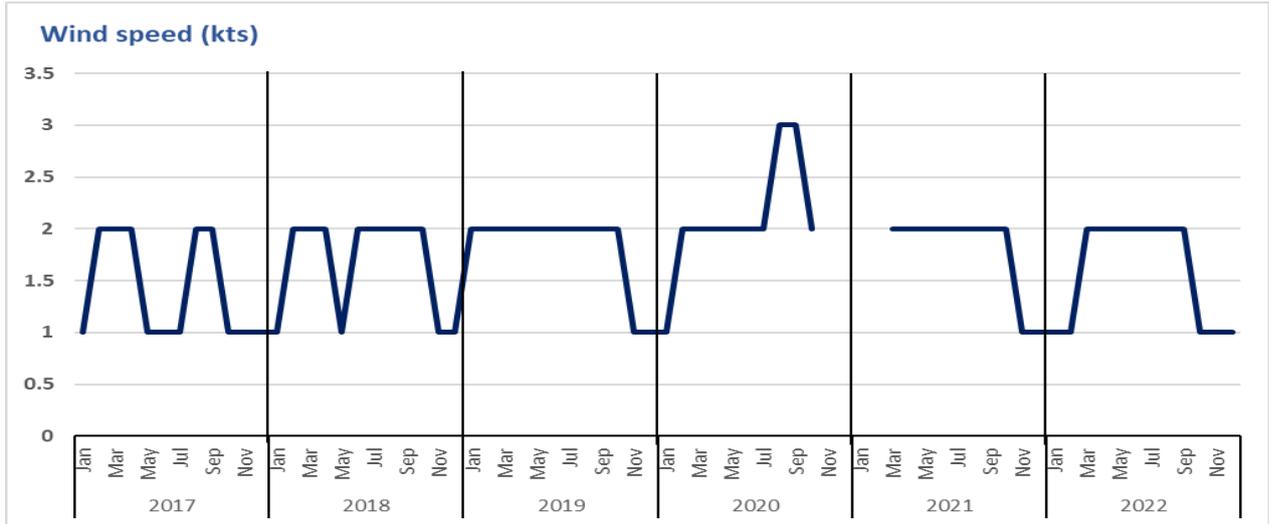


Figure 5.3 Average wind speed at KIS (GMA, 2023)

Temperature and Relative Humidity

The temperature and relative humidity at the project site vary little during the year. Variation in monthly mean temperature, based on data from the Ghana Meteorological Agency (2017 to 2020) is presented in Figure 5.4. The warmest month is usually January to April with a peak in March while the coolest month is usually August. The average monthly maximum temperature recorded is 33 °C. The highest drops in temperature usually occur in January for all the years. The difference between the maximum and minimum monthly temperature is usually between 11.8 to 12.5 °C.

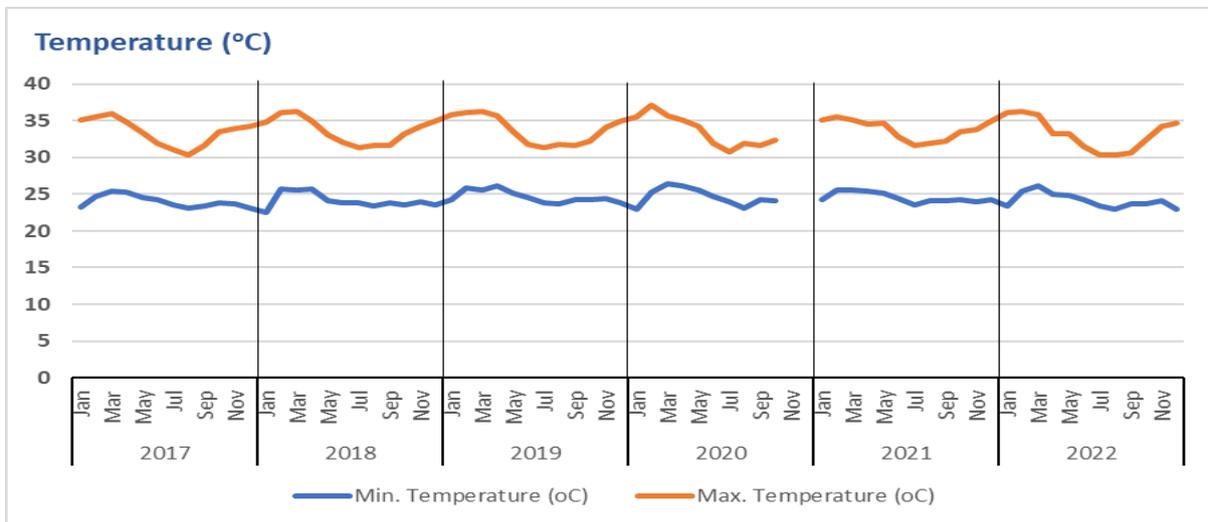


Figure 5.4 Variation in mean monthly temperature at the Akuse Synoptic Station (GMA, 2023)

Relative humidity in the project area is highest between June and July and is least between December and February as presented in Figure 5.5. Annual mean humidity is 74.8%. Relative humidity at 3pm generally low between November and April with the lowest usually recorded in January. From January relative humidity at 3pm rises sturdily to a peak between 74 and 76%.

There is a strong positive relationship between humidity at 6am and 3pm implying that if the humidity in the morning is relatively high, the afternoon humidity will be relatively high as well. A further analysis indicated a very strong negative relationship between maximum temperature and humidity, suggesting that high temperatures will imply low humidity.

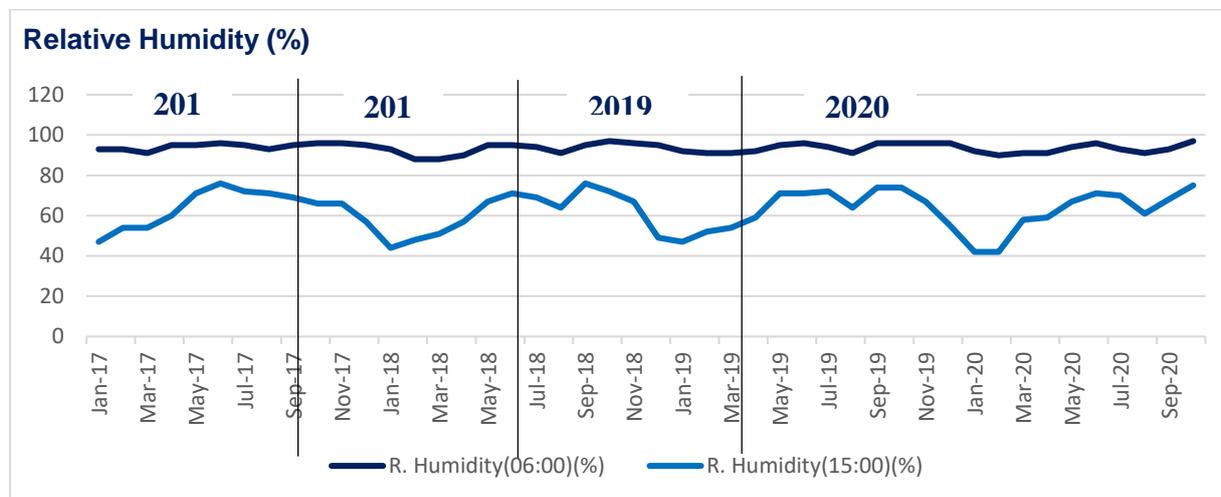


Figure 5.5 Variation in mean monthly relative humidity (GMA, 2023)

5.1.2 Geology and Soil

According to the Soil Research Institute of the Council for Scientific and Industrial Research (CSIR), the soil morphology of the project site is unlikely to change since the last ESIA was prepared, hence the adoption of the data obtained in the previous ESIA. The soil classification at the site as reported in the previous ESIA was based on the morphological properties of the representative soil profiles. Feasibility studies conducted by the project's Engineering Consultants (BRLi), identified seven (7) soil series within the project area. The soils were identified using the local soil series level and then classified using the *World Reference Base for Soil Resources (FAO, 2006)*. Information from previous studies indicates that the soils were developed from acidic and basic gneiss and Volta alluvium deposits. The major soils encountered during the present study are as follows:

- Akuse series (Calcic Pellic Vertisol (Gleyic))
- Bumbi series (Pellic Vertisol)
- Lupu Series, Eutric Gleysol (Clayic)
- Hake Series, (Chromic Eutric Cambisol (Clayic))
- Amo and Tefle Series (Eutric Cambisol (Arenic)) and Eutric Gleysol (Clayic)

These are briefly described below and illustrated in Figure 5.6. The soil types influence the types of crops cultivated in the area.

Akuse series (Calcic Pellic Vertisol (Gleyic))

These soils comprise of black to dark grey, heavy, plastic, highly elastic when wet and become hard and compact when dry, cracking vertically from the surface. The topsoil consists of black to dark grey, silty clay to clay, moderate to strong crumbs and lumps, sticky and plastic with rusty root channels. The subsoil is grey, faintly mottled olive brown, clay, moderate to strong

angular and massive structure with common calcium carbonates and manganese dioxide concretion. A shallow version of the Akuse series (Prampram series) was also encountered within the area.

The nature of the soil makes it unsuitable for manual cultivation using rudimentary methods, however, can be suitable for mechanized irrigation farming. Subsistence farming of maize, cassava, okro and other vegetables occur in some of the areas dominated by this soil type. The areas with this soil type have short grasses providing extensive grazing fields for cattle. The Akuse series is the predominant soil type in the district and is found in the central and eastern parts of the district.

Amo and Tefle Series (Eutric Cambisol (Arenic) and Eutric Gleysol (Clayic))

These soils occur on the higher ground in association with Hake and Tefle series. They are deep (>100 cm), imperfectly to well drained, dark greyish brown to greyish brown topsoil grading into pale brown and greyish brown subsoil with few to common fine and medium prominent yellowish brown and strong brown mottles. They are very strongly acidic in the topsoil. They have silty loam to sandy clay loam topsoil underlain by loamy sand and sandy loam with weak fine and medium sub-angular blocky grading into single grains (structure-less).

These are found in the extreme north and north-eastern part of the district within the Volta flood plain. These soils are moderately supplied with nutrients under natural conditions and are easily workable with simple implements. These soils were in the past used for sugarcane cultivation to feed the Sugar Factory at Asutsuare and are now used extensively for rice cultivation. The Volta flood plain soils are one of the most fertile soils in the Shai-Osudoku District.

Hake Series (Chromic Eutric Cambisol (Clayic))

The series consist of 20 cm of brown, loam, weak fine granular, slightly sticky slightly plastic top soils underlain by yellowish brown, clay to clay loam mottled, strong brown with moderate to strong medium and coarse sub-angular and angular structure, slightly sticky slightly plastic. The soil reaction ranges from pH 5.1 to 7.0 within the soil profile. These soils are very deep (>150 cm), moderately well drained, occurring on very gentle slopes within the site.

Bumbi Series ((Pellic Vertisol))

These soils are deep (>150 cm), poorly drained, black to grey heavy clays found within depressions and valleys within the site. The profile consists of black clay, moderate fine and medium crumbs and granular with rusty root channels in the topsoil underlain by very dark grey, faintly mottled strong brown, sticky plastic with moderate to strong medium and coarse angular blocky, sub-angular and massive structure. The soil contains calcium carbonate nodules and concretions in some of the profiles observed. The soil reaction throughout the profile ranges from 5.6 to 7.7.

Lupu Series (Eutric Gleysol (Clayic))

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These soils are very deep (>150 cm), dark grey to grey, clay, sticky, plastic, non-calcareous with strong brown mottles with slaken size on the surface. The profile consists of dark grey, clay loam to clay, moderate fine and medium crumbs and granular with rusty root channels in the topsoil underlain by dark grey to grey, heavy clay, sticky and plastic with few manganese dioxide concretions, mottled strong brown with many clay skins on ped surfaces. The soil reaction ranges from 6.4 to 6.9 within the profile.

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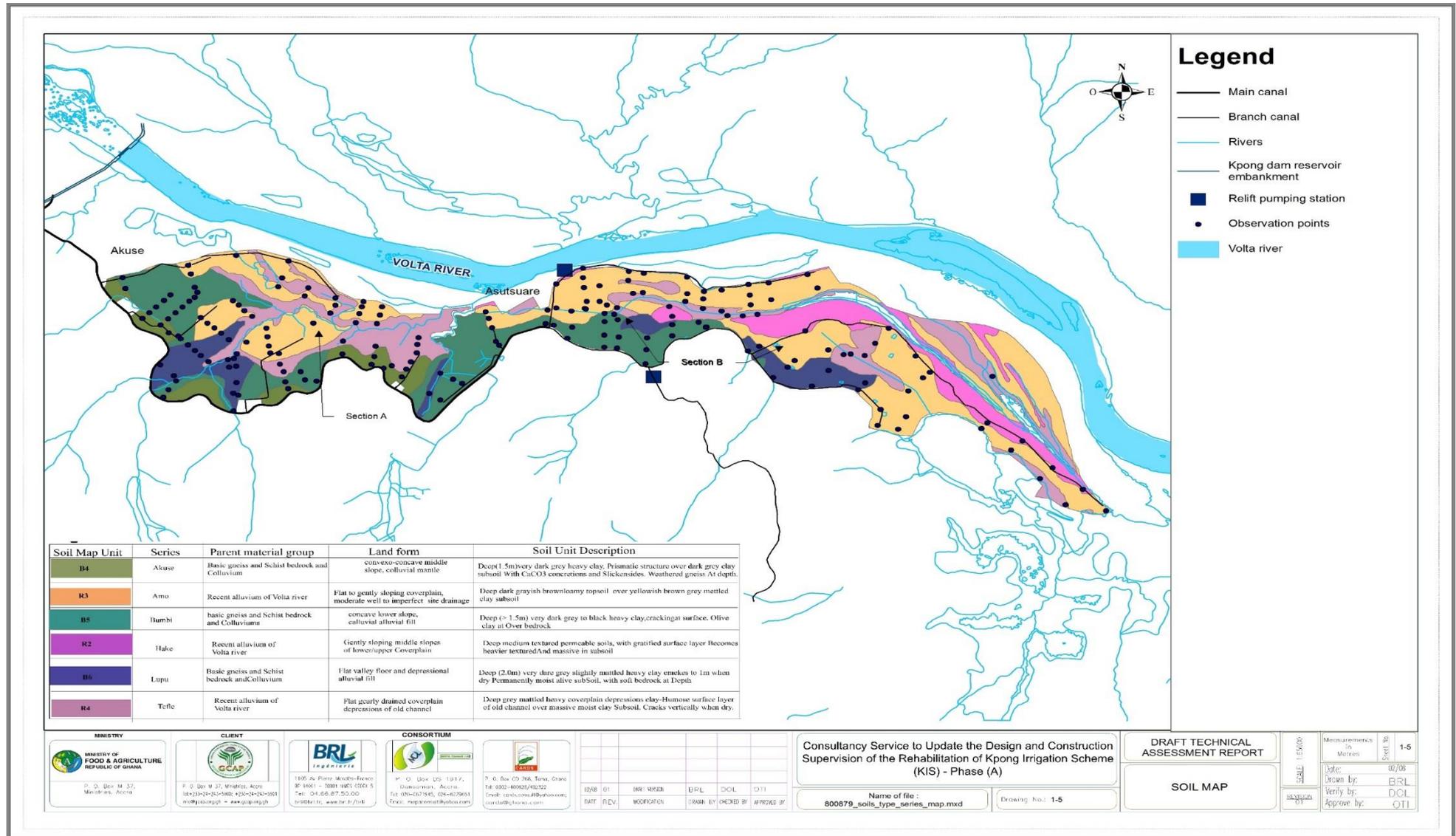


Figure 5. 6 Map of major soils of Section A and B areas of KIS (Source: BRL Report, 2016)

Current soil Quality and Conditions at the Project site

An assessment of soil conditions within the project area was conducted as part of the technical assessment of the feasibility study and the outcome is as follows:

- Generally, the soils are low in fertility with respect to Nitrogen and Phosphorus which must be supplied through fertilizers. The mean available P values of the top soils were very low ranging from 5.5 ppm to 11 ppm. This is nearly 10 times lower than required for adequate plant growth on these soils. Phosphorus thus, is the most limiting nutrient followed by nitrogen;
- Calcium, Magnesium and Potassium were in adequate amounts for good crop growth in all the soils of the Kpong Irrigation Scheme study area with calcium and magnesium having higher concentrations.
- The most fertile soil in terms of plant nutrient availability is the Tefle Series soil. The assessment showed that mean topsoil pH range for the soils was between 5.3 to 7.0. Rice can tolerate a pH of 5.3 but with prolonged fertilization with nitrogenous fertilizers such as Ammonium Sulphate, Urea and Sulfan will further lower the pH and may require liming to maintain productivity of such soils.
- The Akuse Series, Lupu Series and Bumbi Series soils which are deep and heavy clay soils are classified as highly suitable for irrigated rice, maize, vegetables and sugar cane. The Amo Series (heavy clay) and the Tefle Series are also classified as suitable for maize, vegetables and tree crops such as oil palm and mango. The light-textured Amo and Hake series soils are classified as suitable for maize, vegetables and sugar cane.

5.1.3 Drainage and Surface Water Resources

The Volta River is the main fresh water body within the district. It forms the North-Eastern boundary of the Shai Osudoku District. It provides a means of livelihood for the Asutsuare and Akuse communities (project towns), as well as many communities along its bank, including Akupkom, Kadjanya and Dormeliam.

The Kpong Irrigation Scheme Canal is a prominent water resource in the district. The canal takes its source from the Volta River in Akuse (Lower Manya Krobo Municipality) and flows through portions of the Shai Osudoku District around Asutsuare and Volivo areas, and neighbouring localities. The canal is mainly used for irrigation purposes. Neighbouring communities also collect water from the canals for domestic purposes.

Generally, the natural drainage pattern of the project area can be described as dendritic with most streams taking their sources from the Akuapem Range, which serves as a watershed. The surface water drainage system discharges into four drainage lagoons within the KIS (i.e. Kasu, Klebwe, Lupu and Nyapia) as shown in Figure 5.7.

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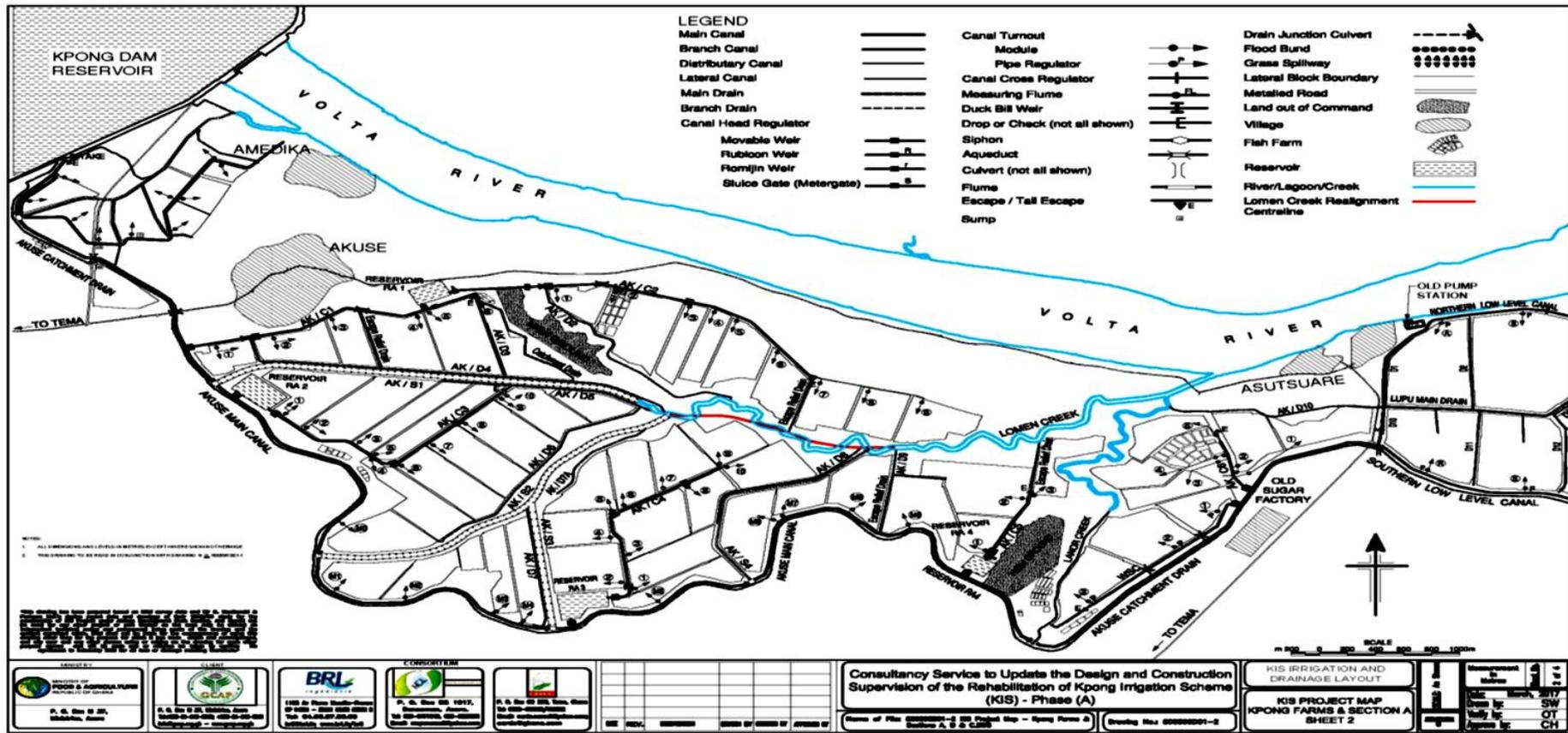


Figure 5.7 Irrigation and drainage layout of the of the Kpong Irrigation Scheme (Source: BRL Report, 2016)

The lagoons are overgrown with weeds and are heavily silted, hence the efficiency of the lagoon has been minimized. Each farm plot has an outlet wastewater drain which converges into a main drain and further flows into the various lagoons at different sections of the scheme. The lagoons are interlinked and serve as settling points for irrigation wastewater. They further drain into the Lukwe River and finally drain into the River Volta. The water balance estimates for the lagoons are shown in Table 5.1.

Table 5.1 Water Balance Estimates for the Lagoons

Lagoons	Design Water Levels (m)		Water Surface (ha)		Available Storage	Area Draining into the Lagoons	Expected Runoff	Excess Runoff Storage
					(1000 m ³)	(ha)	(m ³)	(1000m ³)
Lupu-Klebwe								
Klebwe	5.49	3.96	60	25	476	776	678	202
Lupu	5.49	3.96	86	54	1,060	1,878	1,565	505
Total					1,536	2,654	2,243	707
Kasu -Nyapia								
Kasu	4.88	3.96	325	253	2,600	2,586	2,421	-179
Nyapia	6.10	4.27	1448	210	8,000	16,287	10,692	2,692
Total					10,600	18,873	13,113	2,513

5.1.4 Water Quality

To ascertain the quality of water employed for the irrigation, water samples were collected from three different streams i.e., upstream, midstream and downstream points within the KIS and analysed at Water Research Institute (WRI) laboratory of the Council for Scientific and Industrial Research (CSIR). The upstream sample was collected from the intake point of the main canal, mid-stream was sampled within the main canal and compared with the Target Water Quality Ranges (TWQR) of the Ghana Raw Water Quality Criteria and Guidelines (Volume 4(B): Agricultural Water Use (Irrigation)) to determine its suitability for irrigation. However, the downstream water sample was sampled from the waste water drain from the project site, and compared with the EPA guideline values for general effluent discharge. The results obtained were also compared with the ESIA results of 2018.

The Volta River is a major perennial river which serves as the source of water for irrigation. As a major source of domestic and drinking water for many communities within the KIS, the results of water samples from the upstream were therefore compared with the World Health Organization's (WHO) Drinking Water Quality Guideline (DWQG) and the Target Water Quality Ranges (TWQR) of the Ghana Raw Water Quality Criteria and Guidelines (Volume 4(B): Agricultural Water Use (Irrigation)) to test its suitability for drinking and irrigation respectively. The results of the downstream sample were compared with the EPA guideline values for general effluent discharge into natural water bodies due to the potential for overflow

during heavy rains which could end up in any stream. The comparative results for the 2018 and 2023 are shown in Table 5.2.

The results from the upstream sample show all parameters were compliant with TWQR guideline levels except TDS for sampling point A1, A2 and B2. Consequently, there was not much differences observed in the results of the samples in 2018 and 2023. The results confirm the suitability of the KIS canal water for irrigation. Notwithstanding, it must be emphasized that the water would need some form of treatment before it could be used for any domestic or drinking purpose due to the high microbial load of the samples. Most of the minerals i.e., Fe, Cl, Cr etc. in the water were within the threshold of DWQG.

With regards to the downstream, samples show exceedance levels for total and faecal coliforms (C1 and C2). The wastewater drain is open and exposed to runoff, air, wind soil and many other surrounding environmental conditions which could contribute to high exceedance levels of coliforms. Other parameters such as Turbidity, TSS, Cl, Alkalinity and Fe for C2 exceeded the threshold level set by the EPA for the discharge of effluents. The communities within (i.e., Kasunya and Klebuse) mostly use water from the lagoons for domestic purposes. The physico-chemical constituents of the waters were predominantly satisfactory except for the coliform and turbidity (C2) levels.

Table 5.2 Comparative Water Quality Analysis of Results in 2018 and 2023

Parameter	Upstream		Midstream		TWQR	Downstream		EPA effluent	- DWQG
	A ₁	A ₂	B ₁	B ₂		C ₁	C ₂		
pH (pH Units)	7.55	7.33	7.40	7.17	6.5-8.5	7.67	6.54	6-9	6.5-8.5
Cond. (µS/cm)	74.4	74.3	69	77.0	-	626	157	1500	-
Turbidity (NTU)	8	2.19	9	4.81	-	32	82.0	75	5
Colour (Hz)	7.50	2.50	7	5.00	-	25	100	200	15
TSS (mg/l)	6	2.00	7.5	5.00	<50	12	85.0	50	-
TDS (mg/l)	40.9	44.6	38	46.2	<40	344	94.2	1000	1000
BOD (mg/l)	1.40	1.51	0.910	6.15	-	2.30	17.0	50	-
COD (mg/l)	9.46	8.00	3.59	25.6	-	14.8	83.2	250	-
Oil/Grease (mg/l)	<0.001	<1.00	<1.00	<1.00	-	<0.001	<1.00	5	-
Cl ⁻ (mg/l)	7.90	2.38	6	2.77	<100	0.315	9.83	2	-
Alkalinity (mg/l)	16	31.2	32	32.0	-	0.034	54.0	50	50
S ²⁻ (mg/l)	<0.005	<0.005	<0.005	<0.005	-	<0.005	<0.005	1.5	500
T.PO ₄ (mg/l)	0.073	0.018	0.093	0.008	-	151	0.174	250	250
NO ₃ -N (mg/l)	0.017	0.060	0.090	0.040	<0.5-<5	24	2.37	150	-
Fe (mg/l)	0.421	0.024	0.043	0.106	<5	<0.010	2.10	0.5	0/050
Cu (mg/l)	<0.010	<0.010	0.014	<0.010	<0.1	<0.002	<0.010	0.1	0.003
Cd (mg/l)	<0.002	<0.002	<0.002	<0.002	<0.01	0.308	<0.002	1.0	-
T.Cr (mg/l)	<0.001	<0.010	<0.010	<0.010	<0.1	<0.010	<0.010	0.5	2
Total Coliform cfu/100ml	550	558	350	558	-	680	2790	400	0
Faecal Coliform cfu/100ml	8	6	-	104	-	15	392	-	-

A₁ & A₂ - Results of upstream samples for 2018 and 2023 respectively.

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B₁ & B₂ - Results of midstream samples for 2018 and 2023 respectively.

C₁ & C₂ - Results of downstream samples for 2018 and 2023 respectively.

5.1.5 Groundwater

Groundwater sampling was conducted from communities within the KIS to assess their quality which serve as the main source of drinking water for some of these communities. Groundwater sample results are compared with the World Health Organization's (WHO) Drinking Water Quality Guideline (DWQG) and Ghana Standards Drinking Water Quality Guidance (GS 175-1) since it is the closest groundwater to the project area and serves both domestic and drinking purposes, the results are provided in Table 5.3.

Table 5.3 Groundwater Sampling Results

Parameters/Sites	Jessikope – Lubuse	Akunakope - Lubuse	Morpklikope - Lubuse	WHO/GS 175-1
pH (pH units)	7.79	7.70	7.75	6.5-8.5
Cond. (µS/cm)	1074	795	1794	-
Turbidity (NTU)	<1.00	<1.00	6.59	5
Colour (Apparent) (Hz)	<2.50	<2.50	5.00	15
TSS	<1.00	<1.00	5.00	-
TDS	644	477	1076	1000
BOD	0.940	0.850	1.20	-
COD	3.20	2.13	4.27	-
Oil/Grease	<1.00	<1.00	<1.00	-
Chloride	53.2	23.2	336	250
Alkalinity	378	278	270	-
Sulphide	<0.005	<0.005	<0.005	-
Total-Phosphorus	0.028	0.143	0.131	-
Nitrate-Nitrogen	0.032	0.013	0.014	10
Iron	<0.010	0.216	1.08	0.3
Copper	<0.010	<0.010	<0.010	2
Cadmium	<0.002	<0.002	<0.002	0.003
Total Chromium	<0.010	<0.010	<0.010	0.05
Total coliform (cfu/100ml)	11	0	186	0
Faecal coliform (cfu/100ml)	0	0	8	0

The physico-chemical and bacteriological constituents of the waters were predominantly satisfactory except for the coliform, chloride and turbidity levels in Morpklikope-Lubuse. For drinking purpose, only the borehole at Akunakope – Lubese is recommended. The other two boreholes need to be chlorinated if they are to be used for drinking.

5.1.6 Air Quality and Noise Level

As part of the process of updating the ESIA, a baseline air and noise quality assessment was conducted by GEW Consult to provide first-hand information of the existing environmental conditions in terms of ambient air quality and noise levels within the KIS. The aim is to serve as a benchmark to which future deviation can be measured against during implementation of

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the project. Three (3) different sites were considered after reconnaissance. The location description and GPS coordinates of the selected sampling sites for noise level and air quality are provided in Table 5.4 to 5.5 respectively. The sites 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 for representative samples for air quality and noise level; and
- Potential of air quality and noise levels from project site impacting on the neighbouring environment.

Table 5.4 Description of Noise Sampling Locations

Location ID	Location Description	GPS Coordinates	
		Latitude	Longitude
Golden Exotic Area (NSL1)	Noise sampling was undertaken close to the Golden Exotic Area. The sampling unit was mounted at about 40 m south of the irrigation canals.	6.080680°	0.201797°
Shine Star (NSL2)	Monitoring was conducted at about 20 m south of Shine Star Limited.	6.073430°	0.189700°
Asutuare Basic JHS (NSL3)	Noise measurement was carried out at about 10 north-west of the water canal and 100 m east of the Asutuare Basic Junior High School (JHS)	6.094343°	0.200188°

Table 5.5 Description of Air Quality Sampling Locations

Location ID	Location Description	GPS Coordinates	
		Latitude	Longitude
Golden Exotic Area (AQL1)	Ambient air quality sampling was carried close to Golden Exotic Area. The units were mounted at about 50 m southwest of the irrigation canals.	6.080640°	0.201724°
Shine Star (AQL2)	Air quality monitoring was conducted at about 16 m south of Shine Star Limited.	6.073465°	0.189648°
Asutuare Basic JHS (AQL3)	Air quality survey was carried out at about 12 north-west of the water canal and 95 m east of the Asutuare Basic Junior High School (JHS).	6.094341°	0.200184°

Sampling Equipment and Methodology Employed

Noise Level Measurements

Ambient noise monitoring was carried out at the selected locations to monitor existing ambient noise levels in the vicinity of KIS. A 24-hour continuous measurement was undertaken at the selected sampling locations in two sections – day time (06h00 – 22h00) and night time (22h00

– 06h00) in accordance with the Ghana standard for ambient noise levels. This was to account for the daily variations in environmental sound levels of the area.

Sound recordings were made using Type 1 Cirrus CR: 171B Optimus Plus Sound Level Meter with built-in 1/3 octave band and fully conforms to specifications of IEC 61672-1:2013. The equipment was calibrated in the field prior to use. At each of the selected location, the sound level meter was mounted on a tripod stand with the microphone elevated at a height of 1.5 meters above ground level and inclined at an angle of 45°. Photos of the equipment setup during noise monitoring at each sampling location are provided in Appendix 5.

Air Quality

Similarly, air samplers i.e., MiniVol Tactical Air Samplers (TAS®) were employed to measure the particulate matter (Total Suspended Particulate TSP, PM₁₀ and PM_{2.5}) in specific locations (Table 5.5) within KIS. The equipment was calibrated in the field prior to use. The programmable sampling units were set over a 24-hour period at each sampling location to sample ambient air at a flow rate of 5 L/min. Regular checks of the flow rate were conducted throughout the sampling period to ensure that constant flow rate was maintained.

The sampling units were mounted at a height of about 2.0 meters above ground level and away from any obstacle to ensure unrestricted air flow to the units. At each receptor location, TSP, PM₁₀ and PM_{2.5} were sampled at the same time for the same period. Ambient air was collected over pre-conditioned (pre-weighed) non-fibre whatman filter paper (Ø47 mm) placed within a filter holder. A PM₁₀ and PM_{2.5} impactors were fixed on top of the filter holders which ensured that only particles of size less than 10 and 2.5 microns reach the filter paper. In the case of TSP, no impactor was placed in the filter holder and this allowed total particulates in the air to reach the filter paper. At the end of the sampling period, the filters were removed and kept in sealed filter holders to prevent moisture from reaching the filters. The filters were sent to the laboratory, dried in a desiccator for 24-hours before re-weighing. The net weights were calculated and dust concentrations were computed using the gravimetric method of determination of respirable and total inhalable particulate concentrations. Photos of equipment setup at each of the selected locations sampled for Air Quality are provided in Appendix 5. The formula used to compute dust concentration is provided below.

$$\mu g / m^3 = \frac{\text{Net dust weight (mg)} \times 1000 \times 1000 (L/m^3)}{\text{Flow Rate (L/min)} \times \text{Sample time (min)}}$$

The levels of Sulphur dioxide (SO₂) and Nitrogen dioxide (NO₂) in the ambient air were recorded for 24 hours at the various selected sampling locations within KIS. The units were oriented against the direction of the wind. As the wind blows, air is absorbed onto a sensor and the gas is then detected and logged by the unit. The SO₂ unit has a detection range of 0 – 10 ppm with a resolution of 0.001 ppm whereas the NO₂ unit has a detection range of 0 – 20 ppm with a resolution of 0.001 ppm. Gas recordings were retrieved from the Aeroqual Series 500 units and computed for the levels of NO₂ and SO₂.

Results of Assessment*Results of Noise Level Assessment*

The results of the noise monitoring data obtained was compared to the EPA's National Ambient Noise Level Guidelines (NANLG) as presented in Table 5.6. Based on the categorized zones by the Ghana standard, all the three (3) locations were classified under Zone C (Mixed Used Area) (Refer to Appendix 5).

Table 5.6 Results of Noise Level Monitoring

Location	Time	Noise Level in dB(A) Recorded							
		LA _{eq}	LA _{max}	LA _{min}	LA ₁₀	LA ₅₀	LA ₉₀	LA ₉₅	
Golden Exotic Area	Day (7h00 – 22h00)	50.5	82.7	32.1	53.2	44.3	39.4	38.5	
	Night (22h00 – 7h00)	54.1	72.5	38.8	59.0	46.2	41.1	40.6	
Shine Star Area	Day (7h00 – 22h00)	81.8	101.0	44.5	86.7	57.6	50.0	49.2	
	Night (22h00 – 7h00)	57.1	103.0	45.1	52.4	49.8	48.1	47.1	
Asutuare Basic JHS	Day (7h00 – 22h00)	58.4	87.3	37.1	60.6	55.9	47.8	45.7	
	Night (22h00 – 7h00)	52.7	86.2	40.5	56.3	46.0	42.4	42.1	
Ghana Standard (Zone C)	Day (7h00 – 22h00)	60	-	-	-	-	-	-	
	Night (22h00 – 7h00)	55							

Legend

L_{eq} - Integrated noise level during the measurement period

L_{max} - Maximum noised level

L_{min} - Minimum noise level

L₅₀ - Average noise level

L₁₀ - Nuisance noise level

L₉₀ - Background noise level

The noise levels recorded for day and night time at all three (3) selected locations are in compliance with the respective Ghana standard 60 dB(A) and 55 dB(A) for 'Mixed Used' areas except for day time noise level at Shine Star Area. The high noise level recorded at Shine Star area was due to conversation and shouting by food and fruits sellers. Sources of noise observed during the survey included movement of trucks, tricycles and motors, noise from food sellers at Shine Star area, children playing and swimming in the irrigation dam, noise from Kings Pub, and other domestic activities (conversation by the inhabitants, etc.). Figure 5.8 shows the noise levels in comparison with Ghana Standards.

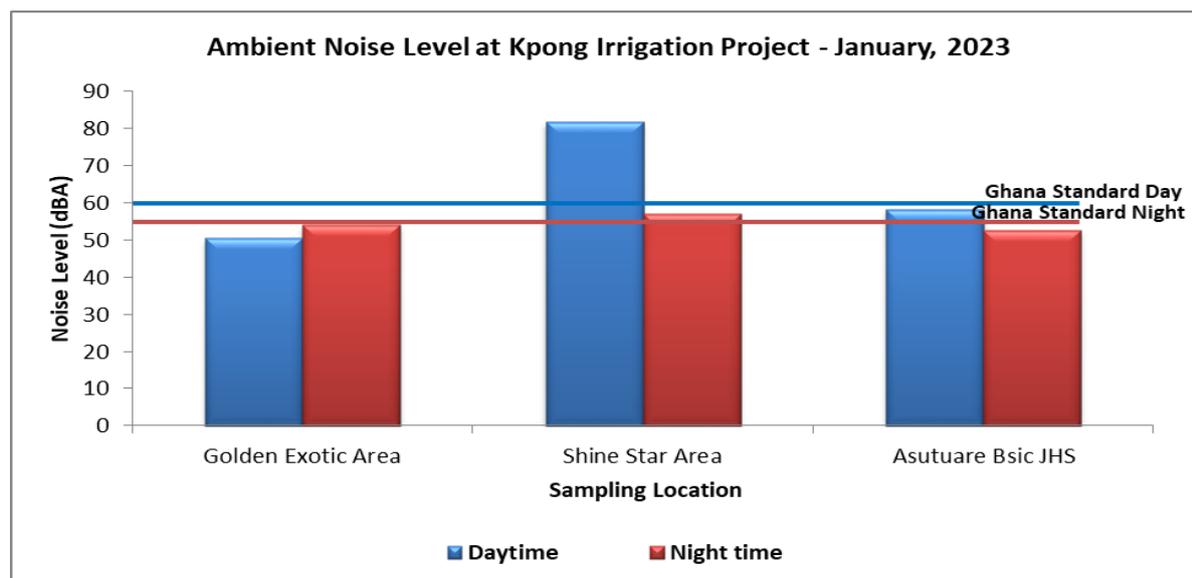


Figure 5.8 Noise levels at KIS

Result of Air Quality Assessment

The results obtained for the baseline ambient air quality assessment are compared to the EPA's National Ambient Air Quality Guidelines (NAAQG) values and WHO Air Quality Guidelines as shown in Table 5.7.

Table 5.7 Results of Air Quality Monitoring

Location	Particulate Concentration			Gaseous Concentration	
	PM _{2.5} (µg/m ³)	PM ₁₀ (µg/m ³)	TSP (µg/m ³)	NO ₂ (µg/m ³)	SO ₂ (µg/m ³)
Golden Exotic Area	77.9	250.0	291.2	58.3	44.5
Shine Star Area	90.6	298.1	395.3	45.2	34.0
Asutuare Basic JHS	92.9	208.7	243.8	41.4	39.3
Ghana Standard (Residential Areas)	35	70	150	150	50
WHO Air Quality Guidelines (WBG, 2007)	25	50	-	200	20

Particulate concentrations recorded at the three (3) selected locations ranged from 243.8 µg/m³ to 395.3 µg/m³, 208.7 µg/m³ to 298.1 µg/m³, and 77.9 µg/m³ to 92.9 µg/m³ for TSP, PM₁₀ and PM_{2.5} respectively. Concentrations recorded for TSP, PM₁₀ and PM_{2.5} at all the three (3) locations exceeded the respective Ghana Standards of 150 µg/m³, 70 µg/m³ and 35 µg/m³ for residential areas. Based on the results, it can be concluded that the existing air quality at the proposed site has negatively been impacted by surrounding activities as compared to data

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obtained for the 2018 ESIA's report. Major air pollution sources observed during the monitoring exercise included movement of trucks, tricycles and motor bikes on the untarred road, smoke from burning of trash at Asutuare community, smoke and soot from neighbouring companies, movement of trucks in and out of Shine Star Company, and increased fugitive dust particles from exposed surfaces due to the dry season (hazy weather condition). Figure 5.9 shows comparative analysis of the results with Ghana standards (GS 1236:2019). Similarly, compared with WHO Air Quality Guidelines or PM₁₀ and PM_{2.5}, the concentrations remained higher at all the three (3) locations. There is no available WHO Air Quality Guidelines for TSP.

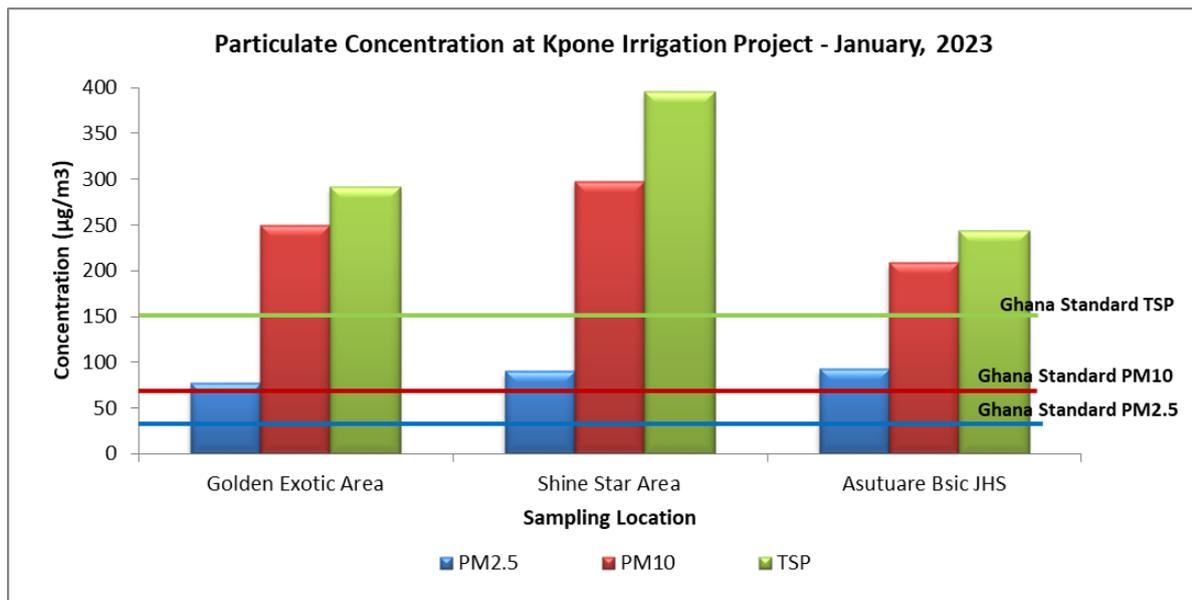


Figure 5.9 Particulate Concentrations of KIS in comparison with Ghana Standards

Gaseous Emission (NO_2 and SO_2)

Concentrations recorded for NO_2 and SO_2 at all the three locations were lower when compared with the respective Ghana standard of $150 \mu\text{g}/\text{m}^3$ and $50 \mu\text{g}/\text{m}^3$ for residential areas. Based on the results, it can be concluded that the existing activities have moderate impact in terms of gaseous emissions (NO_2 and SO_2). Gaseous emission sources observed included emissions from movement of trucks, vehicles and motor bikes, emissions from neighbouring companies and smoke from burning of trash in the Asutuare Community, and domestic activities. Figure 5.10 shows the concentrations of NO_2 and SO_2 .

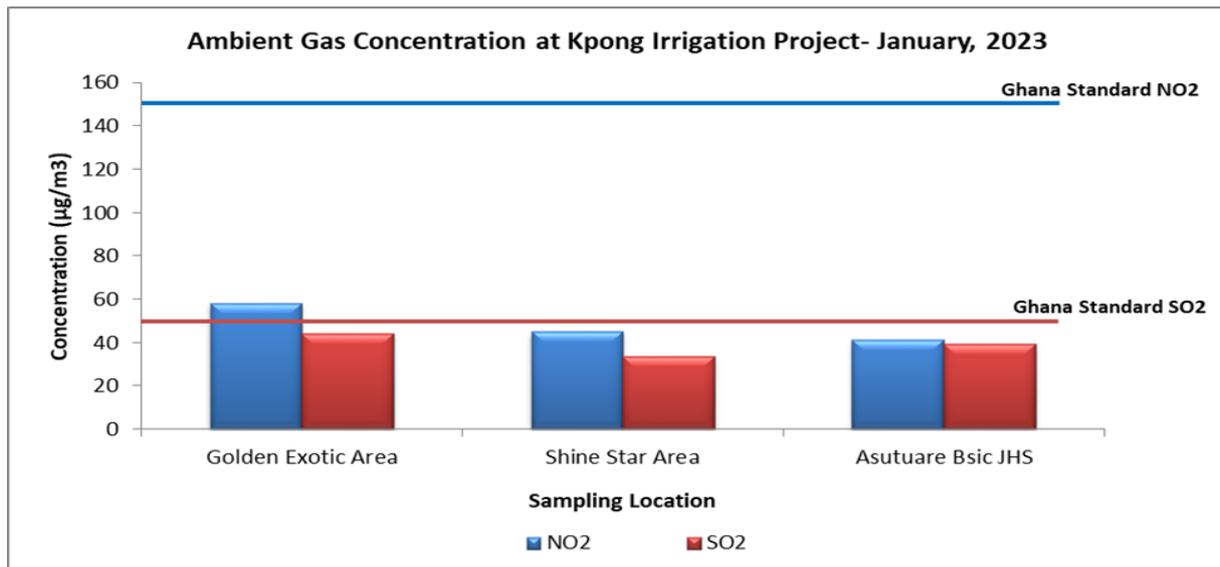


Figure 5.10 Concentrations of Ambient Gases (NO₂ & SO₂)

5.2 Biological Environment

5.2.1 Aquatic Ecology

The most dominant grass is *Typha domingensis* which covers a significantly large area of both lagoons, particularly at the slow-moving banks. Following closely in abundance and area covered are the aquatic floating plants water lily *Nymphaea lotus*, duckweed *Lemna* sp., *Salvinia* sp., water lettuce *Pistia stratiotes*, water hyacinth *Eichhornia* sp. These floating plants normally quickly proliferate and are found in nutrient rich and slow flowing water. The river is very productive with high abundance of fish eggs; shrimp nauplii and crab larvae in high numbers (>100). The plankton community provides food for fish and macro-invertebrates. The explosive development of these plankton groups relates to the productivity of the fishery. There were no harmful micro-algae in the plankton community.



Figure 5.11 Section of the Riverbanks showing the dominance of *Typha dominengensis*

Benthos

The sediment is muddy while benthic organisms are few, made up of only gastropod shells. No bilharzia vector snails were observed during sampling. The paucity of benthic organisms may

be due to the relatively fast flowing nature of the middle portions of the river and the high human activity along the banks.

Vertebrates

There are moderate numbers of shorebirds. Individuals of Black-winged stilt *Himantopus himantopus*, Grey herons *Ardea cinera*, and Little egret *Egretta garzetta*, were recorded feeding in the shallow littoral areas. This observation indicates the area to be a potential feeding and breeding site for a moderate number of shorebirds. Most of these shorebirds are indirectly influenced by the seasonal nature of climatic conditions and tidal influences which affect their habitats and availability of prey.

Fisheries

Fishing for both commercial and subsistence purposes is a common socio-economic activity practiced throughout the year except on Wednesdays of each week. Some of the fish identified by the fishermen on the Kasu and Klebwe drainage lagoons include but are not limited to species provided in Table 5.8. Other species of tilapia found in the lagoons are *Tilapia zillii*, *T. galilaeus* and *Hemichromis fasciatus* in decreasing abundance. Other notable species such as *Citharinus* sp., *Auchenoglanis* sp., *Mormyrus rume*, *Schilbe mystus*, *Alestes nurse*, *Clarias* sp. and *Alestes baremose* were also landed in low numbers seasonally and sporadically. Fishers indicated that *Polypterus senegalus* and *Labeo* sp. were rare in recent years.

Table 5. 8 Catch composition of Fishermen within the Drainage Lagoons

Species	Number	Total weight / g	TL (range) /cm
<i>Tilapia zillii</i>	14	524	11.0 - 13.6
<i>Oreochromis niloticus</i>	45	1684.9	11.3 - 15.3
<i>Tilapia semifasciatus</i>	7	260.3	11.1 - 14.2
<i>Bagrus bayad</i>	1	68.2	23
TOTAL	67	2537.4	

Source: GCAP-KIS ESIA Report - 2018



Figure 5. 12 Nile Tilapia and Gymnarchus niloticus caught during surveys**5.2.2 Terrestrial Flora**

The project areas lie mostly in the Coastal Scrub and Grassland, Antiaris–Chlorophora Association and Guinea Savannah Woodland vegetation types of Taylor, 1960. Hall and Swaine (1981) however, classified the vegetation as mostly Southern Marginal and Dry Semi-deciduous forest subtypes and Guinea Savannah Woodland. The most commonly occurring flora in the project area are: *Chromolaena odorata*, *Ceiba pentandra*, *Morinda lucida*, *Solanum torvum*, *Boerhavia diffusa*, *Nauclea latifolia*, *Azadirachta indica*, *Cardiospermum halicacabum*, *Zanthoxylum xanthoxyloides*, *Alchornea cordifolia*, *Gomphrena celosioides*, *Croton lobatus*, *Amaranthus spinosus*, *Cassia sieberiana*, *Centella asiatica*, *Ludwigia erecta*, *Nymphaea lotus*, *Sorghum arundinaceum*, *Eclipta prostrate*, *Cyperus haspan*, *Pentodon pentandrus*, *Typha domingensis*, *Imperata cylindrica*, *Lonchocarpus sericeus*, *Crotalaria retusa* and *Elaeis guineensis*.

The project area has been largely modified by intensive agricultural activities and human settlement development. The original vegetation types outside the farmed areas have been largely replaced by open, derived savannah with isolated tall trees and thicket clumps as shown in Figures 5.13. The vegetation is thus mostly secondary to tertiary in development, the limiting factor being biotic. The most abundant flora species observed have been provided in Table 5.9.

Table 5. 9 Flora Species in and Around the Project Site

<i>Species</i>	<i>Common Name</i>	<i>IUCN Status</i>	<i>Species</i>	<i>Common Name</i>	<i>IUCN Status</i>
<i>Alchornea cordifolia</i>	Christmas Bush	NA	<i>Gomphrena celosioides</i>	-	NA
<i>Amaranthus spinosus</i>	Spiny pigweed	NA	<i>Imperata cylindrica</i>	Cogon grass	NA
<i>Azadirachta indica</i>	Nim tree	NA	<i>Lonchocarpus sericeus</i>	-	NA
<i>Boerhavia diffusa</i>	Spreading Hogweed	NA	<i>Ludwigia erecta</i>	-	NA
<i>Cardiospermum halicacabum</i>	Baloon Plant	NA	<i>Morinda lucida</i>	Brimstone Tree	NA
<i>Cassia sieberiana</i>	Drumstick Tree	NA	<i>Nauclea latifolia</i>	-	NA
<i>Centella asiatica</i>	Gotu kola	LC	<i>Nymphaea lotus</i>	Water lily	NA
<i>Chromolaena odorata</i>	Siam Weed	NA	<i>Panicum maximum</i>	Grass	NA
<i>Crotalaria retusa</i>	Devil Bean	NA	<i>Pentodon pentandrus</i>	-	LC

<i>Croton lobatus</i>	-	NA	<i>Solanum torvum</i>	Turkey berry	NA
<i>Cyperus haspan</i>	-	NA	<i>Sorghum arundinaceum</i>	-	NA
<i>Eclipta prostrata</i>	False daisy	DD	<i>Typha domingensis</i>	-	LC
<i>Elaeis guineensis</i>	Oil Palm	NA	<i>Zanthoxylum xanthoxyloides</i>	Senegal prickly ash	NA

Note: *NA= Not yet assessed *LC= Least concern *DD =Data Deficient



Figure 5. 13 Typical Vegetation and Rice Fields in the Project Area

Terrestrial Fauna

The project site and its immediate environs are very deficient in wildlife. Biotic pressure in the form of heavy monocropping and cattle grazing as well as man-made fires have led to a decline in the faunal diversity of the project area. The common groups of fauna with the project area are mainly birds, reptiles, and mammals. Their common names and their IUCN conservation statuses are stated in Table 5.10.

Table 5. 10 Common Fauna at the Project Site and their IUCN Conservation Status

Species	Common Name	IUCN Status
<i>Ardeola ibis</i>	Cattle Egret	LC
<i>Cricetomys gambianus</i>	Gambian Pouched Rat	LC
<i>Philothamnus semivariegatus</i>	Green Tree Snake	LC
<i>Heliosciurus gambianus</i>	Gambian Sun Squirrel	LC
<i>Agama</i>	Agama Lizard	LC
<i>Elanus caeruleus</i>	Black Shouldered Kite	LC
<i>Cricetomys gambianus</i>	Northern Giant Pouched Rat	LC
<i>Thryonomys swinderianus</i>	Greater Cane Rat	LC
<i>Dendroaspis viridis</i>	West African Green Mamba	LC

*LC – Least Concern

5.3 Socio-Economic Environment

The immediate geographical area of influence is the proposed 4,040 ha of KIS lands at Asutsuare in the Shai Osudoku District of the Greater Accra Region and Akuse in the Lower Manya Krobo Municipality of the Eastern Region of Ghana. Due to the unavailability of data for the district and municipality from the 2021 Population and Housing Census (PHC) for some of the socio-economic features, the report relied on secondary data from literature sources, 2010 PHC and the Medium-Term Development Plan of the district and municipality. The socio-economic characteristics of the district and municipality are presented below.

5.3.1 Demographic Characteristics

According to the 2021 Population and Housing Census (PHC), the total population for SOD is 105,610 with 50.3% (53,136) males and 49.7% (52,474) females. The district represents 1.9% of the total population of the Greater Accra Region. However, the district covers a quarter (25.9%) of the total land area of the region with an average household size of 3.4. Nearly 56.8% of the populace in the district reside in the rural areas and 43.1% in urban areas. The district has Dodowa as its administrative capital.

The district shares boundaries with North Tongu District to the North-East, Yilo Krobo Municipality, and Upper Manya District to the North-West, Akwapim North Municipality to the West, Kpone Katamanso Municipality to the South-West, Ningo-Prampram District to the South, and Ada West District to the East. The district has about 250 communities/settlements some of which are rapidly getting urbanised because of their proximity to Accra, the national capital. The current population density of the district according to GSS 2021 Report is 125.4 persons per sq. km, an increase of 132% in 2010 census.

The population of the district is youthful, with 34.8% of the population in the 0-14 age group, depicting a broad base population pyramid which tapers off with a small number of elderly persons (4.1% of the total population). The districts age dependency ratio is 635 dependents (children and old age) for every 1000 people working, and the dependency ratios for children and old age 568 and 67 respectively for every 1000 persons in the working ages. The estimated population in Asutsuare is about 6500 and that of Kasunya is about 1000, these are project towns within the district.

The Lower Manya Krobo Municipality (LMKM) is located at the eastern corner of the Eastern Region of Ghana with a total population of 121,478 with 53.4% (64,816) females and 46.6% (56,662) males, according to the 2021 Population and Housing Census (PHC), a 36% increase in population from 2010. The major towns in the municipality include Odumase Township, Akuse and Kpong with Odumase-Krobo as the administrative capital. The municipality covers an area of 316 km² constituting about 1.64% of the total land area of the region (19,323km²) with an average household size of 3.2 and population density of 396.5 per km². It is bounded to the north by Upper Manya Krobo District, south by Shai Osudoku District (SOD) respectively, west to Yilo Krobo Municipal and to the east by Asuogyaman District. The

municipality has about 235 settlements or communities in four zonal areas. The municipality is more urbanized as 75.3% of the populace resides in urban centres as against 24.7% in rural in rural centres.

The population of the municipality is in the working group, with 64% of the population in the 15-64 age group, depicting a broad base population pyramid which tapers off with a small number of elderly persons (5.7% of the total population). The districts age dependency ratio is 562 dependents (children and old age) for every 1000 people working, and the dependency ratios for children and old age are 473 and 89 respectively for every 1000 persons in the working ages. The project area in the municipality, Akuse is situated between Tema and Akosombo and has a total population of 6280.

5.3.2 Education

According to SODA, the educational facilities within the district as at 2015 comprise of 51 pre-schools (public), 53 primary schools (public), 38 public Junior High Schools (JHS), 7 Senior High Schools (SHS – consisting of 5 private and 2 public), 2 Integrated Community Centres for Employable Skills at Dodowa and Agomeda, Dipo Vocational School at Kordiabe and Secretarial and Accountancy School at Ayikuma. According to the 2010 PHC, of the 73,123 persons aged 3yrs and older who either were in school or have ever attended school in the district, 7.2% are in Nursery, 15.6% in Kindergarten, 49.8% in Primary School, 17.8% in JHS, 6.6% in SHS and 2.1% in Tertiary Institutions. Additionally, there are 3 public primary and junior high schools, 2 private basic schools and 1 Senior High School within the Asutsuare area whereas in Kasunya, there are 2 primary and junior high schools.

The LMKMA has 180 public schools (44 KG, 46 Primary schools, 38 JHS, 4 SHS and 1 Voc. /Tech) and the private has 208 schools (84 KG, 77 Primary schools, 40 JHS, 6 SHS and 1 Voc. /Tech). The total enrolment of 21,968 pupils and students in both public and private schools outweigh the available schools. The total enrolment for both boys and girls in public and private schools are 43.5% and 56.5%, and 50.4% and 49.6% respectively. The majority of the existing school infrastructures are not conducive for teaching and learning.

5.3.3 Employment and Industry

The majority (80.6%) of the employed population 15 years and older are employed in the private informal sector, with 10% in the private formal sector and 8.5% in the public (government) sector. This implies that majority of the population in the district are engaged in their own businesses which are not formalized. The main industries are agriculture, forestry and fishing; wholesale and retail; and manufacturing. About 46.4% of the population 15 years and older are engaged in the agriculture, forestry and fishing industry. Stone quarrying is common in areas around the Shai Hills though this industry employs just about 0.1% of the district's population. Sand winning is carried out in parts of the district, with river sand winning taking place at Asutsuare. Crop farming is the main economic activity in Asutsuare and other surrounding towns. Fishing from the Volta River and petty trading are other sources of livelihood for the community members.

Similarly, the economy of the LMKMA is dominated by agriculture with commerce and industrial sectors least developed. Agriculture accounts for about 65% of the municipal labour force, commerce account for about 20%, while industry and other sectors account for about 15% (MTDP, 2022).

5.3.4 Agriculture

Agriculture is the main economic activity in the district. Crop farming, distribution and marketing provides an important source of livelihood for many of the inhabitants. The main crops cultivated include maize, rice, cassava, pepper, mangoes and banana. In the northern portions of the district, around Dodowa, Ayikuma and Agomeda, cassava, maize, and mangoes are commonly cultivated while in the southern portions around Asutsuare, Volivo and Osuwem areas, rice and banana are the main crops.

Rice cultivation is the main economic activity in the areas around Asutsuare and Volivo. This is usually done under the Kpong Irrigation Scheme (KIS) which provides opportunities for rice cultivation by smallholder farmers on the KIS lands, using the KIS canal for irrigation. The rice is usually processed and sold locally. Rice production in the district saw a 50% increase over the last 6 years largely due to increase in the participation of farmers. Banana is cultivated on a large scale for export around Asutsuare by the Volta River Estates Limited (VREL) and Golden Exotics Company Limited, depending on the KIS canal for irrigation. These two companies provide employment for many people in the neighbouring communities.

Cattle grazing is quite common in the district as the predominantly grassland vegetation provides suitable grazing fields for cattle. Incidents of grazing cattle destroying crops on farms are sometimes recorded. Other livestock commonly reared in the district include sheep and goats, poultry and pigs. Aquaculture through the use of cages is done in portions of the Volta Lake in the areas around Asutsuare. The main fish reared is tilapia.

Some of the challenges of agriculture in the district include accessibility of tilling and harvesting machinery for rice such as power tillers and combine harvesters; storage and processing facilities such drying platforms, rice mills and warehouses for rice. Dams and dug-outs developed to promote and intensify irrigation have usually become defunct due to persistent usage and pressure by grazing livestock.

Agriculture in LMKMA accounts for about 65% of the Municipal labour force, commerce account for about 20%, while industry and other sectors account for about 15%. Staples crops such maize, rice, cassava, plantain, cocoyam and yam are the main crops cultivated in the municipality. Similarly, rice cultivation, mango plantations and fish farming are the main economic activities in the in Akuse area with the rice cultivation done under the Kpong Irrigation Scheme (KIS).

5.3.5 Water Supply

According to SODA, pipe-borne water and boreholes are the main sources of water in the district, accounting for 72% of the water supply in the district. Other main sources of water

accounting for the remaining 28% include wells, the Volta River and the Kpong Irrigation Scheme (KIS) Canal. The main source of water for the Asutsuare community is pipe-borne water. Water is also sometimes fetched from the Volta River for other domestic uses. For the communities along the KIS canal, the canal provides an alternative source of water for domestic purposes when the standpipes are not flowing. Some of the very small villages also depend entirely on the canal as their main source of water. The water quality within the KIS has been discussed in Section 5.1.4.

The LMKMA has 42 boreholes categorized into 32 Mechanized and 10 Non-mechanized excluding standing Pipes (GWCL) and 13 non-functional boreholes comprising of 10 mechanized and 3 non-mechanized. There is no pipe born water supply in Akuse with residents depending on groundwater for both domestic and drinking purposes.

5.3.6 Health and Sanitation

The Shai Osudoku District has a district hospital located at Dodowa (district capital), 1 private hospital, 11 Community Heath Planning Services (CHPS) Zones, 7 CHPS compounds, 3 Health Centres, 1 private maternity home and 1 quasi-government clinic. The Asutsuare community has a clinic which is usually the first point of call to access health care services. Others also travel to Akuse for access to health care services at the Akuse Government Hospital. Malaria is the major sickness recorded in the district. Other major diseases include acute respiratory infections, skin diseases, ulcer, hypertension, diarrhoea, rheumatism, joint pains and intestinal worm infestation.

According to the 2010 PHC, the majority of households (30%) in the district use public toilets, with 21% using pit latrines, while 8.9% use water closets and 8.2% use KVIP. Households that do not have access to any toilet facilities defecate in bushes and this form 31.2% of the households in the district. Solid waste disposal is mainly through burning by households which accounts for 34.6% of households, while 31.2% of households use the public dump (open space). Public dump (refuse container) is used by 13.5% of households for solid waste disposal, while 5.5% have their solid waste collected by waste management companies and 10.5% of households dump their solid waste indiscriminately. Some individual households within the Asutsuare Township have toilet facilities while others also depend on public toilets. The main form of solid waste disposal is by household burning.

In the LMKMA, there are 48 health facilities (3 active Municipal Hospitals, 2 Clinics, 4 Health Centres, 10 CHPS Compounds, 27 CHPs zones and 3 laboratories). One of the 3 municipal hospitals is located in Akuse with the others in Atua and Agormanya. According to the MTDP of the municipality, there are 44 KVIP/public toilet facilities, 1 final disposal site, 16 communal refuse containers, 4 slaughterhouses and meat shops in the municipality with Akuse occupying 4 of the KVIP facilities. Unfortunately, Akuse does not have any of the 16 communal containers for refuse collection placed in vantage points in the municipality in addition to a final disposal site. Residents without household toilet facilities resort to open defecation, a practice very common in rural centres in the municipality.

5.3.7 *Tourism*

The tourist sites within the district include the Shai Hills Resource Reserve Dodowa Forest, Chenku falls and Adumanya Apiary which are between 30 km and 50 km from the project location. Wildlife viewing and hiking at the Shai Hills Resource Reserve and visits to a fetish shrine and the Chenku waterfalls in the Dodowa Forest, which is believed to be the battlefield between the Ashanti warriors and the British on 7th August 1826, attracts many tourists to the district. There are also a number of hotels and resorts in the district, with the prominent ones being the Forest Hotel and Marina Hotel at Dodowa, the district capital.

In the case of LMKMA, some of the potential area that could attract tourists to the municipality include mountain Yogaga, Krobo mountain, Kpong Landing Beach, bead industry, Ngmayemi festival and scenic sightseeing landscaping. However, these areas are currently undeveloped and will need some investment to bring it to the level of touristic attraction to be able to accrue revenue for the municipality.

5.3.8 *Culturally Sensitive Areas*

In both SODA and LMKMA, no culturally sensitive sites were identified during the study. The proposed project area is an existing active irrigation scheme. In the unlikely event that there is a chance find, the procedure to follow will be as follows:

- All construction activity in the area will cease immediately;
- The find location will be recorded and necessary steps taken to secure/protect the area;
- The engineering consultant will inform FSRP to engage an archaeologist to assess the finding and advise on the necessary steps; and
- Traditional authorities will be informed and if necessary, the necessary practice performed accordingly.

5.4 **Current Farm Operations and Agriculture Practices**

The KIS Akuse Main Canal gravity feeds water to three designated areas:

- I. Section A, the Akuse Irrigation Area of 1,151 ha, designed as “New Area” under the Sir MacDonal and Partners “SM&P “design and construct” project of 1988/89 to 1997/98,
- II. Section B, the old Asutsuare Irrigation Scheme “Low Area” of 940 ha and designed for rehabilitation works under the SM&P “design and construct” project of 1988/89 to 1997/98, and
- III. Section C, the old Asutsuare Irrigation Scheme “High Area”, supplied from a Re-lift Pump Station abstracting water from the Section B Southern Low Level Canal (SLLC) to the Section C High Level Canal (HLC). The Section C area is now an area of 2,000 ha of banana plantation owned by a Ghanaian registered French Company; Golden Exotics Limited (GEL).

5.4.1 Cropping Pattern

The irrigation scheme's current cropping pattern is for double cropped rice; i.e. rice cultivated during each of the two seasons (major and minor wet seasons but specifically referred to as the Wet Season and the Dry Season).

Table 5.11 below, shows the area cropped for each of the major and minor seasons for the years 2015, 2018, 2020 and 2022.

Table 5.11 Area Cultivated with Rice in 2022

RICE	Total (2015)	Total (2018)	Total (2020)	Total (2022)
Area Cropped – Major Season	1,553 ha	1,706 ha	961.62 ha	1,960 ha
Area Cropped – Minor Season	1,595 ha	1,599 ha	955.00 ha	2,053 ha
Total Area Cropped	3,148 ha	3,305 ha	1,916.62 ha	4,013 ha
Cropping Intensity	1.6	-	-	-

Source: GIDA KIS Scheme Management Records

Presently, the KIS' total irrigated area is only cultivated with rice. There is no crop diversification within the irrigated farms of the KIS. However, vegetables are grown on "high ground" areas of the KIS canal system's command areas – referenced as out-of-command areas – with water taken by pumping from canals either as legally registered with KIS Scheme Management approval or illegally without registration.

5.4.2 Yield Expectations and Production

Consultations with GIDA established that the KIS rice crop yield for both the major and minor cropping seasons for 2022 were 6.0t/ha and 5.5t/ha respectively. It was also observed that there is no significant difference for KIS Section A yields during the major and minor seasons. That is not the case for the yields of KIS Section B where there is a distinct difference, ranging from 1t/ha and 2.2t/ha, between the two seasons. This can be explained by a system of better water management and control within Section B compared to Section A; *older infrastructure in Section A*. This difference in water management and control between the two irrigation areas has a significant impact on the cropping calendar, and then on the crop yield.

Figure 5.14 below shows a data series from 2006 to 2013 for the total production of the scheme (major + minor season). During this period there is a continuous increase in the total scheme crop production, with a peak production in 2013 with 20,000 tons.

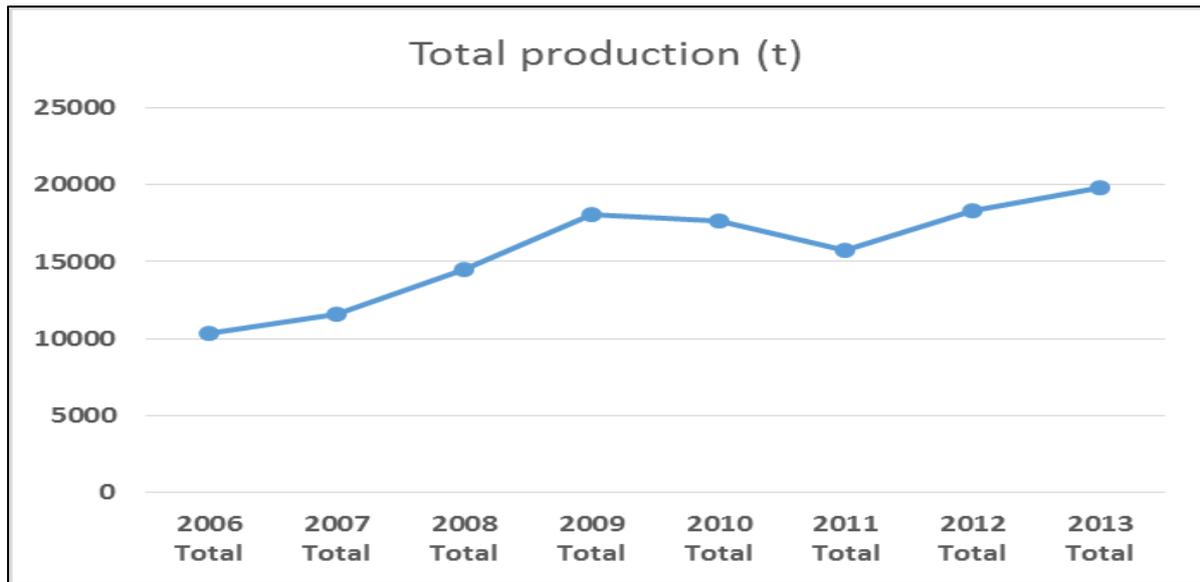


Figure 5.14 *Total Scheme Production Data Series from 2006 to 2013 (Major + Minor Seasons)*

5.4.3 *Typology of farmers*

Approximately 50% of the farmers have less than 1 ha of farm land for rice production. Forty percent (40%) have between 1 and 2 ha, and 10% of farmers have greater than 2 ha of land for crop production. There are four (4) different types of farms within the KIS project area (Table 5.12).

Table 5.12 *Types of Farms under the KIS (source: Agricultural Survey)*

	Type I	Type II	Type III	Type IV	
	Small scale farms	Medium scale farms	Medium scale farms with rainfed crops	Large scale farms	
Total irrigated rice in KIS area (ha) average area / farm (ha)	[0 ; 0,8[0,44	[0,8 ; 1,5[0,98	[0,8 ; 1,5[0,98	1,5 =< 4,71	
Section					
B	82 (86,3%)	26 (37,1%)	37 (52,9%)	15 (48,4%)	
A	13 (13,7%)	44 (62,9%)	33 (47,1%)	16 (51,6%)	
Rainfed crops					
Number of farmers	Yes 35 (36,8%)	No 0 (100%)	Yes 70 (100%)	Yes 15 (48,4%)	
Average area cultivated (ha)	0,61		0,97	1	
Land ownership of rice					
Direct allocation from GIDA	79 (83,2%)	54 (77,1%)	57 (81,4%)	13 (41,9%)	
Subleased from owner	No	No	No	Yes	
Power tiller					
Owner	5 (5,3%)	2 (2,9%)	11 (15,7%)	10 (33,3%)	
Farmers					
Number	95	70	70	31	266
%	36%	26%	26%	12%	100%
Irrigated rice in KIS					
Area total (ha)	42	69	69	70	250
%	17%	28%	28%	28%	100%

Type I represents the small farms that have a maximum area of 0.8 ha of irrigated rice. The majority of these types of farms are mostly in Section B (86%). They have additional fields outside the KIS command area where they grow rain-fed crops (0.6 ha outside the KIS). Only 5% of these farms have a Power Tiller of their own.

Type II farms have an area between 0.8 ha and 1.5 ha for irrigated rice. They are generally located in Section A (63%) and have no other farmland outside of the KIS for rain-fed cropping. Only 3% of these farms have a Power Tiller of their own.

Type III farms have an area between 0.8 ha and 1.5 ha for irrigated rice similar to the Type II farms. But the difference is that they have an additional 1 ha of farmland outside the KIS for rain-fed cropping. Sixteen percent (16%) of the farmers of Type III have a Power Tiller of their own.

Type IV farms represent the large farm with more than 1.5 ha of land for the cropping of irrigated rice. They also have an additional 1 ha farmland for rain-fed cropping outside of the KIS. One farm in three have a Power Tiller of their own.

5.4.4 Private Companies Cultivating Outside of the KIS

The private companies or entities and/or individuals listed under Table 5.13 cultivate vegetables and are in the “out of command” areas within the KIS boundaries or on the “out-of-command” areas outside of the KIS boundaries. These areas cannot be irrigated by gravity feed and are usually serviced by pumping from the nearest canal to these “out-of-command” areas. KIS Scheme Management staff have indicated that the majority of these companies are generally seasonal and do not return after harvesting and are not considered as permanent farmers under farmer beneficiary registration. The majority of “out-of-command” areas are on the RHS of the Akuse Main Canal with some pumped sites on the LHS of the MC, upstream of the Akuse Road Bridge.

Table 5.13 Private Companies/Entities Cultivating Outside of the KIS

No	Company / Individual	Area	Comments
1	Deca Farms	C5	Land use only
2	Emmanuel Narh	C4/9D	
3	Alex Amartey Kasibia	C3; RHS of Main Canal	Land + water use
4	Agbo Hayford	C1	Land + water use
5	OBB Farms Ltd	-	-
6	Vision Youth Agro Foundation	-	-
7	Pastor Stephen Nkansah	-	-
8	Trinity Place Limited	Near Siphon 4	Water use only
9	Geffel Farms	-	-
10	Buersi Mumuni	C1/RA1	Land + water use (pumping)
11	Rashid Zeba	M3	Land + water use
12	Amartey Michael Teye	C3	Land + water use
13	Dr Joseph N. Padi	NLLC	Water use only
14	Felix Osei	C1	Water use only
15	O.G. Farms	Near Siphon 3	Water use only
16	Green Crop Farms	Near Siphon 5	Water use only
17	Abena M. Abedi	-	Land + water use
18	Q Farms Limited	-	Land use only
19	Volta Community Farms	-	-
20	Fealch Farms	-	-
21	El-Gids Farms	C5	-
22	Eric Xavier Amedzo	C2	-
23	Easy Planet Limited	C2	-
24	Jaete Company Limited	C5/B2	-

5.4.5 Milling, Drying Floors and Warehousing

There are twenty (20) milling companies/individual mills listed and accessible in the KIS community area. The main characteristics of these mills are presented in the Table 5.14.

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The main drying floors are owned by KIS and Abians Ltd. The turn-around and turn-over of drying times on these drying floors is very important so that maximum farmers can dry their own paddy production. The major part of a farmer's production is sold on the market in paddy or directly to the mills.

The milling capacity of the area is more than 250t/day and the storage capacity is approximately 10,000 tons.

In 2022, the total production reached was approximately 23,052 tons (major + minor season). The available storage capacity is enough for about 50% of that production in paddy, and for approximately 85% in milled rice. Based on the current KIS area milling capacity 80 days per year are required to mill the total quantity of rice production of KIS.

There is a very significant difference between the mills in terms of the quality of milled rice produced by each mill. The majority of the small capacity mills produce a low-quality white rice which contains small stones and a very high percentage level of broken grains. There is a real need for monetary investment and milling efficiency to increase the quality of the KIS mills. At the opposite end of the milling "quality" spectrum, the large mills like the one from Abians have modern milling equipment and infrastructure and produce quality rice. However, Abians still dry their paddy on drying floors comprising 59 bays in total.

Table 5.14 Mills, Warehouses and Drying Floor Characterises in the KIS Area

Item	Mill Name			Warehouse	Drying Floor			Coordinates (UTMS)		Comments
	Name	Area Located	Rice milled (tons/day)	Storage Capacity (tons)	Dimensions per unit (m)	Number	Total Area (m2)			
1	Abians	Akuse	10	3000	7 x 7	59	2891	183855	674468	
2	Catherine	Akuse	18	270	None	-	-	183912	674411	Tarpaulins are used as drying platforms
3	Mamele	Akuse	9	90	None	-	-	184141	674264	Tarpaulins are used as drying platforms
4	St Mary's	Akuse	13.5	360	None	-	-	184276	674117	Tarpaulins are used as drying platforms
-	KIS Drying Floor	Akuse	-	-	7.5 x 7.5	45	2531	184082	674393	
5	Dakthom	Akuse	13.5	270	7.5 x 7.5	15	844	183806	674580	
6	Mr Boamah	Akuse	-	-	None	-	-	183763	674614	Not operational yet
7	Adom	Akuse	18	250	7.5 x 7.5	24	1350	183087	675139	
8	K-Lines	Akuse	9	450	7.5 x 7.5	30	1688	182866	675098	
9	Goku	Akuse	13.5	216	7.5 x 7.5	15	1460	181515	674877	Additional drying area of 616 m2 available
10	Ocean Baby	Asutsuare	9	54	None	-	-	189809	674005	Tarpaulins are used as drying platforms
11	Douglas	Asutsuare	9	90	7.5 x 7.5	8	450	189819	673991	
12	Ghasel	Asutsuare	4.5	1200	7.5 x 7.5	22	1238	189009	672257	Warehouse is owned by KIS
13	London Boy	Asutsuare	6.3	180	None	-	-	188809	671918	Tarpaulins are used as drying platforms
14	Rebecca	Asutsuare	13.5	1000	None	-	-	191873	672301	Tarpaulins are used as drying platforms
15	Somuah	Asutsuare	18	750	7.5 x 7.5	12	675	191880	672301	Additional 8No drying platforms are to be constructed

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Item	Mill Name			Warehouse	Drying Floor			Coordinates (UTMS)		Comments
	Name	Area Located	Rice milled (tons/day)	Storage Capacity (tons)	Dimensions per unit (m)	Number	Total Area (m2)			
16	Martey	Asutsuare (Area A)	27	225	7.5 x 7.5	84	4725	193912	672935	Drying platforms are owned by KIS
17	Aziagbor	Asutsuare (Area A)	7.2	90				193988	673063	
18	George Guamah	Asutsuare (Area A)	36	360				193988	673063	
19	Pupulampo	Asutsuare (Area A)	5.4	90				194005	673109	
20	Mrs Antwi	Asutsuare (Area A)	9	180				193960	673110	KIS old warehouse used for storage

5.4.6 Agricultural Input Suppliers

There are three main agrochemical agents in the KIS area: Abians, Okle and Altimate. Table 5.15 lists the different types of agro-chemicals and fertilizers and their prices for the KIS area.

Table 5.15 List of Agrochemical Prices in the KIS Area

Item	Type	Unit Weight	Price (GHc)
Weedicide	Tackle	1 litre	80
	Chemosate	1 litre	80
	Adwumara	1 litre	80
	Raidout	1 litre	80
	Glyking	1 litre	80
	Glycot	1 litre	80
	Clear-all	1 litre	80
	Nwuvanura	1 litre	80
	Glyphada	1 litre	80
	Sunamine	1 litre	80
	Nkateetse	500 ml	480
	Bisonrice	250 ml	202
	Onyzoplus	1 litre	148
	Allegator	1 litre	148
	Herbaking	1 litre	80
	Conti-Quat	1 litre	100
Insecticide	Conti-Halothrin	1 litre	122
	Suu-Halothrin	1 litre	80
	Dawa	1 litre	120
	Dursban	1 litre	200
	Termacide	1 litre	132.5
Fungicide	Mancozan	500 g	64
Fertilizer	NPK 15-15-15	50 kg	400
	Urea	50 kg	550 – 600
	S04	50 kg	350

There are several fertilizer suppliers in the KIS area; WIENCO, Olam, Dizengoff, LDC, Yara, AFCOT and G/Stock. The three main types of fertilizers available in the area are; NPK, Urea and Sulphate (see Table 5.15).

All of the farmers use fertilizers and weedicides as part of their cropping practices. The cost for the agrochemicals represents approximately 25% of the total production expenses of the rice farm budget. Details from the agricultural survey show that around 85% of the farmers buy

their fertilizers and other chemicals with their own cash. The other 15% borrow money on credit (approximately 1,000 GHC per ha).

Farmers usually apply 400 kg/ha of NPK + 50 to 100 kg/ha Urea. The quantity of fertilizers that are used are directly linked to the yield expectations of the farmers. The amount of N currently applied in the KIS area is 96 units per ha which corresponds to an expected yield objective of approximately 5 t/ha.

If the yield objective (expectation) is increased, the quantity of fertilizers applied should be increased accordingly. An objective expectation of 7 t/ha for KIS is reasonable and reachable.

5.4.7 Irrigation Demand and Likelihood of Additional Land for Allocation

Section A is irrigated over a 12-hour irrigation schedule and Section B is irrigated over a 24-hour irrigation schedule on each day. The Engineering Design Consultant's calculated Crop Water Requirement (CWR) using the CROPWAT Software, has determined the required field application for the 12 and 24-hour schedule. These are:

- For a 12-hour irrigation schedule – 3.16 l/s/ha
- For a 24-hour irrigation schedule – 1.58 l/s/ha.

From the determination of the KIS cropping pattern CWR, a technical assessment of the required KIS Peak Water/Irrigation Demand was calculated for both a continuous flow application to users and a system of irrigation rotation based on the SM&P designed rotation scheme.

The rotation scheme is the sound method of actual field application of water demand on the basis of an 8-day rotation, with an application of 12-hours in Section A and 24-hours in Section-B. The Peak Demand at the Intake to the MC from the Kpong Dam Reservoir is as follows:

- 1st 12-hour schedule = 6.87 m³/s
- 2nd 12-hour schedule = 6.95 m³/s

The GEL pumping can be increased to 2.1 m³/s. The safety margin remaining flow available for allocation is 0.02 m³/s; available for 24 hours each day.

On the basis of the technical assessment of the required KIS Peak Water Demand, a total additional area of out-of-command area of 168 ha can be irrigated. Specifically, by Drip Irrigation & for Vegetables or Fruit Trees.

5.4.8 Equipment and Machinery

Numbers / Effectiveness

A lot of the agricultural field activities for paddy rice cultivation and harvesting are still done by manual labour. The main agricultural machinery operations are those required for land preparation and for harvesting. And yet, these activities within the KIS farm area are nearly all manually undertaken.

GIDA Assets

The Cultivation Machinery owned by GIDA is listed in Table 5.16.

Table 5.16 List of Cultivation Machinery owned by GIDA

No.	Type	Condition
1.	New Holland tractor TM 135	Serviceable
2.	New Holland tractor 140-90	Unserviceable
3.	New Holland tractor 80-66s	1 serviceable, 1 under repairs
4.	Landini tractor	Under repairs
5.	SAME tractor	1 serviceable, 1 under repairs
6.	Rotavator implement	Serviceable
7.	Disc plough	Serviceable
8.	Chisel plough	Serviceable
9.	Disc harrow (light)	Serviceable
10	Disc harrow (heavy)	Serviceable
11	Rhome harrow	Unserviceable
12	Lowbed trailer	Serviceable

Harvesting Machinery (in custody from Ministry of Food & Agriculture); listed Table 5.17.

Table 5.17 List of Harvesting Machinery

No.	Type	Condition
1	Kukje (DKC685)	Unserviceable
2	Foton DC 2000	Unserviceable
3	KT-09	Under repairs

Farmers' Assets*Land Preparation Machinery*

The most common piece of machinery equipment used by the farmers for land preparation is the Power Tiller. Data from the agricultural survey (Figure 5.18), suggests that only 10% of the farmers have their own Power Tiller. It means that 10 farmers use one Power Tiller on average.

Power Tiller machinery equipment are well suited and adapted for the land preparation within KIS and are far more suited to the KIS field size than tractors. With field areas of between 0.4 ha to 0.8ha it is difficult to plough with a tractor and is far easier with a Power Tiller.

From the agricultural survey data and information on Power Tillers discussed above, the Consultant estimated that there are approximately 200 Power Tillers within the KIS area and available. Additional power tillers are needed within KIS to meet the demand of land preparation, i.e. to complete the planting operation within 30 days and maintain the cropping plan for the field operations of land cultivation and planting.

Rice Seedling Planting Equipment:

From the collected data under the agricultural survey and with discussions and further reviews of machinery input suppliers and machinery centres in Ghana, there are only a very small number of rice planters (for transplanting seedlings) in Ghana.

The majority of KIS farmers plant manually and generally by broadcasting seed or in some cases manually transplanting seedlings farmers. This impacts on field uniformity and ultimately crop yield. If the KIS farmers continue to broadcast seed as their preferred method of planting rice, then increased yields are not likely to be achieved; transplanting seedlings is far superior in yield attainment. For increased yield, seedling beds and transplanting is a required good farm practice.

Rice Harvesting Machinery:

There are very few combine harvesters in the KIS area. Those that are available are old and not well maintained because of the poor and difficult access to obtaining spare parts. The Consultant estimates that less than ten combine harvesters are serviceable within the KIS area. The data in Figure 3.7 from the agricultural survey presents the “farmer use” of combine harvesters.

The majority of the farmers do their harvesting manually through gangs of harvesters and community labour. If the farmers have a choice, they would prefer to hire a combine harvester rather than use hired labour because it is quicker and cheaper and it is becoming more and more difficult to find sufficient numbers of workers for the harvesting period of KIS.

Finding a source of labour becomes far more difficult under a cropping plan when the time for harvesting should be confined to a set 30 or 40 days because of the need to get ready for the second crop. A reason why cropping patterns/ plans fail to be applied by the farmers. Labour for manual harvesting has been reported within various technical journals as being between 30 and 40 persons per ha per day; including reaping, threshing, drying and bagging (IRRI). Although another reference source stated 160 man-hours per ha; i.e. a workforce of 20 per ha per day.

It is therefore understandable as to why the KIS farmers cannot maintain their rice production activities within a planned cropping pattern if there are a limited number of old and poor combine harvesters and the high numbers of labour needed per hectare for manual harvesting.

5.4.9 Cropping Pattern and Irrigation Scheduling

To maintain the cropping pattern/plan (calendar) and to ensure that the irrigation schedule is able to be managed within lateral blocks and between blocks, the schedule of rotation must rely on gates being opened and closed and water delivered as per the water requirements of the whole block. Under a rotation system a farmer/irrigator receives his 8-day allocation in 12 or 24 hours and then his intake gates are closed and the water is delivered to another irrigation block or command area. Without a set cropping pattern, i.e. at its worst – one farmer land

preparation and planting and one farmer harvesting at times when the “water supply (irrigation) is turned off for the “drying out” period, then water management cannot be strictly controlled.

Farmers within a block must be all on the same CROPPING PLAN – same date of land preparation and planting within “possibly” one or two days’ difference. Similarly, with harvesting. For the Cropping Calendar (Pattern/Plan) to be respected and ultimately not fail, either of the following must be provided:

Land Preparation: 300 to 380 Power Tillers must be available (owned or leased)

Planting (Transplanting):

Manual: A workforce of between 2,100 and 2,700 persons
(every day for 20 to 26 days)

OR

Machine: 37 to 49 Rice Transplanting Planters

Harvesting:

Manual: A workforce of 2,460 persons
(every day for 26 days)

OR

Machine: 22 Combine Harvesters – or more

The above are substantial numbers and they defy possibilities of availability. Without acknowledging the above concerns of numbers and availability, the KIS rehabilitation of the infrastructure can be successfully completed. However, the expected future effective and efficient management of the water may not succeed, with a likely return to the current state of management.

5.5 Environmental and Social Audit of KIS

An environmental and social audit was conducted on the scheme to understand the level of compliance to both World Bank and national requirements. Table 5.18 below summarises the findings from the audit in line with the ESS of the World Bank and other national requirements.

Table 5.18 Environmental and Social Audits of the KIS

E&S Standards	Triggered	Major Findings
ESS 1: Assessment and Management of Environmental and Social Risks and Impacts	Yes	<ul style="list-style-type: none"> In 2018, an environmental assessment was carried out to encompass the scheme's construction and operational phases. The scheme secured an environmental permit from the Environmental Protection Agency, for the construction, rehabilitation and operation of the scheme, however, the permit has expired. This study also aims to renew the permit covering the operation of the scheme.

		<ul style="list-style-type: none"> • Water abstraction permit was secured from the Water Resources Commission and is still valid. • Fire Certificate was obtained from the Ghana National Fire Service • There is currently no documented Environmental and Social Management System with related policies such as Environmental and Social Policy, Health and Safety Policy, Human Resources Policies, etc. in place at the Scheme.
ESS 2: Labour and Working Conditions	Yes	<ul style="list-style-type: none"> • The Scheme Management Entity which was put together by GIDA oversees the management of the scheme and ensures that all workers are furnished with official contracts and are provided with the required tools including PPE for work. • GIDA adheres to the stipulation of the national labour law. • Individual farmers within the scheme do not have formal arrangement with their workers and there is no documentation on working contracts. • There are functioning Water Users Associations with organs and structures for the management of individual farmers on the schemes including management of E&S issues. • The Agric Services Officer and the Sanitation Committee of the WUAs see to E&S related issues on the schemes
ESS 3: Resource Efficiency and Pollution Prevention and Management	Yes	<ul style="list-style-type: none"> • Poor management of water as a result of the unrehabilitated sections (Section A) of the scheme. • Contamination of source of water for drinking by the washing of motor bikes, bathing in the canals and the washing of faecal matter through run off into the canal. • Concerns about abandoned borrow pit after the phase one rehabilitation works. These borrow pits are maintenance borrow pits created by Golden Exotic Limited for the maintenance of roads
ESS 4: Community Health and Safety	Yes	<ul style="list-style-type: none"> • There are cattle within the scheme that are reported to cause destruction to crops on the farm • Some farmers burn crop residue after harvesting which has implication on the soil quality and also poses fire risks. • Children are reported to swim in the canal. This was confirmed during field visit.

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		<ul style="list-style-type: none"> • Lack of access road for transport of produce to warehouse • Open defecation along the canals which are washed into main drains or canals whenever it rains contaminating the source of drinking water for some communities. • Inadequate water collection points for access by communities • Disruption of farming activities during rehabilitation of phase 1, affecting farmers' livelihood. Fear of livelihoods disruption or loss during phase 2 rehabilitation • WUA executives are sidelined during project implementation. • Inadequate crossings on canals affecting access to rice fields and forcing farmers and the public to use unapproved crossing points
ESS 5: Land Acquisition, Restriction on Land Use and Involuntary Resettlement	No	<ul style="list-style-type: none"> • The project will not involve additional land acquisition
ESS 6: Biodiversity Conservation and Sustainable Management of Living Natural Resources	Yes	<ul style="list-style-type: none"> • The project area has been greatly modified from extensive agricultural activities. No species of conservation concern was identified on the scheme •
ESS 7; Indigenous People	N/A	There are no indigenous people in Ghana
ESS 8: Cultural Heritage	Yes	Farmers on the scheme adhere to the cultural norms and values of the project communities. No artifacts or relics have been found or anticipated to be found in the project area. The Traditional Authorities noted the necessary rites were performed prior to the construction works in phase one and demand that same should be carried out prior to the commencement of the project.
ESS 9: Financial Intermediaries	N/A	-
ESS 10: Stakeholder Engagement and Information Disclosure	Yes	<ul style="list-style-type: none"> • Ineffective communication between Scheme management and the communities. This resulted in farmers not adequately prepared for the phase 1 rehabilitation

6.0 PUBLIC / STAKEHOLDER INVOLVEMENT

6.1 Rationale for Stakeholder Involvement

Stakeholders were engaged as required by good EA practice in line with the Ghana Environmental Assessment Regulations, 1999 (LI 1652). The World Bank ESS 10 also addresses the requirements for stakeholder consultation as part of the EA process. These consultations were guided by the requirement of Stakeholder Engagement Plan (SEP) developed for the FSRP.

The stakeholder engagement helped engender openness and transparency in eliciting stakeholder contribution, which was beneficial in informing project design and the assessment process and enhancing the project's social acceptability. Effective stakeholder engagement can generally improve the environmental and social sustainability of projects and make a significant contribution to successful project design and implementation.

6.2 Key Stakeholders Engaged

The stakeholders were categorised into government agencies, local government, enforcement and protection agencies and surrounding communities. The list of all stakeholders engaged is given in Table 6.1.

Table 6.1 *Categorisation of Stakeholders*

Government Agencies	Environmental Protection Agency (EPA) Head Office Ghana Irrigation Development Authority (GIDA) Water Research Institute (WRI) Water Resource Commission (WRC), Kpong Farms (Volta River Authority)
Local Government	Shai Osudoku Municipal Assembly (SODA) Lower Manya Krobo Municipal Assembly (LMKMA) Shai Osudoku District Health Directorate
Enforcement and Protection Agencies	Ghana Police Service (GPS) - Dodowa Ghana National Fire Service (GNFS) – Dodowa Fire Station
Association/NGOs/ Farmers	Water Users Association. (WUA) Farmers on the scheme Cattle herdsman
Surrounding Communities	Volivo, Lubuse, Klebuse Kewum, Asutuare, Kasunya, Atlorbinya, Baba Edey, Akuse Quarters
Others	Osuwem Traditional Council

6.3 Stakeholder Notifications and Engagement Planning

Some stakeholder groups identified through the mapping exercise were notified for engagement through phone calls and introductory letters (Appendix 3). Table 6.2 provides the types of notification served and the respective stakeholder.

Table 6.2 Stakeholder Notification

Type of Notification	Use	Stakeholder
Letter	Formal letters of introduction were sent to these stakeholders introducing the consultant for the preparation of the EIA for the proposed project and requesting for their involvement in the consultative engagement process.	EPA SODA LMKMA GPS GNFS WUA GIDA Traditional Authority Kpong Farms (VRA) SME
Phone call	Phone numbers of these stakeholders were obtained, and key personnel contacted to schedule engagement.	Farmers Project communities Cattle herdsman

After the notification and confirmation of appointment with stakeholders, a team of consultants conducted the consultations with the various stakeholders on the scheduled meeting days and time, visited the site, and nearby facilities and communities. The consultation guide/issues are presented in Appendix 5. The engagements were organized between 31st January and 28th March, 2023. These took place through face-to-face interviews and focus group discussions. Subsequent communication was held via emails and phone calls as follow-up to clarify information provided at the first engagement or to request relevant documents.

The engagement schedule employed showing the respective engagement tool used, the key contact persons and their contact details is presented in Appendix 9.1.

6.4 Stakeholder Engagement Highlights

The issues that guided the engagements with stakeholders are compiled below with highlights of the responses and suggestions are compiled in the Table 6.3 below.

Table 6.3 Major Highlights from Engagements

Stakeholder	Highlights of Engagement
EPA	<ul style="list-style-type: none"> A technical committee meeting on the update of the ESIA and ESMPs for KIS concluded that given that the existing ESIA was prepared under GCAP is less than 5 years ago (2018) and that projects activities wouldn't change much, baseline conditions and relevant stakeholders wouldn't change much. However, to satisfy funding requirement, the update of the

Stakeholder	Highlights of Engagement
	<p>existing should be undertaken and 5 copies of the ESIS submitted to the Agency for the renewal of the permit.</p> <ul style="list-style-type: none"> • The Tax Identification Number (TIN) of FSRP would be required for an invoice to be prepared and issued and associated fees paid for the renewal of the Environmental Permit
GIDA	<ul style="list-style-type: none"> • The Kpong Dam is very safe as measures are in place to ensure dam safety. A Dam Safety Report, 2021 received from the VRA has been submitted to the World Bank through the FSRP2. • More watering troughs should be provided on the schemes for cattle grazing within the project area of influence. • The development of pasture land within the scheme should not be encouraged as this would create problems for farmers and would encourage uncontrolled cattle invasion of the project area. • Designated crossing points for cattle should be provided across the canal to prevent using farm roads by the cattle. • Toilet facilities should be constructed on the scheme. • There are 15 Water User Associations (WUA) on the scheme, each with a head. The WUAs should be engaged on where to site the toilet facilities. • GIDA has prepared a proposal on the construction of toilet facilities on irrigation schemes to improve upon sanitation and minimise the incidence of water borne diseases on the scheme. The bio digester technology can be employed on the scheme. • Sensitisation to stop swimming and bathing in the canals should continue. Areas prone to drowning should be barricaded as the locals continue to abuse the canal through swimming and washing in spite of the installation of signage prohibiting the practise. • More foot crossings should be constructed at vantage points so farmers and their workers can access their farms (cross canals) easily. Enough foot bridges would also make it easier for community members to access designated points to collect water. • The canals serve as potable water source for local communities within the project area of influence. For construction works to commence, water to the canals would be closed/blocked to make way for removal of weeds, dredging and lining of the canals. The alternative water source which is borehole is salty in most of the communities, hence not used. It is therefore recommended that the project provides Reverse Osmosis (RO) system for the boreholes in these project communities to treat the water for domestic use. During the rehabilitation of the sections B and C, tanker services were relied on for water supply to the communities close to these sections in the initial stages, however this was discontinued and RO installed to treat the boreholes. • Closing the scheme will result in laying farmers off their livelihood for the period of the rehabilitation work with implications on the financial conditions of farmers.

Stakeholder	Highlights of Engagement
	<ul style="list-style-type: none"> • Again, the rehabilitation work could be phased to ensure that not all farm affected by the rehabilitation are shut at the same time. • The canals serve as potable water source for local communities within the project area of influence. For construction works to commence, water to the canals would be closed/blocked to make way for removal of weeds, dredging and lining of the canals. The alternative water source which is borehole is salty in most of the communities, hence not used. It is therefore recommended that the project provides Reverse Osmosis (RO) system for the boreholes in these project communities to treat the water for domestic use. During the rehabilitation of the sections B and C, tanker services were relied on for water supply to the communities close to these sections in the initial stages, however this was discontinued and RO installed to treat the boreholes. • Laying farmers off their livelihood for the period of the rehabilitation work would have implications on the financial conditions of farmers. This could be mitigated by some form of compensation for the farmers such as jobs on the project. • Again, the rehabilitation work could be phased to ensure that not all farmers are laid off at the same time.
GPS, Shai Osudoku Divisional Command	<ul style="list-style-type: none"> • Isolated cases of Gender-Based Violence exist especially in Dodowa, however, it usually unreported. Sensitisation is key to encourage reporting and prevent the practise. • The Police and the SOMA Social Welfare and Community Development Departments could help with sensitisation if the projects call upon them.
Agric Directorate SOMA/LMK MA	<ul style="list-style-type: none"> • The District MoFA provides support services for the farmers on the scheme by way of training in the areas of agro-chemical application, cultural practices, post-harvest handling of farm produce, through extension officers. The regularity and frequency of such trainings are hampered by limited funds and the number of extension officers. • Increasing capacity of the department with more extension personnel and providing funds for training activities would increase efficiency of the department • Lack of farm machinery makes it difficult for farmers to get the assistance needed. • There have been successful attempts to assist farmers get machinery from private individuals and organisations outside the district • There have been several issues of cattle invasion. • In severe cases of farm invasion that goes to the court, the extension arm of the agraric department conducts evaluation of destroyed crops for the law enforcement authorities
GNFS Shai Osudoku District	<ul style="list-style-type: none"> • Incidents of bush fire are not predominant in the area. Rice farming which dominates the area is done in the swamps, hence less fire prone. • The district fire service station is always ready to combat any issue of bush fire.

Stakeholder	Highlights of Engagement
	<ul style="list-style-type: none"> • Training of fire brigades in the various communities is an absent necessity as the number of fire stations in the district is woefully inadequate.
LMKMA	<ul style="list-style-type: none"> • There are concerns of the length of the rehabilitation period as it would border on the livelihood of the farmers, as experienced in the rehabilitation of section B. Farming communities on the scheme should be notified well in advance. • Expressed dissatisfaction on the delay of the rehabilitation work on section A. • The municipal and district assemblies have the architecture to sufficiently manage the influx of strangers during the project, as has been demonstrated during the rehabilitation of section B. • Community Led Total Sanitation is adopted for waste management in the district. • Waste management is usually by waste bins distributed by waste management company (zoom lion) and picked for disposal at a fee • Most households are not able to afford cost of waste disposal by the company and hampers. • Dumpsites are not enough as issues of proximity of temporary dumpsites leads to improper disposal of domestic waste. • District Environmental Health Unit engages extension officer to educate farmers on the disposal of chemical containers.
Farmers on the Scheme/ WUA	<ul style="list-style-type: none"> • Members expressed concern on the lack of facilities within the communities and farms even though they expected such facilities during the 1st phase of the project. • Concerns were raised about the open defecation along the canals which are washed into main drains or canals whenever it rains. • This contaminates the source of drinking water for some communities. • Farmers admitted to being trained on the disposal of chemical containers, either to burn them on the farms, or bury them, depending on the type of materials. Most farmers however don't comply, forcing the WUA heads to institute sanctions by way of fines against defaulting farmers. • Extension officers give training on chemical application and post-harvest losses. • Cattle invasion is mainly as a result of lack of designated areas for cattle crossing and drinking troughs. • Members complained of the consistent invasion of the cattle on their farms which usually result in conflicts between farmers and herdsmen. • Farmers usually commit additional resource to employ people to protect their farms from the invasion of the cattle. • As a result of lack of drinking troughs, cattle drink water at the community water collection points, contaminating the water with faecal matter. • Each WUA has a disciplinary committee that settle disputes among farmers.

Stakeholder	Highlights of Engagement
	<ul style="list-style-type: none"> • In the case of inter-farmer disputes from different WUA sections, the federation disciplinary committee resolve conflicts. • Grievances from farmers are channelled through the WUA executives to management of the KIS scheme. Farmers however complained about the lack of commitment from management to address same. • Completed portion of the KIS has led to ease of farming, low labour costs, and improved yields and less post-harvest loss. • More community members are engaged in farming now, with better financial returns, social responsibilities better taken care of. • Minors are less engaged for labour works at the rehabilitated part (Section B) as farm roads make it easier for use of machinery in land preparation, harvesting and post-harvest handling • Less invasion of farms by weaver birds as trees that serve as hubs for the birds are cleared. • Post rehabilitation repair works has to be routine. • Uneven distribution of water to the farm plots • Flooding of some farm plots as a result of poor mechanism of the control of water movement • Lack of infield roads makes use of farm machinery difficult. • High cost of labour as machinery cannot be used in most areas • High post-harvest loss as harvesting is mostly manual since combined harvesters are very few. • Invasion by weaver birds as there are trees that serve as hubs for the birds • Farmers raised concern about the construction period. Farmers were made to wait longer than the schedule for completion, meaning that there was no farming activities for the over two year period that the rehabilitation of section B took. This impacted negatively on their livelihood. • Proposed that rehabilitation of section A should be phased so that not all farmers would have to halt farming at the same time • They also proposed that during the rehabilitation, farmers who would have to halt farming should be compensated by considering them for roles in the workforce. • Complained about lack of repair works on the rehabilitated section B, including desilting of drains which results in flooding and uneven flow of water to some of the farm plots. • Concerns were raised on floods caused by choked drains in the Section A and members hoped that the rehabilitation work would begin in time to prevent further flooding. • More foot bridges at reasonable distances are required over the canal and the drains.

Stakeholder	Highlights of Engagement
	<ul style="list-style-type: none"> • Farmers were not happy that their concerns were not addressed during the rehabilitation of the Section B even though they were promised all will be considered during the project implementation. • According to the farmers, the grievance committee never functioned well because member complained they did not have resources to investigate issues. • They suggested that members of the WUA could be co-opted into the project implementation committee since they appreciate the issues more on the ground.
Project Communities Kasunya, Atlorbinya, Papayieda and Dzogberdzi	<ul style="list-style-type: none"> • More community members, including women are engaged in farming now, with better financial returns, social responsibilities better taken care of. • Infield roads make it easier for movement around the communities. • Inadequate footbridges across the canal. • Farmers were laid off without compensation over a long period, thus affecting living standards. Communities are concerned that this may be the case with section A during its rehabilitation. • Water collecting points are not constructed. • Some bore holes in communities like Kasunya and Atlorbinya are not in use because of maintenance and water quality issues forcing them to fetch water from the canals. • Water source is shared with cattle, contaminating the water with faecal matter. • There have been incidents of drowning as a result of bathing in the canal. • Project implementation not taking views of community members. • Communication was ineffective between Scheme managers and the communities. • No regular visits to the communities by managers to engage community members to address concerns of community members.
Traditional Authorities	<ul style="list-style-type: none"> • Pacification rites must be performed before the commencement of construction activities. • Community members must be employed during construction activities. • Traditional authorities indicated support of the project.
Kpong Farms	<ul style="list-style-type: none"> • Water will be available all year round for irrigation activities • Management wants to see a reflection of their inputs into the project design before the finalisation of the design. • Management should be notified well in advance prior to the commencement of project works. • Construction works should be phased out. • Kpong Farms can serve as a center of excellence for the training of farmers on the scheme and beyond.

6.5 Validation Workshop

The consulted key national, regional and district level institutional stakeholders and the local-level stakeholders, including nearby communities were invited to a validation workshop. The findings of the assessment was presented to them at the meeting, as well as the methodology used in order to reach consensus on all the major issues (project's impacts and risks and the corresponding mitigation and risk management measures). Table 6.4 below captures the highlights of concern raised by stakeholders and actions taken during the validation workshop.

Table 6.4 Concerns of Stakeholders and Decision Taken

Stakeholders	Concerns	Decision
WUA/Farmers	WUA to be given key role in security during and after rehabilitation.	The Taskforce of the WUAs would take on the additional responsibility of security of the scheme
	Cattle invasion is a serious issue resulting in conflict and litigations. Police and SODA and LMKMA to prioritize it. MCE of LMKM to bring it up at DISEC meeting.	MCE to of LMKM to liaise with DCE of SODA for a joint security meeting to be held on it
	Pension Scheme for farmers.	SSNIT to be invited to introduce packages to farmers on scheme.
	Some borrow pits not reclaimed during the phase 1 rehabilitation under GCAP	All borrow pits created under GCAP were reclaimed, those not reclaimed belong to GEL which uses it for their maintenance works periodically. FSRP will ensure all pits developed for the phase 2 activities are duly reclaimed as done under GCAP.
	Natriku is a community in the Shai Osudoku District and not Lower Manya Krobo Municipality as indicated in the presentation.	Natriku to be moved to communities in Shai Osudoku District (SOD)
	Contractor does not listen to the concerns raised by WUAs though the WUAs have local knowledge	Communications to contractors by WUA should be done formally through the

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	that the contractor can benefit from	consultant not direct to contractors. Bypass to be created for sector B during rehab of sector A
Design Consultant	The area to be rehabilitated under FSRP (phase 2) is 917.13 Ha instead of the 650 indicated in the presentation.	The area to be rehabilitated corrected to 917.13 Ha
	Number of Cattle trough is 5 in our report as against 4 from GIDA	Design for cattle trough to be changed
Kpong Farms	Rehab to be phased as advised in the ESIA recommendation.	Rehabilitation to be phased and Kpong farms notified in advance of construction works

7.0 ASSESSMENT OF POTENTIAL IMPACTS AND RISKS

The potential impacts likely to be associated with the proposed rehabilitation and modernisation of the KIS have been assessed based on information collected during the field visits, stakeholder engagement and through literature review of similar projects. The significance of each impact was evaluated, taking into consideration stakeholders' opinion, applicable national, international, and industry standards.

7.1 Methodology for Assessing and Ranking Impacts

The likelihood of occurrence of adverse environmental and social risks and impacts as well as the level of significance were evaluated, based on a modified methodology for assessing and ranking impacts adapted from the ISO 14001 Environmental Systems Handbook (Whitelaw, 2004). The ranking system used eight assessing criteria, qualitatively scoring 'low', 'medium'/'moderate' or 'high' for ranking variously the likelihood of occurrence and significance of impacts. The eight criteria used are listed and further outlined below:

1. Knowledge about similar/past projects;
2. Level of risk of impact;
3. Actual or potential nuisance;
4. Spatial scale of impacts (spatial extent);
5. Timescale of impacts (temporal extent);
6. Inducing future incompatible activities;
7. Legislative requirements and standards; and
8. Information availability.

a) Knowledge of Similar/Past Projects or Project Environment

The knowledge of similar projects or various aspects of a project or in relation to the project environment. Aspects and related activities that have had environmental and social problems in the past would have a higher score, since they would have a higher likelihood of occurrence as compared to incident-free record of other activities. Likewise, aspects that generated complaints in the past would be deemed significant.

b) Level of Risk of Impact / Likelihood of Impact Occurrence

This looked at the probability of impact (or risk) occurrence (i.e., likelihood), and the likely consequences should an incident occur. It also assessed concerns such as whether there could be associated risks before and even after mitigation measures are taken (residual risks).

c) Actual or Potential Nuisance

Actual or potential damage or nuisance that the impact could cause surrounding areas or recipients, or any potential nuisance resulting from the proposed activities to the public or other sensitive receptacle within the area of influence. Also considered impacts that are direct or indirect, reversible or irreversible

d) Spatial Scale of Impacts

The spatial extent of impacts considered were whether local only (spatially limited), or community-wide, or district-wide effects or at the national scale.

e) Time Scale of Impacts

The duration over which impacts would occur or would be experienced (duration of exposure). Impacts could be intermittent or occasional, or frequent, persistent, but of less acute or long-term consequence (less serious) than effects with serious and/or long-term consequences.

f) Future Induced Activities

The likelihood of induced activities or adverse situations that may arise (could be cumulative) in the future due to the presence of the project, and what the nature or scale of these potential activities or situations could be (social- or environmental- or health-wise). Any likelihood of future incompatible activities or situations in the area of influence that may affect the objective of the project.

g) Legislative Requirements and Standards

The available legislation, policy, standards/discharge limits or guidelines in place to facilitate evaluation of significance and management of impacts; where available the relevant aspects or impacts were considered less significant, or otherwise considered significant.

h) Information Availability

For lack of information to base a satisfactory assessment on, the relevant aspect or impact was considered significant. In other words, knowledge gaps in the assessment meant it would be based on inadequate information/data, potentially introducing a high degree of uncertainty, hence an evaluation of high significance.

7.2 Opportunities/Beneficial Impacts

Potential benefits to be derived from the proposed project include:

1. Enhance agriculture production;
2. Local employment opportunity;
3. Economic benefits to the project area;
4. Increased climate change adaptation; and
5. Improvement in revenue base of institutions and regulatory bodies.

7.2.1 Enhance Agriculture Production

It is estimated that only 0.2% of cultivated land in the country is under irrigation (Adjei-Nsiah, 2017). The over-reliance on rainfall in the country for crop cultivation limits crop cultivation to the rainy season. The changing rainfall patterns as a result of climate change have caused a reduction of agriculture production over the past decade and reduced food security (Asante and Amuakwa-Mensah, 2015). Crop production in the project area will improve with improved scheme infrastructure and management as this will ensure the sustainable operation of the scheme and enable farmers' plant all year round and avoid losses during dry periods of low rainfall and drought.

The provision of technical advice on the appropriate cropping pattern/calendar, the types and areas to be cropped based on water outflow from the dam / irrigation outlet discharge will assist farmers to significantly increase the yields. The establishment of channel management offices

and their set up /organization, repair shops will significantly improve the sustainability of the scheme.

Capacity building for farmers and transfer of knowledge will help them better manage their farms and boost productivity. Improved methods of crop production and less dependence of rainfall will reduce production losses. Provision of warehousing and rehabilitation of farm access/inspection roads will also reduce post-harvest losses for farmers.

7.2.2 Local Employment Opportunities

The construction phase is expected to take up to about eighteen (18) months, involving an estimated workforce (both skilled and unskilled) of about 250 persons, employed at various stages of this phase. The recruitment of locals will be prioritised and farmers who plots are under rehabilitation will also be offered the opportunity to participate in the workforce. The project will also create indirect jobs for food vendors who will provide services to the construction workers.

The operational phase of the project is expected to provide permanent jobs to scheme management staff and smallholder farmers who have been allocated parcels of land for farming with a reliable water supply for all-year-round farming and farm hands who will be employed by large and medium scale enterprises. This will provide permanent employment opportunities and a reliable income source for the inhabitants of the project community and beyond.

The project will therefore have a major positive impact on the socio-economic conditions of the local communities in and around the project area (Klebuse, Kasunya, Akuse, Kortorkor, Asutsuare, Amedeka, Volivo, Duffor and Nyapienya, among others) as a whole through the creation of permanent and temporary direct jobs as well as indirect jobs.

7.2.3 Economic Benefits to the Project Area and the Nation

The rehabilitation and modernisation of the KIS to attain its full potential will provide important socio-economic benefits to the project community. The availability of a reliable water supply for farming would attract in-migrants, especially farmers to settle in the project area. The potential increase in population in the project community could enhance economic activities for the community dwellers, neighbouring communities and the nation as a whole in the following ways:

- Direct and indirect job creation for locals;
- Increased income for workers;
- Increase in business activities in the communities and neighbouring communities.
- Increased food production which will reduce food cost; and
- Payment of taxes which will improve the revenue base of the economy.

On the national front, the expected increment in food productivity can contribute to reducing the nation's food importation bill. The impact will be regional and permanent, lasting throughout the duration of the project.

7.2.4 Increased Climate Change Adaptation

The proposed project will enable farmers adapt to the effects of climate change as it is a more resilient option compared to rain-fed agriculture due to the availability of water all year round for farming.

Groundwater resources could also be improved through managed aquifer recharge, i.e. enhancing recharge of aquifers through infiltration from the scheme and reservoir.

7.2.5 Improvement in Revenue Base of Institutions and Regulatory Bodies

Revenue will accrue to traditional authorities and regulatory institutions through the payment of royalties and regulatory fees and levies throughout the duration of the project.

The GIDA will derive a substantial revenue from the scheme through land leases and Irrigation Service Charge (ISC). Other public institutions such as the Water Resources Commission (WRC) and the Environmental Protection Agency (EPA) will respectively derive revenue through acquisition and renewal of water abstraction and environmental permits. The WRC will additionally earn revenue from payment of water abstraction charges. The Shai-Osudoku District and Lower Manya Krobo Municipal Assemblies, within whose jurisdiction the scheme falls, will also earn revenue through taxation and issuance of essential permits e.g. building permits for offices, haulage fees etc.

7.3 Potential Adverse Impacts

The potential adverse risks and impacts assessed with the proposed components of the project included the following:

1. Livelihood disruption;
2. Impacts on surface and ground water resources;
3. Waste handling and disposal impacts;
4. Greenhouse gas emission and climate change impacts;
5. Occupational health and safety risks;
6. Community health and safety risks;
7. Noise and vibration impacts
8. Impacts of cattle invasion on project infrastructure;
9. Biodiversity impacts;
10. Infringement on labour rights;
11. Potential use of child labour;
12. Gender-based Violence and Sexual Exploitation and Abuse;
13. Socio-cultural impacts; and
14. HIV AIDS and other STI Transmission.

7.3.1 Livelihood Disruption

The main source of livelihood for farmers within the KIS project area of influence is irrigation farming (mainly rice) and related activities. Many of these farmers are from Asutsuare, Akuse and other communities in and around the scheme. The closure of the portions of the scheme, mainly the Section A command area and portions of Section B will lead to the disruption of

livelihoods for the duration of the construction/rehabilitation period. The key groups of persons/entities to be impacted by the closure of the scheme for rehabilitation works include:

- Farmers of Section A command area;
- Kpong Farms;
- Private entities/individual vegetable farmers who are serviced by pumping water from the closest canal; and
- Communities close to the section A command area who rely on water from the canal for potable purposes.

In spite of the fact that the Section A and portions of Section B irrigable areas are in need of rehabilitation of its irrigation and drainage infrastructure to restore and increase the hydraulic efficiency of the scheme, farmers in that section of the scheme continue to farm all year round, albeit with challenges ranging from uncontrolled water for farming to manual carting of produce, manual land preparation and harvesting among others. Cropping, however, has been made possible because of the availability of water released through earth canals and laterals.

Also, private entities and/or individuals cultivate vegetables in the “out of command” areas within the KIS boundaries or on the “out-of-command” areas outside of the KIS boundaries. These vegetable farms are usually serviced by pumping water from the nearest canal to these “out-of-command” areas. Furthermore, about 20 communities in the project area of influence rely on the canals for water for potable purposes. Key communities close to Section A command area that rely on the canals for water needs include Akuse Zongo, Akuse Quarters and Islamic School Area.

Closing the Section A command area for the 18-months construction period will deny 1,028 farmers, of which 332 are females, the opportunity to farm for three seasons. This is expected to result in the serious loss in revenue and the attendant ability to take care of their dependents as farming is their main source of livelihood. Closure of Section A will also result in the loss of job to farmhands who earn their living working on these farms. Businesses that are involved in the value chain including rice millers, marketers would also be affected as quantities of rice harvested in the scheme reduces. The situation would be exacerbated in the event of extension of the construction period as a result of any delay.

The private entities and individuals who rely on the canal water for vegetable farming would also be deprived of their usufructuary rights. The vegetable farming economy in the project area will also be heavily impacted with implication on loss of livelihoods as a result of the unavailability of water.

It is certain that the canals in section A and parts of section B will be closed to accommodate construction activities. This closure poses a high likelihood of disrupting livelihoods and denying access to usufructuary rights. Furthermore, due to the medium-term duration (18 months) of the construction activities, the impact is ranked high.

7.3.2 Impacts on Surface and Ground Water Resources

The main water resource that could be impacted by the rehabilitation and modernisation and operation of KIS is the Volta River and its tributary, the four (4) drainage lagoons (Kasu, Klebwe, Lupu & Nyapie) and groundwater. The water quality of the canal water is largely within recommended limits of GS: 1212:2019 (Chapter 5), except for coliforms and turbidity

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for the surface water. Also, water quality data indicate that the quality of groundwater abstracted from boreholes in the project area of influence is satisfactory except for coliform, chloride and turbidity levels when compared with WHO guidelines. The potential sources of impacts on the Volta River and its tributaries and the four lagoons as a result of the rehabilitation and operation of the scheme will include:

Construction Phase: -

1. Clearing and excavation work for the construction of irrigation structures;
2. Construction of irrigation and drainage infrastructure;
3. Servicing of machinery and equipment on-site; and
4. Leakages of fuel in storage.

Project activities involving clearing of vegetation (aquatic weeds), excavation and shaping of canals, deploying bulldozers, excavators, backhoe, etc., tend to expose, loosen and disturb the soil, making it susceptible to erosion, especially during the rainy season.

Construction works involving the clearing for irrigation structures and ancillary facilities such as roads, and farm shed would lead to major disturbance of topsoil and sub-soil, exposing the soil surface to potential erosion. In addition, a large volume of excavated material would be generated from excavation activities. Furthermore, large volumes of fine aggregates would be transported to the site for construction works.

Given the gently sloping topography of the project site towards the four drainage lagoons at different sections of the scheme (which are interlinked), thereafter towards the Lukwe River which finally drains into the Volta River, loose soil particles on the cleared land surface and stockpiled excavated spoil could be eroded and washed in runoff into these drainage channels during rainfall. The heavy rainfall episodes in the project area would lead to sheet erosion and massive silt-laden runoff into the lagoons, the Lukwe River and the Volta River consequently resulting in a decrease in the capacity of these water bodies.

The drainage channels and groundwater contamination could also result from spilled waste oil during vehicle and equipment servicing or from accidental spill or leakage of fuel during fuelling. Construction activities would require the use of bulldozers, excavators, concrete mixers, backhoes, etc., which would undergo maintenance.

Furthermore, poorly managed construction site camps and indiscriminate disposal of waste will create unsightly conditions. Open defecation may be promoted if adequate toilet facilities are not provided at camps and the project site during construction. Faecal matter from open defecation by construction workers, may be washed in run off into nearby waterbodies and ultimately the Volta River, thus affecting the water quality.

The likelihood of the occurrence of the impact of construction activities on water resources is moderate, medium-term and of moderate significance lasting for 18 months of the construction phase.

The following are the sources of impact to the water resources during the operations phase:

- Erosion from farmlands may result in the transport of soil sediments into canals which may further travel into nearby streams and rivers;
- Pollution of surface water sources through the transport of agrochemicals in runoff and waste water;
- Eutrophication of surrounding water bodies through transport of nutrient rich sediments; and
- Possible pollution of groundwater through the percolation of agrochemicals through the soil.

Land preparation for rice cultivation would result in the loosening of the topsoil. Erosion from farmlands may result in the transport of soil sediments in runoff into the drainage lagoons, the Lukwe River and ultimately into the Volta River.

Moreover, agrochemicals application, including herbicides, pesticides, and chemical fertilizers on rice farms could be washed in runoff into the canals and consequently into the Lukwe and Volta Rivers with the associated concerns on the water quality of the river. Also, continuous transportation of nutrient-rich sediments (through fertilizers application) into the rivers could also result in eutrophication of the rivers with implication on the water quality and several fish species in the rivers, including *Citharinus* sp., *Auchenoglanis* sp., *Mormyrus rume*, *Schilbe mystus*, *Alestes nurse*, *Clarias* sp. and *Alestes baremose*. Furthermore, continuous usage of agrochemicals could leach in the soil and groundwater and contaminate them.

The lagoons/canals serve as sources of water for drinking and domestic use, construction works in the canals and lagoons will deteriorate the water quality with implications on public health. The likelihood of impact is high and the duration may be long-term lasting throughout the lifespan of the project, therefore the significance is ranked high.

7.3.3 Waste Handling and Disposal Impacts

The development of the KIS project will generate different types of waste at both the construction and operation phases. Major waste types to be generated during the construction phase could include:

- Vegetative waste, excavated soil and topsoil removal from land clearing and preparation activities;
- Packaging materials, pieces of wood, bricks, cables, glass, metals, concrete and other construction wastes from the construction and rehabilitation works of roads, drains, canals, etc.;
- Domestic solid waste – food packaging materials, plastics, papers, leftover food, cans, bottles, etc. from construction workers.;
- Silt, etc. from clearing and preparation of the lateral canals for reconstruction or rehabilitation and the lagoons;
- Pieces of pipes and damaged fittings from the upgrading lateral and sub lateral canals;
- Liquid wastes – faecal matter and urine from construction workers;

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- Spent oils and lubricants from the maintenance and repairs of construction equipment maintenance; and
- Scrap wastes – discarded engine components, batteries, and worn-out tyres, etc. from maintenance of construction vehicles.

The anticipated waste types to be generated during the operation phase of the project are:

- Domestic solid waste - food packaging materials, plastics, papers, leftover food, food scraps, cans, bottles, etc.;
- Liquid waste – Faecal matter, urine, wastewater from farmers;
- Crop residue (stalks, stems, leaves, roots, husks, seeds, branch etc.) from harvesting and post harvesting activities;
- Agrochemical waste – containers and bags from used pesticides by farmers; and
- Silt from periodic desilting of drains, canals and lagoons.

Construction Phase

Vegetative Waste and Excavation Spoil

Large quantities of vegetative material and excavated soils/silt will form the bulk of waste generated from rehabilitation and construction works. It is expected that about 352,470m³ of spoil will be generated from the excavation of canals, drains and night storage reservoirs, roads and lagoons. Additionally, vegetation will be cleared, thus vegetative waste (branches, treetops, bark, foliage, stumps, roots, undersized trees, rotten and broken trees, etc.) will be generated from clearing and excavation works.

The vegetative waste could quickly dry up due to high temperatures, making the heaps susceptible for fire outbreaks. The excavated spoil could also be disposed of inappropriately at the fringes of drains (such as the Lupu Main Drain, etc.) within the project area. This could silt the drains and hence affect the functions, holding and channelling wastewater from the project area. The stagnant conditions created by the siltation of the drains could potentially cause flooding and also provide breeding grounds for mosquitoes and facilitate the spread of malaria and disease vectors.

Construction Waste

It is expected that about 372,515m³ of materials will be required for construction of roads (subbase plus surface material (200mm/150mm) and as compacted fill material for the canals. Additionally, about 28,983m³ of concrete will be required for the concrete filled geocell membrane in the canals and laterals. The construction of the canals, drains and roads will generate wastes including the concrete, wood, gravels, etc. Again, installation works (automation system, automated gates, etc.) may also generate waste such as scrap metal, etc. Construction debris could be disposed of inappropriately within the construction sites and the fringes of drains. The waste could be washed by runoff and potentially silt the drains and lagoons, thereby reducing their water holding capacities and potentially cause flooding.

Domestic Waste

This waste consists of plastics, papers, leftover food, food scraps, etc. The different waste types could be disposed of indiscriminately around the construction areas leading to littering of the surroundings. The organic portion of the waste could putrefy, causing odour nuisance and proliferation of vermin, maggots and flies with repulsive stench at the construction site, which could potentially result in diarrhoea and typhoid cases in the communities.

Liquid Waste

Construction workers could resort to open defecation and urinating in the existing drains or on farmlands with bushy areas. These practices would lead to insanitary surroundings and proliferation of vermin exposing workers and the community members to diseases and ill health, such as diarrhoea and typhoid. The non-observance of hygienic practices such as hand washing with soap and water after defecation and before eating could further exacerbate the spread of these diseases. The practice could also affect the zone's aesthetics and air quality due to the pungent smell from urine accumulation.

Spent Oil and Lubricants

Spent oils, solvents, lubricants, paint residue and paint containers would be generated from maintenance of construction equipment, painting works canal structures, etc. These wastes could be disposed of indiscriminately leaving sections of construction areas fouled with paints, oils, and lubricants residue, which may contain lead (Pb) and other heavy metals. These could adhere to the surface of soils and leach into and contaminate groundwater, as well as being washed by run-off and contaminating nearby water resources (i.e. Lupu Lagoon, Kasu Lagoon, Lukwe River, etc.) making it unsafe for the communities that depend on it for irrigational and domestic purposes and cattle watering. The solvent and paint containers could also end up in nearby communities, where people could use for fetching and drinking water which could lead to public health risks.

Scrap Waste

Scrap wastes such as discarded engine components, batteries, and worn-out tyres will be generated from maintaining construction vehicles. The improper disposal of these wastes could lead to soil and groundwater contamination, air pollution from incineration, littering and visual pollution. The tyres could also serve as breeding grounds for disease vectors such as mosquitoes, which facilitate the spread of malaria within the communities.

The effect of improper disposal of vegetative waste, excavated spoil, construction, domestic and liquid wastes as well as spent oils and other waste would be expected to be localised and temporal lasting over the 18 months construction period. The potential siltation of the drains, susceptible fires (from dried vegetative waste) and contamination of water resources could result in public health issues, hence, the significance of improper waste handling and disposal impact at the construction phase is ranked moderate.

Operation Phase

Crop Residue

Crop residue mainly from field and processing activities consist of waste types such as stubble (stems), leaves, roots, husks, seeds and bran. These waste types could be heaped and burned by the farmers. Successive burning could destroy the organic component of the soil and cause crop yield to decrease overtime. This could also expose the farmers to diseases such as nausea, headaches and bronchitis.

Agrochemical Waste

The use of agrochemicals such as weedicides (i.e. Adwumara, Chemosate, etc.), insecticides (i.e. Termicide, Dursban, etc.) and fertilizers (i.e. NPK, Urea, etc.) as part of cropping practices will lead to the generation of agrochemical containers. The agrochemical containers could be disposed of inappropriately on the fields and could be washed by runoff into nearby water resources such as the Lukpe River. The accumulation of these containers in the water bodies could affect the quality of the water sources thereby making it unsafe for domestic uses.

Domestic Waste

This waste consists of plastics, papers, leftover food, food scraps, etc. The different waste types could be disposed of indiscriminately around the construction areas leading to littering of the surroundings. The organic portion of the waste could putrefy, causing odour nuisance and other health risks to the workers and the community members.

Liquid Waste

Farmers could resort to open defecation as there are no provisions of sanitary facilities within the field. The faecal matter could be washed by runoff into the nearby water bodies and potentially contaminating them. Water used from these sources for irrigational purposes could potentially contaminate the farm crops. This could be source of diseases such as typhoid and diarrhoea within Askuse, Asutsuare and other neighbouring communities.

Silt from Desilted Drains, Canals and Lagoons

The silt from periodic desilting of the lagoons, drains and canals could be heaped at the banks of the lagoons, drains and canals and could be wash back into the drains by rainwater and runoff. This could pose flood risks to residents along the drains and the entire community.

With the quantity of domestic and crop residue to be generated, the effects of improper disposal may be minimal (short term), however, given the health effects of inappropriate disposal of waste type - liquid and agrochemical waste, the significance of waste handling and disposal impact at the operation phase is ranked moderate.

7.3.4 Greenhouse Gas Emissions and Climate Change Impact

Agriculture both contributes to climate change and is affected by climate change. Agricultural related emissions of carbon dioxide account for around 24% of global greenhouse gas emissions. The greenhouse gases with the largest contribution to rising temperature are carbon dioxide (CO₂), methane (CH₄), and nitrous oxide (N₂O). CO₂ emissions come from activities such as tilling of fields, planting of crops, and even the shipment of crops or food cultivated to markets for revenue (USDA, 2022).

Farming in particular releases significant amounts of CH₄ and N₂O, two significant greenhouse gases. CH₄ is produced by the cultivation of paddy rice and can also escape from stored manure. N₂O emissions are an indirect product of organic and mineral nitrogen fertilisers (European Environmental Agency 2021).

The National Climate Change Policy address Greenhouse Gas (GHG) emissions through provision of strategic directions and co-ordinate issues of climate change in Ghana, bearing in mind its linkages with development. Also, the objective of Ghana's nationally determined contributions (NDCs) is to reduce emissions by 15–45% below business-as-usual by 2030 and strengthen climate resilience in close alignment with its development priorities (United Nations Development Programme, 2022). Factors that will contribute to GHG emissions and Climate Change associated with the project have been listed below.

Construction Phase

- Haulage of construction materials

Operation Phase

- Transportation of agriculture produce
- Cultivation of paddy rice
- Burning of crop wastes

Construction Phase

Haulage of Construction Materials

At the construction phase, machinery, and equipment such as hydraulic excavator, bulldozer, soil and plate compactors, concrete batch plant, etc., and construction materials (including geotextile materials, cement, gravels, sand, etc.) will be hauled to the site for the construction and pipe works, lining of the Akuse main canal, completing the rehabilitation of farm roads etc. The haulage of these machineries and equipment will be a onetime activity for the construction phase and then evacuation after the construction activities. Other sources of emission will include haulage of construction materials to the site.

With the rehabilitation works, construction and excavation activities will be short term since some works have already been done and only needs some form of rehabilitation for the full operationalization of the KIS. Thus, the use of machinery and other equipment will be limited to the construction phase, and the haulage of construction materials would make a low general contribution to GHG emissions, in spite of the 18-month construction period. The significance of the carbon footprint from these emission sources at the construction phase to the nationally determined contribution of GHG emission is assessed to be low.

Operation Phase

Transportation of Agricultural Produce

During harvest, the Akuse Junction – Asutuare Road could become busy, especially during peak traffic hours (6am to 9 am and 3pm to 6pm), trucks would have to slowly manoeuvre through traffic to the final destination, and travel time could double, with corresponding increase in GHG emissions responsible for global warming. Daily traffic congestion on long-term basis would contribute cumulatively to climate change impact. This would be at variance with the climate change policy which seeks to lessen the potential hardships posed by factors contributing to climate change hindering sustainable development. Hence the significance is ranked moderate.

Cultivation of Padded Rice

Rice farming in irrigated systems is an important source of greenhouse gases emissions such as methane and nitrite oxide. Rice cultivation in flooded fields creates an anaerobic environment, leading to the production and release of methane (CH₄) gas. Methane is a potent greenhouse gas, with a warming potential much higher than carbon dioxide (CO₂). The process of microbial decomposition of organic matter in flooded rice fields produces methane, which is released into the atmosphere. Methane emissions from rice cultivation account for a significant portion of global methane emissions.

The use of nitrogen-based fertilizers in rice farming can result in the release of nitrous oxide (N₂O) into the atmosphere. Nitrous oxide is another potent greenhouse gas, with a much higher warming potential than CO₂. Excessive or improper use of fertilizers, as well as water management practices, can lead to increased nitrous oxide emissions from rice fields.

Burning of Crop Wastes

The combustion of agricultural crop waste or residue could contribute to GHG and CC. When crop waste is burned, it releases carbon dioxide (CO₂), methane (CH₄), and other pollutants into the atmosphere, intensifying the greenhouse effect and exacerbating global warming. These emissions not only compromise air quality but also contribute to the alteration of climatic patterns, leading to a range of environmental and socioeconomic consequences.

Although transportation, agriculture (rice production) and burning of crop wastes contribute significantly to climate change, Ghana's contribution to global climate change is negligible. Moreover, the project is a climate change adaptation project making available water delivery for all year rice production. The contribution of the project to climate change at the operations phase is ranked moderate in terms of significance.

7.3.5 Occupational Health and Safety Risks

Hazards arising from the rehabilitation of the Kpong irrigation scheme could impair the health and well-being of workers. These could be in a form of falls, burns, loud machinery noise, traffic collisions or knockdowns, animal bites, etc. Some of these are usually unexpected. The occupational health and safety risks at both the construction and operation phases could be associated with the following sources:

- Noise and vibration;

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- Impacts on air quality;
- Accidents and injury from the use of machinery;
- General accidents (trips, falls, abrasion); and
- Attack or bite from snakes, scorpions and insects within the site.

Potential sources at the operation and maintenance phase could arise from:

- Exposure to agrochemicals (through storage, handling, application, etc.);
- Poor maintenance of open canals; and
- Operations at the farm areas.

Noise and Vibration

Noise and vibration effects on workers and the community/public have been assessed under section 7.3.7.

Dust and other emission

Dust and emissions would be generated from land clearing and levelling for the construction of roads, excavation works and stockpiling of excavated material, and the movement of vehicles and machinery, including haulage trucks for the transportation of raw material, excavated spoil, and aggregates. Dust and emissions from these sources could pose respiratory health risks and diseases like asthma and bronchitis. Exposure of workers to a small amount of dust during construction could cause some respiratory complications.

The workers could also be at risk of exposure to/inhaling a high level of cement dust which would be used in constructing components such as culverts, canals, etc. Such exposure could irritate the nose and throat, resulting in difficulty in breathing. Short and long-term exposure to high quantities of cement could lead to burns, allergic reactions, blindness, and damage to the lungs. Workers could also be exposed to wet cement (which contains alkaline compounds such as lime (calcium oxide), trace amounts of crystalline silica and chromium) which has irritant and corrosive properties when in contact with the skin (HSE, 2005; ELCOSH, 2011).

The air monitoring results recorded over 24 hours at 3 locations ranged from 243.8 $\mu\text{g}/\text{m}^3$ to 395.3 $\mu\text{g}/\text{m}^3$, 208.7 $\mu\text{g}/\text{m}^3$ to 298.1 $\mu\text{g}/\text{m}^3$, and 77.9 $\mu\text{g}/\text{m}^3$ to 92.9 $\mu\text{g}/\text{m}^3$ for TSP, PM₁₀ and PM_{2.5} respectively. Concentrations recorded for TSP, PM₁₀ and PM_{2.5} at all the three (3) locations exceeded the respective Ghana Standards of 150 $\mu\text{g}/\text{m}^3$, 70 $\mu\text{g}/\text{m}^3$ and 35 $\mu\text{g}/\text{m}^3$ for residential areas. The air quality impacts will be localised and short term, however on a medium scale due to the land clearing activities. Therefore, the overall magnitude and significance of this impact on the workers is ranked medium.

Construction Phase

Accidents and Injury from the Use of Machinery

The project activities will involve the use of machinery such as graders, compactors, backhoes etc. for the rehabilitation of farm roads. Although construction machinery is important in terms of efficiency and its use, it comes with an inherent risk. Rollovers and machine collisions are the most common heavy machinery accidents. Machines operating on uneven surfaces or edges of the road could roll over. Also, in a case where machines are not properly maintained, it could lose balance and topple to the side, thereby endangering operators who are not fully guarded.

Operators involved in such accidents can sustain severe injuries such as head and spinal cord injury, broken bones, cuts, scrapes and bruises.

Workers on the ground could also be exposed to occupational hazards from machine collisions. During road construction, some workers operate on-site either as banksmen or supervisors. Operators of haulage trucks and other machinery who may not be well trained in defensive driving or disregard site safety precautions (careless driving and over speeding) could run over workers. The workers could also be caught between machines as they may be at the blind side of the operators when backing up or reversing resulting in back or neck injuries, head injuries, and even loss of life.

General Accidents (Trips, Falls, Abrasion)

Obstacles such as pipe tubes, wooden planks, and poor levelling of the work surface could cause workers to trip and fall. Workers not being mindful of the surrounding area could be at risk of falling into the existing canals at the site. These accidents could cause bone fractures, bruises, back injuries, sprains and cuts of affected workers, and temporal or permanent inability to work, and in some cases death. Also, manual handling activities like lifting cement bags and equipment could be done in a repetitive and forceful manner, which could result in injuries.

Attacks/Bites from Snakes, Scorpions and Insects within the Site

Site preparation works will involve clearing and removal of vegetation (aquatic weeds, grass, shrubs, etc.) from the channels and banks of the canals and drains as well as installing pipes in the farming area. However, snakes such as, black cobra, scorpions and other could have their habitats destroyed during land clearing. As a result of the invasion, snakes could attack workers. Bites by these venomous snakes can cause acute medical emergencies involving severe paralysis that may prevent breathing, cause bleeding disorders and other fatalities.

Per the expounded, the likelihood of occurrence of accidents from the use of construction machinery and attacks from reptiles due to the clearing activities is considered moderate as the land is already being cultivated. However, the construction phase is short-lived, thus the significance of the impact is ranked moderate.

Operation Phase

Exposure to Agrochemicals

During the operation agrochemicals such as Propanil, NPK, Urea, etc. will be applied to the farms, thus exposing farmers to health risks. Occupational hazards could emanate from the inappropriate use / indiscriminate spraying of agrochemicals without the necessary safety apparel as well as the burning of pest-treated agricultural wastes and by-products (e.g., pesticide containers). This would result in the emission of persistent organic pollutants for instance aldrin, dieldrin and hexachlorobenzene) which could be directly inhaled by the farmers. These chemicals could also be ingested if workers do not wear gloves or practice regular handwashing. Exposure effects include irritation of the skin and eyes, headache, nausea, dizziness and in the long run damage the liver, kidneys, lungs and other body organs.

Poor Maintenance of Open Canals

The existence of open canals and its stagnant conditions created by the proliferation of aquatic weeds may also provide breeding grounds for mosquitoes which could facilitate the spread of malaria. This condition could be exacerbated by poor maintenance of the canals and increasing weed growth, which slows water flow, encourages sedimentation, and produces attractive breeding grounds for disease vectors. Hence, the workers within the site will be susceptible to malaria and other diseases (typhoid, dengue, and schistosomiasis). This will increase the cases of malaria as it is already a major ailment in the Lower Manya Krobo Municipality and Shai Osudoku District.

Operations at the Farm Areas

The project implementation will require the use of machines such as combine harvesters, rice transplanters, etc for farming. For this purpose, fuel will be used on-site to equip the efficiency of these machines. Hence, fuel spills when fuelling equipment and machinery and leakages from the unit's fuel system could pose a fire risk in the presence of an ignition source such as lit cigarette butts. Oil leaks from machinery and equipment could also pose fire in the presence of an ignition source. Fire from indiscriminate burning of agricultural waste could spread across the site thereby damaging infrastructure and causing harm to workers.

In cases of fire outbreak, workers within the site could be trapped, and in panic, others may rush and cause a stampede, sustaining various injuries ranging from scalds to severe burns. The smoke produced from the outbreak could cause asphyxiation and eye irritation.

The long-term exposure of workers to persistent organic pollutants from the inappropriate usage of agrochemicals could pose several health implications. The likelihood of occurrence is moderate. The significance of the impact on endangering the lives of workers throughout the project life cycle is ranked high.

7.3.6 Community Health and Safety Impacts

The rehabilitation and modernization of the irrigation scheme will pose health and safety risks to the community at both the construction and operation and maintenance phases.

The potential sources of community health and safety risks during the construction phase could include:

- Excessive spillage of dam water and dam failure;
- Noise and vibration;
- Impacts on air quality;
- Movement of haulage trucks along communities;
- Risk of drowning from unsecured excavations (i.e., canals, laterals and drains) and abandoned borrow pits; and
- Proliferation of disease-borne vectors.

The potential source of public health and safety risks at the operation and maintenance phase could arise from inappropriate post-harvest management practices as well as excessive spillage and dam failure.

Excessive spillage of dam water and dam failure

In the event of excessive spillage or unlikely dam break, an estimated 30,000 people would be potentially affected with the likely outcome being the loss of lives and displacement of communities (VRA Stakeholder engagement during simulation exercise in May, 2023). Dam break could be the result of physical and hydrological pressure from excessive water flow above the design capacity of the dam walls. Excessive spillage on the other hand could occur from uncontrolled released of water in the reservoir. However, dam failure and excessive spillage of water is unlikely as the VRA has instrumentation on the dams to measure physical and hydrological data daily, weekly and monthly to ensure its safety.

There is also in place an early warning system which monitors the inflows into Akosombo and Kpong Reservoirs so that it is known in advance if there would be potential spill to be able to advise the necessary stakeholders ahead of time. Although the likelihood of a dam failure or the excessive spillage of water is very low, the significance is ranked high as the loss of lives and livelihoods could be very high in the unlikely event that a dam failure occurs.

Noise and Vibration

Noise and vibration effects on workers and the community/public have been assessed under section 7.3.7.

Construction Phase

Dust and Other Emissions

The potential sources of dust and vehicular emissions will come from land preparation and construction activities; and haulage trucks as well as construction vehicles. Land clearing, excavations, road construction, drainage works, and other construction activities, and haulage, machinery, and vehicle movements will generate dust on-site, and exhaust fumes over a period of 6 months. The immediate recipients would be Akuse and its neighbouring communities, Asutuare, and other smaller project communities, as well as nearby farms close to Section A Command Area.

The dust generated on-site would consist of PM₁₀ and PM_{2.5} mainly, which currently exceed the Ghana standards (refer to Section 7.3.5) and is expected to be in suspension for a few hours and may travel up to 50m as larger particles will settle by gravity.

Haulage trucks transporting quarry products, sand, and aggregates to the site will ply the Okpoenya – Asutuare Trunk Road, through various communities including Akuse. Fly-offs and dust blown up, and exhaust fumes could affect these communities as well as pedestrians along the road corridors.

The fumes from haulage trucks and construction machinery and equipment contain carbon monoxide, sulphur, and nitrogen oxides which could cause serious health problems after long periods of exposure. Health effects from prolonged dust exposure (Habybabady et al, 2018) include:

- Irritation of the airways, coughing, wheezing, and difficulty in breathing;
- Reduced lung function;
- Aggravated asthma, and other chronic lung conditions – shortness of breath and increased frequency and severity of attacks; and
- Rarely, particles may also increase the risk of heart attacks and stroke in susceptible people.

Movement of Haulage Trucks along Communities

The construction phase will involve the deployment of tipper trucks for transporting construction materials from the quarry sites to the project site and at the same time for the haulage of excavated spoil to the disposal site. The movement of haulage trucks could pose safety risks for several townships including Doryumu Junction, Asutsuare Junction, Osuwem, Akuse, etc. Reckless driving of trucks which includes over-speeding, tailgating, aggressive driving, drunk driving, distracted driving, failing to use turn signals, and failure to yield the right-of-way could cause road accidents, knockdowns, potential injuries and fatalities. Driver fatigue could also result in such accidents. However, pedestrians and passing vehicles could be involved in accidents if the operators of the trucks disregard safety precautions when plying the community roads.

Risk of Drowning from Unsecured Excavations and Abandoned Borrow Pits

Excavation works for drains and canals will be done during the construction phase. Moreover, borrow pits created for the extraction of gravels and aggregates could be left abandoned. The excavated pits and abandoned borrow pits could be left open for a period before the actual civil works begin. Rains could set in and fill the pits with stagnant water. Hence, children and animals could be at risk of drowning in the excavated pits and borrow pits especially when the construction sites are not fenced, and work notices are not mounted to ward off people from getting close to such areas. Also, poor security at the project site could enable unauthorized entry of children and other persons into the project site who could be at risk of drowning in the irrigation canals which could pose fatal injuries depending on the depth. This is particularly critical for children in the Klebuse, Kasunya, Akuse and other communities close to the project site.

Proliferation of Disease-borne Vectors

The civil works at the site will include several excavations to clear the areas. These dugout pits could be filled after rainfall and if not desilted may result in stagnant water and breed mosquitoes. Mosquito infestations could affect nearby communities by increasing the cases of malaria. Malaria has always been on the top list as Ghana's most common cause of outpatient department (OPD) attendance for decades and the top ten causes of death for children under five years (GHS, 2017). However, children, the aged and even pregnant women could be

susceptible to the effects of malaria. Malaria may cause fever, muscle aches, diarrhoea, and anaemia and jaundice (yellow colouring of the skin and eyes because of the loss of red blood cells). If not promptly treated, the infection can become severe and may cause kidney failure, seizures, mental confusion, coma, and death.

Malaria, frequent knockdowns by haulage trucks and drowning could be on the rise during the construction phase of the project. Thus, the likelihood of occurrence of the impact is ranked high, however short-term exposure to these health hazards will render the significance of the impact moderate.

Operation Phase

Inappropriate Post-Harvest Management Practices

Agricultural produce will be packed in sacks and stored in a farmhouse after harvesting. The stored grains could be susceptible to attacks from rodents and insects such as weevils if the storage conditions are substandard (e.g. poor ventilation, poor housekeeping and leakages) or the necessary management practices for the farm produce are not carefully adhered to. These insects and rodents may feed on and contaminate the stored grains through their droppings, urine, and hairs which could spread human diseases when consumed. The effects will be widespread to the public as the produce will be sold across several markets.

Exposing agricultural produce to certain poor conditions can affect its quality and pose health risks to the public, both in the short and long term. The likelihood of such occurrences is considered moderate, but given the potential long-term impacts, the significance of the impact is also ranked moderate.

7.3.7 Noise and Vibration

Noise and vibration from construction activities are known to cause great discomfort and health complications (Ayaka et al., 2014). Human exposure to noise generally induces annoyance and stress, hearing impairment, and in the extreme case could lead to hypertension. The use of heavy machinery would exacerbate noise and vibration levels in the project community. The noise levels of the various machinery and sound attenuation from the source during use are presented in Table 7.1.

Table 7.1 Equipment Noise and Sound Attenuation from Source

Equipment Type	Noise (dB(A))	Sound Pressure Level (dB(A))						
		15m	30m	45m	60m	75m	90m	105m
Tipper Truck	98.0	74.5	68.5	64.9	62.4	60.5	58.9	57.6
Power tiller	97.0	73.5	67.5	63.9	61.4	59.5	57.9	56.6
Water bowser	98.0	74.5	68.5	64.9	62.4	60.5	58.9	57.6
Grader	85.0	61.5	55.5	51.9	49.4	47.5	45.9	44.6
Backhoe	80.0	56.5	50.5	46.9	44.4	42.5	40.9	39.6
Soil compactor	57.0	33.5	27.5	23.9	21.4	19.5	17.9	16.6

Combine harvester	88.0	64.5	58.5	54.9	52.4	50.5	48.9	47.6
Rice transplanter	86.0	62.5	56.5	52.9	50.4	48.5	46.9	45.6

Source: Generated from WKC Group Formula

Noise levels recorded at the three selected locations; Golden Exotic Area, Shine Star Area and Asutare Basic JHS showed (LA_{eq}) levels of 50.5 dB(A), 81.8 dB(A) and 58.4 dB(A) respectively for the daytime. Similarly, levels recorded for night time were also 54.1 dB(A) 57.1 dB(A) and 52.7 dB(A). Noise levels recorded for day and night-time at three locations are in compliance with the Ghana standard for “Mixed Used” areas except for day and night time noise level at Shine Star.

The potential sources of noise and vibration during the construction phase could arise from:

- Use of construction machinery
 - Land preparation;
 - Rehabilitation of access roads and drains;
 - Excavation of drains, etc.; and
- Movement and honking of haulage trucks along communities.

Potential sources at the operation and maintenance phase could emanate from operations at the farmlands.

Construction Phase

Noise-generating machinery and equipment will be deployed during the construction phase. These will include power tillers for land preparation, excavators for clearing aquatic weeds, compactors, graders, backhoes, water bowsers for road works; concrete mixers for drains over a period of 12 months. These types of machinery will generate noise which exceeds the Ghana standard limit (GS: 1222:2018) for the area in which the project falls (mixed-used area). The noisiest machines are the tipper truck and water bowser (98dB), noise from these machines will attenuate to 57.6dB at a radius of 105m. The noise effects could be severe on machine operators and workers who may be exposed to levels ranging from 98dB to 74.5dB within a 15m working distance from the equipment. The sensitive receptors to such noise effects could be machine operators and workers situated within a radius of 15m.

Aside from the excavator, the other machinery to be deployed for the road and drain construction produce noise that attenuates to acceptable limits beyond a radius of 90m (Table 7.1). The simultaneous use of these machines in the same area could result in cumulative noise levels that could exceed the prescribed limits. Workers will be exposed to noise levels ranging from 33.5dB to 73.5dB within a 15m working radius from these sources. Exposure of workers to such noise levels could cause stress, interfere with communication and concentration, and contribute to workplace accidents and injuries by making it difficult to hear warning signals.

Communities/residents situated within 15m to 105m from the project site would be exposed to continuous noise from the construction activities. Operations at the site could be day and night hence exacerbating the noise effect. Night-time operations could be particularly disruptive, causing stress, annoyance and also affecting the sleep pattern of the exposed people. The long-term effects include permanent tinnitus and/or hearing loss.

Increased noise from civil works often goes along with vibration effects. The operation of the grader and other machines could produce vibrations resulting in Whole Body Vibration (WBV) of workers. WBV is transmitted through the seat, feet or hands of workers who operate these machines over rough and uneven surfaces as the main part of their job. These exposures would be felt by the machine operators, workers close to the machines, nearby communities and businesses which could have health implications such as musculoskeletal disorders including back pain.

Movement and Honking of Haulage Trucks

The movement and unnecessary honking from tipper trucks bringing in construction materials from the quarry sites and transporting construction waste to the disposal site would generate noise. The noise from these trucks could add to the already exceeded noise level at the Shine Star Area and also increase the existing noise levels from vehicles plying the community roads. However, communities along the haulage route for instance Kasunya, Klebuse, Okwenya, Akuse, and especially the Asutuare and Doryumu Junctions will be exposed to continuous noise from the trucks.

The exposure duration of noise and vibration would be short-term and intermittent. However, the sensitive receptors could be adversely affected by the noise therefore, the significance of the noise impact is ranked moderate. For vibration, although the intensity to the public will be minimal, they could still experience annoyance and stress due to their proximity. Hence, the significance of the vibration impact is ranked moderate.

Operation Phase

Operations at the Farmlands

The use of the power tiller (97dB), combine harvester (88dB) and rice transplanter (86dB) for completing land preparation works, planting and harvesting farm produce would generate noise throughout the operation phase. The noise level of these machines exceeds the GS 1222:2018 thus, prolonged exposure could affect the hearing of farmers and their workers. In addition to hearing loss, high levels of noise could lead to tinnitus, hyperacusis, cardiovascular disease, performance decrements, and sleep disturbance (Themann et al., 2013). Workplace noise from operations at the farms would have detrimental effects as workers could be exposed to noise for 8 hours per day or even more.

The impact of noise from the operation at the farms will largely be localized and (short term) and experienced by the workers mostly, therefore the significance of the impact is ranked moderate.

7.3.8 Impacts of Cattle Invasion on Project Infrastructure

As large tracts of lands are developed under irrigated agriculture, cattle that graze these lands in the past or close to them tend to go back to attempt to graze these lands. The inadequate number of cattle watering troughs and the lack of designated areas for cattle crossings to the only available watering trough on the scheme has resulted in the uncontrolled movement of cattle to the command areas often leading to:

- The destruction of key project infrastructure such as bank of canals and laterals;
- Destruction of crops leading to conflict; and
- Contamination of canal water.

The entry of cattle into the canals could destroy the canal banks, as in the case of the MC bank at various sections along the canal between the intake and the Akuse Bridge and downstream of the Akuse Bridge for several kilometres at various locations. Water losses could occur as cattle herders paid little care to scheme infrastructure in their bid to find water sources for the cattle, resulting in destruction of canals and laterals.

Farmers revealed that the inadequate number of cattle troughs within the KIS scheme has resulted in the animals drinking from the canals which serve as a source of drinking water for some of the communities in the project area of influence. For instance, a community near GEL, Papayieda, shared the same source of water with the cattle with the droppings of the animal scattered around the entrance of the canal. This is usually washed in runoff into the canals thereby contaminating it with faecal coliforms with implication on public health. Contamination of canal water will lead to contamination of the Lukwe and Volta Rivers as assessed under 7.3.2.

Cattle sometimes graze farmers' crops, resulting in conflicts between cattle herders and farmers. Consequently, farmers are forced into committing additional resource to employ people to protect their farms from the invasion of the cattle, which can have long-term economic implications. The significance of the impact of the cattle invasion of the project and project infrastructure is therefore ranked high considering the above consequences.

7.3.9 Biodiversity Impacts

The project area has been largely modified by intensive agricultural activities and human settlement development. The original vegetation types outside the farmed areas have been largely replaced by open, derived savannah with isolated tall trees and thicket clumps. The vegetation is thus mostly secondary to tertiary in development.

The rehabilitation works will involve clearing of vegetation (aquatic weeds, shrubs, grass and trees) from the canals and drains prior to the commencement of the civil works and earthworks. The construction activities are also expected to create borrow pits from which aggregates will be extracted, thereby leading to vegetation loss and related issues. The vegetation at the project site is mainly farm regrowth as the area is used for farming.

Vegetation loss is certain, but will only be localised as the vegetation forms part of a homogeneous vegetation cover in the larger area of which the project site is only a fraction. Thus, the vegetation is not endemic to the site. Moreover, farming and other anthropogenic factors have reduced plant species' richness and abundance considerably, while fauna species are rarely encountered. The animals on the project site, including snakes, grasscutters, and squirrels, among other rodents will migrate to nearby bushes during project implementation.

Since much of the vegetation on the project site has been highly modified, attributable to farming activities, biodiversity impacts induced by this project is expected to be low in significance.

7.3.10 Infringement on Labour Rights

Workplace environment plays a major role in the performance and productivity of an employee. A safe and fair work environment is paramount to achieving and sustaining productivity in a way that does not infringe on workers' rights. The National Labour Act guarantees the rights and responsibilities of both employers and employees, with provisions on employment protection, conditions of employment, remuneration, and discrimination etc.

Informal work in Ghana is characterised by poor working conditions, low wages, high job insecurity, exposure to hazardous conditions and lack of social protection, including pension, maternity leave and paid sick leave (Osei-Boateng and Ampratwum, 2011). Trade unions face major challenges to organize workers; many employers do not honour labour obligations set out in the National Labour Act (Osei-Boateng and Ampratwum, 2011) and are rarely sanctioned for failing to comply (Owoo, Lambon-Quayefio & Manu, 2017). The construction sector has the least union presence. Although around 74% of formal sector workers are unionized, this figure only represents about 7.5% of the total labour force due to the large and predominantly non-unionized informal sector (Owoo, Lambon-Quayefio & Manu, 2017).

There is higher participation of males in the labour force and higher proportion of men in paid employment than women (DTDA, 2020), with some sectors, such as construction, that are usually male dominated (ITUC, 2016). There are also disparities when it comes to compensation – on the average, when employed to carry out an identical work schedule, women receive 30% less compensation than their male counterparts (DTDA, 2020). Persons with Disability also struggle with finding meaningful employment and when employed receive, on average, lower pay. Low societal expectations of their capabilities, architectural barriers at most workplaces, and stigma attached to disability are factors that prevent them from being gainfully employed (Naami, Hayashi and Liese, 2012).

The activities associated with the implementation of the project will require both formal and informal workers, the latter usually having no form of agreement or condition of employment, making them susceptible to infringement on their rights. The main sources of infringement of labour rights during the project implementation at both the construction and operation phase could include:

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- Non-issuance of employment contracts to workers;
- Unfair compensation for workers;
- Inability of workers to organize; and
- Marginalisation of women and Persons Living with Disability (PLWD).

Construction Phase

Workers involved in the activities under this project may either be formal or informal employees. The main constructor and consultants working on the project may have formal structures of employment which may cover issues on matters of workers' rights, including employment protection, conditions of employment, remuneration and termination of employment, eliminating bad employment practices. The rights of the informal workers, on the other hand, may not be protected due to the absence of various employment structures. This could be the situation especially at the construction phase.

Non-issuance of Employment Contracts to Workers

Employment contracts, usually written agreements between an employer and employee, spell out the terms and conditions of employment, including duties of both parties, compensation and benefits (including social protection), hours of work, duration of employment and other relevant matters. Due to the casual nature of their work informal workers are not usually given written contracts by their employers. This gives room for employers to do as they please concerning the employment terms, leaving the workers with no formal protection regarding their employment rights. As informal workers who will be employed as part of the workforce could be without written employment contracts, giving them no protection regarding their rights and threatening their job security.

Unfair Compensation for Workers

Compensation is the reward given to employees in return for their services rendered and it is often the cornerstone of a productive workforce. It includes monetary compensation (wages) and other benefits such as pension scheme. Informal workers could be paid low wages, below the national minimum wage, in an attempt by the contractor to cut costs and maximise profit. Workers could also be made to work overtime without adequate compensation for the extra hours of work. Female workers could be paid lower wages as compared to their male counterparts on similar work schedule, enforcing gender pay gaps. Social protection benefits such as pension scheme could be denied the workers, putting them at risk of not being able to cater for themselves in their old age.

Workers being paid compensation that is unfair denies them the opportunity to be adequately remunerated for their time and effort, reduces their motivation to work, makes it difficult for them to sufficiently support themselves and their dependents/families and reduces their ability to access basic social amenities including healthcare and decent housing. Being denied pension also puts them at risk of not being able to cater for themselves in their old age. All these combine to adversely affect their quality of life. In addition, low motivation also affects their

work performance, inhibiting productivity and possibly leading to lags in the completion and achievement of the project objectives.

Inability of Workers to Organise

Unions play an important role in helping workers negotiate employment contract terms including wages and other non-wage benefits, undertake industrial action educate workers about their rights and generally ensuring improved working conditions. There could be situations where workers are not allowed to form unions. Also, the construction sector in Ghana has the least union presence, a workplace union is likely to not be in place for the construction workers, thereby limiting them from enjoying the various benefits that unionisation provides. Although the National Labour Act protects employees' right to form unions, the contractor could also not honour such protection and will likely not be sanctioned for failure to adhere to the provisions.

Marginalisation of Women and PLWD

The construction sector is known to be male-dominated. As such, there is a preference for male hires over women, even though they may be capable of performing certain roles/activities like plumbing and electrical works. Again, on the average, women tend to earn less than their male counterparts on the same/similar work schedule. In view of this any woman who may seek employment could be denied that opportunity by the contractor, even if they may be able to perform the role. Even when they are hired, they could be compensated less than their male counterparts of the same role.

Persons with Disability could also be denied employment by the contractor due to low expectations of their capabilities and stigma attached to disability. Where any PWD are hired, they could be compensated less than other able-bodied employees on account of their disability. Again, lack of adequate access facilities such as ramps and sanitary provisions could impede their work. They could also not be given required specialised working tools and proper fitting PPEs to be able to carry out their work satisfactorily.

From the above enumeration, informal workers stand the greater risk of labour rights infringement compared to their formal counterparts, due to the informal nature of their work and its inherent precarious characteristics. Again, women and PWDs may be discriminated against in any employment opportunities that could be suitable to them on the grounds of male preference in the industry. Although the Labour Act exists to protect the rights of all categories of workers, informal employers do not usually adhere to its provisions and are rarely sanctioned for any breeches. Therefore, the likelihood and significance of infringement on labour rights on the project is ranked moderate.

Operation Phase

Farmers on the scheme sometimes engage farmhands in an informal basis to support them on their farms. Any informal workers who hired could be subjected to the labour rights infringements expounded above for the construction phase, due to the casual nature of their employment. The nature of work is such that contracts of farmhands come to end at each

planting season. Informal workers stand the greater risk of labour rights infringement compared to their formal counterparts, due to the informal nature of their work and its inherent precarious characteristics. The likelihood and significance of infringement on labour rights at the operation and maintenance phase are both ranked moderate given the transient nature of the contract.

7.3.11 Potential Use of Child Labour

In many developing countries with high poverty rates and poor schooling opportunities, child labour is still prevalent. The Children's Act, 1998 (Act 560) prescribes the minimum age for admission of a child to employment to be 15 years and that of engagement of a person in hazardous work to be 18 years. In Ghana, about 21% of children aged 5-17 are involved in child labour while about 14% are engaged in hazardous forms of labour (UNICEF, 2015). About 79.2% of working children aged 5-14 years are engaged in the agriculture sector, 15.8% in services and 5.0% in the industrial sector (including the construction sector). Children working in the construction sector typically carry heavy loads, operate machines, lay bricks and dig pits (USDL, 2021).

Child labour in the Lower Manya Krobo Municipal is mostly evident on market days where children as young as 7 years are engaged, selling various items such as foodstuffs and pushing of trucks. Most of the children usually forfeit school on Wednesdays to join either their guardians or peers to engage in economic activities. Most of them are also sent to farms even during class's period while others are found at stone quarrying sites. Most of these children fall victim to child labour due to poverty (DMTDP, 2014).

Child labour can result in extreme bodily and mental harm. It can lead to sexual or economic exploitation. And in nearly every case, it cuts children off from schooling, restricting their fundamental rights and threatening their futures, leading to vicious inter-generational cycles of poverty (UNICEF, 2022).

The potential source of use of child labour at the construction phase could be children being engaged in menial activities such as carrying loads, pushing wheelbarrows, stone pitching etc. during the construction of irrigation and drainage structures, etc.

At the operation phase children could be employed or made to:

- Engage in farming activities such as planting, harvesting, etc.; and
- Sell the produce of farms at the market centres.

Construction Phase

Children from the Akuse, Asutsuare and other neighbouring communities could be exploited as cheap labour during the construction phase of the project. They could be employed and made to perform menial jobs such as carrying loads and tools, and masonry works in the construction and rehabilitation works of the drains and canal etc.

Children from poor or low-income households within the community are more susceptible to this manner of exploitation as they could be compelled by most parents to find ways of earning some money to take care of themselves and their families. The contractor could also engage the services of children within the community as children are very easy to manage and less likely to demand higher wages or better working conditions as compared to adults, increasing his profit margin.

Working children would not be able to combine work with school and could become truant in attending school, eventually leading to them dropping out, affect their educational attainment. Again, they could be exposed to physical, verbal, or sexual abuse at the workplace. For example, they could be subjected to physical violence when tasks assigned to them are not properly executed due to their physical limitation for such work. Child labour affects the transition paths of youth and their eventual employment outcomes, minimizing their opportunities for decent work in adulthood while approximating them to poverty.

Due to poverty, children could be prodded by their parents/guardians to seek employment during the construction phase as a means of getting some money to fend for themselves and their family. However, the employment of children on formalised construction projects that involve the use of heavy equipment are generally low, hence the likelihood of children being employed is low. The significance of the impact, however, is ranked moderate considering the health and developmental effects (including deformities and cutting them off school) on victims of the child labour, however, the likelihood of occurrence is low, hence the risk is rated moderate`.

Operation Phase

On the basis of the allotted 30-day period for land preparation and planting activities under the KIS cropping plan, much labour would be needed during these activities, particularly for the planting activities which requires about 25 to 30 persons per hectare (ha)/day. To adhere to the schedule of the KIS cropping pattern, farmers could engage the services of the minors in Akuse, Asutsuare and other neighbouring communities including their own children. They could also engage the services of these children during harvesting periods, which would require about 30 workforce per hectare.

Again, with agriculture being the main economic activity in the project communities and other neighbouring communities, produce from the harvest would need to be marketed for the farmers to make economic gains from their yields. In view of this, farmers and traders could employ the services of children in the communities to assist them in marketing of goods in the market centres, especially on market days.

The employment of these children in the farming activities could expose them to agrochemicals, physical hazards (like injuries) and parasites infections (like snake bites), causing respiratory illnesses, and musculoskeletal injury among others. This could also deprive them of attaining education as they would stay away from school during the preparation of the farmlands, planting and harvesting of the agricultural produce. These could affect the paths of

the youth and their eventual employment outcomes, minimizing their opportunities for decent work in adulthood, therefore perpetuating a cycle of poverty by limiting their future earning capacity.

Although some parents of the project communities may coerce their children into labour activities such as farming and selling of foodstuffs at market centres during school hours, the formal management of KIS by a SME and WUA makes likelihood of child labour occurring during the operation phase low, however, the significance of impact is also ranked moderate as the effects are detrimental with far-reaching and long-term consequences.

7.3.12 Gender-Based Violence and Sexual Harassment

The risk of exposure to violence is often greater in jobs and sectors where work is informal (such as casual labourers in construction (WEIGO, 2022)) or precarious, where wages are low, where workers are stopped from joining or forming trade unions and where management accountability is low. Women in male-dominated sectors such as construction and transport are more exposed to forms of GBV (ITUC, 2016). Victims of GBV suffer from physical and mental health problems including self-harm, depression and suicide (COE, 2022).

Several policy/legal/legislative instruments/frameworks as well as institutions exist to address GBV, sexual exploitation, abuse and harassment in Ghana. However, the relevant institutions, including the Domestic Violence and Victims Support Unit of the Ghana Police Service, health facilities, the Department of Social Welfare at the Metropolitan, Municipal and District Assemblies, Gender-Based Violence Courts and GBV non-governmental organisations, are often handicapped in providing support to victims due to logistical challenges, inadequate funding, training and prevention activities, lack of coordination and inaccessibility (MWH, 2021).

The potential sources of gender-based violence and sexual harassment at the construction and operation phase could include:

- Employers soliciting for sexual favours from female job seekers;
- Supervisors/workers sexually harassing/abusing female colleagues; and
- Male workers sexually harassing/abusing women and girls in the community.

Construction Phase

Research indicates that major civil works increase the risk of gender-based violence (GBV), sexual exploitation and abuse/sexual harassment (SEA/SH), in both public (at the workplace) and private spaces (between workers and community members). Over the years, gender disparity and imbalance have been recorded in the construction industry. Many jobs go to men because they have greater physical strength required for the job, and there remain discrimination because of stereotypes within the industry and individual companies, thus there are often very few women working in these environments. This could be the situation during the project implementation.

Women who are employed as part of the project's labour force may be at risk of gender-based violence and sexual exploitation from their colleagues/supervisors, especially where the workforce is likely to be male dominated as the agricultural sector has more males than females. Where women are employed, they are usually few and often have to endure or capitulate to sexual abuse by colleague workers and superiors. Sexual favours may be solicited for employment and the rejection of such favours by women usually results in denial of employment opportunities. Hence, women who are in dire need of employment may succumb to such advances.

The presence of migrant workers in the community could also attract local women and girls who would want to cook, clean and provide other services which can place them at risk of GBV and SEA/SH. Close interactions between workers on the project and local communities may result in cases where some workers could commit sexual abuse or have sexual intercourse with women and underage community girls resulting in pregnancies, single parenthood and economic hardship for the women and girls.

Per the enumerations above, the likelihood of occurrence of gender-based violence would be high. Victims suffer serious physical and mental health problems and there could be under-reporting of cases, meaning victims are not able to access available support. Even if support is available, many institutions responsible continue to face dire challenges in providing needed support to victims. Therefore, the significance is ranked high considering the long-term consequential effects.

Operation Phase

Since women in male-dominated sectors and informal work are more at risk of GBV, women who may seek employment as farmhands during planting and harvesting could be faced with solicitations of sexual favours by the employer before they are hired. Women who deny such advances are likely to miss out on an employment opportunity. Where women are employed, they may have to endure or capitulate to sexual abuse/harassment by colleague workers and superiors.

The likelihood of occurrence of GBV at this phase is moderate considering the number of workers likely to be employed, however, the significance is ranked high, as any victims may suffer serious physical health and emotional problems, in the long term.

7.3.13 Socio-cultural Impacts

The inhabitants of the project community and other communities in the Lower Manya Krobo and the Shai Osudoku Districts are predominantly Ga-Adangmes. The prominent festival celebrated by the locals is the Aadegbor Festival. Engagement with the community indicate that (Appendix 4) the inhabitants of the project community take pride in their cultural norms and values and have strong sentiments towards it.

Mondays are regarded as sacred days for the gods and ancestors in the project area, and farming and other activities in the project area are prohibited. The observance of the sacred day (Mondays in the week) when no one is supposed to work in the bush is a cultural value upheld in the project communities. Construction schedule will be carried out throughout the week (including Mondays) in order to meet the construction timelines. Some of the construction workers (mostly the skilled workforce) are likely to migrate from urban centres, such as Accra, Tema and Koforidua to the project community during the construction period. The migrant workers may not be aware of the cultural beliefs, norms and practices of the host communities and could flout or disregard the cultural beliefs, norms and practices of the project communities.

Breaking of local cultural norms and taboos could offend the sensibilities of the inhabitants of the project communities. This could lead to a potential conflict between residents and workers; the situation could result in community agitations and further result in the delay of the project implementation schedule. The formalised nature of contractors to be engaged for the construction works make the likelihood of breaking cultural norms low, thus the significance is ranked moderate given the consequences that could arise as a result of impact occurrence.

At the operational phase, most of the beneficiary farmers would come from the two project districts and would be accustomed to the local cultural norms and values. Hence, the likelihood of the farm workers breaking local cultural norms and values is low and the significance also ranked low.

7.3.14 HIV/AIDS Transmission Risks

The HIV prevalence is lower in rural areas (1.7%) as compared to 2.4% among the urban population (according to the 2014 Demographic and Health Survey). As a result, the influx of migrant workers mainly from urban to rural areas for employment purposes is an avenue for potential transmission of HIV/AIDS. Majority of the migrant workers, often men, travel to new work environment without their regular partners and therefore tend to engage in sexual relationships and promiscuous lifestyles.

According to the ILO Guidelines (2008), which is in line with the National Workplace HIV/AIDS Policy, a number of work and lifestyle factors that expose construction workers to the risk of HIV infection include:

- High mobility, resulting in long periods spent away from home and family, or contact with highly mobile workers;
- Isolation and working in confined environments with limited contacts;
- Male-dominated profession and a predominantly masculine environment, with the cultivation of a ‘macho culture’ including openness to occasional sexual relations;
- Stress due to working and living conditions; and
- Misinformation or lack of information about HIV/AIDS.

Generally, the income level in rural areas is low, coupled with poverty and unemployment, and makes it easy for relatively high earning workers to lure young women into sexual relationships, while some women even turn to prostitution as a new lifestyle. Some sex workers would also be attracted to these rural communities to engage in the commercial sex trade and could be patronised by some workers and locals. Job seekers and others with various business interests could migrate to the project area and surrounding communities leading to an increase in commercial and related social activities. The enticement of female community folks with money, some women turning to prostitution for livelihoods, and the attraction of sex workers to the community could potentially lead to an increased rate of infection and risk of spread of HIV and other sexually transmitted infections (STIs) in the community.

The HIV prevalence rate for the Eastern Region is 2.4%, which is much higher than the national prevalence rate of 1.69% (National HIV Fact Sheet, 2019). In comparison, the prevalence rate for the Shai Osudoku and Lower Manya Krobo Districts are high at 1.57% and 5.68% respectively (National HIV Fact Sheet, 2019). The prevalence rate of the Shai Osudoku District and Lower Manya Krobo Municipality could go even higher than the current rate with the likely increased prevalence of the project communities. For fear of stigmatisation, workers who may be HIV positive may hide their status and could engage in unprotected sexual acts, contributing to the spread of infection. Workers who contract HIV could increase the risk of spread, as they can travel elsewhere and possibly engage in sexual relations.

Thus, any occurrence of HIV transmission could potentially spread regionally and even nationally, with long term effects. The likelihood of transmission occurrence is moderate, although the migrant population likely to settle in the project communities is expected to be few. However, the significance of the risk is high due to the national epidemic status of HIV/AIDS.

8.0 ENVIRONMENTAL AND SOCIAL MITIGATION MEASURES

The assessment revealed some significant potential impacts and risks for which mitigation measures will be required to ensure environmental sustainability, social acceptability, health and safety as well as project sustainability throughout the project life cycle. While some of the measures have been built into project design, others would be implemented during project execution. Other measures will also aim at enhancing potential project opportunities. The relevant mitigation measures include the following:

1. Minimisation of Livelihoods Disruption;
2. Surface and ground water resources protection measures;
3. Waste segregation and management measures;
4. Greenhouse gas emission reduction and Climate Change adaptation measures;
5. Occupational health and safety measures;
6. Community health and safety measures;
7. Noise and vibration minimisation measures;
8. Cattle invasion prevention measures;
9. Biodiversity conservation measures;
10. Labour rights risk management measures;
11. Child labour prevention measures;
12. Gender-based violence prevention measures;
13. Socio-cultural risk management measures; and
14. HIV/AIDS prevention measures.

8.1 Minimisation of Livelihoods Disruption

The rehabilitation of Section A and portions of Section B will be conducted in phases so that farmers can still cultivate their rice. FSRP2 will plan the implementation of the project in consultation with farmers who will then be informed in advance of construction works. A bypass for water delivery will be created to farming plots during the rehabilitation and constructions works to allow farming so as to minimize impacts on farmers completely losing their sources of livelihood. Also, the four communities close to the Section A command area namely Akuse Zongo, Quarters, the communities in the Akuse Islamic School area will be entreated to access pipe borne water in Akuse. The following measures will be undertaken in addition to the above:

- As part of its awareness creation efforts, FSRP2 and GIDA will continue with efforts to ensure that persons within the KIS scheme (i.e. farmers and inhabitants) are adequately informed, in advance, of the scope, magnitude and schedule of the proposed project, its implications for their continued farming over the construction period. These measures will minimise the problem of confrontation and conflicts and will reduce this impact significantly.

8.2 Surface and Ground Water Resources Protection Measures

During the construction phase, vegetation clearing and levelling will take place outside the peak rainy season. Excavated material will be stockpiled and covered with tarpaulin to be used for backfilling canal embankment and reclamation purposes. Embankment slopes will be stabilised by growing vegetation to trap silts and other soil particles from being washed away.

Maintenance and servicing of construction equipment and machinery will be outsourced to a third party contractor to prevent the risk of oil spillage on the site which could potentially lead to the contamination of water resources. Fuelling of the machinery will be done at approved fuelling stations.

During the operation phase, surplus water from land surfaces will be removed without causing any significant damage to crops and other assets through the drainage system. Plot layout pattern would follow soil conservation measures and will include field drains along the least slope within the field. The drains will be constructed to have a higher flow time than the infiltration opportunity time for excess water to percolate down.

The drainage system of each plot in the irrigable area have been designed to ensure that all the outflows lead to the lagoons. A drainage network will also be constructed along the main farm roads and infield access roads to cater for the occasional runoff that may be the outcome of an excessive rainfall event. The drains along the sides of the roads and infield roads would be typical open drains – grass waterways, with a depth of 35 centimetres and an approximate width of 1.5m. These will be grass-covered to prevent erosion and will be well maintained and the grass well cut.

The SME will ensure that farmers purchase EPA approved agrochemicals from licensed agrochemical shops for use at the recommended application rates. The manager of the KIS System and farmers will also adopt integrated weed and pest management practices for weed and pest control such as the use of certified and disease tolerant seed varieties, use of early maturing seed varieties, proper land preparation, early planting, following recommended planting space, timely/early weeding, suitable water management practices and the use of agrochemicals as spelt out in the Integrated Pest Management Plan for the FSRP2. This will minimise the rate of agrochemical use.

Farmers will adopt minimum tillage during planting seasons to reduce the susceptibility of the soil to erosion and hardpan formation associated with continuous ploughing at the same depth. After harvesting, crop residue comprising process residue (straw) and field residue will be tilled into the soil to improve the soil structure and soil organic matter content.

Furthermore, periodic water quality monitoring whose frequency will follow the Environmental Permit conditions will be undertaken and the results compared with the baseline

values in section 5.1.4 and 5.1.5 to ensure effective measures are immediately put in place in the event of any water contamination.

8.3 Waste Segregation and Management Measures

In compliance with the objectives and the specific guidelines for environmental sanitation services of the Environmental Sanitation Policy (2010), measures would be put in place to minimise the impact of waste on the environment. The waste management measures are grouped into:

- Vegetative waste and excavated spoil;
- Construction waste;
- Segregated waste;
- Oily waste;
- Liquid waste;
- Agrochemical waste; and
- Crop residue.

Vegetative Waste and Excavated Spoil

Construction Phase

The pulled-down trees and shrub stems will be stockpiled and made available to the Akuse and Asutsuare communities and other interested parties for collection and use as fuelwood and fencing materials outside working hours (5:00pm – 6pm). The leaves and twigs will be spread and ploughed into soil or allowed to decompose.

Excavated material will be used for backfilling of roads, canals, trenches and embankments, etc. Excess excavated material will also be used in reclaiming burrow sites. During the construction phase, all stockpiled excavated material will be covered with tarpaulin, to prevent being washed by runoff, silting drains and lagoons, and potentially causing flooding.

Segregated Waste

Construction Phase

The segregated waste will comprise of construction, domestic, scrap metals, containers of oil, lubricants and paints and oily rags. Once segregated, the wastes could become potential resource for re-use or recycling after treatment, and thus, no longer pose any of the assessed environmental and health risks.

Five types of waste bins will be used for the purpose. The bins will be clearly labelled, or colour coded for ease of identification and use for waste segregation and placed at vantage points. The wastes will be segregated at source into five general and a special separate, labelled bins as follow:

- General bins: -
 - Blue Bin – plastics, glass and bottles;
 - Yellow Bin – lubricant cans and containers;
 - Brown Bin – scrap metals;

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- Black Bin – paper, cardboard; and
- Green Bin – organic (food left over), wood, other miscellaneous waste.

The segregated construction waste including the following will be outsourced to accredited waste management contractors for removal and appropriate handling:

- Cement paper bags, paper, cardboard, etc. (Black Bin);
- Pieces of iron rods and scrap metals, etc.(Brown Bin); and
- Recyclable plastics, bottles, etc. (Blue Bin).

The following segregated wastes (hazardous containers) will be transferred to a designated and accredited waste treatment company by the outsourced waste collection contractor:

- Metal cans and containers of paints, lubricants, solvents, etc. (Yellow Bin)

The Green labelled waste bin consisting of organic and miscellaneous waste, will be destined for outright disposal. Orientation training particularly on waste segregation and the use of colour-coded bins will be conducted for workers at the construction phase.

Operation Phase

During the operation phase, farmers would be provided with two coloured waste bins (green and blue). The green bin will be designated for receiving organic waste whilst the blue bin will be designated for receiving other waste such as plastics, bottles, etc. The recyclable materials will be collected by accredited recycling companies, while the green labelled waste Bin consisting of organic waste will be destined for outright disposal. Orientation training particularly on waste segregation and the use of colour-coded bins will be conducted for the farmers at the operation phase.

Oily Waste

Construction Phase

Vehicle servicing and maintenance works will be outsourced to a third party contractor to ensure proper management of waste oils and scrap waste (discarded engine components, batteries, and worn-out tyres from machinery and vehicle servicing and other repair work during the construction phase of the project.

Operation Phase

During the operation phase, a designated area for maintenance will be developed with the scheme area, fitted with a waste oil tank to hold spent oils and will be returned to the suppliers as and when the tanks are full. The measures for handling the oily waste and rages will also be observed at the construction phase.

Liquid Waste

Construction Phase

In development areas involving construction activities, workers will be provided with mobile toilet units, separated for gender, for use during the construction phase. Also, severe sanctions

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(including summarily dismissal) will be applied to workers who engage in bush/open defecation.

Operation Phase

At the operation phase, bio digester toilet facilities will be developed for use. The number of toilet facilities to be constructed will be decided in consultation with the WUAs.

Agrochemical Waste

Operation Phase

Farmers will be educated and trained to rinse the empty containers three time (triple rinse) after usage. The rinsed containers will then be punctured and disposed of into bins provided on site. The containers will be collected by an accredited recycle management companies.

Crop Residue

Operation Phase

Crop residue comprising of process residue (straw, husks, skins, trimmings, cobs and bran of cereals) and field residue (stalks and stubble/stems, leaves of crops) will be tilled into the soil to improve the soil structure and organic matter content. Excess residue will be carted to feed animals.

Silt

Desilted material will be used to reclaim borrow pits created. Excess materials would be transported for disposal by an accredited waste management company at the municipal waste disposal site.

8.4 Greenhouse Gas Emission Reduction and Climate Change Adaptation and Mitigation Measures

The measures to minimize GHG emissions and CC effects during the project implementation have been listed below.

Construction Phase

It is recommended that FSRP2 undertakes Biodiversity Offset. The FSRP will provide support measures for the Forestry Commission (FC) to help protect and improve on the degraded condition of a Forest Reserve in the Eastern or Greater Accra Region. This will be done through signing a Memorandum of Understanding with the Forestry Commission on the following:

- Participating in the National Green Day celebration in collaboration with communities close to the schemes;
- Reforestation of degraded sections of the selected Forest Reserve; and
- Raising of public awareness of the nearby communities on encroachment offences (logging, hunting, setting fire) and sanctions;

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An amount of up to US\$20,000 will be earmarked for the reserve improvement programme and disbursement would be based on the achievement of milestones and targets as defined in the MoU such as:

- Size of degraded areas planted; and
- Care and growth of planted trees/areas.

Also, the afforestation programme will strategically incorporate reforestation efforts within previously reclaimed borrow sites, where construction materials were extracted, to enhance ecological restoration and promote sustainable land use.

This will ensure that FSRP2 GHGs footprint is significantly reduced in the area.

The contractor will also be required to ensure scheduled maintenance of construction machinery and equipment to reduce exhaust and other emissions.

Operation Phase

The following measures will be implemented at the operation phase of the scheme:

- Avoidance of peak traffic periods and use of alternative route during transportation of farm produce;
- Improved agronomical practices which include:
 - Cultivation of improve rice varieties that produces less methane gas due to their low rates of organic matter decomposition;
 - Alternative wetting and drying (AWD) for rice production which involves periodically draining the fields to allow the soil to dry before re-flooding. water management for rice cultivation; and
- Prompt maintenance of irrigation infrastructure to prevent water losses.

8.5 Occupational Health and Safety Measures

The following occupational health and safety measures will be implemented at the construction phase and operation phase to ensure a conducive working environment and safety of workers:

Construction Phase

Dust and Other Emissions Control Measures

- Dousing of the site with water at least twice daily, especially during dry periods using a tanker fitted spray bar;
- Trucks transporting construction materials such as sand and demolition waste to and from the site will be covered with tarpaulin to prevent dust fly off;
- Air quality monitoring for PM_{2.5}, PM₁₀ and TSP will be conducted at the baseline sampling locations (Golden Exotic Area (AQL1) – 6.080680°, 0.201797°, Shine Star (AQL2) 6.073430°, 0.189700°, Asutuare Basic JHS (AQL3) 6.094343°, 0.200188°) on monthly basis to check the effectiveness of water dousing;

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- Temporary fencing will be provided for enclosure of the sites to reduce dust escape into the environment;
- Institute and enforce a 20km/hr speed limit for the movement of haulage trucks onsite;
- Regular scheduled maintenance and servicing to be carried out on all trucks to improve performance and thus minimize exhaust emissions;
- Engines of vehicles, machineries and other equipment will be switched off when not in use;
- Workers will be provided with the appropriate PPE (eye goggles, nose masks, etc.) and usage enforced;
- Weekly toolbox meetings will be organised to provide safety orientation for all workers (e.g. construction workers, painters, etc.) to raise awareness on dangers of exposure to chemicals and solvents.

Minimisation Measures for Accidents and Injury during the Use of Machinery

- Provision and use of highly visible clothing/ reflectors during construction to mark out workers to truck driver;
- Installation of a rollover protection structure/system on the machinery to protect operators;
- Operators of machinery will be cautioned to always wear seat belts to avoid severe injury in an event of a rollover;
- Trucks will be equipped with reverse alarms to alert workers when trucks are backing up;
- Only well-qualified drivers will be used and all drivers/operators will be trained on defensive driving;
- Provision and usage of PPE such as safety boots, helmets, etc. will be enforced;
- First aid will be provided to cater for injured workers before they are sent to the nearest hospital depending on the level of injury;
- The contractor will deploy a well-qualified first aider to handle work-related injuries and other emergencies;
- All accidents/injuries/near misses and training will be reported, recorded and documented; and
- Use of banksmen at the entry/exit to the sites to supervise the movement of trucks.

General Accidents Prevention

- Provision and usage of PPE such as safety boots, helmets, gloves, etc.;
- Caution notices will be installed onsite at danger zones;
- Foot crossings would be provided at vantage points on the irrigation canal to aid crossing; and
- Use of mechanical aids such as trolleys and wheelbarrows to lift heavy materials to prevent manual handling.

Protection Measures against Snake bites

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- The contractor will support the nearest health facility where necessary, with anti-snake venom to help address cases of snake bites of workers;
- Workers will be supplied with appropriate footwear e.g., wellington boots; and
- All injuries/snake bites will be reported and recorded.

Operation Phase***Mitigation Measures against Agrochemical Exposure and Malaria***

- Provision and usage of PPE such as nose masks, gloves, goggles etc.;
- Workers will be made to practice regular handwashing to avoid the ingestion of agrochemicals; and
- Frequent removal of aquatic weeds from canals and desilting of drains;

Fire Prevention and Control Measures

- Posting readable fire safety signs like “No Smoking”, “Switch-off Engines”, “Mobile Phones Off”, emergency hotlines, etc. conspicuously at the fuel storage and fuelling areas;
- Provide firefighting equipment such as fire beaters, extinguishers, foam concentrates, hose reels, dry chemical powder and CO₂ fire extinguishers at fuel storage areas;
- Ensuring prompt cleaning of accidental spills and fixing leakages;
- Securing a fire certificate from the GNFS;
- Provision of fire assembly points;
- Conducting weekly toolbox meetings on fire safety;
- Designating marked areas for smoking;
- Install smoke detectors and heat alarm on site; and
- Provision of fire emergency exits and entry points within the site.

8.6 Community Health and Safety Measures

The following public/community health and safety measures will be implemented at the construction phase:

Dust and Emissions Control Measures

- Haulage trucks conveying construction materials will be covered with tarpaulins to prevent fly-offs and blow-ups of fine aggregates;
- Dousing of the untarred access roads twice daily especially during the dry periods using a tanker fitted with a spray bar;
- Regular scheduled maintenance and servicing to be carried out on all trucks to improve performance and thus minimize exhaust emissions;
- Education and sensitisation of truck drivers on dust pollution and management; and
- Haulage trucks would be required to comply with a strict maintenance regime and recording, in order to reduce exhaust emissions.

Prevention Measures against Frequent Knockdowns in the Community

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- Road signs will be erected on all roads before the start of works, particularly along roads where the construction vehicles/machinery will operate;
- Use of banksmen or flagmen at community crossing points and/or vantage areas;
- Truck drivers will observe the 30km/hr speed limits in the community and 20km/hr within the construction site;
- Training of truck drivers on defensive driving to avoid frequent knockdowns; and
- Truck drivers will be provided with communication devices (handheld transceivers or cell phones) to be able to immediately report any accident or anomaly in the vehicle.

Measures to Prevent Drowning in Excavated Pits and abandoned Borrow Pit

- Installation of barriers/perimeter fences to prevent pedestrians from falling into excavated pits;
- The contractor will be required to undertake progressive reclamation of all borrow pits created;
- Warning signs (pictorial) prohibiting swimming would be posted at vantage points along canals;
- Appropriate notices and warning signs will be erected around working areas and public areas to warn prospective trespassers of any danger or risk; and
- Ensuring proper security at the site to prevent unauthorized entries.

Control measures against the Risk of Malaria

- Frequent removal of aquatic weeds from canals and desilting of drains.

Operation Phase

The following public/community health and safety measures will be implemented at the operation phase:

Prevention Measures against Inappropriate Post-Harvest Management Practices

The Farmer Support Service Manager and the Agric Committee of the Water User Association will undertake periodic education and awareness creation to farmers to ensure that farm produce is stored in good conditions to prevent the infestation of rodents and insects.

8.7 Noise and Vibration Reduction Measures

Noise and vibration effects during the construction phase could be prevented through the following measures:

- Appropriate use of machinery; and
- Controlled movement of machinery.

Appropriate Use of Machinery

Appropriate use of machinery to ensure noise and vibration effects are reduced to the barest minimum will include:

- Operators of machinery will be required to switch off idling engines;

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- Machinery will undergo scheduled servicing for efficient output and reduction in potential frictional noise from moving parts;
- Operators of vibratory equipment will be provided with and required to use vibration-reduction gloves;
- Padded seats will be fitted in mobile equipment and worn-out pads promptly replaced to limit the effect of vibration transmission to operators;
- Workers will be provided with PPEs including earplugs and cautioned to be mindful of their environment when using the earplugs;
- Operators of noisy and vibratory equipment and machinery such as compactor, power tiller, etc. will operate a 4-hour scheduled shift; and
- Machinery and equipment known to emit strong noise in one or more directions will be oriented so as to direct the noise away from sensitive receptors.

Controlled Movement of Machinery

Controlling the movement of machinery could ensure the reduction of noise and vibration effects through the following:

- Haulage truck drivers will be encouraged to avoid unnecessary honking when moving within the community;
- Scheduling of machinery and truck movements so that communities are not exposed to periods of continuous noise; and
- Unnecessary operation of construction machinery should be avoided. This should be achieved by increasing travel time efficiency and reducing double handling through proper placement of material piles, haul roads, work tool depots and work area.

At the operation phase, noise impacts can be reduced by controlling operations at the farmlands.

Control Measures for Operations at the Farmlands

- Workers will be provided with PPEs including earplugs; and
- Switch off idle machines and other equipment when not in use.

8.8 Cattle Invasion Prevention Measures

The project will establish four (4) sites along the Main Canal as cattle watering points at various locations given in a standalone Design Report. Each site will be provided with four (4) class A concrete and reinforcing, butterfly valves and float valve, PVC pipe, steel mesh fence, steel frame for protection of valves.

The following measure will be additional measures to be undertaken to minimise cattle invasion on the scheme:

- The water delivery will be controlled by the WL in the MC as the trough will be positioned such that when the WL elevation in the trough is equal to the WL elevation in the MC, then the water will stop flowing and so the trough is self-filling by gravity flow.

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- Continuous engagement of herders on adherence to staying out of the command areas
- Provide designated crossing points in consultation with herders
- Sanctions in the form of fines to herders who stray to the command areas.

8.9 Biodiversity Conservation Measures

The contractor would be required to source aggregates from borrow pits and quarries that have been duly approved and permitted by the Environmental Protection Agency. Additionally, it is recommended that the MoFA through FSRP2 undertakes Biodiversity Offset of a selected Forest Reserve as discussed in section 8.4.

8.10 Labour Rights Risk Management Measures

Labour Management Procedures developed by FSRP2 will be adopted and implemented by the contractor as part of their contractual obligations. The contractor and SME will, as part of the Labour Management Procedures, institute measures at both the construction and operation phase to prevent infringement on labour rights through the following measures:

- Issuance of employment contracts to workers;
- Give fair compensation to workers;
- Promote the formation of union among workers;
- Empowerment of women and people living with disability (PLWD); and
- Implementation of a Grievance Mechanism.

Issuance of Employment Contract to all Workers

The contractor is required to issue employment contract to all category of workers. The Labour Act also, makes provisions for the provision of the worker with a copy of the worker's contract of employment without prejudice. The employment contract should cover the following among others:

- Job position and description
- Compensation;
- Working hours and periods;
- Leave and off time;
- Termination;
- Confidentiality and non-disclosure; and
- Code of conduct.

Fair Compensation for Workers

To ensure that the workers are fairly compensated for work done, the contractor will be required to fulfil the following obligations as set out clearly in the employment contract with workers:

- Pay all workers compensation that is equal to or above the national minimum wage;
- Prohibit unsanctioned overtime work and pay workers full compensation for any sanctioned overtime work; and
- Pay male and female employees on the same work schedule equal compensation.

Promote the formation of Union among Workers

Workers would be given the opportunity to form or join any workers' union of their choice and participate in collective bargaining. The Labour Act, Section III also advocates for the right of the worker to join and form trade unions of his/her choice without any restrictive conditions of employment.

Empowerment of Women and PLWD

To promote the empowerment of women and PLWD, the following measures will be implemented:

- The contractor will employ women and PLWDs where feasible;
- The contractor will provide –
 - Adequate and suitable PPEs for any PLWD workers;
 - Adequate access aids for any PLWD workers; and
 - Adequate and separate sanitary facilities for women and PLWDs.

Implementation of a Grievance Mechanism

To ensure transparency in dealings amongst stakeholders including affected parties and provide avenue for stakeholders to make complaints and resolve their concerns as a result of project implantation, the Contractor and SME would be required to implement the Grievance Mechanism (discuss in section 9.7) developed for the KIS.

8.11 Child Labour Prevention Measures***Construction and Operation Phase***

The Labour Management Procedures (LMP) developed by FSRP2 will be adopted and implemented by the contractor as part of his contractual obligations. In line with the LMP, the contractor will:

- Verify the age of all project employees by checking any national identification document such as ECOWAS Identity Card (Ghana Card), birth certificate, and national drivers' license;
- Keeping records of employees, including verified dates of birth; and
- Withdrawing the employment of any underage employee found to be working on the project.

The project will implement the FSRP2 dedicated grievance mechanism discussed in Section 9.7 involving children which aligns with the Child Act, 1998 (560) and MoGCSP Standard Operating Procedures (SOPs) for Child Protection and Family Welfare cases. Also, Section 16 of the Children's Act mandates the MMDAs to protect and promote the welfare and right of children within its area of authority. Hence, the FSRP2 and GIDA and the Social Welfare and Community Development Department (SWCDD) and DOVVSU of the LMKMA and the SODA will collaborate to:

- Undertake community and farmer education against child labour to prevent children from engaging in construction activities;

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- Undertake impromptu monitoring of construction activities to eliminate all forms of child labour during the construction phase; and
- Withdraw children who are not over the minimum age of 18 years and working at the various intervention areas and report to the District Department of the Social Welfare and Community Development (DDSWCD) of the Ministry of Gender, Children and Special Protection (MoGCSP), where the recruitment of children is non-criminal or low risk case and report to District Command of Domestic Violence and Victims Support Unit (DOVVSU) of the Ghana Police Service where the recruitment is related to trafficking or classified as high risk case; and
- Undertake sensitisation of local communities on the grievance mechanism developed for the project and the need to resort to the grievance mechanism developed where children are concerned.

If underage workers are found working on the project the following actions will be undertaken:

- Termination of the contract and services agreement with the contractor immediately as per the Labour Act of 2003 (Act 651);
- Schedule a meeting with the child and seek to determine the reasons for seeking employment;
- Refer the child to other support services including social services and the Ministry of Education; and
- Consider employing another adult member of the family if the child's family is determined to be vulnerable or in dire circumstances.

8.12 Gender-Based Violence Prevention Measures

Workers will be provided with extensive education on human rights, while ensuring each worker signs onto a code of conduct developed by the contractor that incorporate human right clauses. A grievance mechanism (GM) to report sexual harassment and abuse, and other human rights violations will be implemented for the prevention of gender-based violence (Section 9.7).

The PIU of FSRP2 will undertake sensitization of the project communities as part of stakeholder consultation, on the need to resort to the GM to address issues that may come up. During this process the communities will be informed of the details of the project, the application of GM – what it is, establishment of District Grievance Committee (DGC) at the district level, what they are to do and how individuals could access the DGC with their complaints. The communities will also be briefed about how the process employs the ADR system in resolving issues that are related to the project. The community people will be informed of the availability of a Focal Persons that they can reach and file complaints with. They will also be informed of the various means/channels through which they can present complaints for the needed attention and resolution.

Other measures to be implemented at the construction and operation phase, for the prevention of gender-based violence are listed below:

- The contractor will be required to develop and institute a GBV and SEA/SH policy in line with the Sexual Exploitation and Abuse and Sexual Harassment Prevention and Response Action Plan.
- The contractor will dismiss all perpetrators of GBV and SEA/SH and incidences of GBV and SEA/SH will be reported to the Focal Person the FSRP2 shall appoint for verification and classification of grievances. The complainants will be advised on the appropriate steps to get it resolved, since such complaints cannot be handled by the FSRP2 grievance system.
- Victims will be advised and referred to a desk that handles related issues at the Ministry of Gender, Children and Social Protection (MoGCSP) for counselling and further guidance, if the complainant so wishes. The Social Specialist (SS) at the PIU will liaise with the said outfit at the MoGCSP and collaborate with them for referrals and redress; and
- The Assembly will be assisted in public education campaigns and sensitisation programmes on GBV and SEA/SH.

8.13 Socio-cultural Risk Management Measures

The following measures will be undertaken to safeguard socio-cultural values:

- FSRP2 will conduct ground truthing of the project site for the presence of any cultural heritage sites within the project area that could potentially be impacted and ensure relocation of any identified sites in consultation with Traditional Authorities;
- FSRP2 shall bear the full cost of pacification rites which would have to be performed to make up for the inevitable working on sacred days (Mondays) at the construction site;
- Local community members as well as communities within the LMKM and SOD will be prioritised for employment when recruiting the construction workforce.
- Migrant construction workers will be sensitised on the cultural norms and values of the project communities;
- Representatives of the project contractor will participate in cultural rites and festivals of the project communities; and
- Notify the National Museum and Monument Board in an event of a chance find following agreed laid down procedures.

8.14 HIV/AIDS Prevention Measures

The goal of the National HIV and AIDS Policy (2019) is to create an enabling environment for the development and execution of effective and efficient HIV and AIDS interventions and for the achievement of epidemic control. This policy provides the overarching perspective, position and direction of Ghana as it continues on its journey for an end to the epidemic of AIDS by 2030, which is the SDG 3 specific target 3.3. An objective is to ensure the availability of adequate funding to execute the policy strategies.

The contractors would be required to develop a workplace HIV/AIDS policy to be implemented would. The policy would be derived from the ILO Guidelines (2008), and also in line with the National Workplace HIV/AIDS Policy, to help maintain a safe and healthy work environment include the following:

- Awareness creation among workers on HIV/AIDS prevention programmes such as –
 - Facilitation of voluntary testing;
 - Peer counselling;
 - Support for behavioural change for workers;
 - Safe sex practices, condom use, abstinence, etc.;
- Provision of condoms at accessible and convenient locations for workers;
- Incorporation of the workplace HIV/AIDS policy into working conditions to prevent discrimination or stigmatisation of workers based on perceived or real HIV/AIDS status;
- Refusal of employment or dismissal would not be based on HIV status; nevertheless, testing for HIV would be encouraged to know one's status; and
- Due care and confidentiality will be exercised in handling information on HIV status of workers, on the basis of confidentiality set out in the ILO instrument.

Community support and prevention measures will include:

- Enhanced awareness programme for the nearby communities on HIV/AIDS risks;
- Support to SODA and LMKMA Health Directorates on their community education campaign on HIV/AIDS and other STIs; and
- Distribution of awareness leaflets in the project beneficiary communities.

9.0 PROVISIONAL ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN

A Provisional Environmental and Social Management Plan (PESMP) is developed for the project in accordance with the Environmental Assessment Regulations of 1999, LI 1652 to ensure that the rehabilitation and modernization of the KIS are 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 PESMP has further been developed into a full standalone ESMP to guide the implementation of the project.

9.1 Key Objectives of the Provisional Environmental Management Plan

The primary objective of the PESMP is to implement the appropriate mechanisms that will address the risks and adverse impacts likely to be associated with the implementation of the project. The action plans constituting the PESMP define the approaches and activities to ensure project implementation is followed up to achieve desired outcomes and ensure project sustainability.

The ten specific objectives of the provisional plans are listed below:

- To ensure the project affected parties are not made worse off by the project implementation;
- To ameliorate project-induced socio-cultural changes and manage community apprehension;
- To facilitate management of all processes and handling of waste streams in compliance with national environmental and sanitation policies;
- To protect the nearby drainage channel from siltation and oil contamination, while preserving the integrity of groundwater;
- To protect the health and safety of workers by minimizing exposure to noise and emissions, accident risks and hazards;
- To ensure public health and safety (particularly near project site and communities along haulage routes) is not compromised, by minimizing noise, dust and emission generation;
- To ensure fire prevention and control whether originating from on-site or off-site sources, thereby eliminating the risk of spread;
- To prevent the potential spread of HIV in nearby community, while ensuring fair treatment, non-discrimination, and equal opportunity for all workers; and
- To prevent the potential incidence of GBV, sexual abuse and exploitation, child labour and infringement of the right of workers during project implementation.

9.2 PESMP Implementation Capacity

The design and construction management of the project will be done by MoFA through FSRP2 and GIDA; affording them the full responsibility for maintaining control of the budget and

schedule throughout all the stages of project development, as well as implementation of the PESMP. The main entities identified to perform key roles in the environmental and social management plans and activities during implementation of the project are the:

- Project Proponent (MoFA through FSRP PIU);
- Design and Supervision Engineers and Supervisor of the SME (GIDA)
- Specialist Contractors; and
- Shai Osodoku District and Lower Manya Krobo Municipal Assemblies.

9.2.1 Project Proponent

The MoFA through the FSRP2 PIU will ensure that all the relevant environmental and social management measures are mainstreamed into all engineering, procurement and construction management services associated with the project development as well as infrastructure and services. This will include the following:

- Engineering design (blue print) for earthworks, civil works, structural works, etc.;
- Project services including, cost control, scheduling, reporting, claims processing;
- Procurement including purchasing, inspection of materials and equipment, expediting and contract administration;
- Logistics co-ordination, including overview of all aspects of the logistic services;
- Construction management including site management, control and inspection of all construction activities, safety management; and
- Project commissioning including pre-commissioning and testing, operator training and operational assistance.

The availability of qualified personnel with the requisite capacity is essential to the project implementation. The broad capacity building areas include environmental and social (E&S) risk management implementation and regulatory compliance, as well as institutional and reporting requirement. The relevant personnel identified for E&S capacity building include:

- Social Specialist of GIDA;
- Environmental Specialist of GIDA;
- Project Manager of Contractor;
- Health Safety and Environment (HSE) Manager of Contractor;
- Scheme Management Entity (SME) of KIS;
- Executives and Committees of WUA; and
- Key department of Shai Osodoku District and Lower Manya Krobo Municipal including Social Welfare and Community Development, MoFA Directorates.

9.2.2 Contractors

FSRP2 will engage specialist contractors with expertise in irrigation infrastructure development. These contractors will work on specialist tasks with relatively shorter project duration, though some could be on long-term basis. These contractors will bid tenders and the best will be awarded the contract, based on their technical competences and experiences, as well as the extent to which they will be able to demonstrate understanding and familiarity in applying social and environmental risk management measures.

The contractors would be required to, during project construction phase, submit project implementation monitoring reports, demonstrating their environmental and social risk management compliance and environmental and social management stewardship.

The FSRP2 PIU Environmental and Social Specialists will review these monitoring reports. The PIU will complement their review with results from field monitoring exercises to verify the compliance status by the Contractors and provide feedback to the contractors. Furthermore, FSRP PIU will regularly conduct E&S risks management compliance audit. This will ensure that all specialist contractors carry out their construction or service tasks in a manner consistent with the PESMP. This will be necessary to avoid bringing the name of FSRP PIU into disrepute, by the action or inaction, omission or commission of any E&S infractions by its contractors. The monitoring reports from the specialist contractors will also serve as useful input to GIDA's Annual Environmental and Social Reports and other monitoring reports to be submitted to EPA.

9.3 Programme to meet Requirements.

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

- Adoption of Environmental, Health and Safety Policies and Operational Procedures;
- Management Structuring;
- Environmental, Health and Safety Committee;
- Farmers' information and training;
- Environmental and social monitoring programmes; and
- Environmental and social management budgeting.

9.3.1 Adoption of Environmental, Health and Safety Policies and Operational Procedures

KIS management shall, (or engage the services of a Consultant to assist the company), develop environmental, health and safety policies to guide the sustainable implementation of the project. Standard Operational Procedures (SOPs) for all the operations of the project from land preparation through to storage and marketing, waste management, agrochemical handling and use, material storage and management, etc. shall also be developed. The standard operational procedures will serve to guide the farmers/workers in their daily activities and also serve as a training manual for in-service training as well as training farm hands engaged on the farm.

9.3.2 Environmental, Health, Safety and Security (EHSS) Management Structuring

The Scheme Management Entity (SME) shall be responsible for managing, supervising and regulating the activities of the WUAs and WUA Federations; and implementing GIDA policies on the scheme.

The Farmer Support Service Manager (FSSM) of the SME shall take on additional responsibility of the management of the environment, health and safety of farmers and workers, and security at the project site during the operation phase of the project. The Central

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Committee, Agric Committee, Dispute Settlement Committee and Task Force of each Water WUA) shall work with the FSSM on the day-to-day implementation of environmental, health and safety procedures of the scheme. They shall hold weekly meetings to deliberate and discuss environment, health, safety and security issues arising during the previous week and put in measures for the ensuing week. Figure 9.1 shows the organizational structure for EHSS Management of the scheme.

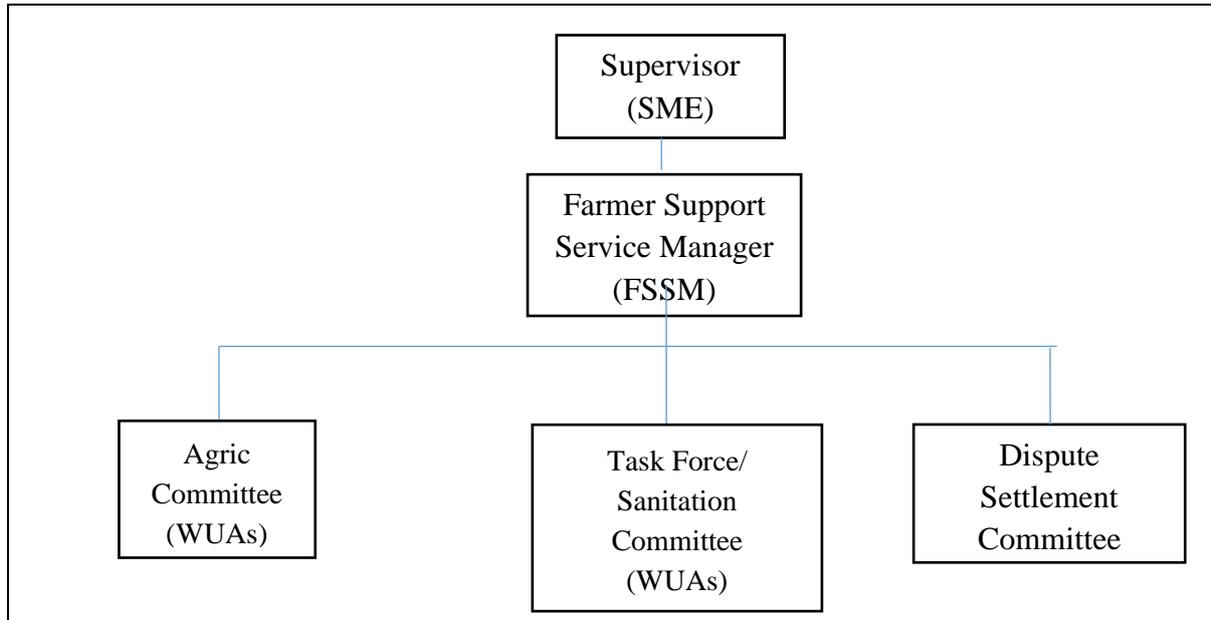


Figure 9.1 Organizational Structure for EHSS Management of KIS

The main functions of the FSSM, Agric Committee, Task Force and the Dispute Settlement Committee are summarised in Table 9.1.

Table 9.1 Key functions of the FSSM, Agric Committee, Task Forces and Dispute Settlement Committee

FSSM	Agric Committee	Task Force /Sanitation Committee	Dispute Settlement Committee
1. Lead the implementation of environment, health, safety and security policies of the project, including technical and non-technical operations.	1. Liaising with the FSSM to ensure implementation of environment, health and safety policies.	1. Liaising with the FSSM to develop and ensure implementation of security policies.	1. Hear and determine disputes relating to water use and distribution, determination of ISC, contravention of by-laws, etc.
2. Liaise with the Scheme Supervisor to ensure all required PPEs, waste bins and other logistics are provided for the project.	2. Ensuring adherence to environment, health and safety procedures and the correct use of PPEs provided for farmers/ workers in carrying out their activities.	2. Ensuring adherence to security measures in and around the project site.	2. Acknowledge receipt of complaints and conduct investigation upon receiving complaints.
3. Train and create awareness on environmental and social management including the use of PPEs, agro-chemicals application and management of waste	3. Ensuring waste bins provided at the farm and all premises (warehouse/workshop/offices, etc.) are appropriately used and emptied on time for proper disposal at approved dump sites	3. Organizing and coordinating training on security and lifeguard services for farmers and security awareness program for farmers/workers.	3. Hear the matter within seven days of receipt of a complaint and inform parties of the decision taken on the matter
4. Liaise with regulatory institutions such as EPA, Department of Factories Inspectorate and GNFS.	4. Keeping records and reporting all incidents/accidents and illnesses to the FSSM.	4. Keeping records and reporting on all security issues to the FSSM	-

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FSSM	Agric Committee	Task Force /Sanitation Committee	Dispute Settlement Committee
5. Work closely with all Consultants engaged in carrying out their work.	5. Reporting all complains from the farmers/workers concerning environment, health and safety to the FSSM.	5. Supervising security activities to ensure security is maintained at the project site.	-
6. Supervise the Agric & Sanitation Committees and Task Force, to ensure implementation of environment, health, safety and security procedures.	6. Reporting all non-compliances to environment, health and safety procedures to the FSSM for appropriate action.	6. Preventing unauthorized access to the canal system by community members, especially children.	-

9.3.3 Environment, Health, Safety and Security Committee

The Scheme Manager, FSSM, Representatives of Agric committee and Task Force of each WUA, shall constitute the Environment, Health, Safety and Security (EHSS) Committee of the Rehabilitation and Modernisation of KIS. The EHSS Committee shall have monthly meetings to discuss and deliberate on environment, health, safety and security issues. To ensure the commitment and direct involvement of the Management of the Scheme, the Scheme Manager shall head the EHSS Committee and chair all meetings.

The functions of the Environment, Health, Safety and Security Committee shall among other things include:

- Implementing environment, social, health, safety and security policies formulated for the Project;
- Implementing the environmental permit conditions and mitigation, monitoring and management measures in the ESIA report;
- Engaging the services of Consultant(s) where necessary to assist with the preparation and implementation of environment, social, health, safety and security policies and environmental permit conditions;
- Identifying appropriate training programmes for the workers/farmers;
- Reviewing monthly data collated on environmental management, farmers’/workers’ health and safety and security issues;
- Addressing environment, health, safety and security complaints and concerns of farmers/workers and communities;
- Undertaking disciplinary actions against workers and farmers who don’t comply with health and safety procedures; and
- Prepare minutes of the monthly meeting and monthly progress report for dissemination to KIS/FSRP PIU.

9.3.4 Farmers/Workers Information and Training

The Scheme Manager will ensure effective dissemination of information to all workers and farmers. Training programmes will be regularly organized for workers and farmers in collaboration with Agricultural Extension Officers and Consultants on agronomic practices, appropriate use and handling of agrochemicals, environmental health and safety issues, etc. These will include training for all farmers, farm hands and workers before they are engaged, formal in-service trainings and demonstrations at farms, warehouses, workshops and other premises.

The Agric Committee, Sanitation Committee and the Task Force will be trained on the environmental permit conditions and mitigation and management measures in this ESIA report as well as provided with first aid training. The Task Force will have training on ensuring adequate security at the project site, preventing unauthorized access to the project site, especially children from the neighbouring communities and performing lifeguard services during emergencies.

Providing adequate training for the workers and farmers and ensuring effective dissemination of information will contribute immensely towards:

- Environmental management through the judicious use of resources, appropriate disposal of wastes;
- Prevention of accidents that might cause injury to workers and farmers and pose risks to persons and the general environment; and
- Ensuring security in and around the project site to protect lives and property of the workers/farmers and the neighbouring communities.

9.3.5 Environmental and Social Monitoring Programmes

Monitoring plan contained in the PESMP will be updated during project implementation for relevant parameters, in accordance with the directives of the EPA in the environmental permit conditions.

9.3.6 Audits and Reviews

A mid-term E&S audit will be undertaken after project implementation to assess the compliance to and effectiveness of E&S management measures in place during the rehabilitation phase. A final E&S audit, which will form part of the Implementation Completion and Results Report (ICR) will be undertaken at the end of the project prior to handing over of the site to SME.

Annual environmental, health and safety audits and reviews will be conducted during the operation phases to assess the performance of the environmental, health and safety policies and operational procedures implemented. The monitoring programme will form the basis for effective auditing and reviews. The outcome of the annual audits and reviews will underpin the periodic update of the ESMP of the proposed project.

An Environmental and Social Management Plan will be prepared 18 months after the commencement of the Project and every three (3) years thereafter in line with the EA Regulations, 1999 (LI 1652).

9.4 Implementation Plan

The environmental, social, health and safety impacts/risk management plans are outlined below and presented in Tables 9.2 to 9.14:

1. Livelihoods disruption minimisation management plan;
2. Water resources protection management plan;
3. Waste management plan;
4. GHG emission reduction and climate change adaption plan;
5. Occupational health and safety plan;
6. Community health and safety plan;
7. Cattle invasion prevention plan;
8. Biodiversity conservation plan;

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9. Labour rights risk management plan;
10. Child labour prevention plan;
11. Gender-based violence prevention plan;
12. Socio-cultural risk management plan; and
13. Reduction in HIV/AIDS and other STIs transmission plan.
- 14.

9.4.1 Livelihoods Disruption Minimisation Plan

The objective of the Livelihood disruption minimisation plan is to minimise potential hardship to farmers as a result of livelihoods disruption or make their living conditions and livelihoods worse of due to the rehabilitation works. Table 9.2 provides an outline of the scope of the plan.

Table 9.2 Livelihoods Disruption Minimisation Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Notification of farmers in advance of construction activities	<ul style="list-style-type: none"> Farmers to be adequately informed, in advance, of the scope, magnitude and schedule of the proposed project, its implications for their continued farming over the construction period. Construction will be scheduled such that farmers will be allowed to harvest prior to commencement of activities. 	To minimise livelihoods disruption and denial of usufructuary rights	Ensure that Farmers are well informed about the scope and schedule of work	Included in the project cost	Pre-construction Phase	Environmental and Social Specialist of PIU / Environmental and Social Specialist of GIDA

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<p>Phased construction activities</p>	<ul style="list-style-type: none"> • Construction activities to be phased so farmers can farm at any given period of construction phase. • Creation of bypass for water delivery • Contractor shall not interrupt the water supply to an existing irrigation consumer or reduce it below the normal flow for growing crops, without the recorded and witnessed consent of the consumer. 		<p>Ensure that bypass are created for water delivery</p>			
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<p>Grievance resolution</p>	<ul style="list-style-type: none"> • FSRP2 and GIDA will ensure that farmers already cultivating portions of the project site will be allowed to continue temporary farming at areas of the land which will not be affected by construction of the canal system. • FSRP and GIDA will ensure all grievances/concerns by local communities, traditional authorities, livestock owners and cattle herders are resolved prior to construction works 					
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9.4.2 Water Resources Protection Plan

The plan (Table 9.3) is to protect the Volta and Lukwe Rivers and the four drainage lagoons and ground water resources from potential contamination during the construction and operational phases of the project. The plan establishes as core components provision of a designated maintenance area with concrete surface and oil sumps.

Table 9.3 Water Resource Protection Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Construction Phase						
Excavated material to be stockpiled and covered for reused	Excavated material to be stockpiled and covered with polythene sheets to be used for backfilling canal embankment	To prevent siltation of drainage channels	Minimise siltation of the drainage channels	Included in project cost.	Construction phase	Project Manager of Contractor
Subcontracting maintenance and fuelling of machinery	Sub-contract servicing of vehicles/machinery to a third party	To prevent the contamination of groundwater	0% oil spillage		Construction period	HSE Officer of Contractor
Creation of drainage in each plot	Drainage system in plots to be such that all outfalls lead to the drainage lagoons	To prevent waterlogging of farms and ensure the drainage lagoons receives runoff	Collection of runoffs into the drainage lagoons			
Farmers to use EPA approved agro chemicals	Farmers to use EPA approved agro-chemicals at the recommended application rate	To ensure the right chemicals are used and also to prevent the abuse of agrochemicals usage	All chemicals used to be approved	800	Operation phase	Agric Committee
Periodic surface water and groundwater quality monitoring	Water quality monitoring whose frequency will follow the Environmental Permit conditions will be undertaken	To ensure the water quality is within recommended standards	Quality of water to be within	1,000		FSSM

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Construction Phase						
	and the results compared with the baseline values		recommended standard			

9.4.3 Waste Management Plan

The plan defines the appropriate strategies for the collection, handling and disposal of various waste types in compliance with national sanitation codes and environmental regulations. The objective of the plan is to ensure that mitigation measures are adequately implemented by identifiable individuals (Table 9.4).

Table 9.4 Waste Management Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Construction Phase						
Re-use of vegetative waste	Big size twigs and shrubs portion of the vegetative waste to be given out to locals as fuelwood. The twigs and leaves to be disposed of at vantage points on the irrigable area to undergo natural decomposition	To re-use the vegetative waste	Re-use all vegetative waste produced		Construction phase	HSE Officer of Contractor
Segregation and reuse of excavated	Excavated materials will be used for canal embankment, backfilling of pipelines, culverts	To prevent siltation of the	Re-use about 100% of the waste produced			

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
and construction waste	back filling and reclamation of borrow pits	drainage channels		Included in project cost		
	Construction waste to be segregated into paper, plastics, wood, and pieces of concrete. <ul style="list-style-type: none"> • Wood to be given to locals as fuelwood. • Broken pieces of concrete for backfilling • Non-recyclable portion to be disposed of by an accredited waste management company. 					
Domestic Waste segregation	Segregation of domestic waste into plastics and other waste. Plastics to be given to recycling companies. Other wastes to be disposed of by an accredited waste company	To prevent littering and indiscriminate disposal of waste	Reduction of waste to be disposed of by 50% o			
Subcontracting maintenance of machinery	Sub-contract servicing of vehicles/machinery to a third party	To prevent soil, groundwater, and drain channels	0% oil spillage on bare floor			
	Activities involving the use of oils and lubricants to be					

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	performed on an impervious platform fitted with an oil sump	contamination with waste oil				
	Provide waste oil tanks to hold spent oils					
	Ensure contractor returns waste oil to suppliers.					
Operations Phase						
Returning of spent and batteries and panels to suppliers	Obsolete batteries and damaged solar panels to be stored at designated areas and returned to suppliers	To prevent the burning of e-waste to recover metals	0% burning of e-waste	5,000	End of life of batteries and panels	Scheme Management
Tilling of crop residue into soil	Crop residue to be tilled into the soil to improve the soil structure and organic matter content and also carted to feed animals.	To convert the waste into a resource (manure)	100% re-use of vegetative waste		During land preparation	Agric Committee of WUA
Provision of bins for segregation of domestic waste	Segregation of waste into plastic and other waste. Plastic waste to be given for recycling. Other waste to go to the district dump	To reduce the waste to be sent to the dumpsite	50% reduction of waste		Operation phase	
Proper management of chemical containers	Provide labelled bins for the collection of agrochemical containers, foil seals, lids, and fertilizer sacks for return to the suppliers for recycling/proper disposal	To prevent the use of chemical containers as water containers	All containers to be returned 100%		Operation phase	

9.4.4 GHG Emission Reduction and Climate Change Adaption Plan

The objective of the plan is to reduce GHG emission and use resources efficiently and contribute to prevent climate change. Table 9.5 outline the measures in place and responsible officers in place to achieve this objective.

Table 9.5 GHG Emission Reduction and Climate Change Adaption Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Biodiversity Offset	The FSRP to provide support to Forestry Commission (FC) to protect and improve degraded condition of a Forest Reserve or marginal lands within the project communities and/ or district	To reduce GHG emission and contribute to climate change mitigation	Afforestation and improvement of a degraded Forest Reserve	20,000	Pre-construction	Environmental Specialist of FSRP
Emission reduction	<ul style="list-style-type: none"> Ensuring scheduled maintenance of construction machinery and equipment to reduce exhaust and other emissions 		Reduction in GHG emission and water losses	Included in the project cost	Construction phase	HSE Officer of Contractor
Alternative water management for rice cultivation and improved	Improved agronomical practices which include: <ul style="list-style-type: none"> Cultivation of improve rice varieties that produces less methane 			1,000	Operations phase	Agric Committee

agronomic practices	<p>gas due to their low rates of organic matter decomposition</p> <ul style="list-style-type: none"> Alternative wetting and drying for rice production which involves periodically draining the fields to allow the soil to dry before reflooding. water management for rice cultivation 					
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9.4.5 Occupational Health and Safety Plan

The overall objective of this plan is to avoid potential accidents, exposure to dust and emissions, noise, and vibration, as well as offer prompt medical response for accidents and emergencies, including snakebites. This will help to minimise likely downtime while ensuring work delivery is on schedule. The plan (Table 9.6) will guide the implementation of measures to reduce noise and vibration impacts, ensure the effective use of PPE, and protect the workers from dust among others.

Table 9.6 Occupational Health and Safety Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
Dust and emissions reduction	<ul style="list-style-type: none"> All trucks/equipment to follow the maintenance regime and recorded Toolbox meeting for safety orientation for all workers Appropriate PPE supplied and used - nose masks, 	To minimise the effect of dust on the workers	Minimise effects of dust generation by 80%	Included in project cost	Construction phase	HSE Officer of Contactor

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
	safety goggles, safety overalls <ul style="list-style-type: none"> Haulage trucks to be covered with tarpaulin Dousing of the site with water twice daily Air quality monitoring for PM_{2.5}, PM₁₀ and TSP will be conducted at the baseline sampling Engines of machinery to be switched off when not in use 					
<ul style="list-style-type: none"> Noise and vibration minimisation 	<ul style="list-style-type: none"> Use of earplugs/earmuffs and high dexterity hand gloves Operators of machinery and vehicles will be required to switch off idling engines Padded seats will be fitted in mobile equipment and worn-out pads promptly replaced to limit the effect of vibration transmission to drivers Operators of heavy-duty machinery and equipment 	To minimise the exposure of workers to excessive noise and vibration	Minimise exposure to noise and vibration by 80%		Construction phase	HSE Officer of Contractor

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
	such as bulldozers, compactors, and backhoes to take intermittent breaks after every 4-hour operation					
<ul style="list-style-type: none"> Protection from sprains, trips, and falls and accident prevention 	<ul style="list-style-type: none"> Provide PPE - hard hats, high-visible clothing Observe good housekeeping practices Provide First Aid Kits Support health facility with anti-snake venom stocks Record and report all accidents/injury and snakebite cases to the FSRP 2 PIU and the World Bank within 24 hours Use of high visibility safety jackets by all workers on site 	To minimise the risk of workers getting involved in accidents	Eliminate accidents on-site completely		Construction phase	<p>HSE Officer of Contractor</p> <p>HSE Officer of GIDA</p>
Vehicular accidents and knockdown prevention	<ul style="list-style-type: none"> All trucks and other equipment will follow a maintenance regime and records kept Impromptu tests on alcohol consumption levels of truck drivers 	To minimise the risk of vehicular accidents and knockdown of workers	Eliminate accidents on-site completely		Construction phase	HSE Officer of Contractor

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
	<ul style="list-style-type: none"> Compliance with the 20km/h speed limit driving on site Reverse alarms on trucks and other vehicles 					
<ul style="list-style-type: none"> Fire prevention and Control Measure 	<ul style="list-style-type: none"> Support GNFS to create awareness and educate locals on dangers associated with bushfire and bushfire prevention; Provide support to the GNFS to train fire volunteers in the Project Communities to help fight fires; Posting readable and pictorial fire safety signs like “No Smoking”, “Switch-off Engines”, “Mobile Phones Off”, emergency hotlines, etc. conspicuously at the fuel storage and fuelling areas; Provide firefighting equipment such as fire beaters, extinguishers, foam concentrates, hose reels, dry 	<ul style="list-style-type: none"> To minimise the incidence of bushfire To help fight fire in the event of an outbreak To caution workers of the dangers associated with likely ignition or heat sources identified To be able to fight fire and contain it in the event of any outbreak 	<ul style="list-style-type: none"> Reduce bushfire by 95% Getting Project Community members to be volunteers 0% fire incident on-site Available equipment to fight fire 	<p>Included in project cost</p> <p>800</p>	<p>Construction and operation phase</p>	<p>HSE Officer of Contractor / FSSM</p>

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
	chemical powder and CO2 fire extinguishers at fuel storage areas; <ul style="list-style-type: none"> • Conducting weekly toolbox meetings on fire safety 	<ul style="list-style-type: none"> • To educate workers on fire and its prevention 	0% fire incident on-site			

9.4.6 Community Health and Safety Plan

The objective largely is to ensure community's health and safety is not compromised, by minimising noise, dust, and emission generation associated with the project. The measures developed to safeguard public safety are outlined in Table 9.7.

Table 9.7 Community Health and Safety Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
Dust and vehicular emissions control	<ul style="list-style-type: none"> • All trucks and other equipment will follow a maintenance regime • Trucks hauling excavated spoil will be covered with tarpaulin to prevent fly-offs • Precautionary signs showing a speed limit of 30km/h will be posted at vantage points in communities and on-site 	To minimise the exposure of the public to dust and other emissions	Minimise effects of dust generation on the general public by 95%	Included in project cost	Construction phase	HSE Officer of Contractor

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
	<ul style="list-style-type: none"> Haulage trucks will be required to reduce speed to 30km/hr when approaching untarred roads 					
Noise control	<ul style="list-style-type: none"> Haulage trucks and other construction machinery, equipment, and vehicles would be required to follow a strict maintenance regime and recording It will be mandatory for operators of machinery, equipment, and vehicles to switch off idling engines Haulage and working hours will be restricted to daytime (8:30 to 17:00) 	To minimise the exposure of the general public to excessive noise generated due to the project	Minimise exposure of the general public to noise by 90%		Construction phase	HSE Officer of Contractor
Traffic and vehicular accidents prevention	<ul style="list-style-type: none"> Trucks and vehicles will be equipped with reflective breakdown triangle, fire extinguishers, etc.; Vehicle fleet management system or haulage timetable to prevent hauling in fleets, peak traffic periods, and driver fatigue; Erection of road signs before commencement of construction works Sensitisation of community on impending works and traffic impacts; 	To prevent traffic and vehicular accidents and prevent public health issues as much as practicable	Eliminate accidents completely			HSE Officer of Contractor

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
	<ul style="list-style-type: none"> All trucks and other equipment will follow a maintenance regime and records kept; Use of flagmen/banksmen at vantage points and busy crossing points in communities Posting reflective signs such as “Heavy Trucks Turning” and also speed limits at approaches to the junction to the site; Trucks and vehicles will be labelled with complaints and emergency phone numbers for reporting irresponsible driving; Compliance with the 30km/h speed limit driving through towns; Only licensed (Class E) drivers will be qualified to drive trucks; Reflectors on haulage trucks will be mandatory for hired trucks to caution other road users. 					
Agronomic (chemical application) and post-harvest	<ul style="list-style-type: none"> Education of farmers on the proper application of agro chemicals, storage of farm produce to avoid infestation of rodents and insect attacks 		Prevent public health issues as much as practicable	500	Operation phase	Agric Committee

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
management practices						
Drowning Prevention	<ul style="list-style-type: none"> • Installation of barriers/perimeter fences to prevent pedestrians from falling into excavated pits; • Undertake progressive reclamation of all borrow pit created; • Sensitisation of community on impending works and adverse impacts; • Warning signs prohibiting swimming would be posted at vantage points along canals; • Appropriate notices and warning signs will be erected around working areas and public areas to warn prospective trespassers of any danger or risk; and • Ensuring proper security at the site to prevent unauthorized entries. 			Included in project cost	Construction Phase	HSE Officer of Contractor

9.4.7 Cattle Invasion Prevention Plan

The plan (Table 9.8) is to prevent cattle invasion of the scheme to protect the life span of irrigation and drainage infrastructure and also avoid conflict between farmers and herders.

Table 9.8 Cattle Invasion Prevention Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Construction Phase						
Establish watering troughs	<ul style="list-style-type: none"> Construct four (4) sites along the Main Canal as cattle watering points Continuous engagement of herders on adherence to staying out of the command areas Sanctions in the form of fines to herders who stray to the command areas Provide designated crossing points in consultation with herders 	To prevent cattle invasion of drainage infrastructure and command areas	Reduce invasion by 80%	Included in the project cost	Construction phase	HSE Officer of Contractor/Agric Committee
Engagement						
Designated Crossing points						

9.4.8 Biodiversity Conservation Plan

The plan seeks to conserve biological resources by ensuring that raw materials are not extracted from unsustainable sources. The plan is also to ensure that mitigation measures are adequately implemented by identifiable individuals (Table 9.9).

Table 9.9 Biodiversity Protection Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Construction Phase						

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Raw material extraction at approved sources	Aggregate to be extracted at EPA approved quarries and borrow pits	To conserve biological resources	Quarries and borrow pits to be approved by EPA	Included in Project Cost	Construction phase	HSE Officer of Contractor

9.4.9 Labour Rights Risk Management Plan

The objective of the plan is to protect the rights of workers in accordance with the convention of the ILO. The plan institutes measure to protect the human rights of workers and create a conducive working condition of workers (Table 9.10).

Table 9.10 Labour Rights Risk Management Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Adoption and implementation of FSRP Labour Management Procedures with provision for:	Adoption and implementation of FSRP 2 Labour Management Procedures by the contractor (Appendix 7) as part of contractual obligations	Worker empowerment through the implementation of the Labour management Procedures.	Recruiting about 30% women	Included in Project Cost	Construction phase	Project Manager of Contractor
	Issuance of employment letters with conditions of services which are consistent with national labour laws		Ensure all construction workers are given employment letters			

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
<ul style="list-style-type: none"> • Issuance of employment letters • Payment of fair, realistic, salaries and documentation • Payment of social security contributions • Provision of a safe working environment • Prohibition of excessive compulsory overtime duties • 	Provision of payslips to workers monthly	Comply with labour laws	Ensure compensations are in line with the prevailing economic situations in the country			
			Ensure that the monthly social security contributions of all workers are paid			
	Provision of PPE and basic amenities at the construction site		Provide conducive working environment for workers			
	Ensure workers work for eight (8) hours a day		Ensure all workers are fairly treated			
	<ul style="list-style-type: none"> • To ensure transparency in dealings amongst stakeholders including affected parties and provide avenue for stakeholders to make complaints and 		To ensure transparency in dealings amongst stakeholders including affected parties			

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	resolve their concerns <ul style="list-style-type: none"> • Promote freedom of association of workers, that is the formation of workers union. • Ensure safe and conducive working environment • Issuance of non-discriminatory policy 					

9.4.10 Child Labour Prevention Plan

The objective of the plan is to protect children in the project communities to from unsafe work. The plan institutes measure to safeguard the human rights of children (Table 9.11).

Table 9.11 Child Labour Prevention Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
<ul style="list-style-type: none"> • Prohibition of child labour 	<ul style="list-style-type: none"> • Verify the age of all project employees by checking any national identification document 	Comply with labour laws and eliminate all	Avoid recruiting minors during project implementations	Included in Project Cost	Construction and Operation phases	Social Expert of GIDA/HSE Officer of Contractor/

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	<ul style="list-style-type: none"> • Keep records of employees, including verified dates of birth • Terminate the contract and services agreement with the contractor • Undertake community and farmer education against child labour • Undertake impromptu monitoring of construction activities to eliminate all forms of child labour • Withdrawal of children who are not over the minimum age of 18 years and under the age of 21 working at the various intervention areas and report to DDSWCD of MoGCSP or DOVVSU of the Ghana Police Service • Undertake sensitisation of local communities on the grievance mechanism 	forms of child labour				FSSM (at Operation phase)

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	developed for the project and the need to resort to the grievance mechanism developed where children are concerned;					

9.4.11 Gender-Based Violence Prevention Plan

The objective of this plan is to prevent any form of gender-based violence and sexual harassment against workers and members of the community. The plan is presented in Table 9.12.

Table 9.12 Gender-Based Violence Prevention Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Prevention of issues related to GBV and SEA/SH Implementation of FSRP GBV and SEA/SH	<ul style="list-style-type: none"> Workers will be provided with extensive education on human rights and gender equality, while ensuring each worker signs onto a code of conduct developed by the contractor that incorporate human right clauses 	To prevent GBV and SEA/SH	0% incidence of GBV and SEA	Included in Project Cost	Construction and Operation Phases	Social Specialist of GIDA/ HSE Officer of contractor / FSSM (at Operation Phase)

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	<ul style="list-style-type: none"> • A grievance mechanism (GM) for reporting sexual harassment and abuse, and other human rights violations will be implemented for the prevention of gender-based violence (Section 9.7). • sensitization of the project communities as part of stakeholder consultation, on the need to resort to the GM to address issues that may come up • The contractor will dismiss all perpetrators of GBV and SEA/SH and incidences of GBV and SEA/SH are reported. 					

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	<ul style="list-style-type: none"> Victims will be advised and referred to a desk and appropriate agencies that handles related issues at the Ministry of Gender, Children and Social Protection (MoGCSP) for counselling and further guidance 					

9.4.12 Socio-Cultural Risk Management Plan

The objective of the plan is to protect socio-cultural values in the project communities to avoid potential cultural conflict. The plan institutes measure to safeguard cultural values (Table 9.13).

Table 9.13 Socio-cultural Risk Management Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Performance of pacification rites	<ul style="list-style-type: none"> Ground truthing of the project site for the presence of any cultural heritage sites within the project area that could 	To enable construction activities to be carried out on sacred days	To safeguard cultural resources as well as avoid socio-cultural conflicts that could	Included in project cost.	Construction Phase	Environmental and Social Specialist of GIDA/HSE Officer of Contractor

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
	<p>potentially be impacted and ensure relocation.</p> <ul style="list-style-type: none"> • Notify the National Museum and Monument Board in the event of chance find. • Payment for pacification rites • Local community members and communities within the Lower Manya Krobo Municipality (LMKM) and Shai Osodoku District (SOD) to be prioritised for employment. • Migrant workers to be sensitised on the cultural norms and values of the project communities. • Representatives of the project contractor to participate in cultural rites and festivals of the project communities 		<p>ensue between the communities and the construction workers</p>			

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Identified Action	Actual Action	Objective	Target	Budget (USD)	Proposed Time Frame	Responsibility
Recruitment of more of construction workers from the project districts	Employ construction workers locally especially farmers whose water access have been blocked	To avoid potential flouting of local customs, values and norms by migrant workers	0% incidence of flouting local customs			Project Manager of Contractor
Sensitisation of migrant workers on the customs, values and norms of the host communities	Provision of orientation to migrant workers					HSE of Contractor
Participation in cultural rites and festivals of the project communities	Presentation of items and money during the celebration of rites and festivals of the project communities	To promote a harmonious relationship between the project contractor and host communities	To obtain social license to carry out project activities smoothly			Environmental and Social Experts of GIDA /HSE of Contractor

9.4.13 HIV/AIDS Transmission Prevention Plan

The plan in Table 9.14 defines the mechanisms to prevent the potential risk of spread of HIV/AIDS and protect the population of the nearby community from exposure, as well as from increasing the prevalence of HIV/AIDS at the district level.

Table 9.14 HIV/AIDS Prevention Plan

Identified Action	Actual Action	Objective	Target	Budget (USD)	Time Frame	Responsibility
Contraction and spread of HIV/AIDS through: <ul style="list-style-type: none"> • An influx of migrant workers into the project area • Enticement of locals by workers • Luring of high-earning workers by females 	Awareness creation among workers on HIV/AIDS risks and dangers through preventive programmes including, peer counselling, facilitation of voluntary testing and support for behavioural change for workers, safe sex practices, condom use, abstinence, etc.	To reduce the transmission and spread of HIV/AIDS	Achieve UNAIDS/national target under the 90-90-90 Programme	Included in Project Cost	Construction Phase	HSE Officer of Contractor
	Provision of condoms for use by the contractor/employee at accessible and convenient locations for workers					
	Incorporation of HIV/AIDS prevention clauses in the workplace policy					
	Enhanced awareness programme for the nearby communities on HIV/AIDS risks					
	Support to SOMA and LMKMA Health Directorate in its community education campaign on HIV/AIDS					
	Distribution of awareness leaflets in the project beneficiary communities					

9.5 Environmental and Social Monitoring Plans

Environmental quality parameters that will be monitored to track the effectiveness of the proposed mitigation measures will focus on the following:

1. Livelihoods disruption minimisation monitoring plan;
2. Surface and groundwater protection monitoring plan;
3. Waste management monitoring plan;
4. GHG reduction and Climate Change adaptation monitoring plan
5. Occupational health and safety monitoring plan;
6. Community health and safety monitoring plan;
7. Cattle invasion prevention monitoring plan;
8. Biodiversity conservation monitoring plan
9. Labour rights risk management monitoring plan;
10. Child labour prevention monitoring plan;
11. Gender-based violence prevention monitoring plan;
12. Socio-cultural risk management monitoring plan; and
13. HIV/AIDS transmission reduction monitoring plan.

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9.5.1 Livelihoods Disruption Minimisation Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.15.

Table 9.15 Livelihoods Disruption Minimisation Monitoring Plan

S/n	Parameter	Frequency	How to Monitor	Who Monitors	Budget (USD)
1.	Notification of farmers in advance of construction activities	Once	Review records of minutes of meeting with farmers on notification of commence of construction works	Social Expert of GIDA	Included in project Cost
2	Create bypass for water delivery	Semi-annually	Check on field for water availability	Social Specialists of PIU	
3.	Phased construction and rehabilitation activities	Quarterly	Review effectiveness of phased construction works		
	Grievance resolution	As and when	Review records of all complaints received and actions taken	Social Specialists of PIU	

9.5.2 Surface and Groundwater Protection Monitoring Plan

The measures to be monitored, and actions to execute the monitoring to facilitate the effectiveness of implementation are addressed in Table 9.16.

Table 9.16 Water Resource Protection Monitoring Plan

S/n	Parameter	Frequency	How to Monitor	Who Monitors	Budget (USD)
1.	Excavated material to be stockpiled and covered with polythene sheets to be used	Once	Inspect the schedule of work	Environmental Expert /Social Expert of GIDA	

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	for backfilling and reclamation				Included in Project Cost
2.	Restricting maintenance and fuelling to a designated area which will be concreted and fitted with oil sumps	Monthly	Check for oil spillage on site		
3.	Drainage system in plots to be such that all outfalls lead to the drainage lagoons	Once	Inspect drain for adequacy		
Operations Phase					
4.	Farmers to use EPA approved agro-chemicals at the recommended application rate	Monthly	Check containers of chemicals for adherence		
5.	Implementation/adherence to the Integrated Pest Management Plan (IPMP) prepared for FSRP2	Quarterly	Impromptu check on adherence to the IPMP	Environmental Expert of, GIDA/FSSM	
6.	Periodic surface water and groundwater quality monitoring	Quarterly	Review records of water quality of reservoir, canal water and groundwater.	Environmental Specialist of FSRP, GIDA/FSSM	500

9.5.3 Waste Management Monitoring Plan

The actions to be monitored to ensure that waste disposal concerns are adequately address as shown in Table 9.17.

Table 9.17 Waste Management Monitoring Plan

S/n	Parameter	Frequency	How to Monitor	Who Monitors	Budget (USD)
1.	Big twigs and woody portion of vegetative waste to be given to locals	Daily	Checking quantities that have been given out	Supervision by Environmental and Social Specialist of PIU	Included in Project Cost
2.	Excavated material for backfilling and reclamation	Weekly	Check quantities of materials used		
3.	Segregation and re-use of construction waste	Weekly	Inspect quantities of waste segregated, re-used, and sent to a dumpsite		
4.	Domestic waste segregated and given to recyclers or sent to district dumpsite	Monthly	Check quantities of waste segregated and given to recyclers or sent to a dumpsite		
5.	Provide waste oil tanks to hold spent oils to be given to interested parties	Monthly	Check quantities of waste oil produced and stored Check for signs of oil spillage on the bare floor	Environmental Expert /Social Expert of GIDA	500
6.	Provision of toilet facilities on the scheme	Quarterly	Check for state and adequacy of toilet facilities Check for signs of open defecation	FSSM of SME	
7.	Agrochemicals container management	Monthly	Check for use of containers as drinking cups or water containers. Review records of containers perforated and returned to suppliers		

8.	E-waste	Yearly	Review records of quantities stored and returned to the suppliers		
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9.5.4 GHG Reduction and Climate Change Adaptation Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.18.

Table 9.18 GHG Reduction and Climate Change Adaptation Monitoring Plan

S/n	Parameter	Frequency	How to Monitor	Who Monitors	Budget (USD)
1	Biodiversity Offset	Annually	Review the number of trees planted and number that survived	Environmental Specialist of FSRP	
2.	Scheduled maintenance of construction machinery	Annually	Review maintenance schedule for machinery	Environmental Expert of GIDA	3,000
3.	Alternative water management for rice cultivation and improved rice variety that produces less methane gas	Annually	Review of yield produced using alternative water management and improved rice variety	Irrigation Engineer of GIDA	

9.5.5 Occupational Health and Safety Monitoring Plan

The monitoring plan, presented in Table 9.19 is intended to protect the workers from accidents, control dust and emissions, noise and vibration effects, as well as effectively handle snakebite cases.

Table 9.19 Occupational Health and Safety Monitoring Plan

Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
<i>Air Emission Prevention and Exposure Control</i>					
All trucks/equipment to follow the maintenance regime and recorded	Records of maintenance	Half-yearly	Review maintenance schedule for machinery	Environmental Officer /Social Officer of GIDA	Included in Project Cost
Toolbox meeting for safety orientation for all workers	Effectiveness of the scheme	Quarterly	Review the effectiveness of toolbox meetings		
Appropriate PPE supplied and used - nose masks, safety goggles, safety overalls	Quantities of PPEs supplied	Monthly	Inspect records of PPEs supplied		
Haulage trucks to be covered with tarpaulin	Adherence to the use of tarpaulin	Half-yearly	Impromptu checks on haulage trucks on adherence to the use of tarpaulin		
<i>Noise and Vibration Control</i>					
Use of earplugs/earmuffs and high dexterity hand gloves	Records of provision and use of earplugs	Monthly	Impromptu checks on the use of earplugs and hand gloves	Environmental Officer /Social Officer of GIDA	Included in Project Cost
Operators of machinery and vehicles will be required to switch off idling engines	Adherence to switching off idle machinery	Monthly	Impromptu checks on machine operators		
Padded seats will be fitted in mobile equipment and worn-out pads promptly replaced	Compliance with use and replacement	Quarterly	Checks on use and records of replacement of padded seats		
Operators of heavy-duty machinery and equipment to take	Review records of breaks of operators	Quarterly	Records of breaks of operators		

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Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
intermittent breaks after every 4-hour operation					
General Accident Prevention and Handling of Snakebite Cases					
Provide PPE - hard hats, high-visible clothing	Records of PPEs provision and use	Monthly	Impromptu checks on provision and use of PPEs	Environmental Officer /Social Officer of GIDA	Included in Project Cost
Observe good housekeeping practices	Cases of accident/ injury recorded	Monthly	Review records of accidents/injuries and near misses		
Set up a First Aid centre	Patronage and type of cases reported	Monthly	Review adequacy and patronage of First Aid Centre		
Provide First Aid Kits	Records of supplies to centre	Monthly	Records and availability of supplies		
Support health facility with anti-snake venom stocks	Records of case morbidity/fatality	Monthly	Review records of anti-snake venom stocks procured		
Record all accident/injury and snakebite cases	Treatment records	Monthly	Review records of cases of snakebites and accidents		
Vehicular Accidents and Knockdown Prevention					
Use of high visibility safety jackets by all workers on site	Records of jackets provision and use	Monthly	Impromptu checks on provision and use of jackets	Environmental Officer /Social Officer of GIDA	Included in Project Cost
All trucks and other equipment will follow a maintenance regime and records kept	Records of maintenance	Half-yearly	Review maintenance schedule for machinery		

Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
Compliance with the 20km/h speed limit driving on site	Incidences of over speeding	Quarterly	Check vehicle speed using tracking systems		
Reverse alarms on trucks and other vehicles	Effectiveness of the alarms	Quarterly	Review incidences of accidents and knockdowns from reversing		

9.5.6 Community Health and Safety Monitoring Plan

The plan outlined in Table 9.20 will ensure compliance with mitigation measures developed to reduce the impacts of noise and dust from project construction and haulage activities and protect the general public from accidents and potential harm from the project.

Table 9.20 Community Health and Safety Monitoring Plan

Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
<i>Dust and other emissions</i>					
All trucks and other equipment will follow a maintenance regime	Records of maintenance	Quarterly	Review maintenance schedule for machinery	Environmental Officer /Social Officer of GIDA	Included in Project Cost
Trucks hauling excavated spoil will be covered with tarpaulin to prevent fly-offs	Records of offenders and sanctions applied	Quarterly	Impromptu check on tarpaulins use		
Precautionary signs showing a speed limit of 30km/h will be posted at vantage points in communities and on-site	Number and position of signs posts	Quarterly	Check presence and visibility of signage		

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Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
Haulage trucks will be required to reduce speed to 30km/hr when approaching untarred roads	Incidences of over speeding	Quarterly	Impromptu check on the adherence to the 30km/h speed limit		
Machinery, trucks, and vehicles deployed to be less than 5 years old	Records of registration documents	Quarterly	Inspect vehicle registration documents		
Noise levels					
Haulage trucks, machinery, and vehicles to comply with strict maintenance regime and recorded	Records of maintenance	Quarterly	Review records of serviced trucks and conditions	Environmental Officer /Social Officer of GIDA	
Operators of machinery and vehicles will be required to switch off idling engines	Adherence to switching off idle machinery	Monthly	Impromptu checks on machine operators		
Restrict haulage and working hours to daytime	Records of logbook	Monthly	Inspect logbook of haulage trucks		
Replace worn-out machinery and equipment parts promptly and record	Records of worn-out parts changed and replaced	Yearly	Review records of worn-out parts replaced or changed		
Traffic and vehicular accidents					
Trucks and vehicles will be equipped with reflective breakdown triangle, fire extinguishers, etc.	Availability of First Aid box, fire extinguisher, triangles	Quarterly	Impromptu checks on the state of safety kit	Environmental Officer /Social Officer of GIDA	Included in Project Cost

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Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
All trucks and other equipment will follow a maintenance regime and records kept	Records of maintenance	Quarterly	Review maintenance schedule for machinery		
Use of flagmen/banksmen at vantage points and busy crossing points in communities	Availability of banksmen at the designated points	Impromptu	Check on the use of banksmen at the designated points		
Erection of road signs before commencement of construction works	Number and type/nature of visible road signs provided	Weekly	Check availability and visibility of road signs		
Sensitisation of community on impending works and traffic impacts;	Records of sensitisation programmes organised	Monthly	Review records of sensitisation programmes organised		
Posting reflective signs and also speed limits at approaches to the junction to the site	Number and position of signs posts	Half-yearly	Check presence and visibility of signage		
Labelling trucks with emergency phone numbers and reflectors	Emergency phone numbers and reflectors on trucks	Half-yearly	Check position and visibility of labels		
Tests on alcohol consumption levels of truck drivers	Records of alcohol levels of drivers	Half-yearly	Impromptu checks of alcohol levels of drivers		
Compliance with the 30km/h speed limit driving through towns	Incidences of over speeding	Quarterly	Check vehicle speed using tracking systems		
Only licensed (Class E) drivers will be qualified to drive trucks	Records of the expiry date of licenses	Half-yearly	Check the validity of licenses		
<i>Agrochemical Application and Post-harvest Management Practices</i>					

Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
Education of farmers on the proper application of agro chemicals and storage of farm produce	Records of engagement with farmers on chemical application and post-harvest practices	Annually	Review records for training mounted for farmers	FSSM	500
<i>Drowning Prevention</i>					
<ul style="list-style-type: none"> Installation of barriers/ perimeter fences to prevent drowning in excavated pits. Develop a Reclamation plan and undertake progressive reclamation of all borrow pit created; Warning signs prohibiting swimming would be posted at vantage points along canals; Provision of safe community fetching points at designated places along the main canals 	<p>Integrity of perimeter fences</p> <p>Number of borrow pits reclaimed.</p> <p>Availability of warning signs prohibiting swimming and bathing in canals</p> <p>Number of designated safe water fetching points on main canal</p>		<p>Inspection of the integrity of perimeter fences/ barriers</p> <p>Inspection of borrow pits to check for reclamation.</p> <p>Inspection to check for the availability of prohibitory signs against swimming and bathing along main canals.</p> <p>Adequacy of safe designated community fetching points</p>	<p>Environmental Specialist of FSRP PIU/ Social Specialist of FSRP PIU / Environmental Officer Social Officer of GIDA</p>	Included in Project Cost

9.5.7 Cattle Invasion Prevention Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.21.

Table 9. 21 Cattle Invasion Prevention Monitoring Plan

S/n	Parameter	Frequency	How to Monitor	Who Monitors	Budget (USD)
1.	Watering troughs established. Engagements	Annually	Review adequacy of watering troughs Review records of grievances filed and resolved	Environmental Specialist of FSRP/Social Specialist of FSRP / Environmental Officer /Social Officer of GIDA during the Construction Phase	Included in Project Cost
2.	Designated crossing points	Once	Review adequacy of designated crossing point for cattle	FSSM/District Agric Directorate of SODA/ Municipal Agric Directorate of LMKMA during the Operations Phase	1,000

9.5.8 Biodiversity Conservation Monitoring Plan

The actions to be monitored and the responsibility for monitoring to ensure the protection of biodiversity resources on the project site from further degradation are outlined in Table 9.22.

Table 9. 22 Biodiversity Protection Monitoring Plan

S/n	Parameter	Frequency	How to Monitor	Who Monitors	Budget (USD)
	Biodiversity offset				
2.	Raw material sources	once	Check for Environmental permit of quarry and borrow pit where aggregates are extracted	Environmental Officer of GIDA	Included in Project Cost

3.	Migrate to animals to adjoining bushes	Weekly	Impromptu checks of the state of clearing to ensure animal are allowed to escape		
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9.5.9 Labour Rights Risk Management Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.23.

Table 9. 23 Labour Rights Risk Management Monitoring Plan

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
5.	Issuance of employment letters	Review of records employees	Once	Social Officer of GIDA / Social Specialist of FSRP	Included in Project Cost
7.	Payment of fair, realistic, salaries and documentation	Review of employment contract			
8.	Payment of social security contributions	Review of payment records for the payment of social security	Semi-annually		
9.	Provision of a safe working environment through the provision of PPEs	Review of records for supply of PPE and working amenities Review incidence register for accidents and near misses	Quarterly		
10.	Prohibition of compulsory overtime duties	Review of employment contract Impromptu checks after working hours compulsory overtime	Impromptu		
12.	Implementation of grievance mechanism	Review of grievance mechanism for grievances	Monthly		

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
		received and number resolved and number unresolved			

9.6.10 Child Labour Prevention Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.24.

Table 9. 24 Child Labour Prevention Monitoring Plan

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
11.	Community and farmer education against child labour	Review records of education programmes mounted, content and participants	Once	Social Officer of GIDA / Social Specialist of FSRP 2.	Included in Project Cost
	Monitoring of construction activities to eliminate all forms of child labour	Impromptu checks of project site for the presence of child labour			
	Withdrawal of children below the age of 18 years working at the various intervention areas and report to DDSWCD of MoGCSP or DOVVSU of the Ghana Police Service	Review records for cases involving child labour, those withdrawn and reported and follow up action	Semi-annually		
	Sensitisation of local communities on the grievance mechanism developed for the project	Review of content, participants and methodology and frequency of sensitization of local communities on Project Grievance Mechanism	Annually		

9.5.11 Gender-Based Violence Prevention Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.25.

Table 9.25 Gender-Based Violence Prevention Monitoring Plan

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
1.	Worker's education on human rights, and signing onto a code of conduct developed by the contractor that incorporate human right clauses	Review of content, participants and methodology and frequency of sensitization of local communities on Project Grievance Mechanism	Once	Social Officer of GIDA / Social Specialist of FSRP2	Included in Project Cost
2.	Implementation of Grievance Mechanism (GM) to report sexual harassment and abuse, and other human rights violations		Once		
3.	Sensitization of the project communities on the need to resort to the GM to address issues that may come up		Semi-annually		
4.	Dismissal of all perpetrators of GBV and SEA/SH and incidences of GBV and SEA/SH are reported.	Review of grievances received and number issues resolved and follow up action	Annually		
5	Victims to be advised and referred to a desk that handles related issues at the MoGCSP		Semi-annually		

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
	for counselling and further guidance				

9.5.12 Cultural Heritage Preservation Monitoring Plan

The aspects of mitigation measures to be monitored, and actions to execute the monitoring in order to facilitate the effectiveness of implementation are addressed in Table 9.26.

Table 9. 26 Socio-Cultural Risk Management Monitoring Plan

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
1.	Performance of pacification rites	Inspection of records of items presented and money paid for pacification rites	Once	Social Officer of GIDA	Included in project cost
2.	Recruitment of locals	Review employment records for percentage of locals recruited	Semi-annually		
3.	Sensitisation of migrant workers on the customs, values and norms of the host communities	Review records for number of sensitisation programmes mounted Review of recorded cases of breaches of local norms and customs and follow up action	Annually		
40.	Participation in cultural rites and festivals of the project communities	Inspection of records of items presented and money donated	Annually		

S/n	Parameter	How to Monitor	Frequency	Who Monitors	Budget (USD)
5.	Adherence to chance find procedure provided in Appendix 10.0	Review of recorded cases of chance find	Annually		

9.5.13 HIV/AIDS Transmission Reduction Monitoring Plan

The effectiveness of HIV/AIDS prevention measures and support programme implementation will be monitored through the measures outlined in Table 9.27

Table 9.27 HIV/AIDS Prevention Monitoring Plan

Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
Awareness creation among workers on HIV/AIDS e.g., peer counselling, voluntary testing, and safe sex practices	Awareness programmes organised	Yearly	Review types and number of awareness programmes organised and records of attendance	HSE Officer of Contractor	Included in Project Cost
Provision of condoms at accessible and convenient locations for workers	Availability of condoms	Monthly	Checks for availability and supply of condoms to workers		
Incorporation of HIV/AIDS prevention clauses in the workplace policy	HIV/AIDS policy implementation	Yearly	Review policy implementation		
Support to SOMA and LMKMA Health Directorate in its community education campaign on HIV/AIDS	Effectiveness of educational campaigns	Yearly	Review number of educational campaigns organised		

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Mitigation Measures	Parameters	Frequency	How to Monitor	Who Monitors	Budget (USD)
Distribution of awareness leaflets in the project beneficiary communities	Leaflets distributed	Quarterly	Review the number of leaflets distributed		

9.6 Public Participation

The offices of the Scheme Management Entity will always be open to the general public for complaints/grievances, suggestions and advice on environmental and social related issues. Complaints and suggestions may also be channelled through the Scheme Manager, FSRP PIU, LMKMA, SODA and WUA executives.

9.7 Capacity Building and Training

Capacity building and training will be organized to guide the implementation of the ESMP, Permit Schedule, triggered World Bank Environmental and Social Standards and environmental management. The training on the ESMP implementations will include the public health and safety issues, Grievance Mechanism for the project, ESMP monitoring and reporting. The capacity building issues are detailed in below.

9.7.1 Objectives of the Capacity Building and Training

The main objective of the capacity building and training activities is to create, enhance and develop the necessary skills and abilities for successful implementation of the proposed project.

9.7.2 Methodology for the Capacity Building and Training

The methodology to implement the capacity building and training will include:

- Workshops and site meetings;
- Field demonstrations and trainings; and
- Community sensitization.

It is recommended that the site meetings discuss the ESMP issues and any health and safety issues identified during the month. Non-compliances identified during monitoring would be reviewed and corrective actions taken. A capacity building measure proposed to achieve this is provided in Table 9.28.

Table 9.28 Capacity Building and Training Plan

N o.	Activity	Target Group/ Participants	Timeline/ Frequency	Proposed Facilitator	Estimated Cost/(USD)
CONSTRUCTION PHASE					
1.	Training Workshop on ESMP, grievance mechanism, public health and safety issues, ESMP monitoring and reporting, Permit Schedule, triggered World Bank	<ul style="list-style-type: none"> • FSRP/GIDA • Construction Supervisor • Contractor 	Project design phase and prior to construction works	Environmental and Social Safeguards Specialist (FSRP/ GIDA) / Environmental Consultant	Included in Project Cost

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N o.	Activity	Target Group/ Participants	Timeline/ Frequency	Proposed Facilitator	Estimated Cost/(USD)
	Environmental and Social Standards				
2.	Health and Safety induction	Construction workers	Construction phase	Contractor	Part of Contractor's duties
3.	Health and safety briefings	Construction workers	Weekly	Contractor	Part of Contractor's duties
4.	Site meetings	<ul style="list-style-type: none"> • Construction Supervisor • Contractor • FSRP/GIDA 	Monthly	Construction Supervisor / Contractor/ FSRP/GIDA	5,000.00
5.	Community sensitization on project, environmental and health & safety issues, grievance mechanism, etc.	Project communities	Periodically during construction phase	FSRP/GIDA	10,000.00
OPERATIONAL PHASE					
1.	Refresher training workshop on ESMP, grievance mechanism, public health and safety issues, ESMP Monitoring and reporting, Permit Schedule, Triggered World Bank Environmental and Social Standards	<ul style="list-style-type: none"> • SME • WUA Committees and Executives • Anchor Farmers (Leaders) 	One-off training at commencement of Agricultural development and operational phase	Environmental and Social Safeguards Specialist (FSRP/ GIDA) / Environmental Consultant	3,000.00
2.	Health and Safety Meetings	<ul style="list-style-type: none"> • SME staff • WUA Committees • Anchor farms workers • Smallholder farmers 	Monthly	Farmer Support Services Manager/ Agric Committee	As part of duties of FSSM/ Agric committee
3.	Field demonstrations and in-service	<ul style="list-style-type: none"> • Anchor farmers 	Periodically	FSSM/	1,000.00 annually

N o.	Activity	Target Group/ Participants	Timeline/ Frequency	Proposed Facilitator	Estimated Cost/(USD)
	trainings on agronomic practices, appropriate use and handling of agrochemicals, environmental health and safety issues, waste management, etc.	<ul style="list-style-type: none"> Smallholder farmers 		Agric Committee	
4.	Community sensitization on project, environmental and health & safety issues, grievance mechanism, etc.	-Project communities	Biannually	FSSM of SME	1,000.00 annually
TOTAL COST					20,000.00

9.8 Grievance Mechanism

The Grievance Mechanism captured in this report was adapted from the Standalone Grievance Mechanism developed by FSRP 2 for the WAFSRP, which has been approved by the World Bank. A grievance is any query, call for clarification, problems, and concerns raised by individuals or groups related to activities undertaken or processes applied by the project. Grievances can be an indication of growing stakeholder concerns and can escalate if unidentified and resolved. The management of grievances is therefore a vital component of stakeholder management in ensuring the sustainability of the project. A Grievance Mechanism (GM) is therefore a system by which queries or clarifications about a project are responded to, problems that arise out of implementation are resolved and grievances are addressed efficiently and effectively. An effective and efficient GM should have multiple avenues or channels for lodging complaints, transparency, promptness and timeliness of responses and clear procedures.

For the rehabilitation and modernisation of the KIS, the GM of FSRP2 was adopted. Special attention will be paid to accessibility of the GM to the disadvantaged and vulnerable individuals or groups who may be affected by rehabilitation activities during implementation. The prime objectives of the grievance process are to ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants by using Alternative Dispute Resolution (ADR) approach and avoid the need to resort to judicial proceedings at the courts. Specifically, the GM:

- Provides affected people with avenues for making a complaint and/ or resolving any dispute that may arise during the course of the implementation of the project;

- Ensure that appropriate and mutually acceptable redress actions are identified and implemented to the satisfaction of complainants;
- Helps community members build relationship of trust with the project staff and reduces social risk, and enables more responsive and responsible management;
- Ensures transparency in dealings amongst stakeholders including affected parties through a proper communication system; and
- Provide avenue for vulnerable groups and victims of SEA/SH to have equal access to grievance redress process and support.

9.8.1 Grievance Committee Structure

The Grievance Committees will be established to operate at two levels, namely. the Regional and MMDAs levels, that is the Regional Grievance Committee (RGC) and the District Grievance Committee (DGC). These will be assisted by Focal Person, the Agriculture Extension Agent (AEA). The RGCs will serve as a referral point where issues that are not resolved at the DGC level are referred to for settlement. Individual complainants who do not obtain satisfactory outcomes would have the opportunity to proceed to the Court of Law.

Regional Level

The RGCs consist of representatives from selected institutions/bodies. These institutions will be tasked to nominate their representatives to the RGC. These individuals will be trained prior to the start of work. The following institutions/bodies will have representation on the RGC:

- 1) Regional Coordinating Council (RCC) – Chairperson;
- 2) MoFA Regional Directorate – Secretary;
- 3) Regional Lands Commission;
- 4) Traditional Leaders;
- 5) Farmer/Value Chain Actor;
- 6) Judicial Service (the Ghana Association of Mediators and Arbitrators); and
- 7) Chairperson of a District Grievance Committee (where grievance was filed).

Municipal/District Level

A Municipal/District Grievance Committee (DGC) will be constituted of five (5) members represented by members of institution/bodies listed below. These institutions/bodies will be officially requested to nominate their respective representatives to the DGC for training prior to the start of work. The proposed representation of the Municipal/District Grievance Committee (DGC) is as follows:

- 1) Shai Osodoku District Assembly;
- 2) Lower Manya Krobo Municipal Assembly;
- 3) The Traditional Authorities;
- 4) Farmer/value chain actors;
- 5) Scheme Manager;
- 6) Cattle Farmer (cattle corridor);
- 7) NGOs; and

- 8) Agriculture Extension Agents (AEA) in the project area will be a non-voting member of the DGC.

The DGC will be the First Tier of the grievance system for processing and addressing complaints. After receiving a complaint filed by a complainant/aggrieved person through the Focal Persons/ DGC directly, the Focal Person/ DGC then categorizes the complaint into the Levels 1 – 4 for redress. The DGC then informs the party/parties involved and initiate an investigation process if required. A Grievance Logbook will be kept at all levels of the grievance system, i.e. by the Focal Person, DGC and RGC in which all complaints received at the respective level will be logged. Walk-in and phone call complaints will be received by the Focal person. If the investigations prove that the issue has to be processed, it does so by setting a date for the procedure. The DGC will then convene and handle the grievance so reported to have it resolved.

9.8.2 Mode of Making and Receiving Complaints

A person or group of persons that are affected or have concerns with the Project activity will have access to initiate a complaint with the designated offices/officers at the community level or with the DGC. Where the complainant cannot write, the issue can be narrated to the receiving officer who will write the issues out. It will be read to the complainant to accept the content before recorded in the Complaints Logbook. Apart from direct submission of complaint/ grievance to a designated office/ officer, the complainant can have the issue of concern written and submitted through any of the receiving avenues listed as follows:

- Referral pathway – Online Form;
- Contact numbers;
- E-mail system – separate email address for grievance mechanism;
- Bulletin Boards/Notice Boards; and
- Complaint boxes at the site.

9.8.3 Grievance Process

The GM implementation will follow clearly defined steps/processes. Individuals will bring forward grievances and disputes related to the project through the provided channels or in person to the GC that have been established in the project Districts and Focal Persons. The general steps of the grievance process comprise:

1. Receipt & recording of complaints;
2. Assessment & classification of complaint;
3. Investigation of causes;
4. Generation of options for solving the matter;
5. Dialogue with the parties involved in the complaint/ claim;
6. Resolutions of complaint;
7. Drafting of report and follow-up; and
8. Alternative actions for unresolved complaints.

The PIU of FSRP 2 will sensitize the project communities on the need to resort to the GM to address issues that may come up. They will be informed of the application of GM. The project communities will be made aware of the establishment of the DGCs at the MMDA level. They will also be informed of the availability of Focal persons (community representative) that they can reach and file complaints with. They will be again informed of the various means/channels through which they can present complaints for the needed attention and resolution. Complaints received will be sorted into four levels as follows:

- Level 1: Complaints and enquiries that can be responded to promptly, e.g., reason for road diversion, alternate road provided, and length of time diversion will be in place;
- Level 2: Complaints that border on disputes between communities and projects; public agencies and Communities; investors and public agencies; amongst and within the communities as well as labour issues;
- Level 3: Complaints related to valuation of project affected properties/items; and
- Level 4: Complaints that border on integrity of persons including fraud or crime – corruption, rape, GBV, SEA/SH and and/ or forced labour issues.

After verification and classification of complaints by Focal Persons, those that fall within levels 2, 3 and 4 will be referred to the DGC. Levels 2 and 3 complaints will be investigated and attended to by the DGC. For Level 4 complaints, which border on crime/corruption, the complainants will be advised on the appropriate steps to get it resolved, since such complaints cannot be handled by the FSRP grievance system. Some examples of Level 4 complaints include stealing, extortion, sexual exploitation, abuse or harassment, forced labour etc. In the case of sexual abuse, exploitation and harassment, the complainant will be advised and referred to a desk that handles related issues at the Ministry of Gender, Children and Social Protection (MoGCSP) for counselling and further guidance, if the complainant so wishes. The Social Specialist (SS) of the PIU of FSRP will liaise with the said outfit at the MoGCSP and collaborate with them for referrals and redress. Complaints that fall within Level 1 which requires simple explanations/ responses will be attended to by Focal Persons and discontinued.

Once grievances are resolved, the Chairman of the committee will complete the Grievance Uptake Form (Appendix 6) detailing and confirming the resolution. The form will be signed by the complainant, and other parties. A complaint logbook will be opened for all complaints at the project level. All DGC minutes will be recorded and made available for review upon request. Table 9.29 provides a summary of grievance mechanism procedure and timelines.

Table 9.29 Summary of Grievance Mechanism Procedure and Timelines

Steps	Process	Actions/ Description	Time frame
1	Receipt & recording of complaints	Complaint (Project Affected Person/ Community) will be received through: (1) face to face (2) phone (project DGC Offices, hotline) (3) letter/ e-mail (4) during public/ community interaction	Day 1 (after receipt of complaint)

Steps	Process	Actions/ Description	Time frame
		Complaint recorded	
		Receiver forwards complaint to DGCs	
2	Assessment & Classification of complaint	Document complaint in Formal Logbook	2 – 3 Days after receipt of complaint
		Sort/ Classify complaint	
		Acknowledgement of complaint through appropriate medium	
		Level 1 complaints responded to and resolved	5 Days (within a day to 5)
3	Investigation of causes	DGC investigates the cause of complaint	8 – 10 Days
4	Generation of options for solving the matter	DGCs deliberates on suitable options for resolution of complaint	12 – 13 Day
5	Dialogue with the parties involved in the complaint/ claim	Parties agree on options adopted (Levels 2 & 3)	11 Day (After investigation is done)
6	Resolutions of complaint	Redress action is implemented and communicated to complainant (if the complainant is not present at time of redress)	15 – 17 Days
7	Drafting of report and follow-up	A detailed report on the resolution is prepared	20 Days (3 Days after the complaint is resolved)
8	Alternative actions for unresolved complaints.	If satisfactory resolution is not reached, issue is forwarded to the Regional Grievance Committee (RGC) for resolution	27 – 30 Day
		Documentation, tracking, reporting and monitoring	(7 Days after final meeting where resolution was not reached)

9.8.4 Special Considerations for Children in Grievance Processes

Due to their young age, grievance cases that involve children under 18 are to be given special considerations and dealt with in accordance with the Child Act, 1998 (560) and MoGCSP Standard Operating Procedures (SOPs) for Child Protection and Family Welfare cases.

The grievance mechanism should be alerted:

- If a child below 14 is working in connection to project activities;
- If a child between 14 and 15 is found working in connection to project activities under conditions that are not qualified as light socializing work;
- If a child below 18 is found to perform hazardous work;

- If a child below 18 is suspected of being forced to work, or to be a victim of child trafficking; and
- If child is victim of violence or abuse, including sexual abuse and sexual exploitation.

9.8.5 Reporting of Child Labour Cases

The PIU through the GC will make available reporting hotlines where cases of child abuse, child labour, child trafficking, forced labour involving staff/contractors and sub-contractors of the project can be reported. Reports will be registered, assessed and referred as provided in Figure 9.2.

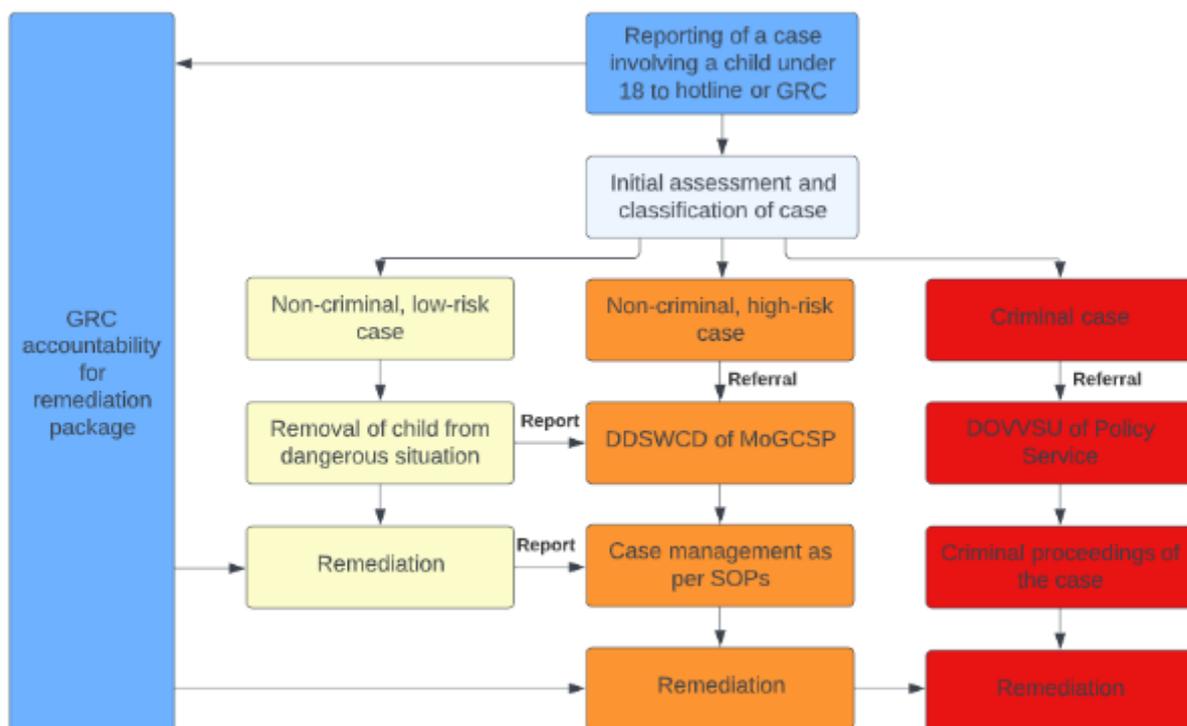


Figure 9.2 Mechanisms for dealing with Child Labour Cases

9.8.6 Sexual Exploitation and Abuse and Sexual Harassment

Cases received by the GM on sexual exploitation and abuse related to the project, will only be recorded after securing full consent of the complainant in line with survival centred approach. The Social Specialist will then refer the complainant to the appropriate SEA/SH service provider or relevant government authorities in line with the SEA/SH Risk Mitigation and Response Action Plan. As part of contractor's agreement, each contractor would be required to sign a code of conduct to mitigate potential risk of SEA /SH. In cases, where the perpetrator(s) is linked to project activities then the contractor will take appropriate actions as per the provision of the contractor's contract agreement and under the effective law in Ghana. The PIU will report activities and outcomes of SEA surveillance and management to the World Bank on a regular basis. The procedure for SEA/SH mechanism (Figure 3) will include:

- 1) Reporting of SEA/SH;

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

- 2) Investigation and referral of complaint to national authority; and
- 3) Disciplinary measures.

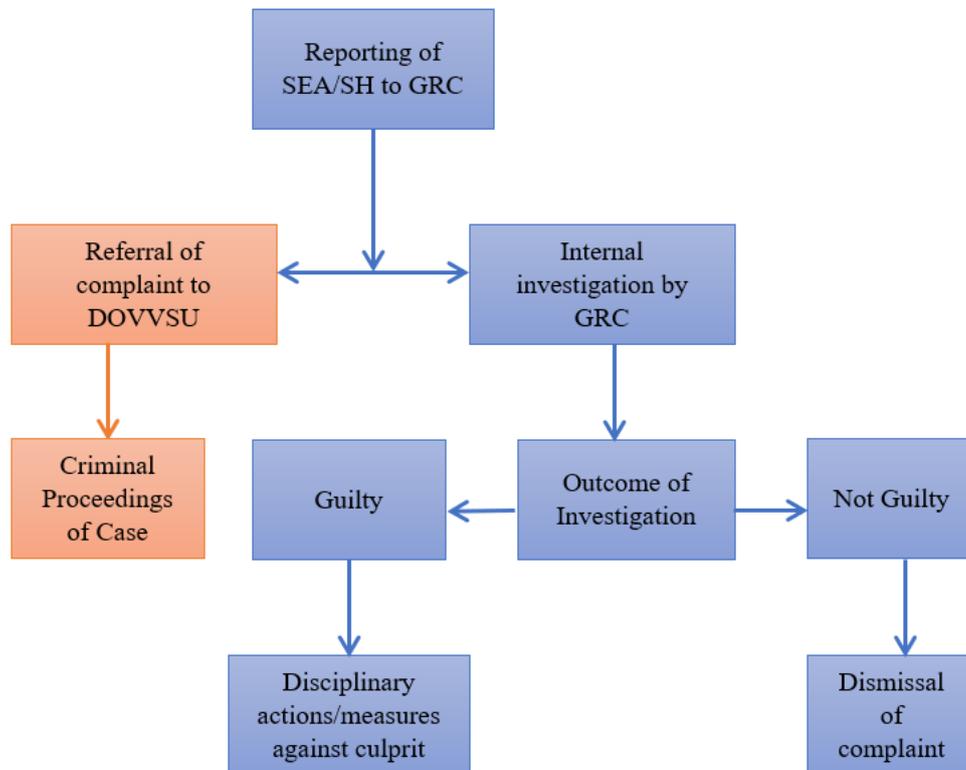


Figure 9.3 SEA/SH Mechanism

The Dispute Settlement Committee of the WUAs will continue to handle and resolve issues involving farmers that border on water delivery or farming practices. Where farmers from different WUAs have issues on agronomical practices or water delivery, the federation of WUAs will resolve such issues.

9.9 Environmental and Social Management Budget

The PESMP described above require detailed cost analysis after project development to determine the budget needed for implementation. Management has however earmarked Ninety-nine Thousand One Hundred United States Dollars (USD 99,100) annually on environmental monitoring and training and awareness creation programmes as well as reporting as shown in Table 9.30. This figure is subject to review following confirmation from cost studies to be carried out after project development phase.

Table 9.30 Environmental and Social Management Budget

No.	Programme	Cost/year (USD)
1.	Environmental monitoring (refer to Section 9.5)	5,000
2.	Implementation of mitigation and enhancement measures (refer to Section 9.4)	29,100
3.	Environmental, Health and Safety Training Programmes	10,000
4.	Capacity building and training	20,000
5.	<u>Environmental Auditing and Reporting</u> <ul style="list-style-type: none"> • Annual environmental, health and safety audits • Mid-term E&S Audit • Final E&S Audit • Returns of Monitoring Reports to EPA (in line with LI 1652) • Preparation of Annual Environmental Reports (in line with LI 1652) • Preparation of Environmental and Social Management Plan 18 months after the acquisition of the Environmental Permit and thereafter every 3 years (in line with LI 1652) 	30,000
6.	<u>Grievance Management and Stakeholder Meetings</u>	5,000
Total		99,100

10.0 EMERGENCY RESPONSE PROCEDURES

Response measures have been proposed for the following emergencies which may arise during project implementation:

- Fire;
- Medical or Accident;
- Agrochemical Spill;
- Oil Spill; and
- Flooding.

10.1 Fire Emergency

Small fires

Small fires would be put out quite safely. A simple firefighting procedure to be followed to put out a small fire is provided below:

- The first person to sight the fire must sound the fire alarm if at a warehouse/ workshop/ office premises or shout FIRE!! FIRE!! FIRE!! if at the farm.
- Farmers and workers trained to use fire extinguishers (fire volunteers) are permitted to fight fire on site. All others must evacuate the area.
- Tackle fire in its very early stages at the source.
- Always put your own and other people's safety first. Make sure you can escape if you need to and never let a fire block your exit.
- Never tackle a fire if it is from a position against the prevailing wind direction and if the source cannot be determined. If in an enclosed area such as warehouse/workshop/office premises, never tackle a fire if it is starting to spread or has spread to other items in the room or if the room is filling with smoke.
- If the situation is solved, investigate the reason for the fire and clean the place.
- Report to the HSE Officer of Contractor during the construction phase and the FSSM during the operation phase.

Large fires

These are fires that cannot be put out by the trained fire volunteers and the GNFS will have to be called to fight it. The evacuation procedures to follow include:

- The first person to sight the fire must sound the fire alarm if at the warehouse/mill/ workshop/office premises or shout FIRE!! FIRE!! FIRE!! if at the farm.
- Evacuate the building or area and report at the ASSEMBLY POINT.
- Immediately report to the Agric Committee/FSSM to call the GNFS.
- Contact numbers of the GNFS (Shai Osudoku District/Lower Manya Krobo Municipality) will be conspicuously displayed at offices, warehouses, and workshop.
- The Agric Committee /FSSM has to check on remaining farmers and workers and carry out a fast, calm and secured evacuation.
- A head count will be conducted to ensure all farmers and workers are safe and present;

- If there has been any injuries, they will be conveyed to the nearest health facility (Osuwem and Asutsuare Health centres, Shai Osudoku District Hospital, Dodowa).
- Keep records of any injuries and the fire event.

10.2 Medical Emergency or Accident

In the event of any accident or injury the procedures to follow include:

- If it is a minor accident/injury and the victim can move, he/she should report to any member of the Agric Committee of the WUA.
- The member of the Agric Committee who is trained in administering first aid, will treat the injury.
- The member of the Agric Committee will decide if the victim needs further treatment at the Medical Centre and if so, will arrange together with the FSSM for the victim to be sent to the nearest health facility (Osuwem and Asutsuare Health centres, SODA District Hospital, Dodowa) immediately.
- The member of the Agric Committee together with the FSSM will investigate and take records of the accident/injury including the source and cause of the accident/injury.
- If the accident/injury is such that the victim cannot move by him/herself but can be moved, the farmer/workers present should assist him/her to the member of the Agric Committee to administer first aid and arrange for the person to be sent to the nearest health facility immediately.
- If the accident/injury is such that the victim cannot be moved, the workers/farmers present should put him in a stable condition and immediately call the member of the Agric Committee/FSSM. The FSSM will immediately arrange for medical staff from the nearest health facility to be brought to the farm to attend to the victim.
- All accidents and injury will be recorded by the ESSM.

In the event of someone falling into the canals the following measures should be followed:

- The first person to sight the victim should immediately raise an alarm by shouting HELP!!HELP!!HELP!! to call a member of the Taskforce to the site.
- The member of the Taskforce (who is trained as a lifeguard) should immediately assess the situation and carry out a rescue mission. The member of the Taskforce should be mindful of his own safety when carrying out a rescue mission and should call for assistance from other members when the need arises.
- Perform a resuscitation on the victim where necessary and administer first aid.
- Take the victim to the nearest health facility for further treatment.
- Report to the FSSM
- An investigation should be conducted and records of the incident kept.

10.3 Agrochemical Spill

Agrochemical spills involving spillages of stored fertilizers, pesticides and weedicides/herbicides may occur in storage sheds/rooms or on the farm when in use. The procedures to follow include the following.

For spillages on concrete floors such as at storage sheds/rooms;

- If the spilled agrochemical is solid such as granulated fertilizer, quickly gather and collect the product using the appropriate PPE such as gloves and wash the area with a lot of water and disinfectant.
- If the spilled agrochemical is liquid, quickly contain the spillage using saw dust provided at the site to prevent the spilled product from spreading. Collect the used saw dust, wash the surface with a lot of water and disinfectant and report to a member of the Agric Committee who will decide the appropriate disposal of the used saw dust together with the FSSM.
- If the spilled product gets into contact with any part of the body, quickly wash the body part with a lot of clean running water and immediately report to a member of the Agric Committee /FSSM.

For spillages at the farm;

- If the spilled product is solid such as granulated fertilizer, gather and collect the product which would have mixed with soil using a shovel and wearing gloves and report to a member of the Agric Committee /FSSM to decide on its use or disposal.
- If the spilled agrochemical is liquid, immediately use a shovel to scoop the contaminated soil into a container. Ensure to scoop beyond the contaminated area to ensure no contaminated soil is left uncollected. Immediately report to the member of the Agric Committee to take a decision on its appropriate disposal together with the FSSM.
- If the spilled product gets into contact with any part of the body, quickly wash the body part with a lot of clean running water and immediately report to the member of the Agric Committee /FSSM/.

10.4 Oil Spill

Oil spills may involve spillages of fuel and lubricants which may occur whiles in storage or in use on hard surfaces (concreted/ tiled/paved floor) such as at storage sheds/rooms, workshop or on the ground.

Spillage on hard surface

- Immediately contain the spillage using saw dust provided at the site to prevent it from spreading.
- Collect the used saw dust, wash the surface with a lot of water and disinfectant and report to the member of the Agric Committee who will decide the appropriate disposal of the used saw dust together with the FSSM.
- If the spilled product gets into contact with any part of the body, quickly wash the body part with a lot of clean running water and immediately report to the FSSM.

Spillage on the ground

- Immediately use a shovel to scoop the contaminated soil into a container. Ensure to scoop beyond the contaminated area to ensure no contaminated soil is left uncollected.

- Immediately report to the member of the Agric Committee to take a decision on its appropriate disposal together with the FSSM.
- If the spilled product gets into contact with any part of the body, quickly wash the body part with a lot of clean running water and immediately report to the FSSM.

10.5 Flooding

Flooding of the farm may occur from continuous heavy rainfall resulting in pools of water in low lying areas of the field, including the paddy fields for rice cultivation, or the distribution canals and streams overflow their banks to flood portions of the farm. As a preventive measure to flooding, the following measure must be followed especially during the rainy season;

- Drainage channels for paddy fields should be cleared of silt and weeds to allow free flow of water.
- Channels in between plots for other crops should be opened at the commencement of the rainy season by clearing any weeds, dead vegetative material or soil to allow free flow of water during the rainy season.

When such flooding occurs the measures to follow include:

- For paddy fields (rice cultivation area), open the wastewater outlet of the paddy field to allow the water flow out.
- For other low lying areas of the field inundated with water, create channels to link the flooded areas to the “inter-plot” channels to allow the flood water flow through the “inter-plot” channels out of the farm.
- Stay away from the boundary of the streams, drainage channels and canals. If possible, use pegs/poles to show the boundary of the streams, drainage channels and canals to serve as a guide to others.
- Report to the member of the Agric Committee /FSSM.

11.0 DECOMMISSIONING

The scope of decommissioning is categorised below under post-construction and post operational phase. Post construction decommissioning involves work camp facilities and equipment, while post operational phase decommissioning will involve the reservoir and irrigation and drainage infrastructure management.

11.1 Post-construction Decommissioning

The work camp facilities will be dismantled and relocated for use at other project sites of the contractor. Bulldozer, hydraulic excavator, pumps, generators, vehicles and other equipment and machinery used for the project will be relocated to new or other project sites in the country managed by the Contractor. It will be ensured that all borrow pits created are reclaimed prior to the relocation of the project machinery and equipment.

Any waste to be generated from the decommissioning process will be properly disposed in accordance with the principles of the waste management hierarchy. Recyclable waste such as machinery and equipment parts will be handed over to scrap dealers for recycling. Non-recyclable waste will be collected and dumped at the Shai Osudoku District approved dump site by an accredited waste management company. The appropriate Oil Marketing Company (OMC) will dismantle any fuel storage tank and the single dispensing pump stand if any.

11.2 Post-Operational Phase Decommissioning

The proposed Irrigation and Drainage Infrastructure will not be decommissioned, but will be rehabilitated when necessary to ensure the continued operation of the Kpong Irrigation Scheme. However, before any future large-scale rehabilitation work is undertaken, a new environmental impact assessment study will be carried out in accordance with the Environmental Assessment Regulations 1999, LI 1652. The EPA will be notified through registration of the undertaking. Other stakeholders such as the Water Resources Commission, the Shai Osudoku District Assembly and Lower Manya Krobo Municipal Assembly will be informed prior to the commencement of such a project.

The project is analysed over a 25-year period, during which it is expected that most of the civil work's structures would still be in a good state of use. The crops to be cultivated are annual crops and will complete their life cycle, from germination to production of seed, within one year. They can be cultivated for as long as the necessary factors of soil nutrient, water availability, market availability etc. exist.

11.2.1 Decommissioning Plan

In keeping with environmental regulations of the country including the Environmental Assessment Regulations 1999, LI 1652, a reclamation or post project closure plan with time frame and cost estimates will be periodically discussed with the relevant regulatory authorities (the EPA, FSRP and Lower Manya Krobo Municipal Assembly and Shai Osudoku District Assembly). An ESIA would be prepared to cover reclamation or post project closure.

Potential Decommissioning Activities

In the event that the project has to be decommissioned, this will be done at the end of the planting season. The principles of the mitigation hierarchy namely, Reduce, Reuse, Recycle and Recover (4 R's) will be applied in all decommissioning phase activities. The likely activities to be carried out during decommissioning of the project are further as follows.

Stakeholder Engagement

Before a decision is taken to discontinue the proposed rehabilitation project, GIDA /KIS will extensively inform and make its programme available to relevant stakeholders including regulatory agencies such as the EPA, WRC, and GNFS, other government agencies such as the Lower Manya District Assembly, Shai Osudoku District Assembly, local authorities including the Chiefs and elders of the Osudoku and Manya Traditional Council. Consultations will also be held with farmers.

Evacuation of Farmers and Workers

At the end of the last farming season, farmers and workers within the KIS will be made to leave the project site. Work at warehouses, workshops and offices will also cease after the last consignment of produce are sold and workers made to leave.

Removal of Moveable Property

Moveable property including equipment and machinery will be removed from the site and sent to new project sites for use or sold to potential users or donated.

Transfer of Ownership of Non-Moveable Property

Non-moveable property which will include the canal system will not be demolished. They will be handed over to the government through the Lower Manya Municipal Assembly and Shai Osudoku District Assembly for reuse.

Waste Management

Any waste to be generated from the decommissioning process will be properly disposed. Recyclable waste such as machinery and equipment parts will be handed over to scrap dealers for recycling. Non-recyclable waste will be collected and dumped at the District Assembly's' approved dump site.

Site Restoration/Rehabilitation

To restore the irrigation scheme farmlands, the management will plant trees (including nitrogen fixing trees) and cover crops within the project area. This will be done in consultation with the Lower Manya Krobo Municipal Assembly and Shai Osudoku Municipal Assembly and other stakeholders such as the landowners and community leaders.

11.3 Cost of Decommissioning after Construction

The cost estimate for implementation of Environmental and Social risk management during decommissioning of the construction site would be \$3,500. This amount has been incorporated into the project cost. The cost estimate took into consideration the following cost areas:

Activity	Cost (USD)
Hiring of labour	1000
Fuel	500
Plants for landscaping	1,000
Monitoring	1,000
Total	3,500

12.0 CONCLUSION

FSRP2 and the Scheme Management Entity of KIS recognise the provisions in the EPA Act 1994, Act 490 and EA Regulations 1999, LI 1652 and remain committed towards compliance with the laws. This updated ESIA has thoroughly identified and assessed key environmental and social impacts and concerns that may arise from the implementation of the proposed rehabilitation and Modernisation of the KIS project.

Consultations with applicable stakeholders, review of relevant literature, field inspections and studies emphasised the identification of the project adverse environmental and social impacts. Mitigation measures have been provided to address these impacts, while management and monitoring plans have been prepared to track the implementation of the mitigation measures. The recommendations laid out in the management plan would ensure a high level of environmental protection is maintained.

Furthermore, the MoFA through the FSRP2 and the Scheme Management Entity are committed to ensuring sustainable environmental management and safeguarding the health and safety of the farmers and all other workers, as well as the general public, during the implementation of the project. Inputs, views and concerns from stakeholder consultations with all relevant stakeholders, were integrated into this report.

The proposed rehabilitation project has the potential to provide numerous benefits to the project communities and the national economy. These include employment opportunities for farmers and farm hands, workers, enhancement of income and livelihoods, increased food production, food security and improvement in revenue generation of regulatory institutions and the national economy.

The recommendations outlined in this updated ESIA will ensure a high level of health, safety and environmental management for the proposed rehabilitation and modernisation of the KIS project. Therefore, increasing the environmental and social soundness of the project in line with both applicable national and international laws and procedures.

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APPENDICES

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Appendix 1.0 Introductory Letter

**WEST AFRICA FOOD SYSTEM RESILIENCE PROGRAMME (FSRP)
MINISTRY OF FOOD AND AGRICULTURE**

Our Ref. No: MC 275/371/02

January 11, 2023

TO WHOM IT MAY CONCERN

Dear Sir/ Madam,

**INTRODUCTORY LETTER - REQUEST TO HOLD A STAKEHOLDER
CONSULTATION WITH YOUR ORGANIZATION**

The Ministry of Food and Agriculture (MoFA) is developing the West African Food System Resilience Project (FSRP) as part of measures to address the impact of climate change and Covid -19 on food systems in the West African sub-region.

As part of preparatory activities for FSRP, the Project Implementation Unit (PIU) is coordinating the preparation of relevant studies required for the implementation of the project activities

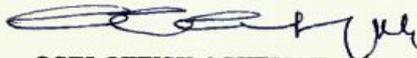
The PIU worked with the Ghana Irrigation Development Authority (GIDA) to identify some irrigation schemes which will be rehabilitated and modernized which includes the Kpong Irrigation Scheme (KIS).

In compliance with the World Bank Environmental and Social Framework (ESF) and the Ghana's national environmental requirements, preparation of Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plans (ESMP) is required for this rehabilitation works.

We therefore wish to introduce to you the Consultants (**Ing. William Amelorku**) and his team who have been recruited to prepare these documents for the Scheme.

We would be grateful if you can accord him the needed support to undertake these consultations with the relevant stakeholders in your organization.

Counting on your cooperation



**OSEI OWUSU-AGYEMAN
PROJECT COORDINATOR**

P. O. Box M37, Ministries, Accra | +233 (0)24 243 5901

Appendix 2.0

Engagement Notification Letter

<p style="text-align: right;">Ing William Kodzo Ametorku P. O. Box A305, La Accra 22nd January 2023</p> <p>The District Health Director Shai Osudoku District Dodowa</p> <p>Dear Sir,</p> <p><u>STAKEHOLDER ENGAGEMENT: UPDATE OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR Kpong IRRIGATION SCHEME</u></p> <p>We have been engaged by Ministry of Food and Agriculture (MoFA) through the Food Systems Resilience Project to update the site Specific Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plans prepared for the rehabilitation and modernisation of the Kpong Irrigation Scheme (KIS). In line with the requirements in the preparation of Environmental and Social Impact Assessment Report (in line with the requirements of the Environmental Assessment Regulations, LI 1652), Stakeholder Consultation has to be undertaken for input for the rehabilitation and modernization of the two scheme.</p> <p>As part of the environmental and social assessment for the study, a number of consultation meetings with key stakeholders are planned in Accra and the project area between 22nd and 31st January 2023. The purpose of the meeting is to inform Stakeholders of the progress made on the project and solicit your views and inputs, including concerns and expectations on the issues outlined in the table attached to the letter including introduction (Greetings / Presentation of Participants / Meeting Objectives) and presentation of the Project.</p> <p>Your institution is considered a key stakeholder, and therefore scheduled for consultation meeting on Tuesday, January 31, 2023 with the consultants.</p> <p>Thank you.</p> <p>Yours sincerely,</p>  <p>Ing. William Kodzo Ametorku Contact No. +233243631936 E-Mail: williamametorku@gmail.com</p>	<p style="text-align: right;">Ing William Kodzo Ametorku P. O. Box A305, La – Accra 22nd January 2023</p> <p>The District Fire Officer Ghana National Fire Service Shai Osudoku District Dodowa</p> <p>Dear Sir,</p> <p><u>STAKEHOLDER ENGAGEMENT: UPDATE OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR Kpong IRRIGATION SCHEME</u></p> <p>We have been engaged by Ministry of Food and Agriculture (MoFA) through the Food Systems Resilience Project to update the site Specific Environmental and Social Impact Assessments (ESIAs) and Environmental and Social Management Plans prepared for the rehabilitation and modernisation of the Kpong Irrigation Scheme (KIS). In line with the requirements in the preparation of Environmental and Social Impact Assessment Report (in line with the requirements of the Environmental Assessment Regulations, LI 1652), Stakeholder Consultation has to be undertaken for input for the rehabilitation and modernization of the scheme.</p> <p>As part of the environmental and social assessment for the study, a number of consultation meetings with key stakeholders are planned in Accra and the project area between 22nd and 31st January 2023. The purpose of the meeting is to inform Stakeholders of the progress made on the project and solicit views and inputs, including concerns and expectations on the issues outlined in the table attached to the letter including introduction (Greetings / Presentation of Participants / Meeting Objectives) and presentation of the Project.</p> <p>Your institution is considered a key stakeholder, and therefore scheduled for consultation meeting on Tuesday, January 31, 2023 with the consultants.</p> <p>Thank you.</p> <p>Yours sincerely,</p>  <p>Ing. William Kodzo Ametorku Contact No. +233243631936 E-Mail: williamametorku@gmail.com</p>
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Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

Ing William Kodzo Amelorku
P. O. Box A305, La – Accra
22nd January 2023

The Divisional Police Commander
Shai Osudoku
Dodowa

Dear Sir,

STAKEHOLDER ENGAGEMENT: UPDATE OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR Kpong IRRIGATION SCHEME

We have been engaged by Ministry of Food and Agriculture (MoFA) through the Food Systems Resilience Project to update the site Specific Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan prepared for the rehabilitation and modernisation of the Kpong Irrigation Scheme (KIS). In line with the requirements in the preparation of Environmental and Social Impact Assessment Report (in line with the requirements of the Environmental Assessment Regulations, LI 1652), Stakeholder Consultation has to be undertaken for input for the rehabilitation and modernization of the scheme.

As part of the environmental and social assessment for the study, a number of consultation meetings with key stakeholders are planned in Accra and the project area between 22nd and 31st January 2023. The purpose of the meeting is to inform Stakeholders of the progress made on the project and solicit views and inputs, including concerns and expectations on the issues outlined in the table attached to the letter including introduction (Greetings / Presentation of Participants / Meeting Objectives) and presentation of the Project.

Your institution is considered a key stakeholder, and therefore scheduled for consultation meeting on Tuesday, January 31, 2023 with the consultants.

Thank you.

Yours sincerely,

Ing. William Kodzo Amelorku
Contact No. +233243631936
E-Mail: williamamelorku@gmail.com

The Project Coordinator
FSRP
MoFA Projects office
Government Secretarial School, Cantonments, Accra.
P. O. Box M.37, Accra, Ghana
22nd November 2022

The Executive Director
Environmental Protection Agency
P O Box M326
Ministries, Accra

Dear Sir,

NOTIFICATION: UPDATE OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENTS (ESIAs) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLANS (ESMPs) FOR Kpong AND VEA IRRIGATION SCHEMES

We write to notify you of the intention of the Ministry of Food and Agriculture (MoFA) through the Food Systems Resilience Project to update the site Specific Environmental and Social Impact Assessments (ESIAs) and Environmental and Social Management Plans prepared for the rehabilitation and modernisation of the Kpong Irrigation Scheme (KIS) and the Vea Irrigation Scheme (VIS). Ghana Agriculture Commercial Project (GCAP) prepared Environmental and Social Impact Statements (ESISs) and Environmental and Social Management Plans (ESMPs) for the rehabilitation and modernization of the two schemes in 2018. However, due to inadequate funds, works could not be completed at the KIS and started at the VIS. The ESIAs and ESMPs of the two schemes must therefore be updated to account for any significant changes including baseline conditions, new stakeholders etc., which might have changed the potential risks and impacts associated with these works.

More importantly, site specific ESIAs and ESMPs are to be prepared for each selected site by FSRP2 per the requirement of the Project's Environment and Social Management Framework (ESMF) prepared for the project. Given that the ESIAs for both schemes under GCAP were prepared under the World Bank Operational Policies (OPs) and since the FSRP2 was prepared under the World Bank Environmental and Social Framework (ESF), there is a need to revise the ESIAs to comply with the requirements of relevant World Bank Environmental and Social Standards (ESSs).

The revision of the existing ESIAs and ESMPs would be in response to the requirements of the ESF and would include measures to prevent child labour and forced labour, community health and safety as well as Sexual Exploitation and Abuse (SEA) and Sexual Harassment (SH). This is

Ing William Kodzo Amelorku
P. O. Box A305, La – Accra
22nd January 2023

The Coordinating Director
Shai Osudoku District Assembly
Dodowa

Dear Sir,

STAKEHOLDER ENGAGEMENT: UPDATE OF ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) AND ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP) FOR KPONG IRRIGATION SCHEME

We have been engaged by Ministry of Food and Agriculture (MoFA) through the Food Systems Resilience Project to update the site Specific Environmental and Social Impact Assessment (ESIA) and Environmental and Social Management Plan prepared for the rehabilitation and modernisation of the Kpong Irrigation Scheme (KIS). In line with the requirements in the preparation of Environmental and Social Impact Assessment Report (in line with the requirements of the Environmental Assessment Regulations, LI 1652), Stakeholder Consultation has to be undertaken for input for the rehabilitation and modernization of the two scheme.

As part of the environmental and social assessment for the study, a number of consultation meetings with key stakeholders are planned in Accra and the project area between 22nd and 31st January 2023. The purpose of the meeting is to inform the District Assembly of the progress made on the project and solicit your views and inputs, including concerns and expectations on the issues outlined in table attached to the letter including introduction (Greetings / Presentation of Participants / Meeting Objectives) and presentation of the Project.

Your institution is considered a key stakeholder in this project, and therefore scheduled for consultation meeting on Tuesday, January 31, 2023 with the consultants.

Thank you.

Yours sincerely,



William Kodzo Amelorku
Contact No. +233243631936
E-Mail: williamamelorku@gmail.com

Appendix 3.0

Engagement Issues

3.1 EPA

1. Overview of the project
2. The view of the Agency on the need to update the ESIA to reflect the provisions of the World Bank Groups Environmental and Social Framework since the existing ESIA prepared under GCAP was guided by the Operation Policies and Bank Procedures
3. The following are some key potential impacts/risks that could arise from the development and modernisation of the irrigation scheme. Are there any others that could be added?
 - Impacts on lake water and groundwater resources;
 - Waste disposal impacts;
 - climate change impacts on the project;
 - Greenhouse gas emission;
 - Occupational health and safety impacts;
 - Community health and safety impacts;
 - Impacts of cattle invasion on project infrastructure
 - Biodiversity impacts;
 - Air quality impacts;
 - Noise and vibration;
 - Labour influx;
 - Cultural heritage;
 - Socio-cultural impacts including vulnerable groups, gender-based violence, sexual exploitation and abuse, child labour, among others; and
 - HIV/AIDS and STIs transmission risk.
4. What data are available on biodiversity and water quality issues related to the project

4.2 Ghana Irrigation Authority

1. Overview of project
2. Relevant documents and information on the general status of the irrigation scheme and impending plans underway for the rehabilitation and modernisation of the sections left
3. Sanitation issues on the scheme (with respect to toilet facilities for farmers) and current management measures in place and concerns.
4. Management of pesticides containers and provision for the management of obsolete chemicals
5. How is the wastewater following the draining of the scheme managed? Which streams take the discharged wastewater and which communities rely on such streams, if any?
6. What is the estimated employment opening and other opportunities for local communities arising from the irrigation development? What is the gender distribution?
7. How does the water level (variability) affect irrigation activities?
8. Cattle invasion of the scheme and how it is managed
9. Abuse of canal by local communities and ways of managing concerns
10. Measures in place to prevent drowning; have there been any incidence of drowning? Do you have an environmental and social incident reporting tool?
11. Have there been any incidence of flooding? Which areas are affected and how has it been managed?
12. How has the incompleteness of the project initially under GCAP affected farmers whose sections were not rehabilitated and how have they been coping until now

4.3 Ghana Police Service

1. Prevalence of/Data on gender-based violence, sexual exploitation and abuse, child labour among others in the district
2. Which areas is child labour practiced the most in the district
3. Measures to eliminate or control such concerns

4.4 Fire Service

1. Prevalence of bush fire in the district and courses
2. Bush fire concerns on the scheme and the processes involved in engaging GNFS to train farmers and fire volunteers on fire safety and prevention of bushfires

4.5 District Assembly

1. Notification of the Assembly on the update of the project and the impending works
2. Waste management infrastructure in the district including sanitation issues, especially around the area covering the irrigation scheme
3. What is the existing waste management situation in the municipality and conditions of district dumpsites?
4. How is the generation of special waste such as obsolete agro-chemicals and chemical containers of interest to the Assembly and how should such waste be managed on the scheme

4.6 Social Welfare and Community Development Department

1. Prevalence of/Data on gender-based violence, sexual exploitation and abuse, child labour among others in the district
2. Which areas is child labour practiced the most in the district
3. Measures being undertaken to eliminate or control such concerns
4. Prevalence of/Data on gender-based violence, sexual exploitation and abuse, child labour among others in the district
5. Children involvement in farming activities on the scheme
6. Other issues of concern

4.7 District Agricultural Department

1. Availability of training programmes for farmers including use and management of agro chemicals
2. Agro-chemical usage and related concerns including disposal of chemical containers after use.
3. Availability of machinery to facilitate crop production and related concerns
4. Support for farmers to be able to produce on a larger scale.
5. Cattle invasion of the scheme and related concerns and how this can be managed

Appendix 4.0

Engagement Outcomes

4.1 EPA

Date: 06/02/2023	Time: 3:30pm
Participants: Adriana Nelson – Director, Environmental Assessment and Audit	Consultant: Ing. William Kodzo Amelorku
Discussions	
<p>1. Permitting Requirements for the Project</p> <ul style="list-style-type: none"> After a technical committee meeting on the letter submitted by FSRP on the update of the ESIA's and ESMPs for both KIS and VIS, it was concluded that given that the existing ESIA's was prepared less than 5 years ago (2018) and that projects activities wouldn't change much, there was be no need for an update of the existing ESIA's to renew the current Environmental Permit. The TIN of FSRP would be required for an invoice to be prepared and issued and associated fees paid for the renew of the Environmental Permit 	

4.2 Ghana Irrigation Development Authority

Date: 31/01/2023	Time: 3:30pm
Participants: Prosper Gliste – Principal Engineer Lilian Darkoah Koranteng - Environmental Officer Ama Acheampong – Senior Sociologist Officer Ing. James Ashaley – Principal Engineer	Consultant: Ing. William Kodzo Amelorku
Discussions	
<p>1. Overview of project</p> <p>GIDA was very pleased that FSRP has received funding to complete the uncompleted section of the scheme (Section A) to realise the full potential of the KIS. GIDA pledged to support the project work with their experience in management of irrigation schemes.</p>	
<p>2. Cattle invasion and related issues</p> <ul style="list-style-type: none"> More watering troughs should be provided on the schemes for cattle grazing within the project area of influence. The development of pasture land within the scheme should not be encouraged as this would create problems for farmers and would encourage uncontrolled cattle invasion of the project area. Designated crossing points for cattle should be provided across the canal to prevent using farm roads by the cattle. 	
<p>3. Sanitation and related issues</p> <p>Toilet facilities should be constructed on the scheme. There are 15 Water User Associations (WUA) on the scheme, each with a head. The WUAs should be engaged on where to site the toilet facilities. GIDA has prepared a proposal on the construction of toilet facilities on irrigation schemes to improve upon sanitation and minimise the incidence of water borne diseases on the scheme. The bio digester technology can be employed on the scheme</p>	
<p>4. Drowning of locals and how this can be prevented</p> <p>Sensitisation to stop swimming and bathing in the canals should continue. Areas prone to drowning should be barricaded as the locals continue to abuse the canal through swimming and washing in spite of the installation of signage prohibiting the practise. Also, more foot bridges should be constructed at vantage points so farmers and their workers can access their farms (cross canals) easily. Enough foot bridges would also make it easier for community members to access designated points to collect water and avoid high risk areas</p>	
<p>5. Rehabilitation Works and How That Would Affect Local Communities in Section A Of The Scheme</p>	

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

- The canals serve as potable water source for local communities within the project area of influence. For construction works to commence, water to the canals would be closed/blocked to make way for removal of weeds, dredging and lining of the canals. The alternative water source which is borehole is salty, hence not used. It is therefore recommended that the project provides Reverse Osmosis (RO) system for the boreholes in these project communities to treat the borehole water for domestic use. During the rehabilitation of the sections B and C, tanker services were relied on for water supply to the communities close to these sections in the initial stages, however this was discontinued and RO installed to treat the boreholes.
- Laying farmers off their livelihood for the period of the rehabilitation work would have implications on the financial conditions of farmers. This could be mitigated by some form of compensation for the farmers. Again, the rehabilitation work could be phased to ensure that not all farmers are laid off at the same time.

6. Management of chemical containers

Agric Extension Officers who are staff of the Scheme Management Entity provide training to farmers on the management of chemical containers among other forms of training. Sanctions in the form of fines, implemented through the WUAs are in place to deter farmers from throwing chemical containers into the drains

7. Incompleteness of The Project Under GCAP and How it Has Affected the Locals

- Insufficient release of water into plots hampers utilisation of some plots.
- Flooding of some farm plots as water flow is difficult to regulate.
- Farm roads are not available for carting of harvested rice and access to farm plots for land preparation and harvesting by farm machinery is hampered
- Lack of farm roads for carting purposes means the use of children and labourers for activities that otherwise would be done by farm machinery, resulting in high labour cost and child labour issues
- Delay in farming activities as work is usually done manually at a slow pace.
- Trees around farms at the uncompleted site serve as hubs for quelea birds to invade farms.
- Cumulative effect is low yield, child labour, high cost of labour and low grain quality

4.3 Ghana Police Service

Date: 31/01/2023	Time: 3:30pm
Participants: DSP Georgina Tawiah Divisional DOVVSU Director	Consultant: Ing. William Kodzo Amelorku
Discussions	
1. Sexual Abuse and Harassment/Gender based violence	
<ul style="list-style-type: none"> • Cases exist especially in the district but usually unreported. Sensitisation is key to encourage reporting and prevent the practise. • The Police and the DA Social welfare department and community deployment departments could help with sensitisation if the projects call upon them 	

4.4 Fire Service

Date: 31/01/ 2023	Time:
Participants: David Kotey – Bush Fire Coordinator – GNFS	Consultants: Joshua Etse Wemegah Wilson Amelorku
Discussions:	
1. Prevalence of Bush Fire	

Bushfire is not prevalent; few cases caused by bush burning by herdsmen and land preparation by some farmers.

2. Bush Fire Concerns on the Scheme

The scheme is not fire prone because of the rice farming being closer to wetlands.

4.5 District Assembly

Date: 31/01/2023	Time:
Participants: Justice Glover – Presiding Member Agnes Kabutey – DEHO	Consultants: Joshua Etse Wemegah Wilson Amelorku
Discussions:	
<p>1. Update of the Project and Impending Works</p> <ul style="list-style-type: none"> The assembly are aware of the incompleteness of the project but have no prior knowledge of when the rehabilitation of the uncompleted phase will commence. The assembly showed it concerned with the length of the rehabilitation as it borders on the livelihood of the farming community. <p>2. Waste Management Structure</p> <ul style="list-style-type: none"> There is a final disposal site within the district but far from the project communities. Waste management in the district is basically by distribution of Zoomlion bins. Project communities don't benefit from this waste management scheme as they are far from the dumpsites. There is the need for regularized temporary dumping sites around the scheme. Waste segregation is carried out at the final dumping site. There also is a Community Led Total Sanitation (CLTS) programme adopted for sensitization on waste disposal and open defecation. <p>3. Condition of the District Dumpsite</p> <p>There is a final dumpsite and some temporary sites but most communities do not have dump sites, especially around the project communities.</p> <p>4. Generation and Management of Special Wastes</p> <ul style="list-style-type: none"> Some form of waste segregation is carried out at the final dumping sites to utilize any waste of profit. Farmers are educated on the disposal of chemical containers, principally by burying. Spatial monitoring of chemical waste disposal is carried out by the district environmental health department Education on, and monitoring of chemical waste disposal by farmers is impeded by availability of funds to the department There are still some problems with disposal of chemical containers by farmers on the scheme. 	

4.6 Social Welfare and Community Development Department

Date: 31/01/2023	Time:
Participants: Eunice Owusu Annor – Social Development Officer Monica Kodua - Social Development Officer	Consultants: Joshua Etse Wemegah Wilson Amelorku
Discussions:	
<p>1. Prevalence of GBV/SEA/SH</p> <ul style="list-style-type: none"> Gender based violence in the district is not extreme. Teenage pregnancy is of concern in the district. Most Issues of teenage pregnancy are as a result of family pressure. <p>2. Child Labour</p>	

Child labour issues are not predominant, but most cases normally occur at the farming communities in the rice farming areas, during bird scaring and harvesting times, children are often used.

3. Children involvement on the Scheme

Children not used as labourers, usually they offer helping hands in the farms to their parents or guardian.

4. Measures to Control Child Labour

- The department have placed in measures to keep children in school.
- Parental education and community sensitization through community leaders are also carried out.
- Community engagement on child protection and delinquency issues, are carried out quarterly.
- Monitoring of communities is also done by the department, especially farming communities.

4.7 District Agricultural Department

Date: 31/01/2023	Time:
Participants: Forgive Adetie – Administrator	Consultants: Joshua Etse Wemegah Wilson Amelorku
Discussions:	
<p>1. Availability of Training Programs for Farmers</p> <ul style="list-style-type: none"> • Training programs are done for farmers through extension officers and farmer-based organizations on the scheme (WUA) • The extension officers working on the scheme are not enough to meet the training needs of all the farmers. <p>2. Agrochemical Usage and Related Concerns</p> <ul style="list-style-type: none"> • Monitoring is carried out to ensure that only approved chemicals are available in licensed agrochemical shops. • Agrochemical shops are also, capacitated to provide advice to farmers on the chemicals they buy from the shops. • Farmers are educated through extension officers on the disposal of chemical containers, there are still some challenges with the throwing of chemical containers into drains along the scheme. <p>3. Availability of Machinery to Facilitate Crop Production.</p> <ul style="list-style-type: none"> • Farmers write through the Agric Department to obtain subsidized farm machinery. • Extension officers through farmer organizations (WUA) put farmers in clusters for proper utilization of limited machinery. <p>4. Cattle Invasion of the Scheme and Management</p> <ul style="list-style-type: none"> • The department fosters engagement between farmers and cattle owners to settle cattle invasion issues. • Where there is the need for compensation, the department does evaluation of the damage and makes recommendations to/ law enforcement agencies. • Unavailability of drinking troughs around the scheme for cattle encourages cattle invasion of farms. 	

4.8 Water Users Association and Farmers

Date: 18/01/2023	Time:
Participants: See Appendix 8	Consultants: Mutala Mohammed Wilson Amelorku
Discussions:	

1. Sanitation

- Members expressed concern on the lack of facilities within the communities and farms even though they were promised of such facilities during the 1st phase of the project.
- Concerns were raised about the open defecation along the canals which are washed into main drains or canals whenever it rains which contaminate the source of drinking water for some communities.

2. Training Farmers on Farm Management and Handling of Agro-chemicals

- They admitted of being given regular training on disposal of chemical containers by extension officers; however, they rarely comply by either burying it on the ground or burn it on the farm.
- Concerns were raised about the contamination of their source of water for drinking by the washing of pesticides.

3. Cattle Invasion Issue and Management Measures

- Cattle invasion is mainly as a result of lack of designated areas for cattle crossing and drinking troughs.
- Concerned were raised with the number of cattle troughs within the KIS scheme, as a result the animals drink from the canals which serve as a source of drinking water for some of the communities. In a community near GEL, Papayieda, the community shared the same source with the cattle with the droppings of the animal scattered around the entrance of the canal. This is usually washed into the canal when it rains.
- Members complained of the consistence invasion of the cattle on their farms which usually result in conflicts between farmers and herdsmen.
- Farmers had to commit additional resource to employ people to protect their farms from the invasion of the cattle.

4. Conflict Resolution Among Farmers

- In the case of conflict, each WUA has a disciplinary committee that settle disputes among farmers. However, in the case of inter-farmer dispute from different WUA sections, the federation disciplinary committee resolve conflict issues
- Grievances are channelled through the WUA executives to management of the KIS scheme.

5. Other Concerns of Farmers

- Farmers raised concern about the construction period. In the 1st phase of the project, those in the section B were made to halt farming until the rehabilitation was completed in a 12-month calendar year. However, farmers on that section did not farm for over 2 years which affected their source of livelihood.
- For the 2nd phase, they are proposing that the construction could be divided into sections of the scheme without shutting down the entire Section A.
- Farmers on the rehabilitated Section B expressed their delight on the positive impact of the rehabilitation on their farming activities i.e., productivity and flooding control.
- Concerns were raised on floods caused by choked drains in the Section A and members hoped that the rehabilitation work would begin in time to prevent further flooding.
- Most of the farmers' sole livelihood is rice cultivation hence farmers concerns were based on what measures will be implemented for those whose farms will be affected by the works. They were promised of support during the rehabilitation of the Section B but the support never came with farmers out of job for 2 years.
- Concerns were raised on how long the rehabilitation would last and what are the measures put in place for farmers while this is ongoing.
- Concerned were raised on the number of footbridges across the canals as some farmers have to access their farms by crossing the canal.
- Farmers were not happy that their concerns were not addressed during the rehabilitation of the Section B even though they were promised all will be considered during the project implementation.
- They suggested that members of the WUA could be co-opted into the project implementation committee since they appreciate the issues more on the ground.
- Some farmers in the rehabilitated section still have difficulty in accessing water onto their farms though the water is flowing.

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

- Concerns were raised on the grievance committee which was set up during the project implementation but has never functioned.
- The sharing of water between the Golden Exotic Farms Limited (GEL) and the Section CY & CZ of the scheme as well as the silting of the canal is impeding the flow of water to rice fields. The opening of the canal on Fridays and closing on Mondays makes it difficult for the farmers to access water onto their farms.
- Proposal was made to ensure regular clearing and desilting of the Kasu drain to allow water to flow.
- Issues of access road were also raised which makes it difficult for farmers to bring their produce to warehouse.
- Concerns were raised on the improper construction of the gate's chamber which allow water to flow to fields causing flooding.
- Concerns were raised on the blockage of the valves of the chambers by waste materials which impedes the flow of water to the field. Suggestions were made if mesh could be placed on the valves to prevent the entrance of the waste materials.
- Concerns were raised on the spraying of the weeds in the drains which leaves the weeds in the drain impeding water flow.
- Suggestions were made to add more footbridges to the Lupu drain to enable farmers to access their fields instead of traveling long distance to access the only footbridge on the drain.
- Proposal on the increase on the number of water collection points to allow farmers to have access to the water especially for mixing of chemicals.
- Concerns were raised on the bad relationship of the previous contractor with the farmers which makes it difficult for cooperation between the beneficiaries and the contractor.
- Concerns were raised on the limited supply of water to some rice fields.
- Blockage of the main drains and not regularly desilted.
- Provisions not made for access to water from the scheme for domestic use.

4.9 Project Communities

Date: 18/01/2023	Time:
Participants: See Appendix 8	Consultants: Mutala Mohammed Wilson Amelorku
Discussions:	
<p>1. Flood</p> <ul style="list-style-type: none"> • Some farms have had flooding issues as a result of irregular desilting, blockages and pipe defects • No formal design for flooding interventions <p>2. Effects of the Incompleteness of the Project on Farmers</p> <ul style="list-style-type: none"> • Irregular water supply to farm plots, low yields and transportation problems. • Availability of uncleared trees and bushes at points where project is uncompleted provided perching places for invading birds and as such high incidence of birds at the uncompleted parts. <p>3. Ways the Communities Benefited from the KIS Project</p> <ul style="list-style-type: none"> • More community members are engaged in farming now, with better financial returns, social responsibilities better taken care of. • Infield roads in the farms make it easy for movement across communities. • Engaging kids to carry rice after harvest has reduced as infield roads make it easy for access to harvest fields by vehicles. <p>4. Issues with Migrant Workers</p> <ul style="list-style-type: none"> • No major issues with migrant workers. • Issues of land allocation to strangers at the expense of the local people raised at Kewum, Avakpo and Atlorbinya. For example, teachers posted to the communities begin to own rice fields with the indigenes finding it difficult to access lands to farm. 	

5. Main Challenges of the Implementation of the KIS Scheme

- Farmers were laid off without compensation over a long period, thus affecting living standards.
- Longer than necessary period for completion of the project, 30 months instead of 12 months promised.
- Project implementation not taking views of community members.
- Inadequate footbridges constructed.
- Access point for water for domestic use not constructed.
- Communication was ineffective between Scheme managers and the communities.
- No regular visits to the communities by managers to engage community members.
- Relevant people to the scheme are not accessible.

4.10 Kpong Farms

Date: 29/03/2023	Time:
Participants: Jacob Wilson – Administrator Seth Wardie – Farm Manager	Consultants: Joshua Etse Wemegah Wilson Amelorku
Discussions:	
<ul style="list-style-type: none"> • Management wants to see a reflection of their inputs into the project design before the finalisation of the design • Management should be notified well in advance prior to the commencement of project works • Construction works should be phased out. • Kpong Farms can serve as a center of excellence for the training of farmers on the scheme and beyond 	

4.11 Traditional Authorities

Date: 29/03/2023	Time:
Participants: 1. Nene Sackitey Ofori Nadu - (Chief Priest and Traditional Overload of Osudoku Traditional Council) 2. Nomo Kwadjo Tekpetey (Elder, Osudoku Traditional Council) 3. Labia Deleku 4. Florence Ofori	Consultants: Joshua Etse Wemegah Wilson Amelorku
Discussions:	
<ul style="list-style-type: none"> • Pacification rites must be performed before the commencement of construction activities • Community members must be employed during construction activities • Promised support to the project so far as proper recognition is given to the role of the traditional authorities 	

Appendix 5.0

Ambient Air Quality and Noise Monitoring Report

Methodology

Monitoring protocols used during the exercise are outlined in this section. The protocols are consistent with the approved Ghana standard methods and are accepted internationally.

Sampling was conducted in the locality of the proposed project area from 13th to 15th January 2023. The period coincided with the main dry season. The weather condition was clear and sunny during the sampling period.

Noise Level Monitoring and Analysis

Calibration of Sound Level Meter

The microphone capsule (MK:224) together with the preamplifier was mounted on a tripod stand and fitted to the sound level meter (CR:171B) via the CK:675 outdoor measurement kit. The sound level meter was then switched on and allowed for about 2 minutes to load. An acoustic calibrator (CR:515) was also switched on and fitted on top of the microphone capsule. The “CALIBRATION” button on the sound level meter was then pressed for the commencement of calibration. After about 5 seconds, the sound level meter (screen) showed “OK” to signify end of calibration. The “OK” button was pressed to end the calibration process. The acoustic calibrator was removed and switched off.

Noise Measurement

Ambient noise survey was carried out to monitor existing ambient noise levels at the proposed project sites (Contractor equipment and holding sites). A 24-hour continuous measurement was undertaken at each sampling location to account for daily variations in noise levels of the area.

Sound level recordings were made using Type 1 Cirrus CR:171B Optimus Plus Sound Level Meter with built-in 1/3 octave band and fully conforms to specifications of IEC 61672-1:2013. **At each of the selected location**, the sound level meter was mounted on a tripod stand with the microphone elevated at a height of 1.5 meters above ground level and inclined at an angle of 45°. The meter was set to fast respond time for all measurements. The equivalent (L_{eq}), maximum (L_{max}) and minimum (L_{min}) as well as statistical values for LA_{10} , LA_{50} , and LA_{90} noise levels were computed and recorded over the same period (day and night) at each sampling location.

Photos of equipment setup during noise monitoring at each sampling location are provided below.



Noise Level survey at NSL1 – Golden Exotic Area



Noise Level survey at NSL2 – Shine Star Area



Noise Level survey at NSL3 –Asutuare Basic School

Ambient Air Quality Monitoring

Particulate (TSP, PM₁₀ & PM_{2.5}) Sampling and Analysis

MiniVol Tactical Air Samplers (TAS®) were used for the measurement of particulate matter (TSP, PM₁₀ and PM_{2.5}). The programmable sampling units were set over a 24-hour period at each sampling location to sample ambient air at a flow rate of 5 L/min. Regular checks of the flow rate were conducted throughout the sampling period to ensure that constant flow rate was maintained. The sampling units were mounted at a height of about 2.0 meters above ground level and away from any obstacle to ensure unrestricted air flow to the units. At each receptor location, TSP, PM₁₀ and PM_{2.5} were sampled at the same time for the same period.

Ambient air was collected over pre-conditioned (pre-weighed) non-fibre whatman filter paper (Ø47 mm) placed within a filter holder. A PM₁₀ and PM_{2.5} impactors were fixed on top of the filter holders which ensured that only particles of size less than 10 and 2.5 microns reach the filter paper. In the case of TSP, no impactor was placed in the filter holder and this allowed total particulates in the air to reach the filter paper.

At the end of the sampling period, the filters were removed and kept in sealed filter holders to prevent moisture from reaching the filters. The filters were sent to the laboratory, dried in a desiccator for 24-hours before re-weighing. The net weights were calculated and dust concentrations were computed using the gravimetric method of determination of respirable and total inhalable particulate concentrations. The formula used to compute dust concentration is provided below.

$$\mu\text{g}/\text{m}^3 = \frac{\text{Net dust weight (mg)} \times 1000 \times 1000 (\text{L}/\text{m}^3)}{\text{Flow Rate (L}/\text{min}) \times \text{Sample time (min)}}$$

Photos of equipment setup at each of the selected locations sampled for Air Quality are provided below.



Ambient Air Quality Survey at AQL1 – Golden Exotic Area



Ambient Air Quality Survey at AQL2 – Shine Star Area



Ambient Air Quality Survey at AQL1 – Asutuare Basic School

Gaseous Emission Sampling and Analysis

Gases (SO₂ and NO₂) were recorded for 24 hours at the various selected sampling locations within the proposed project site. Aeroqual Series 500 single gas detectors were mounted to detect the presence and concentrations of Nitrogen dioxide (NO₂) and Sulphur dioxide (SO₂).

The units were oriented against the direction of the wind. As the wind blows, air is absorbed onto a sensor and the gas is then detected and logged by the unit. The sulphur dioxide unit has a detection range of 0 – 10 ppm with a resolution of 0.01 ppm whereas the nitrogen dioxide unit has a detection range of 0 – 20 ppm with a resolution of 0.001 ppm. Gas recordings were downloaded from the Aeroqual Series 500 units by means of USB cable and computed for the levels of Nitrogen dioxides (NO₂) and Sulphur dioxide (SO₂).

Quality Control

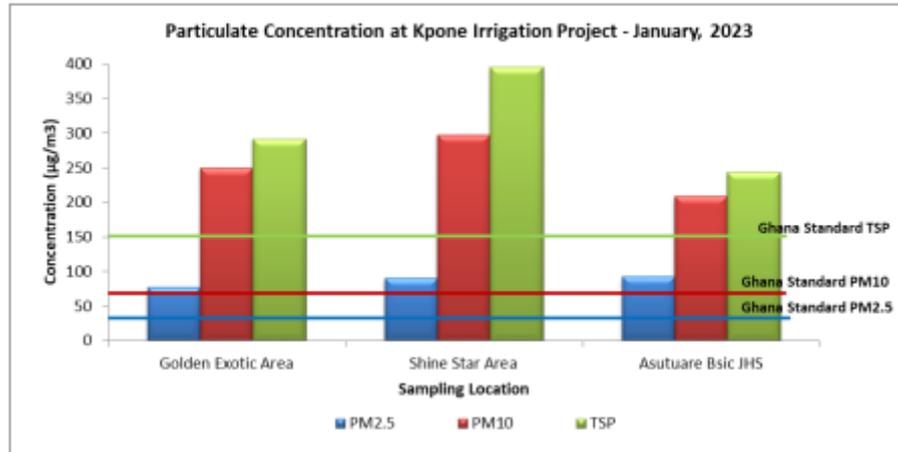
Field quality control involved regular calibration checks and documentation of the operational flow-rate to track the sampler's calibration stability.

Ambient Air Quality

Particulate Monitoring (TSP, PM10 & PM2.5)

Concentrations of TSP, PM10 and PM2.5 in ambient air were monitored over a 24-hour period at the three (3) selected locations and the results compared with the respective Ghana standards and IFC guidelines (refer Table 3.1).

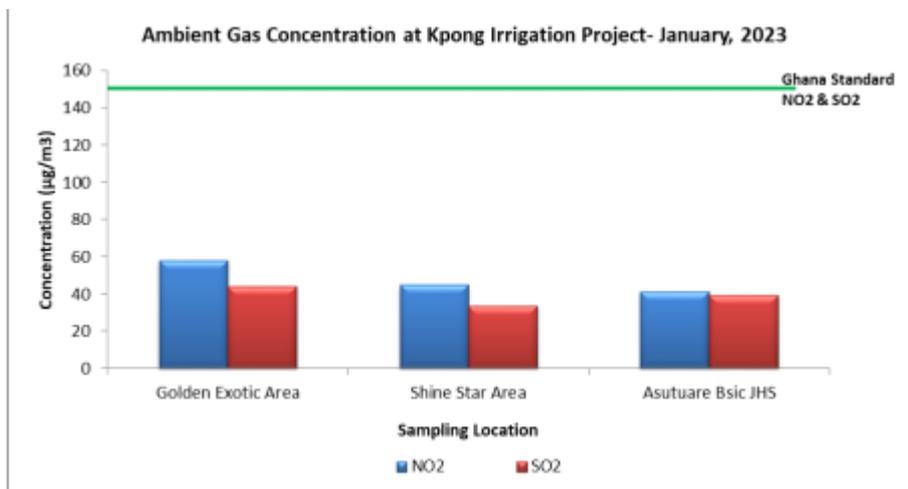
Particulate concentrations recorded at the three (3) selected locations ranged from 243.8 µg/m³ to 395.3 µg/m³, 208.7 µg/m³ to 3298.1 µg/m³, and 77.9 µg/m³ to 92.9 µg/m³ for TSP, PM10 and PM2.5 respectively. Concentrations recorded for TSP, PM10 and PM2.5 at all the three (3) locations exceeded the respective Ghana Standards of 150 µg/m³, 70 µg/m³ and 35 µg/m³ for residential areas. Based on the results, it can be concluded that the existing air quality at the proposed site has negatively been impacted by surrounding activities. Major air pollution sources observed during the monitoring exercise include movement of trucks, tricycles and motor bikes on the untarred road, smoke from burning of trash at Asutuare community, smoke and soot from neighbouring companies, movement of trucks in and out of Shine Star Company, and increased fugitive dust particles from exposed surfaces due to the dry season (hazy weather condition). Figure 3.1 shows comparative analysis of the results with Ghana standards (GS 1236:2019). Compared with the IFC guidelines for PM10 and PM2.5, the concentrations remained higher at all the three (3) locations. There is no available IFC guideline for TSP.



Concentrations of the proposed site in comparison with Ghana Standards

Gaseous Emission (NO₂ & SO₂)

Gaseous emissions monitoring was also carried out for nitrogen dioxide (NO₂) and sulphur dioxide (SO₂) for 24-hour period. Concentrations recorded for NO₂ at SO₂ at all the three locations are lower when compared with the respective Ghana standard of 150 µg/m³ and 50 µg/m³ for residential areas. Based on the results, it can be concluded that the existing activities have moderate impact in terms of gaseous emissions (NO₂ and SO₂). Gaseous emission sources observed include emissions from movement of trucks, vehicles and motor bikes, emissions from neighbouring companies and smoke from burning of trash in the Asutuare Community, and domestic activities. Figure 3.2 shows the concentrations of NO₂ and SO₂.



Concentration of Ambient Gases (NO₂ & SO₂) in Comparison with Ghana Standard

Ghana Ambient Noise Standards

For the purposes of comparison, the requirements for ambient noise control levels based on categorized zones for Ghana standards are provided in table below.

Requirement for Ambient Noise Control Level Based on Categorized Zones

Zone	PERMISSIBLE NOISE LEVEL IN dB(A)	
	DAY (6:00am – 10:00pm)	NIGHT (10:00pm – 6:00am)
A (Residential areas)	55	48
B	55	50

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

(Education and health facilities, office and law courts)		
C (Mixed used)	60	55
D (Areas with some light industry)	65	60
E (Commercial areas)	75	65
F (Light industrial areas)	70	60
G (Heavy industrial areas)	70	70

Source: GS 1222:2018

Based on the categorized zones by the Ghana standard, all the three locations are classified under Zone C (Mixed Used Area).

Results

Results obtained for the baseline ambient air quality and noise level monitoring are provided in tables respectively. The results are representative of the environmental conditions of the proposed project area at the time of the monitoring.

The applicable Ghana standards and IFC guidelines are also provided to allow for comparison.

<i>Summary of Air Quality Results over 24-Hour Period</i>							
Location ID	Date		Particulate Concentration			Gaseous Concentration	
	Started	Stopped	PM _{2.5} ($\mu\text{g}/\text{m}^3$)	PM ₁₀ ($\mu\text{g}/\text{m}^3$)	TSP ($\mu\text{g}/\text{m}^3$)	NO ₂ ($\mu\text{g}/\text{m}^3$)	SO ₂ ($\mu\text{g}/\text{m}^3$)
Golden Exotic Area	13-Jan-23	14-Jan-23	77.9	250.0	291.2	58.3	44.5
Shine Star Area	14-Jan-23	15-Jan-23	90.6	298.1	395.3	45.2	34.0
Asutuare Basic School	14-Jan-23	15-Jan-23	92.9	208.7	208.7	41.4	39.3
Ghana Standard – Residential Area			35	70	70	150	50
IFC Guidelines			25	70	50	200	20

<i>Summary of Environmental Noise Levels Recorded over 24-Hour Period</i>								
Location ID	Time	Noise Level in dB(A) Recorded						
		LA _{eq}	LA _{max}	LA _{min}	LA ₁₀	LA ₅₀	LA ₉₀	LA ₉₅
Golden Exotic Area	Day (7h00 – 22h00)	50.5	82.7	32.1	53.2	44.3	39.4	38.5
	Night (22h00 – 7h00)	54.1	72.5	38.8	59.0	46.2	41.1	40.6
Shine Star Area	Day (7h00 – 22h00)	81.8	101.0	44.5	86.7	57.6	50.0	49.2
	Night (22h00 – 7h00)	57.1	103.0	45.1	52.4	49.8	48.1	47.1
Asutuare Basic School	Day (7h00 – 22h00)	58.4	87.3	37.1	60.6	55.9	47.8	45.7
	Night (22h00 – 7h00)	52.7	86.2	40.5	56.3	46.0	42.4	42.1
Ghana Standard (Zone C)	Day (7h00 – 22h00)	60	-	-	-	-	-	-
	Night (22h00 – 7h00)	55						

Conclusion

This baseline report has been compiled as part of the EIA process to ensure compliance with the Ghanaian EIA laws, Environmental Protection Agency Act, 1994 (Act 490), and the Environmental Assessment Regulations, 1999 (L.I.1652).

Sampling was conducted within the proposed project site from 13th to 15th January, 2023. Three (3) sites were selected for both ambient air quality and noise monitoring.

Based on the categorized zones by the Ghana standard and the activities at the proposed area, all the three (3) locations can be classified under **Zone C (Mixed Used)**. Noise levels recorded for day and night time at all three (3) selected locations are in compliance with the respective Ghana standard 60 dB(A) and 55 dB(A) for 'Mixed Used' areas except for day time noise level at Shine Star. The high noise level recorded at Shine Star area was due to conversation and shouting by food and fruits sellers. Sources of noise observed during the survey include movement of trucks, tricycles & motors, noise from food sellers at Shine Star, children playing and swimming in the irrigation dam, noise from Kings Pub, and other domestic activities (conversation by the inhabitants, etc.).

Appendix 6.0 Grievance Mechanism

6.1 Complaints/Grievance Form

Complainant(s):			
(tick): 1. Individual 2. Institution 3. Group / Association 4. Whole Community			
Name:			
Do not fill the name field if you choose to remain anonymous			
Sex (tick): 1. Male 2. Female			
Telephone:			
Email:			
Mode of contact: (tick) 1. SMS 2. Email 3. Phone Call 4. Physical Meeting			
Preferred method you would wish to be contacted			

6.2 Sample Grievance and Resolution Form

Grievance and Resolution Form		
Name (Complainant): _____		
ID Number: _____ (PAPs ID number) _____		
Contact Information: _____ (Village: mobile phone)		
Nature of Grievance or Complaint: _____		

Date	Individuals	Summary of Discussion
_____	_____	_____
Signature: _____		Date: _____
Signed (Complainant): _____		
Name of Person Filing Complaint: _____ (if different from Filer)		
Position or Relationship to Filer: _____		
Review/Resolution		
Date of Conciliation Session: _____		

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Was Filer Present?	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
Was field verification of complaint conducted?	YES	<input type="checkbox"/>	NO	<input type="checkbox"/>
Findings of field investigation:				

Summary of Conciliation Session Discussion:				

Issues _____				
Was agreement reached on the issues? <input type="checkbox"/> <input type="checkbox"/> Yes <input type="checkbox"/> No				
If agreement was reached, detail the agreement below: (tick)				
If agreement was not reached, specify the points of disagreement below: (tick)				

Signed (Conciliator): _____				
Signed (Filer): _____				
Signed: _____ Date: _____				
Independent Observer				

Appendix 7.0

Labour Management Plan

This Labour Management Plan provide an overview of the applicable national legislative provisions and how the risks and issues related to labour will be managed in the implementation of the project.

Assessment of Key Potential Labour Risks

Based on project activities, the labour risks involved with the project are viewed as minimal. Most of the labour risks will be related to extended hours of work mainly during construction and operation phases. The probability of the incidence of child labour or forced labour is also moderate. The project requires technical staff with skills that require experience and education, which will not be possible for children or those below the age of 18 to possess. A register of all young persons employed by the project and the dates of their births will be kept in keeping with Section 60(1) of the Labour Act, 2003 of Ghana. No person under the age of eighteen years shall be employed.

The project will adopt a zero-harassment policy for all of its workers and sub-contractors. The zero-harassment policy will be part of the workers Code of Conduct developed by the contractor. This policy will be broadcast to all workers through various mediums and several formats. The project will provide an extra layer of supervision for young workers to ensure they are educated of their rights, the project's policies on harassment, intimidation and exploitation.

The project through the labour management procedures plan will ensure that all applicable occupational health and safety provisions in Section 118 of the Labour Act, 2003, the Persons with Disability Act, 2006 (Act 715), the WBG General Environmental Health and Safety Guidelines and the OP 4.01 are observed.

Some of the highlights specific to certain areas in in the Labour Act are listed:

Forced Labour

Section 117 interpret forced labour to mean work or service that is exacted from a person under threat of a penalty and for which that person has not offered himself or herself voluntarily, but does not include:

- Labour required as a result of a sentence or order of a court;
- Labour required of a member of a disciplined force or service as his or her duties; and
- Labour required during a period when the country is at war or in the event of an emergency or calamity that threatens life and wellbeing of the community, to the extent that the requirement of the labour is reasonably justifiable in circumstances of a situation.

Section 116 highlights the prohibition of forced labour to include:

- A person shall not be required to perform forced labour;
- It is an offence for an employer to exact or cause to be exacted, or permit to be exacted, for his or her benefit forced labour from any worker; and
- Any employer convicted of an offence under subsection (2) is liable to a fine not exceeding 250 penalty units.

Prohibition of employment of young persons in hazardous work (Section 58)

- A young person shall not be engaged in any type of employment or work likely to expose the person to physical or moral hazard;
- The Minister may, by legislative instrument, determine the type of employment that is likely to expose a young person to physical or moral hazard;
- An employer shall not employ a young person in an underground mine work; and
- A person who contravenes subsection (1) or (3) commits an offence and is liable on summary conviction to a fine not exceeding 100 penalty units.

Health of Young Persons (Section 59)

- 1) An employer shall not employ a young person on any work unless a medical practitioner has certified that the young person is in good health and is medically fit for the work; and
- 2) Where a person fails to comply with subsection (1) the person shall be ordered by the Minister to have the medical examination conducted.

Employment of Persons with Disability (PWD)

Section 46 of the Labour Act makes provisions for an employer who employs a person with disability to notify the nearest Centre for Registration of the employment and where the employer fails to do so, the Chief Labour Officer shall direct the employer to comply. Also, special incentives are provided to an employer who employs persons with disability.

Section 11 of the Persons with Disability Act, 2006 (Act 715), also charges persons who employ persons with disability to provide the relevant working tools and appropriate facilities required by the PWD for efficient performance of functions required by the employment.

Brief Overview of Labour Legislation: Terms and Conditions

The primary law and regulations that govern employment relationships in Ghana are the Labour Act 2003 (Act 651) and the Labour Regulations. The Labour Act consolidates all laws relating to employment. The act refers to three categories of workers, namely: permanent workers; temporary workers; and casual workers.

Interpretation

Section 78. of the Act defines terms that are applicable in the law

- “Temporary worker” means a worker who is employed for a continuous period of not less than one month and is not a permanent worker or employed for a work that is seasonal in character; and
- “Casual worker” means a worker engaged on a work which is seasonal or intermittent and not for a continuous period of more than six months and whose remuneration is calculated on a daily basis.

The Labour Act distinguishes between a ‘contract of employment’ and a ‘contract for employment’. A contract of employment creates an employer-employee relationship between the parties. This affords the employer and especially the employee protection under the Labour Act. On the other hand, a contract for employment does not create an employment relationship between the parties, but rather a principal-contractor relationship. Here, the contractor is neither considered to be an employee of the principal nor entitled to benefits of employment such as social security contributions. Section 74 of the Act spell out the conditions of a contract of employment:

1. A contract of employment of a casual worker need not be in writing;
2. A casual worker shall;
 - a) Be given equal pay for work of equal value for each day worked in that organization;
 - b) Have access to any necessary medical facility made available to the workers generally by the employer;
 - c) Be entitled to be paid for overtime work by his or her employer in accordance with section 35; and
 - d) Be paid full minimum remuneration for each day on which the worker attends work, whether or not the weather prevents the worker from carrying on his or her normal work and whether it is possible or not, to arrange alternative work for the worker on such a day.

On the other hand, Section 75 of the Act highlights the conditions for a temporary worker:

- 1) A temporary worker who is employed by the same employer for a continuous period of six months and more shall be treated under this Part as a permanent worker; and
- 2) Without prejudice to the terms and conditions of employment mutually agreed to by the parties, the provisions of this Act in respect of minimum wage, hours of work, rest period, paid public holidays, night work and sick leave are applicable to a contract of employment with a temporary worker.

Salary, Wages, Allowances and Deductions

The Labour Act provides that all salary, wages and allowances are payable in legal tender, in addition to any non-cash remuneration.

Generally, employers are precluded from deducting any amount from the remuneration of their employees – whether it is a pecuniary penalty imposed on the employee or interest or discount on remuneration advanced to the employee.

However, Section 70 of the Labour Act sets out situations in which an employer can, with the consent of the worker, legally deduct funds from their remuneration in relation to:

- Provident, pension or other funds or contributions agreed to by the employee;
- A financial facility advanced by the employer to the employee or guaranteed by the employer;
- Amounts paid in error or in excess of the employee’s remuneration to the employee;
- Membership fees or contributions to an organisation of which the employee is a member; and
- Deductions for any loss suffered by the employer as a result of damage to its property under the control of the worker; however, no deduction can be made in this regard unless it is shown that the worker is fully responsible for the damage.

Family and Medical Leave

Female employees are entitled to a statutory maternity leave of 12 weeks in addition to any annual leave that they may have. This statutory leave can be enhanced by contractual agreement between the parties. Female employees on maternity leave must be paid their full salary and other benefits while on leave. In addition, a female employee is entitled to additional leave to be determined by a medical practitioner where it is found that she has developed an ailment as a result of her pregnancy. Leave is also typically granted for bereavement in relation to close family members.

The Labour Act strictly prohibits discrimination of employees based on race colour, national extraction, social origin, religion, political opinion, sex, marital status, family responsibilities or disability. An employee also has the right, by law, to remove himself or herself from a work situation which he or she reasonably believes presents an imminent or serious danger to life or health.

Age of Employment

The project will be guided by the Labour Act, 2003 which states that the minimum age of employment in Ghana is eighteen (18) years old. In addition to the Employment Act, Ghana is a signatory to the following international conventions related to the minimum age of employment:

- Convention on the Rights of the Child (CRC): “Signed on the 19th April 1990 and ratified on the 9th October 1990” (UNICEF, 2015);
- Minimum Age Convention, 1973 (No.138) (International Labour Organization, 2017);
- Forced Labour Convention, 1930 (No. 29) (International Labour Organization, 2017); and
- Worst Forms of Child Labour Convention, 1999 (No. 182) (International Labour Organization, 2017).

Employees over the minimum age of 18 and under the age of 21, may be employed or engaged in connection with the project only under the following specific conditions:

- The work is not likely to be hazardous and is not harmful to the child’s health or physical, mental, spiritual, moral or social development, and will not interfere with the child’s education;
- An appropriate risk assessment is conducted prior to the work commencing; and
- The Borrower conducts regular monitoring of health, working conditions, hours of work and the other requirement of the World Bank Group General Environmental Health and Safety Guidelines.

The following process will be followed to verify the age of project workers:

All project employees will be asked to produce identification documents (ID) that are acceptable in local laws, employment and human resources practices as “proof of age”. These forms of ID will be birth certificates, national drivers’ licenses and national registration cards. In the absence of one of those forms of IDs the project will apply and document an age verification process.

The age verification process will consist of alternative methods including copies of academic certificates, testimony/affidavits from officials of the schools attended, a medical examination, statements from family members and parish/village officials/local authorities. In addition, all documents will be cross-referenced and subjected to a verification process to ensure the validity of the documents. In instances where the documents are thought to be falsified the project will conduct the same process to ensure their

authenticity. In all of the processes the attendant care will be provided to ensure that the applicant or employee's data are protected and their right to privacy is guaranteed.

All copies of the IDs and documents pertaining to the applicant's age and other supporting materials will be kept in files with the human resources personnel. Audits and controls of the process will be a requirement of the contractors and included in the contracts, in keeping with the Labour Act 2003 (Act 651) and Data Protection Act.

In the event that underage workers are found working on the project the following actions will be undertaken:

- Termination of the contract and services agreement immediately as per the Labour Act of 2003 (Act 651);
- Schedule a meeting with the child and seek to determine the reasons for seeking employment;
- Refer the child to other support services including social services and the Ministry of Education;
- Leverage the services of Non-government and Community Based Organizations to assist the child; and
- Consider employing another adult member of the family if the child's family is determined to be vulnerable or in dire circumstances.

The Labour Act 2003 (Act 651) will be used as a guide in the conduct of the assessment of risks associated with persons below the age of 18. The procedure for assessing the risks will be as follows:

- All persons will be asked to provide a medical certificate with the results of a medical examination;
- An assessment will be done of the tasks assigned, to ensure that persons below the age of 18 are not subjected to hazards and risks;
- There will be clear policy guidelines regarding supervision of young persons to prevent exploitation and sexual harassment; and
- Young persons will be provided with educational and awareness information on the policies of the workplace including sexual harassment policies and labour related grievances and the grievance redress mechanism of the project.

Terms and Conditions

The following terms and conditions will apply to project workers in accordance with the Labour Act 2003 (Act 651).

Contracts

- The project, contractors, sub-contractor, and assignees of contracts shall pay rates of wages and observe hours and conditions of employment which are not less favourable than those established in the country (minimum wage);
- Contractors and sub-contractors shall be certified according to the Government requirements for governmental contractors including contractors certify that the wages and conditions of employment of all those employed by the contractor in the trade or industry in which the contractor is seeking to contract with the Government are fair and reasonable;
- The contracts will be guided by the principle of collective bargaining is applicable and where there is no minimum wage or rates established in the country, the guiding principle will be of fair wages and reasonable rates commensurate with governmental minimum wage and similar established rates and conditions;
- In keeping with the Labour Act, the contractor shall keep proper wage records and time sheets for all those employed in relation to the execution of the contract, and the contractor shall produce the wage records and timesheets for the inspection of any person authorised by the project or the Labour Commission of Ghana;
- Contractors are required by law, to post conditions of work in conspicuous places informing workers of their rights and conditions of work;
- A subcontractor shall be bound to conform to the conditions of the main contract and the main contractor shall be responsible for the observance of all contract conditions; and
- Contractors and subcontractors shall recognise the right of their workers to be members of the trade unions.

Minimum Wage

All project workers shall be paid a wage that is above or equal to the minimum wage as established by the Government of Ghana. Wages will be paid on a weekly, bi-weekly or monthly basis. Each employee is entitled to a statement accompanying pay that itemised the following: "(a) the employee's gross wages due at the end of that pay period; (b) the amount of every deduction from his or her wages during that pay period and the purpose for which each deduction was made; and (c) the employee's net wages payable at the end of that pay period."

Hours of Work

The maximum number of ordinary hours of work for employees shall be eight hours a day or forty hours a week except in cases expressly provided for in the Labour Act.

Project employees are prohibited from working more than 10 hours per day inclusive of two hours for lunch and rest periods. No person under the age of eighteen years shall be employed or allowed to work. Other provisions related to hours of work will be guided by the Labour Act (Act 651) on this matter.

Contractor Management

It is mandated that the contractor execute the management of the contract in a manner that is acceptable to the client and is in accordance with the World Bank rules and regulations specifically relating to the selection process for contractors, management of labour issues, including health and safety, procedures for managing and monitoring of performance for contractors, as well as reporting on workers under the project.

Information on Public Records: The Contractor must have in place information on corporate registers and documents relating to the violation of applicable law, including reports from labour inspectorates and other enforcement bodies.

Certification and Approval of Business and Workers: Documentation of approved business licenses, registration, permits and other approvals and workers' certification/permits and training to perform the work.

Health and Safety: Have in place labour management systems as it relates to organizational health and safety. Records of incidents and corresponding root cause analysis with a corrective mitigation plan. First aid cases, high potential near misses, and remedial and preventive activities required. Identification and establishment of safety committee and records of meetings.

Workers Payroll Records: Documentation of the number of hours work and pay received inclusive of all payments made on their behalf, for example payment made to the National Insurance Scheme and other entitlements regardless of the workers being engaged on a short- or long-term assign mentor fulltime or part time worker.

Community Workers

The construction and operation phases of the project will envisage the hiring of community workers on the work. Community workers hired by the project will be provided with contracts similar to other project staff and workers. The Grievance Redress Mechanism of the project will also be applicable to community workers of the project.

APPENDIX 8

Participants List – Stakeholder Engagement



STAKEHOLDER ENGAGEMENT ATTENDANCE RECORD

Updated ESIA/ESMP for the Rehabilitation and Modernisation of the Kpong Irrigation Scheme under the Food Systems Resilience Project (FSRP) - Ministry of Food and Agriculture

Institution / Community:
Location:

Date: 18/01/2023

No.	NAME	POSITION	SIGNATURE
1	Neizer Ndzio	Chairman	[Signature]
2	Adams Amikomov	Member	[Signature]
3	Appias Emmanuel	Chairman	[Signature]
4	AKOFA Subotic	Organizer	[Signature]
5	Emefa Danyi	Farmer	[Signature]
6	Ameh David	Farmer	[Signature]
7	Paul Afienu	Farmer	[Signature]
8	Samuel Kwame	Chairman	[Signature]
9	Mark Kwame	Farmer	[Signature]
10	Muhammad Alunchoku	Chairman	[Signature]
11	Abdullahi Philip	Chairman	[Signature]
12	Samuel Kwame	Secretary	[Signature]
13	Lawyer Moses	Chairman	[Signature]
14	Amankwa Samuel	Chairman	[Signature]
15	Abaka Philip Amankwa	Vice Chairman	[Signature]
16	Abaka Emmanuel	Vice Chairman	[Signature]
17	Joseph Kwame Apap	NLC Chairman	[Signature]
18	Kwame Kwepono	Farmer	[Signature]
19	Samuel T. Appah	SLC/B Sec.	[Signature]
20	Joseph Kwame	NLC/B Chairman	[Signature]
21	Evans Abaka	NLC/B Secretary	[Signature]
22	Boateng Kwame	MSG Chairman	[Signature]
23	Joseph Osei	MSG Sec	[Signature]
24	Simon Osei	C3 Chairman	[Signature]
25	Frank Teku	Farmer	[Signature]



STAKEHOLDER ENGAGEMENT ATTENDANCE RECORD

Updated ESIA/ESMP for the Rehabilitation and Modernisation of the Kpong Irrigation Scheme under the Food Systems Resilience Project (FSRP) - Ministry of Food and Agriculture

Institution / Community: *Atrobinya, Avakpo & Kewum*
 Location:

Date: *18/01/2023*

No.	NAME	POSITION	SIGNATURE
1	<i>Sifrad Tettey</i>	<i>Farmer / Kewum</i>	<i>[Signature]</i>
2	<i>Martey Felix</i>	<i>Farmer / Atrobinya</i>	<i>[Signature]</i>
2	<i>Thomas Koleky</i>	<i>Farmer / Atrobinya</i>	<i>[Signature]</i>
4	<i>Kweku Lander</i>	-	<i>[Signature]</i>
5	<i>Charles Ayerley</i>	-	<i>[Signature]</i>
6	<i>Teye Anor</i>	-	<i>[Signature]</i>
7	<i>Gladys Ziador</i>	-	-
8	<i>Hellen Yeje Ayerkwar</i>	-	-
7	<i>Lawyer Victoria Mante</i>	-	<i>[Signature]</i>
10	<i>Agbedom Esther</i>	-	<i>[Signature]</i>
11	<i>Lede Nede Christians</i>	<i>Farmer - Kewum</i>	<i>[Signature]</i>
12	<i>Diana Ayerley</i>	<i>Farm - Atrobinya</i>	<i>[Signature]</i>
13	<i>Bernard Ayerley</i>	<i>- Atrobinya</i>	<i>[Signature]</i>
14	<i>Martey Patrick</i>	<i>- Atrobinya</i>	<i>[Signature]</i>
15	<i>Patience Ayerley</i>	<i>- Atrobinya</i>	<i>[Signature]</i>
16	<i>Kanor Gabriel</i>	<i>Farmer Kewum</i>	<i>[Signature]</i>
17	<i>Lamey Ayerley</i>	<i>Farmer Atrobinya</i>	<i>[Signature]</i>
18	<i>Comfort Agbedom</i>	<i>Farmer</i>	<i>[Signature]</i>
17	<i>Evans Koto Aboagye</i>	<i>Farmer Atrobinya</i>	<i>[Signature]</i>
20	<i>James Akushi William</i>	<i>Farmer Atrobinya</i>	<i>[Signature]</i>

Engagement with Atrobinya, Avakpo and Kewum Communities

APPENDIX 9

Appendix 9.1 Stakeholder Engagement Schedule

Stakeholder	Engagement Tool	Contact Person	Position
EPA	Notification/ Interview	Adriana Nelson	Director, Environmental Assessment and Audit
GIDA	Interview	Prosper Gliste Lilian Koranteng Ama Acheampong Ing. James Ashaley	Principal Engineer Environmental Officer Senior Sociologist Principal Engineer
Scheme farmers	Group interview	Samuel Guamah	WUA Chairman
SODA	Interview	Justine Glover	Presiding Member
GPS, Divisional Command, SODA	Interview	DSP Georgina Tawia	Divisional DOVVSU Director
GNFS, SODA	Interview	David Kotey	District Bushfire Coordinator
Social Welfare, LMKMA	Interview	Grace, Ama Baiden	Coordinating Director, LMKMA
LMKMA	Interview	Simon R. Tetteh	MCE
E.H.S.U (LMKMA)	Interview	Gordon Amevor	District Environmental Health Officer
E. H.S.U SODA	Interview/ Questionnaire	Agnes M. Korletey	District Environmental Health Officer
Agric Department SODA	Questionnaire	Adetie Forgive	Administrator, Department of Agric
Agric Department LMKMA	Interview	Godswill Glante	District Director of Agric
Physical Planning LMKMA	Interview	Duncan Esi J. Elizabeth	Municipal Head of Physical Planning

Rehabilitation and Modernization of Kpong Irrigation Scheme (KIS)

Stakeholder	Engagement Tool	Contact Person	Position
Ghana Health Service (SODA)	Interview/Phone call	Rev. Ebenezer Asiamah	District Health Director
Zoomlion LMKMA	Interview	Daniel Nartey	District Manager
Asutuare	Community engagement	Hon. Kezo	Assembly Man
Kasunya	Community engagement	Hon. John Mensah.	Assembly Man
Volivo	Community engagement	Neizer Narh-Fio	Opinion Leader
Dzogbedzi-Klebuse	Community engagement	Etse Bright	Community Member
Papa Edey	Community engagement	Swanzy Felix	Community Leader
Atlorbinya	Community engagement	Hon. John T	Assemblyman
Akuse Quarters	Community engagement	Esther Osei	Opinion Leader

Appendix 9.2 Scenes of Consultations and Field Work



Engagement with WUA Leaders and Farmers



Engagement with the Traditional Authority of Osuwem



Engagement with Farmers and Community Members



Engagement with Kpong Farms



Engagement with the Ghana National Fire Service





Validation Workshop



Water Trough for Cattle



Cattle accessing the canal for water



Aerial view of rice fields at KIS

Appendix 10.0

Chance Finds Procedures

Should an antiquity or cultural heritage object (Chance finds) be uncovered or discovered while undertaking excavation during the construction phase of the project the contractor will apply the chance find procedure as spelt out in the National Museum Act, 1969 (NLCD 387). In line with the Act the contractor shall:

- Alert or inform all workers on site;
- Engage and inform the Traditional Authorities of the area;
- Identify the site of the antiquity or cultural heritage object with flag tape;
- Determine the GPS position of the antiquity or cultural heritage object;
- Cease any works within the immediate vicinity of the antiquity or cultural heritage object identified;
- Determine and mark the exclusion boundary of the area; and
- Write to notify National Museum and Monument Board on the discovery of the antiquity, with details on the exact location in which it is situated and the place to which, and the purpose for which the antiquity needs to be removed.