ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP)

FOR THE PROPOSED 400 HECTARES IMPROVED RAIN-FED RICE CULTIVATION PROJECT
NEAR KUKOBILA IN THE NASIA-NABOGO INLAND VALLEY

EMTRADE COMPANY LIMITED

Prepared by:
Ignatius D. Kansanga
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Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila: Environmental & Social Management Plan (ESMP)

Final Edition
© August, 2016

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Clients: Ghana Commercial Agriculture Project (GCAP) under the auspices of the Ministry of Food and Agriculture (MoFA)

(Emtrade Company Limited)
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LIST OF ACRONYMS

ADB  Agricultural Development Bank
BP  Bank’s Policy
CBR  Crude Birth Rate
CDR  Crude Death Rate
CHPS  Community-Based Health Planning and Services
CSR  Corporate Social Responsibility
DP  Degree of Perturbation
E&S  Environmental and Social
EA  Environmental Assessment
ECOWAS  Economic Committee of West African States
EERP  Environmental Emergency Response Plan
EHS  Environment, Health and Safety
EMP  Environmental Management Plan
ECL  Emtrade Company Limited
EPA  Environmental Protection Agency
ERT  Emergency Response Team
ESIA  Environmental and Social Impact Assessment
ESMP  Environmental and Social Management Plan
ESO  Environmental Safeguards Officer
EU  European Union
FAO  Food and Agriculture Organisation of United Nations
GCP  Ghana Commercial Agriculture Project
GIDA  Ghana Irrigation Development Authority
GIPC  Ghana Investment Promotion Centre
GNFS  Ghana National Fire Service
GoG  Government of Ghana
GRC  Grievance Redress Committee
GRM  Grievance Redress Mechanism
GWCL  Ghana Water Company Limited
HMMP  Hazardous Material Management Plan
IFAD  International Funds for Agricultural Development
INMP  Integrated Nutrient Management Plan
IWMP  Integrated Waste Management Plan
IWMS  Integrated Weed Management Strategy
KVIP  Kumasi Ventilated Improved Pit
LEP  Livelihood Empowerment Programme
MESH  Ministry of Environment, Science and Technology
MLGRD  Ministry of Local Government and Rural Development
MMDAs  Metropolitan, Municipal and District Assemblies
MoFA  Ministry of Food and Agriculture
MoFEP  Ministry of Finance and Economic Planning
MoTI  Ministry of Trade and Industry
OP  Operational Policy
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

OPD  Out Patience Department
OSH  Occupational Safety and Health
PAPs  Project Affected Persons
PPP  Private Public Partnership
PNDC  Provisional National Defence Council
SADA  Savannah Accelerated Development Authority
SEA  Strategic Environmental Assessment
ToR  Terms of Reference
UN  United Nations
USAID  United States Agency for International Development
WB  World Bank
WHO  World Health Organisation
WRC  Water Resource Commission
1.0 INTRODUCTION

According to the Ministry of Food and Agriculture (MoFA), rice has become the second most important staple food in Ghana after maize. The growth in rice consumption in Ghana has risen substantially since the 1990s. From a steady level of 7-8 kilograms per year, per capita rice consumption increased to 11.5 kilograms per year on average during the 1990s and rose considerably to 27 kilograms per year for the period from 2001-2005\(^i\).

Based on current demographic trends and income growth, MoFA further estimates that demand for rice in Ghana will increase at a compound annual growth rate of 11.8% from 939,920 metric tons to 1,644,221 metric tons between 2010 and 2015\(^ii\). However, the country’s production in 2013 amounted to only 569,524.00 tonnes\(^iii\). It was reported that Ghana would import 600,000 metric tons of rice between October, 2014 and September, 2015 to augment the country’s rice needs\(^iv\). According to the United States Department of Agriculture (USDA), Ghana would have imported almost 70 percent of its rice needs due to low production locally (30 percent)\(^v\).

Meanwhile, vast tracts of fertile lands with flexible terms of acquisition exist in the Northern sector of Ghana. These lands have water resources available for commercial rice cultivation all along the Northern Ecological Zone/Savannah Accelerated Development Authority (SADA) Zone found in the Northern Region of Ghana. It is reported that Ghana has about 16% of arable land currently under agricultural production, leaving a vast portion yet to be developed into commercial agribusiness.

Irrespective of this, the country’s rice needs continue to further exacerbate because of the low-productivity due to subsistence based rice cultivation practiced in the country mostly rain-fall dependent. It is estimated that rainfall dependent rice production contributes about 84 percent of total current production\(^vi\). This quantity alone generates an average paddy yield of about 1.0-2.4 metric tons per hectare while irrigated production totals only 16% at an average paddy yield of 4.5 metric tons per hectare\(^vi\). These factors have resulted in low domestic rice production vis-à-vis domestic demand. Ghana has to resort to importation of rice considerably from Thailand, Vietnam, U.S., India and Pakistan to meet increasing demand for rice as a staple food in the country.
1.1 PROJECT BACKGROUND

Emtrade Company Limited has been shortlisted by the Ghana Commercial Agriculture Project (GCAP) to receive funding and technical support from the project to undertake an improved rain-fed rice cultivation agribusiness at the Nasia-Nabogo Inland Valley in the SADA Zone of Ghana.

The GCAP project is being funded by the World Bank and United States Agency for International Development (USAID) and has a development objective to improve agricultural productivity and production in both smallholder and nucleus farms in selected project intervention areas with increased access to reliable water, land, finance and agricultural inputs and output markets. Through GCAP, Emtrade Company Limited is expected to receive support in the form of land preparation and development/construction of rain water harvesting facilities to enhance rice cultivation at the Nasia-Nabogo Inland Valley in the SADA Zone of Ghana.

The shortlisted investor is obliged to fulfil the World Bank’s safeguards requirements and the Ghana Environmental Protection Agency (EPA) Act, 1994 (Act 490) including the Environmental Assessment Regulations, 1999 (LI 1652) of Ghana as a condition for financial support to commence the project. This ESMP has been prepared by Emtrade Company Limited is being prepared in compliance with the World Bank’s operational procedures and safeguard policies by the shortlisted investor to serve as a guide to the implementation of sound environmental and social mitigation measures for a sustainable implementation of the project near Kukobila in the Nasia-Nabogo Inland Valley.

1.2 THE SCOPE OF ESMP

The scope of the ESMP covers the environmental and social matters of the proposed 400 ha rain-fed rice cultivation project by Emtrade Company Limited located near Kukobila in the Nasia-Nabogo Inland Valley of the Northern Region of Ghana. The ESMP provides practical, costed, timed and monitorable measures to mitigate the identified adverse impacts and enhance positive impacts associated with the implementation of the 400 ha rain-fed agriculture project.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

1.3 OBJECTIVES OF THE ESMP

The main objectives of this ESMP are to document actions required to prevent or minimize predicted negative environmental and socioeconomic impacts of the proposed project and provides the overall framework for the management of environmental related responsibilities associated with the proposed rain fed agricultural project.

In specific terms, the ESMP is designed to ensure:

- Compliance with the World Bank’s safeguards policies and operational procedures
- fulfilment of other donor agencies requirements

1.4 POLICIES OF EMTRADE COMPANY LIMITED

1.4.1 Environmental Policy

Emtrade Company Limited is committed to meeting and exceeding relevant environmental regulations and other environmental related requirements through the continual improvement of its environmental management system. ECL has the vision to ensure best practice in environmental management that targets excellent environmental performance.

Emtrade Company Limited does not have a documented environmental policy but has expressed total commitment to establish and use best agricultural practices that will eliminate adverse environmental effects, including developing and improving upon practices to minimize waste generation, prevent air, water and land pollution, and conduct business in compliance with applicable legal requirements.

1.4.2 Health and Safety Policy

Emtrade Company Limited is committed to a policy that enables work activities to be carried out under satisfactorily safe and healthy conditions such that the employer, supervisors and workers are all responsible for health and safety. ECL has pledged to take reasonable measures to remove (or at least reduce) risks to the health, safety and welfare of workers, contractors, authorised visitors and persons exposed to the project risks. Employees will be sensitized to act safely at all times and to ensure their own safety as well as those of other employees in the workplace. This policy shall be enforced at all phases of the improved rain-fed agricultural project.
1.4.3 Corporate Social Responsibility Policy

Emtrade Company Limited commits to the principle of sustainable business and has expressed this commitment in the form of corporate social responsibility improvement options. ECL expressed his intention to improve livelihood opportunities for socio-economic development of the project area to minimize detrimental impacts to society. ECL has embraced the out grower scheme and will further support the development of the area through payment of applicable levies as well as voluntary donations to improve the cultural and economic lifestyle of the communities.
2.0 LEGAL, POLICY AND INSTITUTIONAL FRAMEWORK

This section of the report examines the relevant Ghanaian legal, policy and institutional framework as well as the World Bank's policies applicable to the project.

**Table 2-1: Legal and institutional compliance of Emtrade Company Limited**

<table>
<thead>
<tr>
<th>Legal/Policy/Standard</th>
<th>Core Requirement</th>
<th>Applicability to Project</th>
</tr>
</thead>
<tbody>
<tr>
<td>Ghana National Environmental Policy, 2012</td>
<td>Promote sound management of the environment and sustainable use of resources</td>
<td>Project ESIA and ESMP preparations seek to ensure environmental protection</td>
</tr>
<tr>
<td>Forest and Wildlife Conservation Policy, 2011</td>
<td>Conservation and sustainable development of the nation’s forest and wildlife resources</td>
<td>The project location is within the SADA Zone and wildlife impacts from hunting and poaching are relevant for consideration. The zone does not lie within any forest or reserve.</td>
</tr>
<tr>
<td>National Land Policy, 1999</td>
<td>Offers guidelines and action for administration and land use in Ghana.</td>
<td>Large track of land within farming zone can generate social impacts on the livelihood of farmers who may lose their family land to the project.</td>
</tr>
<tr>
<td>Occupational Safety and Health (OSH) Policy of Ghana, Draft 2004</td>
<td>Prevent workplace accidents and injuries and define health and safety responsibilities for employers and employees</td>
<td>Employees of ECL both skilled and unskilled trigger occupational safety and health risks</td>
</tr>
<tr>
<td>National Workplace HIV/AIDS Policy, 2012</td>
<td>Protects, care, support and counsel people living with HIV/AIDS and ensuring prevention of employees from contracting the disease through sensitization.</td>
<td>Welfare of workers or persons in project area living with HIV/AIDS and those exposed to the risk of infection with the virus.</td>
</tr>
<tr>
<td>National Irrigation Policy, Strategies and Regulatory Measures, 2011</td>
<td>Addresses the problems, constraints and opportunities pertinent to irrigation sub-sector</td>
<td>Possible irrigation facilities in future after GCAP support and planning for a potential all year round farming programme</td>
</tr>
<tr>
<td>Riparian Buffer Zone Policy for Managing River Basins in Ghana, 2011</td>
<td>Provide comprehensive measures and actions for vegetative buffer creation around water systems</td>
<td>Surface water bodies within the project area including the Nasia river.</td>
</tr>
<tr>
<td>PPP Policy Document (MoFEP, 2011)</td>
<td>Focuses on role of private sector in transforming the agriculture sector</td>
<td>Agribusiness Investment by Emtrade Company Limited with support from GCAP and World Bank.</td>
</tr>
<tr>
<td>Legal/Policy/Standard</td>
<td>Core Requirement</td>
<td>Applicability to Project</td>
</tr>
<tr>
<td>-------------------------------</td>
<td>-----------------------------------------------------------------------------------</td>
<td>------------------------------------------------------------------------------------------</td>
</tr>
<tr>
<td>Environmental Assessment</td>
<td>Screening of potential impacts and determination of project category for the</td>
<td>Potential project impact identification and scope of Environmental Assessment</td>
</tr>
<tr>
<td>(OP 4.01)</td>
<td>appropriate environmental assessment (Categories A, B, C or FI)</td>
<td></td>
</tr>
<tr>
<td>Pest Management (OP 4.09)</td>
<td>Promotes the use of biological or environmental control methods and reduces</td>
<td>Pest Control (including weeds)</td>
</tr>
<tr>
<td></td>
<td>reliance on synthetic chemical pesticides.</td>
<td></td>
</tr>
<tr>
<td>Involuntary Resettlement (OP</td>
<td>Require avoidance of resettlement or minimize resettlement impact</td>
<td>Project Affected Persons and economic resources within the project land are guided by</td>
</tr>
<tr>
<td>/BP 4.12)</td>
<td></td>
<td>resettlement action plan.</td>
</tr>
<tr>
<td>Physical Cultural Property</td>
<td>Investigation and inventory of cultural resources likely to be affected.</td>
<td>Cultural and historical artefacts and chance findings</td>
</tr>
<tr>
<td>(OP 4.11)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Conservation of Natural</td>
<td>Promotes conservation of natural habitats</td>
<td>Natural habitat especially water courses</td>
</tr>
<tr>
<td>Habitats (OP 4.04)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Bank’s Policy on Disclosure</td>
<td>Require people residing in a project’s area of influence to have the right to</td>
<td>Public awareness in project area and dissemination of information concerning project to</td>
</tr>
<tr>
<td>(BP 17.50)</td>
<td>be informed of proposed project</td>
<td>relevant stakeholders</td>
</tr>
<tr>
<td>Forest (OP 4.36)</td>
<td>Supports sustainable and conservation oriented forestry</td>
<td>Vegetation cover of project area is outside the forest zone as gazetted in Ghana</td>
</tr>
<tr>
<td>The 1992 Constitution</td>
<td>Require the protection and safeguard of Ghana's environment and its territorial</td>
<td>Prevention of pollution and degradation of environmental resources within the project's</td>
</tr>
<tr>
<td></td>
<td>waters. It imposes obligations on citizens to take reasonable care of the</td>
<td>area of influence and the need for Emtrade Company Limited to make conscious efforts to</td>
</tr>
<tr>
<td></td>
<td>environment for posterity</td>
<td>improve and safeguard the environment and water resources</td>
</tr>
<tr>
<td>Environmental Assessment</td>
<td>All activities likely to have an adverse effect on the environment must be the</td>
<td>Environmental and Social Assessment, Environmental and Social Management Plan (s)</td>
</tr>
<tr>
<td>(EA) Regulations, 1999 LI</td>
<td>subject of an environmental assessment prior to the commencement of operations.</td>
<td></td>
</tr>
<tr>
<td>1652</td>
<td></td>
<td></td>
</tr>
<tr>
<td>The Water Resources Commission</td>
<td>Responsible for regulation and management of the utilization of freshwater</td>
<td>Management of water bodies and water abstraction, if any in the future as well as</td>
</tr>
<tr>
<td>Act, 1996 (Act 522)</td>
<td>resources</td>
<td>potential use for irrigation purposes during dry spells and minor seasons</td>
</tr>
<tr>
<td>Water Use Regulations</td>
<td>Regulate the use of water resources including rivers, lakes, springs, underground</td>
<td>Water use permits/rights</td>
</tr>
<tr>
<td></td>
<td>water and provide for related matters</td>
<td></td>
</tr>
<tr>
<td>Control and Prevention of</td>
<td>Prohibits the starting of undesired bushfires for any purpose such as hunting,</td>
<td>Bushfires for the purpose of land preparation, hunting of wildlife, charcoal production</td>
</tr>
<tr>
<td>Bush Fires Act, 1990 (PNDC</td>
<td>farming and charcoal production.</td>
<td>within farm etc.</td>
</tr>
<tr>
<td>229)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Local Government Act, 1994</td>
<td>This Act established the Metropolitan, Municipal and District Assemblies (MMDAs)</td>
<td>Administrative authority responsible for the regulations on land use planning and</td>
</tr>
<tr>
<td>(Act 462)</td>
<td>as the district planning and administrative authority.</td>
<td>sanitary waste disposal</td>
</tr>
</tbody>
</table>
## Legal/Policy/Standard | Core Requirement | Applicability to Project
--- | --- | ---
### The Labour Act, 2003 (Act 651)
Stipulates employer’s duty to ensure that every worker employed works under satisfactory, safe and healthy conditions. The Act also determines the working times and compensation for injured persons while on duty. | Health and Safety and welfare of persons employed by ECL Working hours and determination of compensation and overtime allowances for workers |
### Fire Precaution (Premises) Regulations, 2003 (LI 1724)
Require businesses to obtain fire certificate for offices and warehouses | Fire certificate for offices and warehouse where applicable and provision of firefighting equipment and layout plans and emergency systems |
### Land Acquisition Legislation
Regulate land acquired by Government for public use | Land acquisition & compensation issues |
### Ghana Investment Promotion Council (GIPC) Act, 1994 (Act 478)
Requires potential environmental effects of the business be taken into account in setting up the business. Businesses are obliged to ensure identification and mitigation of environment | Impact identification and mitigation through the ESIA and ESMP processes |
### Ghana AIDS Commission Act, 2002 (Act 613)
Requires project developers to contribute to the fight against HIV/AIDS through advocacy, joint planning, monitoring and evaluation for the eventual elimination of the disease. | Emtrade Company Limited is required to demonstrate commitment to reducing HIV and AIDS prevalence rates in Kukobila. |
### Wild Animal Preservation Act, 1961 (Act 43)
Consolidates and amends the law relating to wild animals, birds and fish and to continue the observance of the convention to which Ghana is a signatory for the protection of wild animals. | Likely encounter of wild fauna species owing to the vast extent of the proposed project land and its proximity to the Nasia Tributaries Forest Reserve (2.22km E). |
### Rivers Act, 1903 (CAP 226)
Regulates the use of certain rivers and provide for related matters. | The project design proposed by Emtrade Company Limited does not entail the diversion, pumping or damming of any river in this initial consideration. |
### Economic Plants Protection Act, 1979 (A.F.R.C.D. 47)
Prohibits the destruction of plants of economic value. | Flora species of economic value identified such as shea trees, dawadawa trees and baobab will not be felled during land preparation. |
### National Wildfire Management Policy, 2006
Conserves, enhances and protect the natural environment from uncontrolled fires through a proactive, pragmatic and comprehensive framework. | Management of wildfires which are characteristic of the Kukobila area especially in the long dry season (November to March) |
### African Convention on the Conservation of Nature & Natural Resources
The African Convention takes into force the protection of the natural environment through the creation of laws and regulations. | Preparation of this ESMP is a proactive step to ensure early identification and mitigation of pertinent environmental and social impacts related to implementation of the proposed project. |
3.0 DESCRIPTION OF PROJECT ACTIVITIES

The improved rain-fed system aimed at facilitating commercial cultivation of rice in the Nasia-Nabogo Inland Valley is a component three initiative of GCAP. Under this Component, GCAP aims to secure Private-Public Partnerships (PPPs) and small-holder linkages in the SADA zone.

3.1 PROJECT LOCATION

The site earmarked for Emtrade Company Limited’s proposed project is located along the Tamale-Bolgatanga highway in the Savelugu-Nanton Municipality. The land lies within the following coordinates:

- 0º51’53.121” W, 10º8’46.924” N at its northernmost corner;
- 0º51’0.982” W, 10º8’23.451” N at its easternmost corner;
- 0º52’29.925” W, 10º5’27.565” N at its southernmost corner; and
- 0º53’20.019” W, 10º5’50.056” N at its westernmost corner.

It lies within the Nasia-Nabogo Inland Valley covering an acquired land size of 567.49 ha with a total cultivable area of 400 ha. This valley is in the basins of the Nasia and Nabogo Rivers, sub-catchments of the White Volta Basin. The site is north of the Savelugu-Nanton Municipality and about 2 km from the West Mamprusi and Savelugu-Nanton border as shown in figure 3-1.

3.2 PROJECT DESIGN AND COMPONENTS

The design concept of the improved rain-fed rice fields is based on a 100 ha model to cover the total 400 ha. The project design for Emtrade Company Limited was developed by Agriconsulting Europe S.A. (AESA) and approved by GCAP. Emtrade Company Limited will roll out the proposed project in phases. Hundred hectares (100 ha) of the earmarked agricultural land (*about 25% of total area*) will be cultivated in 2016. This will be increased gradually until the entire concession is cultivated by 2019. Figure 3-2 shows the proposed cropping pattern or roll out plan for the proposed 400 ha improved rain-fed rice cultivation project.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobilla in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 3-1: Location Map of Project Site

Figure 3-2: Project’s cropping pattern/ Roll out plan
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobilla in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

3.2.1 Paddy Rice Fields

Bunds will be constructed on the rice fields with each bund having an average area of one (1) hectare. This means that 100 hectares will accommodate about 100 bunds. Therefore, 400 bunds will be constructed over the entire area of 400 hectares. The dimension of a bund is 100 m x 100 m and assuming a depth of 1 m will mean that each bund will require a maximum water retention of 10,000 m$^3$ (10,000,000 litres).

The rice farm design has simple rainwater harvesting bunds and management structures. This comprises sites where field bunds and main drainage structures are provided. The bunds facilitate improved rainwater retention and controls within the fields, whilst the drainage structures facilitate water distribution by gradient to ensure optimal use of water levels within the overall site, and mitigate against flooding of the fields and facilitate drainage of the fields during harvest, if so required. A typical layout is shown in figure 3-3 with selected photographs of similar sites in figure 3-4.

![Figure 3-3: Layout of the model for the proposed rice farms](image-url)
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobilla in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

3.2.2 Rainwater Retention Facilities

The water requirements of the project will be met by harvesting run-off and subsurface flow from the uplands and fringes, and from drainage from inland valleys further upstream. The “improved” designs (bunds) will facilitate harnessing and management of the water sources to ensure optimum conditions for rice production. Based on the topography of the site, the bunds will be in a north-west south-east orientation. A cross-section of a bund is shown in figure 3-5 below.

Rainfall patterns within the inland valley is marginally insufficient for rain dependent rice cultivation. The rainfall only appears as a reliable source of water in case of evenly distributed rainfall pattern. However, rainfall is not distributed evenly or regularly across the
wet season, hence purely rain dependent cultivation of rice in the inland valley will not meet the water requirements of the proposed project.

Therefore, runoff, generated in the hydromorphic fringe and uplands, will be harvested via control levees in reservoirs and channelized to supplement the shortfall in precipitation as well as provide some insurance against "dry spells" (14 days) of 1209 m³/ha. Thus, improved rainwater harvesting is essential to minimize the irregularities in rainfall through the construction of bunds to retain runoff and makes water available for the project when the rains fail.

### 3.2.3 Design Parameters for Rice Basin Bunds and Field Roads

The design consists of three main types of rice basin bunds, namely: - closing, contour and field bunds. These all retain the rainfall in the basin itself, so improving the moisture level of the soil. The closing bunds also act as flood protection bunds, to prevent the uncontrolled ingress on flood waters into the command area.

#### 3.2.3.1 Closing bunds

The closing or a perimeter bund is a boundary bund enclosing the entire basin command area. The bund prevents excess inflow into the basin. The bund will be constant level and will have the same dimension throughout its length. The design top width of the closure bund is 1.5 m with side slopes of 1:1. The height of the bund is 0.6 m.

#### 3.2.3.2 Contour Bunds

These bunds will follow the control lines which represent the topography. The main objective of these bunds is to retain and control the water inside the basin. These bunds will be constant elevation end to end. The top width of the closure bund is 0.6 m with side slopes of 1:1. The depth of ponding will be maintained to a height of 0.075-0.15 m and excess will spill over to the next field and the arrangement continues till the excess to be spilled through to adjoining drains. These are parallel or along the contour or transverse to the field bunds at contour spacing or approximately 100 m depending upon the width in-between the two contours.
3.2.3.3 Field Bunds

These bunds will link contour bunds to each other as well as partition the cropping area. It will further reduce the slope length on the cultivable land to retain water on the field. The field bunds are spaced at 9.3 - 100 m and are assumed to maintain uniform depth of water within the levelled basin. The top width of these sub-basin bunds is kept at 0.40 m with a slope of 1:1 to 1:1.5 keeping the height up to 0.40 m. These bunds will also be pre-regulated to ease movement and regulation of flow especially during the peak growing season (*August and September*).

3.2.3.4 Field Road System

A field road system will be provided to facilitate access to all areas of the farm for movement of farm equipment, transportation of farm produce/ inputs and labour as well as easy maintenance of the rain harvesting and water retention facilities. The closest access road to the site runs about 1.2 km parallel to the northern boundary of the earmarked land. About 40-45 km of access road with width of about 3.5 m will be required to service the first phase cultivation of 100 ha. The perimeter of the site will also be developed into an access road to serve as a fire belt and aid movement.

The design parameters of the rice field bunds and field roads is summarised in table 3-1 below.

*Table 3-1: Summary of design of Levee, Bund, Field Channel, Access Road Dimensions and Volume of Earthwork.*

<table>
<thead>
<tr>
<th>Descriptions</th>
<th>Top width (m)</th>
<th>Side Slopes (°)</th>
<th>Height of Bund (m)</th>
<th>Base Width (m)</th>
<th>Cross-Sectional Area (m²)</th>
<th>Volume (m³)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Control Levee</td>
<td>0.5</td>
<td>1</td>
<td>2</td>
<td>4.5</td>
<td>5</td>
<td>5</td>
</tr>
<tr>
<td>Closing Bunds</td>
<td>0.5</td>
<td>1</td>
<td>1</td>
<td>2.5</td>
<td>1.5</td>
<td>1.5</td>
</tr>
<tr>
<td>Contour Bunds</td>
<td>0.6</td>
<td>1</td>
<td>0.4</td>
<td>1.4</td>
<td>0.4</td>
<td>0.4</td>
</tr>
<tr>
<td>Field Bunds</td>
<td>0.4</td>
<td>1</td>
<td>0.4</td>
<td>1.2</td>
<td>0.32</td>
<td>0.32</td>
</tr>
<tr>
<td>Distribution/Field Channel</td>
<td>0.60</td>
<td>1</td>
<td>0.45</td>
<td>1.50</td>
<td>0.47</td>
<td>0.95</td>
</tr>
<tr>
<td>bunds (2)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Access road</td>
<td>3.5</td>
<td>1.5</td>
<td>0.4</td>
<td>4.7</td>
<td>1.64</td>
<td>1.64</td>
</tr>
</tbody>
</table>
3.2.4 Storage Facilities

The development of a warehouse in Nasia community is planned in collaboration with other investors in the Nasia project catchment area for easy transportation of produce to market centres with an estimated floor area of 2,784 m². Emtrade Company Limited will support this warehouse with secondary storage facilities when needed. Further specifications of the warehouse capacity are subject to final engineering designs.

Heavy machineries will be kept under sheds in the farms to protect them from adverse impacts of the weather. Minor maintenance will be done at the farm camps while major maintenance works will be done at external mechanical shops at Tamale.

As part of Emtrade Company Limited’s commitment to sustainable implementation of the project, agro-chemicals will be stored in well secured and ventilated facility on the farms to ensure community health and safety.

3.2.4 Energy Source

The electric power requirement for the project will be limited to the administrative offices of Emtrade Company Limited to be located in Kukobila. Therefore, electrical power can be sourced directly from the national grid per the requirements of the Northern Electricity Development Company (NEDCo). Solar power will be used as a sustainable option for farm camp lighting and other minor electrical power needs on site.

3.3 PROJECT ACTIVITIES

This section examines the agricultural activities to be undertaken during various stages of the rice cultivation. Table 3-2 shows a summary of activities at the various phases of project implementation.

**Table 3-2: Summary Table of Project Activities**

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>Sub-activities</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Establishment</td>
<td>Land Preparation and provision of water management infrastructure</td>
<td>Land Clearing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Stumping</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Ploughing and Harrowing</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Construction of bunds</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Levelling of basin</td>
</tr>
<tr>
<td>Nursery Care</td>
<td>Seed Selection</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Nursery Bed Preparation</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Sowing in Nursery</td>
<td></td>
</tr>
</tbody>
</table>
Environment and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobilla in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

### 3.3.1 Field Establishment Activities

#### 3.3.1.1 Seed Selection

Winnowed seeds will be selected by using the specific gravity method. The selected seeds will be washed and dried for later use. After pre-germination (soaking of the selected seeds for 24 hours), the seeds will be broadcasted on the prepared nursery seedbed. Alternatively, seeds will be put in jute bags and soaked in running water (sub-lateral or canal) or in a container. The water will be changed every 8 hours when soaked in a container. After 24 hours soaking, seed will then be kept in a warm place until it germinates.

#### 3.3.1.2 Nursery Bed Preparation

In preparing a nursery bed, the land will be ploughed and harrowed to a fine tilth. Wet beds of width 1.2 m would be made. An alley will be created and left between beds to facilitate irrigation and minimize rodent attack. The nursery area would be 700-500 m² per ha representing 1/15th - 1/20th of the area transplanted. Approximately, 80 kg of selected seed rice would be needed to establish a hectare of rice field.

#### 3.3.1.3 Sowing in Nursery

At this stage, pre-germinated seed will be broadcasted on wet beds and covered slightly with sieved soil. Broadcasting would be light in order to reduce seed rot and over population. The nursery will be fenced and also slightly mulched with dried rice straw or any suitable

---

1 The rice seed will be poured into a solution of salt and water (1.8kg of common salt in 20 litres of water) of specific gravity (1.06). Seeds which are not good will float at the surface while the good seed rest at the bottom of the container.
material in areas where mice infestation is expected. However, mulch will be removed after germination to gradually harden the plants.

### 3.3.1.4 Disease and Pest Control in nursery

One critical area under this category is control of pest and disease. Application of *Mancoseb 80 WP* or *Sulfa 80 WDG* four to seven-days interval at a rate of 2.4 kg per ha is very essential and would be carried out. Also, 50% of *Fenithrothion* would be applied concurrently at the rate of 3 ml per 15 litres of water.

### 3.3.1.5 Water Control in Nursery

To facilitate growth, water must be maintained permanently up to about 80% alley capacity. To achieve this, water will be regularly added when the plants are young. As growth proceeds, the water level will be reduced or topped up. The nursery will be allowed to flood two (2) days before transplanting to ease seedlings removal.

### 3.3.1.6 Land Preparation for Transplanting

The land will be cleared, stumped, ploughed, harrowed and rotovated to a fine tilth making sure that the land is levelled. Where necessary, *Farm Yard Manure (FYM)* will be applied (10 tonnes per ha per year). Also, 70% of the recommended rate of *Compound Fertilizer (15-15-15)*, that is, 7 bags or 350 kg per ha would be used before harrowing or rotovating. Due to the lightness of soil in certain areas, half (5 bags) of the total compound fertilizer will be used after land preparation in order to avoid leaching.

### 3.3.1.7 Transplanting

Transplanting will be carried out at a 3-5 leaf stage or 15-21 days after sowing at a spacing of 22-25 cm x 15 cm. To ensure efficiency and effectiveness of this method, more labour will be employed and where necessary machine implements will be used.

### 3.3.1.8 Fertilizer Application

Fertilizer application at the right time and in the right quantity is one of the surest ways of increasing yield. As a result, about 500 kg per ha of *Compound Fertilizer (NPK 15-15-15)* and 300 kg per ha of *Ammonium Sulphate* would be applied. About 7 bags (350 kg) of the *Compound Fertilizer* would be applied during land preparation. It would subsequently be followed by addition of *Ammonium Sulphate* at the tillering stage, 7-12 days after
transplanting. This will be followed by a mixture of Compound Fertilizer and Ammonium Sulphate at panicle initiation stage or around 40 days after transplanting depending mostly on the requirements of the plant. Table 3-3 shows the intended fertilizer application needed to sustainably cultivate a hectare of rice on the project site.

Table 3-3: Fertilizer Application for one ha rice on the project

<table>
<thead>
<tr>
<th>Fertilizer</th>
<th>Land preparation (kg)</th>
<th>Tillering (kg)</th>
<th>Panicle Initiation (kg)</th>
<th>Head (kg)</th>
<th>Total (kg)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nitrogen Component</td>
<td>52.50</td>
<td>31.50</td>
<td>38.25</td>
<td>17.75</td>
<td>140.00</td>
</tr>
<tr>
<td>Phosphate</td>
<td>52.50</td>
<td>-</td>
<td>22.50</td>
<td>-</td>
<td>75.00</td>
</tr>
<tr>
<td>Potassium</td>
<td>52.50</td>
<td>-</td>
<td>22.50</td>
<td>-</td>
<td>75.00</td>
</tr>
<tr>
<td>Compound Fertilizer (15-15-15)</td>
<td>350.00</td>
<td>-</td>
<td>150.00</td>
<td>-</td>
<td>500.00</td>
</tr>
<tr>
<td>Ammonium Sulphate</td>
<td>-</td>
<td>150.00</td>
<td>75.00</td>
<td>75.00</td>
<td>300.00</td>
</tr>
</tbody>
</table>

3.3.2 Maintenance of Rice Fields

3.3.2.1 Diseases and Pests Control

The main disease pertinent to rice cultivation in Ghana is Rice Blast caused by Pyricularia oryzae. As a measure, Kocide or Agrithane will be sprayed at the rate of 1.2 kg per 100 litres of water with two weeks interval as prophylactic and at weekly intervals when there is disease incidence.

To control Rice Stem Borer, 20 kg per hectare of FURA 39 granules would be applied before maximum tillering stage. For general insect control, Fenithrothion 50% (W/C) would be sprayed at the rate of 1 litre per ha with 400 litres of water. For prophylactic purposes and spraying convenience Mancozeb 80WP may be sprayed together. Spraying activities will be done using pneumatic machines.

3.3.2.2 Weed Control

Weeds will be controlled by puddling the soil using a Power Tiller Rotovator coupled with proper water management practices. With this practice, one or two times of light hand weeding is envisaged. For direct seeded and ill-levelled plots, herbicide application and/or two times of hand weeding would be implored. However, Integrated Weed Management
Strategies (IWMS) such as tilling and optimal row spacing will be applied to reduce weedicide use.

### 3.3.2.3 Water Management

Excess water after transplanting or broadcasting pre-germinated seed will be drained off. This is to avoid possible heating of the water layer which might lead to damage of pre-germinated seeds or transplanted seedlings.

Consequently, the field will be left in a saturated condition for 5-7 days. After transplanting, water level of 2-3 cm up to about 25 days will be maintained. Full land basking will be done for 4-7 days and intermittent land basking for 3-4 days every 7 days to ensure aeration of the soil and to check invalid tillering. After land basking, 3-5 cm of water will be maintained from panicle initiation to 10-15 days before harvesting when water is completely drained off. However, this practice will be discontinued in the event rice fields are invaded by mice.

### 3.3.3 Harvesting of Matured Rice

Rice will be harvested when panicle is approximately 90% ripe. Harvesting would be done mechanically using *Combine Harvesters* for effective harvesting to reduce loss of paddy. Farm workers and other locals will be allowed to glean rice from areas that could not be accessed by the harvesters. The expected yields per hectare of rice field is shown in table 3-4.

*Table 3-4: Expected rice yields*

<table>
<thead>
<tr>
<th>Years after commencement</th>
<th>Expected yield (metric tonne/ha)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>4.76</td>
</tr>
<tr>
<td>2</td>
<td>5.43</td>
</tr>
<tr>
<td>3</td>
<td>5.83</td>
</tr>
<tr>
<td>4 – 60 years</td>
<td>6.00</td>
</tr>
</tbody>
</table>

### 3.4 KEY PROJECT REQUIREMENTS

The subsequent sections elaborate on the key project requirements and their anticipated volumes or quantities.

#### 3.4.1 Water Requirement

Water required for the proposed rice cultivation will be limited to watering in the pre-nursery and main nursery through to transplanting and establishment of the field. The quantity of
water requirements for the project herein is contingent on the development stage. The water requirements for the proposed project will be from rainwater and a bund system for storing flood water for irrigation purposes. The details of the irrigation water requirements are shown in table 3-5. The peak irrigation water requirement of 1.33 litre per second per hectare (l/s/h) and is envisaged to occur during the month of December.

Table 3-5: Irrigation Water Requirements

<table>
<thead>
<tr>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sept</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Wet Season Start 12/7 (l/s/h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>49.5</td>
<td>276.4</td>
<td>0</td>
<td>0</td>
<td>64.4</td>
<td>24.2</td>
<td>0</td>
</tr>
<tr>
<td>Precipitation Deficit (mm)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>156.5</td>
<td>152.9</td>
<td>144.7</td>
<td>96.9</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>0</td>
<td>471.2</td>
</tr>
<tr>
<td>Dry Season Start 1/12 (l/s/h)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>0.42</td>
<td>0.58</td>
<td>0.48</td>
<td>0.32</td>
<td>0.06</td>
<td>0.19</td>
<td>1.03</td>
<td>0</td>
<td>0</td>
<td>0.2</td>
<td>0.09</td>
<td>1.33</td>
</tr>
</tbody>
</table>

3.4.2 Agro-Chemicals

Pesticides will be applied at various phases during implementation of the project. Only EPA approved agrochemicals will be used; as those are certified to be environmentally friendly and meet recommended standards. Agro-chemical inputs needed to cultivate one hectare of rice is indicated in table 3-6 all of which are EPA approved agro-chemicals.

Table 3-6: Farm input or agro-chemicals for cultivating one hectare of rice field

<table>
<thead>
<tr>
<th>Item</th>
<th>Unit</th>
<th>Quantity</th>
<th>Associated activity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fertilizer</td>
<td>kg</td>
<td></td>
<td>Land preparation to panicle initiation</td>
</tr>
<tr>
<td>NPK (15-15-15)</td>
<td></td>
<td>500</td>
<td></td>
</tr>
<tr>
<td>Ammonium sulphate/urea</td>
<td></td>
<td>250</td>
<td></td>
</tr>
<tr>
<td>Triple superphosphate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Insecticide</td>
<td>Litre</td>
<td>5</td>
<td>Pest and disease control</td>
</tr>
<tr>
<td>Fenithrothion 50 (w/v)</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>36g cypermethion</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fungicide</td>
<td>Kg</td>
<td></td>
<td>Pest and disease control</td>
</tr>
<tr>
<td>Agrithane, sulfa 8WDG</td>
<td></td>
<td>4-5</td>
<td></td>
</tr>
<tr>
<td>Herbicide</td>
<td>Litre</td>
<td>3</td>
<td>Weed control</td>
</tr>
<tr>
<td>Atrazine</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Glyphosphate</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Rodenticide</td>
<td>Kg</td>
<td></td>
<td>Pest and disease control</td>
</tr>
<tr>
<td>Baraki</td>
<td></td>
<td>15</td>
<td></td>
</tr>
</tbody>
</table>
3.4.3 Machinery

Due to the large area, ECL intends to cultivate, mechanised farm implements will be used. However, in areas where the soil type and topography will not permit the use of mechanised farm implements, farmers will resort to manual farming methods to use the land. Table 3-7 is a list of some heavy and simple farm implements likely to be used from the initial stage of production to the harvesting stage.

Table 3-7: List of farm machineries

<table>
<thead>
<tr>
<th>Mechanised farm machineries</th>
<th>Simple farm implements</th>
<th>Others</th>
</tr>
</thead>
<tbody>
<tr>
<td>Four-wheeled tractor</td>
<td>Cutlass</td>
<td>Sack sewing needle</td>
</tr>
<tr>
<td>Two-wheeled tractor</td>
<td>Hoe</td>
<td>Basket</td>
</tr>
<tr>
<td>Rice planter</td>
<td>Spade</td>
<td>Sacks</td>
</tr>
<tr>
<td>Thresher</td>
<td>Power sprayer</td>
<td>Crates</td>
</tr>
<tr>
<td>Combine Harvester</td>
<td>Knapsack sprayer</td>
<td></td>
</tr>
<tr>
<td>Water tanker</td>
<td>Threshing boxes</td>
<td></td>
</tr>
</tbody>
</table>

3.4.4 Labour Requirements

Paddy cultivation is extremely labour-intensive, therefore, requires more labour in comparison to other cereal crops. Labour is necessary for preparing the field, weeding, sowing, transplanting, manuring, harvesting, threshing, winnowing and milling. For the proposed project, a large number of work forces (skilled and unskilled) will be required. The labour requirements for implementing the Emtrade Company Limited’s proposed 400 ha project is estimated at over 230 casuals and 10 permanent employees by the year 2019 for each farming season.
4.0 ENVIRONMENTAL AND SOCIAL BASELINE

This section presents an overview of the biophysical and socio-economic characteristics of the project’s area of influence.

4.1 LAND RESOURCES

4.1.1 Topography

The project site is generally flat with elevation ranging from a minimum of 390 m to maximum of 414 m above sea level which occurs towards the south-west of the project site. The lowest point on the hand is at the north-west of the project site about 400 meters from the northern boundary. Figure 4-1 shows the elevation profile across the site earmarked for the project. The terrain of the project site is ideal for cultivation of paddy rice.

Environmental Concern: The topography of the project site does not pose any observable concern in respect of environmental impacts. Erosion impacts are less significant because of the gentle gradient of land.
Mitigation Measure: ECL will adopt good agricultural practices for land preparation to reduce gradient alteration. No ploughing along slope is recommended.

4.1.2 Geology and Soil

The project site geological rock base is entirely made up of the Obosum and Oti Beds; two of the Tripartite Stratigraphic Division for Voltaian Super-Group. This geological type mainly comprises of shale, mudstone, sandy and pebbly beds. As shown in figure 4-2, Lixisols dominate the entire project site. Lixisols are strongly weathered soils in which clay is washed down from the surface soil to an accumulation horizon at some depth. Though the soils have low levels of available nutrients and low nutrient reserves, the chemical properties of lixisols are generally better than ferralsols and acrisols because of their higher soil-pH and the absence of serious Al-toxicity. They are typically in seasonally waterlogged flat lands emphasizing its suitability for commercial rice cultivation.

Figure 4-2: Soil Map of the project’s area of influence
**Environmental Concern:** The geological features favour the cultivation of rice in the area and repeated land use may potentially deplete the soils of important nutrients and may result in soil degradation. Its ability to retain water will help conserve the water requirements for the project.

**Mitigation Measure:** ECL is recommended to adopt good agricultural practices for land use including fertilizer application and possibility to allow land to regenerate by fallowing. As much as possible ECL will rely on water retention bunds to conserve water use and apply gradient flow to irrigate the entire fields.

### 4.2 HYDROLOGICAL RESOURCES

#### 4.2.1 Drainage

The proposed project site is situated in the White Volta Basin. This site and its area of influence is drained by the White Volta and Nasia River as well as their tributaries (see figure 4-3). The Nasia River is the drainage basin of the left bank tributary of the White Volta. During the long dry season period, the Nasia River reduces in volume whereas all other streams dry up completely.

![DRAINAGE MAP OF PROJECT SITE](image_url)

*Figure 4-3: Project’s local hydrological pattern*
Environmental Concern: The project area falls within the Nasia-Nabogo Inland Valley and is susceptible to seasonal flooding when the rivers overflow their banks. Again, flooding of the valleys is known to occur when the Bagre Dam in Burkina Faso is spilled periodically. Besides the negative impact of flooding, farming activities such as agrochemical application is likely to pollute the Nasia river.

Mitigation Measure: Emtrade Company Limited will design the water retention systems to trap excess water during the rainy season and use it as a fall-back facility to complement his irrigation needs in case of shortages in rainwater. ECL shall ensure information related to rainfall patterns and flood management of Bagre Dam are factored into the farm monitoring indicators. Usage of agrochemicals will as much as possible be limited and an adequate buffer zone will be conserved between the tributary of Nasia river and the farm. Additionally, only approved agrochemical will be used under strict supervision.

4.2.2 Water Yield in the White Volta Basin

The mean yield in the White Volta Basin is 3.7 m³/hour. In the Crystalline Basement Complex and around 50% in the Voltaian Formations, the average drilling success rate stands around 70%. Table 4-1 below indicates the statistical evidence related to occurrence and potential rate of groundwater abstraction in the basin.

Though the mean yield of the Voltaian formation of the White Volta River Basin (1.139 l/s) is low, implementation of the project will not involve the abstraction of groundwater since the proposed rain harvesting technology will meet the water requirements for the proposed project.

Table 4-1: Water yield in the White Volta River Basin

<table>
<thead>
<tr>
<th>Geological zone</th>
<th>Depth of borehole (m)</th>
<th>Depth to aquifer top (m)</th>
<th>Borehole yield (m³/hour)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Range</td>
<td>Mean</td>
<td>Range</td>
</tr>
<tr>
<td>Birimian Formation</td>
<td>10 – 104</td>
<td>43.6</td>
<td>1 – 81</td>
</tr>
<tr>
<td>Voltaian Formation</td>
<td>6 – 180</td>
<td>54.2</td>
<td>1 – 72</td>
</tr>
</tbody>
</table>

*Yield range given as probable (95%) of occurrence, i.e. the interval excludes the 5% lowest and highest recorded yields to avoid "outliers".*

Current groundwater production in the basin is less than 1% of estimated recharge with production less than 5% of recharge the north-eastern part of the basin, where groundwater
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobilla in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

abstraction is relatively high\textsuperscript{v}. The adoption of rain fed irrigation systems is therefore a sustainable source of water for the project.

**Environmental Concern:** The project will depend largely on surface water available during rainfalls. The yield parameters have less obvious environmental concerns in respect of the project.

**Mitigation Measure:** The Water Retention Facilities will be engineered such that they can store enough water to complement any shortages in rainfall or rainwater.

### 4.2.3 Surface and Ground Water Quality Assessment

Surface and ground water has been identified as a major environmental receptor in the project area. Since historical surface and ground water quality data was not available, water quality assessment was conducted in two (2) phases to serve as a benchmark for future environmental monitoring programmes during implementation of the proposed project (see figure 4-4). The output data was compared to the WRC TWQR for agricultural water use (irrigation) and FAO guidelines for irrigation water.

A preliminary water quality assessment was conducted during the dry season. At the time of visiting the project area on the 4\textsuperscript{th} and 5\textsuperscript{th} of February, 2016, floodplains and tributaries of the Nasia River were dried up. Therefore, sampling of surface water and in-situ measurements were carried out in the main channels of the Nasia River. During this assessment, in situ measurement of water parameters was carried out using a “Hanna Instrument HI 9829 Multiparameter” device to serve as indicative measurements. Samples were also collected employing standard sampling techniques, stored and transported on ice at 4°C for assessment at the Ghana Water Company Limited (GWCL) laboratory (see Appendix 01).

A detailed assessment was commissioned in the wet season (7\textsuperscript{th} and 8\textsuperscript{th} July, 2016). Samples of surface water were collected at upstream and downstream locations on the Nasia River as shown in figure 4-5. Groundwater samples were also collected from Kukobila. Standard sampling techniques were employed in collecting the water samples to achieve highly accurate water quality results. Sampling bottles were thoroughly rinsed with clean water as well as samples of the water to be collected. Water samples were taken below the
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobilla in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana.

water surface and collected into clean 500 ml plastic bottles. The samples were transported to the Water Research Institute (WRI) laboratory in Tamale on ice and stored at 4 °C for a comprehensive analysis of parameters as stipulated by the WRC TWQR for agricultural water use (see Appendix 02).

The parameters measured, their values and the corresponding FAO (irrigation) and WRC TWQR for agricultural water use (irrigation) guidelines are presented in table 4-2 below.

Figure 4-4: Water Quality Assessment Activities

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2 WRI is one of the thirteen (13) institutes of the Council for Scientific and Industrial Research (CSIR) in Ghana.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Table 4-2: Water quality assessment results

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Preliminary</th>
<th>Comprehensive</th>
<th>Standards</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Surface Water</td>
<td>Ground Water</td>
<td></td>
</tr>
<tr>
<td></td>
<td>River Nasia</td>
<td>Kukobila</td>
<td>WRC TWQR for Agricultural Water use (Irrigation Water)</td>
</tr>
<tr>
<td></td>
<td>River Nasia</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Up Stream</td>
<td>Down Stream</td>
<td></td>
</tr>
<tr>
<td></td>
<td>(10° 13’ 33.18” N &amp; 0° 43’ 0.27” W)</td>
<td>(10° 5’ 10.46” N &amp; 0° 52’ 16.78” W)</td>
<td></td>
</tr>
<tr>
<td>Odour</td>
<td>Unobjectionable</td>
<td>Odourless</td>
<td>Odourless</td>
</tr>
<tr>
<td>pH</td>
<td>7.7</td>
<td>6.57</td>
<td>6.85</td>
</tr>
<tr>
<td>App./ True Colour*</td>
<td>-</td>
<td>157/33</td>
<td></td>
</tr>
<tr>
<td>Turbidity (NTU)</td>
<td>-</td>
<td>42.8</td>
<td>2.0</td>
</tr>
<tr>
<td>Conductivity (µS/cm)</td>
<td>0.0</td>
<td>-</td>
<td>416</td>
</tr>
<tr>
<td>Dissolved Oxygen (mg/L)</td>
<td>0.0</td>
<td>-</td>
<td></td>
</tr>
<tr>
<td>TDS (mg/L)</td>
<td>0.0</td>
<td>-</td>
<td>4.2</td>
</tr>
<tr>
<td>TSS (mg/L)</td>
<td>-</td>
<td>14.0</td>
<td></td>
</tr>
<tr>
<td>BOD (mg/L)*</td>
<td>-</td>
<td>100.0</td>
<td>4.2</td>
</tr>
<tr>
<td>COD (mg/L)</td>
<td>-</td>
<td>166.0</td>
<td>35.52</td>
</tr>
<tr>
<td>Total Phosphorus (mg/L)</td>
<td>-</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Phosphate (mg/L)</td>
<td>-</td>
<td>0.6</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Nitrate (mg/L)</td>
<td>-</td>
<td>0.02</td>
<td>12.23</td>
</tr>
<tr>
<td>Nitrite (mg/L)</td>
<td>-</td>
<td>0.0</td>
<td>&lt;0.001</td>
</tr>
<tr>
<td>Total Nitrogen (mg/L)</td>
<td>-</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Ammonia (mg/L)</td>
<td>-</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Sulphate (mg/L)</td>
<td>-</td>
<td>10.0</td>
<td>8.80</td>
</tr>
<tr>
<td>Total Coliform (cfu/ml)*</td>
<td>-</td>
<td>1.0</td>
<td>1x10³</td>
</tr>
<tr>
<td>Faecal Coliform (cfu/ml)</td>
<td>-</td>
<td>0</td>
<td>0</td>
</tr>
<tr>
<td>Temperature</td>
<td>-</td>
<td>27.0</td>
<td>26.9</td>
</tr>
</tbody>
</table>

In situ

GWCL

Water Research Institute (WRI)

FAO Guidelines (Irrigation Water)
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Parameters</th>
<th>Preliminary Surface Water River Nasia (9° 44’ 25.9” N &amp; 0° 49’ 28.6” W)</th>
<th>Comprehenssive Surface Water River Nasia</th>
<th>Ground Water Kukobila (10° 7’ 27.8” N &amp; 0° 48’ 28.6” W)</th>
<th>WRC TWQR for Agricultural Water use (Irrigation Water)</th>
<th>FAO Guidelines (Irrigation Water)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fluoride (mg/L)</td>
<td>-</td>
<td>0.831</td>
<td>0.831</td>
<td>&lt;2</td>
<td>-</td>
</tr>
<tr>
<td>Silica Oxide (mg/l)</td>
<td>-</td>
<td>25.61</td>
<td>9.67</td>
<td>25.61</td>
<td>-</td>
</tr>
<tr>
<td>Manganese (mg/l)</td>
<td>-</td>
<td>0.002</td>
<td>0.148</td>
<td>0.002</td>
<td>&lt;0.02</td>
</tr>
<tr>
<td>Total Iron (mg/l)</td>
<td>-</td>
<td>0.111</td>
<td>3.598</td>
<td>0.111</td>
<td>&lt;5</td>
</tr>
<tr>
<td>Lead (mg/l)</td>
<td>-</td>
<td>&lt;0.017</td>
<td>&lt;0.017</td>
<td>&lt;0.017</td>
<td>&lt;0.2</td>
</tr>
<tr>
<td>Cadmium (mg/l)</td>
<td>-</td>
<td>&lt;0.020</td>
<td>&lt;0.013</td>
<td>&lt;0.020</td>
<td>&lt;0.01</td>
</tr>
<tr>
<td>Copper (mg/l)</td>
<td>-</td>
<td>&lt;0.014</td>
<td>0.008</td>
<td>&lt;0.014</td>
<td>&lt;0.1</td>
</tr>
<tr>
<td>Zinc(mg/l)</td>
<td>-</td>
<td>0.023</td>
<td>0.341</td>
<td>0.023</td>
<td>&lt;1</td>
</tr>
<tr>
<td>Chromium(mg/l)</td>
<td>-</td>
<td>0.088</td>
<td>0.024</td>
<td>0.088</td>
<td>&lt;0.1</td>
</tr>
</tbody>
</table>
The preliminary assessment results indicate that the quality of surface water from the Nasia River generally conforms to the WRC TWQR for agricultural water use (irrigation) and FAO (irrigation) guidelines. However, untreated water from the Nasia River could be used for other purposes such as irrigation and dilution of agro-chemicals.

The comprehensive assessment also indicates that the quality of surface water for both upstream and downstream on the Nasia River generally conforms to the WRC TWQR and FAO guidelines for irrigation except total iron, manganese, cadmium, sulphate and conductivity. Data gathered from water quality assessment on total iron and manganese indicate that recorded values of 7.658 mg/L (upstream), 3.586 mg/L and 0.148 mg/L (upstream and downstream) are all above the WRC TWQR recommended guidelines for irrigation. Cadmium concentration of 0.015 mg/L and 0.013 mg/L upstream and downstream respectively exceeds the WRC TWQR for agricultural water use (irrigation) recommended guideline level of 0.001 mg/L. In addition, both sulphate and conductivity also exceed FAO recommended threshold for irrigation water of 0-20 mg/L and 0-3 mg/L respectively. These exceptions can be attributed to a number of factors including nature of the river bed rocks and anthropogenic activities. The presence of Total Coliforms shows faecal contamination possibly from surface runoff and open defecation.

Groundwater quality assessment at Kukobila further indicates that parameters assessed generally conforms the WRC TWQR and FAO guidelines. Results however, indicate high concentration of cadmium in the borehole sampled (<0.020mg/L) which exceeds the WRC TWQR for agricultural water use (irrigation) level of 0.01 mg/L. The high level of nitrate of 12.23 mg/L above the FAO recommended threshold for irrigation also indicates chemical contamination. These values generally indicate there is some level of groundwater contamination.
**General Observation:** Assessment results indicate that the quality of surface water from the Nasia River generally conforms to the WRC and FAO guidelines for use as irrigation and dilution of agro-chemicals. However, the high concentration of some parameters indicates some level of both surface and groundwater contamination.

**Mitigation Measure:** ECL is recommended to implement a periodic water quality assessment programme to determine the trends of project impacts on the water quality of the Nasia River. ECL will not use water from river for the purpose of irrigation but will rely on only rain-fed agriculture.

### 4.3 BIOLOGICAL RESOURCES

#### 4.3.1 Vegetation/Flora and Land Cover

The project’s area of influence lies within an extensive area of very sparse open and closed cultivated Guinea Savanna Woodland capable of sustaining large scale livestock farming as well as staples like rice, groundnuts, yams, cassava and maize (see figure 4-6). The vegetation has a tree cover ranging from eleven to twenty trees per hectare. The common
trees include Vitellaria paradoxa (shea), Parkia biglobosa (dawadawa), Piliostigma thonningli, Combretum glutinosum, Anogeissus sp., Detarium sp., Afzelia sp., Prosopiss sp., Pterocarpuss sp., Butyrospermums sp., Antiaris sp., Vitex sp., Pliostigmas sp., Lonchocarpuss sp. and Acacias sp.

The Nasia Tributary Forest Reserve (approximately 28363 hectares) is the only closest protected area or nature reserve to the project area. However, the project site to the Reserve is located 2.22 km east of the Reserve. The implementation of the project will therefore have minimal impact on water resources in the Reserve. Game hunting will be prohibited for all farm workers.

![Landcover Map of the project’s area of influence](image)

**Figure 4-6: Land cover Map of the project’s area of influence**

Tables 4-3 shows a list flora in the project area including their conservation status according to the International Union for Conservation of Nature and Natural Resources (IUCN) and mode of identification. All the flora species identified in the project area are of Least Concern (LC) with the exception of the Shea tree, which is a Vulnerable (VU) flora species. Owing to
the sparse distribution of shea trees in the savannah belt and their VU conservation status, it is recommended that shea trees within ECL concessions are identified and preserved during land preparation.

Table 4-3: Common flora species in the project area

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Common Name</th>
<th>IUCN Status</th>
<th>Mode of Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Sapotaceae</td>
<td>Vitellaria paradoxa</td>
<td>Shea tree</td>
<td>VU</td>
<td>Sighted</td>
</tr>
<tr>
<td>Malvaceae</td>
<td>Ceiba pentandra</td>
<td>Kapok tree</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td>Rubiaceae</td>
<td>Mitragyna inermis</td>
<td>-</td>
<td>-</td>
<td>Literature</td>
</tr>
<tr>
<td>Fabaceae</td>
<td>Parkea Biglobosa</td>
<td>-</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td>Convolvulaceae</td>
<td>Ipomoea aquatica</td>
<td>Pig weed</td>
<td>LC</td>
<td>Reported</td>
</tr>
<tr>
<td>Euphobiaceae</td>
<td>Alchornea laxiflora</td>
<td>-</td>
<td>LC</td>
<td>Reported</td>
</tr>
<tr>
<td>Leguminosae</td>
<td>Centrosema pubescens</td>
<td>Legume</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td>Memosoideae</td>
<td>Mimosa invisa</td>
<td>Legume</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td>Poaceae</td>
<td>Andropogon gayanus</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Diplachne fusca</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Hyparrhenis involucrate</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Hyparrhenia rufa</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Hyperthelis dessolute</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Leersia hexandra</td>
<td>Grass</td>
<td>Secure (NatureServe)</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Oryza longistaminata</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Imperata cylindrical</td>
<td>Grass</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Pennisetum polystachion</td>
<td>Grass</td>
<td>-</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Echinochloa pyramidalis</td>
<td>Grass</td>
<td>-</td>
<td>Literature</td>
</tr>
</tbody>
</table>

Environmental Concern: Though the project area experiences perennial bushfire which destroys the vegetation cover, the clearing of the existing flora species and habitats cumulatively could lead to climate change and loss of flora species in the area.

Mitigation Measure: The development of the land must not extend into adjoining lands. As much as possible, vegetative species that can be preserved should be isolated and protected. Green plantation of rice will continue to absorb greenhouse gases thereby reducing global warming effects. Also, ECL will take inventory of all economic trees removed or destroyed and replace them in 2-3 folds at appropriate locations.

4.3.2 Fauna

Fauna species within the project concession is very limited due to seasonal bush burning activities. Some fauna species typical in the project area are reptiles, insects, amphibians and small rodents. However, locals report that *Naja nelanoleuca* (cobra), *Bitis gabonica*...
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana.

(gaboon viper), *Veranus niloticus*, *Francolinus sp.* (bush fowl), *Falconidae sp.* (falcons, hawks, and eagles), *Psittacus erithacus* (grey parrot), *Neophron sp.* (vultures), *Guttera edouardi* (guinea fowl), *Vidua nigeriae* (first quailfinch indigo bird) and many others are common in in the project area.

Tables 4-4 and 4-5 list fauna in the project area including their conservation status according to the International Union for Conservation of Nature and Natural Resources (IUCN) and mode of identification. All the fauna species identified in the project area are of Least Concern (LC).

### Table 4-4: Common amphibians, reptiles, arthropods and birds in the project area

<table>
<thead>
<tr>
<th>Class</th>
<th>Species</th>
<th>Common Name</th>
<th>IUCN Status</th>
<th>Mode of Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Amphibians</td>
<td>Rana sp</td>
<td>Frogs</td>
<td>LC</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Amietophrynus regularis</td>
<td>Toad</td>
<td>LC</td>
<td>Sighted</td>
</tr>
<tr>
<td>Reptiles</td>
<td>Agama agama</td>
<td>Agama lizard</td>
<td>LC</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Python sebae sebae</td>
<td>African python</td>
<td>LC</td>
<td>Reported</td>
</tr>
<tr>
<td></td>
<td>Veranus niloticus</td>
<td>Nile monitor lizard</td>
<td>LC</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Naja nigricollis</td>
<td>Black cobra</td>
<td>-</td>
<td>Literature</td>
</tr>
<tr>
<td>Arthropods</td>
<td>Pandinus imperator</td>
<td>Scorpion</td>
<td>-</td>
<td>Reported</td>
</tr>
<tr>
<td></td>
<td>Centipede</td>
<td>-</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Millipede</td>
<td>-</td>
<td>-</td>
<td>Sighted</td>
</tr>
<tr>
<td>Aves (birds)</td>
<td>Actophilornis africanus</td>
<td>Lily trotter</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Amandava subflava</td>
<td>Zebra waxbills</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Anas sparsa</td>
<td>Ducks</td>
<td>LC</td>
<td>Sighted</td>
</tr>
<tr>
<td></td>
<td>Apus affinis</td>
<td>Little African swift</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Ardea ralloides</td>
<td>Squacco herons</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Egretta alba</td>
<td>Great white egret</td>
<td>LC</td>
<td>Reported</td>
</tr>
<tr>
<td></td>
<td>E. cerix</td>
<td>Red bishop</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>E. hordeacea</td>
<td>Black-winged red bishop</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Hippolais polyglotta</td>
<td>Melodious warbler</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Megaceryle alcyon</td>
<td>Banded Kingfisher</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Merops bulocki</td>
<td>Red-throated bee eater</td>
<td>LC</td>
<td>Literature</td>
</tr>
<tr>
<td></td>
<td>Ploceus melanocephalus</td>
<td>Black-headed weaver</td>
<td>LC</td>
<td>Literature</td>
</tr>
</tbody>
</table>

*NE = Not Evaluated; DD = Data Deficient; LC = Least Concern; NT = Near Threatened; VU = Vulnerable; EN = Endangered; CR = Critically Endangered; EW = Extinct in the Wild; EX = Extinct*

### Table 4-5: Common fish species in the project area

<table>
<thead>
<tr>
<th>Family</th>
<th>Species</th>
<th>Common Name</th>
<th>IUCN Status</th>
<th>Mode of Identification</th>
</tr>
</thead>
<tbody>
<tr>
<td>Anabantiidae</td>
<td>Ctenopom patherici</td>
<td>Climbing perch</td>
<td>LC</td>
<td>Literature</td>
</tr>
</tbody>
</table>
Environmental Concern: The project will impact on fauna as some will have their habitats destroyed making them fall prey to other animals. The displacement of the fauna will lead to some of them being killed by hunters and that will impact on their populations.

Mitigation Measure: Emtrade Company Limited shall implement fauna protection measures to assist species relocate to new habitats. Consequently, the land development should be done systematically to allow enough time for fauna to migrate and relocate to new habitats outside the concession.

4.4 ATMOSPHERIC PARAMETERS

4.4.1 Ambient Air Quality and Noise Levels

4.4.1.1 Air Quality Assessment
To establish the baseline information of the project site, an air quality monitoring assessment was conducted within the Nasia project catchment specifically north east of the project site (location D) and outside the project area but within Nasia area (location C) on 8th to 10th July 2016. The parameters measured were PM$_{10}$ and TSP for a period of 24 hours at each location.

The monitoring assessment was conducted using MiniVol Tactical Air Samplers (TAS®) at the two (2) locations determined based on wind direction and pollution dispersion conditions. The monitoring equipment and procedures used were consistent with the method approved by the EPA of Ghana. Table 4-6 below summarises the results of the ambient air quality assessment.

### Table 4-6: 24-hour average air quality values recorded

<table>
<thead>
<tr>
<th>Sampling Point</th>
<th>Latitude (N)</th>
<th>Longitude (W)</th>
<th>Date</th>
<th>Dust Concentration (µg/m$^3$)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Started</td>
<td>Stopped</td>
</tr>
<tr>
<td>Location C</td>
<td>10° 08'59.4''</td>
<td>000° 50' 40.1''</td>
<td>08-July-16</td>
<td>09-July-16</td>
</tr>
<tr>
<td>Location D</td>
<td>10° 11' 16.6''</td>
<td>000° 45' 59.2''</td>
<td>09-July-16</td>
<td>10-July-16</td>
</tr>
</tbody>
</table>

**EPA Standard (24 hour averages)**  
70  230

**IFC/World Bank (Interim Target 1)**  
150  N/A

The values of the air quality parameters (TSP and PM$_{10}$) recorded at both locations fall within the acceptable limits of the Ghana EPA Air Quality and IFC/World Bank limits of 230 µg/m$^3$ and 70 µg/m$^3$ for TSP and PM$_{10}$ respectively. Results indicate that the mean level recorded for TSP was 177.48 µg/m$^3$ and 133.12 µg/m$^3$ for location C and D respectively. The relatively high concentrations recorded at location C compared to D of PM$_{10}$ is attributed to its close proximity to the untarred access road increasing the amount of particulate generation. Figure 4-7 and 4-8 show trend analysis of the values recorded which indicates temporal variation of both TSP and PM$_{10}$. The daily trend for TSP across both locations was such that daytime concentrations were higher whiles nighttime concentration levels were below (see table 4-7).

### Table 4-7: Hourly PM$_{10}$ and TSP Concentration values
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Time</th>
<th>PM10 µg/m³ Location C</th>
<th>PM10 µg/m³ Location D</th>
<th>TSP µg/m³ Location C</th>
<th>TSP µg/m³ Location D</th>
</tr>
</thead>
<tbody>
<tr>
<td>13:00</td>
<td>130.65</td>
<td>101.16</td>
<td>209.45</td>
<td>122.47</td>
</tr>
<tr>
<td>14:00</td>
<td>162.73</td>
<td>133.24</td>
<td>208.35</td>
<td>207.55</td>
</tr>
<tr>
<td>15:00</td>
<td>123.93</td>
<td>94.44</td>
<td>206.73</td>
<td>215.74</td>
</tr>
<tr>
<td>16:00</td>
<td>119.42</td>
<td>89.93</td>
<td>218.21</td>
<td>121.23</td>
</tr>
<tr>
<td>17:00</td>
<td>108.65</td>
<td>79.16</td>
<td>211.45</td>
<td>110.47</td>
</tr>
<tr>
<td>18:00</td>
<td>94.17</td>
<td>64.68</td>
<td>214.28</td>
<td>127.3</td>
</tr>
<tr>
<td>19:00</td>
<td>94.66</td>
<td>65.17</td>
<td>134.76</td>
<td>107.78</td>
</tr>
<tr>
<td>20:00</td>
<td>31.37</td>
<td>26.33</td>
<td>48.27</td>
<td>46.96</td>
</tr>
<tr>
<td>21:00</td>
<td>28.68</td>
<td>25.54</td>
<td>45.58</td>
<td>44.27</td>
</tr>
<tr>
<td>22:00</td>
<td>27.99</td>
<td>19.34</td>
<td>54.89</td>
<td>43.58</td>
</tr>
<tr>
<td>23:00</td>
<td>25.48</td>
<td>19.42</td>
<td>62.38</td>
<td>41.07</td>
</tr>
<tr>
<td>0:00</td>
<td>28.17</td>
<td>17.53</td>
<td>45.07</td>
<td>43.76</td>
</tr>
<tr>
<td>1:00</td>
<td>27.96</td>
<td>23.87</td>
<td>44.86</td>
<td>43.55</td>
</tr>
<tr>
<td>2:00</td>
<td>30.1</td>
<td>22.19</td>
<td>57</td>
<td>45.7</td>
</tr>
<tr>
<td>3:00</td>
<td>27.61</td>
<td>23.09</td>
<td>68.51</td>
<td>43.2</td>
</tr>
<tr>
<td>4:00</td>
<td>27.52</td>
<td>23.33</td>
<td>57.42</td>
<td>43.11</td>
</tr>
<tr>
<td>5:00</td>
<td>28.24</td>
<td>22.79</td>
<td>55.14</td>
<td>43.84</td>
</tr>
<tr>
<td>6:00</td>
<td>28.16</td>
<td>24.02</td>
<td>109.06</td>
<td>43.75</td>
</tr>
<tr>
<td>7:00</td>
<td>63.73</td>
<td>44.29</td>
<td>197.4</td>
<td>159.32</td>
</tr>
<tr>
<td>8:00</td>
<td>61.76</td>
<td>52.05</td>
<td>202.7</td>
<td>157.35</td>
</tr>
<tr>
<td>9:00</td>
<td>82.45</td>
<td>61.14</td>
<td>118.73</td>
<td>178.04</td>
</tr>
<tr>
<td>10:00</td>
<td>90.09</td>
<td>88.13</td>
<td>120.42</td>
<td>185.68</td>
</tr>
<tr>
<td>11:00</td>
<td>80.5</td>
<td>76.97</td>
<td>109.06</td>
<td>176.09</td>
</tr>
<tr>
<td>12:00</td>
<td>86.66</td>
<td></td>
<td></td>
<td>110.47</td>
</tr>
</tbody>
</table>
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 4-7: Trend of Total Suspended Particles Concentration

Figure 4-8: Trend of Particulate Matter Concentration
The trend of concentration during the day and night can be attributed largely to the agriculture ground preparation activities. The other contributing factors to higher daytime levels of TSP were the relative humidity, temperature and topography of the area.

4.4.1.2 Ambient Noise Survey

Ambient noise survey was also conducted along with the air quality assessment using the same locations and duration. The noise monitoring instrument used was Class 1 Casella CEL633C. The sound level meter was mounted on a tripod stand with the microphone elevated at a height of 1.5 meters above ground level. The recorded 24-hour mean noise levels range between 28.6 dBA to 47.4 dBA across both sampled locations. Recorded noise levels at these locations were considerably lower than the stipulated EPA and IFC/WB limit of 70 dBA. The summary of values recorded at both sampling locations (C and D) are presented in table 4-8.

<table>
<thead>
<tr>
<th>Sampling Points</th>
<th>Latitude (N)</th>
<th>Longitude (W)</th>
<th>24-Hr Noise Level (dBA)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td></td>
<td>Mean</td>
</tr>
<tr>
<td>Location C</td>
<td>10° 08’59.4’’</td>
<td>000° 50’ 40.1’’</td>
<td>47.4</td>
</tr>
<tr>
<td>Location D</td>
<td>10° 11’ 16.6’’</td>
<td>000° 45’ 59.2’’</td>
<td>28.6</td>
</tr>
<tr>
<td>EPA Guideline</td>
<td></td>
<td></td>
<td>70</td>
</tr>
<tr>
<td>IFC/World Bank Guideline</td>
<td></td>
<td></td>
<td>70</td>
</tr>
</tbody>
</table>

Generally, the results indicate that the background noise levels within the project area are below and within both EPA and IFC/World Bank Guideline values regulatory limits with no significant environmental or health impact. The mean value recorded at Location C is higher than D because of its proximity to an access road.

Environmental Concern: One resultant effect of the project implementation is the likelihood of increase in vehicular traffic. Though the impact might be minimal, it could lead to an increase in local ambient noise levels and air quality deterioration.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

**Mitigation Measures:** ECL should adopt speed limit controls (30 km/h on-site and 50 km/h when approaching towns) to minimize dust generation. Regular servicing and maintenance of vehicles, machinery and equipment are also recommended to reduce excessive noise.

### 4.4.2 Precipitation Pattern

The wet period at Nasia generally begins in May and ends in September with rainfall averages of 160 mm. As shown in table 4-9, the driest months are December and January with rainfall values below 3 mm. In September, the precipitation reaches its peak with an average of 215 mm spread across 22 days as shown in figure 4-9. The pattern shows suitability for a single rainfall dependent farming cycle of 5 months (May – September).

*Table 4-9: Average monthly precipitation (mm) values*

<table>
<thead>
<tr>
<th>Months</th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Precipitation (mm)</td>
<td>3</td>
<td>8</td>
<td>35</td>
<td>70</td>
<td>110</td>
<td>145</td>
<td>150</td>
<td>180</td>
<td>215</td>
<td>90</td>
<td>10</td>
<td>4</td>
</tr>
<tr>
<td>Average Rainfall Days</td>
<td>6</td>
<td>2</td>
<td>8</td>
<td>10</td>
<td>13</td>
<td>15</td>
<td>17</td>
<td>21</td>
<td>22</td>
<td>12</td>
<td>5</td>
<td>5</td>
</tr>
</tbody>
</table>

![Graph showing monthly precipitation and average rainfall days](image)

**Graph:**
- **Precipitation (mm):** Represented by blue bars.
- **Average Rainfall Days:** Represented by an orange curve.

Days range from 0 to 25 along the vertical axis, and precipitation ranges from 0 to 200 mm on the horizontal axis. The graph visually represents the data from the table, highlighting the peak in September with 215 mm of precipitation and 22 days of rainfall.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 4-9: Precipitation (mm) trend

**Environmental Concern:** Precipitation figures are important in planning farming programmes. There is no obvious environmental impact except to give suggestion on rainfall prediction.

**Mitigation Measure:** Emtrade Company Limited will monitor precipitation figures as per the Ghana Meteorological Services Authority records to determine rainfall predictions.

### 4.4.3 Temperature

The warmest month of the year is April with an average temperature of 31.5 °C. At 25.5 °C on average, August and September are the coldest months of the year. Average diurnal temperature variations range from 4 °C to 5 °C. The temperature pattern in the project area has implications on the planting and harvesting timelines as well as the water requirement of the project. Table 4-10 and figure 4-10 show the average monthly temperature variations at Nasia.

**Table 4-10: Average monthly temperature (°C) variations**

<table>
<thead>
<tr>
<th></th>
<th>Jan</th>
<th>Feb</th>
<th>Mar</th>
<th>Apr</th>
<th>May</th>
<th>Jun</th>
<th>Jul</th>
<th>Aug</th>
<th>Sep</th>
<th>Oct</th>
<th>Nov</th>
<th>Dec</th>
</tr>
</thead>
<tbody>
<tr>
<td>Average High (°C)</td>
<td>29</td>
<td>30</td>
<td>32</td>
<td>34</td>
<td>32</td>
<td>29</td>
<td>28</td>
<td>27</td>
<td>27</td>
<td>29</td>
<td>30</td>
<td>30</td>
</tr>
<tr>
<td>Average Low (°C)</td>
<td>25</td>
<td>26</td>
<td>29</td>
<td>29</td>
<td>27</td>
<td>25</td>
<td>25</td>
<td>24</td>
<td>24</td>
<td>25</td>
<td>26</td>
<td>25</td>
</tr>
<tr>
<td>Mean</td>
<td>27</td>
<td>28</td>
<td>30.5</td>
<td>31.5</td>
<td>29.5</td>
<td>27</td>
<td>26.5</td>
<td>25.5</td>
<td>25.5</td>
<td>27</td>
<td>28</td>
<td>27.5</td>
</tr>
</tbody>
</table>
Rainfall is the most important weather element for successful cultivation of rice. Rainfall recorded for Nasia in most years is not adequate for the cultivation of most crops without any irrigation intervention because it is erratic and not uniformly distributed. With a mean annual rainfall values ranging between 85 mm to 88.55 mm as well as erratic pattern and ununiformed distribution which is further exacerbated by contemporary climate change, rain dependent cultivation is not recommended in the inland valley.

Rice being a tropical and sub-tropical plant, requires a fairly high temperature, ranging from 20° to 40°C. The optimum temperature of 30°C during day time and 20°C during night time seems to be more favourable for the development and growth of rice crop. As indicated in table 4-10, the project area records a mean monthly temperature of 28°C which makes the area good for rice cultivation. However, there are local temperature variations associated with rainfall pattern changes.

Temperatures beyond critical thresholds of 34°C not only reduce the growth duration of the rice crop but also increase spikelet sterility, reduce grain-filling duration and enhance respiratory losses, resulting in lower yield and lower quality rice grain\textsuperscript{xviii} \textsuperscript{xix}. However, there are local temperature variations attributed to local rainfall pattern differences.
4.5 ECONOMIC & SOCIO-CULTURAL BASELINE

Analysis of prevailing socio-economic conditions in the project area is crucial as it serves as a benchmark for forecasting the social risks associated with a specific project.

4.5.1 Demographic Characteristics

Kukobila, the nearest (about 1 kilometre) settlement to the project site is inhabited by about 873 people with an annual population growth rate of 2.9%. The proportion of females are more than males exhibiting the regional trend in female population.xx. Similar to the district demographic pattern, the Kukobila community generally depicts a young population culminating into high dependency ratios of 95.7. It houses a few number of migrants from neighbouring villages, towns and district.

4.5.2 Household Information

The community of Kukobila has about 37 dwelling units in the community with 99.4% of households having the extended family structure.xx. The nuclear family households form only 0.6% of total households. This confirms the notion that the extended family household structure still remains an important feature among the people in the community. Household heads form 10.6 percent of total household population. Males are mostly (98%) heads of households. Male household head constitutes greater proportion of the male household population than female household heads.xx.

4.5.3 Human Settlement Pattern

There are 2 communities within a 5 km buffer of the project site namely; Tamaligu and Kukobila. These communities could be described as rural. They are spatially apart from each other and has untarred but good road networks. Each community is surrounded by large tracts of unoccupied land and smallholder farmlands. At Kukobila, the settlement pattern is nucleated at the core and seemingly scattered at the periphery.

4.5.4 Vulnerable Groups

Vulnerable groups in the project area include children, women, adolescent girls and youth and persons with disabilities. Vulnerable unemployed people especially youth; pregnant teenagers, young mothers and school drop outsxxi have been identified in the Kukobila
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia–Nabogo Inland Valley in the Northern Region of Ghana

community. These groups are linked to the incidence of extreme poverty, prevalence of harmful traditional practices and weak institutions.

Social and economic benefits such as skill transfer to local subsistence farmers (*including women*), provision of some local infrastructure (*for instance, access roads to facilitate transportation of rice produce and agricultural inputs*), and creation of job opportunities, increase in local rice production inter alia will improve the condition of these vulnerable groups.

Aside the positive impacts associated with the project on these vulnerable groups, the group particularly those in the working class or unemployed youth will serve as a major source of labour for the project implementation and could also function as middlemen in the rice supply chain process of the business.

**4.5.5 Current Land use of the Proposed Project Location**

The project area is an agrarian economy dominated by small-scale farming activities and few commercial agricultural projects. At the time of preparing this ESMP, there were no activities (*possibly due to the long dry season*) on the project site but interactions with locals indicate that some subsistence farming activities are carried out on portions of the earmarked site. No structures or settlements were identified within the project area.

**4.5.6 Agricultural Activities**

Agriculture is a major backbone of residents in the community even though it is predominantly subsistence in nature. Average farm sizes vary from 0.5 hectares to 2.4 hectares. Most of the farmers are into the cultivation of staples like rice, groundnuts, yams, maize, cowpea and sorghum as well as medium scale livestock rearing. About eight out of 10 (80.9%) males are into agriculture compared with 68.0 percent of females. The cash crops in the area include sheanut and cotton. Sheanut trees are dominant in the area and form part of the natural vegetation. During the dry season where farming activities become redundant, the local people gather firewood for charcoal production for private use and for sale.
4.5.7 Education and Literacy

With regards to education and literacy, Kukobila which is the closest community has one primary school. It has a total pupil population of about 76 with 60% males and the remaining are females. Most of the inhabitants are illiterate particularly the adult group. Due to the absence of Junior High School in the community, qualified pupils pursue their education in bigger towns such as Pong-Tamale (16 km by road).

4.5.8 Public Health, Sanitation and Water

Health service coverage is generally very low as available facilities are woefully inadequate in the Project District. Kukobila lacks basic health and sanitary facilities. The indigenes rely on herbal medicine to cure diseases and in case of emergency or serious medical conditions, patients are sent to health facilities at Pong-Tamale (*Pong – Tamale Community Health Center*) and Nasia (*Nasia CHPS Compound*) for medical attention 16 km and 4 km away respectively. These health facilities have the capacity to administer basic health services (*OPD services, first aid, ante-natal, post-natal, vaccinations, HIV counselling and testing*) by community health nurses, midwives and Registered General Nurses.

Historic health data acquired from the local government authorities (*Savelugu-Nanton Municipal Assembly*) have indicated Malaria as the leading cause of OPD cases and deaths in the project district (*see Table 4-11*).

*Table 4-11: Top 10 causes of OPD cases and death in project area*

<table>
<thead>
<tr>
<th>Rank</th>
<th>OPD Cases and Death in Project Area</th>
</tr>
</thead>
<tbody>
<tr>
<td>1st</td>
<td>Malaria</td>
</tr>
<tr>
<td>2nd</td>
<td>Typhoid</td>
</tr>
<tr>
<td>3rd</td>
<td>Anaemia</td>
</tr>
<tr>
<td>4th</td>
<td>Diarrhoeal diseases</td>
</tr>
<tr>
<td>5th</td>
<td>Hypertension</td>
</tr>
<tr>
<td>6th</td>
<td>Malaria in Pregnancy</td>
</tr>
<tr>
<td>7th</td>
<td>Pneumonia</td>
</tr>
<tr>
<td>8th</td>
<td>Other ARI (Acute Respiratory Infection)</td>
</tr>
<tr>
<td>9th</td>
<td>Skin Diseases and Ulcers</td>
</tr>
<tr>
<td>10th</td>
<td>Rheumatism &amp; Joint Pains</td>
</tr>
</tbody>
</table>

The community also does not have pipe-borne water. The local people depend on stream water, borehole and hand dug wells for domestic and other purposes. Most people in the
Kukobila community and other communities in the project’s sphere of influence have no access to toilet facilities and open defecation commonly known as the ‘free-range’ system is practised.

**4.5.9 Local Economy**

The community remains an agriculture-based economy with few agro-processing and no industrial activities to aid and promote the general life status of the people. Income levels are generally low. This is contingent on the fact that majority of the populace depend on rain fed agriculture. Agro-processing is generally done by traditional methods and on very small-scale bases. There are, however, efforts by external support agencies to upgrade technologies, especially for women in the processing of sheanut, groundnuts, rice, cotton ginnery, and soap manufacturing.

**4.5.10 Ethnicity, Religion and Cultural Heritage**

Kukobila community is predominantly Dagombas ethnic group who constitute a greater proportion of the existing ethnic groups with very few Frafras (nearly one percent). These ethnic groups bury their dead in the family compounds. The community has rich historical and cultural heritage but no prominent tourism potentials. The main traditional festivals celebrated in the district are the Bugun (fire festival) and Damba festivals.

The majority of the population in the project district is Muslim accounting for (95.4%) with almost equal proportion of both males and females belonging to the religion. Only 0.3 percent of the population have no religious affiliation\textsuperscript{xx}. Site observations and interactions with locals and migrant farmers indicate that there are no sacred, heritage sites or burial grounds within the earmarked concession.
5.0 STAKEHOLDER PARTICIPATION AND CONSULTATION

This chapter identifies the key stakeholders consulted and summarizes the consultation activities conducted with reference to Community Engagement report of MEL Consulting Limited; Consultant engaged to undertake extensive Community Engagement on the interest of Stakeholders and PAPs.

Stakeholder participation and consultation for a proposed project has a critical role to play in helping to integrate economic, social and environmental objectives. This ensures more sustainable development by acting as a means to strengthen and increase public awareness of the delicate balance between economic and environmental trade-offs. In addition, stakeholder engagement is the basis for building strong, constructive and responsive relationships that are essential for the successful management of the project’s environmental and social impacts.

This is an on-going process that may involve, in varying degrees, stakeholder analysis and planning, consultations, disclosure and dissemination of information, public participation and reporting to affected communities. The nature, frequency and level of effort involved in this process commensurate with the project’s risks and adverse impacts as well as the project’s phases of development as required by the Environmental Assessment Regulations, 1999 (LI 1652) and WB’s Policy on Disclosure (BP 17.50).

5.1 CRITERIA FOR STAKEHOLDER IDENTIFICATION

A professional blend of literature reviews, expert judgement as well as discussions with officials from key governmental institutions were the basis for identifying the various stakeholders. The main considerations in the selection of stakeholder groups are presented in table 5-1.

Table 5-1: Stakeholder identification

<table>
<thead>
<tr>
<th>Criteria</th>
<th>Stakeholder(s) Identified</th>
</tr>
</thead>
<tbody>
<tr>
<td>Those involved in the actual project implementation</td>
<td>GCAP, MoFA</td>
</tr>
<tr>
<td>Those whose activities coincide or overlap with those proposed by the project</td>
<td>MoFA, MoTI, MLGRD, EPA</td>
</tr>
<tr>
<td>Those who may be directly and indirectly affected by the project</td>
<td>Local population in the project area, FBOs, women groups</td>
</tr>
<tr>
<td>Those whose interests and influence can affect implementation of the proposed project</td>
<td>EPA, WRC, GIDA</td>
</tr>
</tbody>
</table>
5.2 COMMUNITY ENGAGEMENT PROGRAMME (CEP)

Community engagement is necessary for minimizing or avoiding public controversy, confrontation and delay; and can make a positive contribution towards the successful implementation of the proposed project. The overarching objective of the CEP was to establish consensus and acceptance of project by soliciting the views and concerns from communities in the project area, the media and the public. Other objectives of the programme were to:

- disseminate and inform this category of stakeholders about the project with special reference to its key components and location;
- gather comments, suggestions and concerns of interested and affected parties as well as their proposed solutions and mitigation measures; and
- establish a communication channel between this group of stakeholders on one hand and ECL on the other hand.

Activities such as interviews, community meetings and print media were undertaken as part of the CEP to meet the aforementioned objectives. These subsequent sections are elaborations of these activities.

5.2.1 Community Consultation

Community engagements were undertaken by the GCAP appointed Community Engagement Consultant (Mel Consulting Limited). Groups that have been engaged include community members, traditional leaders, FBOs, subsistence farmers, NGOs, women groups and the youth (see figures 5-1, 5-2).

Documented evidence of the engagements undertaken so far have been perused by the Environmental Consultant and deemed adequate for the purpose of environmental assessment. It was evident that this group of stakeholders have understood the relevance of the proposed project and are willing to collaborate with ECL.
5.2.1.1 Engagement of Community Leaders

The community engagement activities revealed that “community leaders welcome the new agricultural investment opportunities presented by GCAP and the benefits they stand to gain, but are apprehensive about promises made and not honoured by past project and potential investors”xxiv. It was therefore suggested that a tangible agricultural investment is made within the 2016 farming season which will enable the community members have a first-hand experience of benefits inherent in the proposed project; mainly out grower contracts for FBOs and direct employment for women and the youth.

5.2.1.2 Engagement of Traditional Authorities

In general, traditional authorities have been reported to express their readiness for the project. “They look forward to the economic growth opportunities such as employment creation, nucleus farmer and out grower relationships which will help improve farming practices in general and the economic wellbeing of community members in particular.” xxiv

However, some raised concerns about issues relating to re-settlement and compensation of persons whose lands may be appropriated due to the infrastructural developments and compensations for economic trees that may be felled. This concern was addressed by the incorporation of social safeguard clauses in the land lease agreement which will protect the interest of community members.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 5-1: Engagement of community leaders

Figure 5-2: Engagement of FBOs and subsistence farmers
5.2.2 Interviews

As a confirmation of the level of community engagement carried out as part of the CEP, random one-on-one interview of migrant and local farmers were carried out during visits to the individual project sites by Environmental Consultant and his team on the 4th and 5th of February, 2016. Some Locals in Kukobila were also randomly engaged in interactions aimed at confirming their awareness of the proposed project and to solicit their views and opinions on some anticipated E&S impacts and project expectations. Approximately five persons were interviewed in each community.

During these engagements, it was identified that information regarding the intended project was well disseminated among the locals but few migrant farmers were aware of the proposed project. The locals were also pessimistic regarding the realisation of the project since no activity had been seen on the sites ever since the project was introduced to them. Most of the local subsistence farmers interview confirmed their readiness to join the out-grower programme if the project is implemented.

5.2.3 Scoping Notices

Per the requirements of LI 1652 and as directed by the EPA of Ghana, a scoping notice was advertised in a national newspaper to solicit opinions from stakeholders who may have a stake in the proposed project (i.e. public and media). The scoping notice was published in a national newspaper (*Daily Graphic*) on the 26th of February, 2016 to allow twenty-one (21) days for the target audience to make their views and concerns known (*see Appendix 03*).

Public scoping notices (*see figure 5-3*) were also posted on public notice boards in expected communities to inform the local population about the intended project and avenues through which they can make their concerns/ suggestions related to the project known.
5.3 INSTITUTIONAL ENGAGEMENT PROGRAMME

Varied groups of stakeholders raised comments and suggestions regarding aspects of the proposed project as part of Institutional Engagement Programme (IEP). These included MoFA, MoTI, EPA, GIDA, MLGRD, WRC, AESA and WB Representative (see figure 5-4). Comments and suggestions articulated as part of this programme served as inputs in the identification, mitigation and enhancement of project potential impacts. Table 5-2 summarises these issues and the institutions that raised them.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 5-4: Field visit and meeting with GCAP, WB Representative and AESA
### Table 5-2: Summary of Issues Articulated During IEP

<table>
<thead>
<tr>
<th>Date</th>
<th>Stakeholder</th>
<th>Mode of Interaction</th>
<th>Issues Articulated</th>
<th>Comments/Suggestions</th>
</tr>
</thead>
</table>
| 04/02/2016 | Environmental Protection Agency (EPA)                                        | Meeting with EPA regional Director and other field officers | Climate Change, land tenure, gender equality, use of agro chemicals, operational health and safety issues, agro processing, agriculture waste management, value chain marketing activities and Environmental permit and monitoring. | ▪ An Integrated Pest Management Plan should be implemented to address pests expected including post-harvest pests as well as pesticide types, uses, handling, disposal of containers and obsolete/ expired pesticides.  
▪ Information on the project and the proposed design should be extensively disseminated in the respective project areas.  
▪ ECL should ensure commitment and adherence to all regulatory requirements  
▪ ECL should have a central collection point for waste generated on the farms. ECL should send these wastes to the nearest dump site approved by the local authorities. |
| 11/02/2016 | Ministry of Food and Agriculture (MoFA) and Ghana Commercial Agricultural Project (GCAP) | Meeting with Director (PPMED) and Deputy Director (Sustainable Land Management Northern Region Director) | Climate change issues, land management, land tenure system, cover cropping and creation of awareness | ▪ ECL should ensure extensive sensitization and awareness creation.  
▪ ECL should use of modern and environmentally friendly agriculture practises for maximum yield while promoting environmental sustainability  
▪ ECL should ensure monitoring of all required environmental receptors  
▪ Ensure necessary sensitization on clauses in the Land Lease Agreement(s) to be signed by ECL. |
| 15/03/2016 | Ministry of Trade and Industry (MoTI)                                        | Meeting with Papa Kow Bartels                               | The value chain system, value chain marketing activities                           | ▪ Storage facilities to be used by ECL should also consider out grower outputs.  
▪ Produce from the project should be targeted towards the local market  
▪ Local rice preferences should be considered in selecting rice species to be cultivated |
### Environmental and Social Impact Assessment (ESIA) for the proposed 2,900 hectares improved rain-fed rice production project at Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Date</th>
<th>Stakeholder</th>
<th>Mode of Interaction</th>
<th>Issues Articulated</th>
<th>Comments/Suggestions</th>
</tr>
</thead>
</table>
| 23/07/2016 | West Mamprusi District Assembly (MLGRD)          | Meeting with District Chief Director, District Agric Director, Planning Officer and Municipal Land Valuation Officer | Inadequate credit facilities; inability to purchase fertilizer, poor farming technology and inadequate access to extension services | ▪ ECL should ensure effective implementation of Livelihood Empowerment Programmes  
▪ ECL should consider improvement of local infrastructure as part of Corporate Social Responsibilities (CSRs).  
▪ Empty agro-chemical containers should be stored well to restrict public access.  
▪ Promote nucleus farmer and out grower relationships to help improve farming practices.  
▪ Encourage best waste management practices  
▪ Employment priority should be given to locals to help curb local unemployment rates.  
▪ Measures should be implemented to control the spread on seasonal bush fires into the project concessions. |
▪ Project design to integrate the delineation of a 15 m buffer zone at either side of the Nasia River as well as its tributaries. |
| 7/08/2016  | Ghana Irrigation Development Authority (GIDA)    | Meeting with James Akatse (Director-Operations), Francis Ohemeng (Director-Environment) | Erratic and unreliable rainfall in project area                                     | ▪ Design of rainwater retention facilities should consider rainfall pattern in project area. |
6.0 POTENTIAL ENVIRONMENTAL AND SOCIAL IMPACTS

This section presents potential environmental and social impacts during the site establishment, maintenance & harvesting phases of the proposed project as well as other related supporting facilities.

Table 6-1: Anticipated Project Impacts

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>Potential Impacts</th>
<th>How impact is generated</th>
<th>Affected Media</th>
<th>Degree of Perturbation (DP) and Class</th>
<th>Reasons for the assigned DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Site Establishment</td>
<td>Land acquisition</td>
<td>Social risk from land appropriation</td>
<td>▪ Land will be appropriated from individual subsistence farmers who might lose their source of livelihood with a possible effect on their standard of living.</td>
<td>▪ Local farmers (PAPs)</td>
<td>Medium (Negative)</td>
<td>Project Affected Persons (PAPs) will be integrated into an out grower scheme that will take up about 60% of the concession. This impact is reversible, has a short term effect and is temporary.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Loss of savannah biodiversity</td>
<td>▪ Removal of flora and fauna ▪ Fragmentation of disturbed animal habitat ▪ Impediment of fauna movement</td>
<td>▪ Biodiversity ▪ Vegetation</td>
<td>High (Negative)</td>
<td>Though this impact can have medium to long term effects on the affected media, seasonal bush-fires in project’s AOI has already diminished biodiversity</td>
</tr>
<tr>
<td></td>
<td>Land clearing</td>
<td>Potential Solid waste generation</td>
<td>▪ Improper disposal of plant residues such as debris twigs and branches can lead to waste accumulation on farm. ▪ Farm workers lifestyle including usage of sachet water and other items may lead to waste generation</td>
<td>▪ Farmland</td>
<td>Low (Negative)</td>
<td>Clearing and stripping residue may have economic value and can be used as firewood or converted into charcoal. Generated organic waste will be composted and separate waste receptacles will be provided for non-compostable waste</td>
</tr>
</tbody>
</table>
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
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</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Social risk from reduced pasture and movement of livestock</td>
<td>▪ Creation of bunds, rice fields and farm camps will result in a reduction/ even loss of pastureland or serve as a barrier to the movement of herders and their flocks across the field and restrict access to water resources. ▪ This can cause conflicts between herders and the project proponents.</td>
<td>▪ Livestock ▪ Fulani herders</td>
<td>High (Negative)</td>
<td>which will be disposed at approved sites. Consequently, this impact is reversible.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Ploughing, Harrowing, Rotovating, Puddling</td>
<td>▪ Uncontrolled land clearing exposes the soil to erosion ▪ Puddling of the soil and uncontrolled movement of farm machinery compacts soil and reduces water infiltration ▪ Ploughing, harrowing and puddling disturb soil structure ▪ Tillage activities will expose soil inhabiting organisms to their prey</td>
<td>▪ Soil ▪ Soil living organisms</td>
<td>Medium (Negative)</td>
<td>Though the project area serves as a dry season fall-back zone for livestock, the associated impact will have medium to long term effect.</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Refuelling and maintenance of tractors, rotovators and</td>
<td>▪ Fuel or lubricant spills and waste from refuelling and maintenance of farm machinery.</td>
<td>▪ Nasia River and tributaries ▪ Soil</td>
<td>Medium (Negative)</td>
<td>The total land area (400 ha) will be cultivated in phases and progressively using qualified land developers thus will have temporary effect.</td>
<td></td>
</tr>
</tbody>
</table>

The total land area (400 ha) will be cultivated in phases and progressively using qualified land developers thus will have temporary effect.
## Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

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<tr>
<th>Phase</th>
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<th>Potential Impacts</th>
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<th>Affected Media</th>
<th>Degree of Perturbation (DP) and Class</th>
<th>Reasons for the assigned DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Other farm machinery</td>
<td></td>
<td>- Carrying of fuel and lubricant spills by runoff into Nasia River and its tributaries.</td>
<td></td>
<td></td>
<td>High (Negative)</td>
<td>areas thereby culminating into short term and reversibility of the impact. Buffer zone of about 15 m will be provided between farm site and water bodies</td>
</tr>
<tr>
<td>Application of compound fertilizer during land preparation</td>
<td></td>
<td>- Excessive nutrients from improper application of fertilizers can lead to contamination of nearby water bodies.</td>
<td></td>
<td></td>
<td>Low (Negative)</td>
<td>Though this impact can have short to medium term effects on the affected media, fertilizers will only be applied when needed. Buffer zone of about 15 m will be provided between farm site and water bodies</td>
</tr>
<tr>
<td>All activities</td>
<td>Community health and safety hazards</td>
<td>- Cumulative health risk to local population from dust, noise and localised vibrations.</td>
<td></td>
<td>Local population of Kukobila</td>
<td>Low (Negative)</td>
<td>Residents of Kukobila, the closest community to the project site, are not likely receptors of these impacts since it is about 1 km away from the potential impact source, hence it has no effect on local residents.</td>
</tr>
<tr>
<td>Activities of farm workers and out growers</td>
<td>Occupational health and safety hazards</td>
<td>- Injuries and accidents such as cuts from farm tools and machinery; attack from wild animals; respiratory disorders from the inhalation of dust; fire hazards; unsafe conditions from the non-use or improper use of PPEs</td>
<td></td>
<td>Farm workers Out growers</td>
<td>Medium (Negative)</td>
<td>Potential impacts can range from minor incidents to fatal accidents.</td>
</tr>
<tr>
<td>Phase</td>
<td>Activities</td>
<td>Potential Impacts</td>
<td>How impact is generated</td>
<td>Affected Media</td>
<td>Degree of Perturbation (DP) and Class</td>
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<td>----------------------------------</td>
</tr>
</tbody>
</table>
| Recruitment of labour     | Pressure on public facilities and potential increase in social vices        | • Influx of people into the Kukobila Community in search of perceived employment opportunities will put pressure on the existing public facilities within the community.  
  • People who may be unsuccessful in getting employment opportunities may resort to engaging in social vices such as stealing. |                                                                                       | Local population (Kukobila)                                                                                                                                  | Medium (Negative)      | The Kukobila community lacks public infrastructure that can assimilate extra population. However, the impact is considered to have temporary effect. |
| Creation of employment    | • Direct opportunities from project implementation.                        |                                                                                     |                                                                                       | Micro economy                                                                                                                                     | High (Positive)         | The project will generate over 300 casual and 10 permanent jobs                                      |
| Establishment of rice field and rainwater retention facility | Improvement in management of arable land                                   | • Best agricultural technologies adopted will maximise the use of arable land resources in the area.  
  • Rain water retention facilities to be provided by GCAP will fully and sustainably utilise precipitated water to achieve the project objectives. |                                                                                       | Land  
  Water                                                                                                                                                | Medium (Positive)      | The long term expected yield per hectare is 6 metric tonnes/ hectare. This impact however is envisioned to be permanent as long as the project remains operational |
<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
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<th>Reasons for the assigned DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Farm Maintenance and harvesting</td>
<td>All activities</td>
<td>Other benefits</td>
<td>▪ Improvement in basic services such as access roads and the standard of living of the locals with rippling implications on the local economy.</td>
<td>▪ Micro economy</td>
<td>High (Positive)</td>
<td>Improvement in basic services in Kukobila, a rural community, will generate several multipliers such as food vending, ease in transportation of locally produced farm produce and other wares (firewood, charcoal, etc.)</td>
</tr>
<tr>
<td>Maintenance of farm machinery</td>
<td>Application of fertilisers and pesticides</td>
<td>Water and soil contamination</td>
<td>▪ Runoff and leaching of excess crop nutrients can contaminate groundwater resources as well as eutrophication of the Nasia River and its tributaries. ▪ Accumulation of agro-chemical nutrients in the soil. For instance, soil acidification can occur due to excessive urea or ammonium salt content in fertilizers. ▪ Improper disposal of agro-chemical containers, obsolete and expired pesticides and fertilizers</td>
<td>▪ Soil ▪ Nasia River and its tributaries</td>
<td>High (Negative)</td>
<td>Fertilizers and pesticides will be used during each farming season hence the impact could have medium to long term effect on both water and soil.</td>
</tr>
<tr>
<td></td>
<td>Maintenance of farm machinery</td>
<td></td>
<td>▪ Spilled fuel and lubricants from minor maintenance of farm machinery on the project site can cause chemical contamination of the immediate soil.</td>
<td></td>
<td>Low (Negative)</td>
<td>Only minor maintenance works of farm machinery will be carried out within the project concession, therefore resulting in short term effect.</td>
</tr>
<tr>
<td>Phase</td>
<td>Activities</td>
<td>Potential Impacts</td>
<td>How impact is generated</td>
<td>Affected Media</td>
<td>Degree of Perturbation (DP) and Class</td>
<td>Reasons for the assigned DP</td>
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</tr>
<tr>
<td>Operation of farm machinery</td>
<td>Impacts from Atmospheric Emissions</td>
<td>▪ Atmospheric emissions of fuel combustion by-products including carbon dioxide (CO₂), sulphur dioxide (SO₂), nitrogen oxide (NOₓ), and particulate matter (PM).</td>
<td>▪ Air</td>
<td>Medium (Negative)</td>
<td>Several farm machineries such as tractors, rotovators, combine harvesters, etc. will be used during project implementation. This could lead to a short to medium term effect.</td>
<td></td>
</tr>
<tr>
<td>Retention of rainwater and water management of paddy</td>
<td>Cumulative global warming impact</td>
<td>▪ Greenhouses gas (GHG) emissions, including nitrous oxide (N₂O), methane (CH₄), and ammonia (NH₃), may result from the use of fertilizers or from soil conditions associated paddy fields. ▪ Ammonia and nitrous oxide are volatilized under high wind and elevated temperature conditions.</td>
<td>▪ Air</td>
<td>Medium (Negative)</td>
<td>Emission of greenhouse gases such as methane (CH₄) is prominent in rice farming and poses a cumulative climate change impact which is irreversible.</td>
<td></td>
</tr>
<tr>
<td>Risk of waterborne diseases</td>
<td></td>
<td>▪ Stagnant water on the farms can serve as a medium for propagating water-related diseases such as schistosomiasis, malaria, guinea-worm, bilharzia, among others which can pose both</td>
<td>▪ Human</td>
<td>Medium (Negative)</td>
<td>Water borne diseases such as malaria and diarrhoea are among the top ten OPD cases and causes of death in the Savelugu-Nanton Municipality</td>
<td></td>
</tr>
</tbody>
</table>
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nubogo Inland Valley in the Northern Region of Ghana

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</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Flooding</td>
<td>▪ Excessive precipitation above mean rainfall values.</td>
<td>▪ Crops ▪ Human</td>
<td>High (Negative)</td>
<td>The project site lies in a floodplain and is susceptible to flooding, thus could have long term impact on the receiving media.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Bush burning in adjoining fields</td>
<td>▪ Rampant bush fires in the project area could lead to the extensive destruction of crops, farm camps and other adjoining developments.</td>
<td>▪ Human</td>
<td>Medium (Negative)</td>
<td>This impact can have medium to long term effects on the affected media considering seasonal bush burning which is rampant in the project area.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Harvesting of rice</td>
<td>▪ Poor management of organic wastes (crop residue and rice bran) as well as domestic and sanitary waste generated by farm workers. ▪ Domestic waste could serve as a breeding ground for pests and other parasites with health and safety implications to the residents of Kukobila as well as farm workers.</td>
<td>▪ Human</td>
<td>Low (Negative)</td>
<td>This impact is reversible because rice straw and bran can be used for feeding livestock or ploughed into the soil to increase soil organic content.</td>
</tr>
<tr>
<td></td>
<td></td>
<td>Pest infestation</td>
<td>▪ The paddy field and irrigation system will establish favourable environmental conditions for the development of invasive aquatic plants.</td>
<td>▪ Soil ▪ Crops</td>
<td>Medium (Negative)</td>
<td>Pest infestation in the mono cropped rice project will be difficult to control thereby resulting in medium to long term effects on the receiving media.</td>
</tr>
</tbody>
</table>

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<table>
<thead>
<tr>
<th>Phase</th>
<th>Activities</th>
<th>Potential Impacts</th>
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<th>Reasons for the assigned DP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Recruitment of labour</td>
<td>Employment creation</td>
<td>▪ Abundance of rice will attract seed-eating birds that will impact adversely on rice production or increase production costs through the development of more intensive control measures. ▪ Infestation by other pests such as rats, insects, fungi, bacteria or leaf-eating caterpillars resulting in decrease in production yield, loss of revenue and possible increase in soil acidification resulting from the control of pests using pesticides.</td>
<td>▪ Human ▪ Micro economy</td>
<td>High (Positive)</td>
<td><strong>term impact on both soil and crops</strong></td>
<td>This impact is envisioned to be permanent (as long as the project remains in operation) since the local population within the employable age group (20-59) will be employed by the project.</td>
</tr>
<tr>
<td>Payment of taxes and revenue</td>
<td>Other socio-economic benefits</td>
<td>▪ Implementation of the project will provide an estimated 310 direct job opportunities who will be involved in activities such as agrochemical application, harvesting of crops, bagging/packaging of rice and transporting of harvested farm products to storage areas. ▪ Indirect employment opportunities to both locals and migrants are also eminent.</td>
<td>▪ Human ▪ Micro economy</td>
<td>Medium (Positive)</td>
<td>Project implementation will increase agricultural productivity and promote</td>
<td></td>
</tr>
<tr>
<td>Phase</td>
<td>Activities</td>
<td>Potential Impacts</td>
<td>How impact is generated</td>
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</tr>
</tbody>
</table>
|       | Production of rice | ▪ This will help curb the importation of rice into the country accruing revenue to the nation in the long term.  
▪ Payment of taxes and levies shall generate revenue for the Government of Ghana and Assembly. |                     |                | Medium (Negative) | food security with medium to long term benefits on poverty alleviation and macro-economic stability. |
|       | Activities of farm workers | Occupational Health and Safety | ▪ Excessive exposure of farm workers to organic dust during harvesting could lead to respiratory and other associated diseases.  
▪ Cumulative health risks from exposure to extreme weather conditions, agro-chemical fumes and manual tasks. | Human | Medium (Negative) | Potential impacts can range from minor incidents to fatal accidents as well as postural deformities. This impact is however consider to be temporary. |
7.0 MITIGATION AND MONITORING PLAN OF POTENTIAL E&S IMPACTS

This section presents best industry practices as well as legislative requirements that can effectively mitigate the potential negative environmental impacts and social risks while enhancing positive E&S benefits identified to be associated with the project development. These measures are proposed to reduce, avoid or offset the potential adverse environmental consequences of the proposed project. These recommendations follow a hierarchical approach that seeks to minimize or eliminate the negative impacts while improving the positive environmental and social impacts (as shown in figure 7-1). In general, the impact mitigation process seeks to:

- Avoid the impact altogether by not taking a certain action or parts of an action;
- Minimise impacts by limiting the degree or magnitude of the action and its implementation, e.g. by implementing site establishment measures to minimise impact;
- Rectify the impact by repairing, rehabilitating or restoring the affected environment;
- Reduce or eliminate the impact over time by preservation and maintenance operations during implementation of the project; and
- Compensate for the impact by replacing or providing substitute resources or environments.

*Figure 7-1: Sequential preference for mitigation measures*

This section also contains monitoring actions and indicators to measure environmental performance and allocation of responsibilities for tasks in the monitoring of project related impacts. It takes into account the most relevant considerations based on site visits, community engagement and literature review. Implementation of the Environmental Action Plan is budgeted to cost *Forty-nine thousand Ghana Cedis only (GHC 49,000)* annually.
7.1 ORGANIZATIONAL STRUCTURE AND RESPONSIBILITIES

The organizational structure for the project is headed by the Managing Director who is the administrative head. He performs his job functions with the support of the first line of management which include the Logistics Officer, Transportation Officer, Finance and Marketing Officer, Crop Production Officer and Environmental Safeguard Officer.

The Managing Director (ECL) is responsible for coordinating and managing all activities related to the project including recruiting suitable candidates to fill vacancies. The Environmental Safeguard Officer (ESO) has the responsibility of implementing the ESMP and ensures timely submission of all relevant environmental reports to EPA, GCAP and other applicable national authorities. ESO will also periodically review and report on the project performance and sustainability options to management.

The Logistics and Transport Officer is in charge of coordinating all logistics and transportation activities related to the project. This role supervises or oversees all activities conducted by the farm mechanical team who are responsible for maintaining farm machinery, farm implements and equipment.

The Marketing and Finance Officer is primarily responsible for undertaking all financial related actions and devises strategy to market and sell produce from the field. The Production Officer is charged with the responsibility of all crop production on the farm and manages storage facilities as well as oversees distribution of wholesale and retail orders. He is also required to communicate with the Managing Director in order to prepare and plan his weekly tasks.

The EHS team is a nucleus group consisting of heads of the various units under the project that meet regularly discusses matters related information dissemination, training of other farm workers and out growers, enforcement of environmental and safety rules and EHS responsibilities as determined by the ESO.

The farm workers’ responsibility is to adhere to instructions of the farm management. Additional responsibilities for the various departments and employees are detailed in table 7-3. The project specific organizational structure is shown in figure 7-2 beneath.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 7-2: Organizational structure of Emtrade Company Limited
Table 7-1: Mitigation and monitoring plan for potential negative impacts

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Loss of Savannah Biodiversity</td>
<td>Site Establishment Phase</td>
<td>▪ Loss of flora species&lt;br▪ Loss of fauna within the project area</td>
<td>Strict adherence to limits of areas to be cleared to avoid unnecessary exposure of bare ground.&lt;br▪ Preservation of riparian vegetation along bank of Nasia River and its tributaries by maintaining a 15 – 20 m buffer.&lt;br▪ Limitation of access road creation to avoid unnecessary exposure of bare land&lt;br▪ Progressive clearing of cultivable area to allow fauna migration to adjoining areas.&lt;br▪ Recording and reporting of all accidental knock down or killing of wildlife to the Wildlife Department including remedies and precautions&lt;br▪ To further protect wildlife, hunting and trapping by employees on the farm will be strictly prohibited.&lt;br▪ Tracking of all destroyed economic trees and replanting them at appropriate and well documented areas in 2-3 folds&lt;br▪ Preservation of large trees (that is, trees will be felled only when absolutely necessary)</td>
<td>Area cleared vis-à-vis acquired land area&lt;brRecords on destroyed and replanted trees</td>
<td>May</td>
<td>Quarterly</td>
<td>Environmental Safeguards Officer (ESO)</td>
</tr>
<tr>
<td>Soil Degradation</td>
<td>Site Establishment Phase</td>
<td>▪ De-structuring of soil&lt;br▪ Loss of organic matter and soil chemical fertility&lt;br▪ Compaction of surface soil&lt;br▪ Soil erosion and aridity</td>
<td>Limiting of clearing activities to cultivable area.&lt;br▪ Controlling movement of farm machinery&lt;br▪ Adoption of runoff control such as the use of cover crops and shelterbelts, where necessary.&lt;br▪ Poor agronomic practices such as slash and burn will be avoided&lt;br▪ Soil stabilisation, runoff control (regular maintenance of freeboard), shelterbelts, planting across general slope directions or contours and growing of cover crops on uncultivated land will be employed to mitigate soil erosion.</td>
<td>Sample Soil nutrient content (such as roughness, soil moisture (SM), soil salinity, nitrogen and organic matter content)&lt;brGPS sample point: 10°6’10.098” N 0°48’20.307” W</td>
<td>May/June</td>
<td>Before each farming season</td>
<td>ESO</td>
</tr>
</tbody>
</table>
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

#### Site Establishment Phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
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<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Soil and Water Contamination</td>
<td>▪ Appropriate machinery such as 2 and 4 wheel tractors will also be used to avoid soil compaction caused by excessively heavy equipment. ▪ Standard practices will be adopted during construction of farm infrastructure such as farm camps and creation of earth bunds. ▪ Best agronomic practices such as growing of rice species well adapted to the local climate and soil conditions (Jasmine 85, IR 84, TOX 3107, Togo Marshall) as well as factoring fallow periods involving the use of cover crops into medium to long term planting cycle will be practised.</td>
<td>Water quality assessment (Odour, pH, App./ True Colour, Turbidity, Conductivity, Dissolved Oxygen, TDS, TSS, BOD, COD, Oil &amp; Grease, Total Phosphorus, Phosphate, Nitrate, Nitrite, Total Nitrogen, Ammonia, Sulphate, Turbidity, Total Coliform, Faecal Coliform)</td>
<td>May</td>
<td>Before each farming season</td>
<td>ESO</td>
<td>2,000</td>
</tr>
<tr>
<td></td>
<td>Site Establishment Phase</td>
<td>▪ Regular servicing of construction machinery and equipment ▪ Proper application of agro-chemicals to prevent excessive use leading to accumulation in the soil. ▪ Adherence to GCAP Pest Management Plan ▪ Farm workers will be trained to employ best practices in application of only EPA, Ghana approved agro-chemicals. ▪ Storage and handling of fuel and lubricants as well as maintenance of farm implements will be carried out in concrete bunded areas. ▪ Expired and obsolete fertilizers and their bags will be kept in a bunded, aerated and dry place for subsequent collection by supplier/waste management contractor. ▪ Designated areas for storing waste oil, fuel and lubricants will have secondary containments to avoid spills and subsequent runoff/leakage into surface and underground water respectively. ▪ Reserving a buffer of 15m between farmland and water bodies</td>
<td>GPS sample point for upstream monitoring: 10°7’8.992” N 0°48’16.381” W</td>
<td></td>
<td></td>
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</tr>
<tr>
<td>Phase</td>
<td>Impact</td>
<td>Mitigation Measures</td>
<td>Monitoring Parameters</td>
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</tr>
</tbody>
</table>
| Farm Maintenance and Harvesting Phase | ▪ Leaching and washing of fertilizer and pesticides into surface and ground water  
▪ Soil contamination from accumulation of fertilizers and pesticides  
▪ Spilled fuel and lubricants can also cause chemical contamination. | ▪ Implementation an annual water quality monitoring programme at upstream and downstream locations on the Nasia River  
▪ Adherence to GCAP Pest Management Plan  
▪ Fertilisers and other agrochemicals will be applied at the recommended rate to prevent excessive use leading to accumulation in the soil and ground water.  
▪ Farm workers will be trained to apply fertilizers in accordance with manufacturer’s recommendations and in line with standard procedures.  
▪ Fertiliser and pesticide application will be documented and supervised by a competent personnel with expertise in agro-chemical application  
▪ Integrated Weed Management Strategies (IWMS) such as tilling and optimal row spacing that will reduce the use of herbicides as well as an Integrated Nutrient Management (INM) to avoid nutrient depletion or accumulation will be practised.  
▪ The selection and management of agro-chemicals will be done in accordance with the requirements of EPA Act, 1994 (Act 490).  
▪ Designated areas for storing waste fuel, lubricants and liquid agro-chemicals will have secondary containments to avoid spills and subsequent runoff/leakage into surface and underground water respectively  
▪ Pesticides containers management scheme will be implemented which will include triple washing, puncturing and collection in dedicated containers for onward disposal at treatment facilities or authorised institutions. | Downstream monitoring:  
10°5'17.748” N  
0°46'53.929” W | | | | |
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Farm Maintenance and Harvesting Phase | Impact from Atmospheric Emissions | ▪ Respiratory and other associated diseases among workers and locals  
▪ Impediment to photosynthesis process  
▪ Reduction in crop yield  
▪ Global Warming/Climate Change | ▪ Regular servicing of farming machinery and equipment regularly will help reduce emissions.  
▪ Use of overage farm machinery will be avoided  
▪ The machinery would also use fuel with low sulphur content and lubricants to reduce exhaust emissions.  
▪ Fugitive dust emissions from ground disturbing activities and movement of trucks on untarred areas of the site will be minimized and kept under control by adopting dust suppression techniques such as dousing untarred access roads with water when heavy vehicular movement is expected or maintaining low speeds on untarred roads.  
▪ Implementation of the following to reduce methane emissions:  
▪ Water management in particular promoting mid-season aeration by short-term drainage and use of less methane emitting rice species  
▪ Use less methane emitting rice species  
▪ Preference and use of mineral fertilizers and organic matter component  
▪ Regular medical screening and check-ups among farm workers/staff | Air Quality Assessment (NO₂, SO₂, TSP, PM₁₀)  
GPS sample point: 10°6’34.964” N 0°48’12.454” W  
Employee personal record file | August | Annually | ESO | 5,000 |
| Site Establishment Phase | Impacts from Crop Residue and Other Solid Waste Generation | ▪ Occupational and public health and safety risks  
▪ Pollution of soil and nearby water bodies  
▪ Poor plant growth | ▪ Farm workers, out growers and contractors, if any, will be sensitised on proper handling of waste  
▪ Cleared vegetation will be chipped and formed into windrows and allowed to decompose to add to the manure content of the soil.  
▪ The quantity of organic waste generated should also be reduced by strict adherence to selective clearance and preservation of sensitive environments. | Volume of biomass generated | Early June | Quarterly | ESO | 2,000 |
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
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<th>Phase</th>
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<th>Monitoring Parameters</th>
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<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Farm Maintenance and Harvesting Phase | ▪ Proliferation of pests and parasites in the project area  
▪ Occupational and public health risks  
▪ Pollution of soil and nearby water bodies | ▪ Proper collection, storage and disposal of waste oil from vehicles and equipment  
▪ Periodic sensitisation of farm workers, out growers and contractors on proper waste management practices.  
▪ Emtrade Company Limited will segregate and reuse crop residue and other organic wastes. For instance, herders and local animal farmers will be allowed to collect or use rice straw and bran as livestock feed. Unused rice straw will be used for mulching, where needed, or rotovated into the soil during the next planting season to improve the soil fertility.  
▪ Domestic waste generated by farm workers will be stored in waste containers and disposed of at an approved dumpsite at Kukobila.  
▪ Used agro-chemical containers will be stored in well-ventilated storage areas for collection and proper disposal by the agro-chemical supplier.  
▪ Sanitary facilities (Kumasi Ventilated Improved Pits (KVIPs) and mobile toilets at remote areas of farmland) will be provided for farm workers. | Volume of waste generated  
State of waste storage and disposal areas | July to October  | Monthly  | ESO  | 3,000  |
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

#### Phase: Pest Infestation

- **Impact:**
  - Decrease in yield
  - Increase in production cost
  - Nuisance to adjoining rice fields
  - Soil acidification resulting from excessive use of pesticides

- **Mitigation Measures:**
  - Rice fields will be kept free from weeds to reduce attraction of seed-eating birds.
  - Environmentally friendly ways to control birds and mice will be implemented. These include:
    - Visual scares such as scarecrows;
    - Sonic scares such as use of taut cassette tapes and castanets;
    - Barriers such as the use of nets to control birds and trap barrier system to control mice.
  - Weed cutting programs and cleaning of waterways invaded by aquatic plants will be implemented.
  - Integrated weed management strategies will be implemented to prevent the proliferation of other invasive plants such as water hyacinth.
  - Compliance with GCAP Pest Management Plan

- **Monitoring Parameters:**

- **Timing:**
  - June to October

- **Frequency:**
  - Monthly

- **Responsibility:**
  - ESO

- **Annual Budget (GHC):**
  - 3,000

#### Phase: Flooding

- **Impact:**
  - Destruction of the rice field, farm camps and other facilities

- **Mitigation Measures:**
  - Effective flood control measures such as provision of adequate drainage in cognisance of the terrain of the concession will be integrated into the design of rice fields and rainwater retention facilities
  - Freeboard on bunds will be maintained regularly to allow free flow of excess water from the rice fields

- **Monitoring Parameters:**

- **Timing:**
  - July to September

- **Frequency:**
  - Weekly during farm maintenance and harvesting phase

- **Responsibility:**
  - ESO and Emergency Response Team (ERT)

- **Annual Budget (GHC):**
  - 2,000
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Bush Fires                                 |                                                                        | ▪ Smoking, use of naked flames and burning of waste will be prohibited on the project site and the immediate surroundings.  
▪ Fire belts of 15 m wide would be created and maintained during the minor farming and dry season to mitigate the spread of wildfires from adjoining fields.  
▪ Access roads within the concession will be designed to facilitate movement of firefighting vehicles. | State of fire belts  
State and layout of access roads | Septemb er | Monthly throughout non-farming season | ESO and ERT | 2,000 |
| Farm Maintenance and Harvesting Phase     | ▪ Destruction of the rice field, farm camps and other facilities  
▪ Pollution of the ambient air shed | ▪ Prior to the commencement of the project, workers will undergo induction training on work ethics, sensitization on occupational health and safety measures and good environmental practices.  
▪ Recommended PPEs shall be made available to all workers and their appropriate use made obligatory and enforced.  
▪ First aid boxes would be provided to manage minor injuries.  
▪ Adequate measures shall be implemented for emergencies. | Training records  
Incident Records  
Lost time injuries | May/ June | Weekly | ESO | 4,000 |
| Occupational Health and Safety Risks      | ▪ Incidents from operation of vehicles, machinery and other equipment  
▪ Outbreak of diseases and infections from inappropriate management of waste  
▪ Transmission of communicable diseases | ▪ Provision of clean drinking water and adequate sanitary facilities. |                                                                                         |                             |                |                |                |

Phase | Impact | Mitigation Measures | Monitoring Parameters | Timing       | Frequency | Responsibility | Annual Budget (GHC) |
-----|--------|---------------------|-----------------------|--------------|-----------|----------------|---------------------|
Bush Fires | ▪ Destruction of the rice field, farm camps and other facilities  
▪ Pollution of the ambient air shed | ▪ Smoking, use of naked flames and burning of waste will be prohibited on the project site and the immediate surroundings.  
▪ Fire belts of 15 m wide would be created and maintained during the minor farming and dry season to mitigate the spread of wildfires from adjoining fields.  
▪ Access roads within the concession will be designed to facilitate movement of firefighting vehicles. | State of fire belts  
State and layout of access roads | Septemb er | Monthly throughout non-farming season | ESO and ERT | 2,000 |
Farm Maintenance and Harvesting Phase | ▪ Prior to the commencement of the project, workers will undergo induction training on work ethics, sensitization on occupational health and safety measures and good environmental practices.  
▪ Recommended PPEs shall be made available to all workers and their appropriate use made obligatory and enforced.  
▪ First aid boxes would be provided to manage minor injuries.  
▪ Adequate measures shall be implemented for emergencies. | Training records  
Incident Records  
Lost time injuries | May/ June | Weekly | ESO | 4,000 |
### Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

#### Farm Maintenance and Harvesting Phase

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
|                                    | Incidents to employees                      | ▪ Ensuring strict supervision for high risk activities such as use of agrochemicals  
▪ All legal requirements relating to occupational health and safety will be adhered to during operations.  
▪ Administrative controls such as scheduling of manual work to be carried out in the morning and evenings to reduce prolonged exposure of workers to extreme weather conditions will be implemented.  
▪ Rim hats will be provided for workers who have to work in the rice fields between 10 am to 3 pm.  
▪ All farm workers and out growers will undergo training on the handling of farm equipment, appropriate use of PPEs during agro-chemical application and general working procedures aimed at maintaining the safety of workers.  
▪ To ensure that the occupational health and safety of workers enhanced, the provision and enforcement of PPE use, availability of first aid boxes (*with atropine*), access to water and conduction of regular health checks for the workers will be ensured.  
▪ To maintain proper hygiene and sanitation, sanitary facilities (*KVIPs and mobile toilets*), waste containers and portable water shall be provided at strategic locations within the concession and farm camp. |                        | July to November | Weekly           |                      | 3,000               |

|                                    | Transmission of communicable diseases       |        |
|                                    | Development of terminal diseases            |        |

#### Community Health and Safety Risks

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
|                                    | Disturbance and nuisance                    | ▪ Procurement of equipment with noise suppressors, where possible  
▪ Control movement and speed of farm machinery  
▪ Regularly maintain farm machinery and farm vehicles | Complaint records     | May/June         | Weekly           | ESO            | 3,000               |
|                                    |                                             | Maintenance Records                                                                 |                        |                  |              |                |                     |
## Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

### Phase

**Risk of Waterborne Diseases**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Farm Maintenance and Harvesting Phase | ▪ Propagation of waterborne diseases in the project area  
▪ Increase in OPD cases and probably, death cases | ▪ The project shall focus on the intensive control of water-borne diseases (*malaria, bilharzia, diarrhoea and other water-related diseases*) by natural draining and drying of the rice fields during dry seasons.  
▪ Information dissemination, training and awareness creation programmes shall be instituted by Emtrade Company Limited.  
▪ ECL will support public health programmes aimed at reducing waterborne diseases in Kukobila.  
▪ Occasional fumigation/spraying of communities against disease-borne vectors using approved residual pesticides will be encouraged when necessary in consultation with community health personnel. | OPD Cases  
Causes of death | August | After each farming season | ESO | 3,000 |

### Site Establishment Phase

**Social Risks from Land Appropriation**

<table>
<thead>
<tr>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Site Establishment Phase | ▪ Reduction in PAPs standard of living  
▪ Community agitations | ▪ Emtrade Company Limited will first explore the option of integrating Project Affected Persons (PAPs), if any, as out-growers and a Memorandum of Understanding (MoU) established between such PAPs and ECL.  
▪ Emtrade Company Limited shall follow recommendations of resettlement studies and pay any appropriate compensation to the PAPs and landowners timely before implementation of the project.  
▪ Evaluation of assets and compensation of those affected by the project will be conducted in a fair and equitable manner in accordance with the Abbreviated Resettlement Action Plan (ARAP). | Number of complaints | May | Annually for three years | ESO | 1,500 |
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
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<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Social Risks from Reduced Pasture and Movements of Livestock |                                                                        | ▪ Barrier to the movement of herders and their flocks  
▪ Restricted access to water resources  
▪ Conflict between herders and ECL  
▪ Reduction or loss of pasturceland | ▪ Collaborative measures through town hall meetings, durbars (consensus with all herders encountered during land preparation and project implementation) will be adopted in delineating rangeland, determining corridors of access to pastures and water points, especially by facilitating access to livestock feed from rice straw.  
▪ Grievance redress procedures shall also be available for aggrieved persons to register their concerns. | Number of complaints | May and August | Annually  | ESO          | 2,000                |

<table>
<thead>
<tr>
<th>Phase</th>
<th>Impact</th>
<th>Mitigation Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
</table>
| Pressure on Public facilities and Potential increase in social vices | ▪ Increase in social vices  
▪ Pressure on public facilities  
▪ Local population increase | ▪ Giving of employment priority to locals  
▪ Information dissemination on recruitment criteria  
▪ Emtrade Company Limiteds will assist in providing basic infrastructure such as boreholes, health centers, roads and schools in Kukobila as part of its Corporate Social Responsibility (CSR). | Local demographic trends vis-à-vis public infrastructure improvements | June  | Annually throughout project implementation | ESO          | 3,000                |

**SUB-TOTAL**  
**48,500**
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Table 7-2: Enhancement and monitoring plan for potential positive impacts

<table>
<thead>
<tr>
<th>Phase</th>
<th>Benefits</th>
<th>Enhancement Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Improvement in Management of Arable Land</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
| Site Establishment Phase                  |                                                                          | ▪ Introduction of best agricultural practices in the management of land resources  
▪ Sustainable utilization of land and hydrological resources | ▪ Improved farming methods (*minor water retention facilities, IWMS, INM*) will be adopted to ensure that maximum yield per hectare is achieved with less environmental impacts.  
▪ Water resources in the area will be sustainably utilized to achieve the project objectives.  
▪ Also, competent personnel with technical know-how in natural resource management will be engaged either as staff or as consultants to assist with the management of natural resources and the land. | Yield per hectare | November    | Annually   | ECL appointed ESO | 1,000               |
| Employment Creation                       |                                                                          |                                                                                                                                                                                                                      |                        |             |           |                      |                     |
| All phases                                |                                                                          | ▪ Emtrade Company Limited will assist community programmes that aim to empower the local people especially vulnerable groups as part of its CSR.  
▪ Employment of minors (*persons less than 18 years*) will not be allowed  
▪ All arrangements with farm workers will be tailored to meet the requirements of the Labour Act, 2003 (Act 651) of Ghana.  
▪ Local content will be encouraged by giving the local population priority during employment to improve the local economy.  
▪ ECL will ensure wide dissemination of recruitment criteria within their respective project areas.  
▪ An information/awareness campaign on the project issues and objectives will be implemented  
▪ ECL shall observe a “No discrimination policy” on issues related to employment | Gender ratio of farm workers  
Number of locals employed | May to October | Annually | ECL appointed ESO | 1,000               |
<table>
<thead>
<tr>
<th>Phase</th>
<th>Benefits</th>
<th>Enhancement Measures</th>
<th>Monitoring Parameters</th>
<th>Timing</th>
<th>Frequency</th>
<th>Responsibility</th>
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<tbody>
<tr>
<td>Other Benefits</td>
<td></td>
<td></td>
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<td></td>
</tr>
</tbody>
</table>
| Site Establishment Phase                        | ▪ Improvement in basic services such as access roads  
▪ Improvement in standard of living in Kukobila  
▪ Improvement in local economy of Kukobila  | ▪ Assist in programmes that will empower the local people  
▪ Assist in provision of basic public facilities such as KVIPs, boreholes, etc.  
▪ Consult traditional authorities and local opinion leaders periodically to ascertain local needs for incorporation in ECL’s CSR  | Number of public infrastructure provided  
Amount spent as part of CSR programmes  | May to October  | Annually       | ECL appointed ESO  | 3,000                     |
| Farm Maintenance and Harvesting Phase           | ▪ Revenue generation  
▪ Increase in local agricultural productivity  
▪ Promotion of food security  
▪ Reduction in rice imports  
▪ Poverty Alleviation  
▪ Skill transfer  | ▪ Emtrade Company Limited will support local agricultural improvement programmes aimed at increasing output from subsistence farming activities as part of its CSR  
▪ Taxies and levies imposed by the local government authorities would be paid promptly by ECL.  
▪ ECL will assist in improving public infrastructure in Kukobila as part of its CSR.  
▪ ECL will also study the possibility of assisting the local people in the field of health, education and socio-economic development.  
▪ Beneficiaries of the out grower scheme will be trained on establishing improved rain-fed irrigation systems, IWMS, natural ways of controlling pests, among others.  
▪ Emtrade Company Limited will assist out grower scheme beneficiaries in procuring agricultural inputs and implements such as tractors.  | Level of tax compliance  
Amount spent as part of CSR programmes  | November, December and January  | Annually       | ECL appointed ESO  | 2,500                     |

**SUB-TOTAL**                                      |                                                                                               |                                                                                                             |                                             |                     |           |                | 5,500             |
7.2 KEY INSTITUTIONAL ARRANGEMENT TO ENSURE MONITORING AND COMPLIANCE

This section presents key institutions identified and their role in ensuring environmental monitoring and/or compliance. The identified institutions are technically equipped to successfully and effectively carry out the assigned monitoring responsibilities.

Table 7-3: Key Institutions and their Respective Monitoring Roles

<table>
<thead>
<tr>
<th>Institutions</th>
<th>Specific role</th>
</tr>
</thead>
<tbody>
<tr>
<td>GCAP</td>
<td>Perform oversight role of ensuring ECL’s compliance to environmental and social safeguard plans and policies.</td>
</tr>
</tbody>
</table>
| Savelugu-Nanton Municipal Assembly  | ▪ Monitor solid waste generation and disposal  
▪ Monitor pressure on public facilities  
▪ Employment creation and improvement on livelihood of citizens of Kukobila                                                                |
| EPA                                 | ▪ Collaborate with MoFA to monitor soil degradation, water and land management issues and provide guidance on prevention of pollution.  
▪ Ensure Emtrade Company Limited comply with all environmental programmes stated in permit schedule                                       |
| MoFA                                | ▪ Land and Water Management Unit collaborate with EPA to monitor soil degradation, water and land management.                                 |
| Water Resource Commission           | ▪ Monitor quality of water in the Nasia River and tributaries and regulate possible abstraction of water from the river system.            |
| Traditional Authorities             | ▪ Monitor effectiveness of activities undertaken by ECL as part of corporate social responsibility.  
▪ Monitor community complaints related to project activities.                                                                               |
| District Health Directorate         | ▪ Monitor prevalence rate of waterborne diseases such as bilharzia, malaria, guinea worm, etc.  
▪ Monitor prevalence rate of other diseases such as HIV, tuberculosis, etc.                                                                  |
| Ghana National Fire Service         | ▪ Monitoring occurrence of bush fires  
▪ Ensure compliance with Fire Precaution (Premises) Regulations, 2003 (LI 1724)                                                           |
8.0 ENVIRONMENTAL EMERGENCY RESPONSE PLAN

Emergency preparedness involves pre-impact activities that establish a state of readiness to respond to extreme events that could affect the biophysical environment and smooth operation of the project. It ensures Emtrade Company Limited’s readiness to minimize the adverse impact of such events by means of active responses to protect the health and safety of individuals as well as the integrity and functioning of physical structures.

Cognisant of potential hazards, the management of Emtrade Company Limited is committed to ensuring the safety and security of all farm workers, out growers, contractors and the communities during disasters and emergency situations. As a result, this emergency preparedness and response plan has been developed to ensure that all persons can identify, evaluate, and react to a wide spectrum of emergencies, including those arising from injuries and illness, attack from animals and fire outbreak.

8.1 RESPONSIBILITIES

Table 8-1 summarise the responsibilities of all parties in ensuring a smooth implementation of this Environmental Emergency Response Plan (EERP).

Table 8-1: EERP implementation responsibilities

<table>
<thead>
<tr>
<th>Designation</th>
<th>Responsibilities</th>
</tr>
</thead>
</table>
| ECL         | ▪ Provide adequate resources needed to implement the EERP  
             ▪ Appoint a qualified Environmental and Safeguard Officer to oversee implementation of the EERP |
| Environmental Safeguards Officer (ESO) | ▪ Review and update this plan, at least annually  
                                            ▪ Receive suggestions, comments or questions from all stakeholders regarding the EERP  
                                            ▪ Establish communication with nearest emergency services  
                                              ✓ Ghana National Fire Service,  
                                              ✓ National Disaster Management Organisation,  
                                              ✓ National Ambulance Service,  
                                              ✓ Ghana Police Service  
                                              ✓ Major health institutions  
                                            ▪ Appoint Emergency Response Team (ERT) made up of selected farm workers and out growers  
                                            ▪ Undertake regular training (at least annually) for selected farm workers (including ERT), out growers and all contractors on topics such as:  
                                              o Raising alarm and warning others  
                                              o Emergency shut down of farm machinery  
                                              o First aid  
                                              o Calling for external help (through the ERT)  
                                              o Response protocols for flooding, injuries and bush fires |
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Designation | Responsibilities
--- | ---
Emergency Response Team (ERT) | ▪ Serve as principal contact persons to the emergency services
▪ Assist in collecting information about incidents and accidents
▪ Assist during environmental, health and safety incident investigations
▪ Assist the ESO in other tasks assigned
All farm workers, out growers and contractors (All) | ▪ Report all incidents/ accidents to the ERT or directly to the ESO, with adequate information
▪ Follow all laid down emergency protocols for bush fires, flooding and injuries

8.2 PROVISIONAL EMERGENCY PROCEDURES

The table below (Table 8-2) identifies possible emergency situations and proposed plans to response plans to effectively handle the situation.

Table 8-2: Summary of emergency/contingency and response plan

<table>
<thead>
<tr>
<th>Emergency</th>
<th>Procedure/Action</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bushfire</td>
<td>Detect the fire</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Move away from fire</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>If operating a farm machinery, move machinery away from fire</td>
<td>Farm machinery operators</td>
</tr>
<tr>
<td></td>
<td>Alert others via shouting or clapping</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Notify next available ERT member or ESO</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Sound siren</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Alert emergency services</td>
<td>ERT or ESO</td>
</tr>
<tr>
<td></td>
<td>Carry out quick head count at assembly area and take records</td>
<td>ERT and ESO</td>
</tr>
</tbody>
</table>

Injuries and wild animal attacks | Move victim to safer place | ERT or ESO |
| | Administer first aid | |
| | Assess if the victim will require further medical attention | ERT or ESO |
| | If victim requires further medical attention, transport him/her using appropriate vehicle available on site | ERT or ESO |
| | Victim is sent to health centre for treatment | ERT |
| | Initiate incident investigation | ESO |
| | Incident investigation report and forms completed and submitted to Management | ESO |

Flooding | Detect rising water levels | All |
| | Keep calm and notify next available ERT member or ESS | All |
| | Alert emergency services | ERT or ESO |
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

<table>
<thead>
<tr>
<th>Emergency</th>
<th>Procedure/Action</th>
<th>Responsibility</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Switch off all electrical equipment, if any</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Move to nearest highest location or secured platform</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Sound siren</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Make random contacts with farm workers and out growers to confirm their safety and for updates</td>
<td>ERT and ESO</td>
</tr>
<tr>
<td></td>
<td>Take records of emergency event</td>
<td>ERT and ESO</td>
</tr>
<tr>
<td>Spills</td>
<td>Communicate to other farm workers about the incident (spillage) observed</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Control the spill with sand or dry soil immediately</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Contain it with spill materials provided on site</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Clean spill by using shovel to collect soil containing spillage material and place it carefully in a marked container for disposal</td>
<td>All</td>
</tr>
<tr>
<td></td>
<td>Correct</td>
<td>ESO</td>
</tr>
</tbody>
</table>

8.3 REPORTING AND ACCIDENT INVESTIGATION PROCEDURES

Reporting will be done according to the following procedures, presented graphically in figure 8-1:

- Workers report all incidents/accidents to the EHS team/ERT.
- EHS team/ERT in collaboration with ESO investigate reported incidence/accident and submit findings to ECL.
- Emtrade Company Limited per the recommendations made will execute remedial actions as early as possible.

![Figure 8-1: Structure for Reporting an Emergency Event](image)

In investigating an accident, the beneath procedures should be followed:
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

- Develop a plan
- Assemble an investigation team
- Investigate all incidents and accidents immediately
- Collect facts
- Interview witnesses
- Write a report
9.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN IMPLEMENTATION

9.1 CAPACITY OF EMTRADE COMPANY LIMITED TO IMPLEMENT THE ESMP

This chapter assesses the capacity and track record of Emtrade Company Limited in implementing E&S requirements in compliance with the World Bank environmental safeguards and operational procedures. This will ensure that implementation of the project is undertaken with due regard for the integrity of the environmental resources to be affected. Development of this section was based on discussions with ECL regarding the proposed undertakings and any future agricultural development plans.

9.1.1 Profile of Emtrade Company Limited

Emtrade Company Limited is an agribusiness company located and currently operating in Ghana in accordance with the Companies Registration Code of 1963. ECL has operational sites in the Gomoa East District (Central Region) and has contributed significantly to the production of viable maize seeds to improve the supply of farm inputs for maize farmers in Ghana. The company has been striving to comply with all regulatory requirements and to operate in a sustainable environment.

9.1.1.1 Track Record

Over several years of operations, the agribusiness has been engaging in commercial projects. Emtrade Company Limited was one of the shortlisted private sector partners in the Agricultural Mechanization Service Center (AMSEC) program which was executed as a main program of the MoFA in 2007 with the aim of accelerating the agricultural mechanization sector in Ghana.

Currently Emtrade Company Limited is embarking on a large scale maize cultivation project and other local agricultural improvement programmes. This project in the Gomoa East District, involves the establishment of a thirty-five (35) hectares maize farm aimed at producing viable maize seeds to be sold to maize farmers across the country.

Emtrade Company Limited in all of its operations, is cognizant of his responsibility to promote environmental sanity by implementing best agricultural practices and avoiding pollution across all his operations. To ensure compliance to the environmental regulations of Ghana, ECL has registered the project with the EPA of Ghana and has been directed to
initiate a Preliminary Environmental Assessment. The assessment, when completed, will culminate into the issuance of an environmental clearance from the EPA of Ghana accompanied by schedules to ensure continual environmental sustainability of the maize farm project.

**9.1.1.2 Current Capacities**

Emtrade Company Limited is cognisant of the need to ensure environmental and social integrity during implementation of the proposed project. ECL has assigned responsibility for the management of environmental and safeguards initiatives to a competent staff (ESO) that is also in charge of the implementation of the ESMPs for all their operations.

Emtrade Company Limited environmental and safeguard initiatives are very recent and may require time for effective implementation. Based on professional opinion from preliminary assessment, ECL has demonstrated policy commitments to operate the agribusiness in compliance with environmental requirements and has expressed this desire in the assignment of responsibility and provision of resources to drive environmental performance.

**9.1.2 Roles and Responsibility**

The ESMP provides environmental and social mitigation measures to ensure sustainable implementation of the proposed 400-hectare improved rain fed rice cultivation project near Kukobila. Successful implementation of the ESMP will depend largely on the competence of ECL appointed Environmental Safeguard Officer (ESO). The ESO will also establish a 7 – 10 member Environmental, Health and Safety (EHS) team *(made up of out growers, farm workers and contractors, if any)* that will assist in information dissemination, training of other farm workers and out growers, enforcement of environmental and safety regulations and other EHS responsibilities as determined by the ESO.

**9.1.3 Capacity Building Requirements**

Human resource development through capacity building workshops is important to improve and diversify the skills and knowledge of workers involved in the agricultural project. The local farmers in the operational areas of Emtrade Company Limited are adapted to their traditional methods of farming mostly using poor agricultural practices. The capacity building initiatives will equip these individuals with the understanding, skills and access to
information, knowledge and training that enable them to carry out the activities safely and effectively.

The track record and current capacity of Emtrade Company Limited demonstrate existence of corporate arrangements to support the implementation of this ESMP. However, technical capacity gaps have been identified and can be addressed through capacity building by the involvement of experts in the sector. The capacity building requirements recommended will mostly be in the form of training workshops and seminars. A training workshop on the ESMP and the WB E&S safeguard policies *(OP 4.12 and OP 4.01)* should be organised for ECL appointed ESO, EHS team and Management. The following additional training topics are proposed:

- HIV/ AIDS Awareness;
- Water quality assessment;
- Emergency response procedures;
- Occupational Health and Safety relevant to agricultural projects;
- Identification and handling of historical artifacts;
- Agronomic practice; and
- Environmental awareness training programmes;
- Record keeping on environmental safeguards and trainings.

### 9.1.4 Budgetary Allocation

The total cost for meeting Emtrade Company Limited capacity building programme is estimated at *Forty-three thousand Ghana Cedis only (GHC 43,000)* as outlined in the table 8-1 below.

Table 9-1: Budgetary allocation for Capacity Building

<table>
<thead>
<tr>
<th>Activity</th>
<th>Description</th>
<th>Frequency</th>
<th>Annual Budget (GHC)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Awareness creation and capacity building for key personnel in ECL</td>
<td>Training workshop on ESMP implementation</td>
<td>Once</td>
<td>8,000</td>
</tr>
<tr>
<td></td>
<td>Farm tour for selected EHS Team</td>
<td>Once</td>
<td>4,000</td>
</tr>
<tr>
<td>Awareness creation and information dissemination workshops</td>
<td>General public on E&amp;S issues relating to project implementation</td>
<td>Biannually</td>
<td>21,000</td>
</tr>
</tbody>
</table>
Subcontractors will be required to develop their own ESMP more robust than ECL as a tool to drive sound implementation of the plans outlined in the ESMP. It will be the responsibility of subcontractors to ensure the dissemination relevant information and provision of training workshops to improve the knowledge and skills of their employees.

**9.2 GRIEVANCE REDRESS MECHANISM**

A properly established Grievance Redress Mechanism (GRM) is transparent, accountable and provides a safe opportunity for local people and project beneficiaries to raise valid concerns. It also facilitates objective addressing of such complaints and grievances by the project developer.

**9.2.1 Objectives of a Grievance Redress Mechanism**

The specific objectives of a formalised GRM are as follows:

- Serves as an early warning indicator that enables project owners and implementers to deal with any potential problem before it escalates.
- Serves to rectify minor and unintended mistakes or injustice as well as simple misunderstandings that could generate rumours. Rumours could escalate into threats and acts of retaliation which could impede successful implementation of the project.
- Helps in complementing impact monitoring and the development of impact indicators and monitoring activities.
- Serves as a statistic documentation as complaints are processed and recorded.

**9.2.2 Channels of Receiving Complaints**

Complaints shall be made known via:

- filling of the complaint form (*see Appendix 04 for template*);
- traditional leaders;
- telephone calls and emails to complaint centre;
- walk-ins; and
As part of the Community Engagement Programme, ECL expressed willingness to accept complaints and grievances through various channels including local government authorities and the traditional leaders.

### 9.2.3 Complaint Investigation

Emtrade Company Limited will establish a Grievance Redress Committee (GRC) made up of representatives from GCAP, MoFA, EPA, Savelugu-Nanton Municipal Assembly, traditional leaders and the agribusiness Investor. The GRC shall be responsible for investigating complaints raised and will be required to submit a report on their findings and provide recommendations. All complaints received will be captured on the complaint form (*see Appendix 04*) for subsequent consideration by the GRC.

The complaints are to be discussed and recorded including detailed information about the social and/ or environmental issue (key issues, complaint received date, address of complainant, among others). Personal information of the complainant shall be kept confidential at all times. Provisions shall also be made for raising anonymous complaints.

Feedback or responses and recommendations from the investigation process will be communicated to the complainants for acceptance upon satisfactory resolution of complaints by both parties. Any matter for which an amicable resolution is not feasible may be referred to the legal court system for hearing.

The complaint/ grievance mechanism procedure would be archived in the project profile after issues are resolved to serve as referrals for future improvement options. The entire GRM process is summarised and graphically represented in figure 9-1 below.
Environmental and Social Management Plan (ESMP) for the proposed 400 Hectares Improved Rain-fed Rice Cultivation Project near Kukobila in the Nasia-Nabogo Inland Valley in the Northern Region of Ghana

Figure 9-1: Graphical representation of Grievance Redress Mechanism (GRM)
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