



MANDELA MILLERS

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TIN: 1009572807

Date: 13 May 2024

The Executive Director,
National Environment Management Authority (NEMA),
P.O Box 22255, Kampala

Dear Sir,

**RE: SUBMISSION OF THE ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT FOR
THE PROPOSED CAGE FISH FARM AT TENDE BAY ON LAKE VICTORIA, IN BULEGA-
MBIRU VILLAGE, NALUGALA PARISH, KATABI TOWN COUNCIL, WAKISO DISTRICT**

We hereby submit to your office the Environmental and Social Impact Statement for the above-mentioned project for your review and consideration for approval.

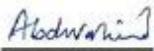
The proposed project site is geographically located at UTM Coordinates 36N 450586mE 7249mN, at an elevation of 1140m above sea level.

The proposed project is estimated to cost **UGX 2,500,000,000** (Two billion five hundred million Uganda Shillings).

Please do not hesitate to contact us for any further information with regards to this submission.

Hoping to hear from you at the earliest convenience.

Yours Sincerely,


ABDIRASHID ATEYE

aateye@mandelapremiumfeeds.com.

DIRECTOR

ENVIRONMENTAL AND SOCIAL IMPACT STATEMENT

FOR THE PROPOSED CAGE FISH FARM TO BE LOCATED AT TENDE BAY, ON LAKE VICTORIA, IN BULEGA-MBIRU VILLAGE, NALUGALA PARISH, KATABI TOWN COUNCIL, BUSIRO SOUTH COUNTY, WAKISO DISTRICT

Site UTM Coordinates: (WGS 84) 36N 450586mE 7249mN, at an elevation of 1140m above sea level

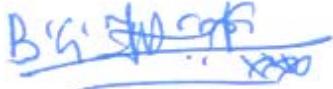
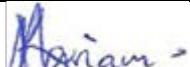


Prepared by:	On Behalf of:
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June, 2024

Consultancy team

The following team of certified environmental practitioners undertook the Environmental and Social Impact Assessment for the proposed cage fish farm to be located at Tende Bay, on Lake Victoria, in Bulega-Mbiru Village, Nalugala Parish, Katabi Town Council, Busiro South County, Wakiso District.

Name	Profession & Role on team	Signature
Mr. Abdallah Munubi	ESIA Team Leader/ Environmental Health and Sanitation, Waste Management and Land use planning and Development specialist	
Ms. Mariam Kemigisha	Environment Engineer; Waste management & Pollution Control Specialist	
Ms. Emodek Phenella	Fisheries/Aquatic Ecologist	
Mr. Joachim Owen Bagonza	Occupational Safety and health specialist	

The above environmental practitioners were supported by the following specialists:

Ms. Kyarisiima Prisca	Land use planning specialist
Ms. Anne Tumushabe	Sociologist
Mr. Oyeng Denis	Occupational safety and Health specialist
Ms. Namanda Clare	Biodiversity specialist
Mr. Matovu Eriyasafu	Stakeholder engagement and consultation

Acknowledgement

The consultancy team extends sincere gratitude to Mandela Millers Limited for procuring our services to carry out this Environmental and Social Impact Assessment (ESIA) for the proposed project. We appreciate the support we received in and out of the field.

We also appreciate all the people whose support enabled us to produce this report. We categorically recognize the people we consulted. They are the key stakeholders of the project operations whose views have enabled us to objectively present our findings and suggest practical recommendations that we believe, if well implemented, will make the project much more environmentally sustainable, socially acceptable, and economically viable.

Developer's Statement

I **Abdirashid A. Ateye**, having commissioned the Environmental and Social Impact Assessment for the proposed Cage fish farming project on behalf of Mandela Millers Limited, do acknowledge that I have read this report and understood its contents. I hereby commit to comply with the suggested mitigation measures stated in the Environmental Management and Monitoring Plan to address the potential negative impacts associated with the development phases and actual implementation of the project, and undertake to implement further instructions as NEMA may deem appropriate in relation to the findings of this study and from time to time as inspections may inform.

Designation: Director

Signature: 

Date: 24th May, 2024

Executive Summary

Background information

This report presents the findings of the Environmental and Social Impact Assessment for the proposed cage fish farm, to be established by Mandela Millers Limited at Tende Bay, on Lake Victoria, on Plot 22, Block 452, in Bulega-Mbiru Village, Nalugala Parish, Katabi Town Council, Busiro South County, Wakiso District. The proposed site is a 20.26 Hectares piece of land, geographically located at UTM Coordinates 36N 450586mE 7249mN, at an elevation of 1140 meters above sea level. The proposed site boundary coordinates are as shown in the table below;

Point	UTM Eastings	UTM Northings
1	450339mE	7454mN
2	450356mE	7496mN
3	450716mE	7649mN
4	450721mE	7643mN
5	450681mE	7616mN
6	450912mE	6880mN
7	450290mE	6665mN
8	450047mE	6779mN
9	450524mE	7375mN
10	450423mE	7441mN

This assessment has been undertaken in compliance with the provisions of the National Environment Act, 2019, which requires that Environmental and Social Impact Assessment be conducted for all projects whose activities are likely to have an impact on the environment. This ESIA report provides a detailed description of the pre-project environment, specifically in terms of the biophysical and socio-economic environment of the area. Furthermore, the report provides a comprehensive description of the proposed project activities as well as numerous specialist studies undertaken for the ESIA Phase and stakeholder consultation process, and the way forward in the form of conclusions, recommendations and an Environmental Management and Monitoring Plan (ESMMP).

Project overview and cost

The proposed project will be a fully-fledged farm with the following components;

- Administrative building: which will include the farm office, a lecture room, training room, labs, and staff house.
- Storage warehouse; which will be used for storage of materials, equipment and feeds.
- Hatchery: A hatchery is a facility designed for the artificial breeding, hatching, and rearing of fish eggs and larvae under controlled conditions. It is a crucial component of the proposed farm, serving as a specialized environment for the early stages of fish development. The hatchery will be in one of the two existing buildings. It will be refurbished and modified to serve the new purpose.
- Brooders ponds: These ponds serve as the habitat for the mature, sexually mature fish known as brood stock. Brood stock are the breeding fish that produce fertilized eggs, which are then used to produce the next generation of fish. The farm will have 4 brooders ponds of size 32m X 32m X 1m each.
- Nursery ponds: Nursery ponds play a vital role in the early stages of fish farming, specifically in the rearing of fry (young fish) after they hatch from eggs. These ponds provide a controlled environment

where fry can grow and develop before being transferred to larger grow-out ponds. The proposed farm will have 4 nursery ponds of size 32m X 32m X 1m each.

- Juvenile cages: Juvenile fish cages are structures designed to rear and grow young fish in a controlled environment, typically in open water bodies such as lakes.
- Grow out fish cages: Grow-out cages, also known as fish cages, are floating or submerged structures in water bodies, where fish are reared to marketable size. These cages provide a controlled environment for fish growth. The proposed farm will have 12 floating fish cages at the lake.

Other components will include the gate house, truck and car parking areas, drive way and walkways. The area around the ponds will be planted with grass. The fish cage area will be separated from the rest of the farm components by a chain link fence. The proposed site layout plan is attached in appendix 9.

As per the certificate of valuation (attached in appendix 7), the proposed project is estimated to cost approximately **UGX 2,500,000,000** (Two billion five hundred million Uganda Shillings).

Study methodology and approach

This Environmental and Social Impact Statement has been prepared in accordance with the earlier submitted and approved scoping report and ToR for the proposed project, and following the relevant National legislation. The study was conducted through three stages that included screening, scoping and detailed ESIA study. The methods involved extensive review of literature on relevant policies, legislations, regulations and institutional frameworks. Other local and global ESIA studies were also reviewed. The team used a rigorous participatory approach involving consultations with both the client and key stakeholders such as statutory officers, technical staff in lead agencies, site immediate neighbours and area political leaders. The multidisciplinary ESIA team generated most of their decisions through structured continuous brainstorming sessions. Desk-based assessments, baseline surveys, and site visits, as appropriate, have been conducted to determine the baseline conditions of the environment and area that may be affected by the proposed project.

A detailed site survey was conducted and inventory created to document site characteristics, and measure baseline conditions of environmental indicators such as bio-diversity, water and air quality, soil, health, and noise levels. These steps were supplemented with the consultant's expert judgment.

Possible alternative land uses were assessed based on compatibility with the surrounding land uses, zoning regulations, value chain benefits and environmental risks. Potential bio-physical and socio-economic impacts were identified for the proposed project implementation activities using a matrix that recorded the estimated intensity and duration of each possible impact. Mitigation measures were also identified for each negative impact, and implementation and monitoring plans proposed.

A standard rating scale based on the methodology for Impact Assessment for the planned activities during the construction and operation of the proposed project was used when evaluating the significance of the impacts identified in both phases on the biological, physical and socio-economic components of the environment. This methodology is discussed in detail in section 6.2 of this EIS.

Policy, Legal and Institutional Frameworks' Review

Relevant national Policy documents, Laws and Regulations were reviewed during the ESIA. This review was done to integrate the national and sectoral policies and principles into the Project Plan and determine compliance of the project with the existing policies and laws. It helped identify indicators and determine legally

acceptable thresholds on environmental standards for environmental quality (e.g. air, noise, water, soil) and protection of sensitive ecosystems, standards for solid and liquid waste management, land use guidelines, ecological and socio-economic issues. Bio-physical and socio-economic issues arising out of the legislations and regulations have been addressed by the project by including preventive measures in the design. The key institutions identified as critical for the success of the project environmental strategy include: the developer; the National Environment Management Authority (NEMA); OSH Department – Ministry of Gender, Labour and Social Development, and Ministry of Water and Environment, Department of Fisheries- MAAIF, and Katabi Town Council. Each key institution has designated responsibilities to ensure environmental sustainability of the project.

Area baseline bio-physical and socio-economic environment

The proposed site has a gentle slope and drains towards the west, and drains towards the lake. The general landscape in Wakiso belongs to Buganda surface classification. It lies at an approximate range of about 900 to 1340 meters above sea level. The district is characterized by isolated flat-topped hills with steep slopes, often merging abruptly into long and gentle pediments, which are usually dissected by relatively broad valleys. Wakiso district is divided into two main topographic zones, the Lake Victoria zone and the high land zone (central and northern hills).

The site immediate neighbourhood is a rural setting with primary vegetation except for cultivated areas and residential establishments.

The area can be described as predominantly residential. The source of income for people in the area is employment in Entebbe and Kampala, and retail trade. Fishing is another economic activity in the area, carried out at the lake, and recreational facilities along the lake shore. The main land use activities in the area include settlement and subsistence farming, and fishing activities on the lake.

The site immediate neighbourhood is sparsely populated. The 2014 National Population and Housing Census estimated the population of Wakiso District at 2,007,700 people, making it the most populated District in the country. Of this population, 952,781 are males and 1,054,919 are females.

The population in the area is mainly rural with clustered settlements. The housing structures are a mixture of permanent and semi-permanent houses.

The main land use activities in the area include settlement and subsistence farming, recreation facilities along the lake shoreline, and fishing activities on Lake Victoria.

A detailed description of the area baseline environment is given in chapter 4 of this report.

Stakeholder engagement and consultation

Stakeholder consultations were undertaken during the study in accordance with the provisions of the National Environment Act, 2019. The people consulted welcomed the project citing its potential to create employment and contribution to the development of the area, as well as improving community livelihood.

The district and Lead agency technical officials consulted expressed concern/interest in the maintenance of the ecological functions of the area, minimal disturbances of environment and protection of workers from the anticipated various hazards associated with the project operation activities, as well as obtaining all relevant government approvals. A detailed stakeholder engagement and consultation process is given in chapter 5 of

this report. Lists of people consulted and recommendations from area local leaders are attached in appendices 8 and 9 respectively.

Analysis of alternatives

The study also investigated alternatives to the proposed project i.e. “*different means of meeting the general purpose and requirements of the activity*” which includes alternatives to:

- (a) The location of the project;
- (b) The design of the activity;
- (c) The technology to be used, and;
- (d) The operational aspects of the project.

The option of not proceeding with the proposed project (i.e. the No project Option) was also assessed and the most feasible alternative recommended.

Potential Impacts and mitigation measures

The study team evaluated the anticipated impacts of the proposed project activities on the bio-physical and the socio-economic environment. The impacts were categorised as positive or negative and their level of effect on the environment were also gauged. The key findings of the study indicate that the positive impacts of the proposed project will outweigh all negative impacts provided the mitigation measures are implemented as recommended to avoid or eliminate the negative impacts.

Mitigation measures to address the identified negative impacts have also been provided in this report. Whereas the positive impacts should be enhanced, the negative impacts should be prevented or mitigated. The impacts outlined above are discussed in detail and evaluated in section 6 of this report, and mitigation measures for the negative impacts provided. The table below is an outline of the anticipated impacts and their level of significance.

Project Phase	Impact	Significance	
		Without Mitigation/enhancement	With Mitigation/enhancement
Construction Phase	Positive impacts		
	Creation of employment opportunities	Medium	High
	Provision of market for construction materials	Medium	High
	Negative impacts		
	Loss of vegetation cover	High	Low
	Excavated soil erosion impacts	High	Low
	Occupational safety and Health impacts	High	Low
	Solid waste disposal impacts	High	Low
	Onsite construction material storage impacts	High	Low
	Human waste disposal Impacts	High	Low
Operation phase	Habitat Alteration	Medium	Low
	Positive impacts		
	Provision of employment opportunities	Medium	High
	Provision of market for farm inputs	Medium	High
	Contribution to government revenue through taxes and permits.	Medium	High
	Source of protein rich food	Medium	High
	Reducing pressure on the Natural water bodies	Medium	High
	Improvement in area security	Medium	High

	Skills transfer to locals	Medium	High
Negative Impacts			
Water Quality Degradation	High	Low	
Solid waste management and disposal impacts	High	Low	
Occupational safety and health impacts	High	Low	
Disease Spread from the farm	High	Low	
Impacts of escaped fish species	High	Low	
Predation impacts	High	Low	
Chemical use impacts	High	Low	
Site security impacts	High	Low	
Social disharmony due to population influx	High	Low	
Erosion and pond flooding impacts	High	Low	
Housekeeping and sanitation impacts	High	Low	
Drainage and storm water management impacts	High	Low	
Traffic management impacts	High	Low	
Community safety impacts	High	Low	

Conclusion and Recommendations

The implementation of the project presents an opportunity for positive / beneficial impacts to the regional and national economy. On the other hand, the ESIA study has identified negative impacts likely to arise from the implementation of this project. These negative impacts have been thoroughly evaluated and mitigation measures suggested for implementation. The activities of the proposed project are unlikely to generate any irreversible negative impacts.

This study has provided adequate mitigation measures for the identified negative impacts. An Environmental and Social Management and Monitoring Plan (ESMMP) has been provided in this report to guide the developer and all stakeholders towards the management of all identified negative impacts. Environmental monitoring will be carried out during the project cycle based on the potential impacts identified. Implementing these mitigation measures and adhering to local regulations and best practices can help reduce the environmental impacts of the proposed cage fish farming project and make it a more sustainable project. Additionally, ongoing research and innovation are crucial for continually improving the environmental performance of the project.

In light of the findings of this study, the consultancy team recommends that the proposed project be approved for implementation by the National Environment Management Authority (NEMA) and relevant stakeholders, subject to committed implementation of the proposed impact mitigation measures, the ESMMP as detailed in this report, and other conditions prescribed by the Authority, line Ministries, relevant lead agencies, and any other stakeholders. The developer is also required to embrace current environmental management systems and practices throughout the life of the project, closely monitor the project's environmental performance through annual audits and reporting to NEMA the findings. In cases where the indicators vary from the expected/recommended considerably, immediate remediation measures should be implemented.

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List of Abbreviations and Acronyms

EIS	Environmental Impact Statement
ESIA	Environmental and Social Impact Assessment
ESMMP	Environmental and Social Management and Monitoring Plan
ESMP	Environmental and Social Management Plan
MAAIF	Ministry of Agriculture, Animal Industry and Fisheries
NAFIRRI	National Fisheries Resources Research Institute
NARO	National Agricultural Research Organisation
NEMA	National Environment Management Authority
OSH	Occupational Safety and Health
PAPs	Project Affected Persons
ToR	Terms of Reference
UTM	Universal Transverse Mercator

1 Introduction

1.1 Background Information

Fish stocks/catches in the natural Lakes have been on the decline while there is an increase in demand for fish in Uganda due to consumers recognizing its nutritional value. Tilapia and Nile perch are the most traded fish in terms of value and are in high demand amongst both local and international consumers. The demand for fish, specifically Tilapia and Nile perch will continue to increase as wild stocks are declining. In response to this demand, Mandela Millers, a privately owned company in Uganda, is proposing to establish a fish farm. The proposed farm will be a cage fish farm, to be located at Tende Bay, on Lake Victoria, in Bulega-Mbiru Village, Nalugala Parish, Katabi Town Council, Busiro South County, Wakiso District. Cage fish farming involves the growing of fish in existing water resources while being enclosed in a net cage which allows free flow of water. It is an aquaculture production system made of a floating frame, net materials and mooring system (with rope, buoy, anchor etc.) with a round or square shape floating net to hold and culture large number of fish and can be installed in reservoir, river, or lake.

The proposed project will be fully fledged, commercial farm comprising of a total of 40 grow out cages, to be sited about 0.5km into the lake. It will also comprise of brood stock, fry, and fingerling ponds on land, offshore and juvenile cages, and support office and storage facilities. The project implementation activities will therefore include construction of land components, excavation ponds, installation of the cages, and subsequent farm operation activities. These activities are anticipated to result in direct and indirect environmental and social impacts. It is a requirement under the National Environment Act, 2019, that the developer of a project whose activities are likely to have an impact on the environment undertakes an Environmental and Social Impact Assessment (ESIA) prior to its implementation.

In compliance with the above legislation, Mandela Millers Limited (herein after also referred to as "the developer") has contracted a team of certified environmental practitioners at HeboConsult Limited to undertake the ESIA prior to establishment of the proposed cage fish farm (herein after also referred to as "the project"). This report therefore presents the findings of the ESIA. Potential environmental and social projections that may arise e.g. impacts due to climate change, are not included in this study. Project description is based on the information provided by the developer and by specialists at the time of this process.

1.2 Purpose of the Assessment

Section 110 (Part X) of the National Environment Act, 2019 requires that all projects or policies that may, are likely to or will have significant impacts on the environment should be subjected to Environmental Impact Assessment (ESIA) so that adverse impacts can be eliminated or mitigated. The proposed project is listed in the fifth schedule of the Act among the projects for which ESIA is mandatory, in **category 6. Agricultural investments, livestock, range management and fisheries; (h) Establishment of fish cages for commercial production**. The purpose of the Assessment therefore is to identify, predict and analyze the magnitude of environmental and social impacts that are likely to arise from the various activities of the proposed project during construction and operation phases and propose mitigation measures for the significant adverse impacts.

1.3 Objectives of the study

The primary objective of the ESIA is to safeguard the environment during project planning, design, construction and operation of the proposed project and associated facilities by mitigating environmental impacts envisaged during the various phases of the project. The study was designed to evaluate the proposed

project activities considering environmental factors and prepare an Environment and Social Management Plan (ESMP) for the project. Specific objectives of the ESIA are to:

- Determine the Baseline environmental, social and cultural conditions of the project area.
- Identify sensitive environmental and social components likely to be affected by the proposed project.
- Define positive social and economic benefits local communities can derive from the proposed project implementation,
- Identify, predict and assess environmental, health, and social impacts that might arise during the construction and operation of the proposed project and activities associated with it.
- Suggest impact mitigation measures in order to eliminate or reduce the negative impacts as part of the Environmental Management Plan.

1.4 Scope of the study

The Environmental and Social Impact Assessment was conducted for the areas that would be influenced or impacted by the project implementation activities. The study also considered the local population surrounding the project site which could be directly or indirectly affected by the implementation and operation activities of the project. The scope of work during the ESIA included details of the following tasks;

- Description of the proposed project,
- Review of provisions of the relevant legislation,
- Assessment of the present/baseline biophysical and socio-economic components of the environment,
- Identification and quantification of impacts due to the proposed project on environmental components (during the pre-construction, construction and operation phases),
- Evaluation of the identified environmental impacts,
- Analysis of alternatives,
- Preparation of Environmental and Social Management Plan (ESMP) outlining additional control technologies to be adopted for mitigation of adverse impacts, and
- Description of post-project environmental quality monitoring to be pursued by the project developer.

1.5 Study approach and methodology

The study was undertaken by NEMA Certified Environmental Practitioners in accordance with the earlier approved scoping report and Terms of Reference and ESIA regulations of Uganda. The Consultants undertook the task of ESIA for the proposed project by clearly defining the assignment into a number of discrete activities. These activities facilitated development of a workable framework for the speedy and timely execution of the assignment. They included but were not limited to the following;

1.5.1 Environmental screening

Environmental screening was carried out to determine whether an ESIA study is necessary for this project and at what level of evaluation. This took into consideration the requirements of the National Environmental Act, 2019. From the screening process, the proposed project was identified as among those that require Environmental Impact Assessment.

1.5.2 Scoping

Scoping is the initial step in the Environment and Social Impact Assessment process and it is undertaken when according to the relevant guidelines, the project falls under those for which ESIA is mandatory. The scoping study was done to identify the key issues to be studied during the detailed ESIA study. The scoping

stage established the focus and content of the ESIA, and identified the potentially significant environmental and social impacts relating to the project that needed further investigation. It involved setting the context and objectives, establishing the baseline and deciding on the scope and consultation. Scoping also takes into consideration the concerns of stakeholders, in order to ensure that these are addressed in the ESIA Study. In this regard, a scoping report and Terms of Reference was prepared to define the scope of the study. It was submitted to NEMA for review and approval. A copy of the letter of approval is attached as appendix 1.

1.5.3 Desk research/ review of related literature

Review of literature helped in the deeper understanding of the process and possible type of outcomes. Some of the literature reviewed included past ESIA studies in different areas, and the project design documents. Documents containing state of Environment data for the district were also reviewed. The study was also informed by the review of policy, legal and institutional frameworks. A number of policies, laws and regulations relevant to the proposed project were reviewed by the study team to establish their relevance and legal implications to the project and its implementation. The relevant clauses were pointed out for the attention of the developer. A detailed description of the relevant policy, legal and institutional considerations for this plan is presented in chapter 3 of this report.

1.5.4 Site/Field Visit

A site visit was made for physical inspection of the proposed site in order to gather information on the state of environment prior to implementation of the project. The purpose of the visit was to observe the features on the ground and establish facts that needed to be considered in the ESIA process. These included facts on the type of terrain (landscape), drainage, vegetation, sensitive ecological features, site land uses, neighboring land uses, status of the land quality and observable environmental and socioeconomic challenges. Land use and other environmental attributes likely to be affected by the project implementation activities were assessed. This information supplemented the information got from literature review. Information was gathered by use of: observation, key stakeholders' interviews, and photography. Site /field visit and inventories created assisted in establishing benchmarks that will be used in monitoring compliance of the project to impact mitigation measures. A detailed description of the baseline biophysical and socio-economic environment is presented in chapter 4 of this report.

1.5.5 Stakeholder consultation

The study also sought stakeholder opinion/views through a consultation exercise. Interviews were held with various stakeholders to ensure public participation in the Assessment process as recommended under the National Environment Act, 2019, and Guidelines for ESIA in Uganda. The aim of these consultations was to identify and take note of environmental and social concerns and views of all the stakeholders at an early stage so that their proposed recommendations are incorporated in the final implementation plan. The stakeholders for consultation were selected as per the stakeholder identification and engagement plan in the earlier submitted and approved scoping report. A detailed report of the stakeholder consultation process and the comments records is presented in chapter 5 of this report, while the list of the stakeholders is attached as appendix 6 of the report.

1.5.6 Evaluation of Impacts

As part of the study methodology, an impact assessment methodology was clearly outlined for purposes of evaluating the significance of environmental and social impacts. Four factors were considered when assessing the significance of all the social impacts, namely: (i) relationship of the impact to temporal scales

(relating to measured time). The temporal scale defines the significance of the impact at various time scales, as an indication of the duration of the impact; (ii) relationship of the impact to spatial scales (relating to space). The spatial scale defines the physical extent of the impact; (iii) the severity/beneficial scale (state or extent of badness or benefit). The severity of the impact is used in order to scientifically evaluate how severe negative impacts would be, or how beneficial positive impacts would be on a particular affected system (for ecological impacts) or a particular affected party. The severity of impacts was evaluated with and without mitigation in order to demonstrate how serious the impacts would be when nothing is done about them; (iv) the likelihood (degree of probability) of the impact occurring. The likelihood of impacts taking place as a result of project actions differs between potential impacts. There is often no doubt that some impacts will occur (e.g. loss of vegetation), but other impacts are not as likely to occur, and may or may not result from the proposed project. Although some impacts may have a severe effect, the likelihood of them occurring may affect their overall significance. A detailed impact evaluation is presented in chapter 6 of this report.

1.5.7 Developing and refining alternatives

Alternatives are fundamental to the Environmental and Social Impact Assessment process and are required under the ESIA Regulations. Consideration of alternatives in ESIA provides the opportunity to identify and explore different ways to deliver the project's objectives while addressing environmental issues. The alternatives considered under this study included a “no-project” scenario, where the project is not implemented, alternative location of the project, and technology alternatives among others. The study team analysed the pros and cons of implementing each of the alternatives and the best alternative was recommended. The recommended alternative entails implementation of the project with consideration of mitigation measures to prevent, offset or avoid its negative impacts thereby maximizing its benefits. It recognizes the viability and need for the proposed project, is designed to address environmental issues and social concerns and meets local regulatory requirements. A detailed presentation of the analysis of alternatives is presented in chapter 7 of this report.

1.5.8 Professional judgment

The environmental assessment process is an interdisciplinary and multi- step procedure to ensure that environmental considerations are included in decisions regarding projects that may impact the environment. The study team comprised of a diverse of specialists. Professional judgment and technical evaluation of issues related to the nature of the proposed project was done by the various specialists to come up with conclusions. The information gathered during this exercise was evaluated and data analyzed to determine the required level of environmental performance and make recommended action plans to ensure compliance with the National Environmental Management Authority requirements and/or guidelines relating to issues listed in the National Environmental Act, including the Regulations on ESIA. A report (this EIS) has been compiled. Professional judgement was used to provide the appropriate and feasible mitigation measures for the identified negative impacts associated with the implementation of the project, as well as draw conclusions, and recommendations as detailed in various sections of this report.

1.6 Developer's Contact address

Mandela Millers Limited
Plot No. 411-412, Masaka Road, Busega
P.O Box 10022, Kampala – Uganda
Tel. Contact: +256 741 672 531
Email: aateye@mandelamillers.com

1.7 Project Cost

As per the certificate of valuation (attached in appendix 7), the proposed project is estimated to cost approximately **UGX 2,500,000,000** (Two billion five hundred million Uganda Shillings).

1.8 Structure of the EIS

This report is divided into the following principal sections that follow in a chronological order:

Executive Summary: This section presents a summary of the ESIA report. It broadly covers the ESIA background, study methodology, study findings, baseline environmental conditions of the study area, environmental impacts, mitigation, environmental management plan, conclusions and recommendations.

Chapter 1: Introduction; This chapter details the Background information to the project, objectives of the study, scope, and methodology for undertaking this EIA study

Chapter 2: Description of the Project: This chapter gives a detailed description of the proposed project, its components and the main project activities.

Chapter 3: Review of Policy, Legal and Institutional Framework: This chapter provides an overview of the policies, legislation and institutional frameworks relevant to the ESIA study and implementation of the proposed project.

Chapter 4: Baseline Environmental and socio-economic Conditions: This chapter describes the existing physical, biological and socioeconomic environmental conditions of the project area, infrastructure and services in relation to the project site.

Chapter 5: Stakeholder Engagement and Consultations: This chapter details the stakeholder consultation process, stakeholders consulted, and emerging issues/ stakeholder concerns.

Chapter 6: Impact Evaluation, Analysis and mitigation: This chapter presents an analysis and evaluation of the potential environmental and socioeconomic impacts and possible mitigation measures for all significant negative impacts.

Chapter 7: Analysis of Alternatives: This chapter discusses alternatives to the proposed project and justification for the preferred alternative.

Chapter 8: Environmental and Social Management and Monitoring Plan: This chapter describes the management plan of the environmental and socioeconomic impacts. The chapter further describes the monitoring plan.

Chapter 9: Conclusion and Recommendations – This chapter provides the conclusion and recommendations of the ESIA study regarding project implementation and future operations.

2 Description of the Project

2.1 Introduction

This section presents a detailed description of the proposed project. It details the nature of the proposed project, its location, designs and site layout/plan as well as details on supportive resources i.e. man power and utility requirements. It presents the activities that will be involved during all stages of project implementation. The description of the project, its components and activities has been developed based on the following:

- The project design and description documents provided by the developer (as attached in appendices);
- Meetings and discussions with the developer on this regard; and
- Field visit and investigation done by the study team.

2.2 Site geographical location and accessibility

The proposed site is geographically located at UTM Coordinates 36N 450586mE 7249mN, at an elevation of 1140 meters above sea level (taken in the middle of the site). The proposed site boundary Coordinates (as shown with the red line on the Google image) are given below;

Table 2-1: Proposed site boundary coordinates

Point	UTM Eastings	UTM Northings
1	450339mE	7454mN
2	450356mE	7496mN
3	450716mE	7649mN
4	450721mE	7643mN
5	450681mE	7616mN
6	450912mE	6880mN
7	450290mE	6665mN
8	450047mE	6779mN
9	450524mE	7375mN
10	450423mE	7441mN

The site neighbourhood is a predominantly residential area with sparse settlements. The site immediate neighbourhood comprises of the Country resort and the lake in the north, and residences. To the immediate south of the site is a residence and the lake. To the immediate east are crop gardens and garuga Road, while to the immediate west is Lake Victoria.

The site is accessed via an earth road off the main Garuga Road, at about 7km from the turn off from Entebbe Road.

The Google image in figure 2.1 below shows the proposed site boundary (shown by the red line), while figure 2.2 shows the site location and accessibility.



Figure 2-1: Google image showing the proposed site boundary and immediate neighbourhood

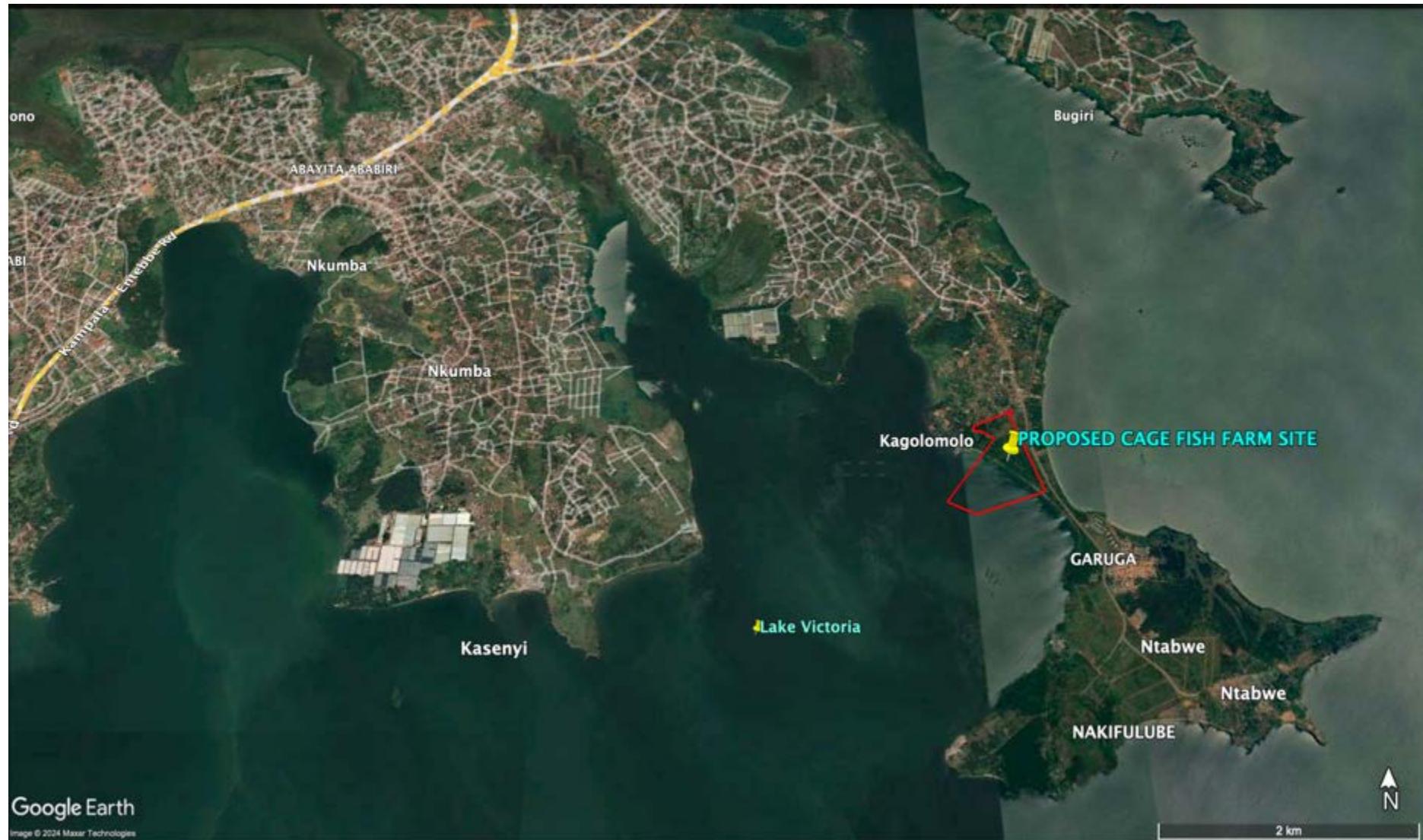


Figure 2-2: Google image showing the proposed site location and accessibility

2.3 Site suitability for the proposed project

Proper site selection is an important initial aspect for any aquaculture development activity. Mandela Millers having identified Tende bay on Lake Victoria as a potential site for the proposed cage aquaculture project, and approached the National Fisheries Resources Research Institute (NaFIRRI) to have this area surveyed to assess its suitability for cage aquaculture. The assessment aimed to characterize the biophysical, chemical and general environmental features of Tende bay. Based on the general environment, bio-physio-chemical assessment findings, the site was found to be most suitable and would offer the most conducive conditions for any upcoming aquaculture developments. The proposed site with Tende bay was found to be between two cage fish farms (Victoria Treasures and Pearl Aquatics Ltd). The adjacent land was found to be having a hotel and a small beach. A detailed copy of the site suitability assessment report is attached in appendix 8 of this report.

2.4 Proposed Project Components

The proposed project will be a fully-fledged farm with the following components;

- Administrative building: which will include the farm office, a lecture room, training room, labs, and staff house.
- Storage warehouse; which will be used for storage of materials, equipment and feeds.
- Hatchery: A hatchery is a facility designed for the artificial breeding, hatching, and rearing of fish eggs and larvae under controlled conditions. It is a crucial component of the proposed farm, serving as a specialized environment for the early stages of fish development. The hatchery will be in one of the two existing buildings. It will be refurbished and modified to serve the new purpose.
- Brooders ponds: These ponds serve as the habitat for the mature, sexually mature fish known as brood stock. Brood stock are the breeding fish that produce fertilized eggs, which are then used to produce the next generation of fish. The farm will have 4 brooders ponds of size 32m X 32m X 1m each.
- Nursery ponds: Nursery ponds play a vital role in the early stages of fish farming, specifically in the rearing of fry (young fish) after they hatch from eggs. These ponds provide a controlled environment where fry can grow and develop before being transferred to larger grow-out ponds. The proposed farm will have 4 nursery ponds of size 32m X 32m X 1m each.
- Juvenile cages: Juvenile fish cages are structures designed to rear and grow young fish in a controlled environment, typically in open water bodies such as lakes.
- Grow out fish cages: Grow-out cages, also known as fish cages, are floating or submerged structures in water bodies, where fish are reared to marketable size. These cages provide a controlled environment for fish growth. The proposed farm will have 12 floating fish cages at the lake.

Other components will include the gate house, truck and car parking areas, drive way and walkways. The area around the ponds will be planted with grass. The fish cage area will be separated from the rest of the farm components by a chain link fence. The site layout plan is attached in appendix 9 of this report.

2.5 Fish species to be kept at the farm

The farm will be stocked with Nile Tilapia fish (Ngege). This specie has been chosen because it has a local market and is recommended by the ministry. Nile Tilapia Fish (*Oreochromis niloticus*) are native to the Nile

River Basin in Africa but have been introduced to many other parts of the world due to their popularity as a food fish. They can thrive in both freshwater and brackish water and are known to inhabit rivers, streams, lakes, ponds, and even man-made reservoirs. Nile Tilapia Fish are one of the most important species of fish in aquaculture due to their fast growth rates, ability to adapt to different environments, and high nutritional value.

2.6 Project inputs and equipment to be used

The major equipment to be used during the project includes:

- Motorized boat for navigation on the lake
- Pick-up truck for transportation
- Welding machine(s) for making cages (to be hired)

Material inputs into the project shall include;

- Tilapia fingerlings of 2g each, to be bought from farms in the area like source of the Nile (SON) fish farm in Bugungu village, Nyenga Division or Rock Springs in Tororo.
- Plastic drums.
- Ropes
- G.I frames
- Floaters
- Imported nets
- Water pipes.
- Sinkers

2.7 Production capacity

The proposed farm will produce approximately 80Metric Tons of fish production/year.

2.8 Workforce

The proposed project is estimated to employ about 30 people during construction and 100 during operation. The workers will include the farm manager, fish specialists, casual workers, loaders and off loaders.

2.9 Pond construction

Well-designed and constructed ponds are easily managed and maintained, leading to less "down time" due to failures and more efficient operation and production. After clearing the site, marking out the area of the ponds and walls, the construction phase will begin. It involves excavation of the proposed fish ponds. Pond excavation will be done using an excavator. The proposed fish ponds are rectangular and of dimensions 32m X 32m X 1m for brooder ponds and nursery ponds. The main parts of the pond to be constructed during excavation include the pond walls/embankment and the pond drainage structures (water inlet and outlet structure). They will be concrete lined ponds.

Pond drainage structures

The pond inlet structures: The inlet structure will be built to supply water into the ponds. For the proposed farm, plastic pipes will be used at the inlet. The inlet pipes will be raised above the desired pond water level so that water falling into the pond will be aerated. To prevent predators and other unwanted species from entering the pond, a screen will be used at the inlet pipe.

The pond outlet structures: The outlet structure will be built to empty water out of the ponds. Fish ponds have to be emptied either partially or fully, especially during harvesting and cleaning. When there is excess water in the pond it has to be drained to required level to prevent pond wall from being weakened and collapsing. Plastic pipes will be used. The outlet pipes will be fitted with wire mesh screens to prevent escape of fish.

Water inflow to and outflow from the ponds: The ponds will have independent water supply (inlets) and separate outlets (ponds in parallel). This will make it possible to drain the water from each pond without the water having to flow through a second pond. The advantage of this construction is that, in case of parasites and diseases outbreak in one pond, its water can be easily drained and the other ponds will not be affected.

2.10 Fish cage design and installation

Fish cage selection: Four different types of cages are commonly used in open water fish culture such as the fixed, floating, submersible, and submerged. The proposed project will utilize floating cages. The cages will have a robust design with double barriers to prevent the escape of biomass and protection against predators.

Fish cage structure and specifications: The cages will consist of a double barrier “escape-proof” with an inner net in nylon and an outer barrier is typical green Mesh. Each cage will be equipped with a movable cover with a net to sort out the fish for harvesting.

Construction and setting up cages: Cages will be made by building the frame using high density polythene pipes which will be joined onto empty plastic drums and to which netting made from nylon or a similar material will also be attached on the sides to ensure that fish remains in the cage and protect them from predator and on top to protect the fish from birds. The type of frame to be used will be around one because there is little threat from predators in the area. The cages will be hung on the floating frame and will be placed in the lake and held in place with heavy rocks or concrete blocks (referred to as sinkers) which settle at the bottom of the lake. Low volume high density (LVHD) cage fish culture is the proposed system since it is the most common system in Uganda. Fish will be raised at high density in cage volume 6 – 18m at optimum densities of 200 – 500 individuals at carrying capacities of 100 – 200kg of fish/m.

Placement of the cages: The fish species to be farmed don't require highly oxygenated water, hence the Lake Victoria waters are suitable for placement of the proposed cages. The cages will be placed in the bay at a distance of 0.5km within the lake. The cages will be installed in slow moving waters, free from pollutants. Prior to installation of the cages, the Lake will be checked by a qualified aquaculture technician for its appropriateness. Location of the cages within the lake should be such that it allows for easy navigation and doesn't obstruct main waterways or access points used by local residents.

2.11 Operation phase activities

2.11.1 Brooding

The fish farming process will begin with the selection and management of brood stock in the specialized brooding ponds. These mature fish are carefully chosen for their health, genetic traits, and suitability for reproduction. The brood stock are induced to spawn, and natural or assisted reproduction takes place in the brooding ponds. Fertilized eggs are collected from these ponds as the starting point for the next stages.

2.11.2 Hatching

The collected eggs will be transferred to the hatchery for incubation. In the hatchery, optimal conditions will be maintained to ensure the successful development and hatching of the eggs. Larvae hatch from the eggs, and the early stages of fish development take place in controlled environments.

2.11.3 Nursery Ponds

Once the larvae hatch, they will be transferred to nursery ponds. These ponds provide a protected and controlled environment for the young fish to grow and develop. Specialized feeds and careful monitoring will be done to contribute to their healthy growth.

Weaning and Transition in Nursery Ponds: In the nursery ponds, the fish may undergo a weaning process, transitioning from live feeds to formulated diets. This prepares them for the next stage of development.

Grading and Sorting in Nursery Ponds: Fish in the nursery ponds may be graded and sorted based on size and developmental stage to ensure uniformity. This allows for better management of stocking densities.

2.11.4 Grow-Out Cages

Once the fish in the nursery ponds reach a suitable size and developmental stage, they will be transferred to the grow-out cages at the lake. These cages, floating in water bodies, provide a controlled environment for further growth.

2.11.5 Stocking the fish

The farm will start with 50% operational capacity and will reach to full capacity in the 4th year. Fish will be bought from nurseries in the area. Stocking shall be done early in the morning or late in the afternoon to avoid too much stress, which may cause high mortality. Proper care shall be taken to acclimatize the newly procured fish from the supplier (hatchery) to the temperature of the stocking area by floating the bags / tanks in the Lake for at least 15 minutes before releasing into the cages.

2.11.6 Feeding the fish

Caged fish nutrition comes from commercial fish feed. Commercial fish feed contains the balance of proteins, amino acids, vitamins, and minerals that fish needs to grow and stay healthy. Fish in grow-out cages are fed a formulated diet to meet their nutritional requirements. The feeding regime is adjusted based on the growth and appetite of the fish. In terms of food content, the fish will be fed on 50% protein, 70% silver fish and maize brand and soya bean. The feeding is according to body weight and food conversion ratio (FCR). Fish will be fed on pellets which have 30% protein until they are 200gms for a period of two months. After gaining 200gms, the protein content will be reduced to 20% depending on the growth rate.

Fish stocks will be fed on commercial feeds following a feeding rate of 2.5% of their average body weight, the ratio being adjusted on a Bi- monthly basis. Using this feeding measure, Tilapia fish weighing 500g – 1kg fish will be generated in 7 months. Under intensive management and regular harvesting, it is expected that 8 – 10 tons of fish rationally be obtained per production cycle.

2.11.7 Harvesting fish from the cages

When the fish gains between 500g to 600g, it will be harvested using a hand-held net and if the cage is large, nets may be used to move the fish towards one corner, ready to be sold. The fish harvested from the proposed

farm will be weighed and graded by size, iced and later transported for sale to neighboring and regional markets. Transportation will be in accordance with fisheries industry best practices.

2.11.8 Farm management

The developer will employ a dedicated team of biologists to be responsible for regular health checks, fish stocking, fish grading and biosecurity monitoring and management of the company's entire project activities. The company will also employ a Fish Veterinarian who will be responsible for veterinary services to ensure a healthy fish at all times with focus on disease prevention through efficient biosecurity controls and ongoing monitoring. The developer will use approved drugs, antibiotics or other medicinal treatment options, as stipulated in the Aquaculture Licensing Regulations. Routine maintenance of the grow-out cages is conducted to ensure their structural integrity. This includes inspections, repairs, and cleaning to prevent the accumulation of debris or fouling.

The fish cages will be cleaned and inspected regularly, and fish feed will be carefully monitored to ensure that it is not left available, and feed spreaders will be oriented downwards and set to spread the feed evenly, ensuring that there is no available feed source to attract birds. If there is an increase in predatory bird interaction, scarecrows will be used on site. The presence of mortalities is known to attract predators, and an effective mortality removal procedure, will be used to reduce the risk of predator attacks.

2.12 Biosafety and Biosecurity Measures

Biosecurity refers to a set of preventive measures designed to reduce the risk of transmission of infectious diseases, pests, and invasive species to animals, plants, and humans. In the context of fisheries and aquaculture, biosecurity encompasses practices and protocols aimed at protecting aquatic organisms and ecosystems from pathogens and other biological threats. The general Biosafety and Biosecurity Principles include;

- Prevention: Implement measures to prevent the introduction and spread of diseases.
- Control: Establish protocols to quickly detect and control disease outbreaks.
- Education: Train staff on biosafety and biosecurity practices.
- Documentation: Maintain accurate records of all biosafety and biosecurity activities.

2.12.1 Hatchery biosecurity measures

Facility Design and Maintenance

- Physical Barriers: Install barriers to prevent the entry of unauthorized personnel and animals.
- Sanitation Stations: Place footbaths and hand sanitizing stations at all entry points.
- Controlled Access: Restrict access to the hatchery to essential personnel only.
- Quarantine Area: Designate a quarantine area for new or sick fish.

Water Quality and Management

- Ensure the water source is free from contaminants and pathogens.
- Use filters and UV sterilization to treat water entering the hatchery.
- Test water quality parameters regularly, including temperature, pH, DO, ammonia, nitrite, and nitrate levels.

Disease Prevention

- Health Screening: Screen all broodstock and new fish for diseases before introduction.

- Vaccination: Vaccinate fish against common diseases where applicable.
- Bio secure Handling: Use sterile equipment and procedures when handling fish.

Sanitation and Disinfection

- Clean and disinfect tanks, equipment, and surfaces regularly.
- Use appropriate disinfectants for different surfaces and materials, ensuring they are effective against common pathogens.
- Waste Management: Properly dispose of hatchery waste, including dead fish, to prevent contamination.

2.12.2 Entire Fish Farm Measures

Site Security

- Perimeter Fencing: Erect a fence around the whole farm perimeter to prevent unauthorized access.
- Visitor Protocol: Implement a protocol for visitors, including registration, and supervised access.

Biosecure Feed and Supplies

- Feed Quality: Source feed from reputable suppliers and ensure it is free from contaminants and pathogens.
- Storage: Store feed in a clean, dry, and rodent-proof environment.
- Supply Management: Sanitize all equipment and supplies before bringing them onto the farm.

Staff Training and Hygiene

- Training Programs: Regularly train staff on biosafety and biosecurity measures, including disease recognition and emergency procedures.
- Personal Protective Equipment (PPE): Provide appropriate PPE, such as gloves, boots, and coveralls, and ensure their proper use.
- Hygiene Practices: Enforce strict personal hygiene practices, including handwashing and disinfection before and after handling fish.

2.12.3 Monitoring and Surveillance

Routine Health Checks: Conduct regular health assessments of fish stocks, looking for signs of disease or abnormal behavior.

Surveillance Program: Implement a surveillance program for early detection of diseases, including regular sampling and laboratory testing.

2.12.4 Emergency Response Plan

Establish a biosecurity response team trained to handle disease outbreaks and emergencies.

Develop protocols for isolating and treating infected fish to prevent the spread of disease.

Define procedures for notifying regulatory authorities and stakeholders in the event of a disease outbreak.

2.12.5 Environmental Management

Treat effluents to remove contaminants and pathogens before discharge into the environment.

Regularly remove and treat sediment from cages and tanks to prevent buildup of harmful substances.

Monitor and protect local biodiversity by minimizing the farm's environmental footprint.

2.12.6 Record Keeping and Documentation

Maintain detailed health records for all fish stocks, including vaccination, treatments, and disease incidents.

Keep logs of all staff training sessions and attendance.

Document regular inspections and audits of biosafety and biosecurity measures.

2.12.7 Review and Improvement

Conduct an annual review of biosafety and biosecurity measures to assess their effectiveness and identify areas for improvement.

Engage with experts, regulators, and stakeholders to incorporate any new research findings and best practices into the biosecurity plan.

3 Policy, Legislation and Regulatory Considerations

3.1 Introduction

This section provides an overview of the policy, legal, and institutional framework considered relevant to the proposed project. Various laws reviewed relate to minimum acceptable operational requirements, environmental quality, land use, public health, occupational safety, and labour standards and legal obligations.

3.2 National Policies

3.2.1 The National Environment Management Policy, 1994

The overall goal of this policy is the promotion of sustainable economic and social development that enhances environmental quality without compromising the ability of future generations to meet their own needs. The policy aims at conservation and restoration of the environment, raising public awareness, and ensuring individual and community participation in environmental and development activities. The policy states that an Environmental Impact Assessment should be conducted for a policy or project that is likely to have impacts on the environment. This is also reaffirmed in the National Environment Act, 2019 which makes ESIA a requirement for eligible projects.

Relevance to the Project: Implementation of this project will have negative impacts on the general environment and therefore an ESIA being necessary as regards to the policy. This Policy will guide the implementation of the proposed project so as to ensure that environmental conservation and sustainable development is achieved. The developer is committed to implementing the project within means that does not harm the environment in order to promote environmental conservation, restoration and sustainability.

3.2.2 National Fisheries Policy, 2004

The policy provides for fisheries to be managed and developed to promote the socially and economically sustainable use of fisheries resources and the protection of aquatic ecosystems so as to meet the needs of present generations without compromising the ability of future generations to meet their needs. It also stipulates that adverse environmental impacts on fisheries will be minimised and mechanisms will be established at appropriate levels to achieve this. The policy also provides for promotion of Aquaculture fish production to reduce the gap between fish supply and the increasing demand for food fish.

Relevance to the Project: The company will continue to work with the department of aquaculture management and development, and the department of fisheries resources during the operation of the project.

3.2.3 National Water Resources Policy, 1999

The policy caters for safeguarding water sources. It also stipulates that the quality of drainage water shall be such as not to pollute the receiving water or ground water and that all measures must be taken by the users to prevent increase in salinity levels in receiving waters, to prevent the accumulation of dangerous or toxic compounds in the subsoil, capable of contaminating underground waters.

Considering the nature of activity to take place, this policy offers guidance on how to execute the project diligently and cautiously.

3.2.4 Child Labour Policy, 2006

This policy prohibits employment of children. Children are more prone to accidents at workplaces. The policy defines child labour as;

- Work that is mentally, physically, socially and/or morally dangerous and harmful to children. In addition, child labour is perceived as work or activities that interfere with children's school attendance.
- Hazardous work, which by its nature or the circumstances under which it is performed jeopardizes the health, safety and morals of a child.

Relevance to the Project: The developer will ensure strictly no employment of children at the farm in accordance with this policy. The construction contractor must also comply with this requirement. No children below 18 years shall be employed at the site.

3.2.5 The National HIV/AIDS Policy, 2004

The policy provides the principles and a framework for mounting an optimum response to HIV/AIDS in the entire Ugandan world of work. It forms the basis for the development of workplace policy guidelines, which addresses the more specific issues related to the workplace HIV/AIDS response.

Relevance to the project: The Company will develop an HIV/AIDS workplace policy. It will be adequately communicated to all the workers and displayed around the premises. There will also be periodic sensitisation sessions among workers on HIV/AIDS prevention.

3.2.6 The National Gender Policy, 2007

The Policy objectives are to reduce gender inequalities so that all women and men, girls and boys, are able to move out of poverty and to achieve improved and sustainable livelihoods; to increase knowledge and understanding of human rights among women and men so that they can identify violations, demand, access, seek redress and enjoy their rights; to strengthen women's presence and capacities in decision making for their meaningful participation in administrative and political processes; to address gender inequalities and ensure inclusion of gender analysis in macro-economic policy formulation, implementation, monitoring and evaluation.

Relevance to the project: The developer will ensure that policy objectives are adhered to by ensuring equal employment for both men and women. Sanitary facilities will be well labeled for gender difference.

3.3 Uganda National legal framework

3.3.1 The Constitution of Uganda, 1995

The constitution of the republic of Uganda is the cardinal law in Uganda upon which all environmental laws and regulations are founded. Under 17 (j), it is the duty of every citizen of Uganda to create and protect a clean and healthy environment & article 39 states that every Ugandan has a right to a clean and healthy environment. Objective XXVII (i) obliges the State to promote sustainable development and public awareness of the need to manage land, air and water resources in a balanced and sustainable manner for the present and future generations. Implementation of this project must thus be commensurate with the requirements of the Ugandan constitution.

Relevance to the Project: The developer has a duty to protect and preserve the environment and as such has appointed the study team to undertake an ESIA study in order to establish adverse environmental impacts

and propose adequate mitigation measures which are discussed in chapter 6 and will be implemented during all phases of the project life cycle. Undertaking of the environmental impact assessment also promotes awareness among the project stakeholders. All negative impact mitigation actions of the project are therefore meant to conform to the broader objectives of the Constitution which requires a health environment for all citizens. The developer will ensure that the activities of the project do not affect this right. The project premises will be kept clean to ensure a healthy working environment.

3.3.2 The National Environment Act, 2019

The National Environment Act of 2019 is the main law relating to the protection of the environment in Uganda. This Act states the duty to protect and preserve the environment and also provides for the establishment of measures to manage the environment for sustainable development and promotion of environmental awareness. National Environment Management Authority was created under this Act and is mandated with the responsibility to oversee, coordinate and supervise environmental management in Uganda, including the review of environmental impact assessments carried out for various projects.

The Act provides for various strategies and tools for environment management, which also include ESIA (Part X) for projects likely to have significant impacts on the environment. The Act imposes a mandatory duty on a project developer to have an Environmental and Social Impact Assessment conducted before embarking on a project. The fifth Schedule of the Act lists the types of the projects to be subjected to ESIA.

Relevance to the Project: The Act governs and guides environmental management in Uganda. It is in line with this provision that the developer sought the services of ESIA experts to undertake an Environmental and Social Impact Assessment and prepare an ESIA Report for the proposed project activities. This addresses the requirement as the activities are likely to have associated negative environmental impacts as discussed in detail in the various sections of this report. This will ensure continuous improvement on environmental, health and safety management and takes appropriate measures to mitigate any adverse impacts to the environment and the surrounding communities that the project may have during its operation.

3.3.3 The Fish Act, 2000

This Act makes provision for the control of fishing, the conservation of fish, the purchase, sale, marketing and processing of fish, and matters connected therewith. Section 6 subsection (1) of this Act states that any person who, without a valid specific license issued for that purpose— engages in the processing of fish or any fish product in any prescribed place or area; or engages, in any prescribed place or area, in the marketing, purchase or sale of fish, commits an offence.

Relevance to the project: The developer will apply for and obtain a permit from the department of Aquaculture Management and Development to operate the proposed fish farm.

3.3.4 The Physical Planning Act, 2010

Clause 32 of this Act provides for a landowner to use services of a qualified planner to prepare a local physical plan that shall be submitted to the local physical planning committee for adoption with or without modifications. Part 8 is concerned with control of development and clause 38 of this part specifies that an applicant for development permission in a planning area must obtain an Environmental Impact Assessment certificate in accordance with the National Environment Act.

Section 33 (I) of this Act states that, “a person shall not carry out a development in a planning area without obtaining development permission from a physical planning committee”.

Relevance to the Project: The area where the proposed site is located is under the jurisdiction of Wakiso District. The proposed project will therefore be implemented with guidelines and planning provisions of the district. The proposed site plans will be submitted to the district physical planning committee for review and approval prior to commencement of construction works.

3.3.5 The National Environment (Environmental and Social Assessment) Regulations, 2020

These regulations hold for all projects/activities for which an environmental and social impact study is required to be undertaken in accordance with section 113 of the Act and Schedule 5 of the National Environment Act of 2019.

The regulations state in section 15 (Environmental and social impact study) that Upon approval of the terms of reference, the developer shall undertake an environmental and social impact study to — (a) assess the anticipated positive and negative direct, indirect, induced, cumulative and transboundary environmental, health, socio-economic, cultural and climate change impacts of the proposed project, including expected carbon footprints of the project.

Section 16 of the regulations also state in sub section (1) that the developer shall, in undertaking the environmental and social impact study, carry out consultations with relevant stakeholders, communities likely to be affected by the project and the public.

The regulations make it an offence for any person to commence, proceed or execute any project with significant impact on the environment without approval from NEMA.

Relevance to the Project: This ESIA has been made in compliance with this requirement. The developer must also submit an Environmental Audit report annually as a requirement by this regulation to confirm the efficacy and adequacy of the Environmental Management and Monitoring Plan that will be put in place. This assessment was also carried out in consultation with stakeholders. The findings of stakeholder consultation are in chapter 5 of this report, while the list of people consulted is attached in appendix 6.

3.3.6 The National Environment (Waste Management) Regulations, S.I No. 49, 2020

Part II—General Provisions Relating to Waste Management of these regulations, section 4 (Compliance with environmental principles) of these regulations require that a person who generates waste, a waste handler or a product steward shall, in compliance with the environmental principles set out in section 5 of the Act—
(a) Apply measures in the management of waste to prevent harm to human health and ensure safety of human beings;

(b) Apply measures in the management of waste to prevent pollution, harm to biological diversity and contamination of the wider environment by waste;

(c) Use best available technologies and best environmental practices to manage waste; and

(d) Ensure resource efficiency—

- (i) by the application of the waste management hierarchy and the control or minimisation of the generation of waste to the greatest extent possible;
- (ii) by promoting proper cyclical use of resources; and
- (iii) by ensuring proper disposal of circulative resources not put into cyclical use.

Section 5 provides for Responsibility for Waste Management, and states that a person who generates waste, a waste handler or product steward has a duty of care and shall take measures to ensure that—

- (a) Waste is managed appropriately and securely in accordance with the Act, these Regulations, any other applicable law, environmental standards and conditions of the licence;
- (b) Waste is managed in a manner that does not cause harm to human health or the environment;
- (c) Any leakage or spillage of waste is quickly detected and managed; and
- (d) Spillages which may cause pollution are managed in accordance with regulation 95.

Relevance to the Project: These regulations apply to wastes generated at the site, which should be managed in a way such as to avoid environmental and public health impact. The developer will ensure there is proper contractual agreement with licensed waste handling companies and that wastes are disposed in the manner prescribed. There are also means in the Environmental Management and Monitoring plan to ensure that the impact of the waste generated is minimised and that the waste generated is managed as per standard requirements.

3.3.7 The National Environment (Audit) Regulations, S.I No. 47, 2020

The Regulations reinforce the requirement to undertake Self-Environmental Audits as contained in the EIA Regulations. Normally, under approval conditions of NEMA, it is a requirement to undertake audits for projects which comply with the EIA requirement as part of the conditions of EIA approval.

Part III—Environmental Compliance Audit, section 12 (Environmental compliance audit) of these regulations states in the following sub sections that;

- (1) The developer of a project or activity listed in Schedule 3 to these Regulations shall carry out an environmental compliance audit.
- (3) The environmental compliance audit referred to in sub regulation (1) shall be undertaken annually, unless otherwise required by the Authority.
- (4) The developer shall ensure that an environmental compliance audit is undertaken by an environmental audit team of persons duly certified and registered in accordance with the National Environment (Conduct and Certification of Environmental Practitioners) Regulations, 2003.
- (5) The audit team referred to in sub regulation (4) shall be supervised by a duly certified and registered lead environmental auditor.

Relevance to the project: During operation, the developer will submit to the authority annual environmental compliance audits of the fish farm. These Audits will be conducted by a team of certified environmental Auditors.

3.3.8 The National Environment (wetlands, River Banks and Lake Shores Management) Regulation, 2000

Section 34 (1) highlights the fact that any developer desiring to conduct a project which may have significant impact on a wetland, river bank or lake shore shall be required to carry out an environmental impact assessment in accordance with sections 20, 21, and 22 of the Statute.

Sub-section 2 makes it mandatory for the developer/owner of an establishment near the shore line to carry out annual audits and monitoring on such activities and shall submit reports to the Executive Director and lead agency in accordance with sections 23 and 24 of the Statute.

The developer will apply for and obtain a user permit to operate the project on the lake.

3.3.9 National Environment (Standards for Discharge of effluent into Water or on Land) Regulations, 2020

These regulations Part II subsection 6(1,2) (standards for effluent), states that the standards for effluent or waste water before it is discharged into water or on land shall be as prescribed in these Regulations and that a person who intends to discharge effluent into water or land shall ensure that the effluent meets the standards for general chemicals and micro-biological discharge set out in Schedule 2 to these Regulations.

Part II subsection 4 (1) states that person whose activities are likely to produce effluent shall put in place measures to prevent and mitigate pollution in accordance with the Act, the National Environment (Waste Management) Regulations 2020, the Petroleum (Waste Management) Regulations 2019, the Water (Waste Discharge) Regulations and environmental standards, including by—

- (a) employing the best available technologies and cleaner production techniques; and
- (b) installing effluent treatment equipment and facilities for effluent emanating from the activities of their industry or any other facility.

Relevance to the Project: The proposed project activities are not anticipated to generate any effluent. Sewage will be managed onsite through a septic tank and soak pit, while storm water will collect into a well-built onsite drainage system.

3.3.10 The Local Government Act, Cap 243, 1997

The Local Government Act, 1997 provides for decentralization and devolution of Government functions, powers and services from the central to local governments and sets up the political and administrative functions of local governments. The local governments are responsible for the protection of the environment at the district level. This therefore, implies that local governments shall be consulted on projects to be located within their jurisdiction and on matters that affect their environment.

Relevance to the Project: The project will be under jurisdiction of Wakiso district, which is mandated under the Local Governments Act, Cap 243 to sanction and oversee development projects in the local government. The Environmental Officer is mandated to inspect and monitor environmental considerations for development projects in their areas of jurisdiction. The developer will work with the local authorities throughout the operation of the project.

3.3.11 The Occupational Safety and Health Act, 2006

The Occupational Safety and Health Act of 2006 consolidate, harmonise and update the law relating to occupational safety and health and repeal the Factories Act of 1964. It makes provisions for the health, safety, welfare and appropriate training of persons employed in work places. The Act provides for safe access to the workplaces and safe work practices which applies to this project as well.

The key areas addressed by the Act include:

- General duties including duties of employers and employees.

- Enforcement of the act including powers of an occupational safety and health officer.
- Registration of workplaces.
- General Health provisions including cleanliness, ventilation, lighting and sanitary conveniences.
- Machinery safety including safe handling of transmission machinery, hand held and portable power tools, self-acting machines, hoists and lifts, chains, ropes & lifting tackle, cranes and other lifting machines, steam boilers, air receivers, refrigeration plants and compressed air receiver.
- General Safety Provisions including safe storage of dangerous liquids, fire safety, evacuation procedures, precautions with respect to explosives or inflammable dust or gas.
- Chemical safety including the use of material safety data sheets, control of air pollution, noise and vibration, the handling, transportation and disposal of chemicals and other hazardous substances materials
- General welfare provisions including supply of drinking water, washing facilities, and first aid.

To promote health and safety of employees who are at risk of being exposed to chemical substances, requires every employer to maintain at the workplace material safety data sheets and chemical safety data sheets respectively for all chemicals and other hazardous substances in use and ensure that they are easily available to the employees.

Relevance to the project: The Act is applicable in relation to protection of workers against secondary injuries and hazards during execution of their duties or work. The developer must provide for the protection of workers from adverse weather, provision of a clean and healthy work environment, sanitary conveniences, washing facilities, First Aid and facilities for safe drinking water and meals. In summary, this act will be used as a guideline to ensure health and safety of workers is guaranteed. The developer must provide PPE to its entire staff and ensure fire extinguishers are serviced annually. The company will also generate an occupational safety and health policy to guide the operation activities of the site.

3.3.12 The Public Health Act, Cap 281, 1964

The Public Health Act aims at avoiding pollution of environmental resources that support health and livelihoods of communities. It gives local authorities powers (Section 103) to prevent pollution of watercourses in interest of public good.

Relevance to the project: This Act relates to disposal of waste from the proposed project in so far as improper handling, disposal of solid waste and effluent some of which will be classified hazardous, and could potentially impact on public health. With implementation of the proposed impact mitigation measures, the developer aims to operate the project without subjecting the public or the environment to any danger/nuisance arising from the operations of the project.

3.3.13 The Employment Act, 2006

The Employment Act 2006 is the governing legal statutory instrument for the recruitment, contracting, deployment, remuneration, management and compensation of workers. The Employment Act, 2006 is based on the provisions of Article 40 of The Constitution of Uganda. It is the principal legislation that seeks to harmonize relationships between employees and employers, protect workers' interests and welfare and safeguard their occupational health and safety through:

- a) Prohibiting forced labour, discrimination and sexual harassment at workplaces (Part II; Part IV).
- b) Providing for labour inspection by the relevant ministry (Part III).

- c) Stipulating rights and duties in employment (weekly rest, working hours, annual leave, maternity and paternity leaves, sick pay, etc. (Part VI).
- d) Continuity of employment (continuous service, seasonal employment, etc. (Part VIII).

This Act is also concerned with child labour, wage calculation and maximum working hours for employees. The Act mandates Labour officers to regularly inspect the working conditions of workers to ascertain that the rights of workers and basic provisions are provided and workers' welfare is attended to.

Relevance to the project: The Act will govern labour type and conditions under which the people employed by the project work. It prohibits Child labour, as well as providing guidance on work rights during the operation phase.

3.3.14 The Workers Compensation Act, Cap 225

The Workers" Compensation Act outlines responsibilities and obligations for both parties (employer and employee) in guaranteeing the safety and health of the workers. The Act outlines matters of compensation for injuries and accidents as well as the responsibility of employees to take care of their health and safety while on the project. Section 28 of the Workers' Compensation Act of 2000 states that; where a medical practitioner grants a certificate that a worker is suffering from a scheduled disease causing disablement or that the death of a workman was caused by any scheduled disease; and the disease was due to the nature of the worker's employment and was contracted within the twenty-four months immediately previous to the date of such disablement or death, the worker or, if he or she is deceased, his or her dependents shall be entitled to claim and to receive compensation under this Act if such disablement or death had been caused by an accident arising out of and in the course of his or her employment. It also emphasizes the provision of personal protective equipment (PPE) to employees to minimize accidents and injuries.

Relevance to the project: The proposed project is labour intensive, making cases of injuries and illnesses unavoidable. Therefore, the developer shall take all measures to ensure that the workers are well compensated in cases of injuries and illness. The developer will also ensure provision of PPE and health insurance for all workers at the farm.

3.4 Institutional Framework

3.4.1 National Environment Management Authority (NEMA)

The National Environmental Act, Cap 153 established NEMA as the principal agency responsible for coordination, monitoring and supervision of environmental conservation activities. NEMA also enforces regulatory compliance during and after implementation of projects. NEMA is under the Ministry of Water and Environment (MWE) but has a cross-sectoral mandate to oversee the conduct of EIAs through issuance of guidelines, regulations and registration of practitioners. It reviews and approves environmental impact statements in consultation with any relevant lead agencies.

NEMA works with District Environment Officers and local environment committees at local government levels who also undertake inspection, monitoring and enforce compliance on its behalf. In Government ministries, NEMA works with Environmental Liaison Units to ensure incorporation of environmental issues in their activities, policies and programs.

Role in the project: NEMA will:

- Review and approve this report (EIS). This environmental impact assessment report will be submitted to NEMA for subsequent review and approval authorizing the project to commence and the management of the proposed project will make an effort to consult NEMA for any environmental related concerns
- Undertake monitoring during project implementation.

3.4.2 Occupational Safety and Health Department – Ministry of Gender, Labour & Social Development

This Ministry sets policy direction and monitoring functions related to labour, gender and general social development. The Occupational Safety and Health (OSH) Department in the ministry is responsible for inspection and monitoring of occupational safety in workplaces and this could be during project construction and operation to ensure safe working conditions.

Role in the project: All workplaces are required to be registered with this department. The developer will register the project with this department and obtain and display at the premises, the Certificate of Registration of Workplaces. The department may also carryout regular inspections during operation to ascertain compliance with safety and health requirements.

3.4.3 Directorate of Water Resources Management (DWRM)

The Directorate derives most of its roles from the Water Act, Cap 152, with the Ministry of Water and Environment being its line Ministry. Some of its key roles include; the rational management and use of the waters of Uganda through the introduction and application of standards and techniques; the coordination of all public and private activities that may influence water quality and quantity; and to allow for the orderly development and use of water resources. DWRM has the mandate to “promote and ensure rational and sustainable utilization, effective management and safeguard of water for social and economic welfare and development as well as for regional and international peace”. It is responsible for managing, monitoring and regulation of water resources through issuing water use, abstraction and waste water discharge permits.

If the developer intends to abstract water from the lake, to be used at the farm. The developer will apply for and obtain a surface water abstraction from this Directorate and make quarterly submissions as required. The developer will work with this directorate throughout the implementation of the project to ensure sustainable use of water.

3.4.4 Ministry of Water and Environment

The ministry is the institution responsible for the formulation of policies that govern environmental management in Uganda hence responsible for environmental issues in the country. The Ministry is responsible for the protection of the Environment including water, Land, Natural Heritage, and other natural ecosystems. The Ministry has also been consulted during the assessment to obtain their initial consent and guidance. Comments from this Ministry are recorded in chapter 5 of this report.

3.4.5 Ministry of Agriculture, Animal Industry and Fisheries (MAAIF)

The Ministry is responsible for formulating and reviewing National policies, plans, legislation, standards and programmes relating to the agricultural and Fisheries sector in Uganda. In line with fish farming or aquaculture, the Ministry of Agriculture, Animal Industry and Fisheries (MAAIF) in its manual 2005, presented the following criteria for good fish ponds; The water source, quality and quantity of ponds must be relatively unlimited.

- i. Little and seasonal water is difficult to manage for fish production.

- ii. The soils must be impervious to water (do not allow water to drain away).
- iii. Pond water should fill and drain by gravity. It is expensive to pump water in or out of the pond.
- iv. Ponds should be above the water table (i.e. water should not seep from the bottom). Otherwise, it is difficult to drain.
- v. The farm should be accessible to markets and supplies (good road)
- vi. Ponds should be large enough (from 20m x 50m to more than 2 hectares) for commercial fish production. Larger ponds are less costly to build per square meter but require large equipment to operate.
- vii. Rectangular ponds are easier to manage.
- viii. The average pond water depth of 1.5m is recommended but the pond bottom should not be flat. The shallow end should be 0.5m – 1.0m and the deeper end should be 1.0m to 1.7m.

(Source: MAAIF; Aquaculture Technical Manual Volume 1, an Introduction to Commercial Fish Farming)
Consultations have been conducted with the technical staff in the Department of Fisheries Resources at the Ministry of Agriculture, Animal Industry and Fisheries during this assessment. Their comments are given in chapter 5.

3.4.6 National Fisheries Resources Research Institute (NAFIRRI)

NAFIRRI is one of the seven public National Agricultural Research Institutes (NARIs) under the policy guidance and co-ordination of the National Agricultural Research Organisation (NARO) which was established under the National Agriculture Research Act of 2005. Its main mission is to conduct basic and applied research of national and strategic importance in Aquaculture, Capture fisheries, Water environment, Socio-economics and Marketing, and Information Communication Management, and emerging issues in the fisheries sector. The institute was consulted during this assessment and their comments are given in chapter 5.

3.4.7 The Local Government – Katabi Town Council

The local governments in project areas are responsible for regular inspection of facilities and ensuring environmental compliance within the respective areas. The proposed project is within the jurisdiction of Katabi Town Council, which will be responsible for conducting regular inspections at the farm premises to ascertain compliance. The Council will also monitor the construction process to ensure that the contractor is meeting the requirements for environmental management. Initial consultations have been conducted with the Town Council environment office and the comments are attached in appendix 5 of this report.

3.5 NARO Guidelines for Cage Fish Farming in Uganda

As per NARO's guidelines, Prospective cage fish farmers should prepare a proposal and share it with the District Fisheries Office (DFO); Get a suitability and capability report of the proposed site from the National Fisheries Resources Research Institute (NaFIRRI); Apply for an establishment permit from the Directorate of Fisheries Resources (DiFR); Obtain a water use permit from the Directorate of Water Resources Management (DWRM); and depending on the scale of production, conduct an Environmental and Social Impact Assessment (ESIA) and submit an Environmental Impact Statement (EIS) to the National Environmental Management Authority (NEMA) for approval. NARO further issues the following guidelines; Conclusions These guidelines have been prepared based on the experience of established cage fish farms in Uganda, experiments conducted by NaFIRRI, and acceptable international standards for cage fish farming.

Siting

Cages should be located in a site where they have minimum interference with other lake uses and suitable conditions for fish growth. The recommended minimum distances of the site from other lake uses are: Security installations (2km); Harbors (200m); Navigation routes (100m); Protected areas (100m); Recreational facilities (500m); Landing sites (200m); Fish breeding and nursery areas (200 m); Hydropower plants (1km); Water extraction points (500m); Effluent discharge and waste disposal points (500m); and Weed hotspots (100m).

The recommended optimum environmental conditions of the site are: Depth: 5-20 m; Dissolved Oxygen (DO): $\geq 5 \text{ mgL}^{-1}$; Water transparency: $>70 \text{ cm}$; Wind velocity $\leq 10 \text{ knots}$; Wave height: $<1 \text{ m}$; Temperature: $24\text{-}30^\circ\text{C}$; Biochemical oxygen demand (BOD): $\geq 6 \text{ mgL}^{-1}$; Water current speed: 10 to 100 cm.sec^{-1} ; Carbon-dioxide (CO₂): $<5 \text{ mgL}^{-1}$; Total phosphorous: $<100 \mu\text{g/L}$; Chlorophyll-a $<75 \mu\text{g/L}$; Total Ammonia Nitrogen: $<0.01 \text{ mgL}^{-1}$; Nitrate: $0.1\text{-}4.0 \text{ mg L}^{-1}$; Nitrite: $<0.2 \text{ mgL}^{-1}$; Total dissolved solids (TDS): $<40 \text{ mg L}^{-1}$; Total suspended solids: $<10 \text{ mgL}^{-1}$; Alkalinity: 120-400 ppm; pH: 6.5-9; Conductivity: 30-5,000 m Siemens/cm; Hardness: 30-180 mgL^{-1} ; Chloride: 60-100 mg L^{-1} ; Faecal coliform ≤ 100 count per 100 ml.

The site should be zoned with GPS coordinates and adjacent lake uses indicated. The views of communities in the area should be sought.

Farm plan and layout

The farm should have a plan showing: The boundary with GPS coordinates; Cage design, number and placement; Buildings; Utilities; Access roads; Waste management and net cleaning points. There should be measures to control fish escapes, predators, theft and vandalism. The farms should have a decommissioning plan to clear and restore the site to its original state at the end of the operation.

Installation

Accessories such as feed barriers, covers and sinkers should be attached to the cage bags prior to rigging onto the frames and before installation. The cages should be placed in water at least twice the depth of the cage. Cage grids should be firmly secured with anchors of at least 40 kg and strong nylon ropes of at least 18 mm.

Production practices

Culture species: The species to be cultured should be native or naturalized in the water body such as Nile tilapia (Ngege).

Feed and feeding: Fish should be fed on nutritionally complete floating pellets from certified suppliers.

Health and environmental management: Fish health should be checked regularly by monitoring fish behavior, deformities, mortality and presence of parasites. Infected fish should be removed from the cage, isolated, recorded and reported to relevant authorities. Water quality in the cage area should be monitored regularly by checking key parameters especially DO, Temperature, pH, Total Ammonia Nitrogen and Turbidity.

Harvesting and marketing: The market should be identified before harvesting. Harvesting can be done by lifting the cage bag out of water and removing the fish or by using a scoop or cast net. Fish should be handled and preserved properly. Small scale producers are advised to produce and sell fish through groups to optimize profits.

Production records: The farmer should keep accurate production records to facilitate good business and financial management.

Environmental monitoring

The water environment, bottom sediments, and biological communities in and around the cage fish farm should be monitored at least twice a year by an independent competent authority and compared with the baseline data collected at siting and with National, Regional and International standards to guide development of mitigation measures and compliance with good production practices.

3.6 FAO codes of practices for responsible fisheries and aquaculture

The Food and Agriculture Organization (FAO) of the United Nations has established comprehensive guidelines for responsible fisheries and aquaculture to ensure sustainable practices that balance environmental, social, and economic considerations. These codes of practice are designed to promote the long-term viability of aquatic ecosystems and the communities that depend on them.

One of the key emphases is on minimizing the environmental impact of aquaculture operations through site selection, feed management, and waste disposal practices.

4 Project Area Environmental and Socio-economic Baseline

4.1 Introduction

The physical, biological and socio-economic aspects of the existing environment in the vicinity of the project site are described in this section. This description provides a benchmark for continued monitoring and assessment of the impact of the proposed project on the environment. The data collected comprises of secondary information obtained mainly from the district state of environment report and site-specific characteristics.

4.2 Proposed site current status

The proposed site comprises of the dry land part and the lake part. The lake part will be used for installation of cages, while the land part will be used for the ponds and the project support buildings. The site is currently undeveloped and under vegetation cover. The pictures below show the site current status.



The land part of the site



The lake part of the site

Figure 4-1: Photograph showing the proposed site current status

4.3 Site neighbourhood environmental setting

The site neighbourhood is a predominantly residential area with sparse settlements. The site immediate neighbourhood comprises of the Country resort and the lake in the north, and residences. To the immediate south of the site is a residence and the lake. To the immediate east are crop gardens and garuga Road, while to the immediate west is Lake Victoria. The photographs in the figure below show the proposed site immediate neighbourhood.



Northern neighbourhood





Figure 4-2: Photographs showing the proposed site immediate neighbourhood

4.4 Bio-Physical environment

4.4.1 Vegetation cover

Apart from the lake, the site immediate neighbourhood is a rural setting with primary vegetation except for cultivated areas and residential establishments. The vegetation cover of Wakiso District as a whole is very varied. It ranges from medium altitude evergreen forest, through medium altitude moist semi-deciduous forests, savannas, and swamps. Wakiso has over nineteen (19) government forest reserves with a total area of 6,773 ha.

4.4.2 Topography and drainage

The proposed site has a gentle slope and drains towards the west, and drains towards the lake. The general landscape in Wakiso belongs to Buganda surface classification. It lies at an approximate range of about 900 to 1340 meters above sea level. The district is characterized by isolated flat-topped hills with steep slopes, often merging abruptly into long and gentle pediments, which are usually dissected by relatively broad valleys. Wakiso district is divided into two main topographic zones, the Lake Victoria zone and the high land zone (central and northern hills).

4.4.3 Baseline air quality

The ambient air quality at the propose site is well within acceptable limits given that the site is currently undeveloped. Air quality issues anticipated from the project activities will include dust emissions during construction. Provisions are made in the impact analysis section of this report for dust management. The developer will supervise the activities of the contractor to ensure that dust management measures are adequately implemented and that dust emissions are kept to the minimum.

4.4.4 Baseline Water quality

The proposed project site is located at the shores of Lake Victoria, and the cages will be located on the lake. For maximum fish production, water quality conditions in the proposed site must be within optimal ranges. Water quality assessment was carried out during the site suitability assessment and it was established that quality meets the requirements for cage fish farm. A sample of water from the lake was also collected for laboratory analysis during the ESIA to ascertain baseline quality prior to project implementation. From the results, all the physio-chemical parameters are within recommended National Standards for Effluent Discharge levels. A copy of the sample results is attached in appendix 3 of this report. The proposed project is not anticipated to lead to significant pollution of the lake provided the impact mitigation measures are implemented as recommended, and the project design is implemented as planned.

4.4.5 Climate

The climatic and physical conditions of the area around the fish farm compares favourably to other areas of the Northern shorelines of the lake (1200 – 1500mm of rain with average minimum temperature of 17°C and average maximum temperature of 26°C). The climatic condition of the entire Wakiso District is tropical in nature being modified by relief and closeness to Lake Victoria. The district has an annual mean rainfall of 1320mm, though in many areas of the lake zone it is between 1750 and 2000mm. Temperatures are moderated by altitude of the area, but vary between 15°C-30°C. The minimum surface air temperature of the district is 11°C while the maximum is 33.3°C.

4.4.6 Geology

Wakiso District is underlain by both old and recent rock systems, which include Precambrian, Cainozoic and Laterites. All the three major divisions of rocks i.e. sedimentary, igneous and metamorphic are represented. The Cainozoic rocks extend southwards to the Lake Victoria shores and river valleys of the district. They include mainly swamps deposits, alluvium and lacustrine deposits. The laterite rocks are widespread on Wakiso summits in the central and northern parts of Wakiso district. It is well developed below the summit levels where it forms protective pavements on many slopes.

4.4.7 Soils

The soils of Wakiso District are generally mainly sandy clay soils. The dominant soils types are red gravelly loams with occasional murram reddish brown sandy loam on red clay loam and yellowish sands with quartz grave. The soils in the wetlands include grey sands whose parent material is alluvium and hill wash, grey coarse sand from lake deposits, black and grey clays from river alluvium and peat sands and clay formed from papyrus residue and river alluvium. Wakiso soils are generally of high productivity.

A soil sample was also picked from the proposed site for laboratory analysis and the results (attached in appendix 4) indicate that all environmental contaminants parameters are within acceptable limits.

4.5 Socio-economic environment

4.5.1 Local economy

The area can be described as predominantly residential. The source of income for people in the area is employment in Entebbe and Kampala, and retail trade. Fishing is another economic activity in the area, carried out at the lake, and recreational facilities along the lake shore.

4.5.2 Population characteristics

The site immediate neighbourhood is sparsely populated. The 2014 National Population and Housing Census estimated the population of Wakiso District at 2,007,700 people, making it the most populated District in the country. Of this population, 952,781 are males and 1,054,919 are females. It should be noted that by the time of the census, the area where the farm is located was administratively located in Katabi Sub County (current Katabi Town Council) with the following population characteristics.

Table 4-1: Population characteristics for Katabi

Sub County	House Hold		Population		
	Number	Average size	Males	Females	Total
Katabi Sub County	28,546	3. 5	48,946	55,389	104,335

Source: UBOS, 2014: National Population & Housing Census

The population in the project area is mainly rural with clustered settlements. The housing structures are a mixture of permanent and semi-permanent houses.

4.5.3 Land tenure arrangement

Customary land ownership is the most widespread land tenure system in Wakiso district. Land tenure in Entebbe is a mixture of leases, private mailo and free hold tenure. The proposed land is owned by the developer under leasehold tenure from Impala Investments Limited. A copy of the land lease agreements and land title is attached in appendix 2.

4.5.4 Land use

The land use in the proposed site immediate neighbourhood and Bulega Village as a whole can be described as predominantly residential settlement with pockets of unused land, commercial setups along the main roads, recreational facilities, and fish landing sites. Wakiso District as a whole is one of the fastest growing districts in the region as the capital city's industrial activities are expanding in its direction.

4.5.5 Electricity supply

The site area is currently served with the National electricity grid from where the farm will be connected for electricity supply. The developer will also consider alternative energy sources such as solar to minimise cost and also ensure natural conservation.

4.5.6 Waster and sewerage services

The area is also served with piped water by NWSC. The develoepr will use these services for the farm. A qualified plumber will be employed to ensure proper workmanship and minimise blockages and leakages.

4.5.7 Waste management services

The site area is under the jurisdiction of Katabi Town Council. Therefore, waste management in this area is by council. Waste is collected in skips that are placed at selected locations within the division. Other private collectors registered by NEMA also provide door-to-door waste collection services to individual households and commercial establishments at a fee. The project implementation process is anticipated to generate significant volumes of waste both during construction and operation. The company will contract a NEMA registered waste management company to collet waste from the farm for disposal in approved dumpsites.

4.5.8 Communication networks

The site is within reach of basic communication infrastructure such as the mobile network coverage of MTN and Airtel, Orange Uganda and Uganda telecom limited (UTL). The company will work with the service providers for any communication services required.

4.6 Cultural and historical environment

There were no sites of cultural significance seen on or around the site.

5 Stakeholder Engagement and Consultation Process

5.1 Introduction

Stakeholder involvement is a fundamental principle of the ESIA process under the National Environment Act, 2019, and the ESIA Regulations, 2020. Timely, well planned and appropriately implemented stakeholder involvement programmes contribute to the successful design, implementation, operation and management of projects. Specifically, stakeholder involvement is a valuable source of information on key impacts, potential mitigation measures and the identification and selection of alternatives. It also provides an opportunity for those directly affected by a project to express their views regarding the project and its environmental and social impacts. Stakeholder consultation, if conducted in a participatory and objective manner, is also a means of enhancing project sustainability. This section of the report outlines the stakeholder consultation approach adopted for this ESIA study, identifies the concerned groups of stakeholders, describes the consultation process carried out as part of this study, and gives the findings from the stakeholder consultation process.

5.2 Objectives of stakeholder consultations

The key objectives of stakeholder involvement are to:

- Inform the stakeholders about the proposed project with special reference to its key components and its likely effects;
- Gather comments, inputs, concerns and suggestions of the affected persons.
- Take account of the information and views of the stakeholders in the ESIA and decision making.
- Obtain local and traditional knowledge that may be useful for decision-making;
- Facilitate consideration of alternatives, mitigation measures and tradeoffs;
- Ensure that important impacts are not overlooked and benefits are maximized;
- Reduce conflict through the early identification of contentious issues;
- Provide an opportunity for the public to influence project design in a positive manner (thereby creating a sense of ownership of the project); and
- Increase public confidence in the ESIA process.

5.3 Stakeholder identification and engagement

Stakeholders are defined as individuals, groups of people and entities that are affected by a development activity either directly or indirectly or those that may exert either positive or negative influence on the project. Consultations were carried out with three groups of stakeholders, namely;

- Directly affected persons; People or groups of people who derive their livelihood from the zone of direct impact of the project.
- Indirectly affected persons; Persons who reside/operate near the project area or rely on resources likely to be affected by the project.
- Government agencies/institutions (Lead Agencies); Government agencies, line ministries, political and administrative leaders in the project area including the LC and district technical officials.

Interactive one on one interviews were used during consultation. The contacted people fully participated in the identification of impacts (both positive and negative) the proposed project is likely to have on the environmental, social, and economic conditions as well the ecosystem as a whole.

5.4 Comments registered/findings from stakeholder consultations

A number of stakeholders (who were available at the time of the study) participated in this exercise. These included area Local Council leaders and residents of Bulega-mbiru Village, as well as the technical personnel in the relevant government agencies.

The residents welcomed the project, citing its potential to provide employment opportunities to the local youth, and contribution to development of the area. The residents are optimistic that the project will boost trade and open up new markets for their various agricultural products by supplying the anticipated large number of workers at the project.

However, several concerns were also raised and suggestions made for better performance. Key among the concerns is fear of the company restricting accessibility to the lake. The table below shows the comments raised by the stakeholders that were consulted during the ESIA process. A list of the people consulted is attached in appendix 6 of this report.

Table 5-1: Comments from stakeholders consulted during the assessment

Name	Designation/Contact	Comments/Concerns	Response/remarks
Eng. Byaruhanga K. Godfrey	Aquaculture systems Designer – NARO-NAFIRRI 0772471348	<ul style="list-style-type: none">✓ Ensure that a well-documented suitability report which informed the decision on the location of the site for the proposed cage fish farm is included in the ESIA report.✓ Emphasize biosafety and biosecurity measures for the hatchery and the entire fish farm.✓ Clearly state the measurements and include designs for the nursery ponds and grow out ponds. The designs should clearly indicate how cage shifting will be done.✓ Emphasize the role of protective gears and safety trainings for the workers.	<ul style="list-style-type: none">✓ A site suitability assessment as carried out and a report is attached in appendix 8 of this report.✓ Biosecurity measures provided in section 2 of the report.✓ Project design described in chapter 2 and site plan attached in appendix 9.

Name	Designation/Contact	Comments/Concerns	Response/remarks
		<ul style="list-style-type: none"> ✓ Put in place a proper sewage and waste management system that ensures there's no contamination of the water in which the cages will be put. ✓ Emphasize greening of the remaining dry land as this does not only contribute to air cleaning but also raises the levels of the much-needed oxygen within the environment. ✓ In the report, describe the pond water system clearly. ✓ There's need for a conditioning process for the fly during transfer to reduce mortalities. Fish fly cannot be transferred immediately after hatching. 	
Mr. Kassi Yusuf	Senior Fisheries Officer-Aquaculture Management Directorate of Fisheries resources - MAAIF	<ul style="list-style-type: none"> ✓ In your desk review, pay attention to requirements for a cages site with emphasis on no go areas (see cage establishment guidelines), and compliance to codes of practices and other regulations by planned cage farm. ✓ A Fish diversity specialist and fisheries resource management specialist are important on this project. ✓ Include an annual environmental monitoring plan in the mitigation measures for potential impacts. ✓ Provide mitigation measures for the potential impacts from the hatchery operations, potential impacts of cage operations including but not limited to fish escapes, nutrient addition from the feed of poor quality, spread of diseases to wild fish etc. ✓ Document detailed mitigation measures for each area of project activity/across the value chain since the project will 	<ul style="list-style-type: none"> ✓ All relevant guidelines have been reviewed as shown in chapter 2. ✓ A fisheries specialist has been part of the study team for this ESIA. ✓ Project monitoring plan is provided in chapter eight. ✓ All anticipated impacts have been evaluated and mitigation measures provided.

Name	Designation/Contact	Comments/Concerns	Response/remarks
		be implemented in a highly sensitive environment with potential social economic ramifications.	
Mr. Gerald Babi Mr. Katto David Mr. Odong Joseph Mr. Abaho Joseph Mr. Obote Bonny Emmanuel Mr. Denis Ocoromac Mr. Chepkurui Gordon	Water Officers – Ministry of Water and Environment (Signed list attached in appendix 6)	<ul style="list-style-type: none"> ✓ Assess the possibilities of impacts from population influx in the area on natural resources and sanitary issues as a result of the project. ✓ Where the developer establishes a waste water treatment system. The developer should provide the design, capacity of the plant and the expected amount of waste water to be released to the environment. ✓ Where the developer intends to construct any other project components which are likely to consume significant amount of water and energy, the developer should come up with resource utilization and technology to ensure efficient use of water and energy. Cleaner production technologies are recommended. ✓ Paving of surfaces and roofing in the project area will lead to increased run-off/stormwater. If not properly handled could lead to siltation and contamination of the lake. Therefore, strategies for management of stormwater should be catered for in the ESIA study. ✓ Water pollution with concerns from algae bloom and antibiotics, vaccines, disinfectants and substances used to prevent corrosion of cages which can change the composition of the surrounding aquatic ecosystem should be assessed and mitigation measures provided. 	<ul style="list-style-type: none"> ✓ All possible impacts anticipated from the activities of this project have been evaluated and mitigation measures provided.

Name	Designation/Contact	Comments/Concerns	Response/remarks
		<ul style="list-style-type: none"> ✓ Management of fish feeds, quality, and including feeding regimes should be assessed in order to avoid wastage, pollution and eutrophication. ✓ The community should not be restricted from accessing the project area though some areas may be fenced. The community should also be consulted so that they feel part and partial of the project. ✓ Undertake baseline water quality assessment during the ESIA study, and during project operation, carryout regular water quality analysis in different seasons in order to know the trend of water quality in the project area and assessing the impact of the project on water quality. ✓ There may be an issue of sediments from the cages which will be derived from organic debris and other wastes at the bases of the cages and disposal of such waste is a concern with respect to the health and water ecosystem. 	
Ms. Eva Katusabe	Principal Safety Inspector – OSH Department; Ministry of Gender, Labour and Social Development 0779651582	<ul style="list-style-type: none"> ✓ The fish farm/workplace must be registered with this department. ✓ The company should have safety policies. ✓ Trained first aiders should be employed to handle first aid cases. ✓ There is need to have adequate toilets at the premises and they should be separate for male and female. 	<ul style="list-style-type: none"> ✓ The fish farm will be registered with the department and a certificate of registration of workplaces will be obtained and displayed at the farm. ✓ The company will develop relevant policies for the project. ✓ First aid facilities will be provided as recommended in this report.

Name	Designation/Contact	Comments/Concerns	Response/remarks
		<ul style="list-style-type: none"> ✓ Dressing rooms at the premises should be gender sensitive/ separate for both male and female. ✓ Workers should be provided with appropriate and adequate personal protective equipment (PPEs). 	<ul style="list-style-type: none"> ✓ Well labeled dressing rooms will be built as provided for in the project design. ✓ All workers on the project will be provided with appropriate PPE.
Mr. Lwanga Charles	Information secretary - LC 1 0774220329	<ul style="list-style-type: none"> ✓ We welcome the project in our area because it is going to improve security. ✓ Our youths will get jobs once the project is implemented. ✓ The developer needs to work hand in hand with the local leaders for the success of the project and development of the area. 	
Ms. Atieno Mariam Shilat	Resident- Bulega-Mbiru 0773537335	<ul style="list-style-type: none"> ✓ We welcome the project and we pray that they give us some jobs as residents of this area. ✓ The workers at the cage fish farm will support local business and will be an ever-present market for the locally produced foods. ✓ The workers who will operate the farm should be provided with appropriate protective clothing like water proof clothes and life jackets. 	<ul style="list-style-type: none"> ✓ All workers on the project will be provided with appropriate PPE.
Mr. Katongole Jerry	Resident- Bulega- Mbiru 0707-849261	<ul style="list-style-type: none"> ✓ The country will get taxes from the proposed project. ✓ I hope most of our jobless youths can be considered when giving jobs. 	<ul style="list-style-type: none"> ✓ Local youths will be given priority for jobs on the project.
Mr. Abdallah Mbulla	Current site caretaker	<ul style="list-style-type: none"> ✓ The security of the proposed location is going to improve. ✓ The aesthetics of the area is going to improve. 	

Name	Designation/Contact	Comments/Concerns	Response/remarks
	0773 942525	✓ Jobs will be created for the residents.	
Mr. Olweny Isaac	Neighbor 0782834674	<ul style="list-style-type: none"> ✓ The project will contribute to the development of the area and the entire village. ✓ More jobs will be created and we pray that they consider our residents. ✓ Government taxes will increase which will further boost development of our country. 	
Mr. Bwambale / Rufungura	Current site caretaker 0783-491888	<ul style="list-style-type: none"> ✓ I am happy about the proposed development because security of the place is going to improve. ✓ The project will also create jobs for several people who will work on the farm. 	
Mr. Sodri Henry	Current site caretaker	<ul style="list-style-type: none"> ✓ I welcome the project because it is going to improve our standards of living as employees. ✓ The security of the area will also improve. 	
Ms. Kagoya Harriet	Resident- Bulega- Mbiru	<ul style="list-style-type: none"> ✓ We request that our children are considered first when giving jobs. ✓ The trucks that transport products need to be controlled to avoid accidents once the project has commenced. 	<ul style="list-style-type: none"> ✓ The developer will consider local residents for the jobs they will qualify for. ✓ Traffic management measures will be implemented as recommended in this report.
Mr. Kalanda Charles	Resident 0782 422846	<ul style="list-style-type: none"> ✓ The proposed project is good for provision of job opportunities. ✓ However, there is information that the proposed land for the cage fish farm is still under contest in the court. 	<ul style="list-style-type: none"> ✓ The developer has provided land ownership documents as attached in appendix 2.

Name	Designation/Contact	Comments/Concerns	Response/remarks
Mr. Achile Sulaiman	0777 528228	<ul style="list-style-type: none">✓ We welcome the development because it will create employment and lead to development of the area.	
Mr. Isingoma John	Resident 0771 266516	<ul style="list-style-type: none">✓ I personally welcome the project in our area. It will contribute to development.✓ The government will earn revenue from the farm in form of taxes and permits.✓ Once operational, the fish farm can be used as a demonstration farm to teach young farmers different skills.✓ However, we fear that the developer may stop the local fishermen from going about normal businesses once the cages are put at the lake.	<ul style="list-style-type: none">✓ The placement of the sages will be restricted to the area where they do not affect the operations of other lake users.
Ms. Nakimuli Mukasa	Resident 0776 829789	<ul style="list-style-type: none">✓ I hope that as residents of Bulega Mbiru, we will be able to get jobs in case anyone meets the required qualification.✓ The workers at the cage fish farm will support local business and will be an ever-present market for the locally produced foods.	<ul style="list-style-type: none">✓ The developer will employ people from the local community.

5.5 Remarks/recommended actions

From the comments presented in the table above, the stakeholders generally provided technical guidance, anticipated project benefits, possible negative impacts and recommendations for implementation. The highlighted guidance and suggestions/recommendations have been mostly provided for in the design of the project, and the impact analysis and mitigation sections of this report. The developer will use this documentation during the implementation of the project to ensure that its impact on the environment and social economic setting of the area is kept to a minimum. There is no stakeholder conflict anticipated from the activities of this project. The developer will work closely with the identified stakeholders throughout the implementation of the project.

To further address community concerns, the following recommendations should be adhered to;

- Engage with the local community early in the project planning process. Seek their input and address any concerns they may have about access to the lake.
- Maintain open lines of communication with the local community throughout the operation of the project. Address any concerns promptly and transparently.
- Install visible markers around the cage farm to indicate safe passage areas for boats. This helps local residents navigate around the farm without difficulty.
- Provide training to local residents on safe navigation around the cage farm. Educate them about the benefits of sustainable aquaculture and how it can coexist with traditional fishing practices.
- Develop an emergency response plan in collaboration with local authorities to address any unforeseen events. This can help build trust with the community by demonstrating a commitment to their safety and the health of the lake.

6 Impact Evaluation, Analysis and Mitigation

6.1 Introduction

This section identifies both positive and negative impacts associated with the proposed development. These impacts are identified at two distinct phases of the project i.e. site preparation and construction phase, and the operation phase. The impacts were identified with due consideration to issues pertaining to the bio-physical and socio-economic environment. These impacts are based on the design of the project, environmental and socio-economic baseline study, stakeholders' views, as well as expert judgment. Impacts anticipated are both positive and negative. While the positive impacts will be enhanced, adequate mitigation measures are provided for implementation to minimise, avoid, or mitigate the identified negative impacts. A detailed mitigation plan upon which each impact will be mitigated is given in section 8.

6.2 Methodology for Impact Evaluation

This section assesses the level of potential negative impacts based on various criteria including severity of impacts, duration, geographical scope, and the existence of readily identifiable cost-effective mitigations. The assessment also takes into account the impacts identified during the stakeholder consultation process. Potential and apparent impacts have been identified based on proposed activities to be undertaken, through specialist studies on site and through consultations with key stakeholders.

The initial impact identification presented in Table 6.1 specifically targets issues identified within the First schedule of the EIA Regulations for Uganda of 1998. Within this Impact identification phase, the project in general is evaluated against the possibility of resulting into a stated impact on Ecology, Social considerations, landscape or Land use.

The anticipated probability of causation of impact is rated as:

- ✓ Not possible (No)
- ✓ May impact
- ✓ Likely to impact
- ✓ Will Impact

Table 6-1: Impact Screening based on anticipated activities from the proposed project

Recommended considerations	Will the Project Directly or indirectly impact on?	No	May	Is likely	Will impact	Activities/ stage of Project implementation
Ecological considerations						
a) Biological diversity	Number, diversity, breeding habits, etc. of wild animals and vegetation.	X				There is secondary vegetation on site. Part of the site is located on a lake, with possible effect on diversity.
	Gene pool of domesticated plants and animals e.g. monoculture as opposed to wild types.	X				There are no domesticated plants at the site.
b) Sustainable use	Soil fertility	X				No impact on soil anticipated.
	Breeding populations of fish and game or wild animals.	X				No breeding sites were observed onsite.
	Natural regeneration of woodland and sustainable yield	X				No impact on wood land from the project
	Wetland resource degradation or wise use of wetlands	X				No impact wetland resources anticipated.
c) Ecosystem maintenance	Food chains.		X			Project will contribute to food supply.
	Nutrient cycles.	X				No impacts on nutrient cycle anticipated
	Aquifer recharge, water run-off rates etc.	X				No impact on aquifers and water runoff rates.
	Areal extent of habitats.	X				No habitats onsite.
	Fragile ecosystems		X			The site is a part of a fragile ecosystem.
Social considerations				X		
	Generation or reduction of employment in the area				X	Employment opportunities will be available during cage installation and operation of the project.
	Social cohesion or disruption				X	Cohesion possible due to influx of project labour.
	Effect on human health.				X	Impacts on workers' health and safety possible during operation.
	Immigration or emigration.		X			The project may import expertise/skilled personnel. The project will however employ locals for unskilled labour.

Recommended considerations	Will the Project Directly or indirectly impact on?	No	May	Is likely	Will impact	Activities/ stage of Project implementation
	Communication - roads opened up, closed, re-routed.	X				The project will use existing road infrastructure. There will be no opening of new roads. The existing roads will not be closed.
	Local economy				X	Increased revenue due to payment of taxes and licenses.
	Culture and objects of cultural value.	X				No elements of cultural value observed on or near the site.
Landscape	Views opened up or closed	X				No views will be opened or closed due to the implementation of the proposed project.
	Visual impacts (features, removal of vegetation, etc.)	X				Magnitude of project structures will not have visual affect
	Compatibility with surrounding area.	X				Project is compatible with area land use.
Land Uses	Current land uses and land use potentials in the project area.		X			Area is mainly residential.
	Possibility of multiple use	X				The project will have a single use.
	Surrounding land uses and land use potentials	X				Area main land use is farming and fishing

6.3 Criteria for rating impact Significance

Impacts likely to occur at different project development phases are categorically defined as High, Medium or Low and these have been determined based on the spatial extent of the impact, persistence of the impact, Probability that the impact will occur and the Intensity of the impact. Impact evaluation was undertaken using an Impacts rating matrix as presented in Table 6.1. The following impact Rating Criteria was adapted:

High level Impacts

- Causing severe alterations of natural properties, functions or processes, which are of – long term duration and large spatial extent, or – long-term duration and medium spatial extent, or – medium-term duration and large spatial extent.
- Notable alterations of natural properties, functions or processes, which are of long-term duration and large spatial extent.

Medium level Impacts

- Causing notable alterations of natural properties, functions or processes, which are of – medium term duration and medium spatial extent, or – long-term duration and local spatial extent.
- Notable alterations of natural properties, functions or processes, which are of short-term duration and medium spatial extent.

Low-level Impacts

- Negligible alterations of natural properties, functions or processes of – short term duration and localized, or – short term duration and medium spatial extent, or – medium term duration and localized.
- Notable alterations of natural properties, functions or processes, which are of short-term duration and localized.

Table 6-2: Methodology for rating impact significance

Impact Rating	Definition	Significance	Colour Code
Magnitude	Severe	Severe alteration of natural properties, functions, processes	High
	Medium	Notable alteration of natural properties, functions, processes	Medium
	Negligible	Negligible alteration of natural properties, functions, processes	Low
Duration	Long term	Continuously or regularly (once per day) over project life, permanent or irreversible effects (including aftermath effects)	High
	Medium term	Several years (< 5) of duration, (including aftermath effects) reversible, periodic events (several times per year)	Medium
	Short term	Less than one year or restricted to construction stage, reversible	Low
Spatial Extent	Large Extent	Effects beyond project site and nearby areas beyond 1,000 m distance of origin	High
	Medium Extent	Within the project site and nearby areas within 1,000 m distance of origin	Medium

	Local	Within the area of the project site within 100 m distance of origin	Low
Probability of occurrence	Definite	Highly probable (> 80%) or will definitely occur	High
	Possible	Fair chance of occurrence	Medium
	Un likely	Little or no chance of occurring (< 20%)	Low

6.4 Positive impacts/expected project benefits

The proposed project will have the following benefits;

- The project will generate employment opportunities during cage installation and operation. The project will employ both skilled and unskilled workers. Majority of the local people will be employed as casual laborers, semi-skilled workers and a few will be eligible for skilled jobs.
- Contribution to government revenue: The proposed project will be a potential source of revenue for Katabi Town Council and Wakiso District as a whole through payment of various taxes and license fees. Through the revenues generated, the government will be capable of financing its obligations to the citizens.
- Source of protein rich food: For the ever-increasing population of Uganda, the proposed project will provide a source of food. A healthy diet, high in protein is necessary to ensure that the growing population does not succumb to sickness and disease. Fish and aquatic species in general are a much healthier source of protein compared to livestock commonly consumed. Some studies also suggest that eating fish regularly reduces the risk of heart disease through reducing the probability of clot formation, lowering blood pressure and increasing the good cholesterol levels in the blood stream.
- Reducing pressure on the Natural water bodies: With increase in population, there has been an increase in the demand for fish, leading to over fishing in the Natural water bodies. This threatens the fish species with a possibility of extinction. Once implemented, the proposed project will provide more fish on market to meet the demand thus reducing the pressure on the Natural water bodies.
- Provision of market for the farm inputs: The proposed project will provide market for the various farm inputs like fingerlings, feeds, screens and nets that will be used at the farm.
- Skills transfer to locals: The unskilled and the semi-skilled personnel who will get opportunity to work with the project will acquire skills, knowledge & experience. The unskilled are likely to be upgraded to semi-skilled while the semi-skilled will be exposed to better techniques and work methodologies. By employing as many local people as possible, there will be skills transfer thus building human capacity in the area.
- Creation of business opportunities: The local communities will benefit indirectly from the increased spending of the work force at the farm both during construction and operation. They will gain directly through the sale of items like food and basic consumer goods. The increase in demand of products will lead to increased supply and creation of market for products thereby improving the incomes and general welfare of the local communities and their families.

6.5 Negative Impacts during the construction and cage installation phase

Given that the proposed farm site is located adjacent to the company's existing fish processing plant, the workers employed during the construction phase will use the existing facilities such as the stores, offices and sanitary facilities. There will therefore be no impacts associated with human waste disposal during this phase. The specific impacts anticipated during this phase include the following;

6.5.1 Loss of vegetation cover

The existing vegetation on part of the site will be cleared to prepare for the excavation of the proposed fish brooding and nursery ponds, and construction of the project buildings. Clearing of this vegetation will lead to permanent loss of green cover. Most of this vegetation is mainly swampy vegetation that has been acting as storm water filtration and the catchment for the site area.

Proposed mitigation measures

- Only the specific area required for the ponds and construction will be excavated so as to minimize on the loss of vegetation cover.
- Re-vegetation will be done around the ponds after construction to compensate for the lost vegetation.

Overall assessment with mitigation: Low

6.5.2 Excavated soil erosion impacts

The proposed site is in the low-lying area and at the receiving point for most of the storm water from the area. Earth excavation and moving activities conducted during construction of the proposed ponds may result in soil erosion and the subsequent sedimentation of nearby water resources. Excavation and construction activities can lead to sedimentation and water quality degradation. Sedimentation of water resources may contribute to eutrophication and overall degradation of water quality.

Proposed mitigation measures

- Pond excavation works will be carried out during the dry season to reduce sediment runoff.
- The ponds and levees will be constructed with at least 2:1 slope as this adds stability to the pond banks and reduces erosion.
- The pond embankments will be stabilized to prevent erosion.

Overall assessment with mitigation: Low

6.5.3 Solid waste disposal impacts

Considerable volumes of solid waste will be generated during the construction phase, which will include excavated soil, plastic drums, nets and HD – pipes as well as offcuts from cage installation activities, waste from building construction activities, and domestic waste from human activity. Indiscriminate disposal of this waste will lead to littering of the area, clogging of drainage systems, sedimentation of the nearby lake, and can become a public health nuisance. This is a long-term impact but reversible with appropriate management measures.

Proposed mitigation measures

- The excavated soil will be used for embankment of the ponds as proposed by the developer.

- The solid waste will be collected in well covering waste collection containers for disposal by a NEMA registered waste collection company to an approved dumpsite.
- There will be sorting of waste at the site. Recyclable plastic materials will be sold to recycling plants in the area while reusable materials shall be reused at the farm or sold to interested people.
- Workers shall be regularly sensitized on good housekeeping and waste management practices.

Overall assessment with mitigation: Low

6.5.4 Construction safety and health impacts

As with any construction site, there is potential for impacts on human health and safety to occur as a result of accidents and unplanned events that may occur during the construction process and excavation works. Safety and health issues include accidents/cuts from machinery, falls from working at heights, accidents from falling debris, effects on eyes from welding activities, and burns among others. Fish cage installations require workers to handle heavy equipment and work on or near the water. Occupational hazards such as slips, trips, falls, and drowning can occur if safety measures are not in place. While some accidents could be minor and not life threatening, others can be grave leading to permanent disability or loss of life of construction workers.

Proposed mitigation measures

- All workers involved in the construction works should be provided with adequate Personal Protective Equipment (PPE) fit for the task they are involved in. The PPE shall be inspected regularly and maintained or replaced as necessary. It should be made mandatory for all workers to use PPE while on duty.
- Only trained personnel and skilled labourers shall be employed during construction.
- There shall be a safety awareness and compliance training by a certified safety person to all on-site personnel before commencement of construction works. Workers will be trained in safety procedures including accident prevention, safe lifting practices, proper control and maintenance of equipment and facilities. Continuous safety training will be carried out in form of daily toolbox meetings throughout the construction period.
- A fully equipped first aid kit will be available on site for use on minor accidents and to administer first aid in case of serious accidents before the victims are transferred for extensive medical attention. This should be accessible to the workers at all times as part of the occupational health and safety requirements.
- Project supervising engineers (of the developer) should inspect the contractor's compliance with safety precautions during construction.

Overall impact significance with mitigation: Low

6.5.5 Human waste disposal Impacts

The construction process is expected to employ a significant number of people daily. Lack of or inadequate provision of sanitary facilities for use by construction workers can lead to ad hoc defecation in secluded areas or structures on the site, thus creating unsanitary conditions and sources of fly infestation, which can lead to disease outbreak. This can threaten the health of workers and site immediate neighbours.

Proposed mitigation measures

- The contractor will provide chemical mobile toilets to be used during the construction process. Sanitary facilities will be the first structures to be constructed onsite for use for the rest of the construction process.
- These facilities will be properly maintained throughout the period of use to ensure good hygienic conditions.

Overall impact significance with mitigation: Low

6.5.6 Habitat Alteration

Installation and placement of the proposed cages may result in some localised disturbance of the lake, including the movement and suspension of sediment and substrate materials within the water column, affecting local aquatic species. Cages may physically disrupt the lake bottom and its associated vegetation, impacting the biodiversity of the area.

Proposed mitigation measures

- Select cage sites carefully, considering the local environment and potential impacts.
- Use mooring systems that minimize lakebed disturbance.
- Monitor and assess the lakebed regularly to ensure minimal damage.

Overall assessment with mitigation: Low

6.5.7 Onsite construction material storage impacts

The improper siting of stockpiles and storage of sand, gravel, cement, etc., at the construction site could lead to fine materials being washed away during heavy rainfall events. This would not only represent a waste of materials but would also contribute to turbidity and sedimentation with consequent negative impacts on the area drainage system and possible flooding. Eroded materials may also lead to siltation of the lake. Hazardous and flammable materials (e.g. paints, thinner, solvents, etc.) improperly stored and handled on the site are potential health hazards for construction workers and spilled chemicals would have the potential to contaminate soil and inhibit plant growth in localized areas.

Proposed mitigation measures

- The stockpiling of construction materials shall be properly controlled and managed; Fine grained materials (sand, etc.) shall be stockpiled away from any surface drainage features and lake shoreline.
- Low berms shall be placed around the piles and/or tarpaulin used to cover open piles of stored materials to prevent them from being washed away during rainfall.
- Safe storage areas shall be identified and retaining structures put in place prior to the arrival and placement of material.
- Hazardous chemicals (e.g. paints and fuels) shall be properly stored in appropriate containers and these shall be safely locked away. Conspicuous warning signs (e.g. 'No Smoking') shall also be posted around hazardous waste storage and handling facilities.

Overall impact significance with mitigation: Low

6.6 Negative impacts during the operation phase

6.6.1 Water Quality Degradation

The proposed cages will be placed in the lake. Water quality is likely to be affected by the increase in nutrient levels from excess/uneaten feed and fish waste, which leads to oxygen depletion and contribute to harmful algal blooms, which harm aquatic ecosystems. Operation of the fish ponds is also likely to cause pollution of the nearby Lake Water resources as well as ground water through effluent from the ponds. Water pollution may also result from poorly managed solid and sanitary waste which might flow in the lake, storm water from land activities and chemicals oozing off the materials to be used in cage construction in case poor quality/un suitable materials are used.

Proposed mitigation measures

- Effluent from the ponds will be well treated using a sedimentation pond downstream of the fish ponds before releasing it to the environment. There will be regular monitoring of the effluent to ensure that it meets the effluent discharge standards.
- Properly size and place cages to ensure water circulation.
- Use high-quality feed. Use of good quality feeds has the advantage of easy digestion, faster growth, water quality protection, zero water pollution, optimized labour usage and zero wastage of raw materials. Extruded feed is safer, because fed ingredients are pasteurized or sterilized during feed extrusion operation, thus reducing the effects of feed on the health of aquatic animals and water quality. Good quality feed should float long enough to reduce waste as the feed is usually broadcast on the surface of the water and is consumed by the fish as it settles through the water column.
- Implement proper feed management practices to reduce overfeeding.
- Undertake regular water quality monitoring and adjust feed rates accordingly.
- Implement water exchange systems to maintain oxygen levels.

Overall impact significance with mitigation: Low

6.6.2 Solid waste management and disposal impacts

The proposed project operation activities will generate an appreciable amount of solid waste. These will include waste feed, old/used nets, and domestic waste from human activity. Fish cages will also produce waste in the form of uneaten feeds, feaces, etc. Indiscriminate disposal of this waste will lead to littering of the area, clogging of drainage systems, sedimentation of the lake, and can become a public health nuisance. Buildup of this waste in the lake can deplete the water of oxygen, creating algal blooms and dead zones.

Proposed mitigation measures

- Provide waste collection bins and contract a registered and licensed waste collection company for collection from the farm to approved dumpsites.
- Ensure a relatively lower stocking rate;
- Procure quality feeds and practice good feeding practices
- Ensure periodic fallowing of cage sites

Overall impact significance with mitigation: Low

6.6.3 Occupational safety and health impacts

Occupational safety and health impacts during the operation of the project will include exposure water-borne diseases due to frequent contact with water, possible drowning into the lake especially during maintenance activities, and exposure to chemicals that may be used to treat and /or control disease organisms or to facilitate production. Worker's protection from such risks during operation is therefore paramount.

Proposed mitigation measures

- Provide appropriate protective equipment to all workers at the farm. This should include water proof overalls, life jackets, safety shoes, helmets, gloves and any other as may be required. The PPE shall be inspected regularly and maintained or replaced as necessary. It should be made mandatory for all workers to use PPE while on duty.
- All workers at the farm should undergo training in safe working practices to avoid accidents. The training of the workers should be continuous throughout the operation life of the farm. Workers will be regularly trained on the use of the PPE, administering first aid, and on the safety measures and procedures so as to limit the risk of accidents due to ignorance.
- Provide an adequate number of well-equipped First Aid kits to be kept at the farm to be used in minor accidents and to administer first aid in case of serious accidents before the victims are transferred for extensive medical attention.
- The developer should draft an overall Occupational Safety and Health policy for the farm and the workers sensitized on following its procedures throughout the operation of the project. This will be well displayed in all working areas, and its requirements discussed during training of workers.
- Develop and communicate site safe work practices and emergency procedures/protocols to all workers, and display appropriate warning signage in highly visible places around the premises.
- The company should employ an Occupation Safety and Health officer as a permanent employee, who will be in charge of the operation of the project and ensure the safety of the workforce.

Overall assessment with mitigation: Low

6.6.4 Disease Spread from the farm

High-density fish farming in cages can promote the spread of diseases, which may require the use of antibiotics or other treatments. A poorly managed fish farm can be a haven for disease causing organisms such as fish lice, mosquitoes and tsetse flies. Mosquitoes cause malaria to the farm workers and surrounding communities. While the lice are detrimental to the health and quality of the fish, they also cause other diseases that will have an impact on the workers and the local population around the farm.

Proposed mitigation measures

- Practice good biosecurity measures, such as disinfection of equipment and regular health checks for fish.
- Implement proper stocking densities to reduce stress and disease transmission.
- Develop and use disease-resistant fish strains when possible.

Overall assessment with mitigation: Low

6.6.5 Impacts of escaped fish species

Caged and pond fish frequently escape through netting or mesh damaged by predators, floating objects, or rough weather. Once they mix in the natural surroundings, escaped farmed fish can have impacts on wild stocks through competition, interbreeding as well as spreading parasites and causing genetic pollution via interbreeding and hybridization. Escapees also have the capacity to spread infectious diseases to wild populations or, the exotic species may be able to out-compete native species for food sources, placing an unfavorable amount of stress on the native species.

Proposed mitigation measures

- The ponds inlet and outlet pipes should be fitted with screens preferably wire mesh to prevent escape of the fish to the surrounding.
- Use escape-proof cage designs. Prior to installation, the nets will be inspected to avoid possible escapes from the cages.
- Install double netted cages with strong and appropriate nets, including a predator net. Nets will be appropriately sized to retain the stocked fish.
- The nets should be installed in such a way that they extend above the water line to prevent overtopping by storm surges or waves.
- Train workers on protocols for transferring; changing nets or harvesting fish from the cages e.g. use of fish boxes.
- Place trapping devices in between cages to sample for escapees and take a record of findings and actions taken. The minimum distance between the bottom of the cage and the bottom of the receiving waters where the cage is placed will be 6.0 m.
- Regularly inspect and maintain cages to prevent damage.
- Develop and implement contingency plans for escapes, including rapid response and recapture strategies.

Overall assessment with mitigation: Low

6.6.6 Predation impacts

Cages attract a wide range of fish-eating vertebrates. The range of species expected to cause problems at cage farm includes fish, reptiles, birds and mammals. Many of these species move into an area where a fish farm has been established, attracted by the large numbers of readily detected fish and also by the bags of commercial feed if left unprotected. Abundance of such wild life in the project area

Proposed mitigation measures

- Double netting with anti-predator nets will reduce the impact of predators on fish cages.
- The cage top will be covered to avert bird attacks.

Overall assessment with mitigation: Low

6.6.7 Site security impacts

The proposed farm will have valuable equipment, materials and fish. The most common security threats to the farm will include violence, theft, vandalism, and trespassing. This could lead to loss of property and lives.

Proposed mitigation measures

- Access to the farm will be restricted through a gate at the existing land infrastructure.
- A security lighting system will be installed around the premises to enhance visibility.
- A competent, registered security company will be engaged to ensure the general safety and security at all times within and around the premises. The company will provide guards at the site during the day and night.
- Employment of the local people will also enhance project reception in the community and reduce chances of thieves from among the local residents.
- The developer will work closely with the local authorities and the nearest police to enhance security at the premises.

Overall assessment with mitigation: Low

6.6.8 Chemical use impacts

The use of chemicals, such as antibiotics and antifoulants, can have negative effects on water quality and non-target organisms.

Proposed mitigation measures

- Implement responsible and judicious use of chemicals.
- Use alternative methods for managing fouling and disease (e.g., integrated pest management).
- Follow regulations and best practices for chemical use.

Overall assessment with mitigation: Low

6.6.9 Social disharmony due to population influx

The proposed farm is anticipated to employ a significant number of people during its operation. While most workers may originate from the local community where they have families, there might be others from distant places and working at the farm. With some disposable income to spend, this might induce illicit sexual relationships. Irresponsible sexual relationships in project communities can break families and heighten risk of contracting HIV/AIDS and other sexually transmitted diseases. The influx of people may also come with ill behaviour like theft, alcoholism and drug abuse among others. Other social concerns will include child labour.

Proposed mitigation measures

- The proposed project will create a number of jobs. Priority for employment should be given to the local residents who may work at the farm and go back to their homes thus reducing the influx of project labour. Employment of local residents also increases chances of project reception and easy conflict resolution.
- The developer will take the initiative to register the new employees with the LC leaders as and when they begin working on the project.
- The developer will develop and implement a Grievance Redress Mechanism to deal with any complaints from residents, community members and any other stakeholders during the project operation. Logs of grievances received from the public will be recorded. A grievance form may include the name, contact, description and date of grievance, action identified to resolve grievance and responsible party among others.

- The developer should work closely with the local authorities and the nearby police in maintaining law and order at the premises.
- The developer will ensure strictly no employment of children below 18 years at the farm.
- As an obligation, the developer shall be required to have a workplace HIV/AIDS policy and a framework (responsible staff, action plan, etc.) to implement during project execution.

Overall assessment with mitigation: Low

6.6.10 Erosion and pond flooding impacts

Failure and blockages in the pond piping system may lead to over filling of the ponds and possible flooding. Too much rain may also lead to over filling of the ponds. Flooding can lead to escape of fish and destruction of downstream property and vegetation. Floods can also lead to erosion of the pond banks, which may lead to depositions of soil in the nearby lake.

Proposed mitigation measures

- Storm water channels will be dug around the fish ponds and properly maintained to effectively drain the ponds area.
- Proper slopes and compaction will be used to minimize erosion potential on pond embankments.
- Discharge structures and canals will be designed to prevent erosion by impact of water or scouring by excessive water velocity.
- Vegetative cover will be planted on embankments to prevent erosion.

Overall assessment with mitigation: Low

6.6.11 Community safety impacts

Community safety impacts anticipated from the proposed project include possible drowning by unsuspecting children and local people who may want to swim in the ponds. This will lead to loss of lives. There is also a likelihood that predators especially birds and snakes may congregate in the farm area, seeing the fish stock as a possible food source. Local crop production in the surrounding area may not be able to withstand the increase in bird density.

Proposed mitigation measures

- Ponds will be fenced with wire mesh to restrict accessibility by the local people.
- The farm area especially around the ponds will be cleared of bushes and trees that provide shelter for birds. The grass level shall be maintained through regular slashing.

Overall assessment with mitigation: Low

6.6.12 Drainage and storm water management impacts

Construction of the proposed project structures will create impervious surfaces on the site as roofed project houses and paved parking lots will be set up. Impervious areas and compacted soils generally have higher runoff coefficients than natural area, and increased floods are a common consequence. This will inevitably increase runoff at the site. Poor runoff management can lead to flooding.

Proposed mitigation measures

- The project design will limit paving of surfaces by planting grass and landscaping the un-built areas on site. The planted area will not only improve the site aesthetics but will also allow infiltration of water thereby reducing the volume of runoff from the premises.
- A comprehensive surface drainage system; which includes an adequate number and sizes of drainage channels will be constructed at the premises to facilitate storm water flow from the paved surfaces. The drainage system will be aligned to follow the natural drainage system of the area.
- Roof water shall be collected through pipes into the surface drainage system.
- The drainage channels will be provided with grates to avoid blockage by solid materials.
- The drainage channels will be regularly de-silted and properly maintained for effective functionality throughout the life of the project.

Overall impact significance with mitigation: Low

6.6.13 Housekeeping and sanitation impacts

The proposed farm will host a significant number of people during its operation. Housekeeping, hygiene and sanitation are paramount to a healthy working environment. Lack of or inadequate provision of sanitary facilities for use by these people can lead to ad hoc defecation in secluded areas or structures on the site, thus creating unsanitary conditions and sources of fly infestation. Poor sanitation can lead to disease outbreak which will affect the workers and neighbours. Poor housekeeping may also lead to littering at the farm, cause accidents from tripping on litter, and may lead to pollution of the nearby areas.

Proposed mitigation measures

- The project design incorporates sanitary facilities with toilets, showers and changing rooms with smooth, water-proof, washable walls and floors that will be used by the workers and any other persons at the farm. They will have provisions for separate use by Males and females and provisions for hand washing. These facilities will be connected to a well-built septic tank and soak pit for effective sewage management.
- The company will employ staff responsible exclusively for cleaning of sanitary facilities daily.
- Cleanliness and good hygiene will be maintained to avoid litter around the farm. This will be achieved by employing staff dedicated to daily cleaning of the premises and all working areas. All waste should be collected in designated areas and disposed of properly to avoid clutter around the farm.

Overall impact significance with mitigation: Low

6.6.14 Traffic management impacts

During operation of the proposed farm, there will be an increase in traffic volume along the farm access roads from the workers' personal cars, trucks delivering feeds to the farm and fish from the farm. This will result into risk of traffic-related accidents on residents or injuries to workers and accidents to other road users. Moving vehicles within the farm can also cause accidents if not properly managed. Traffic-related accidents can cause injuries to workers and death.

Proposed mitigation measures

- The project design and site layout provide for adequate and well demarcated driveways for traffic flow and vehicle parking areas to avoid parking outside the boundary wall. This will eliminate congestion of vehicles along the road.
- Pedestrian walkways around the farm will be well marked and with designated crossing points to minimise the interface of vehicles and pedestrians. Toolbox safety talks shall also be conducted for all drivers.
- There will be training and inductions for workers and visitors on pedestrian areas and traffic flows as part of farm entry safety training.
- Speed management measures including humps and speed limit signage will be installed around the farm. The speed limit close to and within the farm shall not exceed 10KPH and the developer will ensure that truck drivers respect speed limits. Temporary barriers shall be used when trucks are loading and unloading.
- The entrance and exit points of the proposed farm will be wide enough and clearly marked as one-way systems to allow for free vehicle navigation without causing traffic disruption along the roads.
- There will be adequate lighting within the farm to enhance visibility.
- Safe vehicles shall be used at the farm: Vehicles in good mechanical condition, vehicles fitted with protective structure to avoid falling objects, and vehicles will not exceed loading capacity.
- The developer will use qualified (trained and competent) drivers and will conduct refresher trainings and provide safety guidelines for project drivers to follow. All project drivers will work under strict company policies of professionalism.
- There will be regular medical checks for all drivers to ensure that the drivers are fit for work. Such tests will also include drug and alcohol tests.

Overall impact significance with mitigation: Low

6.7 Summary of potential impacts

To systematically evaluate the impacts associated with the proposed project, an impact matrix table below has been constructed as per the identified categories. It contains a summary of the biophysical and socio-economic impacts associated with the construction and operation phases of the proposed project.

Table 6-3: Summary of impact analysis (Impact Matrix table)

Project Phase	Impact	Significance	
		Without Mitigation/enhancement	With Mitigation/enhancement
Construction Phase		Positive impacts	
	Creation of employment opportunities	Medium	High
	Provision of market for construction materials	Medium	High
Negative impacts			
	Loss of vegetation cover	High	Low
	Excavated soil erosion impacts	High	Low
	Occupational safety and Health impacts	High	Low
	Solid waste disposal impacts	High	Low
	Onsite construction material storage impacts	High	Low
	Human waste disposal Impacts	High	Low
	Habitat Alteration	Medium	Low
Operation phase		Positive impacts	
	Provision of employment opportunities	Medium	High
	Provision of market for farm inputs	Medium	High
	Contribution to government revenue through taxes and permits.	Medium	High
	Source of protein rich food	Medium	High
	Reducing pressure on the Natural water bodies	Medium	High
	Improvement in area security	Medium	High
	Skills transfer to locals	Medium	High
Negative Impacts			
	Water Quality Degradation	High	Low
	Solid waste management and disposal impacts	High	Low
	Occupational safety and health impacts	High	Low
	Disease Spread from the farm	High	Low
	Impacts of escaped fish species	High	Low
	Predation impacts	High	Low
	Chemical use impacts	High	Low
	Site security impacts	High	Low
	Social disharmony due to population influx	High	Low
	Erosion and pond flooding impacts	High	Low
	Housekeeping and sanitation impacts	High	Low
	Drainage and storm water management impacts	High	Low
	Traffic management impacts	High	Low
	Community safety impacts	High	Low

7 Analysis of Alternatives

7.1 Project Need

According to the Food and Agriculture Organization (FAO) of the United Nations (FAO, 2020) aquaculture is among the fastest growing food sectors in the world, accounting for nearly 50% of the world's total fish production. The global demand for seafood is steadily increasing. Human population growth, rising per capita incomes, and urbanization are fueling a 6.9 - 9.9% increase in demand each year. Currently, traditional capture fisheries can only supply half the global seafood demand. The other half of the global supply already comes from aquaculture. Since many fishing stocks are facing intense depletion – the world's growing demand can only be met by increasing aquaculture production (FAO, 2020). The developer is banking on the prediction that farm-raised fish from the proposed project can contribute and help feed the population with high quality protein.

7.2 Project alternatives

7.2.1 The “No project” alternative

Current capture fisheries in Uganda are not sustainable and have resulted in significant overfishing during the last 20 years. Over-fishing has contributed towards an ongoing decline in per-capital fish consumption and broad undernourishment of large sections of Uganda's population. Fishing communities are becoming increasingly impoverished due to low catches, taking a step backwards in development. In addition, the proposed fish farm will be a source of reasonably priced food (and cheap animal protein), income, pride, and employment to many people in the project area. The no project alternative will therefore deny the community these benefits. This alternative is therefore not favourable due to its negative impact on national development, foreign exchange reserves and national food security.

7.2.2 Alternative project location

With the proposed farming method (cage culture), the proposed site is most suitable. In addition, fish farming is one of the activities allowed within a river bank, lakeshore, wetland or swamp as stated in the second schedule of the National Environment (Wetlands, River Banks and Lake Shores Management) Regulations, 2000; number 7-Fishing using fish gear and weirs, fish farming and other aquaculture. This regulation requires the developer to seek for a permit to use lakes, among other requirements. This report therefore is in conformity with this regulation. The proposed site location on Lake Victoria, is the most suitable available site for cage fish farming in terms of natural conditions; water quality, temperature and proximity to market in the area. For these reasons, no alternative sites were assessed during the study. The proposed site is deemed suitable.

7.2.3 Cage Culture without Tilapia Species

The developer proposed Tilapia fish species. No other options were considered under this study due to the following reasons.

- Tilapia is the fish species of choice as it is the only proven fish species suitable for economical cage culture in Uganda and is already established in the natural conditions of Lake Victoria.
- The law prohibits translocation of species across watersheds, which means that at species level, there is no alternative to the proposed type. Tilapia fish are widespread in the wild within the lake waters.

- The business risks of large-scale production of an un-tested species would stop the development of this project. Using an alternative species on Lake Victoria also has no environmental effect.

7.2.4 Fishpond Culture Option

The alternative to cage culture is to raise fish from ponds. If this option is taken, a big size of land would be required for ponds to produce the planned output. However, the cage culture option will only take up a small area in terms of cage area. Not only is it more costly to set up such an aquaculture operation with grow out fishponds, it also comes with greater negative environmental consequences and costs for operations and decommissioning. Fishpond production is more suitable for small operations; such as fish hatcheries, brooding, nurseries and quarantine services.

In addition, fish growth rates are higher in open water cages than in fishponds and fixed and variable costs are lower. Available literature indicate that pond investment costs are three times higher per kg of output compared to floating cages, which would push up fish prices. Fish ponds also have a lengthier and more costly decommissioning process, with higher environmental risks during decommissioning. Discharge of effluent from ponds is greater than in cages. For an oligotrophic environment like that of Lake Victoria, cage culture benefits wild fish through uneaten feeds and fisheries through increased biomass. It is therefore feasible to choose fish cage culture rather than fishponds for intensive production operations for the proposed project.

7.2.5 The proposed project as described in the EIS (the “action” alternative)

This alternative will see the implementation of the project as proposed by the developer, and as described in this report. Under the proposed project alternative, the developer would be issued with a License (ESIA approval certificate) to establish and operate the proposed cage fish farm at the proposed site. Based on the project need, this study made a comprehensive environmental and social impact assessment of the proposed establishment and future operations of the project. The study has found no significant issues (economic or environmental) to stop the implementation of the project. Mitigation measures for the identified negative impacts of this alternative have been thoroughly discussed in this report.

Commitments associated with this alternative would ensure that potential impacts are avoided or reduced to levels of insignificance. In addition, the “Action alternative” contributes towards a national goal to expand the opportunities for development, provide for a diversified economy, and a foreign exchange earner. Significant forward and backward linkages associated with the local sourcing of farm inputs and employment opportunities during operation would also be created. The recommended alternative is the “Action” alternative because it recognizes the viability and need for the proposed project, is designed to address environmental issues and concerns and meets local regulatory requirements.

8 Environmental and Social Management and Monitoring Plan

8.1 Introduction

This section presents the Environmental and Social Management and Monitoring Plan (ESMMP). Whereas efforts are usually made to develop mitigation measures for a proposed project, it is during the implementation lifespan of the project that actual impacts are noted or experienced. It is therefore important to integrate in the Environmental and Social Impact Assessment process, an environment management plan that includes the monitoring of the progress of mitigation measures being implemented while also monitoring the project for any new negative impacts that were not earlier considered or anticipated.

8.2 Environmental and Social Management Plan (ESMP)

The assessment process has identified a number of impacts that are likely to arise from the implementation of the project as evaluated in section 7. Where adverse impacts have been identified, the ESIA has examined the extent to which these impacts would be mitigated through the adoption of industry standard best practice and guidelines, and following legislative requirements. The Environmental and Social Management Plan (ESMP) describes both generic good practice measures and site-specific measures, the implementation of which is aimed at mitigating potential impacts associated with the proposed project activities.

The Environmental and Social Management Plan is prepared to facilitate environmental management of the project; in general, and implementation of the mitigation measures in particular. For each stage of the project, the ESMP lists all the requirements to ensure effective mitigation of every potential bio-physical and socio-economic impact identified in the ESIA. For each impact or operation which could otherwise give rise to impact, the following information is presented;

- A comprehensive listing of the mitigation measures (action) that the developer shall implement,
- The parameters that shall be monitored to ensure effective implementation of the action,
- The timeframe for implementation of the action to ensure that the objectives of the mitigation are fully met, and
- The responsible person/party to implement the measures.

The Plan is presented in table 8.1 below.

Table 8-1: The Environmental Management plan (Impact - Mitigation- Responsibility Matrix)

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
Impacts during the construction and cage installation phase				
Loss of vegetation cover	<ul style="list-style-type: none"> ✓ Only the specific area required for the pond and construction will be excavated so as to minimize on the loss of vegetation cover. ✓ Re-vegetation will be done around the ponds after construction to compensate for the lost vegetation. 	<ul style="list-style-type: none"> ✓ Excavated areas ✓ Re-vegetated areas after construction 	Once during excavation and re-vegetation after construction	<ul style="list-style-type: none"> ✓ Site engineer
Excavated soil erosion impacts	<ul style="list-style-type: none"> ✓ Pond excavation works will be carried out during the dry season to reduce sediment runoff. ✓ The ponds and levees will be constructed with at least 2:1 slope as this adds stability to the pond banks and reduces erosion. ✓ The pond embankments will be stabilized to prevent erosion. 	<ul style="list-style-type: none"> ✓ Loose soil on site ✓ Erosion gullies on site 	Throughout the construction period	Contractor
Solid wastes disposal impacts	<ul style="list-style-type: none"> ✓ The excavated soil will be used for embankment of the ponds as proposed by the developer. ✓ The solid waste will be collected in well covering waste collection containers for disposal by a NEMA registered waste collection company to an approved dumpsite. ✓ There will be sorting of waste at the site. Recyclable plastic materials will be sold to recycling plants in the area while reusable materials shall be reused at the farm or sold to interested people. ✓ Workers shall be regularly sensitized on good housekeeping and waste management practices. 	<ul style="list-style-type: none"> ✓ Litter around the farm. ✓ Foul odour from decomposing waste. ✓ Presence of Waste collection bins onsite. ✓ Contracts with and waste delivery notes by registered waste management companies. 	Daily and weekly inspections throughout operation of the project.	<ul style="list-style-type: none"> ✓ Developer ✓ Workers
Safety and health impacts	✓ All workers involved in the construction works should be provided with adequate Personal Protective Equipment (PPE) fit for the task they are involved in. The PPE shall be inspected regularly and maintained or	✓ Reports of injuries on site	Throughout the construction phase	<ul style="list-style-type: none"> ✓ Contractor ✓ Construction workers

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
	<p>replaced as necessary. It should be made mandatory for all workers to use PPE while on duty.</p> <ul style="list-style-type: none"> ✓ Only trained personnel and skilled labourers shall be employed during construction. ✓ There shall be a safety awareness and compliance training by a certified safety person to all on-site personnel before commencement of construction works. Workers will be trained in safety procedures including accident prevention, safe lifting practices, proper control and maintenance of equipment and facilities. Continuous safety training will be carried out in form of daily toolbox meetings throughout the construction period. ✓ A fully equipped first aid kit will be available on site for use on minor accidents and to administer first aid in case of serious accidents before the victims are transferred for extensive medical attention. This should be accessible to the workers at all times as part of the occupational health and safety requirements. ✓ Project supervising engineers (of the developer) should inspect the contractor's compliance with safety precautions during construction. 	✓ Availability of personal protective equipment		✓
Habitat Alteration	<ul style="list-style-type: none"> ✓ Select cage sites carefully, considering the local environment and potential impacts. ✓ Use mooring systems that minimize lakebed disturbance. ✓ Monitor and assess the lakebed regularly to ensure minimal damage. 	✓ Changes in lake water quality	Throughout the construction phase	<ul style="list-style-type: none"> ✓ Contractor ✓ Construction workers
Human waste disposal Impacts	✓ The contractor will provide chemical mobile toilets to be used during the construction process. Sanitary facilities will be the first structures to be constructed onsite for use for the rest of the construction process.	✓		✓

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
	✓ These facilities will be properly maintained throughout the period of use to ensure good hygienic conditions.			
Onsite construction material storage impacts	<ul style="list-style-type: none"> ✓ The stockpiling of construction materials shall be properly controlled and managed; Fine grained materials (sand, etc.) shall be stockpiled away from any surface drainage features and lake shoreline. ✓ Low berms shall be placed around the piles and/or tarpaulin used to cover open piles of stored materials to prevent them from being washed away during rainfall. ✓ Safe storage areas shall be identified and retaining structures put in place prior to the arrival and placement of material. ✓ Hazardous chemicals (e.g. paints and fuels) shall be properly stored in appropriate containers and these shall be safely locked away. Conspicuous warning signs (e.g. 'No Smoking') shall also be posted around hazardous waste storage and handling facilities. 	✓ Drainage system blockage by washed away materials	Throughout the construction phase	✓ Contractor
Impacts in the operation phase				
Water quality degradation	<ul style="list-style-type: none"> ✓ Effluent from the ponds will be well treated using a sedimentation pond downstream of the fish ponds before releasing it to the environment. There will be regular monitoring of the effluent to ensure that it meets the effluent discharge standards. ✓ Properly size and place cages to ensure water circulation. ✓ Use high-quality feed. Use of good quality feeds has the advantage of easy digestion, faster growth, water quality protection, zero water pollution, optimized labour usage and zero wastage of raw materials. Extruded feed is safer, because feed ingredients are pasteurized or sterilized during feed extrusion operation, thus reducing the effects of feed on the health of aquatic animals and water quality. Good quality feed 	<ul style="list-style-type: none"> ✓ Algae growth in the surface water around the farm. ✓ Complaints from other lake users 	Throughout the project life	Developer

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
	<p>should float long enough to reduce waste as the feed is usually broadcast on the surface of the water and is consumed by the fish as it settles through the water column.</p> <ul style="list-style-type: none"> ✓ Implement proper feed management practices to reduce overfeeding. ✓ Undertake regular water quality monitoring and adjust feed rates accordingly. ✓ Implement water exchange systems to maintain oxygen levels. 			
Solid waste management and disposal impacts	<ul style="list-style-type: none"> ✓ Provide waste collection bins and contract a registered and licensed waste collection company for collection from the farm to approved dumpsites. ✓ Ensuring a relatively lower stocking rate. ✓ Procuring quality feeds and good feeding practices and ✓ Ensure periodic fallowing of cage sites 	<ul style="list-style-type: none"> ✓ Foul odour around the farm 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer
Impacts of escaped fish species	<ul style="list-style-type: none"> ✓ The ponds inlet and outlet pipes should be fitted with screens preferably wire mesh to prevent escape of the fish to the surrounding. ✓ Use escape-proof cage designs. Prior to installation, the nets will be inspected to avoid possible escapes from the cages. ✓ Install double netted cages with strong and appropriate nets, including a predator net. Nets will be appropriately sized to retain the stocked fish. ✓ The nets should be installed in such a way that they extend above the water line to prevent overtopping by storm surges or waves. ✓ Train workers on protocols for transferring; changing nets or harvesting fish from the cages e.g. use of fish boxes. ✓ Place trapping devices in between cages to sample for escapees and take a record of findings and actions taken. The minimum distance 	<ul style="list-style-type: none"> ✓ Record of reduced fish in the cages. 	Implementation during cage installation and monitoring during operation	<ul style="list-style-type: none"> ✓ Employees at the farm ✓ Developer

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
	<p>between the bottom of the cage and the bottom of the receiving waters where the cage is placed will be 6.0 m.</p> <ul style="list-style-type: none"> ✓ Regularly inspect and maintain cages to prevent damage. ✓ Develop and implement contingency plans for escapes, including rapid response and recapture strategies. 			
Occupational health and safety impacts	<ul style="list-style-type: none"> ✓ Provide appropriate protective equipment to all workers. This should include water proof overalls, life jackets, safety shoes, helmets, gloves and any other as may be required. ✓ Train the farm workers in safety precautions, use of PPE, and administering first aid, and ensure regular monitoring to ensure that they observe safety at every time of operation. ✓ Draft an occupational health and safety policy for the project and sensitize the workers on following its procedures. ✓ Procure and keep onsite, a well-equipped first aid kit. ✓ Employ an Occupation Safety and Health officer as a permanent employee, who will be in charge of the operation of the project and ensure the safety of the workforce. 	<ul style="list-style-type: none"> ✓ Record of accidents ✓ Presence of first Aid kits ✓ Record of training of staff. ✓ Records of drowning of workers 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer
Disease Spread from the farm	<ul style="list-style-type: none"> ✓ Practice good biosecurity measures, such as disinfection of equipment and regular health checks for fish. ✓ Implement proper stocking densities to reduce stress and disease transmission. ✓ Develop and use disease-resistant fish strains when possible. 	<ul style="list-style-type: none"> ✓ Records of diseases 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer ✓ workers
Predation impacts	<ul style="list-style-type: none"> ✓ Double netting with anti-predator nets will reduce the impact of predators on fish cages. ✓ The cage top will be covered to avert bird attacks. 	<ul style="list-style-type: none"> ✓ Increase in the number of predators around the farm area 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer ✓ workers

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
Site security impacts	<ul style="list-style-type: none"> ✓ Access to the farm will be restricted through a gate at the existing land infrastructure. ✓ A security lighting system will be installed around the premises to enhance visibility. ✓ A competent, registered security company will be engaged to ensure the general safety and security at all times within and around the premises. The company will provide guards at the site during the day and night. ✓ Employment of the local people will also enhance project reception in the community and reduce chances of thieves from among the local residents. ✓ The developer will work closely with the local authorities and the nearest police to enhance security at the premises. 	<ul style="list-style-type: none"> ✓ Incidences of theft at premises ✓ Break-ins 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer ✓ workers
Social disharmony due to population influx	<ul style="list-style-type: none"> ✓ The proposed project will create a number of jobs. Priority for employment should be given to the local residents who may work at the farm and go back to their homes thus reducing the influx of project labour. Employment of local residents also increases chances of project reception and easy conflict resolution. ✓ The developer will take the initiative to register the new employees with the LC leaders as and when they begin working on the project. ✓ The developer will develop and implement a Grievance Redress Mechanism to deal with any complaints from residents, community members and any other stakeholders during the project operation. Logs of grievances received from the public will be recorded. A grievance form may include the name, contact, description and date of grievance, action identified to resolve grievance and responsible party among others. ✓ The developer should work closely with the local authorities and the nearby police in maintaining law and order at the premises. 	<ul style="list-style-type: none"> ✓ Complaints from residents 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer ✓ workers

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
	<ul style="list-style-type: none"> ✓ The developer will ensure strictly no employment of children below 18years at the farm. ✓ As an obligation, the developer shall be required to have a workplace HIV/AIDS policy and a framework (responsible staff, action plan, etc.) to implement during project execution. 			
Chemical impacts	<ul style="list-style-type: none"> ✓ Implement responsible and judicious use of chemicals. ✓ Use alternative methods for managing fouling and disease (e.g., integrated pest management). ✓ Follow regulations and best practices for chemical use. 	<ul style="list-style-type: none"> ✓ Complaints from workers 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer ✓ workers
Erosion and pond flooding impacts	<ul style="list-style-type: none"> ✓ Storm water channels will be dug around the fish ponds and properly maintained to effectively drain the ponds area. ✓ Proper slopes and compaction will be used to minimize erosion potential on embankments. ✓ Discharge structures and canals will be designed to prevent erosion by impact of water or scouring by excessive water velocity. ✓ Vegetative cover will be planted on embankments and above water slopes of the channels to prevent erosion. 	<ul style="list-style-type: none"> ✓ Incidences of floods around the site area 	Once off construction and regular maintenance throughout operation	<ul style="list-style-type: none"> ✓ Developer ✓ Workers
Community safety impacts	<ul style="list-style-type: none"> ✓ Ponds will be fenced with wire mesh to restrict accessibility by the local people. ✓ The farm area especially around the ponds will be cleared of bushes and trees that provide shelter for birds. The grass level shall be maintained through regular slashing. 	<ul style="list-style-type: none"> ✓ Complaints from residents ✓ Incidents of drowning 	Throughout the project life	<ul style="list-style-type: none"> ✓ Developer ✓ workers

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
Drainage and storm water management impacts	<ul style="list-style-type: none"> ✓ The project design incorporates a comprehensive surface drainage system; which includes an adequate number and sizes of drainage channels that will be constructed at the premises to facilitate storm water flow from the paved surfaces. The drainage system will be aligned to follow the natural drainage system of the area. ✓ Roof water shall be collected through pipes into the surface drainage system. ✓ The drainage channels will be provided with grates to avoid blockage by solid materials. ✓ The drainage channels will be regularly de-silted and properly maintained for effective functionality throughout the life of the project. 	<ul style="list-style-type: none"> ✓ Incidences of floods around the site 	Once off construction and regular maintenance throughout operation	Developer
Housekeeping and sanitation impacts	<ul style="list-style-type: none"> ✓ The project design incorporates sanitary facilities with toilets, showers and changing rooms with smooth, water-proof, washable walls and floors that will be used by the workers and any other persons at the farm. They will have provisions for separate use by Males and females and provisions for hand washing. These facilities will be connected to a well-built septic tank and soak pit for effective sewage management. ✓ The company will employ staff responsible exclusively for cleaning of sanitary facilities daily. ✓ Cleanliness and good hygiene will be maintained at the farm to avoid litter around the factory. This will be achieved by employing staff dedicated to daily cleaning of the premises and all working areas. All waste should be collected in designated areas and disposed of properly to avoid clutter around the farm. 	<ul style="list-style-type: none"> ✓ Litter around the farm 	Throughout the operation of the farm	<ul style="list-style-type: none"> ✓ Developer ✓ Workers

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
Traffic management impacts	<ul style="list-style-type: none"> ✓ The project design and site layout provide for adequate and well demarcated driveways for traffic flow and vehicle parking areas to avoid parking outside the boundary wall. This will eliminate congestion of vehicles along the road. ✓ Pedestrian walkways around the farm will be well marked and with designated crossing points to minimise the interface of vehicles and pedestrians. Toolbox safety talks shall also be conducted for all drivers. ✓ There will be training and inductions for workers and visitors on pedestrian areas and traffic flows as part of farm entry safety training. ✓ Speed management measures including humps and speed limit signage will be installed around the farm. The speed limit close to and within the farm shall not exceed 10KPH and the developer will ensure that truck drivers respect speed limits. Temporary barriers shall be used when trucks are loading and unloading. ✓ The entrance and exit points of the proposed farm will be wide enough and clearly marked as one-way systems to allow for free vehicle navigation without causing traffic disruption along the roads. ✓ There will be adequate lighting within the farm to enhance visibility. ✓ Safe vehicles shall be used at the farm: Vehicles in good mechanical condition, vehicles fitted with protective structure to avoid falling objects, and vehicles will not exceed loading capacity. ✓ The developer will use qualified (trained and competent) drivers and will conduct refresher trainings and provide safety guidelines for project drivers to follow. All project drivers will work under strict company policies of professionalism. 	<ul style="list-style-type: none"> ✓ Incidences of accidents ✓ Complaints from road users 	Throughout the operation period	<ul style="list-style-type: none"> ✓ Developer ✓ Drivers

Negative impact	Proposed mitigation measures	Monitoring indicators	Implementation Timeframe	Responsible Party
	<p>✓ There will be regular medical checks for all drivers to ensure that the drivers are fit for work. Such tests will also include drug and alcohol tests.</p>			

8.3 Environmental Monitoring Plan

Environmental monitoring is the continuous assessment of project implementation in relation to agreed schedules. The purpose of Environmental Monitoring Plan is to ensure sustainable aquaculture practices, minimize environmental impacts, and comply with regulatory requirements. Regular monitoring of important and crucial environmental parameters is of immense importance to assess the status of compliance during project operation. With the knowledge of baseline conditions, the monitoring program will serve as an indicator for any deterioration in environmental conditions due to operation of the project, to enable taking up suitable mitigation steps in time to safeguard the environment.

It will be the responsibility of the developer to conduct regular internal monitoring of the project to audit direct implementation of impact mitigation measures contained in the ESMP. The monitoring of many parameters will form part of the routine management of the proposed project from implementation to operations. There should be a specific reporting, response mechanism and auditing. The interpretation of monitoring data and its implication for management should be provided to the company senior management.

8.3.1 Objectives of monitoring

A monitoring program; measures effectiveness of operational procedures, confirms statutory and mandatory compliance, and identifies unexpected changes. Specifically, for the proposed project, the objectives of monitoring will include the following;

- Monitor water quality parameters to detect any changes that could affect fish health and surrounding ecosystems.
- Assess sediment quality to identify potential buildup of harmful substances.
- Evaluate biological indicators to understand the impact of the farm on local biodiversity.
- Ensure compliance with environmental regulations and standards.

8.3.2 External Monitoring Programmes

The ESIA and Audit Regulations require that, in executing a project or development, after an Environmental Impact Statement has been approved, the developer shall take all practical measures to ensure the implementation of the ESMP by-

- Carrying out auditing annually;
- Preparing an environmental audit report after each audit and submitting the report to NEMA annually or as may be prescribed by NEMA; and
- Ensuring that the criteria used for the audit is based on the ESIA process or after the initial audit.

The developer, through a consultant (registered environmental auditors) will therefore provide NEMA with reports on environmental and social compliance of the project during operation as part of their annual environmental auditing reports.

8.3.3 Monitoring Schedule

Monitoring should be monthly, quarterly and annually as follows;

Monthly Monitoring for Water Quality: pH, temperature, dissolved oxygen (DO), ammonia, nitrite, nitrate, and phosphate, and Sediment Quality: Organic matter content, redox potential, and presence of contaminants (e.g., heavy metals).

Quarterly Monitoring for Biological Indicators: Benthic macroinvertebrate surveys, fish health assessments.

Annual Monitoring for Comprehensive Environmental performance Assessment

8.3.4 Monitoring Location

Monitoring shall be conducted at Cage sites: Within and around the fish cages to assess direct impacts, and reference sites at least 500 meters away from the cages to serve as control sites. Field measurements and sample collections will be undertaken at these locations.

8.3.5 Monitoring Methods and parameters

Water Quality: Collect water samples at various depths (surface, mid-water, bottom), and conduct on-site testing for pH, temperature, and Dissolved Oxygen, and chemical analysis (ammonia, nitrite, nitrate, phosphate).

Sediment Quality: Use a sediment grab sampler to collect samples from the lakebed beneath and around the cages, and measure organic matter content, and laboratory for contaminant analysis.

Biological Indicators: Collect sediment samples, sort and identify macroinvertebrates to the lowest taxonomic level.

Fish Health Assessments: Regularly inspect fish for signs of disease, parasites, or abnormal behavior. Record growth rates and mortality data.

8.3.6 Data Management and Reporting

Maintain detailed records of all sampling events, laboratory results, and observations. Prepare quarterly and annual reports summarizing monitoring results, trends, and any observed environmental impacts. Submit reports to relevant regulatory authorities and stakeholders.

8.3.7 Action Plan

Establish threshold levels for key parameters based on regulatory standards and scientific literature, and develop response actions for when threshold levels are exceeded, including increased monitoring frequency, mitigation measures, and stakeholder notifications.

8.3.8 Review and Improvement

Conduct an annual review of the ESMP to evaluate its effectiveness and incorporate new scientific findings and regulatory changes. Engage with environmental experts, regulators, and stakeholders to continuously improve the monitoring plan.

8.4 Monitoring Roles and Responsibilities

In order to enhance the potential for integrating sustainability concerns in the proposed project, it is important to assign clear roles and responsibilities to dominant professionals, contractors and/or sub-contractors so as to ensure that environmental plans are implemented effectively.

8.4.1 The Role of NEMA and Lead Agencies

National Environmental Management Authority (NEMA) is the regulatory authority responsible for coordinating, monitoring and supervision of environmental protection activities in Uganda. The Authority shall, in consultation with other lead agencies, monitor all environmental issues to make an assessment of any possible changes in the environment and their possible impacts; the operation of any industry, project or activity with a view of determining its immediate and long-term effects on the environment. In accordance to this, an environmental inspector appointed by the authority may at any time enter the proposed project

premises for the purpose of monitoring the effects on the environment of the activities carried out on the premises.

Other lead agencies such as NaFIRRI can undertake monitoring of the cages fish farm, investigating the parameters like water column depth profiles, Secchi depth transparency, selected physical- chemical parameters (water temperature, dissolved oxygen, pH, electrical conductivity); nutrients status (Soluble Reactive Phosphorus, Nitrite nitrogen- NO₂-N, Ammonium-nitrogen- NH₄-N and Total suspended solids- TSS); algae, zooplankton, macro-benthos and fish communities.

8.4.2 The Role of the Developer

As the overall implementing entity for the project, the developer will have the ultimate responsibility for ensuring that the impact mitigation measures are delivered. The developer is ultimately accountable for ensuring that everyone:

- (i) knows and truly understands what their roles and responsibilities are;
- (ii) has the authority, resources, time, and opportunity to carry them out;
- (iii) has the required knowledge (education, training, certification) to fulfil these responsibilities; and
- (iv) Is aware of the consequences for not fulfilling their roles and responsibilities.

Main responsibilities with respect to implementation of the Environmental Management Plan are:

- **Senior Company Management** will be accountable for providing overall leadership, the necessary human and financial resources to implement the Environmental Management Plan and related systems, and reviewing and responding to monitoring reports, performance evaluations and internal and external concerns.
- **The project Manager** will be accountable for the implementation of the Plan and supporting systems, ensuring that sufficient resources are made available and properly used in order to achieve the stated objectives and reviewing and integrating environmental, social and OSH reports and ensuring appropriate action is taken.
- **The OSH Officer** will be accountable for implementation of Occupational Safety and Health safeguards, inclusive of related training, investigation of incidents, risk analysis, promotion of safe practices in work areas, ensuring others are fulfilling their OSH responsibilities and reporting on OSH performance of the project.
- **Every employee** will be accountable to work in a manner that is healthy, safe, environmentally and socially responsible for themselves, their workmates, persons affected by their work and the environment where they work. This includes identifying health risks, responding to them where possible and reporting them to their supervisors for appropriate action.

8.4.3 The Role of Wakiso District

The district officials that will be directly involved in activities of this project include the Environment Officer, the Health inspector, and the Physical planner. Their roles are described below;

Environment officer: The Environment Officer will be responsible for ensuring the compliance of the project with relevant regulations and ESIA approval conditions during project implementation. The environment officer must ensure that environmental and social impact assessment for this project is adequately carried out,

mitigation measures properly incorporated and the operation of the project is environmentally and legally compliant. It is important that the Environment Officer monitors the operations of the farm with particular reference to aspects of solid waste management, health and safety issues, drainage, air pollution and general compliance aspects as relates to national requirements.

Health Inspector: The health inspector should carry out routine checkups to ensure that there is good hygiene and housekeeping at the premises. The Health Inspector also has a role to oversee that the site has in place adequate sanitation facilities and safe drinking water supply for the workers.

District Fisheries officer: This will be responsible for monitoring of the farm activities to ensure that they are consistent with approval conditions and guidelines from the Ministry.

Physical Planner: The physical planner will ensure that the project plans are approved and implementation of the project follows the district physical planning provisions.

9 Decommissioning plan

This decommissioning plan outlines the steps and procedures for the safe and environmentally responsible closure of the proposed cage fish farming project. The company will develop a comprehensive decommissioning plan for the project prior to decommissioning, and submit it to the authority for approval.

9.1 Objectives of the decommissioning

The objectives of the decommissioning plan are as follows:

- To ensure the safe removal of project infrastructure and equipment.
- To minimize environmental and social impacts associated with decommissioning activities.
- To facilitate the restoration of the site to its pre-construction condition or as per regulatory requirements.
- To comply with all relevant laws, regulations, and permits governing decommissioning activities.

9.2 Scope

This decommissioning plan has been prepared to address concerns specific to the project operation areas and facilities. Specifically, this plan;

- Identifies the types of activities and facilities to be decommissioned across the project site;
- Describes the general approach to decommissioning of these activities/facilities;
- Describes rehabilitation actions for decommissioning; and
- Describes the general measures to minimize or manage potential adverse impacts associated with decommissioning of these activities.

9.2.1 Decommissioning Process

Notification and Planning

Activities under this stage include the following;

- Notify relevant regulatory authorities and stakeholders of the intention to decommission the farm.
- Obtain any necessary permits or approvals from relevant regulatory authorities.
- Appoint a decommissioning team to oversee and manage the decommissioning process. This team shall consist of qualified professionals with expertise in environmental management, engineering, and project management.
- Conduct a comprehensive inventory of all infrastructure, equipment, and materials on-site.
- Develop a detailed decommissioning plan outlining tasks, timelines, and responsibilities.
- Train staff on decommissioning procedures and safety protocols.

Infrastructure and Equipment Removal

Activities under this stage include the following;

- Remove all cages, nets, buoys, and other equipment from the lake in a manner that minimizes disturbance to aquatic ecosystems.
- Dismantle and remove all onshore facilities, including nursery ponds, buildings, and tanks.
- Transport removed equipment and materials to designated disposal or recycling facilities.
- Safely handle any hazardous materials such as lead-based paints, and other pollutants and dispose them in accordance with applicable regulations.

Site Remediation

Activities under this stage include the following;

- Conduct a thorough environmental assessment of the site to identify any contamination or damage caused by the project.
- Implement measures to remediate any environmental impacts, such as soil or water contamination.
- Restore the site to its natural state by regrading land, replanting vegetation, and restoring natural habitats where possible.

9.2.2 Monitoring and Reporting

- Monitor the site for a specified period following decommissioning to ensure that environmental conditions remain stable.
- Prepare a final decommissioning report documenting all activities undertaken, environmental monitoring results, and any lessons learned.
- Submit the report to relevant regulatory authorities and stakeholders.

9.3 Stakeholder Engagement

Stakeholder engagement shall be conducted throughout the decommissioning process to ensure transparency and address any concerns or grievances.

Public consultations shall be held to inform local communities and stakeholders about the decommissioning activities and to solicit feedback.

9.4 Financial Assurance

The project developer shall establish a financial assurance mechanism to cover the costs of decommissioning and site restoration activities.

The financial assurance shall be maintained throughout the life of the project to ensure adequate funds are available for decommissioning when required.

9.5 Emergency Response

An emergency response plan shall be developed to address any unforeseen incidents or emergencies that may arise during the decommissioning process.

The plan shall outline procedures for responding to spills, accidents, or other incidents to minimize risks to human health and the environment.

By adhering to the principles outlined in this plan, the project developer aims to minimize the environmental and social impacts associated with decommissioning activities and ensure compliance with relevant regulations and best practices.

10 Conclusion and Recommendations

10.1 Conclusion

This ESIA provided an account of both the benefits and potential negative impacts anticipated as a result of the implementation of the proposed cage fish farming project. The implementation of the project presents an opportunity for positive / beneficial impacts to the local and national economy. The local community and other stakeholders likely to be affected by the project have been consulted and had no objection to this project. Where potential negative impacts were prevalent, the implementation of suggested mitigation measures would allow the developer to sustainably implement the proposed project. The developer is committed to the implementation of the proposed impact mitigation measures and to undertake monitoring of impacts on the environment and will ensure that any other adverse impacts that come up in the course of implementation of the project are addressed adequately. In order to conserve the natural habitat and local biodiversity, the farm layout is such that it does not disrupt the structure of native fish population; enhance eutrophication in the receiving waters, and cause the loss of sensitive habitat. A full evaluation shall be carried out at each stage of the project implementation process in consultation with the Department of Fisheries and the community to ensure that ecological and social conditions are sustained and protected.

10.2 Recommendations

Based on the results of this ESIA, the consultancy team recommends the following;

- An additional Environmental and Social Impact Assessment should be undertaken in case the developer wishes to undertake any additional activity within the project site boundaries that have not been considered in this assessment but is stated in the National Environment Act of 2019 as requiring an ESIA.
- If the developer intends to abstract water from the lake to supply the fish brooding and nursery ponds. The developer should therefore carry out an assessment of the project water demands while factoring in issues of climate change, other water users including existing and planned developments downstream and upstream of the proposed project site.
- In an event of decommissioning of the project due to change in land use or expiry of tenure, an appropriate decommissioning plan should be prepared and followed to ensure minimum environmental impact and complete site restoration.
- The developer should ensure compliance with all relevant laws and regulations and any other lead agency permitting conditions throughout the project life. Stay informed about local and national aquaculture regulations.
- Routine maintenance of the grow-out cages should be conducted to ensure their structural integrity. This includes inspections, repairs, and cleaning to prevent the accumulation of debris or fouling.
- Annual audits of the fish farm should be carried out to ascertain compliance of the operation activities onsite with the ESMMP, ESIA Conditions of Approval from NEMA and in compliance with part XII, section 126 (2) of the National Environment Act 2019. This audit should be conducted by NEMA registered environmental auditors.

In light of the above conclusion, recommendations and the general findings of this study, the consultancy team recommends that the proposed project be approved for implementation by the National Environment Management Authority (NEMA) and relevant stakeholders, subject to committed implementation of the proposed impact mitigation measures, the ESMP as detailed in this report, and other conditions prescribed by the Authority, line Ministries, relevant lead agencies, and any other stakeholders.

References

1. NEMA 2003, Environmental legislation of Uganda
2. NEMA July 1997, Environmental Impact Assessment Guidelines.
3. National Environmental Act, 2019
4. National Environment (Waste Management) Regulations, 2020
5. United Nations Environment Programme (UNEP). 1996. Environmental Impact Assessment: Issues, Trends and Practice.
6. IFC, 2007, Environmental, Health and Safety Guidelines for Aquaculture.
7. National Fisheries policy, 2004.
8. UBOS 2015, The 2014 Population and Housing Census Main Report, Uganda Bureau of Statistics, Kampala, Uganda.
9. Wakiso District Local Government, May, 2017; Wakiso District Physical Development Plan (2018-2040)
10. Project design documents

Appendices

Appendix 1: NEMA Approval Letter for Scoping report and Terms of Reference



NATIONAL ENVIRONMENT MANAGEMENT AUTHORITY (NEMA)

NEMA/4.5

29th February, 2024

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The Director
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RE: TERMS OF REFERENCE AND SCOPING REPORT FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR THE PROPOSED CAGE FISH FARM AT TENDE BAY, ON LAKE VICTORIA, IN BULEGA-MBIRU VILLAGE, NALUGALA PARISH, KATABI TOWN COUNCIL, WAKISO DISTRICT (EIATOR 11211)

This is in reference to the Scoping report and Terms of Reference (ToR) for the above mentioned project that you submitted to this Authority. This Authority has finalized the review and grants formal **APPROVAL** of the said Scoping Report and ToR. Please, note that approval of Terms of Reference does not constitute permission to start project implementation.

In addition to carrying out a comprehensive environmental and social impact assessment for the project, you should consider the following key aspects to provide comprehensive scope and scale of the project.

- (a) Carryout comprehensive consultations with all the key stakeholders including the National Fisheries Resources Research Institute (NaFIRRI), the Directorate of Water Resources Management (DWRM) in the Ministry of Water and Environment, Directorate of Fisherles Resource (DFR) in the Ministry of Agriculture, Animal Industry and Fisheries, Katabi Town Council, Wakiso District Local Government and the local communities in the project area and that the views and or concerns of the stakeholders consulted are well documented and appended to the ESIA report;
- (b) Obtain and append to the Environmental and Social Impact Statement all necessary approvals to carry out the project in the proposed area including authentic copies of site ownership, GPS Coordinates and location map of the proposed site;
- (c) Provide location coordinates and map for the area (mainland) on which the support components for the project are proposed for location;

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- (d) Provide a detailed description of the waste streams that will be generated from the different activities on site and the **measures and equipment** (to minimise pollution of the environment) that will be put in place to handle such waste – containment / storage and disposal methods;
- (e) Include in the report relevant project-site specific baseline information and data relating to the proposed project area as well as, clear-colored photographs depicting the current status of the project area and the neighboring environs;
- (f) Provide details of the various components of the project and activities including the assembly of the cages in the Lake and operational phases of the project and **include costs of works, machinery/equipment and land for the project**;
- (g) Carryout comprehensive assessment of the different fish feeds on the market that are proposed for use on the farm and their implication on the Lake ecosystem;
- (h) Undertake a clear description of the material to be used in the manufacture of the fish cages;
- (i) Conduct exhaustive analyses for both Lake water and main land water sources in the area where the project support infrastructure will be developed and ensure you include the results and analyses in the report;
- (j) Carry out a comprehensive evaluation of the negative environmental impacts associated with the proposed project activities and the relevant mitigation measures to minimize the identified negative impacts and environmental management/monitoring plans that relate to the identified environmental impacts of the proposed project;
- (k) Consider any other critical environmental aspects or concerns which may not have been initially foreseen during the preparation of the Scoping Report and ToR, and include an evaluation of such concerns in the ESIA report;
- (l) Include a hydrologist and Fisheries Scientist on the consulting team and ensure that the team to undertake the study;
- (m) Indicate the actual project (investment) cost and provide the copies of the **investment license** issued by Uganda Investment Authority, and **certificate of valuation** of the project issues by a certified and qualified valuer, in accordance with Regulation 19(1) of the National Environment (Environment and Social Assessment) Regulations, S.I. No. 143/2020;



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- (n) Provide evidence of payment of the 30% ESIA fees, upon submission of the ESIA, in accordance with Regulation 49 of the National Environment (Environment and Social Assessment) Regulations, S.I. No. 143 of 2020.

You may proceed with carrying out the ESIA for the proposed Project.



Leila Akello Gonasa
For: EXECUTIVE DIRECTOR

Appendix 2: Land Lease Agreement

THE REPUBLIC OF UGANDA

THE REGISTRATION OF TITLES ACT (CAP.230)

DATED 3RD DAY OF JAN, 2022

LEASE AGREEMENT

BETWEEN

IMPALA INVESTMENTS LIMITED

(as Lessor)

- and -

MANDELA MILLERS LIMITED
(as Lessee)

In respect of PROPERTY COMPRISED IN

Private Mailo
Land at Ntabo,
Block No. 452 Plot No. 22
Ssaabaddu, Busiro, Mengo

1

THE REPUBLIC OF UGANDA

THE REGISTRATION OF TITLES ACT (CAP 230)

LEASE

THIS LEASE AGREEMENT is made this 3rd day of JANUARY, Two Thousand and Twenty-two

BETWEEN

IMPALA INVESTMENTS LIMITED of P.O. Box 7166 Kampala (hereinafter referred to as "the Lessor", which expression where the context so admits shall include the person(s), firm(s), company or companies for the time being entitled to the reversion immediately expectant upon the determination of the term hereby granted), of the one part;

AND

MANDELA MILLERS LIMITED of P.O. Box 10022, Kampala ("the Lessee", which expression where the context so admits shall include its successors in title) of the other part;

WITNESSETH as follows:

1. DEMISE

- 1.1 The Lessor being the registered proprietor of the land comprised in PRIVATE MAILO, BLOCK 452 PLOT 22, LAND AT NTABO MEASURING APPROXIMATELY 20.26 HECTARES (hereinafter referred to as "the Demised Property"), IN CONSIDERATION of Ug. Shs.10,000,000/= (Uganda Shillings Ten Million Only) per month ("the Consideration") being premium and ground rent payable yearly in advance by the Lessee, HEREBY LEASES to the Lessee the Demised Property TO HOLD the same unto the Lessee for a period of 20 (twenty) years for the premium and ground rent aforesaid with effect from the 3rd day of JAN, 2022, SUBJECT to the

covenants and powers implied under the Registration of Titles Act (Cap 230) (except where such covenants and powers are hereby excluded or modified) and also to the covenants and conditions hereinafter stipulated.

- 1.2 The monthly Consideration of Ug. Shs.10,000,000/= (Uganda Shillings Ten Million Only) herein stipulated shall, starting the second year of the term herein created, be subject to annual revision at the rate of 5%.

2. THE LESSEE'S COVENANTS

The Lessee hereby undertakes as follows: -

- 2.1 To perform and observe all obligations which the Lessor being the Proprietor, Owner or Lessor of the Demised Property is or may be or may become liable to perform or observe during the said term by virtue of any enactment or of any lawful direction or requirement of any public or local authority.
- 2.2 Not to build or erect or create, or permit or suffer to be built or erected or created any building or structure on the Demised Property without obtaining all necessary planning consents and permissions and all other requisite permissions and/or approvals from the relevant local or other authorities before commencing construction of such building or structure.

3. THE LESSOR'S COVENANTS

- 3.1 The Lessor hereby covenants with the Lessee that the Lessee paying the rent hereby reserved and performing and observing the covenants on their part and the conditions herein contained shall peaceably hold and enjoy the Demised Property during the said term without any interruption by the Lessor or any person rightfully claiming under or in trust for the Lessor.

3.2 The Lessee is at liberty to use the Demised Property for any lawful purpose, to mortgage, sub-lease, or part with possession of the Demised Property upon obtaining prior consent from the Lessor.

4. PROVIDED ALWAYS AND IT IS HEREBY EXPRESSLY AGREED as follows:

4.1 The Lease may be renewed or extended for a further period to be mutually agreed upon by the parties on the same or such other terms and conditions as the parties may deem fit, proper and/or expedient at the time of any such renewal or extension.

4.2 The monthly ground rent created herein is included in the premium and therefore commuted and paid together yearly as part and parcel of or at once with the premium.

5. DISPUTE RESOLUTION

5.1 Any dispute, controversy or claim arising out of or relating to this agreement, or the breach, termination or invalidity of this agreement, shall be settled initially by constructive dialogue between the parties or, failing which, by Mediation in accordance with the Arbitration and Conciliation Act (Cap 4) within 60 days of notification of a dispute by one party to the other.

5.2 In the event that the mediation proves ineffective or unsuccessful, the matter shall be referred for Arbitration in accordance with the Arbitration and Conciliation Act of Uganda, for final resolution.

6. APPLICABLE LAW AND JURISDICTION

This Agreement shall be governed by and construed in accordance with the laws of Uganda and the parties hereto submit to the exclusive jurisdiction of the Courts of law of the Republic of Uganda.

7. NOTICES

Any notice under this Lease shall be in writing. Any notice to the Parties shall be sufficiently served if delivered to their respective addresses indicated herein.

8. COSTS

All costs and expenses of and incidental to the preparation of this Lease and the counterpart thereof including stamp duty, registration fees shall be paid by the Lessee.

IN WITNESS WHEREOF this Agreement has been duly executed by the parties this 3rd day of January, 2022

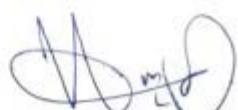
THE LESSOR

The Common Seal of **IMPALA INVESTMENTS LIMITED**
was affixed hereto in the presence of:



DIRECTOR

NAME: OMAR AHMED



DIRECTOR/SECRETARY

NAME: MUSSA AHMED

THE LESSEE



The Common Seal of **MANDELA MILLERS LIMITED**



A.H

Jel.

5

was affixed hereto in the presence of:


DIRECTOR

NAME: YASIN AHMED

DIRECTOR/SECRETARY

NAME: SALMAN AHMED H.

U G A N D A

REGISTRATION

OF TITLES

ACT

Certificate of Title

District N E N G O

County B U S I R O

Block 452

Plot 22

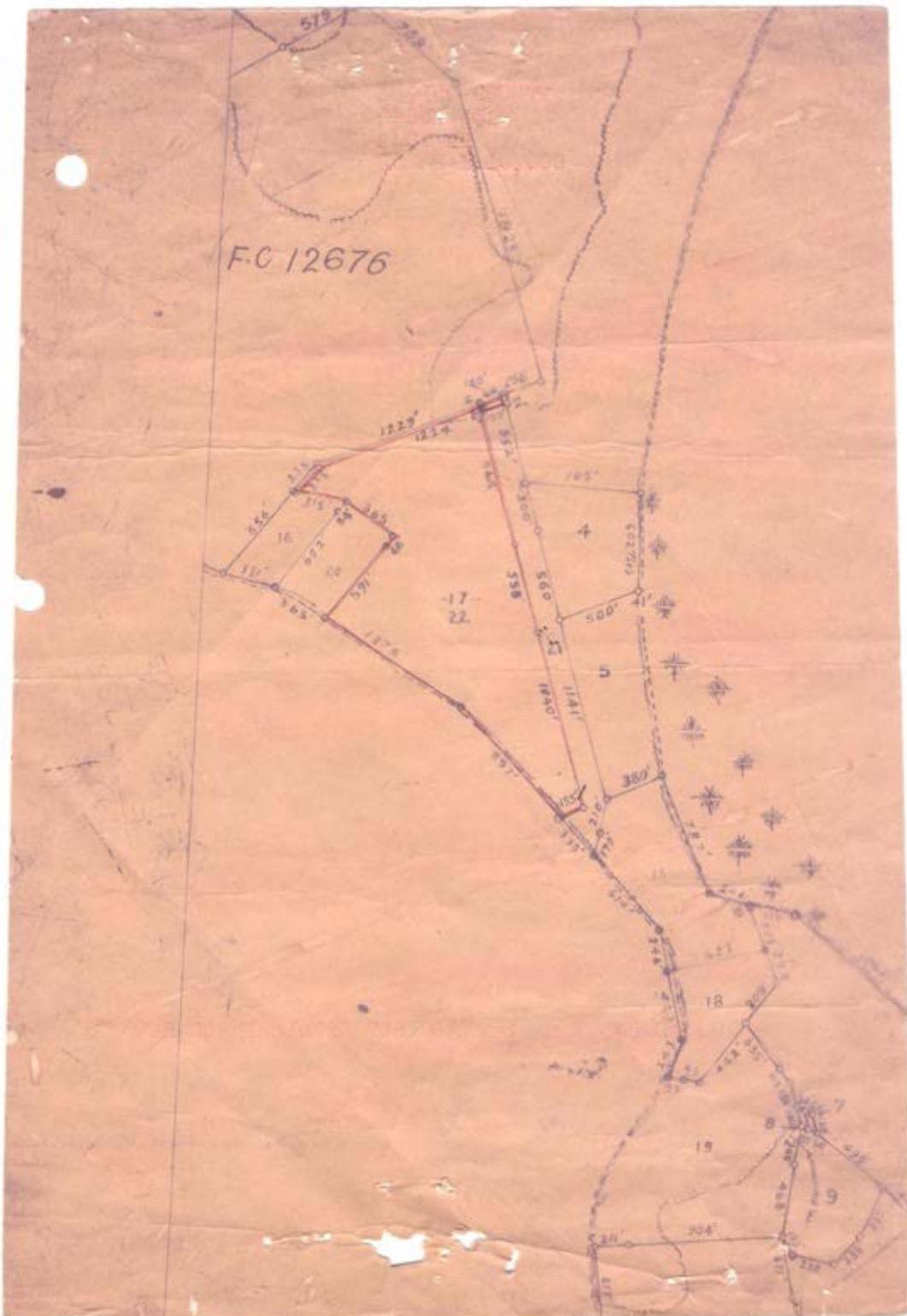
Office of Titles

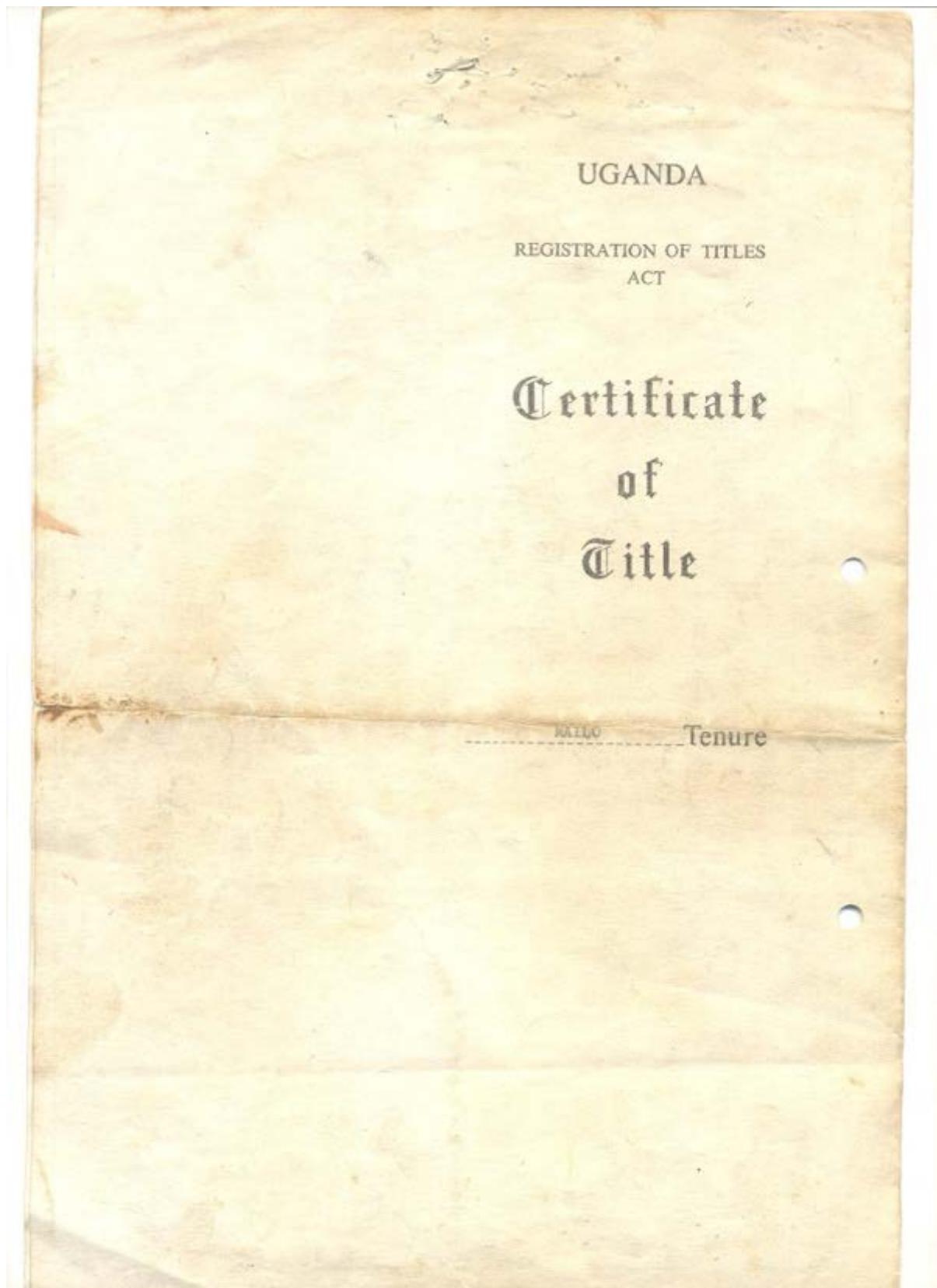
K A M P A L A

June, 2024

COUNTY: BUSHIRO SUB-COUNTY: ISSIA BADDU		UGANDA THE LAND REGISTER		DISTRICT KABALE	PLOT NO. F 22
				BLOCK NO. 452	
				AREA IN HECTARES 06.54 ELA127255 20.25	
NAME OR DESCRIPTION: LAND AT NYABO		PRIVATE MAILO			
ALL THAT piece of FREEHOLD Land situate and described above which is indicated on the Registry Plan by the Block and Plot numbers written hereon.					
Easements, rights etc. appertaining to the land:					
 <small>REGISTRY OF TITLES</small>					
Proprietor's signature or mark					
SEAL OF OFFICE					
Date and time of Registration	Instrument No.	Proprietor's name and address	Father's name (if applicable)	Class (if applicable)	Registrar's Signature
23.3.87 3.10pm	ELA124267	JOHN JOHNSON KAMULUMBA P.O. Box 189, Kampala	Jesus Kamulumba	30.00%	
15.3.87 10.10am	ELA127255	JOHN JOHNSON KAMULUMBA P.O. Box 189, Kampala	Jesus Kamulumba	30.00%	
3.3.10 10.28am	KuA446546	JOSHUA AYIA TIRNA KIRIA P.C. BOX 5480, Kampala			
11.9.85 12.10pm	ELA127255	INPLIA INVESTMENTS LIMITED P.O. Box 1762, Kampala			

PART III - INCUMBRANCES				
DATE AND TIME OF REGISTRATION	INSTRUMENT NUMBER	NAME AND ADDRESS FOR SERVICE OF MORTGAGEE, CREDITOR, CAVEATOR ETC.	PARTICULARS	REGISTRAR'S SIGNATURE
8.6.11 10.32 A.M	KL1502931	BUTANGI MORTGAGES LTD 4/F, KINWAI KHILAT, 4 KINWAI LIV. CLUSTER	CIVIL/EQUITABLE MORTGAGE #1ndress	<i>M. N. H. S.</i> <i>H. D. W. S.</i>
14.9.11 10.26 AM	KL1516506	QUBRIS LTD P.O. BOX 26191 - KAMPALA	Mortgage Released upon sale by Mortgagor	<i>M. N. H. S.</i> <i>J. J. B. S.</i>
17.9.11 12.3pm	KL1516507	QUBRIS LTD P.O. BOX 26191 - KAMPALA		





Appendix 3: Lake Water laboratory analysis results



NATIONAL
AGRICULTURAL
RESEARCH
ORGANISATION



P.O.Box 7065
Kampala, Uganda
Tel: 0414 567 649
Fax: 0414 567 649
Email: karidi@imul.com

Your Ref:

NARL/MM/01/24



Analytical Lab: BIOSPORE-KARL
Client: MANDELA MILLERS C/O HEBOCO CONSULT LTD
District Wakiso
Village Bulega-Mbiru
Parish Nalugala
Type of Sample: 1 water sample
COORDINATES 36°W 45°05'23mE 0°20'38mN
Date of Analysis: 5/24/2024

WATER ANALYSIS RESULTS

CHEMICAL TESTS	Sample reference	Recommended	Method
	Sample 1	ranges	
pH	7.5	5.0-9.0	Electrometric
EC(µS/cm)	215.0	<500 (non saline)	Electrometric
TDS(mg/L)	100.4	< 500	Electrometric
Lead(Pb)	0.03	0.1	Spectrometry
Cadmium(mg/L)	<0.01	0.1	Spectrometry
Arsenic(ppb)	<0.001	10	Spectrometry
Mercury(ppb)	<0.001	2	Spectrometry
Iron(Fe) (mg/L)	0.07	10	Spectrometry
Copper(Cu) (mg/L)	0.036	1	Spectrometry
Turbidity(NTU)	0.10	<5	Nephelometric
Nitrates(ug/L)	13.20	60	Photometric
Phosphates(ug/L)	10.14	15	Photometric

Remarks

1.pH;

(Knutzen. et al 1981) states that the pH tolerance of marine organisms indicates that there is little evidence of damage caused by a decrement or increment in pH of 0.5 to 1.0 pH units on the recommended range.In addition to this the pH can be affected by the concentration of dissolved oxygen(DO) and determines which organisms can live and thrive.

The pH of the test sample is within the recommended range meaning that the water can successfully support marine life as far as pH is concerned.

2.EC(µS/cm);

Studies of inland fresh waters indicate that streams supporting good mixed fisheries have a range

between 150 and 500 $\mu\text{S}/\text{cm}$. Conductivity outside this range could indicate that the water is not suitable for certain species of fish or macroinvertebrates. From the results of analysis it's clear that the EC levels are within range and therefore support good fish farming.

3. Heavy metals(Cd,As,Hg,Pb) and Anions

All the heavy metals and anions(Nitrates and phosphates) analysed are below the threshold levels and therefore fit for the intended purposes.

Prepared by


KIBIRANGO MARK STUART
Senior Chemical Analyst



Appendix 4: Soil analysis results



Our Ref: NARL/MM/24.....

Your Ref:

SOIL REPORT OF ANALYSIS FOR THE PROPOSED CAGE FISH FARM AT TENDE BAY, BULEGA MBIRU VILLAGE, NALUGALA PARISH, KATABI TOWN COUNCIL, WAKISO DISTRICT.

Client: MANDELA MILLERS C/O HEBOCO CONSULT LTD.

DATE: 24/5/ 2024

INTRODUCTION

1 soil sample was picked from the proposed area of construction for **CAGE FISH FARM** at Tende Bay, Bulega-Mbiru village, Nalugala parish, Katabi Town Council, Wakiso District. The sample was brought at the laboratory for analysis to ascertain any likelihood of intoxication/ assess the impact to the environment the project is likely to have.

METHODOLOGIES

Soil sampling:

Within the proposed site, soil samples were taken at a depth of 30cm from 10 different points at a distance of 5 meters apart in a zigzag format. These were later thoroughly mixed together in a clean bucket from which approximately 500g was picked to form a sample and sealed into polythene bag for laboratory analysis. The locations of the samples are indicated in the table below.



Lab analysis:

The soil sample was analyzed using routine analytical methods for heavy metals (Fe, Cu, Mn, Zn, Pb), soil pH (soil acidity / alkalinity), soil organic matter content (% OM), total nitrogen content (% N), extractable phosphorus (P), and available bases (K, Ca, and Mg). The available cat ions and available P were extracted using mehlich 3 extraction method with pH 2.5. Organic matter was analysed using walkey black method, pH was read from a 1:5 soil: water extract.

Preparation: The soil sample was dried at 45°C for 2 days and later ground and passed through a 2mm sieve.

P, K, Ca, Mg.

Extraction

3g of a well ground soil (passed through a 2 mm sieve) was weighed and 30mls of mehlich 3 extractant added. The solution is then shaken at 200rpm for 5 minutes and then left to settle for 10 minutes before centrifuging at 2000 rpm for 5 minutes.

K, Ca, Mg determination

The extract is then aspirated directly into a Microwave Plasma Atomic Spectrometer (MP-AES) at the respective wavelengths.

Phosphorus determination

Using a precision pipette 1ml of the sample and standard was added into 25ml glass vials and then rinsed with the same aliquot of distilled water into the same glass vial. 8 mls of Murphy-riley working solution (Sulphuric acid, Ammonium molybdate, potassium antimony tartarate and ascorbic acid) was added. After 30 minutes the absorbance was read at 860nm using UV/ visible spectrophotometer.

SOILS

Heavy metal analysis

The soils were finely ground to less than 0.060mm and then digested with aqua regia (1:3 HCl: HNO₃) / hydrogen peroxide and later quantified using a Microwave Plasma Atomic Spectrometer (MP-AES) at the respective wavelengths.

DISCUSSION OF RESULTS.

• Soil pH (acidity/alkalinity)

Soil pH in the test sample is 5.8. From the analysis results it is clear that the area from which the sample was picked is *slightly acidic* as seen from the classification scale.

Most crops grow well on soils of pH 5.2 –7.0. This is also the pH range at which most plant nutrients are easily available to crops. *This therefore means the soils can successfully support good plant/ vegetation growth as far as pH is concerned.*

• **Soil organic matter content (% OM)**

Soil organic matter is an important source of plant nutrients in the soil. It also plays many other important roles in the soil, e.g. improving soil physical characteristics, increasing the soil moisture holding capacity and providing a good habitat for soil micro and macro-organisms. Therefore, it is very necessary to have good amounts of it in soils.

A soil is considered to have high soil organic matter content when it has 5.15 % or more OM and a soil with organic matter content below 1.7%, is considered to be low in organic matter and is likely to show response to additions of organic materials.

Soil organic matter content in these soils is *high* as seen from the classification scale and will therefore support good plant growth without further amendments as far as OM is concerned.

• **Extractable (available) phosphorus content (P):**

A good soil is supposed to have at least 36ppm extractable (M-3) P while any soil with less than 23ppm of extractable (M-3) P is considered to be poor and is likely to give good responses to P fertilizers. The sample from the test site has low levels of phosphorus (20.71 ppm) and will therefore require supplements rich in phosphorus for successful plant growth.

• **Exchangeable bases (K, Ca, Mg):**

Exchangeable Potassium (K), another important plant nutrient from the soil is moderate in the test sample (i.e. 0.61 cmol (+)/kg soil). A good soil is supposed to have at least 0.7cmol (+)/kg soil of M-3 K.

Exchangeable Calcium (Ca) content in these samples is generally high. A good soil is supposed to have at least 5 cmol (+)/kg soil of exchangeable M-3 Ca while the critical value is 10 cmol (+)/kg soil.

Exchangeable Magnesium (Mg) content is also from high in the test sample and therefore no further amendments are required.

Iron(Fe), Copper(Cu), Manganese(Mn), Zinc(Zn), Lead(Pb)

Looking at the analysis, it is clear that all the heavy metals analyzed are within the expected ranges with levels well below the threshold levels for soil contaminants .

Table 1: Maximum allowable soil contaminant concentrations in the surface 0-75cm for land used for food production

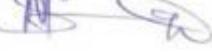
Soils	Ranges (mg/kg)
Nickel	60
Copper	100
Lead	150
Manganese	100 – 4,000
Zinc	200
Iron	5,000 – 50,000

Adapted from EPA (1995).

CONCLUSION

All the environmental contaminants analyzed lie within expected ranges therefore there is no likelihood of intoxication as far as the analyzed parameters are concerned. However further physical tests need to be performed to determine the soils structure and its suitability to support construction.

Prepared by:



KIBIRANGO MARK STUART

Senior Chemical Analyst



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NATIONAL
AGRICULTURAL
RESEARCH
ORGANISATION



P.O.Box 7065
Kampala, Uganda
Tel: 0414 567 649
Fax: 0414 567 649
Email: karidir@imul.com

Analytical Lab: BIOSPORE-NARL
Client: MANDELA MILLERS CO HEBOCO CONSULT LTD
District: Wakiso
Village: Bulega-Mbiru
Parish: Nalugala
COORDINATES: 36N 450523mE 7208mN
Type of Sample: 1 soil sample
Date of Analysis: 5/24/2024

Lab No.	Client's	pH	OM	P	Fe	Mn	Cu	Zn	Pb	Ni	Ca	Mg	K
	ref		%	'----- ppm-----						--cmol(+kg soil)--			
S5159	Sample 1	5.8	3.5	20.706	106.102	77.3	0.61	0.561	<0.01	<0.01	10.01	3.423	0.61

Classification scale of extractable nutrients

	P ppm	K ---cmol(+kg soil)---	Ca	Mg	OM %
Very low	0-12	0-0.2	0-2	0-0.3	0.7-1.0
Low	12.5-22.5	0.2-0.3	2-5	0.3-1.0	1.0-1.7
medium	23-35.5	0.3-0.7	5-10	1-3	1.7-3.0
High	36-68.5	0.7-2.0	10-20	3-8	3.0-5.15
Very high	>69	>2.0	>20	>8	>5.15



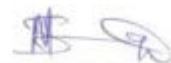
Maximum allowable soil contaminant concentrations in the surface 0-75cm for land used for food production			
Contaminant	maximum concentration(mg/kg dry weight of soil)		
Chromium			
Nickel	81		
Copper	100		
Zinc	200		

Adapted from EPA(1995)

Ratings of soil pH (1:5)

Description	pH	Rating
Extremely acid	<4.5	Very Low
Strongly acid	4.5-5.5	Low
Moderately acid	5.5-6.5	Medium
Slightly acid	6.5-7.5	Medium
Neutral	6.5-7.5	High
Slightly alkaline	7.5-8.5	High
Moderately alkaline	7.5-8.5	Very high
Strongly alkaline	8.5-9.0	Very high
Very strongly alkaline	>9.0	Very high

Prepared by


KIBIRANGO MARK STUART
Senior Chemical Analyst



Appendix 5: Comments from Katabi Town Council Environment Office



THE REPUBLIC OF UGANDA

KATABI TOWN COUNCIL Office of the Environment

Tel: +256 773839295
WAKISO DISTRICT LOCAL GOVERNMENT



Ref: CR 553/1

DATE: 05th June, 2024

The Managing Director
Heboco consult ltd
P.O BOX 3451, Kampala

RE: STAKEHOLDERS INPUT INTO THE ESIA FOR PROPOSED CAGE FISH FARM AT TENDE
BAY IN BULEGA-MBIRU VILLAGE IN NALUGALA WARD, KATABI TOWN COUNCIL,
WAKISO DISTRICT.

With reference to the approved terms of reference, you requested for the input on the above subject matter.

The following issues have been raised for consideration:

- 1) The land should be legally acquired in line with the relevant laws
- 2) Before any developments, all building plans should be submitted to the Town council for consideration of approval.
- 3) Ensure that the engineering designs for the facility be such that they will withstand any changes in water levels beyond current water levels.
- 4) All relevant offices should be involved before and during the project implementations
- 5) **THE OFFICE AWAITS THE ESIA FOR MORE INPUT DURING THE REVIEW PROCESS.**

A handwritten signature in black ink, appearing to read "Muwanguzi Ibrahim".
Muwanguzi Ibrahim
Ass.Environment officer

Appendix 6: List of Names of stakeholders consulted



Uganda House ,
P.O. Box 3451, Kampala – UGANDA
Tel: +256 - 776 - 485230 / +256 - 712485230
Email: hebococonsult@gmail.com

Consulting services in GIS & Remote Sensing Applications, Biodiversity Assessments, Telecommunications, Energy,
Housing, Industrial Planning & Development and Ecosystems management & Restoration

STAKEHOLDER CONSULTATION LIST FOR AN ENVIRONMENTAL IMPACT ASSESSMENT FOR THE
PROPOSED CAGE FISH FARM AT TENDE BAY ON LAKE VICTORIA IN BULEGA-MBIRU VILLAGE,
NALUGALA PARISH, KATABI T/C, WAKISO DISTRICT

Date: 13/06/2024

Village: Kajjansi

Parish: AIZO C

Sub County:

District: WAKISO

Name	Designation	Contact	Signature
Byamhangwa K.	SRO - Engineer	0772471348	Godfrey
GODFREY	Aquaculture systems Designer		



Uganda House,
P.O. Box 3451, Kampala – Uganda
Tel: +256 – 776 - 485230 / +256 - 712485230
Email: hebococonsult@gmail.com
Website: www.heboco.co.ug

Consulting services in GIS and Remote sensing Applications, biodiversity assessment, Telecommunications, energy, housing, industrial planning and development and ecosystems management and restoration

**STAKEHOLDER CONSULTATION LIST FOR THE ENVIRONMENTAL IMPACT ASSESSMENT FOR THE PROPOSED
CAGE FISH FARM**

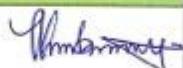
Date: 30/05/2024

Village:

Parish:

Sub County:

District: WAKISO

Name	Designation	Contact	Signature
KASSI YOUSUF	SENIOR FISHERIES OFFICER	Kassiyousuf1@gmail.com 070177495	

REGISTRATION FORM

S/N	NAME	ORGANISATION / DEPARTMENT	DESIGNATION	PHONE CONTACT	E-MAIL	SIGNATURE
01	Eng. David Cheptooe	DWRM	Ag. A.C(WO)	072984862	david.cheptooe@gmail.com	
02	Oding Joseph	DWDM	SWD (SIT)	0773496736	oding.joseph@gmail.com	
3	Kajimu Athanah	DWRM	SWD	0779210628	Kajimu.jr@gmail.com	
4	CHEPKURUI GORDON VINCENT	DWDM	W.O	0775947154	gordonchepkurui@gmail.com	
5	Victoria Langabe Nakabugo	BWRM / WDRS	W.O	0778038113	Victoria.langabe@agri.go.ke	
6	Nanyuya Sylvia	DWRM / W	Ag. PWD (CEG)	0722456134	Sylvia.nanyuya@agri.go.ke	
7	Abaha Joseph	DWDM / WPR	W.O	0774118175	Joseph.abaha12018@gmail.com	



Uganda House,
P.O. Box 3451, Kampala - UGANDA
Tel: +256 - 776 - 485230 / +256 - 712485230
Email: hebococonsult@gmail.com

Consulting services in GIS & Remote Sensing Applications, Biodiversity Assessments, Telecommunications, Energy,
Housing, Industrial Planning & Development and Ecosystems management & Restoration

STAKEHOLDER CONSULTATION LIST FOR AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR
THE CAGE FISH FARM IN BULEGA-MBIRU, WAKISO DISTRICT

Date: 14/12/2023

Village: BULEGA-MBIRU

Parish: NALUGALA

Sub County: KATABI

District: WAKISO

Name	Designation	Contact	Signature
OLIKARI KATAC	Neighbour	078834674	
BUAMBALE/RUTUNGA	EDINERS	0783491885	M.S.B.
SODRI HENRY	Worker	0760459498	
KAGOYA HARRIM	Country resident	07755944447	
Kalando Charles	Neighbour	09224122846	K.C
ACHILLE Sienna	Neighbour	0777528223	
ISINGOMA JOHN	Moda	0771266516	
Makumu Amukoko		0776829789	Makumu



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Housing, Industrial Planning & Development and Ecosystems management & Restoration

STAKEHOLDER CONSULTATION LIST FOR AN ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT FOR
THE CAGE FISH FARM IN BULEGA-MBIRU, WAKISO DISTRICT

Date: 14/12/2023

Village: BULEGA-MBIRU

Parish: NALUGALA

Sub County: KATABI

District: WAKISO

Name	Designation	Contact	Signature
Atieno Mariam Shilat	Neighbour	0740262993	
NALWANGA JAMES	Neighbour	0715537385	
Babangole Jerry	Neighbour	0744507364	
LWAKIGA - CHARLES INF- FOR LCI	077422039	29	
ABDULLA MBULU	Worker	0773942525	

Appendix 7: Certificate of Valuation/Cost estimates



REF: WINDMILL/MANDELA/VAL/07/24

Date: 16.03.2024

The Executive Director
National Environment Management Authority
P.O. Box 22255
Kampala

Dear Sir,

RE: VALUATION CERTIFICATE FOR THE CAGE FISH FARM TO BE LOCATED AT TENDE BAY ON LAKEVICTORIA IN BULEGA MBIRU VILLAGE , NALUGALA PARISH, KATABI TOWN COUNCIL, WAKISO DISTRICT.

1.0 INSTRUCTIONS AND PURPOSE OF VALUATION

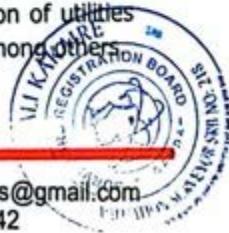
We are instructed by **Mandela Millers** of P. O. Box, **Kampala- Uganda** to carry out a proposed cage fish farm project cost valuation breakdown to be located at Tende Bay On Lake Victoria in Bulega Mbiru Village, Nalugala Parish, Katabi Town Council, Wakiso District.

The aim of the said appraisal is to provide the entire **proposed project cost breakdown** of the said development for submission to NEMA for proposed project approval purposes.

Accordingly, we have carried out the said exercise and contained in this booklet is our valuation report.

2.0 ABOUT THE PROPOSED PROJECT

The proposed project is a cage fish farm project. **Mandela Millers** is going to establish a cage firm farm at Mbiru village and this proposed project is estimated to cost about **Uganda Shillings, 2,500,000,000** however, this Capital will cover the following expenses/costs such construction costs of farm houses and storage facility /office building, fish cages, farm inputs such as nets, life jackets, weighing scales, parameter meters, boats, Land/site cost, installation of utilities like water, power, air conditioning, firefighting, and site clearance among others.



Room 24, 2nd Floor Agip House Plot 9 Kampala Road | Email: windmillvaluerss@gmail.com
P.O.Box 140097 Kampala Tel: 0200952560 / 0700346199 / 0774234542



3.0 PROJECT LOCATION

The proposed project site is located at Tende Bay On Lake Victoria in Bulega Mbiru Village, Nalugala Parish, Katabi Town Council, Wakiso District. It is located at UTM coordinates 36N 450523 mE 7208mN at elevation of 1138 meters above the sea level.

4.0 DEFINITIONS OF OPINIONS OF VALUES EXPRESSED IN THIS REPORT

Market Value

The **Market Value** of a property is the highest price in terms of money which the property under appraisal should or could fetch in a competitive and open market under conditions requisite for a fair sale.

Implicit in this definition is the consummation of a sale at a specified date and the passing of ownership from seller to buyer under conditions whereby: -

- Both the Buyer and Seller are economically motivated and are both acting prudently.
- The sale price is not affected by any undue influence
- Both parties are well informed and well advised and are acting in what they consider to be their own best interest.
- A reasonable time is allowed for exposure in the open market.

5.0 METHODS OF VALUATION USED IN THE VALUATION OF THE PROPOSED PROJECT

Two Methods of valuation have been used in the appraisal namely:

- **Bills of Quantities Approach**
- **The Comparative Method of Valuation**

5.1 BILL OF QUANTITIES (BOQ) APPROACH

The **Bill of Quantities Approach** has been used to establish the Cost that will be incurred during the erecting of the farm houses and storage facility, office building, Internal access roads, and all other site works/ improvements.



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By this method, various building/construction components and items including labour, materials, etc. are itemized and costed to establish the total sum expended in effecting the improvements.

Thus; a typical formula for establishing the building cost using Bills of Quantities approach is as under:

Sum of Building Material Prices	:	A
Add:		
• Cost of Labour at each stage	:	B
• Contractor's Overheads	:	C
• Contractor's Profit	:	D
Estimated Cost of the Developments	:	A + B + C + D

5.2 THE COMPARATIVE METHOD OF VALUATION

The Comparative Method of Valuation, sometimes referred to as the Direct Capital Comparison Approach, has been used to determine the Current Fair Market Value of a portion of the Land Parcel on the Plot under reference earmarked for acquisition.

By this method, the valuer equates the value of the property under appraisal to the value of a known comparable property whereby the latter's value is taken to be the best price that can be obtained by the property being valued, with due allowance made for value affecting differences between the subject property and the comparable property such as:

- Condition
- Location
- Level and amount of services provided
- Accessibility
- Plot size
- Planning and zoning regulations
- Date of transaction
- Parties to the transaction
- Motive of sale
- Tenure and Unexpired term



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6.0 SPECIAL NOTES

It should also be noted that project cost breakdown has been reached on by market analysis by obtaining quotations and through bills of quantities method especially for the buildings.

7.0 PROJECT COST BREAK DOWN

The proposed project is estimated to cost about **Uganda Shillings; 2,500,000,000/= (Uganda Shillings, Two Billion Five Hundred Million Only)** and this cost will cover the following as described hereunder:

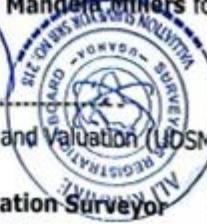
s/n	Project Item	Estimated Cost (US Dollars)
1.0	Land Cost (2 acres)	400,000,000/=
2.0	Construction costs for office, storage facility, internal roads, offices and other sites works	250,000,000/=
3.0	Cost of fish cages, boats and nets	880,000,000/=
4.0	Cost of services such as power, air conditioning, boat mooring and compressors	170,000,000/=
5.0	Farm inputs such as weighing scales, fish stock , food, life jackets, multi parameter meters among others	800,000,000/=
	Total	2,500,000,000/=

8.0 CERTIFICATION

This valuation report has been prepared for **Mandela Millers** for and on behalf of **Windmill Surveyors and Valuers** by:-

Kakaire Ali,

BSc. Land Management and Valuation (UDSM)
RSU, MISU.
Fully Registered Valuation Surveyor



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Appendix 8: Site Suitability Assessment Report



SUITABILITY AND CAPABILITY ASSESSMENT OF TENDE BAY ON LAKE VICTORIA IN WAKISO DISTRICT FOR CAGE AQUACULTURE



By

**National Fisheries Resources Research Institute (NaFIRRI), National
Agricultural Research Organization (NARO)**

For

MANDELA MILLERS

11th November, 2023

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1.0 Introduction

The demand for utilization of inland water bodies for fish production is on the increase world over as a means of bridging the widening gap between dwindling capture fisheries production and the ever-increasing demand for fish as a source of animal protein. For example, Sippel and Muschett (1999) reported the Great lakes basin of the United States and Canada to be hosting over 1200 aquaculture facilities. The same trend of having aquaculture installations in inland water bodies is spread world-wide with varying acceptability levels. Lake Victoria a shared water body by East African member countries is reported to be currently hosting over 1000 cages. The majority of these cages are on the Uganda side. Because the majority of these water bodies are shared water bodies, it is important that any activities carried out in these water bodies do not compromise other member nations and/or users from deriving other benefits. Additionally it is important that any activities carried out in these natural ecosystems has minimal impacts to entire ecosystems health.

Proper site selection is an important initial aspect for any aquaculture development activity if the above factors are to be ensured. It mainly consists of site capability and site suitability. There are many ways in which site capability is carried out and can be integrated with considerations of site suitability, but typically include all bio-physico-chemical parameters and mitigating factors affecting a site's ability to support a proposed activity (Cross and Kingzett, 1992). For this case it involves the site's ability to support an aquaculture enterprise. Biophysical characteristics such as water quality, water quantity, bathymetry, climate, predator and micro and macro fauna are commonly applied (Kapetsky and Manjarrez, 2007). Under water quality the main components considered include dissolved oxygen, pH, temperature, conductivity, soluble reactive phosphorous, ammonia-nitrogen, nitrite-nitrogen, and nitrate-nitrogen among others. In many cases site suitability has been used interchangeably with site capability (FAO, 1989) but it is important to differentiate between these terms. Site suitability focuses on extrinsic aspects of resource use such as potential conflicts, land use patterns, market conditions, infrastructure and technical support (Nath et al., 2000).

These are in addition to the biophysical parameters that represent the focus of site capability analysis.

Approaches that utilize geographic information systems (GIS) are common with a simple overlay process representing the most common technique. In this approach all areas deemed capable of supporting a proposed resource use are evaluated with suitability factors like water exchange / flow rates, depth and others are weighted equally within and across categories.

In selecting for aquaculture site suitability, it is important that type of cage culture system to be adopted is considered. The two commonly used cage types of cages for culturing finfish are the floating type and the stationery type. The floating cages have got an advantage of being movable and can be adopted for use in deep waters. The stationery cages are often used in relatively shallow waters and because of its low cost of construction they are commonly used by small scale fish farmers.

It is based on the above that Abdi Rashid of Mandela Millers contacted the Aquaculture Research and Development Center-Kajjansi of the National Fisheries Resources Research Institute (NaFIRRI) to carry out an assessment of the proposed site for aquaculture production.

1.1 Assignment

Mandela Millers having identified Tende bay on Lake Victoria as a potential site for cage aquaculture, he approached the National Fisheries Resources Research Institute (NaFIRRI) to have this area surveyed to assess its suitability for cage aquaculture.

1.2 General Objective

The general objective of this assignment was to undertake in-depth study to assess the suitability of Tende bay on Lake Victoria in Wakiso District for cage aquaculture.

1.3 Specific Objectives

1. To characterize the biophysical, chemical and general environmental features of Tende bay on Lake Victoria in Wakiso District.
2. To provide a technical report with management recommendations about the suitability of Tende bay on Lake Victoria in Wakiso District in relation to cage aquaculture operations.

2.0 Materials and Methods

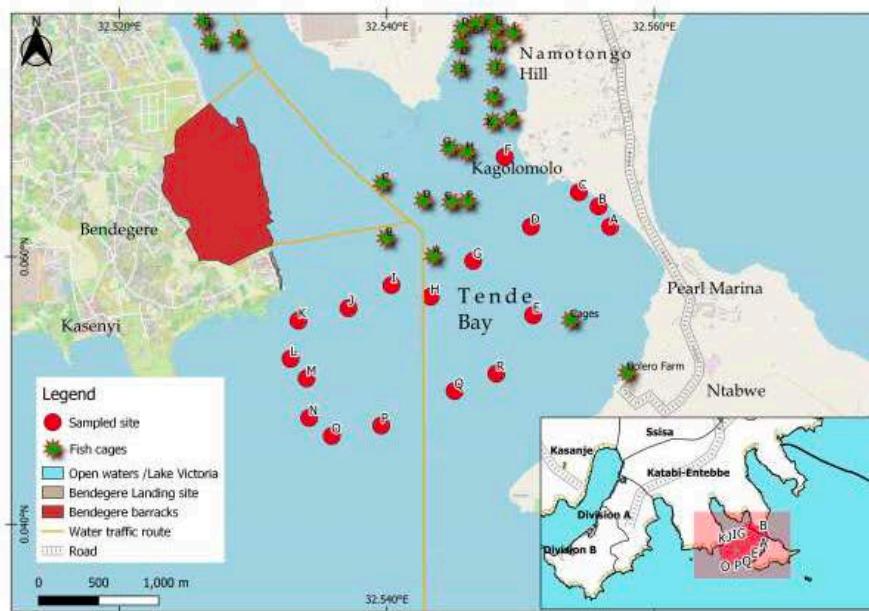


Figure 1: Map of the sampled sites in Tende bay on Lake Victoria in Wakiso district.

The proposed site was found Tende_bay on Lake Victoria, in Wakiso district. The proposed site was found to have an existing tourism site and a crocodile farm. At the time of sampling, the team found some eleven (11), 10m diameter HDPE circular cages already assembled at the site (figure 2).



Figure 2; A hotel adjacent to the proposed site with the field team conducting field in-situ measurements

2.2 Data collection

Data collection from Tende bay on Lake Victoria was carried during the month of November, 2023 with both biophysical and chemical parameters collected during this same period. Although it is important that the physical and chemical parameters are measured over time to obtain accurate data with a reflection of seasonal variations, in this particular study data collection was restricted to a one-time sampling because of time and cost constraints. Although time series data would be preferable, the selection of a single sampling period representing a worst-case scenario can produce information that is useful in determining site capability. Cross and Kingzett (1992) support this approach where they state that “missing information will not affect a site capability evaluation if the variability of the environmental parameters is above the required standard to support aquaculture operations”. Biophysical parameters specific to fresh water aquaculture were based on Queensland Water Quality Guidelines, 2009; Water Quality and Water Quality Management in Aquaculture; Understanding Your Fish Pond Water Analysis Report by Nathan M. Stone and Hugh K. Thomforde; and Best Management Practices for Hawaiian Aquaculture, Center for Tropical Aquaculture by Howerton Robert (2001).

The criteria for site selection and the acceptable ranges or standards are summarized in the table below;

Table 1. 1; Summary of Criteria for Cage Aquaculture Site Selection showing the acceptable standards for cage fish farming

<u>Parameter</u>	<u>Acceptable standard</u>	
<u>Topographical criteria</u>		
Height of wave	- stationary cage	< 0.5 m
	- floating cage	< 1.0 m
Wind velocity	- stationary cage	< 5 knots
	- floating cage	< 10 knots
Depth	- stationary cage	min > 4, max < 8 m
	- floating cage	min > 5, max < 20 m
<u>Physical criteria</u>		
Current velocity		min > 10, max < 100 cm/sec
Suspended solid		> 10 mg/l
Water temperature	- tropical species	27–31 °C
	- temperate species	20–28 °C
<u>Chemical criteria</u>		
Dissolved oxygen	- pelagic fish	> 4 ppm
	- demersal fish	> 3 ppm
Salinity		15–30 ppt
Ammonia-nitrogen (NH ₃ -N)		< 0.5 ppm
Hydrogen ion index (pH)		7.0–8.5
Nitrate (NO ₃ -N)		< 200 mg/l
Nitrite (NO ₂ -N)		< 4 mg/l
Phosphate		< 70 mg/l
Chemical Oxygen Demand (COD)		< 3 mg/l
Biological Oxygen Demand (BOD)		< 5 mg/l
<u>Biological criteria</u>		
Bacteria count (E. coli)		< 3000 cell/ml

Chou and Lee (1997) suggest that water depth should be at least five meters so that floating net-cages possess at least two meters clearance from the bottom. A maximum water depth 50 m is recommended although 100 m is suggested by various researches. Wave height of less than 1 m

and tidal velocity of between 10 cm/s and 100 cm/s have been suggested to avoid straining the net-cages and distorting cage shape (*ibid*).

2.2.1 Topographical and General Environment Assessment Criteria

The nature of the site (sheltered or open), bottom sediment type, percent vegetation cover, history of strong, waves blooms and sud movement; Total Depth, Wave height and other users (e.g navigation, breeding / nursery ground, and capture fisheries) were used to asses suitability under the topographical and general environment criteria

The nature of the site, percentage vegetation cover, and other uses were assessed using visual observation. The sediment type was determined using a bottom grub, while the history of strong blooms, waves and suds movement was assessed by asking the community member and stakeholders when these occurrences were last seen or experienced. The total depth was measured using an echo sounder while wave height was estimated using visual observations. A Global Positioning System (GPS) unit (GARMIN 12XL) was used to take the GPS coordinates and height above sea (Elevation) of the surveyed sites.

2.2.2 Physical Assessment Criteria

At each of the selected sample collection point, physical parameters; temperature, dissolved oxygen, and conductivity were measured in-situ using a water quality mult-probe. A secchi disc was used to determine the secchi depth (transparence) of the water at the different sampled points. The flow rate (cm/sec) was determined using a flow rate meter (valeport, model: 0012/B). The pH was determined using an OAKTON pH Tester 30. The collected water samples were stored in cooler boxes in the field and later transported in the laboratory for nutrient analysis. At each of the sampling points, where applicable all the selected physical parameters were sampled from surface to bottom at intervals of 0.5, 2.5, 5.0 and 10m.

2.2.3 Chemical Assessment Criteria

Nitrite-Nitrogen (NO₂-N), Nitrate-Nitrogen (NO₃-N), Total Ammonia – Nitrogen (NH₄-N), Soluble Reactive Phosphorous (SRP) and Total Suspended Solids (TSS) were the chemical parameters which were determined in this study because of the high relevance and importance in aquaculture. Water samples were picked from various stations and depths by use of a Van Dorn

water sampler. Water samples for dissolved nutrients; soluble reactive phosphorus (SRP), ammonia-nitrogen ($\text{NH}_3\text{-N}$) and nitrite-nitrogen ($\text{NO}_2\text{-N}$) were, filtered through 47mm pore Whatman GF/C filter papers and analysed by spectrophotometric methods following procedures by Stantoin *et. al* 1977. Water samples were also analysed for total suspended solids (TSS). These were measured in mg/l for all the different parameter and compared with the acceptable ranges (table 1.1).

2.2.4 Socio-economic Assessment Criteria

With respect to socio-economic parameters, these were taken through visual observations. Fish cages should be positioned away from local fishing grounds, shipping lanes, harbors, tourist sites and other existing on-shore activities (Henderson and Davies, 2000; Papoutsoglou, 2000). The existence of conservation zones and unique habitats such as coral, aquatic weeds, kelp and spawning ground for endangered species must also be considered with such areas being avoided (Walters, 2007; Vilalba, 2006; Kryvi, 1995).

2.3 Data analysis and Interpretation

2.3.1 Topographical and General Environment Assessment Criteria

The different topographical and general environmental assessment parameters considered in the different sites as given in 2.2.1 above were assessed according to their importance towards a given site being suitable for aquaculture. Where applicable the values in 2.2.1 above were compared with the recommended as well as the acceptable range for establishment of cage aquaculture (table 1.1). The topographical and general environment suitability assessment findings were summarized in table 3.1 below.

2.3.2 Physical Assessment Criteria

The means and standard deviation of the collected data for the different physical parameters measured as given in 2.2.2 above were calculated using MS.excel 2007. The calculated means and their standard deviations for each of the surveyed sites were compared with both the recommended and acceptable ranges for aquaculture. Sites whose measured physical parameters were within the acceptable range were considered to be suitable. The acceptable ranges for the

selected physical parameters are summarized in Table 1.1 above. The findings from the physical Assessment criteria were summarized in table 3.2 below.

2.3.3 Chemical Assessment Criteria

Nitrite-Nitrogen ($\text{NO}_2\text{-N}$), and Nitrate-Nitrogen ($\text{NO}_3\text{-N}$) and were analysed following Wood *et al.*, (1967) Method, American Public Health Association (APHA). Total Ammonia – Nitrogen ($\text{NH}_4\text{-N}$), and Soluble Reactive Phosphorous (SRP) were analyzed following Soloranzo (1969) APHA, and Murphy and Riley, 1962 (APHA) respectively. Total Suspended Solids (TSS) were analyzed using following Wood *et al.*, (1967) Method, American Public Health Association (APHA). The mean (X) and the standard deviation (SD) of the selected chemical parameters (nutrients) were calculated using MS excel, 2007 and these were compared with the acceptable ranges for aquaculture. Sites whose chemical parameters were within the acceptable range were considered suitable.

Table 1.1 above gives a summary of the acceptable ranges for the selected chemical parameters (Nutrients) for aquaculture while table 3.1 below summarized the findings from the chemical assessment criteria.

2.3.4 Socio-Economic Assessment Criteria

The socio-economic activities around Tende bay were identified and their effect on cage aquaculture operations evaluated.

3.0 RESULTS AND FINDINGS

3.1 Topography and General Environment Assessment Criteria

Tende bay was relatively homogenous with respect to physico-chemical parameters since it had no incoming streams. It was found to be a partly sheltered bay with moderate winds, waves and currents.

Table 3. 1 ; summary results for Topographical and General Environment suitability criteria for the selected sampled points within Tende bay in Wakiso district on Lake Victoria

Site	Northings	Eastings	ELEVATION (m/a.s.l)	Total Depth(m)	Flow Rate (cm/sec)	Secchi Depth (m)	COMMENTS
A	0.06224	32.55567	1133	3.5			
B	0.06376	32.55583	1141	2.3			
C	0.06481	32.55436	1140	2.6		1.12	
D	0.06224	32.55077	1145	6.5	20.85	1.31	Cloud cover 45%, granulated algae
E	0.05562	32.55093	1142	8.1	18.50	2.01	
F	0.06745	32.54881	1143	8.6	19.40	2.40	
G	0.05968	32.54645	1142	7.9	19.25		
H	0.057	32.54327	1140	7.81	21.65	1.67	
I	0.05786	32.54034	1140	8.6	22.95	1.78	Traffic route from Gerenge to Bendegere & Lwanjaba landing sites close to the military shoot range
J	0.05615	32.53712	1143	9.2	22.9	1.4	
K	0.05521	32.53338	1143	6.2	15.7	1.7	Close to Lwanjaba
L	00 05236	032 53279	1142	12.2	24.65	1.49	
M	00 05089	032 53399	1143	8.1	19.25		
N	00 04794	032 53418	1146	11.9	21.6	1.69	Lots of granulated algae and snails
O	00 04659	032 53587	1146	12.8	23.95	1.74	
P	00 04736	032 53957	1145	10.1	16.9		
Q	00 04995	032 54506	1148	8.8	18.35	1.89	Gerenge-Lwanjaba traffic route

Site	Northings	Eastings	ELEVATION (m/a.s.l)	Total Depth(m)	Flow Rate (cm/sec)	Secchi Depth (m)	COMMENTS
R	00 05125	032 54819	1144	7.9	20.25	1.33	Close to Pearl Aquatics aquaculture operations

Tende O (12.8m) was found to be the deepest point within Tende Bay, followed by Tende L (12.2m) and N (11.9m) respectively. Tende B and C at 2.3M and 2.6M respectively were found to be the shallowest points among the different sampled points. The highest measured average water flow rate within Tende bay was 24.65cm/sec measured at sampling point L while the lowest was 15.7cm/sec measured at K. Transparency / secchi depth at the different sampled points was found to be ranging between 1.20 and 2.40m all of which were outside the recommended optimum range.

Tende bay was found to be a relatively sheltered bay with a wave height of approximately 0.25m at the time of sampling. No floating suds nor weeds were observed in this bay during the time of sampling.

3.2 Physical Assessment Criteria

Table 3. 2; Summary results for the physical assessment criteria from the different sampled points within Tende bay

SITE	Depth(m)	DO(mg/l)	pH(-)	Temp(°C)	COND(µs/cm)
D	2.67±2.25	8.56±0.89	7.76±0.12	25.00±0.17	96.03±2.66
E	2.67±2.25	7.60±0.58	7.91±0.07	25.00±0.26	99.77±2.03
F	2.67±2.25	7.89±0.28	7.77±0.14	24.97±0.21	96.97±0.83
H	2.67±2.25	7.71±0.41	7.80±0.07	25.03±0.21	99.13±2.61
K	2.67±2.25	7.11±0.67	7.83±0.20	25.47±0.83	97.17±4.40
L	2.67±2.25	6.85±1.23	7.93±0.07	25.17±0.42	97.10±3.20
N	2.67±2.25	7.77±0.32	7.70±0.17	25.13±0.45	97.47±3.23
P	2.67±2.25	8.23±0.40	7.79±0.19	25.17±0.55	99.07±11.35

The average measured DO in all the sampled points within Tende bay ranged between $8.56\pm0.86\text{mg/l}$ and $6.85\pm1.23\text{mg/l}$. The average measured pH in all the different sampled points ranged between 7.70 ± 0.17 and 7.93 ± 0.07 . In all the different sampled points within Tende bay the average measured conductivity was found to range between $96.03\pm2.66\mu\text{s/cm}$ and $99.77\pm2.03\mu\text{s/cm}$. The highest measured average temperature in all the different sampled points was $25.47\pm0.83^\circ\text{C}$ while the lowest measured average temperature was $24.97\pm0.21^\circ\text{C}$ among the different sampled points (Table 3.2).

3.3 Chemical Assessment Criteria

Table 3. 3; Summary results for the Chemical assessment criteria for the different sampled points within Tende Bay on Lake Victoria in Wakiso District

Station	Mean ±SD				
Tende	NH ₄ -N(mg/l)	NO ₂ -N(mg/l)	NO ₃ -N(mg/l)	SRP	TSS
D	0.04±0.01	0.02±0.00	0.04±0.01	0.03±0.01	4.44±2.78
E	0.03±0.01	0.01±0.01	0.06±0.01	0.01±0.00	1.60±1.51
F	0.04±0.01	0.03±0.00	0.07±0.01	0.01±0.00	2.47±0.09
H	0.03±0.00	0.02±0.01	0.05±0.00	0.01±0.01	1.47±0.66
K	0.05±0.01	0.04±0.00	0.04±0.00	0.03±0.01	2.44±2.78
L	0.04±0.01	0.03±0.01	0.06±0.01	0.01±0.00	1.60±1.51
N	0.03±0.01	0.02±0.00	0.04±0.02	0.01±0.00	2.47±0.09
P	0.04±0.00	0.03±0.01	0.05±0.00	0.01±0.01	1.57±0.64

The measured average NH₄-N concentration within the different sampled points ranged between 0.03 ± 0.00 and $0.05\pm0.01\text{mg/l}$. In all the different sampled points, the measured average NO₂-N concentrations ranged between 0.01 ± 0.01 and $0.04\pm0.00\text{mg/l}$. The average measured NO₃-N concentration in all the different sampled points ranged between 0.04 ± 0.00 and $0.07\pm0.01\text{mg/l}$. The average measured Soluble Reactive Phosphorous (SRP) from all the different sampled points within Tende bay ranged between $0.01\pm0.00\text{mg/l}$ and $0.03\pm0.01\text{mg/l}$. From all the sampled points, the measured average total suspended solids (TSS) ranged between 1.47 ± 0.66 and $4.44\pm2.78\text{mg/l}$ (Table 3.3).

3.4 Socio-economic Assessment Criteria



Figure 3; A hotel on the land adjacent to the proposed water for the establishment of a cage fish farm

The proposed site with Tende bay was found to be between two cage fish farms (Lake Victoria Treasures and Pearl Aquatics Ltd) (figure 1). The adjacent land was found to be having a hotel and a small beach (figure 3). Adjacent to the proposed site was also found a stone minning quarry (figure 4). The proposed site was also found to have a traffic route coming to and from the islands, Gerenge landing site, Lwajaba and Bendegere landing sites. At the time of sampling some small fish boat was found to using this traffic route from Lwanjaba to Gerenge landing site (figure 5 & 6, Appendix I). It is important that any planned developments in this bay does not antagonize the traffic routes as well as the other lake users in this bay.



Figure 4; A stone quarry adjacent to the proposed site in the open waters



Figure 5; Tende bay was found to have a traffic route and an artisanal fish ground

4.0 DISCUSSION OF RESULTS

For maximum fish production, water quality conditions in the proposed site must be within optimal ranges as given in table 1.1. These water quality parameters are usually group into general environment, physical, chemical and biological characteristics, all of which must be within acceptable ranges for aquaculture production. Successful management of aquaculture requires an understanding of water quality, which is determined by the general environment

features, bio-physico-chemical factors such as temperature, dissolved oxygen (DO), transparency, turbidity, water color, carbon dioxide, pH, alkalinity, hardness, unionized ammonia, nitrite, nitrate, primary productivity, biological oxygen demand (BOD), plankton population among others. The measured and observed site and water quality characteristics are compared with the acceptable ranges (table 1.1) in this section so as to guide have a logical conclusion about the suitability of the proposed site for aquaculture.

4.1 Topography and General Environmental Assessment

With the exception of A, B and C whose depth were below the recommended, the measured average depth at all the other sampled points was within acceptable ranges for both High Volume Low Density (HVLD) and Low Volume High Density (LVHD) cages of depth not more than 5m. It is important that below the cage bags there is enough depth of at least 3m to allow for clearance of uneaten feeds and fecal waste. All the measured secchi depth transparency was higher than the transparency depth as given in Table 1.1. The high measured secchi depth transparency might be attributed to low primary productivity in the proposed site. Although a high transparency allows for fish to be able to see the feeds within the cages, it is an indication that there is very little natural food in form of phytoplanktons in this area. It is therefore important that all the planned feeding should be based on artificially formulated feeds and complete diets. The water flowrates in the different sampled points were found to be on the lower side of the acceptable recommended range as given in table 1.1. It is therefore important low stocking densities of not more than 30kg of fish per cubic meter are deployed in this bay.

4.2 Physico-Chemical Assessment

The transparency in all the sampled points was found to be outside the recommended range. This implies that for any aquaculture operations in this bay to be successful, there should be very minimal if not no dependence on primary production. With the exception of Conductivity which was found to be on the lower side of the acceptable recommended range of 30 - 1000 μ s/cm at A and B, the resto of the measured physical

chemical parameters considered in this study were found to be within acceptable ranges for fresh water aquaculture production (table 1.1). With low conductivity levels, fish become very prone to disease infection since their immunity becomes low. It is therefore very important that Best Management Practices are observed in routine management practices in this proposed site. Low stocking densities of not more than 30kg of fish per cubic meter should be adopted since the average measured water flow rate was on the lower side of the acceptable range (10 to 100cm/sec).

4.2 Nutrient Assessment criteria

All the measured nutrients were found to be with acceptable ranges for aquaculture operations as per table 1.1. The elevated levels of total suspended solids (TSS) could be attributed to the organic depositions from the adjacent farms, hotel and beach activities. It is important that all adjacent land-based farming activities are based on agricultural practices that minimize soils and siltation into the lake.

4.3 Socio-Economics Assessment

It is important that minimum allowable distance from adjacent fish farms is maintained to avoid conflict with the different farms found in this bay (appendix III). The proposed site was found to have artisanal fishers and a traffic route, therefore any established aquaculture operations in this bay should not be denied the use of this traffic route as well the artisanal fishers not being denied a livelihood. It is important that all stakeholders are sensitized about their responsibility as well as the benefits of having such development venture within their neighborhood. The proposed development should always be mindful of any existing traffic and access routes and therefore protect them to ensure good co-existence.

5.0 Conclusions and Management Recommendations

Conclusions

Based on the general environment, bio-physico-chemical assessment findings, areas between coordinates I to P were found to be most suitable and would offer the most conducive conditions for any upcoming aquaculture developments.

Management Recommendations;

It is important that any aquaculture operations in this proposed area adopt stocking densities of not more than 30kgs of fish per cubic meter.

It is important that the minimum allowable distance between adjacent aquaculture operations is always maintained to ensure a harmonious working environment for all the actors in this area.

Traffic, access routes, artisanal fish ground should be well protected to ensure that all stakeholders continue to benefit from the resource without any encumbrances.

Continuous monitoring is highly recommended to capture seasonal changes and variabilities in the area and the water environment.

It is recommended that the proprietor sticks to the recommended Best Management Practices (BMPs) as means of ensuring environmental sustainability.

6.0 References

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7.0 Appendices

Appendix 1

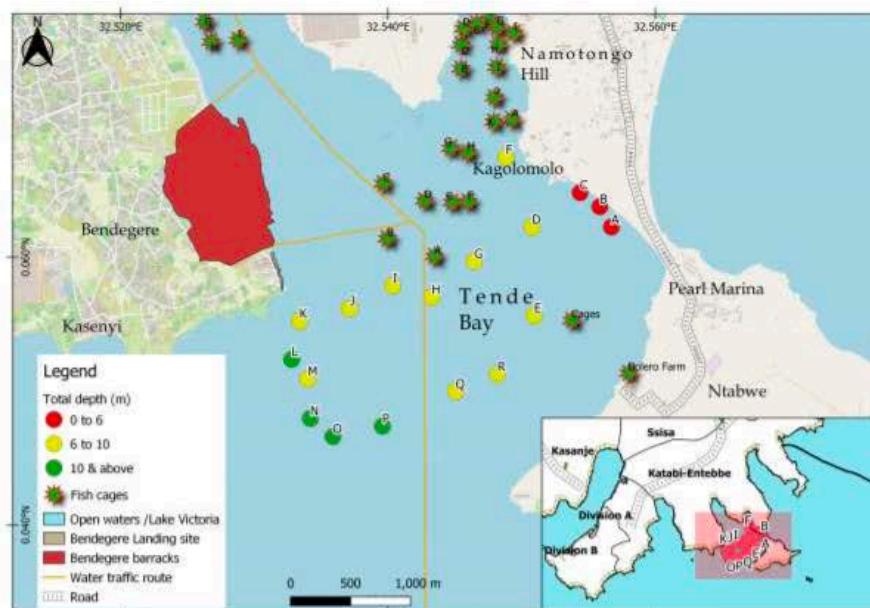


Figure 6; Map showing the depth variation at the different sampled points within Tende bay on Lake Victoria in Wakiso District

Appendix II

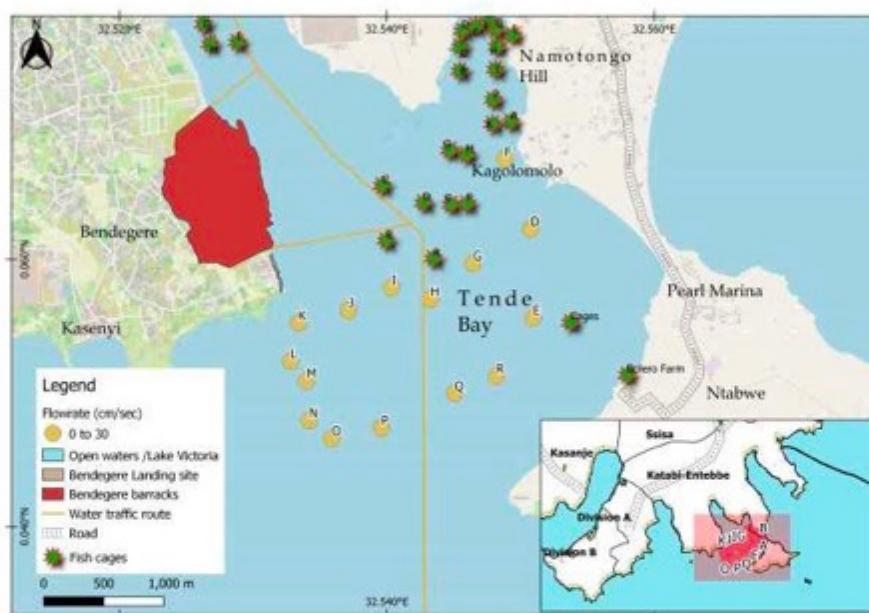


Figure 7; Water current flow rate variations at the different sampled points within Tende bay on lake Victoria in Wakiso District

Appendix III

No go area	Optimal suitability level	Existence or situation at proposed site
Shore line	200 m	Buffer distance applicable
Areas of military or security interest	2 km	None
Published anchorages where ships and boats anchor	500 m	None
Navigation channels for ships, or other water transport	100 m	Fishing and small transport boats exist
Marinas or mooring areas with structures to which vessels may be secured such as piers	500 m	None
Fish sanctuaries and Marine Protected Areas (MPA)	2 km	None
Cables, pipelines and drilling platforms	100 m	None
Parks, conservation and heritage or tourist sites	100 m	None
Gazetted fish breeding and nursery grounds	200-300 m	Wetland fringes are possibly fish breeding areas
Water intake and extraction points	100 m	Extraction point exists for domestic water uses
Fish migration routes;	500 m	None
Hydropower plants	1 km	None
Core Zones of Ramsar sites	2 km	None
Areas with high water depth	500 m	None

and quality fluctuation

Important fishing grounds	1 km	Normal fishing exists
Effluent discharge and waste disposal points	500 m	None
River and stream mouths and sources	1.5 or 3 km	None
Landing sites	200 m	Nansagazi landing site
Weed hotspots (e.g. water hyacinth)	100 m	None
Recreational facilities	500 m	None

Appendix 9: Site layout plan

