

**ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT
FULL STUDY PROJECT REPORT
FOR THE PROPOSED ESTABLISHMENT OF VICTORY FARMS HEADQUARTER ON
PLOT LR. NO. WEST KARACHUONYO/KANAM "B"/1168 (100 ACRES), DOHO
CENTRE, KANAM "B", WEST KARACHUONYO, HOMABAY COUNTY**



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This Environmental Impact Assessment (EIA) Comprehensive Project Report has been prepared in compliance with the Environmental Management and Coordination Act (EMCA), Cap 387.

GPS Coordinates: Latitude: -0.351504S, Longitude: 34.469575E

CERTIFICATION

Certification by Lead Expert

This Environmental and Social Impact Assessment (ESIA) Full Study Report is hereby submitted to the National Environment Management Authority (NEMA) in strict compliance with the Environmental Management and Coordination Act (EMCA), Cap 387, 1999 – Revised 2015 and the (*Environmental Assessments and Environmental Audits*) Regulations, 2003. The report provides a comprehensive and independent evaluation of the anticipated environmental and social impacts associated with the proposed establishment of Victory Farms Ltd headquarter comprising 50 aquaculture ponds for tilapia production; a modern fish hatchery for quality fingerlings; warehousing for industrial cold storage and general storage; a feed mill for animal feed; corporate administrative and operational offices; and staff housing, associated facilities on Land Parcel No. West Karachuonyo/Kanam "B"/1168 (100 acres) at Doho Centre, Kanam "B", West Karachuonyo, Homabay County.

The information contained in this report is a true, comprehensive, and accurate representation of the findings and analyses conducted in relation to the proposed project. The assessment has been undertaken using scientifically accepted methodologies and is based on the documentation, data, and details provided by the project proponent, as well as site visits, stakeholder consultations, and expert evaluations carried out during the study period. We, the undersigned, hereby confirm that the information contained in this Environmental and Social Impact Assessment (ESIA) report accurately reflects the findings, assessments, and recommendations arising from the EIA study.



Signed: _____
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Date: 25/02/2026

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Certification by Proponent

We, Victory Farms Ltd hereby confirm that the contents of this Environmental Impact Assessment (ESIA) report are true to the best of our knowledge, and we will implement the environmental management plan (EMP) proposed in this report and undertake to implement further mitigation measures as NEMA may direct in relation to the findings of this EIA and future inspections by the Authority.

Signed for and on behalf of: Victory Farms Ltd

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Victory Farms Ltd.

12 JUN 2026

Abbreviation and Acronyms

AOI	Area of Influence
BMU	Beach Management Units
BOQ	Bill of Quantity
CEC	County Executive Committee
CIDP	County Integrated Development Plan
CPP	Consultation and Public Participation
DEMS	Digital Elevation Model
DITTO	Same as Above
DOSH	Directorate of Occupational Safety and Health
DVS	Directorate of Veterinary Services
EAC	East Africa Community
EHS	Environment, Occupational Health and Safety
EA	Environmental Audit
EIA	Environmental Impact Assessment
EIA/EA	Environmental Impact Assessment/Environmental Audit Regulations, 2003
EMCA	Environmental Management and Coordination Act
EMS	Environmental Management System
ERP	Emergency Response Plans
EMP	Environmental Management Plan
ESIA	Environment and Social Impact Assessment
ESMP	Environmental and Social Management Plan
FGD	Focus Group Discussion
FSR	Full Study Report
GIS	Geographic Information System
GMOs	Genetically Modified Organisms
GoK	Government of Kenya
GPS	Global Positioning System
GRM	Grievance Redress Mechanism
HDPE	High-density polyethylene
IAP	Interested and Affected Parties
ILRI	International Livestock Research Institute
ISO	International Standards Organizations
IWRM	Integrated Water Resource Management
KeFS	Kenya Fisheries Services
KMA	Kenya Maritime Authority
KPLC	Kenya Power and Lighting Company
LR	Land Registration
LVFO	Lake Victoria Fisheries Organization
NEAP	National Environmental Action Plan
NEC	National Environment Council
NEMA	National Environment Management Authority
NET	National Environmental Tribunal
NETF	National Environmental Trust Fund
PAPs	Project Affected Persons
PPE	Personal Protective Equipment
PRA	Participatory Rapid Appraisal
PSP	Private Sector Participation
PWDs	Persons With Disabilities
SDF&BE	State Department of Fisheries & Blue Economy
SDGs	Sustainable Development Goals
SEM	Sustainable Environmental Management

SEP	Stakeholder Engagement Plan
SMEs	Small and Medium-sized Enterprises
SOPs	Standard Operation Procedures
SSIs	Semi-Structured Interviews
TOR	Terms of Reference
VECs	Valued Environmental Components
WB ESF	World Bank Environment and Social Framework
WRA	Water Resources Authority

EXECUTIVE SUMMARY

I. Introduction

This Executive Summary presents the key findings of the Environmental and Social Impact Assessment (ESIA) conducted for the proposed establishment of Victory Farms administrative and operational Headquarter for its fish farming activities within the Lake Victoria, and the republic. The ESIA was undertaken in accordance with the Environmental Management and Coordination Act (EMCA), Cap 387, of 1999¹ (as amended in 2015) and the Environmental (Impact Assessment and Audit) Regulations, 2003², relevant subsidiary legislation, and applicable county and national policies governing aquaculture development in Kenya.

The purpose of this Executive Summary is to provide a concise yet comprehensive overview of the project, the ESIA objectives, scope, methodology, key environmental and social issues identified, and the proposed mitigation and management measures to ensure sustainable project implementation.

2. Project Overview

Victory Farms Limited is a duly incorporated private company under the Companies Act, Cap 486 of the Laws of Kenya³ with an established mandate to undertake fishery and aquaculture production within the Lake Region and nationwide. The Company operates as a legally recognized corporate entity engaged in the development of integrated aquaculture systems, value chain optimization, and fisheries-based enterprise growth. In compliance with the EMCA, Cap 387 of the Laws of Kenya⁴, and its subsidiary legislation, the Proponent commissioned Lagers Consultancy Limited, through a Registered and Licensed NEMA Lead Expert, to undertake a comprehensive ESIA Full Study Report (FSR) for the proposed headquarters development.

The project entails the relocation and construction of Victory Farms's corporate headquarters from Nairobi to Land Parcel No. West Karachuonyo/Kanam "B"/1168 (100 acres) at Doho Centre, Kanam "B", West Karachuonyo Sub-County, Homabay under the administrative jurisdiction of the Homabay County Government⁵, along the shoreline of Lake Victoria within the Lake Victoria Basin⁶. This Land Parcel (West Karachuonyo/Kanam "B"/1168), covers approximately 175 acres and is strategically positioned to enhance institutional proximity to research, hatchery, and production facilities within the Lake Basin. This spatial realignment is intended to improve operational synergies, reduce logistical inefficiencies, strengthen real-time decision-making, and enhance oversight of production systems and environmental performance.

¹ Republic of Kenya. (1999). *Environmental Management and Coordination Act (EMCA)*, Cap 387. Government Printer.

² Republic of Kenya. (2019). *Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019* (Legal Notice No. 31). Government Printer.

³ Republic of Kenya. (2010). *The Companies Act, Cap 486 (Revised Edition 2010)*. Government Printer.

⁴ Republic of Kenya. (1999). *Environmental Management and Coordination Act (EMCA)*, Cap 387. Government Printer.

⁵ Homa Bay County Government. (n.d.). Administrative jurisdiction. Homa Bay County Government. <https://www.homabay.go.ke>

⁶ Lake Victoria Basin Commission (LVBC). (2008). Lake Victoria Basin report. LVBC Secretariat.

Table 1: Components of the Project

Project Component	Description / Scope of Work
Fish Ponds (50 units)	Construction of 50 aquaculture ponds of varying sizes to support large-scale tilapia production.
Fish Hatchery	Development of a modern hatchery to produce high-quality fingerlings for stocking the fish ponds.
Warehousing	Construction of industrial cold storage facilities and general storage warehouses.
Feed Mill	Establishment of a feed production facility for animal feed using locally sourced crops such as sunflowers and soya.
Victory Farms Corporate Headquarters (VF HQ)	Construction of an administrative and operational headquarters.
Staff Housing	Development of residential facilities for key project personnel and staff.

Pursuant to the Environmental (Impact Assessment and Audit) (Amendment) Regulations, 2019 (Legal Notice No. 31)⁴, the project has been classified as High Risk due to its scale, location within a sensitive lacustrine ecosystem, and potential for significant environmental and socio-economic interactions. Consequently, a Full Study ESIA is required to systematically identify baseline environmental and social conditions, assess potential direct, indirect, and cumulative impacts, and propose robust mitigation, monitoring, and management measures. The approved Terms of Reference (TOR) provide the technical framework for scoping, impact evaluation, stakeholder engagement, and preparation of an Environmental and Social Management Plan (ESMP) consistent with statutory requirements and international best practice.

3. Objectives of the ESIA Study

The Consultant undertook the preparation of an ESIA FSR for the proposed Victory Farms Ltd Headquarters in Homa Hills, located in Homabay County, in strict conformity with the EMCA⁴ and other applicable environmental, land use, and sectoral regulatory frameworks within the Republic of Kenya. The primary objective of the ESIA was to ensure that the proposed headquarters development is environmentally sustainable, socially responsive, and aligned with national and county development priorities, particularly within the ecologically sensitive Homa Hills–Lake Victoria landscape.

The study systematically identified, predicted, and evaluated potential environmental and social impacts—both positive and adverse—associated with site preparation, construction, operation, and long-term maintenance of the headquarters facility. Given the proximity of Homa Hills to the Lake Victoria basin and its associated terrestrial and aquatic ecosystems, the assessment applied a precautionary and risk-based approach to impact evaluation. Appropriate avoidance, minimization, mitigation, and enhancement measures were integrated into the project design to safeguard ecological integrity, community livelihoods, and occupational health and safety.

The specific objectives of the assignment included:

- a) **Regulatory Compliance:** Preparation of the ESIA in accordance with Section 58 of the EMCA⁴ and Part III of the Environmental Impact Assessment and Audit (EIA/EA) Regulations⁷, ensuring full statutory compliance.

⁷ Republic of Kenya. (2003). Environmental (Impact Assessment and Audit) Regulations, 2003. Government Printer.

- b) **Baseline Characterization:** Establishment of comprehensive baseline data on physical, biological, and socio-economic conditions within the Homa Hills project area and its zone of influence.
- c) **Impact Assessment:** Identification and assessment of potential direct, indirect, and cumulative impacts during construction and operational phases.
- d) **Stakeholder Engagement:** Facilitation of inclusive public participation to capture views of local communities, county authorities, and other stakeholders.
- e) **Mitigation and ESMP Development:** Formulation of a robust ESMP, including monitoring frameworks, institutional arrangements, and budgetary provisions.

The ESIA FSR provides the NEMA⁴ with a sound technical basis for informed licensing and approval decisions.

Scope of the Environmental and Social Impact Assessment (ESIA)

The scope of the ESIA for the proposed Victory Farms Ltd Headquarters in Homa Hills, Homabay County, was designed to provide a comprehensive and systematic evaluation of potential environmental and social impacts associated with the planning, construction, and operation of the headquarters facility. In accordance with the EMCA⁴ and the EIA/EA Regulations⁷, the ESIA adopted a risk-based and lifecycle approach to ensure that all material issues were identified, assessed, and addressed in line with statutory and best practice requirements within Kenya.

Specifically, the ESIA Consultant evaluated and reviewed the following:

- a) Direct, indirect, cumulative, and long-term impacts associated with site preparation, land development, infrastructure installation, building construction, and operational activities, including potential effects on terrestrial and aquatic ecosystems within the greater Lake Victoria basin.
- b) Comprehensive environmental and social risk assessment, incorporating qualitative and quantitative analyses to evaluate potential impacts on biodiversity, soil stability, surface and groundwater resources, community livelihoods, occupational health and safety, and local economic conditions.
- c) Policy, legal, and institutional framework analysis, examining applicable national, county, and sectoral regulations governing land use planning, environmental protection, occupational safety, and infrastructure development.
- d) Climate change vulnerability assessment, including exposure to extreme weather events, rainfall variability, erosion risks within the Homa Hills landscape, and implications for infrastructure resilience and long-term sustainability.
- e) Development of an Environmental and Social Management Framework, encompassing mitigation hierarchies, environmental monitoring protocols, occupational health and safety measures, emergency preparedness procedures, and reporting mechanisms.
- f) Stakeholder engagement processes, including structured consultations with local communities, county authorities, and relevant agencies, as well as validation forums to review findings and integrate stakeholder input into the final ESIA Full Study Report submitted to the NEMA⁴.

4. Policy, Legal, and Institutional Framework

The ESIA was undertaken within the framework of applicable national and county legislation and policies. Key instruments reviewed included the EMCA, 1999 (as amended in 2015), Water Act, Fisheries Management and Development Act, Occupational Safety and Health Act, and relevant NEMA regulations on water quality, waste management, and EIA.

At the county level, the assessment considered the Homabay County Integrated Development Plan (CIDP) and other relevant sectoral strategies guiding aquaculture development, natural resource management, and local economic growth. The project was assessed for consistency with these frameworks to ensure regulatory compliance and institutional alignment.

5. The Baseline Environment

Review and description of the existing biophysical environment is an important component of the study which provides the baseline existing information of environment prior to the commencement of the proposed project, as well as providing a general overview of more detailed study and primary data collection to support the ESIA process. Important components of the existing environment consist of climate and weather, topographic, water resources, air quality, geology, and soil. Again, understanding of this mentioned physical information provides the data and information to the regulatory body (NEMA) to monitor and compare the physical parameters change to the baseline before the project is initiated.

Besides, the other existing environments such as terrestrial flora and fauna, public utilities, as well as non-physical components of existing environment such as socio-economic profile, public service, occupational health, and safety would also be important to be investigated and presented as part of the ESIA Study. Based on the preliminary environmental scoping, the following parameters will be included in the description of the environmental baseline, as they are valued environmental receptors that could potentially be impacted by implementation of the project.

5.1 Physical Environment

Climatic conditions include rainfall, temperature, humidity and wind. These shall be described using available data sets and metrological data. A rapid Climate Risk and Vulnerability Assessment (CRVA) shall also be conducted for the proposed project. Ambient noise, air quality and artificial lighting. Existing sources of pollution shall be described.

Topography and landforms shall be described based on land surveys of the area and existing topographic maps and aerial photographs/satellite imagery. Drainage and controls on such shall be characterized [GIS method and Digital Elevation Model (DEMS)] shall be used;

Geology and soils shall be described from existing geological maps and field observations identifying major lithologies underlying the site augmented with Geo-technical investigation.

5.2 Biological Baseline

The ESIA shall include secondary data from flora and fauna surveys of the area, detailed qualitative and quantitative assessment, including inventory (list) and distribution of species. For the identified species and habitats, any existing threats and conservation significance shall be established relative to the *Wildlife Management and Conservation Act (WCMA), 2013*, the *IUCN Red List* and other applicable international references. The field data collected shall include, but is not limited to:

- General vegetation cover including species lists generated from transect and observation;
- Terrestrial Fauna including birds; and
- A review of available literature on seasonal variations in species distributions in Homabay County.

5.3 Socio-economic Baseline

Socio-economic and cultural environment (such as demography, settlements, community structures,

vulnerable and marginal groups, accident data, travel time data, sources and distribution of income, employment and labour markets, land use, and cultural heritage) shall be collected, collate and analyzed. The parameters shall be described using available census data as well as information gathered as part of a primary survey (*Public participation/stakeholder engagement*).

5.4 Baseline Environmental Assessment

Baseline environmental assessment was conducted on 19th February 2026 at the proposed project site. The assessment aimed to establish pre-operational ambient air quality and noise levels to provide a reference point for future monitoring once project activities commence.

The air quality assessment was undertaken in accordance with the Environmental Management and Coordination (Air Quality) Regulations, 2024 (Legal Notice No. 180 of 2024). Key pollutants monitored included particulate matter (PM10 and PM2.5), nitrogen oxides (NOx), sulphur dioxide (SO2), carbon monoxide (CO), carbon dioxide (CO2), and ozone (O3), alongside relevant meteorological parameters. Results indicated that all measured pollutants were within the permissible national limits. The area is predominantly agricultural, with minimal industrial or vehicular emissions. Identified sources of air emissions included wind-blown dust and natural biological processes, both contributing insignificantly to ambient pollution levels.

Noise level measurements were conducted in compliance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009, and the Factories and Other Places of Work (Noise Prevention and Control) Rules, 2005. The results showed that ambient noise levels were within the recommended limits for occupational and community exposure.

The findings confirm that current environmental conditions at the proposed site are satisfactory and pose no immediate risk to public health or the surrounding environment. The results establish a reliable baseline for future environmental monitoring and reinforce the proponent's commitment to regulatory compliance and sustainable development. Key recommendations include periodic environmental monitoring, adoption of emission and noise control measures during operations, worker training and awareness, community engagement, and development of an emergency response plan

6. Methodology

A mixed-methods approach incorporating both quantitative and qualitative techniques was adopted to collect, analyze, and triangulate baseline environmental and socio-economic data. This approach enabled a comprehensive understanding of existing ecological conditions, socio-economic dynamics, and stakeholder perceptions relevant to the proposed project. Data were obtained from both primary and secondary sources using multiple complementary methods, as outlined below.

a) Data Sources

- Primary data were collected through field surveys, direct observations, stakeholder consultations, questionnaires, and interviews.
- Secondary data were obtained from published and unpublished reports, policy and legal documents, scientific literature, government records, and spatial datasets.

b) Ecological and Biophysical Data Collection Methods

- Ecological baseline data were collected through systematic field surveys. These surveys involved direct observation and measurement of physical and biological parameters, including vegetation types, species composition, habitat condition, wildlife signs, and general ecosystem characteristics. Standard ecological assessment techniques were applied to ensure accuracy and consistency of data.

c) Stakeholder Consultations and Key Informant Interviews

- Consultations were held with key informants, including aquaculture farmers, local leaders, government officers, and community members possessing indigenous and historical knowledge of local natural resources.

d) Remote Sensing and GIS Analysis

- Spatial data analysis was conducted using satellite imagery and remote sensing datasets processed through ArcGIS software and the Google Earth Engine platform.

e) Socio-Economic Data Collection Methods

- Household and Stakeholder Questionnaires: Structured questionnaires were administered to selected stakeholders to collect quantitative data on demographic characteristics, livelihoods, land use, resource dependency, and perceptions of the proposed project.
- In-Depth Interviews: Face-to-face, semi-structured interviews were conducted with key stakeholders, including community representatives, Aquaculture farmers, and institutional actors.
- Document Review: Secondary socio-economic data was obtained from census reports, county development plans (Homabay CIDP), policy documents, and previous socio-economic studies.

f) Impact Identification Methodology

- Risk identification tools such as the United Nations Development Programme's Social and Environmental Screening Procedure (SESP) and the African Development Banks' Integrated Risk Assessment Tool were used. In analyzing the risk level, the combination of "impact" and "likelihood" was used to determine the overall significance of each identified risk (**Low, Moderate, or High**).

7. Project Location

The proposed site for Victory Farms Headquarter is in Doho Beach, Kanam on Land Reference Number: West Karachuonyo/Kanam "B"/1168, Konyango Sub Location, Kanam "B" Location, Kendu Bay Town Ward, West Karachuonyo Sub County, Homabay County, Kenya

The proposed project site is strategically located along the shoreline of Lake Victoria, within the Kanan area near, Homa Hills near Kendu Bay, covering an approximate land area of 175 acres.

Geographically, the site is precisely georeferenced at Latitude: **-0.351504°S** and Longitude: **34.469575°E**.

8. Project Components and Activities

The construction and operational for Victory Farms Ltd Headquarter in Homa Hills will involve the following primary components and activities, including but not limited to:

Table 2: Project Components and Activities

#	Components	Activities
a	Construction and Preparation of Fish Ponds (50 Units) – The land-based ponds will be constructed according to design specifications, with appropriate slope, depth, and water retention features	• Excavation and embankment formation • Pond lining where applicable • Installation of inlet and outlet structures • Preparation of water circulation, aeration, and drainage systems • Inspection of pond integrity to ensure leak-free operation and suitability for stocking
b	Development of Fish Hatchery - A modern hatchery will be established to produce high-quality fingerlings for pond stocking.	• Construct hatchery units, including incubation and nursery tanks • Install water treatment, aeration, and temperature control systems • Management of broodstock and breeding operations • Health screening and quality assurance of fingerlings • Monitor hatchery production performance and record keeping
c	Construction of Warehousing Facilities – Industrial storage infrastructure will be developed to support farm operations.	• Construct cold storage warehouses for harvested fish • Construct general storage warehouses for feed, equipment, and supplies • Instal refrigeration systems, shelving, and inventory management tools • Security and access control system installation
d	Establishment of Feed Mill - A feed production facility will be developed to produce high-quality animal feed from locally sourced crops such as sunflowers and soya.	• Construction of feed mill buildings and processing areas • Installation of grinders, mixers, pelletizers, and storage silos • Laboratory setup for feed quality control and nutrient analysis • Staff training in feed formulation, production, and safety protocols
e	Construction of Victory Farms Corporate Headquarters (VF HQ) - An administrative and operational headquarters will be constructed to support corporate and farm management.	• Construct office spaces, meeting rooms, and operational control centers • Instal IT infrastructure and communication networks • Provide staff amenities such as canteens and conference facilities • Landscaping and parking facility development
f	Development of Staff Housing - Residential facilities will be constructed to accommodate key project personnel and staff.	• Construction of housing units, apartments, or dormitories based on staffing needs • Provision of water, electricity, and sanitation infrastructure • Landscaping, recreation areas, and security arrangements
g	Ongoing Farm and Pond Management – Post-construction operations will ensure sustainable aquaculture practices.	• Regular monitoring of pond water quality (temperature, dissolved oxygen, pH, ammonia) • Feeding, disease surveillance, and growth tracking of fish • Pond maintenance including cleaning, aeration management, and repairs • Effluent treatment and environmental compliance to prevent contamination

Table 3: Expected Impacts of the project Activities

Project Component	Key Activities	Potential Environmental / Ecological Impact	Mitigation Measures
Fish Ponds (50 units)	- Excavation and embankment formation - Pond lining (where applicable) - Installation of inlet/outlet structures - Water circulation, aeration, and drainage setup - Inspection and pond stabilization	Waste Generation	- Segregate construction and operational waste into recyclable, reusable, and non-recyclable categories. - Dispose of non-recyclable waste at approved landfills. - Store hazardous chemicals securely and train personnel.
		Displacement of Terrestrial/Aquatic Species	- Schedule construction outside breeding seasons. - Confine excavation to geofenced areas. - Conduct biodiversity surveys pre- and post-construction. - Prompt removal of construction debris.
		Water Contamination	- Install silt traps, sediment fences, and erosion control measures. - Phase earthworks to limit exposed soil. - Train staff in spill response. - Prohibit dumping into natural water bodies. - Use non-toxic pond liner materials.
		Ecological Disturbance	- Avoid wetlands and riparian zones. - Minimize vegetation removal and soil compaction. - Monitor embankments and adjacent land for erosion. - Adjust Pond layout if needed.
		Water Quality Degradation	- Maintain optimal stocking densities. - Regular monitoring of DO, pH, and ammonia. - Quarantine and health screening of fingerlings. - Train staff in fish health management.
		Sediment Enrichment	- Design pond drainage to prevent sediment and nutrient buildup. - Apply precise feeding regimes. - Monitor sediment quality and adjust as needed.
		Fish Disease/Pathogen Spread	- Source fingerlings from certified disease-free hatcheries. - Establish biosecurity zones. - Conduct regular fish health assessments. - Maintain Fish Disease Contingency Plan.
		Genetic Pollution from Escapes	- Use all-male or sterile populations. - Install Pond fencing and inlet/outlet screens. - Inspect infrastructure regularly.

Fish Hatchery	• Construction of incubation and nursery tanks • Installation of water treatment, aeration, and temperature systems • Broodstock management and breeding • Health screening of fingerlings	Water Contamination & Waste	• Treat effluents before discharge. • Properly collect and dispose of mortalities and organic waste. • Train staff in biosecurity and spill response.
		Fish Disease Spread	• Quarantine and health screening of broodstock. • Disinfect equipment and tanks. • Implement disease monitoring and rapid response protocols.
Warehousing (Cold Storage & General Storage)	• Construction of cold storage and general storage buildings • Installation of refrigeration and shelving systems • Inventory management	Waste Generation	• Implement proper storage and segregation of packaging and perishable waste. • Conduct periodic waste audits. • Safely dispose of spoiled products.
		Fuel/Oil Spills	• Train staff in safe handling of generators and forklifts. • Provide spill response kits and emergency procedures.
Feed Mill	• Construction of feed production facility • Installation of grinders, mixers, pelletizers, and silos • Quality control laboratory setup	Air, Noise, and Solid Waste	• Install dust collection and ventilation systems. • Schedule noisy operations during acceptable hours. • Collect feed dust and packaging for recycling or safe disposal.
		Water Contamination	• Treat wastewater before discharge. • Securely store chemicals and additives.
Victory Farms Corporate Headquarters (VF HQ)	• Construction of offices, meeting rooms, and control centres • IT infrastructure installation • Staff amenities and landscaping	Energy and Water Use	• Implement energy-efficient systems and water-saving measures. • Promote waste segregation and recycling.
		Social Conflicts	• Engage local communities in siting decisions. • Provide grievance mechanisms and communicate project benefits.
Staff Housing	• Construction of houses, apartments, or dormitories • Provision of water, electricity, and sanitation • Landscaping and recreation areas	Habitat Alteration / Visual Impacts	• Minimize vegetation clearing. • Use low-profile building designs. • Landscape to blend with local environment.
		Social Conflicts	• Engage communities regarding housing placement. • Provide access roads and utilities to avoid disputes.

10. Environmental And Social Management Plan (ESMP)

This ESIA describes the mitigation measures for the anticipated negative impacts identified during construction, operation and decommissioning phases. An ESMP is designed to provide time frames and implementation mechanisms, reporting responsibilities, description and technical details of monitoring measures, assessment of the institutional needs, staffing requirements and cost outlay for implementation. The plan shows how management and mitigation methods are phased with project implementation. The plan also includes measures to prevent health hazards and to ensure safety in the working environment for the employees and the communities adjacent to the project sites and project affected people.

The ESMP proposes individual mitigation and monitoring measures during construction, operation, and decommissioning, assign institutional responsibilities, and estimate the resources required for its implementation; and Measures for preventing, minimizing, mitigating or compensating for the adverse environmental and social impacts and enhancing beneficial impacts, including costs of the measures and monitoring requirements.

11. Conclusion

A comprehensive ESIA has been conducted for the proposed aquaculture development by Victory Farms Ltd at Homa Hills, Kanam B Location. The project comprises 50 aquaculture ponds for tilapia production, a modern fish hatchery for quality fingerlings, warehousing for industrial cold storage and general storage, a feed mill for animal feed, corporate administrative and operational offices, staff housing, and associated facilities. The assessment was carried out in full compliance with the EMCA Cap 387 of Kenya, as well as relevant international EIA guidelines and best practice frameworks.

The ESIA provides a detailed characterization of the receiving environment, covering physical, biological, ecological, and socio-economic parameters. Both positive and adverse environmental and social impacts associated with the project have been systematically identified and assessed using recognized methodologies, including matrix scoring, checklist evaluation, stakeholder consultations, and expert judgment.

Potential adverse impacts—such as habitat alteration, water quality changes, waste generation, and socio-economic disruptions—were analysed in terms of magnitude, extent, duration, and reversibility. Significance criteria were applied to prioritize mitigation measures. In response, a comprehensive ESMP has been developed, outlining strategies for avoidance, minimization, and mitigation. The ESMP specifies institutional responsibilities, monitoring protocols, key environmental and social indicators, and corrective action procedures to ensure adaptive management and sustainable project operations.

12. Recommendations

Based on the findings of the ESIA, the following measures are recommended to ensure sustainable development of Victory Farms' aquaculture project while safeguarding environmental and social welfare:

1. **Water Resource Management:**
Implement robust water management practices across the aquaculture ponds, hatchery, and feed mill to prevent over-extraction, maintain water quality, and minimize pollution. Establish a routine water quality monitoring program including parameters such as dissolved oxygen, temperature, pH, nitrogen and phosphorus concentrations, and turbidity, with data reviewed regularly for adaptive management.
2. **Integrated Waste Management:**
Develop and implement environmentally responsible waste management systems for pond

effluents, hatchery operations, feed mill residues, and general facility waste. Consider technologies such as sedimentation ponds, biofiltration, composting, or constructed wetlands to reduce environmental impacts.

3. **Habitat and Land Use Protection:**
Minimize land disturbance during construction and operation by following best practices in site planning, erosion control, and vegetation preservation. Restore or rehabilitate disturbed areas where feasible to maintain ecological integrity.
4. **Community Engagement and Livelihood Support:**
Maintain ongoing dialogue with local communities and stakeholders to address concerns, foster transparency, and promote co-management approaches. Where appropriate, develop livelihood support programs or skills training initiatives to enhance community benefits.
5. **Capacity Building and Training:**
Provide continuous training for farm personnel on best aquaculture practices, environmental monitoring, occupational health and safety, and emergency response to enhance operational efficiency and compliance with regulations.
6. **Regular Environmental Audits and Reporting:**
Conduct periodic environmental and social audits to evaluate adherence to the ESMP, national regulations, and international standards. Document and share findings with relevant authorities and stakeholders to maintain accountability.
7. **Contingency Planning for Emergencies:**
Develop and maintain emergency response plans for potential risks such as chemical spills, pond breaches, disease outbreaks, or fire. Plans should define responsibilities, communication protocols, and immediate response actions.

By implementing these recommendations, Victory Farms Ltd can substantially minimize potential negative impacts while promoting sustainable aquaculture development, environmental conservation, and community well-being. It is therefore the expert opinion of this assessment that the project should be licensed, conditional on full compliance with the ESMP and relevant regulatory requirements.

13. Project Estimated Cost

The proposed project is estimated to cost approximately KES. 1,500,000,000 (One and a Half Billion Kenya Shillings Only) – encompassing construction, procurement, and other related activities necessary for successful implementation. A detailed Bill of Quantities (BoQ) outlining the cost breakdown is provided in the report annexure.

TABLE OF CONTENTS

CERTIFICATION	ii
Abbreviation and Acronyms	iii
EXECUTIVE SUMMARY	v
TABLE OF CONTENTS	xvi
TABLE OF FIGURES	xxi
LIST OF TABLES	xxii
List of Plates	xxii
1. CHAPTER ONE: INTRODUCTION	1
1.1. Background of Aquaculture and the Economy	1
1.2. Background and Rational of the ESIA	1
1.3. Project proponent and Location	2
1.4. Project Objectives	4
1.5. Objectives of EIA	4
1.5.1. Reporting	4
1.5.2. Study Team	5
1.6. Scope and Terms of Reference	5
1.7. Methodology	6
1.8. Impact Assessment Methodology	6
1.8.1. Receptor Importance and Sensitivity	7
1.8.2. Identifying the Magnitude of Environmental Effects	7
1.8.3. Evaluating the Significance of Environmental Impacts	7
1.8.4. Evaluating the Significance of Social Impacts	8
1.8.5. Incorporated Environmental and Social Measures	8
1.8.6. Mitigation of Impacts	9
1.8.7. Identification of Residual Impacts	9
1.9. Project Justification	9
1.10. Project Estimated Cost	9
2. CHAPTER TWO: DESCRIPTION OF THE PROJECT	10
2.1. Brief Overview	10
2.2. Construction Components and Activities	10
2.3. Project Location	12
2.4. Land Requirement and Ownership	13
2.5. Decommissioning	17
3. CHAPTER THREE: POLICY, LEGAL, REGULATORY AND ADMINISTRATIVE FRAMEWORK	18
3.1. Introduction	18
3.2. The policy framework	18
3.2.1. Constitution of Kenya (2010)	18
3.2.2. Lake Victoria Fisheries Organization Strategic Plan (2016–2020)	18

3.2.3. Kenya Vision 2030 _____	19
3.2.4. Kenya Aquaculture Development Strategy (2017–2022) _____	19
3.2.5. National Environment Policy (2014) _____	20
3.3. Legal and Regulatory Framework _____	20
3.3.1. Environmental Management and Co-ordination Act, Cap 387 _____	20
3.3.2. Relevant Regulations under EMCA Cap 387 _____	21
3.3.2.1. Environmental (Impact Assessment and Audit) Regulations _____	21
3.3.2.2. Environmental Management and Coordination (Water Quality) Regulations _____	21
3.3.2.3. Environmental Management and Coordination (Waste Management) Regulations _____	22
3.3.2.4. Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Regulations _____	22
3.3.2.5. Environmental Management and Coordination (Air Quality) Regulations _____	23
3.3.3. Fisheries Management and Development Act (No. 35 of 2016) _____	23
3.3.4. Water (Amendment) Act (No. 13 of 2024) _____	24
3.3.5. Sustainable Waste Management Act, 2024 _____	24
3.3.6. Physical and Land Use Planning Act, 2019 _____	25
3.3.7. Occupational Safety and Health Act, 2007 _____	25
3.3.8. Public Health Act (Cap 242) _____	25
3.3.9. Climate Change (Amendment) Act, 2023 _____	26
3.3.10. County Governments Act, 2012 _____	26
3.3.11. Employment (Amendment) Act, 2022 _____	27
3.3.12. Work Injury Benefits Act (WIBA), 2007 _____	27
3.3.13. Land Act, 2012 (No. 6 of 2012) _____	27
3.3.14. Land Registration Act, 2012 (No. 3 of 2012) _____	28
3.3.15. National Land Commission Act, 2012 (No. 5 of 2012) _____	28
3.3.16. Land Valuation and Compensation Regulations, 2017 _____	29
3.3.17. Survey Act, Cap 299 _____	29
3.3.18. Trust Land Act, Cap 288 _____	29
3.3.19. Environmental Land-Use Requirements under EMCA Cap 387 _____	30
3.4. Social Risks Legislations _____	30
3.4.1. Sexual Offences Act, 2006 _____	30
3.4.2. HIV/AIDS Prevention and Control Act (Act No. 14 of 2006, Revised 2012) _____	30
3.4.3. Employment (Amendment) Act, 2022 _____	31
3.4.4. Children’s Act, 2001 _____	31
3.4.5. Equal Opportunities Act, 2010 _____	31
3.4.6. National Cohesion and Integration Act, 2008 _____	32
3.4.7. Occupational Safety and Health Act, 2007 _____	32
3.4.8. Public Health Act _____	32
3.5. Relevant Institutional Framework _____	33
3.5.1. National Environment Management Authority (NEMA) _____	33

3.5.2.	<i>Kenya Fisheries Service (KeFS)</i>	33
3.5.3.	<i>Ministry of Agriculture and Livestock Development (MoALD)</i>	34
3.5.4.	<i>County Government of Homabay</i>	34
3.5.5.	<i>Kenya Maritime Authority (KMA)</i>	34
3.5.6.	<i>Water Resources Authority (WRA)</i>	35
4.	CHAPTER FOUR: BASELINE ENVIRONMENTAL DESCRIPTION	36
4.1.	<i>Introduction</i>	36
4.2.	<i>Physical Features</i>	36
4.2.1.	<i>Climatic Conditions</i>	37
4.2.2.	<i>Geology and Soil</i>	37
4.2.3.	<i>Hydrogeology of the Lake Region</i>	37
4.2.4.	<i>Drainage (Surface Water)</i>	38
4.3.	<i>Biological Environment (Biodiversity)</i>	38
4.3.1.	<i>Flora</i>	39
4.3.2.	<i>Aquatic Fauna</i>	40
4.3.3.	<i>Land Use</i>	41
4.4.	<i>Socio-Economic Baseline Condition</i>	42
4.4.1.	<i>Population Size and Density</i>	42
4.4.2.	<i>Transport and Communication Infrastructure</i>	43
4.4.3.	<i>Economic Activities and Household Income in Rachuonyo South Sub-County</i>	44
4.5.	<i>Baseline Environmental Assessment</i>	45
4.5.1.	<i>Baseline Air Quality Assessment</i>	45
4.5.2.	<i>Noise assessment measurement</i>	48
4.5.3.	<i>Water analysis results</i>	50
4.5.4.	<i>Soil sample analysis results</i>	51
5.	CHAPTER FIVE: METHODOLOGY OF THE STUDY	53
5.1.	<i>Methodology Outline</i>	53
5.2.	<i>Site Surveys</i>	53
5.2.1.	<i>Interviews and Focused Group Discussion</i>	53
5.2.2.	<i>Perusal of Documents</i>	53
5.2.3.	<i>Secondary Data</i>	53
5.3.	<i>Actual EIA Public Consultation</i>	54
5.3.1.	<i>Process of Public Consultation</i>	54
5.3.2.	<i>Objective of Public Consultation</i>	54
5.3.3.	<i>Salient Issues</i>	54
5.3.4.	<i>Consultation & Public Participation (CPP)-analysis</i>	55
5.3.5.	<i>Reporting and Documentation</i>	56
5.3.6.	<i>Key Stakeholders Consulted</i>	56
5.4.	<i>Feedback and Outcome of Public Consultation</i>	57
6.	CHAPTER SIX: ANALYSIS OF PROJECT ALTERNATIVES	58
6.1.	<i>No Project Alternative (Do-Nothing Scenario)</i>	58

6.2.	<i>Location Alternative</i>	59
6.3.	<i>Alternative Technologies</i>	59
6.3.1.	<i>Pond-Based Aquaculture (Selected Option)</i>	59
6.3.2.	<i>Recirculating Aquaculture Systems (RAS) – Alternative Considered</i>	60
6.3.3.	<i>Feed Supply Alternatives</i>	60
6.3.4.	<i>Cold Storage Alternatives</i>	61
7.	CHAPTER SEVEN: ANTICIPATED PROJECT IMPACTS AND MITIGATION MEASURES	62
7.1.	<i>Introduction</i>	62
7.2.	<i>Anticipated Positive Impacts during construction phase</i>	62
7.2.1.	<i>Employment Creation and Income Generation</i>	63
7.2.2.	<i>Growth of Local Enterprises and Supply Chains</i>	63
7.2.3.	<i>Skills Transfer and Capacity Building</i>	64
7.2.4.	<i>Infrastructure Improvement and Area Development</i>	64
7.2.5.	<i>Stimulation of the Aquaculture Value Chain</i>	65
7.2.6.	<i>Increased Government Revenue</i>	65
7.3.	<i>Anticipated Negative Impacts During the Construction Phase</i>	65
7.3.1.	<i>Soil Erosion and Land Degradation</i>	66
7.3.2.	<i>Water Pollution and Sedimentation</i>	66
7.3.3.	<i>Air Pollution and Dust Emissions</i>	66
7.3.4.	<i>Noise and Vibration Disturbances</i>	67
7.3.5.	<i>Solid and Hazardous Waste Generation</i>	67
7.3.6.	<i>Occupational Health and Safety Risks</i>	67
7.3.7.	<i>Traffic Congestion and Road Safety Risks</i>	68
7.3.8.	<i>Social Conflicts and Community Disturbances</i>	68
7.4.	<i>Anticipated Positive Impacts and Enhancement Measures During the Operational Phase</i>	68
7.4.1.	<i>Employment Creation and Income Stability</i>	68
7.4.2.	<i>Contribution to Food Security and Nutrition</i>	69
7.4.3.	<i>Strengthening of the Aquaculture Value Chain</i>	69
7.4.4.	<i>Economic Growth and Revenue Generation</i>	69
7.4.5.	<i>Skills Development and Technological Advancement</i>	70
7.4.6.	<i>Infrastructure and Community Development</i>	70
7.4.7.	<i>Export Potential and Foreign Exchange Earnings</i>	70
7.5.	<i>Anticipated Negative Impacts and Mitigation Measures During the Operational Phase</i>	71
7.5.1.	<i>Water Pollution and Effluent Discharge</i>	71
7.5.2.	<i>Solid Waste Generation</i>	71
7.5.3.	<i>Odor and Air Emissions</i>	72
7.5.4.	<i>Disease Outbreaks and Biosecurity Risks</i>	72
7.5.5.	<i>Increased Water Abstraction</i>	72

7.5.6. Occupational Health and Safety Risks	72
7.5.7. Noise Pollution	73
7.5.8. Social and Community Impacts	73
7.6. Anticipated Positive Impacts and Enhancement Measures During the Decommissioning Phase	73
7.6.1. Employment Opportunities During Decommissioning	74
7.6.2. Environmental Restoration and Ecosystem Recovery	74
7.6.3. Resource Recovery and Recycling	74
7.6.4. Land Reuse and Redevelopment Opportunities	75
7.6.5. Reduced Environmental Pressure	75
7.6.6. Strengthened Institutional and Regulatory Compliance	75
7.7. Anticipated Negative Impacts and Mitigation Measures During the Decommissioning Phase	76
7.7.1. Soil Disturbance and Erosion	76
7.7.2. Water Pollution	76
7.7.3. Solid and Hazardous Waste Generation	76
7.7.4. Occupational Health and Safety Risks	77
7.7.5. Air Emissions and Dust Generation	77
7.7.6. Noise and Community Disturbance	77
7.7.7. Social Disruption	78
7.8. Genetic, Pathogenic, and Socio-Ecological Risks and Management Throughout the Project Cycle	78
7.8.1. Genetic Risks	78
7.8.2. Pathogenic Risks	78
7.8.3. Socio-Ecological Risks	79
7.8.4. Integrated Risk Management Across Project Phases	79
7.8.5. Cross-Cutting Mitigation Measures	79
7.9. Risk Analysis and Cost-Benefit Evaluation Throughout the Project Cycle	80
7.9.1. Construction Phase	80
7.9.2. Operational Phase	80
7.9.3. Decommissioning Phase	80
7.9.4. Cross-Cutting Risk Considerations	81
7.9.5. Conclusion	81
7.10. Risk Analysis and Cost-Benefit Evaluation of Victory Farms Ltd Headquarters	82
8. CHAPTER EIGHT: CLIMATE RISK AND VULNERABILITY ASSESSMENT	85
8.1. Introduction	85
8.2. Kenya Climate	85
8.2.1. Projected Climate Changes	85
8.2.2. Very Hot Days	86
8.2.3. Sea Level Rise	87
8.2.4. Precipitation	87

8.3.	<i>Climate Change Impacts to Key Sectors</i>	87
8.3.1.	<i>Infrastructure</i>	87
8.3.2.	<i>Ecosystems</i>	88
8.3.3.	<i>Agriculture</i>	88
8.3.4.	<i>Water Resources</i>	88
8.3.5.	<i>Homa-Bay County Administrative Boundary</i>	88
8.3.6.	<i>Homabay County Current Situation</i>	89
8.4.	<i>Current and Future Projections</i>	89
8.4.1.	<i>Precipitation</i>	90
8.5.	<i>Climate Change Risks, Hazards and Vulnerabilities in Homabay County</i>	90
8.5.1.	<i>Climate Change Vulnerabilities in Homabay County</i>	91
8.6.	<i>Sectoral Climate Change Analysis in Homabay County</i>	91
8.6.1.	<i>Vulnerable Sectors to Climate Change</i>	91
8.6.2.	<i>Risks Implications for the Proposed Project</i>	92
8.7.	<i>Climate Change Risks Adaptation</i>	93
9.	CHAPTER NINE: ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP)	96
9.1.	<i>Introduction</i>	96
9.2.	<i>Objectives</i>	96
9.3.	<i>Organizations and Their Responsibilities for ESMP Implementation</i>	96
9.4.	<i>Monitoring</i>	103
9.5.	<i>Decommissioning Phase</i>	107
10.	CHAPTER TEN: CONCLUSION AND RECOMMENDATIONS	112
10.1.	<i>Conclusion</i>	112
10.2.	<i>Recommendations</i>	112
	REFERENCES	115
	APPENDICES	119
	Annex 1: NEMA Practicing License	119
	Annex 2: Bill of Quantity (BoQ)	120
	Annex 3: Project Design (Model Layout)	121
	Annex 4: Land Ownership	122

TABLE OF FIGURES

Figure 1: Project Site Layout	3
Figure 2: Proposed Project Layout Design	16
Figure 3: Water analysis results	51
Figure 4: Soil analysis results	52
Figure 5: Air temperature projections for Kenya for different GHG emissions scenarios.	86
Figure 6: Projections of the annual number of very hot days (daily maximum temperature above 35 °C) for Kenya for different GHG emissions scenarios.	86
Figure 7: Projections of the number of days with heavy precipitation over Kenya for different GHG emissions scenarios, relative to the year 2000.	87
Figure 8: Source: Metrological Department Kenya	89

LIST OF TABLES

Table 1: Components of the Project.....	vi
Table 2: Project Components and Activities	xi
Table 3: Expected Impacts of the project Activities.....	xii
Table 4: ESIA Study Team	5
Table 5: Illustrative Example for Determining Receptor Importance and/or Sensitivity	7
Table 6: Determination of significance of impact.....	8
Table 7: Construction Components and Scope of Work	11
Table 8: Construction Components and Activities.....	11
Table 9: The GPS location of the proposed site is:	12
Table 10: Summary of Relevance – Social Risk Legislations.....	32
Table 11: Population by Locations in West Karachuonyo.....	43
Table 12: Economic Activities, Household Participation, and Average Income in Homa Hills, Kanam B Location	45
Table 13: the scope of the pollutants and meteorological conditions monitored.....	46
Table 14: Air quality monitoring standards under Environmental Management and Coordination (Air Quality) Regulations, 2024.....	46
Table 15: Parameters for pure unpolluted air.....	46
Table 16: Ambient air quality result	47
Table 17: Summary of results	48
Table 18: Environmental noise and vibration guidelines	49
Table 19: Recommended Occupational Exposure Levels (OEL-RL).....	49
Table 20: Noise monitoring results (standards noise monitor).....	50
Table 21: Key Stakeholders Consulted.....	56
Table 22 : Summarized Methods, Tools and Techniques for Stakeholder Engagement	57
Table 23: Risk Analysis Table of the Victory Farms Project	82
Table 24: Cost-Benefit Evaluation Table of the Project	83
Table 25: Impact Significance Matrix for the Victory Farms Hatchery and Pond Project	84
Table 26: Climate Variables, Associated Hazards, and Climate Change Risks in Homabay County	90
Table 27: Climate Change Risks and Associated Vulnerabilities in Homabay County.....	91
Table 28: Sectoral Climate Change Vulnerabilities in Homabay County.....	91
Table 29: Climate Risks, Potential Impacts, and Adaptation Measures for Victory Farms Ltd Headquarters, Homa Hills, Kanam B	93
Table 30: ESMP – Construction Phase (Victory Farms Ltd Headquarters, Homa Hills)	98
Table 31: ESMP – Operation Phase (Victory Farms Ltd Headquarters, Homa Hills).....	100
Table 32: Environmental Monitoring Plan – Victory Farms Ltd Headquarters, Homa Hills.....	105
Table 33: Decommissioning ESMP – Victory Farms Ltd Headquarters, Homa Hills.....	109

List of Plates

Plate 2: Homa Hills offices, Kanam “B” Location, West Karachuonyo, Homabay County	10
Plate 3: Proposed Location of the project (current Homa Hills Offices)	12
Plate 4: Proposed Homa Hills Site Location (Source: Google Map Extract-2026 Imagery).....	13
Plate 5: parts of the 100 acres - the proposed Project site	14
Plate 6: Project Location Site (Google Map Extract).....	15
Plate 7: image of Homa Hills on the background.....	39
Plate 8: image of the project site with Lake Victoria on the background.....	42

<i>Plate 9: First Stakeholder meeting – Homa Hills Boardroom on the 2nd January 2026.....</i>	<i>55</i>
<i>Plate 10: Second Stakeholder engagement – Kanam B Chief Office on 19th January 2026.....</i>	<i>55</i>
<i>Plate 11: Third Stakeholder engagement – Kanam B Chief Office on 30th January 2026</i>	<i>56</i>

I. CHAPTER ONE: INTRODUCTION

I.1. Background of Aquaculture and the Economy

Aquaculture has emerged as one of the fastest-growing food production sectors globally and plays an increasingly important role in enhancing food security, nutrition, employment, and income generation. The sector is particularly significant in developing countries, where capture fisheries face mounting pressure from overfishing, habitat degradation, and climate variability. As global demand for fish continues to increase, aquaculture provides a viable pathway for sustainably expanding fish supply while reducing pressure on natural water bodies and contributing to resilient food systems⁸.

In Kenya, aquaculture development forms a key pillar of the Blue Economy and contributes significantly to rural livelihoods and national economic growth. Total national fish production in 2023 was estimated at 161,308 metric tonnes, valued at approximately Ksh. 35.9 billion, representing a 7% decline from 2022 levels. Inland capture fisheries accounted for 121,357 metric tonnes, while marine capture fisheries and aquaculture contributed 39,950 metric tonnes and 31,767 metric tonnes, respectively. Although aquaculture contributes a smaller share by volume, its relatively higher unit value underscores its growing economic and strategic importance within the national economy⁹.

Globally, aquaculture surpassed capture fisheries as the leading source of aquatic animal production in 2022, reaching 94.4 million tonnes, of which 57% was destined for human consumption⁸. Kenya is well positioned to benefit from this transition, with an estimated 1.14 million hectares suitable for aquaculture and approximately 14,681 km² of inland water bodies, offering significant potential for increased production and improved food and nutrition security¹⁰.

I.2. Background and Rational of the ESIA

An ESIA is a systematic and participatory process undertaken to identify, predict, evaluate, and manage the potential environmental and social impacts of a proposed project prior to key decisions being made and commitments finalized. The primary objective of this ESIA is to ensure that environmental and social considerations are integrated into project planning, design, construction, operation, and eventual decommissioning in a manner consistent with national legislation and internationally recognized standards of good practice. This assessment has been prepared with reference to the Environmental and Social Performance Standards of the International Finance Corporation¹¹, the Environmental, Health, and Safety Guidelines of the World Bank Group¹², and relevant international labour conventions and guidance issued by the International Labour Organization (ILO, n.d.). These frameworks provide the benchmark against which project risks and impacts have been identified and mitigation measures designed.

The ESIA process provides a structured methodology for assessing both biophysical and socio-economic conditions within the project's area of influence and for evaluating the significance of potential impacts. Environmental components considered in this assessment include land use and land cover, terrestrial and aquatic biodiversity, ecosystem services, soil and geology, surface water and groundwater resources, air quality, noise and vibration, waste management practices, hazardous materials handling, greenhouse gas emissions, and climate change vulnerability. Social components include demographic characteristics, land tenure systems, livelihoods and local economic activities, labour and working conditions, community

⁸ FAO. (2022). *Guidelines for sustainable aquaculture development*. Food and Agriculture Organization.

⁹ State Department for Fisheries, Aquaculture and the Blue Economy (SDFABE). (2024). *Annual Fisheries Statistical Bulletin 2023*. Nairobi: Ministry of Mining, Blue Economy and Maritime Affairs.

¹⁰ Republic of Kenya. (2024). *Blue Economy and Fisheries Sector Report 2024*. Government of Kenya.

¹¹ International Finance Corporation (IFC). (2012). *Performance standards on environmental and social sustainability*. Washington, DC: IFC.

¹² World Bank Group (WBG). (2007, updated 2017). *Environmental, health, and safety guidelines*. IFC/World Bank Group.

health and safety, cultural heritage resources, gender considerations, and impacts on vulnerable or marginalized populations. In line with international good practice, the assessment considers direct, indirect, induced, and cumulative impacts, as well as transboundary implications where relevant¹¹. Both adverse and beneficial impacts are evaluated to identify opportunities for enhancement and to ensure that negative impacts are avoided, minimized, mitigated, or compensated.

A central principle guiding this ESIA is the application of the mitigation hierarchy, which prioritizes impact avoidance, followed by minimization, restoration, and, where residual impacts remain, offsetting measures¹¹. Alternatives analysis has been undertaken to compare feasible project options, including alternative sites, technologies, layouts, and the “no project” scenario, in order to demonstrate that environmental and social considerations have informed project decision-making. The evaluation of alternatives reflects the precautionary approach and seeks to optimize project design in a manner that reduces risk exposure and enhances long-term sustainability outcomes.

Meaningful stakeholder engagement constitutes a cornerstone of the ESIA process. Consistent with the requirements set forth by the IFC Performance Standard 1¹¹, the project proponent has implemented a stakeholder engagement process that is inclusive, transparent, and culturally appropriate. Stakeholders include project-affected communities, local government authorities, civil society organizations, traditional leaders, and other interested parties. Engagement activities have encompassed public consultation meetings, focus group discussions, key informant interviews, and disclosure of project information in accessible formats and languages. Feedback obtained during these consultations has been incorporated into project planning and the development of mitigation and management measures. A grievance redress mechanism has also been established to enable stakeholders to raise concerns and seek resolution in a timely and transparent manner, consistent with good international practice^{11, 12}.

The baseline studies informing this ESIA were conducted through a combination of primary data collection and secondary data review. Field surveys were undertaken to characterize existing environmental and social conditions, while relevant national statistics, academic research, and regulatory documents were reviewed to contextualize findings. The significance of predicted impacts has been determined through a systematic evaluation of magnitude, duration, reversibility, geographic extent, and the sensitivity and value of affected receptors. The assessment also takes into account applicable occupational health and safety standards and labour requirements consistent with guidance from the ILO (n.d.) and the WBG Environmental, Health, and Safety Guidelines¹².

Based on the findings of the impact assessment, an ESMP has been developed to define mitigation measures, monitoring requirements, institutional responsibilities, and reporting procedures. The ESMP establishes clear performance indicators and monitoring protocols to ensure that mitigation measures are effectively implemented and adaptive management can be applied where necessary. The project proponent is committed to maintaining compliance with applicable national regulatory requirements while aligning with international standards, including the IFC Performance Standards¹¹ and the WBG Environmental, Health, and Safety Guidelines¹². Through this comprehensive approach, the ESIA seeks to support environmentally sound and socially responsible project development that contributes to sustainable economic growth while safeguarding the well-being of affected communities and the integrity of the natural environment.

1.3. Project proponent and Location

The project entails the relocation and establishment of Victory Farms’s corporate headquarters from Nairobi to Land Parcel No. West Karachuonyo/Kanam “B”/1168 (100 acres) at Homa Hills, next to Doho Centre, Kanyango Sub-Location, Kanam “B” Location, West Karachuonyo Sub-County, Homabay County, along the shoreline of Lake Victoria within the Lake Victoria Basin⁶. This Land Parcel (West Karachuonyo/Kanam “B”/1168), covers approximately 175 acres and is strategically positioned to

enhance institutional proximity to research, hatchery, and production facilities within the Lake Basin. Victory Farms Ltd intends to utilise 100 acres of this parcel in this spatial realignment, to improve operational synergies, reduce logistical inefficiencies, strengthen real-time decision-making, and enhance oversight of production systems and environmental performance. Victory Farms Limited is a duly incorporated private company under the Companies Act, Cap 486 of the Laws of Kenya¹³, with an established mandate to undertake fishery and aquaculture production within the Lake Region and nationwide. The Company operates as a legally recognized corporate entity engaged in the development of integrated aquaculture systems, value chain optimization, and fisheries-based enterprise growth in compliance with the EMCA, Cap 387 of the Laws of Kenya⁴, and its subsidiary legislation.



Figure 1: Project Site Layout

¹³ Republic of Kenya. (2010). The Companies Act, Cap 486 (Revised Edition 2010). Government Printer.

I.4. Project Objectives

The primary objective of the project is to relocate and establish Victory Farms's corporate headquarters from Nairobi to Kanam "B" Location, West Karachuonyo Sub-County, Homabay County.

The proposed relocation of Victory Farms's headquarters from Nairobi to Kanam in the Lake Region is driven by strategic, operational, and economic considerations aimed at strengthening the company's efficiency, competitiveness, and long-term growth. Primarily, sitting the headquarters closer to the company's research and production facilities enhances operational coordination and decision-making. Currently, having the administrative, management, and logistics teams based in Nairobi creates a physical and operational disconnect from core production activities, potentially leading to delays in addressing production challenges, inefficiencies in supply chain management, and slower implementation of strategic initiatives. By relocating to Homa Hills, key decision-makers and operational staff will be in proximity to the production sites, enabling real-time oversight, faster problem resolution, and more effective integration of research outcomes into production processes.

Additionally, the proposed project aligns with national and global development priorities, including the Blue Economy Strategy and the Sustainable Development Goals (SDGs), by fostering responsible aquatic resource management and inclusive economic growth through science-based aquaculture innovations.

I.5. Objectives of EIA

The overall objective of the EIA study is to ensure that the proposed project is environmentally and socially sound, as well as sustainable in the long term. EIA evaluates the potential environmental, biological and social impacts associated with the proposed Victory Farms's Project. EIA aims to identify, predict, and assess potential impacts, while proposing appropriate mitigation and management measures to ensure environmentally sustainable, socially acceptable, and climate-resilient aquaculture development.

Other objectives of the EIA are to:

- Assess the current status of the natural and socio-economic environment within the project area, including the baseline environmental quality;
- Evaluate the potential positive environmental and social impacts associated with the proposed project;
- Identify, screen, and predict possible negative impacts that may arise during the construction, operation, and decommissioning phases of the project;
- Propose appropriate mitigation measures to prevent, reduce, or offset any adverse effects; and
- Develop a comprehensive ESMP to guide the implementation of mitigation and monitoring measures throughout the project lifecycle.

These efforts aim to ensure that environmental and social considerations are fully integrated into project planning and execution, while providing a sound and objective basis for regulatory decision-making and approval in accordance with the EMCA, Cap 387 of the Laws of Kenya.

I.5.1. Reporting

The output of the study is the production of this ESIA project report with recommendations for online submission to NEMA for purposes of seeking NEMA license. All the materials and workmanship used in the execution of the work shall be of the best quality and description. Any material condemned by the planners shall be removed from the site at the contractor's cost. Environmental concerns need to be part of the planning and development process and not an afterthought. It is therefore advisable to avoid land use conflicts with the surrounding area through the implementation of the ESMP.

I.5.2. Study Team

Table 4: ESIA Study Team

	Name	Role
1.	Kevin Musiega	Lead EIA Expert / Team leader
2.	James Orage	Lead EIA Expert
3.	Ruth Muhonja	Aquaculture expert and associate expert
4.	Edward Adino	Chemical Analyst and a lead expert
5.	Juliana Akinyi	Socio-Economist Expert
6.	Wycliff Oloo	GIS expert and a planner
7.	John Ambuya	Lead Expert and Green Business Enthusiast

I.6. Scope and Terms of Reference

The scope of the ESIA study covers all activities associated with the conception, construction, operation and decommissioning of the proposed Victory Farms's Headquarter in Homa Hills, including construction of the 50 ponds, water abstraction from Lake Victoria, Establishment of warehouses and offices, installation of hatchery, feed mill and cold storage, water and sanitation gridwork, fish production, waste and effluent management, biosecurity controls, and worker safety.

In accordance with the EMCA⁴ and the EIA and EA Regulations⁷, the ESIA adopted a risk-based and lifecycle approach to ensure that all material issues were identified, assessed, and addressed in line with statutory and best practice requirements within Kenya.

Specifically, the ESIA Consultant evaluated and reviewed the following:

- g) Direct, indirect, cumulative, and long-term impacts associated with site preparation, land development, infrastructure installation, building construction, and operational activities, including potential effects on terrestrial and aquatic ecosystems within the greater Lake Victoria basin.
- h) Comprehensive environmental and social risk assessment, incorporating qualitative and quantitative analyses to evaluate potential impacts on biodiversity, soil stability, surface and groundwater resources, community livelihoods, occupational health and safety, and local economic conditions.
- i) Policy, legal, and institutional framework analysis, examining applicable national, county, and sectoral regulations governing land use planning, environmental protection, occupational safety, and infrastructure development.
- j) Climate change vulnerability assessment, including exposure to extreme weather events, rainfall variability, erosion risks within the Homa Hills landscape, and implications for infrastructure resilience and long-term sustainability.
- k) Development of an Environmental and Social Management Framework, encompassing mitigation hierarchies, environmental monitoring protocols, occupational health and safety measures, emergency preparedness procedures, and reporting mechanisms.
- l) Stakeholder engagement processes, including structured consultations with local communities, county authorities, and relevant agencies, as well as validation forums to review findings and integrate stakeholder input into the final ESIA FSR submitted to the NEMA⁴.

The study aims to ensure that all potential environmental and social risks and impacts both positive and adverse associated with the complex and the operation of the proposed project, including any associated, ancillary, or linked activities, are thoroughly identified, assessed, and evaluated.

1.7. Methodology

A mixed-methods approach incorporating both quantitative and qualitative techniques was adopted to collect, analyse, and triangulate baseline environmental and socio-economic data. This approach enabled a comprehensive understanding of existing ecological conditions, socio-economic dynamics, and stakeholder perceptions relevant to the proposed project. Data were obtained from both primary and secondary sources using multiple complementary methods, as outlined below.

a) Data Sources

- Primary data were collected through field surveys, direct observations, stakeholder consultations, questionnaires, and interviews.
- Secondary data were obtained from published and unpublished reports, policy and legal documents, scientific literature, government records, and spatial datasets.

b) Ecological and Biophysical Data Collection Methods

- Ecological baseline data were collected through systematic field surveys. These surveys involved direct observation and measurement of physical and biological parameters, including vegetation types, species composition, habitat condition, wildlife signs, and general ecosystem characteristics. Standard ecological assessment techniques were applied to ensure accuracy and consistency of data.

c) Stakeholder Consultations and Key Informant Interviews

- Consultations were held with key informants, including aquaculture farmers, local leaders, government officers, and community members possessing indigenous and historical knowledge of local natural resources.

d) Remote Sensing and GIS Analysis

- Spatial data analysis was conducted using satellite imagery and remote sensing datasets processed through ArcGIS software and the Google Earth Engine platform.

e) Socio-Economic Data Collection Methods

- Household and Stakeholder Questionnaires: Structured questionnaires were administered to selected stakeholders to collect quantitative data on demographic characteristics, livelihoods, land use, resource dependency, and perceptions of the proposed project.
- In-Depth Interviews: Face-to-face, semi-structured interviews were conducted with key stakeholders, including community representatives, Aquaculture farmers, and institutional actors.
- Document Review: Secondary socio-economic data was obtained from census reports, county development plans (Homabay CIDP), policy documents, and previous socio-economic studies.

1.8. Impact Assessment Methodology

An overarching framework for the impact assessment methodology is provided below. The approach to the analysis of significance of environmental and social impacts has been separated to reflect the different approaches required assess social and environmental issues.

1.8.1. Receptor Importance and Sensitivity

The term 'receptors' is used to describe features of the environment such as water resources, habitats and species which are valued by society for their intrinsic worth and/or their social or economic contribution and social groups or Project Affected Persons (PAPs) such as individuals and communities that may be affected by the Project. The importance of a receptor will be determined by the consideration of a range of criteria depending on the topic under consideration, including: the economic, social and cultural value of the receptor; locally, nationally and internationally; any local, national or international designations; and the rarity of the receiving environment; the benefits or services provided.

Receptor sensitivity will be determined by the consideration of a receptors' ability to resist or adapt to changes and its resilience to change. The category of the importance or sensitivity of a receptor will be determined based on professional judgement of technical topic leads. Table 5 provides an example of categories of importance and/or sensitivity.

Table 5: Illustrative Example for Determining Receptor Importance and/or Sensitivity

Importance/Sensitivity of Receptor	Example of importance of receptors	Example of sensitivity of receptors
Very High	An attribute with a high quality and rarity on an international, regional or national scale with little or no potential for substitution.	Sensitive area or receptor with little resilience to imposed stresses.
High	An attribute with a high quality and rarity on a local scale with little or no potential for local substitution, or with a medium quality or rarity on a regional or national scale with limited potential for substitution.	
Medium	An attribute with a medium quality and rarity on a local scale with limited potential for substitution, or an attribute of low quality and rarity on a regional or national scale.	The receiving environment or receptor has a moderate natural resilience to imposed stresses.
Low	An attribute of low quality and rarity on a local scale with potential for substitution locally.	The receiving environment or receptor has a high natural resilience to imposed stresses.

1.8.2. Identifying the Magnitude of Environmental Effects

The magnitude of effect will be determined by taking into account several factors. This will vary per topic but may include one or several of the following:

- Intensity of change;
- Geographic extent of change;
- Duration of change; and
- Frequency.

It is proposed that probability is not considered as part of the criteria for the prediction of effects. Probability will be considered only when assessing hazard analysis of malfunctions/accidents, which will be addressed separately in the ESIA.

1.8.3. Evaluating the Significance of Environmental Impacts

Impact significance will be determined by consideration of the importance/sensitivity of the receptor in combination with the magnitude of the effect. Table 6 demonstrates how these parameters are considered in the assessment of significance.

Table 6: Determination of significance of impact

		Magnitude of Impact			
		High	Medium	Low	Negligible
Receptor Sensitivity or Importance	Very High	Major	Major	Moderate	Minor
	High	Major	Moderate	Minor	Negligible
	Medium	Moderate	Minor	Minor	Negligible
	Low	Minor	Minor	Negligible	Negligible

Predicted significance of impacts will be classified according to whether they are considered to be Major, Moderate, Minor or Negligible; and Beneficial, Adverse or Neutral. Significance criteria will be specific to each environmental and social topic and will be defined in the impact assessment using a combination of environmental standards, guidance and professional judgement.

1.8.4. Evaluating the Significance of Social Impacts

The evaluation of social impacts will differ from the evaluation of environmental impacts. The significance of a social impact will not depend on a characterization of the magnitude of the effect and the definition of sensitivity or importance. Most social impacts will not be evaluated in the same quantitative way that can be applied to physical and biological impacts. Evaluation of social impacts will rely on a narrative which will bring together the evaluation of the following four criteria to reach a conclusion for the overall social impact:

- Direction, i.e.
 - Positive direction– impact provides a net benefit to the affected person(s);
 - Negative direction – impact results in a net loss to the affected persons(s); and
 - Mixed direction – mixed directions or no net benefit or loss to the effected person(s);
- Consequence, i.e.
 - Negligible consequence – no noticeable change anticipated;
 - Low consequence – predicted to be different from baseline conditions, but not to change quality of life of the affected person(s);
 - Moderate consequence – predicted to change the quality of life of the affected person(s); and
 - High consequence – predicted to seriously change quality of life;
- Geographic extent of change; and
- Duration.

Each impact will be considered in relation to other impact topics and sub-topics. The objective of the narrative in the evaluation of social impacts is to show the relative importance of social impacts.

1.8.5. Incorporated Environmental and Social Measures

Incorporated environmental and social measures, and industry proactive mitigation / management, are those measures that have been incorporated into the design of the Project. These may include:

- Design changes undertaken to remove or minimise effects that are not considered to be mitigation in terms of ESIA; and
- Good operational practice or construction.

The impact assessment will be undertaken assuming that the above are applied as an integral element of the Project design; and these measures will be set out clearly within the ESMP.

1.8.6. Mitigation of Impacts

Additional measures will be committed to if, as a result of the ESIA, mitigation is required. Mitigation will be identified in accordance with a hierarchy of options in accordance with good practice and comply with IFC Performance Standards.

- Avoid - making changes to the Project's design or location to avoid adverse effects on an environmental feature or adverse social impacts.
- Minimize - reduction of adverse effects through sensitive environmental treatments/design, or different project design to reduce adverse social impacts.
- Restore - measures taken during or after construction to repair/reinstate and return a site to the situation prior to occurrence of impacts.
- Compensate/offset - where avoidance or reduction measures are not available, it may be appropriate to provide compensatory/offsetting measures. Compensatory measures do not eliminate the original adverse effect; they merely seek to offset it with a comparable positive one.
- Improvement measures - projects can have positive effects as well as negative ones, and the Project preparation stage presents an opportunity to enhance these positive features through innovative design.

1.8.7. Identification of Residual Impacts

Residual impacts are those that remain following the implementation of the proposed mitigation. These will be identified for each of the specialist topics by reviewing the predicted impacts against the mitigation measure proposed and then identifying any residual impacts. Residual impacts will be defined based on the same process applied to the evaluation of impacts.

1.9. Project Justification

The establishment of Victory Farms Headquarter in Homa Hills is justified by the growing demand for fish and fish seed, declining capture fisheries, and the need to strengthen local aquaculture production systems. By improving pond infrastructure, hatchery, cold storage, expanded storage capacity, water reliability and closer administrative function closer to sites of operation, the project will enhance productivity while minimizing environmental and social risks.

The project will contribute to local economic development, food and nutrition security, and employment creation, while promoting sustainable use of land and water resources. Adoption of effective biosecurity and occupational health and safety measures will further ensure long-term operational sustainability and regulatory compliance.

1.10. Project Estimated Cost

The proposed project is estimated to cost approximately KES. 1,500,000,000 (One and a Half Billion Kenya Shillings Only) – encompassing construction, procurement, and other related activities necessary for successful implementation. A detailed Bill of Quantities (BoQ) outlining the cost breakdown is provided in the report annexure.

2. CHAPTER TWO: DESCRIPTION OF THE PROJECT

2.1. Brief Overview

Victory Farms Limited is a duly incorporated private company under the Companies Act, Cap 486 of the Laws of Kenya³ with an established mandate to undertake fishery and aquaculture production within the Lake Region and nationwide. The Company operates as a legally recognized corporate entity engaged in the development of integrated aquaculture systems, value chain optimization, and fisheries-based enterprise growth. In compliance with the EMCA, Cap 387 of the Laws of Kenya⁴, and its subsidiary legislation, the Proponent commissioned Lakers Consultancy Limited, through a Registered and Licensed NEMA Lead Expert, to undertake a comprehensive ESIA FSR for the proposed headquarters development.

The primary objective of the project is to relocate and establish Victory Farms's corporate headquarters from Nairobi to Kanam "B" Location, West Karachuonyo Sub-County, Homabay County.



Plate 1: Homa Hills offices, Kanam "B" Location, West Karachuonyo, Homabay County

The proposed relocation of Victory Farms's headquarters from Nairobi to Kanam in the Lake Region is driven by strategic, operational, and economic considerations aimed at strengthening the company's efficiency, competitiveness, and long-term growth. Primarily, sitting the headquarters closer to the company's research and production facilities enhances operational coordination and decision-making. Currently, having the administrative, management, and logistics teams based in Nairobi creates a physical and operational disconnect from core production activities, potentially leading to delays in addressing production challenges, inefficiencies in supply chain management, and slower implementation of strategic initiatives. By relocating to Homa Hills, key decision-makers and operational staff will be in proximity to the production sites, enabling real-time oversight, faster problem resolution, and more effective integration of research outcomes into production processes.

Additionally, the proposed project aligns with national and global development priorities, including the Blue Economy Strategy and the Sustainable Development Goals (SDGs), by fostering responsible aquatic resource management and inclusive economic growth through science-based aquaculture innovations.

2.2. Construction Components and Activities

The construction and operational for Victory Farms Ltd Headquarter in Homa Hills will involve the following 6 primary components:

Table 7: Construction Components and Scope of Work

Project Component	Description / Scope of Work
Fish Ponds (50 units)	Construction of 50 aquaculture ponds of varying sizes to support large-scale tilapia production.
Fish Hatchery	Development of a modern hatchery to produce high-quality fingerlings for stocking the fish ponds.
Warehousing	Construction of industrial cold storage facilities and general storage warehouses.
Feed Mill	Establishment of a feed production facility for animal feed using locally sourced crops such as sunflowers and soya.
Victory Farms Corporate Headquarters (VF HQ)	Construction of an administrative and operational headquarters.
Staff Housing	Development of residential facilities for key project personnel and staff.

The 6 components of the project will have the below listed activities:

Table 8: Construction Components and Activities

#	Components	Activities
a	Construction and Preparation of Fish Ponds (50 Units) – The land-based ponds will be constructed according to design specifications, with appropriate slope, depth, and water retention features	- Excavation and embankment formation - Pond lining where applicable - Installation of inlet and outlet structures - Preparation of water circulation, aeration, and drainage systems - Inspection of pond integrity to ensure leak-free operation and suitability for stocking
b	Development of Fish Hatchery - A modern hatchery will be established to produce high-quality fingerlings for pond stocking.	- Construct hatchery units, including incubation and nursery tanks - Install water treatment, aeration, and temperature control systems - Management of broodstock and breeding operations - Health screening and quality assurance of fingerlings - Monitor hatchery production performance and record keeping
c	Construction of Warehousing Facilities – Industrial storage infrastructure will be developed to support farm operations.	- Construct cold storage warehouses for harvested fish - Construct general storage warehouses for feed, equipment, and supplies - Install refrigeration systems, shelving, and inventory management tools - Security and access control system installation
d	Establishment of Feed Mill - A feed production facility will be developed to produce high-quality animal feed from locally sourced crops such as sunflowers and soya.	- Construction of feed mill buildings and processing areas - Installation of grinders, mixers, pelletizers, and storage silos - Laboratory setup for feed quality control and nutrient analysis - Staff training in feed formulation, production, and safety protocols
e	Construction of Victory Farms Corporate Headquarters (VF HQ) - An administrative and operational headquarters will be constructed to support corporate and farm management.	- Construct office spaces, meeting rooms, and operational control centres - Install IT infrastructure and communication networks - Provide staff amenities such as canteens and conference facilities - Landscaping and parking facility development
f	Development of Staff Housing - Residential facilities will be constructed to accommodate key project personnel and staff.	- Construction of housing units, apartments, or dormitories based on staffing needs - Provision of water, electricity, and sanitation infrastructure - Landscaping, recreation areas, and security arrangements
g	Ongoing Farm and Pond Management – Post-construction operations will ensure sustainable aquaculture practices.	- Regular monitoring of pond water quality (temperature, dissolved oxygen, pH, ammonia) - Feeding, disease surveillance, and growth tracking of fish - Pond maintenance including cleaning, aeration management, and repairs

2.3. Project Location

The project entails the relocation and establishment of Victory Farms's corporate headquarters from Nairobi to Land Parcel No. West Karachuonyo/Kanam "B"/1168 (100 acres) at Homa Hills, next to Doho Centre, Kanyango Sub-Location, Kanam "B" Location, West Karachuonyo Sub-County, Homabay County, along the shoreline of Lake Victoria within the Lake Victoria Basin (Lake Victoria Basin Commission, 2008). This Land Parcel (West Karachuonyo/Kanam "B"/1168), covers approximately 175 acres and is strategically positioned to enhance institutional proximity to research, hatchery, and production facilities within the Lake Basin. Victory Farms Ltd intends to utilise 100 acres of this parcel in this spatial realignment, to improve operational synergies, reduce logistical inefficiencies, strengthen real-time decision-making, and enhance oversight of production systems and environmental performance. Victory Farms Limited is a duly incorporated private company under the Companies Act, Cap 486 of the Laws of Kenya (Republic of Kenya, 2010), with an established mandate to undertake fishery and aquaculture production within the Lake Region and nationwide. The Company operates as a legally recognized corporate entity engaged in the development of integrated aquaculture systems, value chain optimization, and fisheries-based enterprise growth in compliance with the EMCA, Cap 387 of the Laws of Kenya⁴, and its subsidiary legislation.



Plate 2: Proposed Location of the project (current Homa Hills Offices)

Table 9: The GPS location of the proposed site is:

Point Within the Site	Latitude	Longitude:
A	-0.351504°S	34.469575°E.
B	-0.3537417°S	34.4673733°E.
C	-0.3537417°S	34.4673735°E.

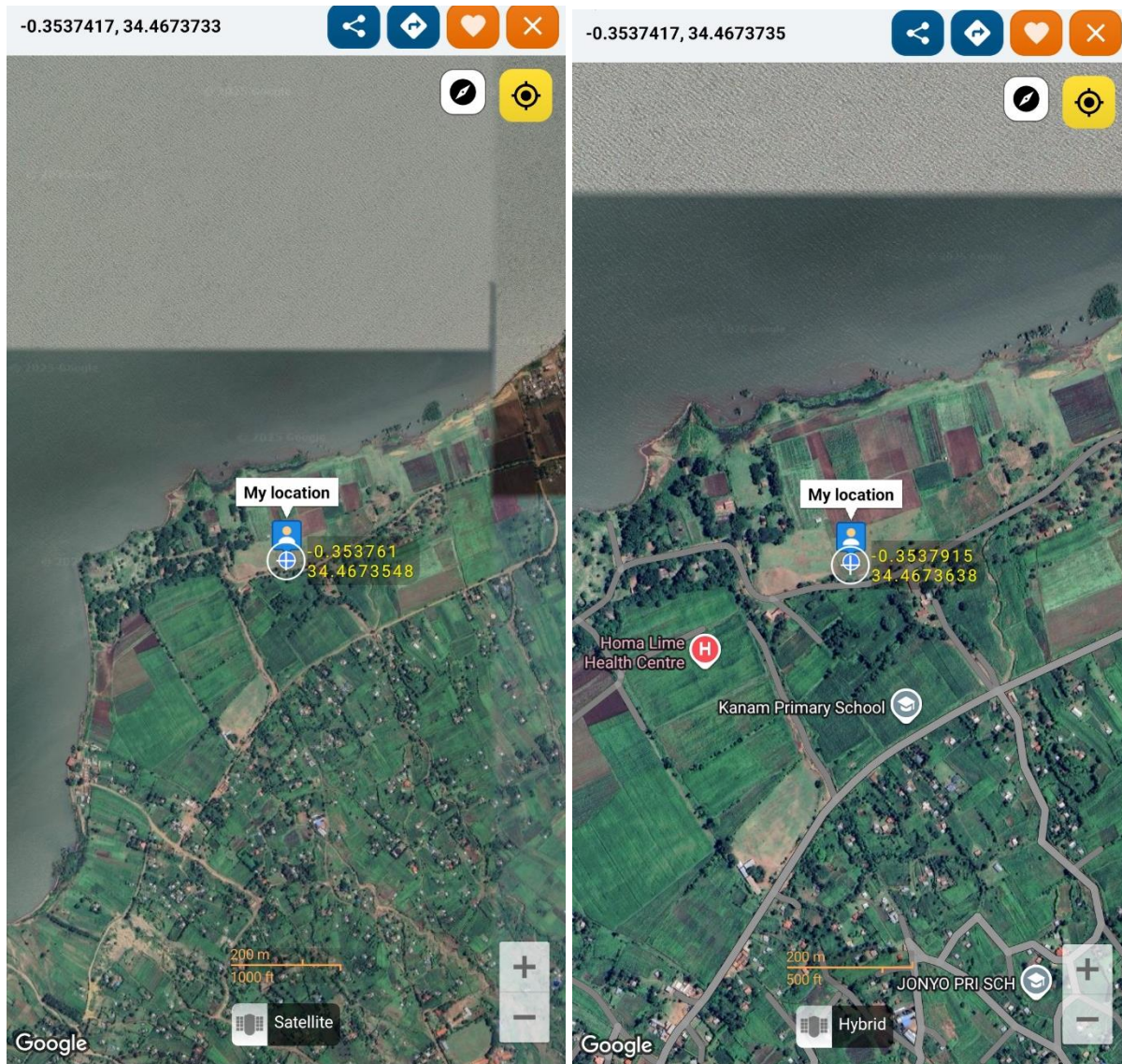


Plate 3: Proposed Homa Hills Site Location (Source: Google Map Extract-2026 Imagery)

2.4. Land Requirement and Ownership

This Parcel LR Number West Karachuonyo/Kanam “B”/1168 covers approximately 175 acres and is registered under the County Government of Homabay, in trust of Homa Hills Community. The proponent, Victory Farms Ltd, has leased out 100 acres out of this parcel from Homabay County Government for the purposes of its Headquarter relocation.





Plate 4: parts of the 100 acres - the proposed Project site

The leasing process for land in Kenya involves several critical stages designed to ensure transparency, legal compliance, and sustainable land management. Primarily, the process requires clearance from the Ministry of Lands, Housing and Urban Development through the Department of Survey, Planning, and Lands. This department is responsible for verifying land boundaries, confirming ownership status, and ensuring proper land use planning to prevent disputes and overlapping claims. These procedures are grounded in the legal and policy framework governing land administration in Kenya¹⁴.

Before this clearance proceeds, the National Land Commission (NLC) must first grant its approval. Established under the Constitution of Kenya, the NLC plays a central role in the management and administration of public land on behalf of both national and county governments (Constitution of Kenya, 2010). Its mandate includes ensuring that land leasing processes comply with constitutional principles such as transparency, equity, and sustainable land use¹⁵.

Once the NLC grants clearance, the Ministry of Lands undertakes the technical and administrative procedures necessary to finalize the lease. These include preparation of lease documents, surveying and planning approvals, registration under the applicable land registration regime, and eventual issuance of the lease certificate. This structured, multi-step approach promotes accountability, minimizes potential conflicts, and safeguards the public interest by ensuring that land leases are allocated transparently and in accordance with established legal frameworks^{15, 14}.

¹⁴ Ministry of Lands, Housing and Urban Development (MLHUD). (2016). *Land laws and regulations*. Government of Kenya.

¹⁵ National Land Commission (NLC). (2012). *National Land Commission Act, No. 5 of 2012*. Government of Kenya.



Plate 5: Project Location Site (Google Map Extract)

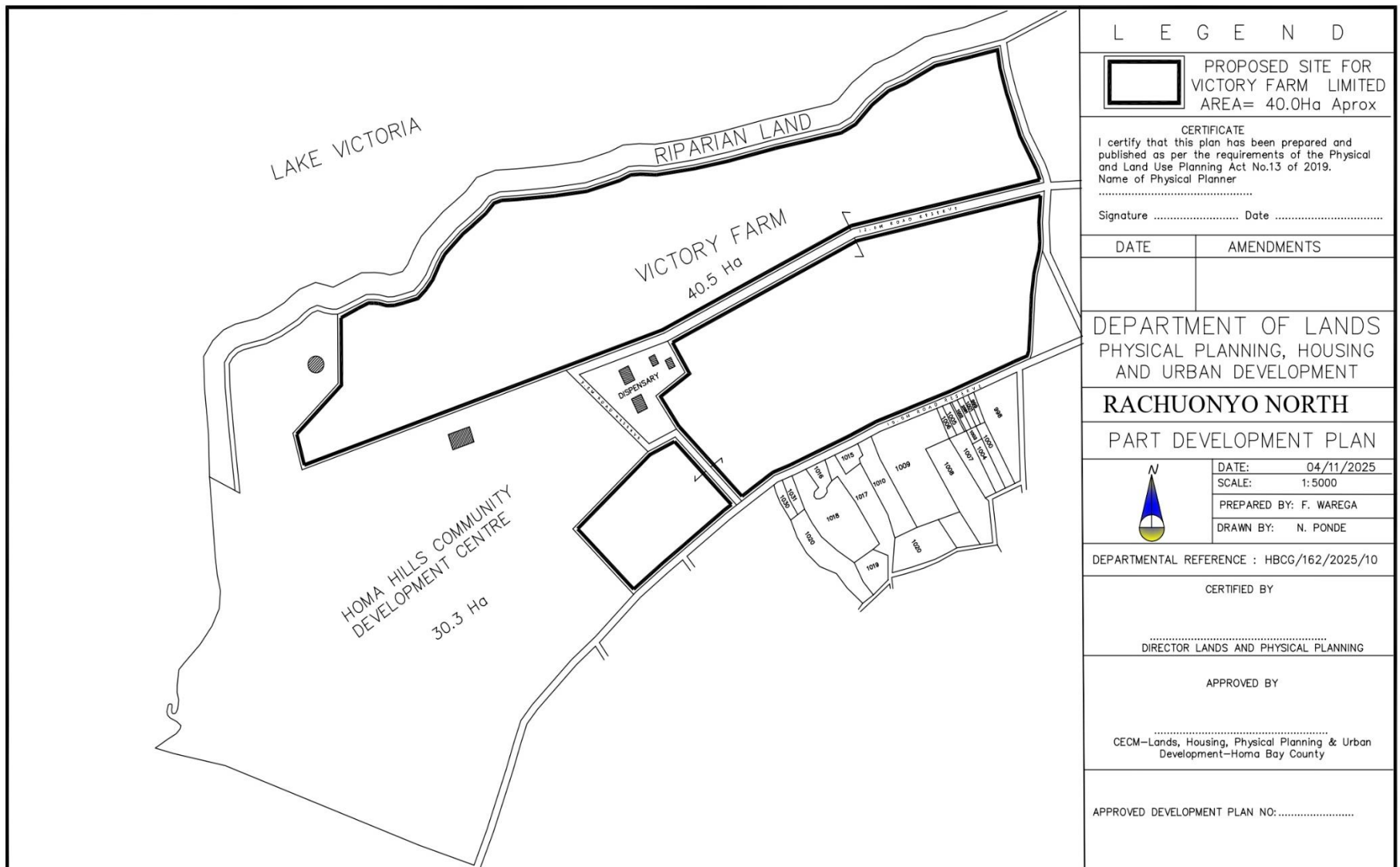


Figure 2: Proposed Project Layout Design

2.5. Decommissioning

The decommissioning of the Victory Farms Ltd Headquarter project—comprising 50 aquaculture ponds, a hatchery, warehouse, staff houses, sanitation facilities, cold storage units, and an animal feed mill—requires a structured and environmentally responsible approach. Decommissioning refers to the safe closure, dismantling, and rehabilitation of project infrastructure at the end of its operational life to minimize environmental, social, and economic impacts¹⁶.

For the 50 ponds and hatchery, decommissioning involves draining water in a controlled manner to prevent downstream pollution, removal of accumulated sludge, and proper disposal of organic waste to avoid eutrophication and disease spread. Sediment testing should be conducted to determine contamination levels before land restoration or repurposing. The feed mill and cold storage facilities require safe dismantling of machinery, proper handling of oils, fuels, and refrigerants, and disposal in accordance with hazardous waste management standards¹⁷. Refrigerants must be recovered to prevent ozone depletion and greenhouse gas emissions.

Warehouse structures and staff houses should be assessed for reusable materials. Salvageable materials can be recycled, while non-recyclable debris must be disposed of at licensed waste disposal sites. Sanitation facilities require careful de-sludging and closure of septic systems to prevent groundwater contamination. All demolition activities should adhere to occupational health and safety standards to protect workers and nearby communities¹⁶.

Environmental restoration is a key component of the decommissioning phase. This may include re-vegetation of cleared areas, soil stabilization, and rehabilitation of disturbed land to restore ecological balance. Additionally, stakeholder engagement, including consultations with employees and local communities, is essential to address socio-economic impacts such as job losses and land-use transition.

A comprehensive Decommissioning Plan approved by relevant authorities ensures regulatory compliance, environmental protection, and sustainable land management.

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¹⁶ International Finance Corporation (IFC). (2007). *Environmental, health, and safety guidelines*. World Bank Group.

¹⁷ National Environment Management Authority (NEMA). (2019). Environmental management and coordination regulations. Government of Kenya.

3. CHAPTER THREE: POLICY, LEGAL, REGULATORY AND ADMINISTRATIVE FRAMEWORK

3.1. Introduction

This section provides a comprehensive review of the legal, legislative, regulatory and policy frameworks, both regional and national, applicable to the proposed Victory Farms Ltd Headquarter Project comprising 50 fish ponds, a hatchery, warehouse, staff houses, sanitation facilities, cold storage units, and an animal feed mill in Kanam B, West Karachuonyo, Homabay County. As an integrated aquaculture and agro-processing development located within the Lake Victoria Basin, the project is subject to a range of environmental governance, fisheries management, land use, and sustainable development policies and regulations. These instruments collectively guide environmental planning, resource utilization, pollution control, occupational safety, public participation, and socio-economic inclusion. Compliance with these frameworks is fundamental to the ESIA FSR and ensures that project implementation aligns with national development goals, ecosystem protection requirements, and community interests.

3.2. The policy framework

3.2.1. Constitution of Kenya (2010)

The Constitution of Kenya (2010) is the supreme law and provides the overarching legal foundation for environmental management and sustainable development. Article 42 guarantees every person the right to a clean and healthy environment, including the right to have the environment protected for the benefit of present and future generations. Article 69 obligates the State to ensure sustainable exploitation, utilization, management, and conservation of the environment and natural resources while encouraging public participation in environmental decision-making. Article 10 entrenches national values such as sustainable development, equity, inclusiveness, transparency, and accountability, all of which are central to environmental governance.

The Constitution also establishes devolved governance, assigning counties responsibilities over agriculture, fisheries development, public health, and county planning. This is particularly relevant in Homabay County, where aquaculture development intersects with land use planning, water resource management, and community livelihoods¹⁸.

Relevance to the Proposed Project

For the Victory Farms Ltd project, constitutional provisions require meaningful stakeholder engagement with communities in Kanam B, equitable access to employment opportunities, and protection of water, soil, and biodiversity resources. The ESIA process ensures compliance with Articles 42 and 69 by identifying potential impacts from pond effluent discharge, feed mill emissions, solid waste generation, and sanitation systems, and prescribing mitigation and monitoring measures.

3.2.2. Lake Victoria Fisheries Organization Strategic Plan (2016–2020)

The Lake Victoria Fisheries Organization (LVFO), an institution of the East African Community (EAC), coordinates sustainable fisheries and aquaculture management among Kenya, Uganda, and Tanzania. The LVFO Strategic Plan (2016–2020) emphasizes ecosystem-based fisheries management, reduction of

¹⁸ Constitution of Kenya. (2010). The Constitution of Kenya, 2010. Government of Kenya.

overreliance on capture fisheries, strengthening aquaculture as a complementary production system, harmonization of regional standards, and protection of the Lake Victoria ecosystem¹⁹.

The plan promotes research, disease surveillance, water quality monitoring, and responsible aquaculture practices to prevent environmental degradation. It also supports value chain development, including fish processing and cold storage infrastructure, to enhance food security and regional trade.

Relevance to the Proposed Project

The proposed 50 ponds, hatchery, and cold storage facilities fall within the Lake Victoria catchment area. Compliance with LVFO principles ensures sustainable abstraction and discharge of water, implementation of biosecurity measures in hatchery operations, and control of nutrient runoff to prevent eutrophication. The integrated feed mill also supports regional objectives of strengthening aquaculture value chains while reducing pressure on wild fish stocks.

3.2.3. Kenya Vision 2030

Kenya Vision 2030 is the country's long-term development blueprint aimed at transforming Kenya into a newly industrialized, middle-income country. It is anchored on three pillars: Economic, Social, and Political²⁰. The Economic Pillar prioritizes agriculture modernization, manufacturing, and blue economy investments. The Social Pillar emphasizes environmental conservation, food security, and equitable access to employment opportunities.

Vision 2030 promotes sustainable use of natural resources, adoption of environmentally sound technologies, and private sector participation in agro-industrial investments. The blue economy agenda under Vision 2030 recognizes aquaculture as a strategic subsector for economic growth and poverty reduction.

Relevance to the Proposed Project

The Victory Farms Ltd project contributes directly to Vision 2030 by enhancing fish production, generating employment in Homabay County, strengthening food and nutrition security, and promoting value addition through cold storage and feed milling. The project's design incorporates sustainable waste management and water conservation measures, aligning with Vision 2030's environmental sustainability objectives.

3.2.4. Kenya Aquaculture Development Strategy (2017–2022)

This Strategy provides a structured roadmap for accelerating aquaculture growth while ensuring environmental sustainability. The strategy promotes improved fish genetics, high-quality feed production, adoption of best management practices, disease control systems, and regulatory compliance. It underscores the importance of conducting EIAs and implementing ESMPs for aquaculture investments.

Additionally, the strategy emphasizes capacity building for farmers, strengthening extension services, improving hatchery standards, and enhancing market linkages. It recognizes aquaculture as a key contributor to employment, rural development, and food security.

Relevance to the Proposed Project

¹⁹ Lake Victoria Fisheries Organization (LVFO). (2016). *Strategic Plan 2016–2020*. EAC Secretariat.

²⁰ Government of Kenya. (2008). *Kenya Vision 2030*. Government Printer.

The integrated hatchery, 50 ponds, and animal feed mill directly align with the Strategy's objectives of improving fish seed quality, promoting local feed production, and increasing productivity. By incorporating biosecurity protocols, water quality monitoring, and waste management systems, the project demonstrates adherence to sustainable aquaculture standards and national regulatory requirements.

3.2.5. National Environment Policy (2014)

This policy provides guidance for integrated environmental planning, conservation of terrestrial and aquatic ecosystems, pollution prevention, climate resilience, and enforcement of EIA requirements. It promotes the use of environmental management tools such as EIAs, Strategic Environmental Assessments, economic incentives, and sustainability indicators²¹.

The policy recognizes the importance of protecting water bodies, managing waste effectively, and ensuring sustainable agricultural and aquaculture practices that do not compromise ecosystem integrity.

Relevance to the Proposed Project

The ESIA for the Victory Farms Ltd Headquarter Project reflects compliance with the National Environment Policy by incorporating effluent management systems for ponds, solid and hazardous waste handling protocols for the feed mill and cold storage units, proper sanitation infrastructure, and land rehabilitation measures. These interventions safeguard the ecological integrity of Kanam B and the broader Lake Victoria Basin while promoting sustainable development.

3.3. Legal and Regulatory Framework

3.3.1. Environmental Management and Co-ordination Act, Cap 387

The EMCA, Cap 387, is Kenya's framework environmental law and provides the legal basis for environmental planning, protection, and enforcement. It establishes the NEMA as the principal regulatory authority mandated to exercise general supervision and coordination over all matters relating to the environment. EMCA operationalizes the constitutional right to a clean and healthy environment by embedding principles such as sustainable development, precautionary principle, polluter-pays principle, intergenerational equity, and public participation (EMCA, 1999).

Section 58 of EMCA requires that projects listed under the Second Schedule—including aquaculture farms, fish processing facilities, feed mills, cold storage plants, and large-scale agricultural developments—undergo EIA prior to implementation. The proponent must submit a comprehensive ESIA report to NEMA for review and obtain an EIA licence before commencement. Section 68 further mandates periodic environmental audits to verify compliance with approved ESMPs. EMCA also provides for environmental restoration orders, improvement notices, and penalties for non-compliance.

Project Requirements:

- Submission of a full ESIA report to NEMA for review and issuance of an EIA licence before any construction or aquaculture activity;
- Development of an ESMP covering ponds, hatchery, feed mill, cold storage, staff houses, and sanitation facilities;
- Periodic environmental audits as per EMCA Section 68 to monitor compliance during operations;

²¹ Ministry of Environment and Natural Resources. (2014). *National Environment Policy 2014*. Government of Kenya.

- Implementation of mitigation measures for effluent discharge, solid and hazardous waste, and air/noise emissions.

Relevance to the Proposed Project

The Victory Farms Ltd Headquarter Project in Kanam B, West Karachuonyo, qualifies as a high-impact integrated aquaculture and agro-industrial development. The 50 ponds, hatchery operations, feed mill, cold storage units, staff housing, and sanitation infrastructure may generate effluent, solid waste, air emissions, and noise. EMCA provides the statutory foundation requiring impact identification, mitigation planning, environmental monitoring, and periodic auditing to ensure long-term environmental sustainability within the Lake Victoria Basin.

3.3.2. Relevant Regulations under EMCA Cap 387

3.3.2.1. Environmental (Impact Assessment and Audit) Regulations

These Regulations outline procedural requirements for conducting EIAs and environmental audits. They prescribe screening, scoping, preparation of Terms of Reference, baseline data collection, impact prediction, public consultation, report submission, expert registration, and licensing procedures. They also require annual environmental audits for operational facilities and submission of audit reports to NEMA.

Project Requirements:

- Provide procedural requirements for EIAs, including scoping, public consultation, and submission to NEMA.

Project Requirements:

- Conduct baseline studies for water, soil, biodiversity, and socio-economic parameters;
- Facilitate public participation in Kanam B to identify community concerns;
- Conduct annual audits of operational facilities, including feed mill and cold storage units.

Relevance to the Proposed Project

For the Victory Farms Ltd project, these Regulations guide stakeholder engagement in Kanam B, preparation of a full ESIA study, and structured impact assessment covering hydrology, biodiversity, socio-economics, public health, and occupational safety. They also require annual audits of pond operations, feed milling emissions, and waste management systems to ensure continued compliance.

3.3.2.2. Environmental Management and Coordination (Water Quality) Regulations

These Regulations establish water quality standards for surface water, groundwater, and effluent discharge. They require effluent discharge licensing, routine water quality monitoring, and protection of riparian zones. Standards are provided for parameters such as Biological Oxygen Demand (BOD), Chemical Oxygen Demand (COD), pH, nutrients, and suspended solids.

Project Requirements:

- Establish standards for effluent discharge, surface and groundwater protection.

Project Requirements:

- Obtain water abstraction and discharge permits from WRA;
- Install sedimentation and treatment ponds for fish pond effluent;
- Maintain riparian buffers around water bodies;

- Monitor water quality parameters (BOD, COD, pH, nutrients) regularly.

Relevance to the Proposed Project

The 50 ponds and hatchery will generate nutrient-rich effluent and sludge. Compliance requires installation of sedimentation ponds, controlled drainage systems, and regular monitoring to prevent contamination of local streams and the Lake Victoria catchment. Abstraction and discharge activities must be licensed and monitored to protect aquatic ecosystems and downstream users.

3.3.2.3. Environmental Management and Coordination (Waste Management) Regulations

These Regulations govern classification, handling, storage, transportation, recycling, and disposal of solid and hazardous waste. They require waste segregation at source, use of licensed waste handlers, and proper documentation.

Project Requirements:

- Govern handling, storage, transport, and disposal of waste.
Project Requirements:
- Develop a Waste Management Plan (WMP) addressing pond sludge, fish mortalities, feed residues, packaging, and hazardous waste;
- Segregate and label waste streams using color-coded bins;
- Contract licensed waste handlers for hazardous material disposal.

Relevance to the Proposed Project

Waste streams may include pond sludge, fish mortalities, packaging materials, feed residues, used oils, and refrigeration waste. The project must implement a waste management plan incorporating composting of organic waste, safe disposal of non-recyclables, and licensed handling of hazardous materials to prevent soil and groundwater contamination.

3.3.2.4. Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Regulations

These Regulations prescribe permissible noise levels for residential, commercial, and industrial zones and require noise permits during construction. They also mandate protective measures for workers.

Project Requirements:

- Prescribe limits for noise and vibration, including during construction.
Project Requirements:
- Use silencers on milling equipment;
- Schedule construction and milling activities during permitted hours;
- Provide Personal Protective Equipment (PPE) and hearing protection for workers.

Relevance to the Proposed Project

Feed milling machinery, generators, transport trucks, and construction activities may generate significant noise. The project must install silencers, schedule noisy operations during permitted hours, and provide PPE to workers to safeguard occupational health and community wellbeing.

3.3.2.5. Environmental Management and Coordination (Air Quality) Regulations

These Regulations regulate emissions from stationary and mobile sources, including particulate matter, dust, combustion gases, and industrial emissions. Facilities must control emissions and conduct periodic monitoring.

Project Requirements:

- Regulate emissions from stationary and mobile sources.
- Project Requirements:
- Install dust collection systems at the feed mill;
 - Use emission controls for generators and refrigeration systems;
 - Conduct air quality monitoring during operational phases.

Relevance to the Proposed Project

The feed mill may emit dust and particulate matter, while generators and refrigeration systems may emit combustion gases. Installation of dust extraction systems, proper ventilation, and emission monitoring will ensure compliance and protect air quality in Kanam B.

3.3.3. Fisheries Management and Development Act (No. 35 of 2016)

The Fisheries Management and Development Act, 2016 establishes the legal and institutional framework for sustainable management and development of both inland and marine fisheries in Kenya. It integrates constitutional environmental principles, international fisheries management obligations, and ecosystem-based management strategies. The Act mandates the establishment of Kenya Fisheries Service (KeFS), which regulates licensing, biosecurity, monitoring, and inspection of aquaculture operations. Key provisions include mandatory licensing, environmental safeguards, technical compliance, disease control, and sustainable use of fish resources. The Act also encourages aquaculture investment to reduce pressure on wild fish stocks, contribute to food security, promote employment, and stimulate local economic growth²².

Project Requirements:

- Obtain KeFS licenses for all 50 ponds and hatchery operations;
- Implement biosecurity protocols to prevent disease outbreaks;
- Adhere to stocking limits, water use restrictions, and monitoring requirements;
- Submit to regular inspections and audits by KeFS.

Relevance to the Proposed Project

The Victory Farms Ltd project, with its 50 ponds, hatchery, feed mill, and ancillary infrastructure, falls under Part VI of this Act. The proponent must obtain aquaculture licenses for pond operations, ensure biosecurity, adhere to stocking limits, and implement disease prevention measures. Routine inspections by KeFS will monitor compliance. This ensures sustainable aquaculture practices that protect Lake Victoria's aquatic ecosystems while boosting fish production and local livelihoods in West Karachuonyo.

²² Fisheries Management and Development (Aquaculture) Regulations, Legal Notice 126 of 2024. Laws of Kenya. Government Printer.

3.3.4. Water (Amendment) Act (No. 13 of 2024)

The Water (Amendment) Act, 2024 strengthens water governance in Kenya, aligning with Integrated Water Resource Management (IWRM) and climate adaptation strategies. It emphasizes sustainable, equitable, and efficient use of water for domestic, industrial, agricultural, and ecological needs. The Act mandates permit for water abstraction, prohibits contamination of surface and groundwater, enforces riparian buffer protection, and requires stakeholder engagement in water management decisions. Water use licenses are issued and monitored by the Water Resources Authority (WRA).

Project Requirements:

- Obtain water use permits from WRA for hatchery, ponds, feed mill, and cooling systems;
- Implement wastewater treatment to prevent nutrient/chemical discharge;
- Maintain riparian buffer zones;
- Employ water-efficient and climate-resilient practices, including rainwater harvesting.

Relevance to the Proposed Project

The project's ponds, hatchery, feed mill, and cooling systems require significant water use. Compliance involves obtaining water abstraction permits, implementing wastewater treatment to prevent nutrient or chemical discharge into Lake Victoria, and maintaining riparian buffers. Water-efficient practices, rainwater harvesting, and monitoring water quality ensure sustainability, regulatory compliance, and protection of the local hydrology.

3.3.5. Sustainable Waste Management Act, 2024

This Act provides a framework for sustainable handling, segregation, recycling, and disposal of waste in Kenya. It requires that all public and private entities segregate non-hazardous waste into organic and inorganic fractions using labelled and color-coded containers. Hazardous waste, such as used oils or chemical residues, must be managed in compliance with EMCA Cap 387. The Act also promotes circular economy practices, pollution reduction, and public health protection²³.

Project Requirements:

- Develop a comprehensive Waste Management Plan (WMP);
- Segregate waste into organic and inorganic fractions;
- Ensure safe disposal of hazardous waste from feed mill, cold storage, and pond operations;
- Explore composting of organic residues from ponds and feed production.

Relevance to the Proposed Project

The Victory Farms Ltd project generates various waste streams: pond sludge, fish mortalities, feed residues, packaging waste, and refrigeration-related chemicals. Implementing a Waste Management Plan (WMP) ensures segregation, composting of organic matter, safe disposal of hazardous materials, and recycling where possible. Compliance mitigates environmental pollution and supports public health in Kanam B.

²³ Sustainable Waste Management Act. (2024). Laws of Kenya. Government Printer.

3.3.6. Physical and Land Use Planning Act, 2019

The Physical and Land Use Planning Act, 2019 provides legal mechanisms for spatial planning, land-use regulation, and development control within counties. It ensures orderly development, protection of public infrastructure, environmental conservation, and community participation. No development may commence without formal approval from the County Executive Committee (CEC) responsible for planning²⁴.

Project Requirements:

- Secure development permits from Homabay County for ponds, feed mill, hatchery, staff housing, cold storage, and warehouses;
- Conduct site surveys to prevent encroachment on environmentally sensitive zones;
- Ensure compliance with zoning and CIDP plans;
- Facilitate public participation during planning approvals.

Relevance to the Proposed Project

The Victory Farms Ltd project requires multiple structures, including ponds, staff housing, hatchery, feed mill, and storage facilities. Securing development permits ensures compliance with zoning regulations, minimizes land use conflicts, preserves riparian areas, and aligns the project with Homabay County's spatial plans. It also ensures public safety, organized infrastructure, and adherence to sustainable land management principles.

3.3.7. Occupational Safety and Health Act, 2007

OSHA, 2007, ensures safe and healthy working conditions across workplaces. It mandates hazard identification, risk assessment, provision of PPE, occupational hygiene, safe handling of chemicals, and appointment of safety officers. Employers must also provide sanitation, clean drinking water, emergency response plans, and ongoing safety training.

Project Requirements:

- Provide PPE for pond construction, feed mill operations, and cold storage maintenance;
- Appoint a Safety Officer to oversee occupational hazards;
- Conduct regular safety training and health checks;
- Maintain sanitation and emergency response facilities.

Relevance to the Proposed Project

Construction of ponds, staff houses, and feed mill facilities involves machinery, chemicals, and wet environments. OSHA compliance ensures protective clothing, emergency response protocols, regular health checks, and occupational safety monitoring, reducing workplace accidents and safeguarding employee health.

3.3.8. Public Health Act (Cap 242)

The Public Health Act safeguards public health by addressing environmental nuisances, sanitation, disease prevention, and pollution control. It requires proper sanitation systems, drainage, and waste disposal to prevent disease outbreaks and maintain environmental hygiene.

²⁴ Physical and Land Use Planning Act. (2019). Laws of Kenya. Government Printer.

Project Requirements:

- Install sanitation facilities for staff houses and operational areas;
- Implement drainage and pond effluent management;
- Monitor waterborne disease risks;
- Ensure hygienic handling of fish and feed.

Relevance to the Proposed Project

The project's sanitation facilities, drainage systems, and staff housing must adhere to Public Health Act standards. Proper sewage treatment, hygienic staff housing, and pond waste management reduce risks of waterborne diseases, protect worker and community health, and ensure regulatory compliance.

3.3.9. Climate Change (Amendment) Act, 2023

This Act strengthens climate adaptation and mitigation in line with Kenya's Nationally Determined Contributions (NDCs) under the Paris Agreement. It promotes climate-resilient infrastructure, ecosystem protection, and integration of climate considerations in all development sectors.

Project Requirements:

- Design climate-resilient ponds and hatchery infrastructure;
- Implement energy-efficient systems in cold storage and feed milling;
- Reduce reliance on wild fish stocks to support ecosystem resilience;
- Integrate flood and drought adaptation measures.

Relevance to the Proposed Project

The aquaculture project supports climate adaptation by reducing pressure on wild fisheries, using energy-efficient equipment, incorporating water conservation technologies, and designing infrastructure resilient to flooding, droughts, or lake-level fluctuations. These measures align with climate resilience goals in Homabay County⁷¹.

3.3.10. County Governments Act, 2012

This Act operationalizes devolution and empowers counties to regulate development, enforce environmental laws, and prepare County Integrated Development Plans (CIDPs). Counties oversee land use, building approvals, service delivery, and local infrastructure management²⁵.

Relevance to the Proposed Project

Victory Farms Ltd must coordinate with Homabay County for all permits, infrastructure approvals, and local environmental compliance. Adherence ensures alignment with county development goals, facilitates regulatory monitoring, and supports sustainable socio-economic growth.

Project Requirements:

- Coordinate with Homabay County for permits, inspections, and approvals;
- Align development with the County Integrated Development Plan (CIDP);
- Facilitate community engagement and local employment.

²⁵ County Governments Act. (2012). Laws of Kenya. Government Printer.

3.3.11. Employment (Amendment) Act, 2022

This Act defines minimum employment conditions, including fair wages, working hours, contracts, leave entitlements, prohibition of child labour, and fair termination procedures. It protects workers' rights and sets standards for employer obligations.

Project Requirements:

- Issue written contracts to all employees;
- Observe minimum wage, working hours, and leave entitlements;
- Prohibit child labour on site;
- Ensure equal pay for equal work;
- Maintain employment records for compliance audits.

Relevance to the Proposed Project

The project will employ construction and operational staff. Compliance ensures legal contracts, fair wages, equal pay, regulated working hours, maternity/paternity leave, and protection against child labour, fostering a safe and lawful workforce.

3.3.12. Work Injury Benefits Act (WIBA), 2007

WIBA provides compensation for work-related injuries, diseases, or deaths. Employers must maintain insurance coverage, report injuries promptly to DOSHS, and provide medical and disability compensation to affected workers.

Project Requirements:

- Ensure all staff have insurance coverage under WIBA;
- Report any workplace injury or incident to DOSHS;
- Provide medical, disability, and survivor compensation as mandated;
- Integrate safety protocols in pond construction, feed milling, and cold storage operations.

Relevance to the Proposed Project

Given the risks in pond construction, feed milling, and cold storage operations, employees will be insured under WIBA. This ensures compensation for medical treatment, temporary or permanent disability, and survivor benefits in the event of work-related incidents.

3.3.13. Land Act, 2012 (No. 6 of 2012)

The Land Act, 2012 establishes a framework for the governance, use, and management of all land in Kenya, including private, public, and community lands. The Act emphasizes sustainable utilization, equitable access, security of tenure, and protection of vulnerable land users. It provides guidelines for leases, transfers, acquisitions, and development rights on both public and private lands.

Requirements for the Project:

- Verification of land ownership and legal title for all parcels earmarked for aquaculture ponds, hatchery, feed mill, warehouses, and staff housing.
- Obtaining formal leases for public or government land, if any portion of the project falls on state land.
- Ensuring that land use does not infringe on community rights or customary land claims.

- Conducting land acquisition in a transparent, consultative manner to prevent disputes.

Relevance to the Proposed Project:

The Victory Farms Ltd project will involve extensive land use across multiple parcels. Compliance with the Land Act ensures that all ponds, warehouses, staff housing, and ancillary facilities are located on legally acquired or leased land. This avoids potential legal disputes with local landowners or communities, enhances social acceptability, and guarantees that land tenure is secure for long-term aquaculture operations.

3.3.14. Land Registration Act, 2012 (No. 3 of 2012)

The Land Registration Act regulates the formal registration of land under the Torrens or deeds system. It provides for verification of ownership, issuance of title deeds, registration of leases, and maintenance of land records in the official land registry.

Requirements for the Project:

- Conduct due diligence to confirm ownership and encumbrances on all project sites.
- Register leases or transfers of land with the Homabay County Land Registry.
- Ensure legal recognition of subdivisions or allocated land parcels for ponds, hatchery, staff housing, and ancillary structures.

Relevance to the Proposed Project:

Proper land registration guarantees that the project's ponds, warehouses, feed mill, and staff housing are legally recognized and protects the proponent from disputes over ownership. It also ensures that the land can be used for commercial aquaculture and associated infrastructure without risk of expropriation.

3.3.15. National Land Commission Act, 2012 (No. 5 of 2012)

The National Land Commission (NLC) manages public land on behalf of the national and county governments, advises on land policy, and resolves disputes involving public and community lands. The NLC must approve all leases or allocations of public land for commercial development.

Requirements for the Project:

- Obtain NLC approval for the use of any public land parcels.
- Ensure public participation and consultation during lease or acquisition processes.
- Conduct land audits where public or trust land is involved to verify compliance with legal standards.

Relevance to the Proposed Project:

If portions of the Victory Farms Ltd project area fall on public land, the NLC's approval is mandatory. Compliance ensures transparent land allocation, prevents future legal disputes, and aligns the project with national land policies supporting sustainable development.

3.3.16. Land Valuation and Compensation Regulations, 2017

These regulations standardize land valuation for acquisitions, leases, or compensation purposes. They ensure that landowners and communities receive fair value for land or improvements affected by development projects²⁶.

Requirements for the Project:

- Conduct professional land valuations for leased or acquired parcels.
- Provide fair and timely compensation for any affected property or community resources.
- Follow established procedures for negotiation and documentation of compensation agreements.

Relevance to the Proposed Project:

Valuation regulations protect both the proponent and affected communities. For Victory Farms Ltd, this ensures that compensation for any land or improvements affected by ponds, staff housing, warehouses, or feed mill construction is fair, minimizing conflicts and fostering goodwill with the local population.

3.3.17. Survey Act, Cap 299

The Survey Act governs the professional surveying and mapping of land. It requires that all parcels intended for development be accurately surveyed and boundaries clearly defined.

Requirements for the Project:

- Conduct a professional survey of all land parcels for ponds, hatchery, staff housing, and feed mill.
- Demarcate boundaries to prevent encroachment on neighbouring land or riparian zones.

Relevance to the Proposed Project:

Accurate surveying ensures proper pond layout, optimal use of land, and prevents disputes with neighbouring landowners. It also facilitates compliance with land registration and zoning requirements.

3.3.18. Trust Land Act, Cap 288

This Act regulates land held in trust by county governments on behalf of communities. Trustees must approve any lease or development on trust land²⁷.

Requirements for the Project:

- Obtain consent from county trust land trustees if any project area falls on trust land.
- Ensure community participation and alignment with local customary practices.

Relevance to the Proposed Project:

This is critical if the aquaculture ponds, staff housing, or feed mill are located on trust land in Kanam B. Proper approval prevents disputes, ensures social license to operate, and aligns with community interests.

²⁶ Valuation of Land Regulations. (2017). Laws of Kenya. Government Printer.

²⁷ Trust Land Act, Cap 288. Laws of Kenya. Government Printer.

3.3.19. Environmental Land-Use Requirements under EMCA Cap 387

EMCA mandates that land use projects, particularly near water bodies or ecologically sensitive areas, incorporate environmental safeguards. This includes protection of riparian zones, wetlands, floodplains, and prevention of soil erosion.

Requirements for the Project:

- Maintain a minimum 30-meter riparian buffer along Lake Victoria and streams.
- Avoid encroachment on wetlands or ecologically sensitive areas.
- Implement erosion control measures for ponds, embankments, and access roads.

Relevance to the Proposed Project:

Compliance ensures that aquaculture ponds, feed mill effluents, cold storage operations, and staff housing do not degrade Lake Victoria or surrounding ecosystems. Environmental safeguards reduce regulatory risk and enhance sustainability.

3.4. Social Risks Legislations

Social risk legislation in Kenya provides legal safeguards against negative social impacts such as gender-based violence, HIV/AIDS transmission, labour exploitation, child labour, discrimination, and unsafe work environments. For a project with significant workforce mobilization, construction, and community interaction like Victory Farms Ltd, adherence to these laws enhances social sustainability, protects human rights, and mitigates reputational, legal, and operational risks.

3.4.1. Sexual Offences Act, 2006

The Sexual Offences Act, 2006 provides a comprehensive legal framework for preventing, detecting, and punishing sexual offences in Kenya. The Act criminalizes rape, defilement, sexual harassment, exploitation, trafficking, and other gender-based violence acts. It sets stringent penalties for offenders and emphasizes protection of vulnerable groups, including women and minors. The law imposes obligations on employers and institutions to prevent sexual misconduct in workplaces, enforce reporting mechanisms, and protect complainants.

Relevance to the Proposed Project:

The Victory Farms Ltd project will attract a diverse workforce and engage with local communities in Kanam B. Without adequate safeguards, there is potential risk of sexual harassment, exploitation, or violence associated with sudden influx of workers, contractors, and external service providers. The proponent must implement a Sexual Harassment and Gender-Based Violence (GBV) Policy, grievance mechanisms, awareness training, and strict codes of conduct for all staff and contractors. This ensures compliance with the Act, protects project workers and community members, and reinforces a safe, inclusive working environment.

3.4.2. HIV/AIDS Prevention and Control Act (Act No. 14 of 2006, Revised 2012)

The HIV/AIDS Prevention and Control Act aims to prevent the spread of HIV/AIDS, protect the rights of infected persons, and eliminate stigma and discrimination. The Act mandates workplace policies for HIV/AIDS, confidentiality of HIV status, voluntary testing, and access to information and support services.

Discrimination based on HIV status is prohibited in employment, service provision, and community interactions.

Relevance to the Proposed Project:

The project's operations will create multiple social interactions among employees, contractors, and host communities in Homabay County, a region with historically high HIV prevalence rates. To align with the Act, Victory Farms Ltd should develop an HIV/AIDS Workplace Policy, provide education and counselling services for workers, ensure confidentiality of health information, and facilitate referrals to health services. Incorporating HIV/AIDS awareness into induction and training programs will protect workforce health and support community awareness efforts.

3.4.3. Employment (Amendment) Act, 2022

The Employment (Amendment) Act sets minimum standards for employment relationships, including written contracts, prohibition of forced labour, discrimination, equal pay for equal work, workplace safety, and regulation of working hours and leave entitlements. It explicitly prohibits discrimination based on gender, disability, religion, or HIV status and mandates anti-harassment measures²⁸.

Relevance to the Proposed Project:

With construction and operational phases requiring diverse labour forces for ponds, hatchery, mill, housing and cold storage construction, compliance with this Act ensures fair contracts, living wages, equal opportunities, and protection against discrimination. It also provides legal recourse for workers and establishes baseline labour protections to mitigate social risks.

3.4.4. Children's Act, 2001

The Children's Act prohibits child labour, exploitation, and any harmful work that endangers health or development. It requires proof of age and restricts children under 18 years from engaging in employment that interferes with schooling or poses safety risks.

Relevance to the Proposed Project:

Victory Farms Ltd must ensure that no contracted workers or indirect labour (e.g., casual workers) include persons under 18. Recruitment processes must require age verification, and policies should prohibit child labour in all project-related activities, including pond construction or maintenance.

3.4.5. Equal Opportunities Act, 2010

The Equal Opportunities Act prohibits discrimination based on gender, age, ethnicity, disability, religion, or social status. It promotes affirmative action where necessary to ensure equitable access to employment, goods, and services.

Relevance to the Proposed Project:

In recruitment for staff houses, warehouse, feed mill, and operational roles, Victory Farms Ltd must promote equal opportunity employment practices and ensure that recruitment, training, and workplace culture do not discriminate against women, persons with disabilities, or marginalized groups.

²⁸ Employment (Amendment) Act. (2022). Laws of Kenya. Government Printer.

3.4.6. National Cohesion and Integration Act, 2008

This Act promotes national unity and prohibits discrimination and segregation on ethnic, religious, or regional basis. It emphasizes conflict prevention, peaceful coexistence, and social integration.

Relevance to the Proposed Project:

Given the multi-ethnic composition of Homabay County and neighbouring regions, the proponent must implement policies and community engagement strategies that reinforce social cohesion, respect diversity, and prevent tensions linked to employment or land use.

3.4.7. Occupational Safety and Health Act, 2007

While OSHA is principally a workplace safety law, it contains provisions to prevent exposure to harmful agents, ensure welfare facilities, and protect employees' physical and psychological wellbeing. This contributes to social risk management by ensuring healthy workplaces and reducing disease transmission²⁹.

Relevance to the Proposed Project:

OHS compliance addresses risks such as exposure to chemicals in the feed mill, work fatigue, sanitation hazards, and communicable diseases. Dedicating resources to health plans, regular medical checks, and workplace safety further reduces social risk.

3.4.8. Public Health Act

The Public Health Act governs sanitation, disease control, waste management, and community health conditions. It empowers health officers to inspect workplaces and communal areas to prevent public health nuisances³⁰.

Relevance to the Proposed Project:

Sanitation facilities at staff houses, pond areas, hatchery, and processing units must meet standards to prevent communicable diseases. Proper waste disposal, water quality management, and hygiene programs will support public health and reduce community exposure to illness.

Table 10: Summary of Relevance – Social Risk Legislations

Legislation	Primary Social Risk Addressed	Relevance to Victory Farms Ltd Project
Sexual Offences Act (2006)	Gender-based violence	Requires policies, training, grievance mechanisms
HIV/AIDS Prevention & Control Act (2006/2012)	Transmission risk & discrimination	Requires workplace HIV/AIDS policy and awareness
Employment (Amendment) Act (2022)	Fair labour practices	Ensures legal contracts, non-discrimination
Children's Act (2001)	Child labour protection	Prohibits under-18 employment
Equal Opportunities Act (2010)	Equity & non-discrimination	Fair hiring and inclusive practices

²⁹ Occupational Safety and Health Act (OSHA). (2007). Laws of Kenya. Government Printer.

³⁰ Public Health Act, Cap 242. Laws of Kenya. Government Printer.

National Cohesion & Integration Act (2008)	Social harmony	Prevents exclusion and conflict
Occupational Safety and Health Act (2007)	Workplace health	Reduces occupational social risk
Public Health Act (Cap 242)	Community health	Ensures sanitation and disease prevention

3.5. Relevant Institutional Framework

Several government and regulatory institutions oversee environmental management, land use planning, water and sanitation services, fisheries, and occupational health—critical areas for the proposed Victory Farms Ltd Headquarter project. Compliance with these institutions ensures legal, social, and environmental accountability, while supporting sustainable project implementation.

3.5.1. National Environment Management Authority (NEMA)

NEMA, established under the EMCA, Cap 387, is the principal agency coordinating environmental matters in Kenya. Its functions include:

- Formulating and enforcing environmental policies, regulations, and standards;
- Supervising and approving EIs) and EAs;
- Monitoring environmental compliance; and
- Coordinating national and county-level environmental protection programs.

Relevance to the Proposed Project:

For Victory Farms Ltd, NEMA approval is mandatory before construction of the ponds, hatchery, warehouses, staff houses, and feed mill. NEMA will review the ESIA, monitor waste management, ensure compliance with water quality standards, and enforce environmental safeguards such as erosion control, chemical handling, and habitat protection³¹. Engaging NEMA early ensures all project components meet Kenya's environmental standards and facilitates ongoing audits during operations.

3.5.2. Kenya Fisheries Service (KeFS)

KeFS is responsible for sustainable management of fisheries resources under the Fisheries Management and Development Act, 2016 (No. 35 of 2016). Its responsibilities include³²:

- Licensing aquaculture operations;
- Monitoring fish health and biosecurity;
- Enforcing compliance with aquaculture regulations; and
- Promoting best practices and technical training for fish farmers.

Relevance to the Proposed Project:

The 50 ponds and hatchery require licensing and adherence to KeFS guidelines for water use, stocking densities, and disease control. The agency will ensure that aquaculture operations are environmentally

³¹ National Environment Management Authority (NEMA). (2023). *Environmental Management and Coordination Act (Cap 387) guidelines for EIA*. Nairobi, Kenya.

³² Fisheries Management and Development Act, No. 35 of 2016. Laws of Kenya. Government Printer.

sustainable, do not deplete Lake Victoria fish stocks, and meet biosecurity and fish welfare standards. Continuous coordination with KeFS is vital during construction, stocking, and operational phases.

3.5.3. Ministry of Agriculture and Livestock Development (MoALD)

MoALD formulates policies, technical standards, and development strategies for agriculture, livestock, and aquaculture. It provides guidance on:

- Sustainable fish production;
- Biosecurity, disease control, and feed standards; and
- Climate-smart aquaculture under Kenya Climate Smart Agriculture Strategy.

Relevance to the Proposed Project:

MoALD will advise on pond design, feed mill operations, hatchery best practices, and disease management. The Ministry ensures that the project contributes to national food security, economic development, and employment creation, aligning with Kenya Vision 2030 and climate-smart strategies³³.

3.5.4. County Government of Homabay

The County Government oversees land use, licensing, development approvals, and public participation within its jurisdiction. Responsibilities include:

- Implementing CIDPs;
- Approving building plans, zoning, and local development permits;
- Facilitating community consultations; and
- Integrating environmental considerations into local development approvals.

Relevance to the Proposed Project:

Victory Farms Ltd must secure approvals for staff houses, warehouses, cold storage facilities, and other structures. County oversight ensures that the project aligns with local spatial plans, contributes to community employment, and adheres to social safeguards³⁴.

3.5.5. Kenya Maritime Authority (KMA)

KMA regulates and oversees maritime activities, including inland waters like Lake Victoria. Key functions include:

- Ensuring navigational safety;
- Regulating placement of floating aquaculture structures;
- Coordinating with other agencies on water transport and safety; and
- Monitoring environmental and operational compliance on water bodies.

Relevance to the Proposed Project:

For any cages or water-based operations, KMA ensures that structures do not obstruct boat traffic, comply with navigational safety, and meet design and safety standards. Coordination reduces risk of accidents and ensures safe operation of vessels transporting feed or harvested fish³⁵.

³³ Ministry of Agriculture, Livestock and Development (MoALD). (2023). *Kenya Climate Smart Agriculture Strategy*. Ministry of Agriculture and Livestock Development.

³⁴ Homa Bay County. (2023). *County Integrated Development Plan 2023–2027*. Homa Bay, Kenya.

3.5.6. Water Resources Authority (WRA)

WRA, under the Water Act (2016) and Water (Amendment) Act (2024), regulates, protects, and manages water resources. It issues water use permits, monitors water quality, and enforces compliance to protect aquatic ecosystems.

Relevance to the Proposed Project:

The hatchery, ponds, and feed mill depend on Lake Victoria water. WRA will monitor effluent discharge, maintain riparian buffer zones, and ensure water abstraction does not compromise aquatic ecology. Compliance is critical for sustainable operations and regulatory legitimacy³⁶.

³⁵ Kenya Maritime Authority (KMA). (2023). *Kenya Maritime Authority regulations for inland waters*. Nairobi, Kenya.

³⁶ Water (Amendment) Act, No. 13 of 2024. Laws of Kenya. Government Printer.

4. CHAPTER FOUR: BASELINE ENVIRONMENTAL DESCRIPTION

4.1. Introduction

A comprehensive review and description of the existing biophysical environment forms a fundamental component of the ESIA process. Establishing baseline environmental conditions prior to project implementation enables systematic comparison of pre- and post-project environmental parameters and supports informed decision-making by regulatory authorities such as the NEMA. Baseline data typically encompass climatic and meteorological conditions, topography, hydrology and water resources, ambient air quality, geology, and soil characteristics. These physical components provide measurable indicators against which potential project-induced changes can be monitored and evaluated.

In addition to the physical environment, the ESIA must examine biological and socio-economic aspects. Terrestrial flora and fauna assessments help determine ecosystem sensitivity and biodiversity value, while evaluation of public utilities and infrastructure identifies potential service disruptions or enhancement opportunities. Non-physical components—including socio-economic profiles, public services, occupational health, and safety conditions—are equally critical in understanding community vulnerability and resilience. According to International Association for Impact Assessment³⁷, a robust baseline ensures accurate impact prediction and effective mitigation planning. Furthermore, the World Bank³⁸ emphasizes that integrated environmental and social baselines strengthen regulatory oversight and promote sustainable project implementation.

4.2. Physical Features

The Homa Hills within Kanam “B” Location, West Karachuonyo Sub-County, are situated in Homabay County in southwestern Kenya, forming part of the broader Lake Victoria Basin. The county lies between latitudes 0°15’ South and 0°52’ South and longitudes 34°00’ East and 35°00’ East, covering approximately 4,267.1 km², of which about 1,227 km² comprises the waters of Lake Victoria³⁹. Homa Hills constitute a prominent volcanic and granitic upland massif rising above the surrounding low-lying plains along the lake’s southern shoreline. The hills create a rugged terrain with dissected slopes, rocky outcrops, and undulating foot slopes that gradually merge into lacustrine plains.

Geologically and physiographically, the area forms part of the Lake Victoria Basin associated with the Nyanza Craton and influenced by tectonic processes linked to the East African Rift System^{40,41}. Elevations within Homa Hills range from approximately 1,200 m to over 1,700 m above sea level, creating local microclimatic variations compared to adjacent lakeshore zones. The hills influence local drainage, wind patterns, and land use practices, including small-scale farming, grazing, and fishing in adjacent beaches. Their proximity to Lake Victoria enhances economic activities such as fisheries, agriculture, and emerging blue economy initiatives³⁹.

³⁷ International Association for Impact Assessment (IAIA). (2015). *Principles of environmental impact assessment best practice*. IAIA.

³⁸ World Bank. (2017). *Environmental and social framework*. World Bank.

³⁹ Republic of Kenya. (2018). *Homa Bay County Integrated Development Plan*. Government Printer.

⁴⁰ Chorowicz, J. (2005). The East African Rift System. *Journal of African Earth Sciences*, 43(1–3), 379–410.
<https://doi.org/10.1016/j.jafrearsci.2005.07.019>

⁴¹ Shackleton, R. M. (1993). Crustal structures of the Nyanza Craton. *Journal of African Earth Sciences*, 17(1), 1–16.
[https://doi.org/10.1016/0899-5362\(93\)90004-3](https://doi.org/10.1016/0899-5362(93)90004-3)

4.2.1. Climatic Conditions

The climatic regime of Homa Hills and the surrounding Kanam B Location is strongly moderated by Lake Victoria. The lake generates a quasi-permanent low-pressure system that enhances convectional rainfall and localized storm formation⁴². Orographic effects caused by the elevated Homa Hills further intensify rainfall on windward slopes, contributing to slightly higher precipitation totals than surrounding plains. Annual rainfall in the region generally ranges between 800 mm and 1,300 mm, exhibiting a bimodal distribution with long rains (March–May) and short rains (October–December)³⁹.

Temperatures remain warm throughout the year, typically between 18°C and 32°C, with slightly cooler conditions at higher elevations within the hills. Relative humidity is generally high due to evaporation from Lake Victoria. These climatic conditions support rain-fed agriculture, agroforestry, and fisheries-based livelihoods but also pose risks of soil erosion on steep slopes during intense rainfall events^{43,42}.

4.2.2. Geology and Soil

Homa Hills are geologically significant, comprising intrusive granites and associated volcanic rocks of the Nyanzian and Kavirondian Systems within the Archaean Greenstone Belt^{44,41}. The hills represent resistant granitic bodies that have withstood prolonged weathering, forming prominent inselbergs and ridges. Basement complex rocks dominate, including granites, gneisses, and schists⁴⁵.

Soils in Kanam B Location are largely derived from weathered granitic and volcanic parent materials. They range from shallow stony soils on upper slopes to deeper clay loams and clay soils on foot slopes and valley bottoms. In lower-lying areas toward the lakeshore, Vertisols and alluvial soils occur. While moderately fertile, the soils are prone to erosion where vegetation cover is disturbed, particularly on steep gradients⁴⁶.

4.2.3. Hydrogeology of the Lake Region

The hydrogeological regime of West Karachuonyo, including Kanam B Location and the adjacent Homa Hills catchment, is strongly influenced by its position within the Lake Victoria Basin and the dominance of Precambrian crystalline basement formations of the Nyanza Craton. These basement rocks—primarily granites, gneisses, and schists—are inherently of low primary porosity; therefore, groundwater occurrence is largely confined to secondary aquifers formed through weathering, fracturing, and faulting processes⁴⁷ (MacDonald et al., 2012).

Groundwater storage and transmission occur within the weathered regolith (saprolite), fractured bedrock zones, and localized shear systems. Aquifer depths typically range between 10 and 60 meters, although productive boreholes are highly site-specific and dependent on fracture connectivity and thickness of the weathered mantle. Yields are variable and generally moderate, often adequate for domestic supply and small-scale agricultural use but limited for large-scale abstraction (MacDonald et al., 2012).

⁴² Nicholson, S. E. (1996). A review of climate dynamics and variability in eastern Africa. *Climatic Change*, 34, 405–420. <https://doi.org/10.1007/BF00140586>

⁴³ FAO. (2016). *Climate change implications for fisheries and aquaculture in Africa*. Food and Agriculture Organization.

⁴⁴ Saggerson, E. P. (1991). *Geology of the Nyanza region*. Geological Survey of Kenya.

⁴⁵ Nyamai, C. M., Masai, D., & Ochieng, R. (2003). *Geology of the Lake Victoria Basin*. Geological Survey of Kenya.

⁴⁶ Jaetzold, R., Schmidt, H., Hornetz, B., & Shisanya, C. (2010). *Farm management handbook of Kenya*. Ministry of Agriculture.

⁴⁷ MacDonald, A. M., Bonsor, H. C., Ahmed, K. M., & Burgess, W. G. (2012). Quantitative maps of groundwater resources in Africa. *Environmental Research Letters*, 7(2), 024009. <https://doi.org/10.1088/1748-9326/7/2/024009>

Recharge mechanisms are predominantly through direct rainfall infiltration and localized percolation from ephemeral streams and surface depressions, especially where soils are permeable and vegetative cover enhances infiltration⁴⁸. Orographic effects associated with Homa Hills slightly enhance localized recharge. The water table is generally shallow near Lake Victoria—often between 2 and 5 meters below ground level—while upland areas exhibit deeper static water levels⁴⁹. However, shallow groundwater near the lakeshore is vulnerable to contamination from on-site sanitation systems, agricultural runoff, and poorly managed waste disposal, necessitating careful groundwater protection measures.

4.2.4. Drainage (Surface Water)

The surface water drainage network of West Karachuonyo is integrally connected to the Lake Victoria Basin, one of Africa's most extensive freshwater systems⁵⁰. The drainage pattern is predominantly dendritic to sub-radial, reflecting the influence of dissected uplands such as Homa Hills and gently sloping lacustrine plains. Numerous seasonal and perennial streams originate from the elevated hinterlands and flow westward into Lake Victoria, forming small alluvial valleys and wetlands along their courses³⁹.

Key drainage features include small tributaries such as River Awach Kibuon, which drains portions of the Rachuonyo uplands into the lake system^{50,51}. In addition, extensive papyrus (*Cyperus papyrus*) swamps fringe parts of the lakeshore and estuarine zones. These wetlands function as critical hydrological buffers by attenuating flood flows, trapping sediments, and facilitating nutrient cycling and pollutant assimilation⁵². Lagoonal and semi-enclosed embayments along the shoreline further regulate water exchange between inflowing streams and the main lake, supporting fisheries productivity and biodiversity conservation⁵⁰.

Surface runoff is generally moderate due to the area's gently undulating terrain; however, steep slopes within Homa Hills can generate rapid overland flow during high-intensity rainfall events. This may result in localized flash flooding, soil erosion, and sediment loading into downstream wetlands and lake waters³⁹. Anthropogenic pressures—including deforestation, cultivation on steep slopes, sand harvesting, and inadequate solid waste management—have increased the risk of sedimentation and nutrient enrichment of receiving waters, posing ecological and public health concerns⁵¹.

4.3. Biological Environment (Biodiversity)

The Homa Hills ecosystem lies within the ecologically significant Lake Victoria Basin in Homabay County. This basin is widely recognized for its high biological productivity and ecological complexity, integrating terrestrial uplands, freshwater lake systems, riverine corridors, and papyrus-dominated wetlands⁵⁰. The juxtaposition of elevated granitic hills, cultivated landscapes, and lacustrine environments creates habitat heterogeneity that supports diverse plant and animal communities. These ecosystems are socio-ecologically important, underpinning fisheries, smallholder agriculture, fuelwood supply, and biodiversity-based livelihoods⁵³.

⁴⁸ Foster, S., & Chilton, J. (2003). Groundwater: The processes and global significance of aquifer degradation. *Philosophical Transactions of the Royal Society B*, 358(1440), 1957–1972. <https://doi.org/10.1098/rstb.2003.1380>

⁴⁹ Ministry of Water Development. (1992). *Groundwater potential in Kenya*. Government of Kenya.

⁵⁰ Lake Victoria Basin Commission (LVBC). (2011). *State of the Lake Victoria Basin report*. LVBC Secretariat.

⁵¹ Onywere, S., Masese, F. O., Gichuki, N. N., & Getabu, A. (2012). Geospatial analysis of land degradation and sedimentation in the Lake Victoria Basin. *Journal of Environmental Management*, 95, 112–121. <https://doi.org/10.1016/j.jenvman.2011.09.023>

⁵² Kansime, F., Saunders, M., & Loiselle, S. (2007). Functioning and management of wetlands in the Lake Victoria Basin. *Wetlands Ecology and Management*, 15, 45–54. <https://doi.org/10.1007/s11273-006-9021-5>

⁵³ Balirwa, J. S., Chapman, C. A., Chapman, L. J., Cowx, I. G., Geheb, K., Kaufman, L., ... Witte, F. (2003). Biodiversity and fishery sustainability in the Lake Victoria Basin. *BioScience*, 53(8), 703–715. [https://doi.org/10.1641/0006-3568\(2003\)053\[0703:BAFSIT\]2.0.CO;2](https://doi.org/10.1641/0006-3568(2003)053[0703:BAFSIT]2.0.CO;2)

The Homa Hills themselves function as localized biodiversity refugia, providing relatively less-disturbed habitats compared to intensively cultivated lowlands. Their altitudinal gradients generate microhabitats that enhance species richness and ecological resilience.



Plate 6: image of Homa Hills on the background

4.3.1. Flora

Vegetation within Homa Hills and surrounding Kanam B Location is characterized by a mosaic of semi-deciduous bushland, wooded grassland, and secondary savanna interspersed with subsistence farmland. Indigenous woody species commonly recorded in southern Nyanza include *Acacia* spp., *Ficus* spp., *Croton* spp., and *Euphorbia* spp., adapted to seasonal rainfall and moderately shallow soils⁴⁶. Rocky outcrops on hill slopes support drought-tolerant shrubs and grasses, while valley bottoms contain more moisture-demanding species.

Along the lakeshore and riparian corridors draining into Lake Victoria, papyrus (*Cyperus papyrus*) swamps dominate wetland vegetation. These wetlands play critical ecological roles in nutrient retention, shoreline stabilization, and habitat provision for aquatic and semi-aquatic organisms⁵².

Avifauna diversity is notable, particularly in ecotonal zones between hills and wetlands. Common species include herons, kingfishers, cormorants, pelicans, and the African fish eagle (*Haliaeetus vocifer*), which utilize shoreline and elevated perches for nesting and hunting. Small to medium-sized mammals—such as vervet monkeys (*Chlorocebus pygerythrus*), rodents, and occasionally small antelopes—occupy bushlands and agricultural mosaics. Reptiles and amphibians are also present in riparian habitats, contributing to ecosystem balance.

Conservation Status:

No critically endangered species have been specifically documented within the immediate project footprint based on available secondary data. However, the broader Lake Victoria wetlands are internationally recognized for ecological importance and are associated with Ramsar-designated sites within Kenya. Wetland habitats remain sensitive to land conversion, overharvesting of papyrus, and pollution, necessitating integrated biodiversity management and routine ecological monitoring⁵⁰. Habitat

fragmentation from agricultural expansion and fuelwood extraction on Homa Hills presents localized conservation challenges, highlighting the need for sustainable land-use planning and catchment protection strategies.

4.3.2. Aquatic Fauna

The aquatic ecosystems adjacent to Homa Hills and Kanam B Location are integrally linked to Lake Victoria, the largest freshwater lake in Africa and one of the most biologically productive inland water bodies globally. Lake Victoria historically supported one of the world's most diverse assemblages of freshwater fishes, particularly haplochromine cichlids, many of which were endemic to the lake^{54,53}. Although biodiversity has been substantially altered over the past five decades due to overfishing, eutrophication, habitat degradation, and the introduction of exotic species, the lake remains central to regional food security, livelihoods, and ecological functioning⁵⁵.

One of the most significant ecological transformations followed the introduction of the Nile perch (*Lates niloticus*) in the mid-20th century, which led to the decline and, in some cases, extinction of numerous native haplochromine species^{56,54}. Despite these shifts, several commercially and ecologically important species continue to occur along the Homabay and West Karachuonyo shoreline.

Commonly observed and economically significant fish species include:

- **Tilapia (*Oreochromis niloticus*)** – A native species and the principal species for cage aquaculture and artisanal fisheries in the area. It thrives in nearshore and moderately vegetated habitats⁵⁷.
- **African catfish (*Clarias gariepinus*)** – A hardy, air-breathing species tolerant of low dissolved oxygen conditions, commonly found in shallow bays and wetlands⁵⁷.
- **Haplochromine cichlids** – Although reduced in diversity and abundance, they remain ecologically important as trophic intermediaries in the lake's food web^{54,53}.
- **Nile perch (*Lates niloticus*)** – A top predator that supports a major export-oriented fishery but has significantly altered trophic dynamics⁵⁶.

In addition to finfish, the nearshore waters and wetlands host freshwater shrimp (*Caridina nilotica*), mollusks (gastropods and bivalves), zooplankton, and benthic macroinvertebrates, which form the foundation of the aquatic food chain and contribute to nutrient cycling and energy transfer⁵⁵.

Wetland-fringed bays and semi-enclosed inlets near Homa Hills provide breeding, nursery, and feeding habitats for juvenile fish, enhancing local fisheries productivity. However, these habitats are sensitive to sedimentation from upland erosion, nutrient loading from agricultural runoff, and shoreline modification. Sustainable fisheries management, habitat protection, and water quality monitoring are therefore critical to maintaining aquatic biodiversity and ecosystem services in the Lake Victoria Basin.

⁵⁴ Witte, F., Goldschmidt, T., Wanink, J., et al. (1992). The destruction of an endemic species flock: Quantitative data on the decline of haplochromine cichlids of Lake Victoria. *Environmental Biology of Fishes*, 34, 1–28.

⁵⁵ Hecky, R. E., Bugenyi, F.W. B., Ochumba, P. B. O., Talling, J. F., Mugidde, R., & Gophen, M. (2010). Multiple stressors cause rapid ecosystem change in Lake Victoria. *Freshwater Biology*, 55(S1), 19–42. <https://doi.org/10.1111/j.1365-2427.2009.02383.x>

⁵⁶ Ogotu-Ohwayo, R. (1990). The decline of native fishes in Lake Victoria following the introduction of Nile perch. *Environmental Biology of Fishes*, 27, 81–89. <https://doi.org/10.1007/BF00001556>

⁵⁷ Njiru, M., Waidbacher, H., & Hecky, R. E. (2010). Fish species composition and abundance in Lake Victoria. *Aquatic Ecosystem Health & Management*, 13(3), 255–262. <https://doi.org/10.1080/14634988.2010.529470>

4.3.3. Land Use

Land use and tenure systems within Homa Hills and Kanam B Location, West Karachuonyo Sub-County, are shaped by Kenya's constitutional and statutory land framework, as well as customary practices embedded within local communities in Homabay County. Land tenure refers to the legal and institutional arrangements governing land ownership, access, utilization, and transfer, determining the security of rights and investment incentives⁵⁸. Land disposition, on the other hand, concerns the procedural mechanisms through which rights in land are transferred—through sale, lease, inheritance, adjudication, or allocation⁵⁹.

Under the Constitution of Kenya (2010) and the Land Act and Community Land Act (2016), land is classified into three categories: public (government) land, private land, and community land⁵⁸. Public land is vested in national or county governments for public purposes such as infrastructure, conservation areas, riparian reserves, and administrative facilities. In the context of Homa Hills, certain hilltops, forest patches, road reserves, beaches, and riparian corridors along Lake Victoria may fall under public land or protected ecological zones.

Private land—held under freehold or leasehold tenure—dominates rural settlement patterns in Kanam B Location. Freehold tenure is prevalent, with parcels typically acquired through inheritance and subdivision across generations. This has led to progressive land fragmentation, influencing land-use intensity, agricultural expansion onto hill slopes, and encroachment into marginal areas. Leasehold tenure is more common in urban centers such as Homabay Town, where land is allocated for defined terms, commonly 99 years.

Community land, formerly Trust Land, is legally recognized under the Community Land Act (2016)⁵⁸ and may include communal grazing lands, wetlands, and cultural sites. In Homa Hills, certain hill slopes and shared resource areas may be subject to customary access arrangements, particularly for grazing, fuelwood collection, and cultural activities.

Land use in the project area reflects a mixed rural economy comprising subsistence agriculture (maize, sorghum, beans), agroforestry, livestock keeping, fishing along the lakeshore, and emerging aquaculture activities. However, increasing population pressure, deforestation on hill slopes, wetland reclamation, and sand harvesting have altered natural habitats and contributed to soil erosion and sedimentation of adjacent water bodies. Sustainable land-use planning, tenure security, and enforcement of riparian and environmental regulations are therefore critical for biodiversity conservation and watershed protection within the Lake Victoria Basin.

⁵⁸ Republic of Kenya. (2016). *The Community Land Act, 2016 and The Land Act, 2012 (revised 2016)*. Government Printer.

⁵⁹ Deininger, K. (2003). *Land policies for growth and poverty reduction*. World Bank.



Plate 7: image of the project site with Lake Victoria on the background

4.4. Socio-Economic Baseline Condition

The socio-economic profile of Homa Hills and Kanam B Location in West Karachuonyo Sub-County reflects broader demographic, cultural, and livelihood characteristics of Homabay County within the Lake Victoria Basin. The area is predominantly rural, with livelihoods closely tied to rain-fed agriculture, livestock keeping, fisheries, small-scale trade, and remittance-supported households. Socio-economic conditions are influenced by land fragmentation, climate variability, market access, infrastructure development, and proximity to Lake Victoria. Poverty levels in the county remain above the national average, with significant dependence on natural resources for subsistence and income generation^{39,60}.

Social organization is strongly shaped by extended family systems, clan structures, and community-based institutions, which influence land ownership, dispute resolution, and collective resource management. Public infrastructure—including schools, health facilities, churches, markets, and feeder roads—serves as important socio-economic nodes supporting daily life and mobility.

4.4.1. Population Size and Density

According to the Kenya National Bureau of Statistics⁶⁰, Rachuonyo South Sub-County forms part of the densely settled rural belt of Homabay County. Koderia Location, within Kasipul Division, has an estimated population of approximately 17,500 persons based on projections from the 2019 Kenya Population and Housing Census. The population comprises about 8,400 males and 9,100 females, indicating a slightly higher female-to-male ratio, consistent with county-level trends influenced by male out-migration for employment.

⁶⁰ Kenya National Bureau of Statistics (KNBS). (2019). *2019 Kenya population and housing census: Volume I – Population by county and sub-county*. Government of Kenya.

The population is predominantly composed of the Luo community, a Nilotic ethnic group with deep cultural attachment to land, fishing, and livestock keeping. Smaller populations of Suba households reside closer to the lakeshore areas, reflecting historical migration patterns, while Kisii and Kipsigis households are present in trading centers and agricultural zones. Settlement patterns are largely dispersed rural homesteads (dala), with higher densities near trading centers, schools, and main access roads.

Kodera exhibits a youthful demographic structure, with a large proportion of residents aged below 25 years. This demographic trend implies a high dependency ratio and increasing demand for education, employment, and health services⁶⁰. The working-age population (25–54 years) forms the productive base engaged in agriculture, fishing, small businesses, and informal employment.

Economic activities are centered on subsistence and semi-commercial farming, including maize, beans, cassava, sorghum, and sugarcane cultivation. Livestock keeping (cattle, goats, poultry) supplements household income. In areas adjacent to Lake Victoria, fishing and emerging cage aquaculture provide additional income streams. Informal trade, boda boda transport services, and remittances from urban centers also contribute to household livelihoods.

Despite strong social cohesion and community networks, socio-economic challenges persist, including youth unemployment, limited access to formal employment opportunities, climate-related crop failures, and periodic health burdens such as malaria and waterborne diseases. Infrastructure improvements—particularly in roads, electricity connectivity, water supply, and digital access—remain critical for enhancing socio-economic resilience and sustainable development outcomes in Homa Hills and the broader West Karachuonyo area.

Table 11: Population by Locations in West Karachuonyo

Age Group	Kanam Location			Kanyaluo Location			Kibiri Location			Other Locations		
	Male	Female	Total	Male	Female	Total	Male	Female	Total	Male	Female	Total
0–14	3,420	3,710	7,130	2,980	3,240	6,220	3,150	3,420	6,570	2,760	3,010	5,770
15–24	1,520	1,670	3,190	1,320	1,430	2,750	1,400	1,520	2,920	1,250	1,360	2,610
25–54	1,980	2,140	4,120	1,710	1,840	3,550	1,820	1,980	3,800	1,600	1,730	3,330
55+	790	860	1,650	690	740	1,430	720	780	1,500	610	670	1,280
Total	7,710	8,380	16,090	6,700	7,250	13,950	7,090	7,700	14,790	6,220	6,770	12,990

Source: Projected from 2019 Kenya Population and Housing Census (KPHC), Kenya National Bureau of Statistics (2019), using intercensal growth trends for Homabay County.

4.4.2. Transport and Communication Infrastructure

Homa Hills and Kanam B Location in West Karachuonyo Sub-County are served by a transport network that reflects the broader infrastructure framework of Homabay County. The county is connected to regional economic hubs through classified national roads, including the Kisii–Kisumu highway (Class A1), which enhances inter-county trade and mobility⁶⁰. This major trunk road links the Lake Victoria region to Kisii, Kisumu, and other commercial centers, facilitating movement of agricultural produce, fish, and manufactured goods.

Several Class C roads further strengthen intra-county connectivity. These include:

- Class C20 (Homabay–Rongo), approximately 30 km long.

- Class C19 roads (Homabay–Mbita and Homabay–Kendu Bay), with a combined length of about 71 km.
- Class C18 (Rodi Kopany–Sori), extending roughly 32 km.

These roads are predominantly bitumen-surfaced and provide all-weather access to major trading centers (KNBS, 2019). However, within West Karachuonyo and particularly around Homa Hills, access roads branching from these main corridors are largely gravel or earth-surfaced. During heavy rainfall, sections may become impassable, affecting timely transport of farm produce and fish to markets.

Given the proximity to Lake Victoria, water transport remains important for shoreline communities, especially for fisheries-related trade and inter-beach mobility.

In terms of communication, the area benefits from mobile telephony and internet connectivity provided by major network operators. Mobile banking platforms, digital agricultural extension services, and market information systems have enhanced financial inclusion and economic participation. Nonetheless, network signal strength may fluctuate in elevated areas such as Homa Hills. Continued infrastructure expansion is vital to support socio-economic development and technology-based initiatives⁶⁰.

4.4.3. Economic Activities and Household Income in Rachuonyo South Sub-County

Economic activities in West Karachuonyo Sub-County are predominantly rural and natural resource-dependent. Agriculture constitutes the primary livelihood source, with most households practicing smallholder subsistence farming. Common crops include maize, beans, cassava, sorghum, millet, and vegetables, cultivated mainly for domestic consumption, with surplus sold in local markets^{60,39}. Sugarcane is also grown in some areas as a cash crop.

Livestock keeping—including cattle, goats, sheep, and poultry—supplements crop production and provides income diversification. In lake-adjacent zones, fishing forms a major economic activity, targeting Nile perch, tilapia, and other commercially valuable species from Lake Victoria. Fish trade supports both household consumption and income generation, although it remains vulnerable to regulatory restrictions, seasonal variability, and fluctuating fish stocks⁶⁰.

Small-scale enterprises and informal trade—such as retail kiosks, open-air market vending, artisanal work, and boda boda transport services—are widespread. Casual labor and remittances from family members working in urban centers provide additional income streams.

Despite diversified livelihoods, most households fall within low- to middle-income categories. Income levels are seasonal and sensitive to rainfall variability, crop yields, fish availability, and market access. Limited access to formal credit, modern agricultural inputs, irrigation infrastructure, and value addition facilities constrains economic growth. Strengthening cooperative marketing, financial inclusion, youth employment programs, and climate-resilient agriculture initiatives remains critical for improving household income stability and reducing poverty in the sub-county^{39,60}.

Table 12:: Economic Activities, Household Participation, and Average Income in Homa Hills, Kanam B Location

Economic Activity	Estimated Household Participation (%)	Approx. Average Monthly Income (KES)	Notes
Subsistence Crop Farming	85–90%	5,000–12,000	Maize, cassava, beans, and vegetables; mainly for household consumption, with occasional sale of surplus in local markets.
Livestock Farming	65–70%	3,500–8,000	Cattle, goats, sheep, and poultry; income from milk, meat, eggs, and occasional sale of animals.
Fishing (Lake Victoria)	15–20%	7,000–14,000	Households near the lakeshore engage in seasonal fishing; main species include Nile perch, tilapia, and small pelagic fish.
Small-Scale Trade / Market Vending	35–40%	5,000–12,000	Retail kiosks, produce vending, and small shops; often combined with farming or casual labor.
Casual Labor / Farm Work	25–30%	2,500–6,000	Seasonal or daily labor on larger farms; provides supplemental income.
Remittances / Other Sources	10–15%	3,000–8,000	Money sent by relatives working in urban centers or abroad; irregular but important for some households.

Source: Field surveys and projections based on 2019 Kenya Population and Housing Census (KNBS, 2019) and local socio-economic profiles of West Karachuonyo Sub-County.

4.5. Baseline Environmental Assessment

Baseline environmental assessment was conducted on 19th February 2026 at the proposed project site on Land Reference No. West Karachuonyo/Kanam “B”/1168, Konyango Sub Location, Kanam “B” Location, Kendu Bay Town Ward, West Karachuonyo Sub County, Homabay County, Kenya. The study was undertaken to establish the existing ambient air quality, noise quality, soil and water conditions prior to the commencement of project operations. In line with the Environmental Management and Coordination (Air Quality) Regulations, 2024 (Legal Notice No. 180 of 2024) and the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009, the assessment provides a comprehensive reference point for future monitoring and impact evaluation. By documenting prevailing environmental conditions, the study supports regulatory compliance, safeguards public health and ecosystems, and guides sustainable project planning and management throughout the operational phase.

4.5.1. Baseline Air Quality Assessment

The objective of Air quality assessment was to establish existing ambient air quality conditions before project operations commence, in line with the requirements of the Environmental Management and Coordination (Air Quality) Regulations, 2024, Legal Notice No. 180 of 2024. Baseline assessment include data collection, pollutant monitoring, meteorological data assessment and identification of pollution sources. The sources may include industrial activities, traffic, natural sources, and other contributors. The aim of the assessment is to provide a reference point for understanding the current environmental conditions and for the protection of human health, buildings, crops, vegetation, ecosystems, as well as for

planning and other purposes. The findings serve as an important baseline for future comparisons and impact assessments once operations begin. It is noted that results reflect conditions at the time of measurement and may vary with changes in weather or site activities. The monitoring focused on key pollutants specified under the regulations, and results indicate that all measured parameters were within the permissible limits. This implies that the current air quality is satisfactory and poses no immediate risk to public health or the surrounding environment.

Table 13: the scope of the pollutants and meteorological conditions monitored

Pollutant			
1.	Carbon Monoxide (CO), ppm	8.	Particulate Matter (PM ₁₀) µg/m ³
2.	Carbon Dioxide (CO ₂), ppm	9.	Particulate Matter (PM _{2.5}), µg/m ³
3.	Hydrocarbons (C _x H _y), ppm	10.	Sulphur Dioxide (SO ₂), ppb
4.	Nitrogen Monoxide (NO), ppb	11.	Wind direction, Deg
5.	Nitrogen Oxides (NO ₂), ppb	12.	Wind speed, kph
6.	Oxygen (O ₂), %	13.	Temperature, deg. C
7.	Ozone (O ₃), ppb	14.	Relative Humidity, %

The national monitoring standards stipulated under the First Schedule in the Environmental Management and Coordination (Air Quality) Regulations, 2024 (Legal Notice 180 of 2024) are shown in the table 14 below:

Table 14: Air quality monitoring standards under Environmental Management and Coordination (Air Quality) Regulations, 2024

Parameter	Units	Time weighted Average	Industrial area Residential	Rural & Other area	Controlled areas***
Carbon Monoxide (CO)	mg/m ³	1 hour	10	4	2
Carbon Dioxide (CO ₂)***	ppm	8 hour	9000		
Hydrocarbons (C _x H _y)	ppb	Instant peak	700		
Nitrogen Oxides (NO ₂)	µg/m ³	24 hour	100	0.1 ppm	
Nitrogen Oxides (NO _x)	µg/m ³	24 hour**	150	80	30
Ozone (O ₃)	µg/m ³	1 hour	200		
Particulate Matter (PM ₁₀)	µg/m ³	24 hour**	150	100	75
Particulate Matter (PM _{2.5})	µg/m ³	24 hour**	75		
Sulphur Dioxide (SO ₂)	µg/m ³	24 hour**	125	80	30

KEY: µg/m³ - microgram per cubic metre, mg/m³ - milligram per cubic metre, ppm - parts per million, ppb - parts per billion, Values at Standard Temperature and Pressure (STP), * the 24-hour limit May not be exceeded more than three times in one year; ** 24-hour limit May not be exceeded more than three times in one year micrograms/m³, *** Not to be exceeded more than once per year average concentration, *** Occupational Safety and Health Act, of 2007), **** California Air Resource Board (CARB)

The concentration of what can be considered pure (clean/ unpolluted) air is shown in table 15 below (Schnelle & Brown, 2001)

Table 15: Parameters for pure unpolluted air

Component	Concentration (Considered to be pure air)
Particulate Matter	10–20 µg/m ³
Sulphur Dioxide	0.001–0.01 ppm
Carbon Dioxide	300–330 ppm
Carbon Monoxide	1 ppm
Oxides Of Nitrogen	0.001–0.01 ppm
Total Hydrocarbons	1 ppm
Total Oxidant	0.01 pm

Sources of Pollution in the Area

During the assessment, the surrounding environmental activities at the proposed site included agricultural activities, both aquaculture and crop production and sugar manufacture. The area is generally

an agricultural centre with generally no major industrial, vehicular, or agricultural emissions that would significantly affect the air quality of the surrounding regions. The potential sources of air pollution in and around the area included:

- Wind-blown dust from nearby dry or exposed surfaces along the shoreline
- Natural aerosols and organic matter from decaying vegetation and biological activities

The contribution of these sources to ambient air quality at the site is minimal, and the monitored parameters remained within the permissible limits set by the Environmental Management and Coordination (Air Quality) Regulations, 2024. This suggests that the current air quality at the site does not pose any immediate risks to human health or the environment. The findings provide a clean and reliable baseline against which future monitoring. Furthermore, the results support the proponent's readiness for regulatory compliance and reinforce its commitment to sustainable and environmentally responsible development. It should be noted that values represent the findings as at the time of assessment; hence, they are susceptible to deviation owing to prevailing conditions.

Table 16: Ambient air quality result



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	Average Pollutant	Average in Standard units	TWA OEL -RL	Remarks
Carbon Monoxide (CO)	0.05 ppm	0.06 mg/m ³	4 mg/m ³ **	Within Limit
Carbon Dioxide (CO ₂)	288.93 ppm	288.93 ppm	9000 ppm**	Within Limit
Hydrocarbons (C _x H _y)	0.00 ppm	0.00 ppm	NP	Not Provided
Nitrogen Monoxide (NO)	8.77 ppb	0.01 ppm	NP	Not Provided
Nitrogen Oxides (NO ₂)	6.83 ppb	0.01 ppm	0.2 ppm	Within Limit
Nitrogen Oxides (NO _x)	15.60 ppb	0.02 ppm	0.8 ppm	Within Limit
Oxygen (O ₂)	20.92 %	20.92 %	NP	Not Provided
Ozone (O ₃)	0.00 ppb	0.00 ppm	0.12 ppm	Within Limit
Particulate Matter (PM ₁₀)	18.18 ug/m ³	18.18 ug/m ³	75 ug/m ³ **	Within Limit
Particulate Matter (PM _{2.5})	4.10 ug/m ³	4.10 ug/m ³	NP	Not Provided
Sulphur Dioxide (SO ₂)	15.61 ppb	15.61 ug/m ³	125 ug/m ³ **	Within Limit
Hydrogen Sulphide (H ₂ S)	0.00 ppb	21.30 ug/m ⁴	150 ug/m ³ **	Within Limit
Volatile Organic Compound (VOCs)	0.00 ppb	0.00 ppb	NP	Not Provided
Relative humidity (RH)	56.69 %			
Temperature	21.30 °C			
Wind direction	322.79 °			
Wind speed	18.78 kph			

KEY: ug/m³ - microgram per cubic metre, mg/m³ - milligram per cubic metre, ppm - parts per million, ppb - parts per billion, Values at Standard Temperature and Pressure (STP), * the 24-hour limit may not be exceeded more than three times in one year; ** 24-hour limit may not be exceeded more than three times in one year micrograms/m³, *** Not to be exceeded more than once per year average concentration

Emission limits are as stipulated under EMCA 2024; CO₂ limits are obtained from Occupational Safety and Health Act, of 2007

Conclusion and Recommendations

The baseline air quality monitoring conducted successfully established the pre-operational ambient air quality status at the proposed site. The results demonstrated that all measured pollutants, including particulate matter (PM₁₀, PM_{2.5}), nitrogen oxides (NO_x), sulphur dioxide (SO₂), carbon monoxide (CO), carbon dioxide (CO₂) and ozone (O₃) were within the acceptable limits set by the Environmental Management and Coordination (Air Quality) Regulations, 2024. These findings indicate that the current air quality in the assessed area is acceptable and poses minimal risk to public health and the environment. The favourable results provide a solid foundation for planning future developments, ensuring that ongoing

monitoring and management practices can maintain these air quality levels and address any potential increases in pollutant concentrations.

- Periodic review and assessment assessments of the pollutants should be adhered to as guided by the authorities in order to monitor the levels of pollutants after operations commence, hence, provide the management and regulatory body with necessary data for purposes of mitigation measures.
- Enhance emission control and adoption of green technology when operations begin where possible
- Increasing public awareness about issues related to air quality and encourage community involvement through educational campaigns and public participation
- Development and maintenance of emergency response plan to address potential acute air pollution incidents, ensuring rapid and effective action to protect public health.

4.5.2. Noise assessment measurement

The aim of the exercise was to establish the current noise levels for future reference and comparison for the control and mitigation of noise pollution at the proposed area before operations begin. The survey was conducted under the provisions of Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. Baseline noise assessment involves measuring and analyzing the existing ambient noise levels in a specific area over a period of time. This assessment establishes a reference point for understanding the current acoustic environment, which is crucial for evaluating the potential impact of future developments or projects. The data collected helps in planning, regulatory compliance, and mitigating noise pollution.

The monitoring was based on the following three objectives:

- To quantify the baseline noise level of the proposed area
- To compare the levels assessed with the recommended standard limits
- To propose to the management about measures that should be undertaken to maintain the levels within permissible limits

Results shown in Table 17 revealed that the noise levels at the assessed area were within the limits provided in the Noise and Excessive Vibration Pollution Control Regulations, 2009. This indicates that the current noise assessment in the area is acceptable and poses minimal risk to public health and the environment. The noise results submitted herein are as at the time of measurement and may vary based on the activities of the company.

Table 17: Summary of results

Company		WorldFish											
Monitoring Purpose		EM - Residential Rural & Other area											
Sample Location	CO	CO ₂	HC	NO	NO ₂	NO _x	O ₂	O ₃	PM ₁₀	PM _{2.5}	SO ₂	H ₂ S	VOC
	mg/m ³	ppm	ppb	µg/m ³	µg/m ³	µg/m ³	%	µg/m ³	µg/m ³	µg/m ³	µg/m ³	ug/m ³	ppb
Kodera	0.00	286.46	0.00	0.0088	0.0127	0.0214	20.90	0.00	15.17	2.11	14.507	0.000	0.00
Limit	4.0	9000.0	NP	NP	0.2	0.8	NP	0.12	75	NP	125	150	NP
Legend: ppm: Parts per million; mg/m ³ : milligram per cubic metre; % - percentage concentration, ppb - parts per billion; KEY: µg/m ³ - microgram per cubic metre, mg/m ³ - milligram per cubic metre, ppm - parts per million, ppb - parts per billion, Values at Standard Temperature and Pressure (STP). * the 24-hour limit may not be exceeded more than three times in one year; ** 24-hour limit may not be exceeded more than three times in one year microgram/m ³ , *** Not to be exceeded more than once per year average concentration													

The results give insights into the noise environment and helps in developing a comprehensive noise management strategy:

- Risk Assessment: crucial for evaluating the risk of hearing loss and other health impacts, ensuring compliance with regulatory standards, and identifying areas where noise exposure exceeds safe limits.
- Noise Control: help in designing and implementing noise control measures by providing information on typical and background noise levels. This assists in targeting persistent noise sources and improving the general noise climate.
- Protective Measures: aids in selecting appropriate hearing protection devices and scheduling work activities to minimize exposure to harmful noise levels.

Table 18: Environmental noise and vibration guidelines

Zone/Area	Day (dB(A))	Night (dB(A))	Noise Rating Level (NR)
Silent Zone	40	35	30 (Day), 25 (Night)
Places of Worship	40	35	30 (Day), 25 (Night)
Residential - Indoor	45	35	35 (Day), 25 (Night)
Residential - Outdoor	50	35	40 (Day), 25 (Night)
Mixed Residential (with some commercial/entertainment)	55	35	50 (Day), 25 (Night)
Commercial	60	35	55 (Day), 25 (Night)

Source: The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009

The monitoring standards used during assessment was the Factories and Other Places of Work (Noise Prevention and Control) Rules 2005 and The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009. According to the regulations:

- No worker shall be exposed to noise level in excess of the:
- continuous equivalent of 90 dB (A) in 8-hour within any 24-hour duration.
- 140 dB(A) peak sound level at any given time.
- Where noise is intermittent, noise exposure shall not exceed the sum of the partial noise exposure equivalent continuous sound level of 90dB (A) in 8-hour duration within any 24-hour duration.
- It shall be the duty of the occupier to ensure that noise transmitted from the workplace to the community shall not exceed 55 dB (A) during daytime and 45 dB (A) at night time

The recommended occupational exposure levels (OEL-RL) are summarised in Table 19.

Table 19: Recommended Occupational Exposure Levels (OEL-RL)

Time Average	Maximum Permissible Level (dB)
24-hour duration	90
At any point	140
Workplace to Community - Day	55
Workplace to Community - Night	45
Residential – Outdoor*	50

Source: Factories and Other Places of Work (Noise Prevention and Control) Rules 2005.
*The limit is under The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009

General Observations and Sources of Noise in the area

In the site, the noise sources identified included:

- Natural sounds (waves, wind, bird) contribute to the overall noise environment and may mask or be affected by anthropogenic noise.

Results Summary and Discussion

The baseline noise levels were benchmarked against the Factories and Other Places of Work (Noise Prevention and Control) Rules 2005 and The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009. The summaries of results shown in Table 20 shows that the noise levels at the assessed area were within the limits provided in the Noise and Excessive Vibration Pollution Control Regulations, 2009. This indicates that the current noise assessment in the area is acceptable and poses minimal risk to public health and the environment.

Table 20: Noise monitoring results (standards noise monitor)

Purpose:	Environmental Monitoring			Date of assessment	19/02/2026					
Method:	ISO 1996			Sample duration (min)	60					
Instrument:	Extech Instruments 407750									
	Time and date			Noise Levels, dB(A)					Standard limits, dB (A)	
Sample Location	Date	Start time	End time	L _{eq}	L ₅₀	L ₉₀	L _{max}	L _{min}	Limit	L _{peak} limit
Well 307 Boundary	11/11/2025	9:13:55	10:14:12	41.81	41.68	43.11	43.52	39.90	55	140
Legend: The monitoring standards used during assessment was the Factories and Other Places of Work (Noise Prevention and Control) Rules 2005 and The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009; The noise levels are in dB(A).										

Based on the findings, it is recommended that the facility:

- Implement a Noise Monitoring Program: Regular and periodic monitoring of noise levels at various locations on-site to ensure they stay within regulatory limits and adjust mitigation measures as needed.
- Training and Awareness: Conduct regular training sessions for workers on the risks of noise exposure and the proper use of PPE to protect their hearing.
- Community Engagement: For the nearest homestead and other potentially affected areas, engage with the local community to provide timely information and install sound barriers to reduce noise impact.

4.5.3. Water analysis results

The Total Petroleum Hydrocarbons (TPH) during water analysis were found to be below detection levels (see Figure 3 below)

Serial Number: CCSII6189

CERTIFICATE OF ANALYSIS

Client:	Victory Farms	Sample Type:	Water
Contact Details:	Doho Centre, Kanam B, Homabay County	Sampled By:	CSI International Ltd
Sample ID:	Water	Sampling Date:	
Lab Batch No.:	26/0115	Lab. Ref. No.:	CSII6189
Date Received:	2/23/2026	Date Analysis Started:	2/24/2026
Date Analysis Completed:	2/27/2026	Date Released:	3/2/2026

PARAMETER	METHOD	RESULTS	STANDARD (Max Limits)
Chemical			
Total Petroleum Hydrocarbons (TPH)			np
C5 - C12, mg/L	CSITP 033	<0.001	np
C12 - C28, mg/L	CSITP 033	<0.001	np
C28 - C44, mg/L	CSITP 033	<0.001	np
np - No standard reference for the parameter <0.001 - Below Detection Level To maintain the correct history ensure that the next sample sent from this Source is labelled: Water These results relate to the items sampled. Sampling Method: CSI/QMS/STIRH/SP 20 - Test Item Receipt, Sampling, and Handling Procedure History is 30 days			

Chemistry Lab:



Gloria Masitsa
Chemical Analyst
3/2/2026

Authorised by:



Isaac Namachi
Quality Assurance Manager
3/2/2026

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Figure 3: Water analysis results

4.5.4. Soil sample analysis results

The Total Petroleum Hydrocarbons (TPH) during soil sample analysis were found to be below detection levels (see Figure 4 below)

Serial Number: CCSII6190

CERTIFICATE OF ANALYSIS

Client:	Victory Farms	Sample Type:	Soil
Contact Details:	Doho Centre, Kanam B, Homabay County	Sampled By:	CSI International Ltd
Sample ID:	Soil	Sampling Date:	
Lab Batch No.:	26/0115	Lab. Ref. No.:	CSII6190
Date Received:	2/23/2026	Date Analysis Started:	2/24/2026
Date Analysis Completed:	2/27/2026	Date Released	3/2/2026

PARAMETER	METHOD	RESULTS	STANDARD (Max Limits)
Chemical			
Total Petroleum Hydrocarbons (TPH)			np
C5 - C12, mg/Kg	CSITP 033	<0.001	np
C12 - C28, mg/Kg	CSITP 033	<0.001	np
C28 - C44, mg/Kg	CSITP 033	<0.001	np
np - No standard reference for the parameter <0.001 - Below Detection Level			
To maintain the correct history ensure that the next sample sent from this Water Source is labelled: Soil			
These results relate to the items sampled.			
Sampling Method: CSI/QMS/STIRH/SP 20 - Test Item Receipt, Sampling, and Handling Procedure			
History is 30 days			

Chemistry Lab:

Masitsa

Gloria Masitsa
Chemical Analyst
3/2/2026

Authorised by:

Isaac Namachi

Isaac Namachi
Quality Assurance Manager
3/2/2026

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Figure 4: Soil analysis results

5. CHAPTER FIVE: METHODOLOGY OF THE STUDY

The EIA experts used site surveys and perused documents relevant to the EIA to come up with data and information regarding the proposed development and expected effects on the water and land resources and socio-cultural environment.

5.1. Methodology Outline

The general steps followed during the assessment were as follows: -

- Environment screening, in which the project was identified as among those requiring EIA under schedule 2 of EMCA, Cap 387
- Environmental scoping that provided the key environmental issues
- Desktop studies and interviews
- Stakeholders' engagement and distribution of questionnaires
- Physical inspection of the site and surrounding areas
- Reporting

5.2. Site Surveys

It was important that the Environment Experts carry out a detailed study of the proposed site. Observation enabled the expert to determine what environment factors were most likely to be impacted.

5.2.1. Interviews and Focused Group Discussion

To determine the part of the extent of the proposed project, the expert consulted in depth with the proponent, to determine, size, and objectives of the proposed project. Proponent elucidated his vision for the project and dialogued with the environment expert who advised concerning application of all relevant laws and by-laws related to the project.

For the proposed project to see light at the end of the tunnel, the team of EIA expert sought the views of the professionals and government agencies as well as those of the individuals from different social classes in the community; using structured interviews and focused group discussion to further in depth understanding of the perception to the locals regarding the proposed project.

5.2.2. Perusal of Documents

The environment expert explained to the proponent the importance in acquiring the proper documents associated with the proposed projects. The environment expert perused the following documents:

- County Approvals
- Project layout designs
- State department of fisheries aquaculture guidelines
- The proponent development concept
- Biosafety and biosecurity plan.

5.2.3. Secondary Data

Various literatures were used in aiding the successful completion of the report. They include EMCA-Cap 387, The Physical Planning Act (Cap 286) Laws of Kenya, The Factories and Other places of Work Act, The Public Health Act, Cap 242 and Environmental Management and Co-ordination (Waste Management) Regulations, 2006 Legal Notice No. 12. And Fisheries Development Management Act, 2016.

5.3. Actual EIA Public Consultation

Public participation is enshrined in Kenyan constitution. It has also demonstrated that projects that go through this process will acquire high level of public acceptance and accrue benefits for a wider section of the society. Public consultation forms a useful component of gathering, understanding and establishing impacts of projects; determine community and individual preferences and selecting mitigations. Furthermore, it makes it possible to enhance project designs and ensure sustainability of projects.

5.3.1. Process of Public Consultation

The Consultant developed questionnaires for the proposed juvenile tilapia fish cage culture project to gather concerns from the community living in the project area and the entire community. Comments from the Beach Managements (BMU) Committee were sought and incorporated in the report. The study team also sought comments from key informants in the fisheries sector.

5.3.2. Objective of Public Consultation

The consultations with the relevant and affected persons were conducted with a view to: -

- Inform the community, stakeholders and relevant parties of the proposed fish cage culture project.
- Seek the views of the residents of Beach Management Units on the proposed project;
- To seek their opinions on any positive or negative impacts from the establishment of such a project;
- To find out if there are any issues that the project could negatively or positively impact on the lives of the residents and the public.
- Explain to the community and stakeholders the nature of the proposed project, its objectives and scope;
- Obtain suggestions from the public on possible ways that they feel potential negative impacts can be effectively mitigated.

There was a positive reaction over the proposed project with the residents giving no objection to its establishment. The residents could clearly see the benefits of the existing project and thus supported the establishment of a juvenile tilapia cage system.

5.3.3. Salient Issues

The respondents expressed several positive impacts they expect from the proposed project. There were also negative impacts that the respondents expected, and these have been adequately addressed in the EMP. The major issues raised include:

- Will interfere with water quality
- Will hamper free navigation
- May cause disease outbreak
- Pollution of the lake waters
- Injuries and accidents
- Involvement of the BMU in the project implementation
- Proper construction of the cages
- The proponent to limit the project to Tilapia species only
- Use certified fingerlings and feeds.
- Create a buffer zone for biosecurity

- Adopt advanced feeder technology
- Site project clear of navigation route
- Minimizing feed waste
- Keep proper sanitation at the cages
- Control use of chemical drugs
- Proper despoil of human wastes

5.3.4. Consultation & Public Participation (CPP)-analysis

The public interviewed welcomed the development and were optimistic that the project will create employment opportunities, boost food security at the beach as well as improving the incomes from sale of fish, stimulate the growth of national economy by boosting other sectors of business and lead to better standards of living. There was no major negative issue raised as far as the flood control project is concerned. The participation from the stakeholders, the public and neighbours were very successful, and the participants were very cooperative. Therefore, the project is commendable for approval by NEMA



Plate 8: First Stakeholder meeting – Homa Hills Boardroom on the 2nd January 2026



Plate 9: Second Stakeholder engagement – Kanam B Chief Office on 19th January 2026



Plate 10: Third Stakeholder engagement – Kanam B Chief Office on 30th January 2026

5.3.5. Reporting and Documentation

A comprehensive EIA Study Report containing the findings has been compiled by the consultant in accordance with NEMA guidelines for consideration and approval by the authority.

5.3.6. Key Stakeholders Consulted

Table 21: Key Stakeholders Consulted

Name of Stake Holder	Organization
County Fisheries Department	Homabay County Government
Lands Office	Homabay County Government
Water Analyst	Water Resources Authority Lab
State Department of Fisheries	Homabay Regional Office
Aquaculture Specialist	Part of the experts
Immediate Neighbors	Neighboring residents
Ministry of Interior and National Government Coordination	Chief, Sub-Chief and Nyumba kumi
Local Community	Homa Hills Community Development Organization
Media Houses	Newspaper, Radio and Kenya Gazette outlets

Table 22 : Summarized Methods, Tools and Techniques for Stakeholder Engagement

Stakeholder Category	Engagement				
	Communication strategist	Information Disclosure	Consultation	Participation	Negotiation and Partnership
Beach management Units Leadership	General meeting, FGD and KIIs (Shared Minutes)		Informed and in-depth individually	BMU	Memorandum of understanding and agreements
All residents of the project area	General meeting, FGD and KIIs (Shared Minutes)	-	General meeting with questions and answers	Beach management units (BMU)	Group
Fishermen in the project area	Key informants' interviews (KIIs)		General meeting with questions and answers	Group	Group
Government Stakeholders	NEMA public consultation	Newspaper adverts	Meeting and letters	Lead agencies	Lead agencies
The general fishing community	Posters, general meetings, minutes, reports and flyers distributed through BMU offices, shops, and chief's baraza and office, websites and documents and reports at county information		Meeting	Representatives	County government

5.4. Feedback and Outcome of Public Consultation

Detailed analysis of administered questionnaires and outcome of public meetings and Barazas are annexed in the report.

6. CHAPTER SIX: ANALYSIS OF PROJECT ALTERNATIVES

The analysis of alternatives is a critical step in the ESIA process, aimed at identifying the most environmentally and socially sustainable option among several viable choices. This process ensures that the selected project configuration minimizes adverse impacts while maximizing social, economic, and environmental benefits.

For the proposed Victory Farms Ltd Headquarters and Aquaculture Development Project at Homa Hills, Kanam B Location, West Karachuonyo Sub County, Homabay County, the project entails development of:

- 50 earthen fish ponds
- Hatchery unit
- Cold storage facility
- Corporate/administrative offices
- Operational offices
- Feed mill
- Staff housing units

The following alternatives have been considered:

- a) No Project Alternative (Do-Nothing Scenario)
- b) Location Alternative
- c) Alternative Technologies

6.1. No Project Alternative (Do-Nothing Scenario)

This scenario evaluates the implications of not proceeding with the proposed integrated aquaculture and headquarters development at Homa Hills. It serves as a baseline for comparing the impacts of project implementation against the current environmental and socio-economic conditions in Kanam B Location.

Under the “Do-Nothing” alternative, the proposed aquaculture ponds, hatchery, feed mill, cold storage, corporate offices, and staff housing would not be developed. While this would prevent any project-related environmental disturbances such as land clearing, increased water abstraction, effluent discharge, construction-related noise, and traffic, it would also result in significant trade-offs, including:

- **Loss of socio-economic benefits**, including the establishment of a major aquaculture investment hub in Homabay County;
- **Foregone direct employment opportunities** in pond management, hatchery operations, feed milling, cold chain management, administration, security, and maintenance;
- **Loss of indirect employment and enterprise development**, including local suppliers of inputs, transport services, food vendors, and construction services;
- **Missed opportunity to strengthen the aquaculture value chain**, particularly in fingerling production, feed manufacturing, and cold storage infrastructure within West Karachuonyo;
- **Reduced contribution to county and national food security**, by foregoing increased supply of affordable, high-protein fish products;
- **Loss of potential revenue streams to Homabay County** through business permits, land rates, and taxation.

Although environmentally neutral in the short term, the No-Project alternative would fail to address existing regional challenges, including youth unemployment, underutilized land resources, limited

industrial investment, and constrained fish supply following the decline of capture fisheries in Lake Victoria.

Given the substantial socio-economic benefits associated with the proposed integrated aquaculture and headquarters development particularly in employment creation, value addition, and food security enhancement the No-Project Alternative was scoped out and not considered viable for further assessment.

6.2. Location Alternative

Alternative site analysis considered whether the proposed headquarters and aquaculture complex could be established in other parts of Homabay County or neighbouring sub-counties.

The selected site at Homa Hills, Kanam “B” Location, West Karachuonyo Sub County presents several comparative advantages:

- Availability of adequate land to accommodate 50 ponds, hatchery, feed mill, administrative buildings, staff housing, and buffer zones;
- Favourable topography suitable for gravity-fed pond systems, reducing pumping energy requirements;
- Proximity to Lake Victoria markets and existing fish trade routes;
- Accessibility via existing road networks;
- Availability of local labour;
- Reduced risk of land use conflict compared to densely populated or ecologically sensitive areas.

Alternative sites closer to the immediate lakeshore were considered less suitable due to:

- Higher ecological sensitivity;
- Increased risk of flooding;
- Greater land use competition with settlement and agriculture;
- Potential conflicts with fisheries and riparian protection regulations.

Sites located further inland were evaluated but would require:

- Higher capital investment in water abstraction and pumping systems;
- Extended access roads and utility infrastructure;
- Greater logistical costs for transport of feed inputs and finished fish products.

Based on environmental suitability, logistical efficiency, infrastructure availability, and minimized social disruption, the Homa Hills site in Kanam B Location was identified as the preferred and most sustainable location.

6.3. Alternative Technologies

Given the integrated nature of the project (ponds, hatchery, feed mill, cold storage, and corporate headquarters), several technological alternatives were evaluated to determine the most appropriate production and infrastructure systems.

6.3.1. Pond-Based Aquaculture (Selected Option)

The proposed development includes 50 earthen ponds supported by a centralized hatchery and feed mill. This system was selected based on:

- Suitability to local soil conditions and topography;
- Lower operational energy demand compared to fully mechanized systems;
- Ease of management and scalability;
- Compatibility with semi-intensive tilapia culture systems;
- Lower technological complexity, making local capacity building feasible.

Environmental impacts such as nutrient loading, effluent discharge, and sludge accumulation can be effectively managed through:

- Proper pond lining and embankment stabilization;
- Installation of sedimentation and treatment ponds;
- Controlled feeding regimes to minimize waste;
- Routine water quality monitoring;
- Maintenance of buffer zones around watercourses.

The pond-based system is considered technically feasible, economically viable, and environmentally manageable under proper environmental management practices.

6.3.2. Recirculating Aquaculture Systems (RAS) – Alternative Considered

Recirculating Aquaculture Systems (RAS) were considered as a high-intensity, water-efficient alternative. However, RAS requires:

- High and reliable electricity supply;
- Advanced water filtration and biofiltration systems;
- Skilled technical personnel;
- Significant capital and maintenance costs.

While RAS reduces water usage and allows higher production density, it presents:

- Higher operational risks in case of power failure;
- Greater financial exposure due to system complexity;
- Increased technical maintenance demands.

Given the current infrastructure realities in West Karachuonyo Sub County including grid stability considerations and cost implications RAS was deemed less suitable as the primary production system for this project.

6.3.3. Feed Supply Alternatives

Two alternatives were considered:

- 1) Procuring feed from external commercial suppliers;
- 2) Establishing an on-site feed mill (Selected Option).

The on-site feed mill was preferred because it:

- Reduces feed transport costs;
- Improves quality control;
- Enhances biosecurity;
- Creates additional employment opportunities;
- Strengthens vertical integration of the aquaculture value chain.

Although it introduces additional energy demand and operational complexity, these impacts can be mitigated through efficient energy use, dust control systems, and proper waste handling.

6.3.4. Cold Storage Alternatives

The project proposes installation of on-site cold storage facilities to preserve harvested fish before distribution.

Alternative reliance on third-party cold storage facilities was considered but would:

- Increase post-harvest losses;
- Raise transportation costs;
- Reduce quality control;
- Limit market responsiveness.

On-site cold storage improves product quality, reduces spoilage, and enhances profitability, while environmental impacts (energy use and refrigerant management) can be mitigated through energy-efficient systems and proper maintenance.

Conclusion

The comparative assessment of alternatives demonstrates that:

- The No-Project Alternative would forgo significant socio-economic benefits;
- The selected site at Homa Hills, Kanam B Location offers optimal environmental, logistical, and economic advantages;
- The proposed pond-based aquaculture system supported by a hatchery, feed mill, cold storage, corporate headquarters, and staff housing represents the most technically feasible, environmentally manageable, and economically viable option;
- Higher-intensity technologies such as RAS, while viable, are less suitable under current local infrastructure and cost conditions.

Accordingly, the proposed integrated aquaculture and headquarters development at Homa Hills is considered the preferred alternative, subject to implementation of the recommended environmental and social mitigation measures outlined in this ESIA.

7. CHAPTER SEVEN: ANTICIPATED PROJECT IMPACTS AND MITIGATION MEASURES

7.1. Introduction

The development of Victory Farms Ltd headquarters, encompassing 50 earthen ponds, a hatchery, feed mill, warehouse, and staff quarters, is expected to generate a range of environmental, social, and economic impacts throughout its project cycle. Positive impacts include employment creation, skills transfer, stimulation of local supply chains, and enhanced infrastructure, which contribute to community development and economic growth. Conversely, the project may result in negative impacts, such as habitat alteration, water pollution, introduction of exotic species, disease outbreaks, noise and dust during construction, and potential socio-cultural disruptions for local communities^{8,61}.

To maximize benefits and minimize risks, mitigation measures will be implemented at each project phase. During construction, measures include adoption of health and safety protocols, dust and noise management, and community engagement programs. Operational measures focus on biosecurity, disease monitoring, responsible effluent management, and use of locally adapted fish stocks to prevent genetic and pathogenic risks. During decommissioning, strategies such as waste management, site rehabilitation, and resource salvage will ensure sustainable closure. By systematically integrating these mitigation measures with careful planning, monitoring, and stakeholder engagement, the project aims to achieve long-term ecological sustainability, social acceptability, and economic viability, aligning with national regulatory frameworks and international best practices^{62,63}.

7.2. Anticipated Positive Impacts during construction phase

The construction phase of this large-scale aquaculture headquarters has the potential to generate substantial short-term socio-economic benefits. One of the most immediate positive impacts is employment creation. Construction activities such as site clearance, excavation of ponds, building of embankments, concrete works, installation of hatchery systems, and feed mill assembly require both skilled and unskilled labour. According to the International Labour Organization⁶³, infrastructure and construction projects significantly contribute to job creation, particularly in developing economies where labour-intensive methods are often employed. Local recruitment enhances household incomes and stimulates spending within nearby communities, thereby generating multiplier effects across local markets.

In addition to direct employment, indirect economic benefits arise from demand for construction materials, transportation services, equipment supply, and food vending. The World Bank⁶² notes that infrastructure development projects stimulate backward and forward economic linkages by increasing demand for locally sourced goods and services. Suppliers of sand, aggregates, cement, timber, and fuel are likely to benefit, thereby strengthening small and medium enterprises in the project area.

Skills transfer and capacity development represent another important positive outcome. Workers engaged in constructing aquaculture ponds, water control structures, hatchery systems, and feed processing facilities gain practical experience in specialized infrastructure. This exposure enhances local technical knowledge in aquaculture engineering and agro-industrial construction. The Food and

⁶¹ De Silva, S. S., & Turchini, G. (2019). *Genetic considerations in aquaculture: Managing risks and sustainability* (FAO Fisheries Technical Paper No. 634). FAO.

⁶² World Bank. (2020). *Infrastructure sector overview*. World Bank.

⁶³ International Labour Organization (ILO). (2015). *Employment-intensive investment programmes: Overview*. ILO.

Agriculture Organization⁸ emphasizes that investments in aquaculture infrastructure can improve local technical capacity and long-term sector sustainability by building human capital.

Furthermore, improvements in site access roads, electricity supply, and water infrastructure during construction may produce long-term community benefits. Enhanced infrastructure can improve mobility, facilitate trade, and increase property values. Such developments align with broader rural development strategies that integrate aquaculture growth with local economic advancement⁶⁴.

7.2.1. Employment Creation and Income Generation

One of the most immediate and tangible positive impacts of the construction phase is employment creation. The development of 50 earthen ponds, hatchery facilities, feed mill structures, warehouse buildings, and staff quarters requires skilled personnel such as engineers, surveyors, equipment operators, electricians, and masons, as well as unskilled and semi-skilled labourers. The International Labour Organization⁶³ notes that construction projects play a critical role in generating employment, particularly in developing regions where labour-intensive techniques are commonly used.

Local hiring during the construction phase contributes to increased household income, improved living standards, and poverty reduction. Income earned by workers is often spent within the local economy, generating multiplier effects that benefit retail businesses, markets, and service providers. According to the World Bank⁶², infrastructure investments have strong short-term employment multipliers due to backward linkages in supply and service sectors.

Enhancement Measures

- Prioritize recruitment of qualified local labour through transparent hiring processes.
- Establish local employment quotas where feasible to maximize community participation.
- Provide fair wages consistent with national labour laws and ILO standards.
- Ensure timely payment of wages to enhance household income stability.
- Promote gender equality and inclusion of vulnerable groups in employment opportunities.
- Offer short-term skills certification programs to improve future employability.
- Encourage subcontractors to adopt similar local hiring commitments.
- Monitor and report employment statistics to demonstrate socio-economic contribution.

7.2.2. Growth of Local Enterprises and Supply Chains

The construction process stimulates demand for locally sourced construction materials such as sand, gravel, cement, timber, steel, fuel, and water. Transport providers, equipment rental services, food vendors, and small-scale traders benefit from increased business opportunities. This enhances the viability of local small and medium enterprises (SMEs) and strengthens local economic resilience.

Infrastructure investments in agriculture and aquaculture are recognized as catalysts for rural economic growth because they create value chain linkages between producers, suppliers, and service providers⁶⁴. During the construction period, these linkages help diversify income streams within the community and increase overall economic circulation.

Enhancement Measures

⁶⁴ FAO. (2020). *The state of world fisheries and aquaculture 2020: Sustainability in action*. Food and Agriculture Organization.

- Prioritize procurement of locally available construction materials that meet quality standards.
- Develop a local supplier database to encourage SME participation.
- Conduct supplier sensitization workshops on quality and procurement requirements.
- Offer long-term supply agreements to reliable local vendors where feasible.
- Facilitate access to information on tender opportunities for local businesses.
- Encourage joint ventures between external contractors and local enterprises.
- Ensure prompt payment to suppliers to improve SME cash flow and sustainability.

7.2.3. Skills Transfer and Capacity Building

The construction of specialized aquaculture infrastructure—particularly hatchery systems and feed mill installations—provides opportunities for technical knowledge transfer. Workers gain hands-on experience in earthworks engineering, water control structure installation, mechanical assembly, plumbing systems, and agro-industrial building construction.

Human capital development is widely recognized as a key outcome of infrastructure projects. According to the FAO⁸, investments in aquaculture facilities contribute to long-term sector sustainability by building technical competencies among local workers and contractors. Skills acquired during construction may enhance future employability and entrepreneurial capacity, thereby producing lasting developmental benefits beyond the project duration.

Enhancement Measures

- Implement structured on-the-job training programs during construction.
- Partner with technical institutions for apprenticeship placements.
- Provide mentorship arrangements between skilled professionals and local workers.
- Facilitate certification for workers in specialized construction skills.
- Conduct regular toolbox talks and technical workshops.
- Document and share best construction practices to build local technical knowledge.
- Encourage contractors to integrate knowledge transfer targets in contracts.

7.2.4. Infrastructure Improvement and Area Development

The construction phase often necessitates improvement of access roads, electricity connections, and water supply systems to the project site. These improvements may remain in place after construction is completed, thereby enhancing mobility and access for surrounding communities. Improved road networks facilitate trade, reduce transport costs, and improve connectivity between rural producers and markets.

The World Bank⁶² emphasizes that infrastructure expansion contributes to broader regional development by improving logistical efficiency and attracting additional investment. In this context, the establishment of a large aquaculture headquarters may position the area as a hub for aquaculture-related economic activity.

Enhancement Measures

- Upgrade access roads to durable standards benefiting both the project and community.
- Coordinate infrastructure improvements with local government development plans.
- Ensure extended utilities (water/electricity) are designed to accommodate community access where feasible.
- Maintain improved roads and drainage systems throughout construction.

- Incorporate climate-resilient infrastructure designs.
- Communicate infrastructure development plans transparently to stakeholders.

7.2.5. Stimulation of the Aquaculture Value Chain

The construction of integrated facilities—including ponds, hatchery, and feed mill—lays the foundation for a vertically integrated aquaculture enterprise. Although the full benefits will materialize during operation, the construction phase signals investor confidence in the sector and may encourage complementary investments.

Aquaculture is recognized globally as one of the fastest-growing food production sectors and a major contributor to food security and economic growth⁶⁴. By initiating construction of comprehensive production infrastructure, the project supports long-term development of fish supply systems, reduces dependence on imported feed, and strengthens domestic production capacity.

Enhancement Measures

- Engage local fish farmers and entrepreneurs in awareness programs about future supply opportunities.
- Facilitate business networking forums linking suppliers, contractors, and aquaculture stakeholders.
- Promote early planning for operational phase integration with local producers.
- Encourage investment forums to attract complementary aquaculture businesses.
- Share technical knowledge about hatchery and feed mill standards with regional stakeholders.
- Support development of ancillary services (transport, cold storage, packaging).

7.2.6. Increased Government Revenue

Construction activities generate tax revenues through business permits, income taxes from employees, and value-added taxes on purchased materials. These revenues can contribute to local government budgets, potentially supporting community services and infrastructure development. According to the World Bank⁶², infrastructure investments can expand fiscal space through increased economic activity and taxation.

Enhancement Measures

- Ensure full compliance with tax regulations and statutory payments.
- Maintain transparent financial reporting systems.
- Collaborate with local authorities to align project contributions with community development priorities.
- Support local government capacity-building initiatives where appropriate.

7.3. Anticipated Negative Impacts During the Construction Phase

The construction phase of a large-scale aquaculture headquarters involving excavation of 50 earthen ponds, development of hatchery and feed mill facilities, warehouse construction, and staff housing development is associated with a range of temporary environmental and social risks. These impacts are generally localized and short-term but may become significant if not properly managed through structured environmental and social safeguards.

7.3.1. Soil Erosion and Land Degradation

The excavation of 50 earthen ponds, site grading, and vegetation clearing will significantly disturb the natural soil structure and landscape. Removal of vegetation exposes topsoil to rainfall and wind erosion, increasing sediment transport and land degradation. Construction activities involving heavy machinery may also cause soil compaction, reducing infiltration capacity and increasing surface runoff. According to the United States Environmental Protection Agency⁶⁵, sediment runoff from construction sites is one of the primary causes of soil degradation and downstream sedimentation. If embankments are not properly engineered and stabilized, slope instability may occur, potentially compromising pond structures and surrounding land.

Mitigation Measures

- Phase clearing and excavation to minimize exposed soil at any time.
- Install silt fences, sediment traps, and temporary drainage channels.
- Compact and stabilize pond embankments properly.
- Stockpile and preserve topsoil for site rehabilitation.
- Re-vegetate disturbed areas immediately after earthworks.

7.3.2. Water Pollution and Sedimentation

Construction activities may increase sediment loads in nearby surface water bodies through stormwater runoff. Elevated turbidity can impair aquatic ecosystems and reduce water quality⁶⁶. Additionally, accidental spills of fuel, lubricants, and hydraulic fluids from machinery may contaminate surface and groundwater resources. Improper disposal of construction debris can further obstruct natural drainage systems and increase localized flooding risks.

Mitigation Measures

- Construct sedimentation basins and silt traps.
- Develop and implement a Stormwater Management Plan.
- Store fuels and chemicals in bunded, secure areas.
- Prohibit equipment washing and servicing near water bodies.
- Establish a Spill Prevention and Response Plan.
- Conduct periodic water quality monitoring.

7.3.3. Air Pollution and Dust Emissions

Earthmoving operations, excavation of ponds, and transportation of materials on unpaved roads generate dust emissions, including particulate matter (PM10 and PM2.5). Exposure to fine particulates may cause respiratory irritation and other health concerns among workers and nearby residents⁶⁷. Diesel-powered machinery also emits nitrogen oxides (NOx), sulfur oxides (SOx), and carbon monoxide (CO), contributing to localized air pollution.

Mitigation Measures

- Regularly sprinkle water on exposed surfaces and access roads.

⁶⁵ United States Environmental Protection Agency (USEPA). (2021). *Developing your stormwater pollution prevention plan: A guide for construction sites*. USEPA.

⁶⁶ World Health Organization (WHO). (2017). *Guidelines for drinking-water quality* (4th ed.). WHO.

⁶⁷ World Health Organization (WHO). (2021). *WHO global air quality guidelines*. WHO.

- Cover trucks transporting loose materials.
- Maintain construction equipment to minimize exhaust emissions.
- Enforce speed limits within the construction site.
- Provide dust masks to workers.

7.3.4. Noise and Vibration Disturbances

Operation of heavy machinery such as excavators, graders, and concrete mixers generates elevated noise levels. Prolonged exposure to high noise levels may lead to hearing impairment and stress-related conditions among workers⁶⁸. Noise may also disturb nearby communities and livestock. Vibration from machinery can cause minor structural disturbances in nearby buildings if construction occurs in close proximity.

Mitigation Measures

- Restrict high-noise activities to daytime working hours.
- Install silencers and mufflers on machinery where feasible.
- Conduct regular equipment maintenance.
- Provide hearing protection devices to workers.
- Notify nearby communities in advance of major construction activities.

7.3.5. Solid and Hazardous Waste Generation

Construction activities will generate solid waste such as scrap metal, packaging materials, concrete debris, and excavated spoil. Hazardous waste may include used oils, lubricants, and chemical containers. If improperly handled, these wastes may contaminate soil and water resources. The World Bank Group¹² emphasizes that poor waste management practices during construction can result in long-term environmental degradation.

Mitigation Measures

- Segregate waste at the source into recyclable and non-recyclable categories.
- Reuse excavated materials where feasible.
- Provide designated and labeled waste collection areas.
- Dispose of hazardous waste through licensed contractors.
- Maintain waste tracking and disposal records.

7.3.6. Occupational Health and Safety Risks

The construction phase presents several occupational hazards, including falls into excavation pits, injuries from heavy machinery, electrical hazards during feed mill installation, and exposure to fuels and lubricants. The construction industry is globally recognized as one of the most hazardous sectors due to high accident rates⁶⁸. Without proper safety management systems, worker injuries and fatalities may occur.

Mitigation Measures

- Develop and implement a Construction Health and Safety Plan.
- Provide appropriate PPE.

⁶⁸ International Labour Organization (ILO). (2019). *Safety and health in construction and demolition*. ILO.

- Fence off excavated areas and install warning signage.
- Conduct regular safety training and toolbox meetings.
- Establish first aid facilities and emergency response procedures.

7.3.7. Traffic Congestion and Road Safety Risks

Transportation of construction materials and machinery may increase traffic volumes on local roads. Heavy trucks may damage road infrastructure and elevate accident risks, particularly in rural areas with limited road safety controls. The World Bank⁶⁹ notes that infrastructure projects often increase short-term road safety risks if traffic management is not adequately addressed.

Mitigation Measures

- Prepare and implement a Traffic Management Plan.
- Install warning signage along access roads.
- Schedule deliveries during off-peak hours.
- Repair road damage caused by construction vehicles.
- Train drivers on safe driving practices.

7.3.8. Social Conflicts and Community Disturbances

The influx of construction workers may strain local services such as water supply and sanitation. Perceived inequities in employment opportunities may create social tensions within host communities. Poor worker conduct may also disrupt community cohesion. The World Bank⁶⁹ underscores the importance of stakeholder engagement and grievance mechanisms to mitigate social risks during project implementation.

Mitigation Measures

- Prioritize recruitment of local labour where feasible.
- Establish a grievance redress mechanism.
- Develop and enforce a worker code of conduct.
- Conduct regular stakeholder and community engagement meetings.
- Monitor and promptly address community complaints.

7.4. Anticipated Positive Impacts and Enhancement Measures During the Operational Phase

7.4.1. Employment Creation and Income Stability

During the operational phase, the aquaculture facility will generate long-term and more stable employment opportunities compared to the temporary construction phase. The hatchery, feed mill, pond management units, warehouse operations, and administrative offices will require a permanent workforce, including aquaculture technicians, feed production specialists, quality control personnel, machine operators, security staff, and administrative personnel.

Aquaculture is recognized globally as one of the fastest-growing food production sectors and a major employer within fisheries value chains⁶⁴. Sustainable aquaculture operations contribute directly to rural employment and poverty reduction, particularly in developing regions. Regular wages enhance household

⁶⁹ World Bank. (2018). *Environmental and social framework*. World Bank.

income stability, improve access to education and healthcare, and contribute to improved living standards.

Enhancement Measures

- Prioritize long-term employment of local community members.
- Provide fair wages and compliant employment contracts.
- Offer continuous professional development and technical training.
- Promote gender inclusion and equal employment opportunities.
- Establish transparent recruitment and promotion procedures.

7.4.2. Contribution to Food Security and Nutrition

The production of fish from 50 earthen ponds supported by a hatchery ensures consistent availability of fingerlings and market-size fish. Fish is widely recognized as an important source of high-quality protein, essential fatty acids, vitamins, and minerals. According to FAO⁸, aquaculture plays a critical role in improving global food security and nutrition by increasing the availability of affordable animal protein.

By increasing domestic fish production, the project reduces dependence on fish imports and enhances national food self-sufficiency. This contributes positively to national nutrition outcomes and supports government food security strategies.

Enhancement Measures

- Maintain high biosecurity standards to ensure continuous production.
- Implement best management practices (BMPs) in pond management.
- Conduct regular health monitoring of fish stocks.
- Ensure quality assurance and certification standards are met.
- Develop reliable distribution networks to local markets.

7.4.3. Strengthening of the Aquaculture Value Chain

The integration of hatchery, grow-out ponds, feed mill, and warehouse facilities represents a vertically integrated aquaculture system. This integration strengthens supply chain efficiency by reducing reliance on imported fingerlings and feed. According to FAO⁶⁴, value chain integration enhances sector resilience, improves cost control, and increases profitability.

The feed mill, in particular, contributes to input security and may supply feed to other fish farmers in the region, stimulating further aquaculture development. The warehouse improves storage capacity and reduces post-harvest losses.

Enhancement Measures

- Maintain efficient feed formulation and quality control systems.
- Develop partnerships with local farmers and suppliers.
- Provide technical extension services to out-growers.
- Implement inventory and supply chain management systems.
- Encourage local sourcing of raw materials where feasible.

7.4.4. Economic Growth and Revenue Generation

Operational activities generate sustained economic activity through fish sales, feed production, and related services. Increased production contributes to gross domestic product (GDP) in the agriculture

and fisheries sector. The World Bank⁶² highlights that agribusiness investments stimulate rural economic transformation by enhancing productivity and market participation.

Additionally, the project will generate government revenue through corporate taxes, income taxes from employees, and business-related levies. Local governments may benefit from increased fiscal resources that can support infrastructure and social services.

Enhancement Measures

- Maintain accurate financial reporting and tax compliance.
- Expand market access through diversified distribution channels.
- Develop branding and marketing strategies to enhance competitiveness.
- Reinvest profits into production efficiency improvements.

7.4.5. Skills Development and Technological Advancement

Operation of hatchery systems, water quality monitoring equipment, feed milling machinery, and cold storage facilities promotes technological transfer and human capital development. Workers acquire specialized technical skills in aquaculture production, feed formulation, fish health management, and quality assurance.

The FAO⁸ emphasizes that aquaculture modernization improves productivity and sustainability through improved knowledge and technical capacity. Continuous skill development enhances employee competence and increases sectoral innovation.

Enhancement Measures

- Provide ongoing technical training and certification programs.
- Collaborate with research institutions and universities.
- Adopt modern monitoring technologies (e.g., water quality sensors).
- Encourage innovation and research in feed efficiency and fish health.

7.4.6. Infrastructure and Community Development

The presence of a large aquaculture headquarters may stimulate further infrastructure improvements such as better roads, electricity reliability, and communication networks. Improved infrastructure benefits surrounding communities by enhancing mobility and access to markets.

Aquaculture development is often associated with rural transformation and improved service delivery⁶². Staff quarters may also contribute to organized settlement planning and improved housing standards.

Enhancement Measures

- Maintain access roads and utility infrastructure.
- Engage in corporate social responsibility (CSR) initiatives.
- Support community development projects (e.g., water supply, schools).
- Establish open communication channels with local stakeholders.

7.4.7. Export Potential and Foreign Exchange Earnings

If production volumes and quality standards meet export requirements, the facility may access regional or international markets. Fish exports contribute to foreign exchange earnings and improve national

trade balances. FAO⁶⁴ notes that aquaculture exports are a major source of foreign income for many developing economies.

Export diversification enhances economic resilience and strengthens competitiveness within the fisheries sector.

Enhancement Measures

- Comply with international food safety and quality standards.
- Obtain relevant certifications (e.g., HACCP).
- Invest in cold chain and quality preservation systems.
- Conduct regular product quality testing and traceability monitoring.

7.5. Anticipated Negative Impacts and Mitigation Measures During the Operational Phase

7.5.1. Water Pollution and Effluent Discharge

During operation, the 50 earthen ponds and hatchery systems will generate effluent containing uneaten feed, fish excreta, suspended solids, nutrients (nitrogen and phosphorus), and possible treatment chemicals. If discharged untreated into surrounding water bodies, these effluents may contribute to eutrophication, algal blooms, oxygen depletion, and degradation of aquatic ecosystems. According to the Food and Agriculture Organization⁶⁴, poor effluent management in aquaculture systems can significantly affect downstream water quality. Nutrient enrichment may alter ecological balance and reduce biodiversity in receiving waters.

Mitigation Measures

- Install sedimentation and treatment ponds before effluent discharge.
- Implement water recirculation systems where feasible.
- Regularly monitor effluent quality (BOD, COD, nitrogen, phosphorus).
- Apply optimal feeding strategies to reduce feed wastage.
- Maintain vegetative buffer zones around ponds.

7.5.2. Solid Waste Generation

Operational activities at the hatchery, feed mill, warehouse, and ponds will generate solid wastes such as feed bags, packaging materials, sludge from ponds, fish mortalities, and general domestic waste from staff quarters. Improper disposal may attract pests, cause odors, and contaminate soil and water. The World Bank Group¹² emphasizes that inadequate waste management in agro-industrial facilities can lead to environmental and public health concerns.

Mitigation Measures

- Segregate organic and inorganic waste at source.
- Compost organic waste and pond sludge where appropriate.
- Dispose of fish mortalities through burial or approved rendering methods.
- Contract licensed waste handlers for non-recyclable waste.
- Maintain waste storage areas in sanitary condition.

7.5.3. Odor and Air Emissions

Decomposition of organic matter in ponds, sludge accumulation, and feed mill dust emissions may generate odours and airborne particulates. Feed milling operations can produce fine dust, which may pose respiratory risks to workers and nearby residents. According to the World Health Organization⁶⁷, exposure to particulate matter is associated with respiratory and cardiovascular health risks. Odor emissions may also affect community comfort if not managed properly.

Mitigation Measures

- Maintain proper pond aeration to prevent anaerobic conditions.
- Regularly remove and manage accumulated sludge.
- Install dust control systems (cyclones or filters) in the feed mill.
- Provide respiratory protective equipment for workers.
- Establish vegetative screening around the facility.

7.5.4. Disease Outbreaks and Biosecurity Risks

High stocking densities in earthen ponds and hatchery systems may increase susceptibility to disease outbreaks. Fish diseases can spread rapidly, leading to economic losses and potential ecological risks if infected stock escapes into natural water bodies. FAO⁸ highlights biosecurity as a critical component of sustainable aquaculture management. Inadequate disease control may result in overuse of antibiotics or chemicals, which can further affect water quality and antimicrobial resistance patterns.

Mitigation Measures

- Develop and implement a comprehensive Biosecurity Management Plan.
- Conduct routine fish health monitoring and diagnostics.
- Maintain optimal stocking densities.
- Restrict site access to authorized personnel.
- Use veterinary-approved treatments under professional guidance.

7.5.5. Increased Water Abstraction

Operational ponds and hatchery systems may require significant water abstraction, potentially affecting local water availability, especially during dry seasons. Over-extraction may reduce groundwater levels or alter stream flow patterns. According to the FAO⁶⁴, sustainable aquaculture requires responsible water resource management to prevent user conflicts and environmental degradation.

Mitigation Measures

- Obtain legal water abstraction permits.
- Monitor water usage regularly.
- Implement water recycling and reuse systems.
- Use water-efficient production techniques.
- Coordinate water use with local authorities and stakeholders.

7.5.6. Occupational Health and Safety Risks

Operational hazards may include machinery-related injuries in the feed mill, electrical hazards in hatchery systems, exposure to chemicals, and risks associated with pond management. The International Labour Organization⁶⁸ identifies agro-industrial operations as environments with moderate to high occupational

risk if safety standards are not maintained. Prolonged exposure to feed dust and chemicals may also cause respiratory or skin irritation.

Mitigation Measures

- Develop and enforce an Occupational Health and Safety (OHS) Plan.
- Provide appropriate PPE.
- Install machine guards and emergency shut-off systems.
- Conduct regular safety training and drills.
- Maintain first aid kits and emergency response procedures.

7.5.7. Noise Pollution

Feed mill operations, generators, water pumps, and vehicle movement may generate continuous noise. Prolonged exposure to high noise levels can affect worker hearing and cause discomfort to nearby communities. The World Bank Group¹² provides environmental, health, and safety (EHS) guidelines for noise management in industrial facilities.

Mitigation Measures

- Install noise-dampening equipment and enclosures.
- Maintain machinery regularly to minimize excessive noise.
- Limit operation of high-noise equipment to daytime hours where possible.
- Provide hearing protection to workers.
- Monitor noise levels periodically.

7.5.8. Social and Community Impacts

Operational activities may increase traffic for feed distribution and fish marketing. Increased vehicle movement may raise accident risks and road wear. Additionally, perceived inequities in employment or procurement practices may create social tension. The World Bank (2018) emphasizes the importance of continuous stakeholder engagement throughout project operation to maintain positive community relations.

Mitigation Measures

- Implement a Traffic Management Plan.
- Maintain access roads and ensure safe driving practices.
- Prioritize local procurement and employment opportunities.
- Establish and maintain a grievance redress mechanism.
- Conduct regular stakeholder engagement meetings.

7.6. Anticipated Positive Impacts and Enhancement Measures During the Decommissioning Phase

Decommissioning refers to the planned closure, dismantling, rehabilitation, and restoration of project facilities at the end of their operational life. When properly managed, the decommissioning phase of aquaculture infrastructure can generate important environmental and socio-economic benefits. International best practice emphasizes structured closure planning to minimize liabilities while maximizing post-project land value and community benefits¹².

7.6.1. Employment Opportunities During Decommissioning

Although decommissioning marks the end of operational activities, it creates short- to medium-term employment opportunities related to dismantling infrastructure, site restoration, waste management, environmental rehabilitation, and transportation of materials. Skilled and semi-skilled labor will be required for demolition of hatchery and feed mill structures, removal of machinery, rehabilitation of ponds, and landscaping activities.

The International Labour Organization⁶³ notes that infrastructure dismantling and rehabilitation projects can generate transitional employment and income opportunities. These temporary jobs can provide income continuity for workers previously employed at the facility and support local contractors specializing in demolition and environmental restoration.

Enhancement Measures

- Prioritize redeployment of existing employees in decommissioning activities.
- Provide retraining programs for workers transitioning to other sectors.
- Engage local contractors and service providers for dismantling works.
- Ensure compliance with labour standards during closure activities.
- Develop a workforce transition plan early in the decommissioning process.

7.6.2. Environmental Restoration and Ecosystem Recovery

Decommissioning provides an opportunity to restore the project site to a stable and environmentally sustainable condition. Rehabilitation of earthen ponds may involve reshaping land contours, re-establishing vegetation cover, and improving soil quality. Proper site restoration can enhance biodiversity, improve soil fertility, and reduce long-term environmental risks.

According to the Food and Agriculture Organization⁶⁴, responsible aquaculture includes post-operation environmental rehabilitation to prevent legacy impacts such as water pollution or habitat degradation. Restored areas may be repurposed for agriculture, conservation, or alternative economic uses, thereby enhancing ecological resilience.

Enhancement Measures

- Develop and implement a Site Restoration and Rehabilitation Plan.
- Re-contour land to natural drainage patterns.
- Re-vegetate disturbed areas using native plant species.
- Remove contaminated soils where necessary.
- Conduct post-closure environmental monitoring.

7.6.3. Resource Recovery and Recycling

Decommissioning allows for recovery and recycling of valuable materials such as metal structures, pipes, tanks, and feed mill equipment. Recycling reduces waste sent to landfills and supports circular economy principles. The World Bank Group¹² encourages material reuse and recycling as part of sustainable facility closure practices.

Recovered materials may be sold or repurposed, generating additional economic value. Proper asset disposal also reduces environmental liabilities associated with abandoned infrastructure.

Enhancement Measures

- Conduct an inventory of recoverable materials before dismantling.
- Engage licensed recyclers for metal and equipment recovery.
- Reuse salvageable construction materials where feasible.
- Dispose of hazardous materials according to regulatory standards.
- Maintain documentation of material recovery and disposal.

7.6.4. Land Reuse and Redevelopment Opportunities

Following decommissioning, the rehabilitated site may be repurposed for alternative productive uses such as agriculture, agro-processing, conservation areas, or community development projects. Strategic land reuse planning can increase long-term land value and stimulate new investment.

The FAO⁸ highlights that sustainable land management practices improve long-term productivity and environmental performance. Properly restored land may support diversified economic activities, thereby contributing to continued regional development beyond the project lifecycle.

Enhancement Measures

- Conduct a post-closure land capability assessment.
- Engage stakeholders in determining future land use options.
- Integrate redevelopment plans with local government development strategies.
- Ensure soil and water suitability for proposed new land uses.
- Secure necessary regulatory approvals for land conversion.

7.6.5. Reduced Environmental Pressure

The cessation of aquaculture operations eliminates operational risks such as effluent discharge, nutrient loading, feed dust emissions, and noise from machinery. As noted by FAO⁶⁴, aquaculture operations require ongoing environmental management; therefore, closure reduces continuous environmental pressures on water resources and surrounding ecosystems.

This reduction in operational impacts may allow local ecosystems to recover over time, particularly if combined with active rehabilitation efforts.

Enhancement Measures

- Ensure proper removal of residual chemicals and feed stocks.
- Drain and treat pond sediments responsibly.
- Monitor water bodies previously receiving effluent.
- Implement biodiversity enhancement measures where feasible.
- Document environmental recovery progress.

7.6.6. Strengthened Institutional and Regulatory Compliance

A well-planned decommissioning process demonstrates corporate responsibility and compliance with environmental regulations. Transparent closure procedures enhance the company's reputation and strengthen stakeholder trust. The World Bank⁶⁹ emphasizes the importance of lifecycle environmental and social management, including responsible project closure.

Proper documentation and reporting during decommissioning can also serve as a model for best practice in aquaculture facility management.

Enhancement Measures

- Prepare and submit a Decommissioning and Closure Plan to relevant authorities.
- Maintain transparent communication with stakeholders.
- Conduct independent environmental audits at closure.
- Ensure full compliance with environmental and labour regulations.
- Document lessons learned for future projects.

7.7. Anticipated Negative Impacts and Mitigation Measures During the Decommissioning Phase

Decommissioning of large aquaculture infrastructure involves dismantling buildings, removing machinery, rehabilitating ponds, and clearing site utilities. While this phase offers positive opportunities, it also carries potential environmental, social, and occupational risks if poorly managed¹². These include soil disturbance, water contamination, waste generation, occupational hazards, and social disruption.

7.7.1. Soil Disturbance and Erosion

Dismantling earthen ponds and associated infrastructure can disturb soil surfaces, particularly embankments and pond floors. Removal of vegetation and excavation activities may increase susceptibility to erosion, especially during heavy rainfall events. Exposed soils may also contribute to sediment runoff, affecting local watercourses.

Mitigation Measures

- Phase decommissioning works to minimize large exposed areas.
- Re-contour pond embankments and compact soils to prevent erosion.
- Apply mulching or temporary vegetative cover on exposed soils.
- Install silt fences and sediment traps where necessary.
- Conduct post-decommissioning soil stabilization monitoring.

7.7.2. Water Pollution

The decommissioning process may generate wastewater containing suspended solids, residual feed, chemicals, and sediments from pond sediments and hatchery systems. Improper management of this runoff may lead to localized water contamination and eutrophication of nearby streams or groundwater⁶⁴. Residual cleaning agents and lubricants from machinery can further exacerbate water pollution risks.

Mitigation Measures

- Treat pond sediments and effluents before discharge.
- Drain ponds gradually to prevent sediment-laden runoff.
- Remove residual chemicals and fuels from machinery responsibly.
- Use sedimentation basins or filtration systems for effluent control.
- Monitor water quality during and after decommissioning.

7.7.3. Solid and Hazardous Waste Generation

Decommissioning will generate large volumes of solid waste, including scrap metal, concrete rubble, timber, plastics, electrical wiring, feed bags, and potentially hazardous materials such as oils, paints, and cleaning chemicals. Improper disposal of these wastes can contaminate soil and water, attract pests, and create public health hazards¹².

Mitigation Measures

- Conduct an inventory of recoverable and hazardous materials prior to dismantling.
- Segregate waste into recyclable, reusable, and hazardous categories.
- Engage licensed contractors for disposal of hazardous waste.
- Recycle metals, plastics, and concrete where feasible.
- Maintain records of waste management and disposal activities.

7.7.4. Occupational Health and Safety Risks

Decommissioning involves high-risk activities such as demolition, handling heavy machinery, dismantling feed mill equipment, and pond excavation. Workers may be exposed to falls, electrical hazards, chemical exposure, dust, and noise. The ILO⁶⁸ emphasizes that facility closure activities can present hazards equal to or exceeding operational risks if not carefully managed.

Mitigation Measures

- Develop and implement a Decommissioning Health and Safety Plan.
- Provide appropriate PPE for all workers.
- Conduct safety training specific to demolition and handling of hazardous materials.
- Restrict site access to authorized personnel only.
- Establish emergency response and first aid facilities.

7.7.5. Air Emissions and Dust Generation

Demolition and dismantling of buildings, feed mill structures, and pond embankments can generate dust and particulate matter. Dust exposure may affect workers' respiratory health and potentially impact nearby communities if the site is close to populated areas. Machinery operation also contributes to localized air emissions⁶⁷.

Mitigation Measures

- Apply water spraying on demolition sites to suppress dust.
- Enclose or cover demolition areas where possible.
- Maintain machinery to minimize exhaust emissions.
- Provide dust masks or respirators for workers.
- Monitor air quality periodically during decommissioning.

7.7.6. Noise and Community Disturbance

Demolition activities, heavy machinery, and transportation of waste materials generate significant noise, which may disturb nearby residents and wildlife. Prolonged noise exposure may also affect the health and safety of workers¹².

Mitigation Measures

- Restrict noisy activities to daytime hours.
- Install noise suppression measures (e.g., mufflers or barriers).
- Notify nearby communities in advance about high-noise activities.
- Maintain machinery to reduce excessive noise.
- Provide hearing protection to workers exposed to high noise levels.

7.7.7. Social Disruption

Decommissioning may result in temporary unemployment for operational staff. Additionally, increased traffic from waste transport and construction equipment can disrupt local transportation and access. Community perception of job loss or reduced economic activity may generate social tension if not proactively managed⁶⁹.

Mitigation Measures

- Develop a workforce transition and redundancy plan.
- Provide counselling, retraining, and placement assistance for displaced workers.
- Schedule waste transport to minimize peak-hour traffic disruption.
- Communicate decommissioning timelines and impacts to local communities.
- Engage local stakeholders in closure planning to maintain transparency.

7.8. Genetic, Pathogenic, and Socio-Ecological Risks and Management Throughout the Project Cycle

The establishment and operation of a large-scale aquaculture facility, such as the Victory Farms Ltd headquarters, presents potential genetic, pathogenic, and socio-ecological risks across the construction, operation, and decommissioning phases. Proper management of these risks is critical to ensure sustainable aquaculture practices, environmental protection, and social responsibility⁶⁴.

7.8.1. Genetic Risks

Genetic risks in aquaculture primarily arise from the introduction of non-native or genetically modified fish stocks, hybridization with wild populations, and selective breeding practices. Escapes from ponds or hatcheries can result in interbreeding with wild fish, potentially reducing genetic diversity, fitness, and resilience of local species⁶¹. Genetic homogenization may also reduce adaptability to environmental stressors, impacting ecosystem stability.

Mitigation Measures

- Use native or locally adapted fish species whenever possible.
- Implement containment systems (nets, barriers, and secured pond embankments) to prevent escapes.
- Conduct regular genetic monitoring of stock and nearby wild populations.
- Limit cross-breeding and strictly control broodstock selection.
- Develop an Emergency Fish Escape Response Plan.

7.8.2. Pathogenic Risks

Pathogenic risks include the introduction and spread of infectious diseases (bacterial, viral, fungal, and parasitic) within farmed fish and potentially to wild populations. High stocking densities, inadequate biosecurity, and poor water quality increase disease susceptibility. Disease outbreaks can lead to significant economic losses and may require chemical or antibiotic interventions that affect water quality and human health⁸.

Mitigation Measures

- Develop and implement a Biosecurity Management Plan covering all phases.
- Quarantine all incoming broodstock and juveniles.

- Conduct regular health checks and disease surveillance.
- Maintain optimal stocking densities and water quality parameters.
- Use veterinary-approved treatments responsibly to avoid antimicrobial resistance.
- Train staff in hygiene practices and disease prevention measures.
- Dispose of diseased or dead fish according to approved protocols.

7.8.3. Socio-Ecological Risks

Socio-ecological risks refer to the potential impacts of the facility on local communities, ecosystems, and livelihoods. These include:

- **Community Conflicts:** Competition for water resources, employment opportunities, or land may generate tension.
- **Environmental Degradation:** Effluent discharge, pond drainage, and chemical use can affect local water quality, soil, and biodiversity.
- **Livelihood Displacement:** Small-scale fishers or farmers may be affected by resource competition.

Such risks, if unmanaged, can compromise local social cohesion and the long-term sustainability of the project⁶⁹.

Mitigation Measures

- Conduct stakeholder engagement and community consultation throughout the project cycle.
- Develop a Grievance Redress Mechanism for affected communities.
- Monitor water use and allocate sufficient water for local community needs.
- Implement environmental management practices to protect local ecosystems.
- Offer local employment and procurement opportunities to enhance social acceptance.
- Develop alternative livelihood programs for potentially displaced or affected communities.

7.8.4. Integrated Risk Management Across Project Phases

Effective risk management requires coordinated measures throughout all project phases:

- **Construction Phase:** Implement sediment and erosion control, prevent accidental introduction of non-native species, and train workers on biosecurity protocols.
- **Operational Phase:** Maintain biosecure hatchery and pond management, conduct regular genetic and health monitoring, and ensure community engagement and fair resource allocation.
- **Decommissioning Phase:** Safely dispose of all fish, feed, and chemicals, rehabilitate ponds, prevent genetic contamination of local species, and restore ecosystems to minimize long-term socio-ecological impacts.

7.8.5. Cross-Cutting Mitigation Measures

- Establish an Environmental and Social Management System (ESMS) covering genetic, pathogenic, and socio-ecological risks.
- Conduct periodic audits and adaptive management to address emerging risks.
- Engage external experts for genetic and pathogen monitoring.
- Maintain transparent reporting and documentation of environmental and social performance.
- Educate and train staff continuously on environmental stewardship, biosecurity, and social responsibility.

7.9. Risk Analysis and Cost-Benefit Evaluation Throughout the Project Cycle

Large-scale aquaculture projects, such as the Victory Farms Ltd headquarters, require careful risk analysis and cost-benefit evaluation to ensure financial, environmental, and social sustainability. The project cycle—comprising construction, operation, and decommissioning phases—presents both opportunities and risks that must be quantitatively and qualitatively assessed. Risk analysis identifies potential hazards and uncertainties, while cost-benefit evaluation estimates economic viability, weighing anticipated gains against costs and potential negative impacts⁶⁹.

7.9.1. Construction Phase

During construction, risks primarily relate to financial overruns, schedule delays, environmental impacts, and occupational safety. Cost-benefit analysis considers investment costs for earthworks, hatchery systems, feed mill construction, staff quarters, and warehouse facilities against anticipated economic benefits, such as job creation, skills transfer, and infrastructure improvements.

Mitigation Measures:

- Conduct detailed project feasibility and risk assessment studies prior to construction.
- Develop a construction schedule with contingency buffers for delays.
- Allocate a risk contingency fund to address unexpected financial or environmental costs.
- Implement environmental and social management plans to reduce negative impacts.
- Ensure health and safety protocols are in place to minimize accidents.

7.9.2. Operational Phase

Operational risks include disease outbreaks, water quality degradation, equipment failure, market fluctuations, and genetic or ecological impacts. Cost-benefit evaluation focuses on long-term returns from fish production, feed milling, and supply chain integration, including contributions to local employment, household income, and government revenues⁶⁴.

Mitigation Measures:

- Establish biosecurity and disease monitoring programs to minimize pathogenic risks.
- Monitor and maintain water quality and pond conditions.
- Maintain mechanical and electrical systems to avoid operational downtime.
- Diversify market channels and product lines to mitigate economic risks.
- Conduct periodic financial audits and operational performance assessments.

7.9.3. Decommissioning Phase

Decommissioning carries risks of environmental contamination, social disruption, and financial costs related to site rehabilitation, waste management, and residual infrastructure removal. Cost-benefit analysis evaluates the value of salvaged materials, land restoration, and ecosystem recovery against decommissioning expenditures¹².

Mitigation Measures:

- Prepare a decommissioning plan including environmental, social, and financial components.
- Recover reusable materials and equipment to offset disposal costs.
- Implement soil, water, and habitat rehabilitation programs.
- Engage local communities in post-decommissioning land use planning.
- Monitor and evaluate residual impacts to ensure site sustainability.

7.9.4. Cross-Cutting Risk Considerations

Across all project phases, risks include climatic variability, regulatory changes, socio-political instability, and financial market fluctuations. Cost-benefit evaluation should integrate sensitivity analysis and scenario planning to account for uncertainties. Engaging stakeholders and maintaining transparent reporting improves risk governance and enhances project sustainability⁶².

Mitigation Measures:

- Conduct regular risk reviews and update mitigation strategies.
- Use scenario-based cost-benefit modeling to account for uncertainties.
- Maintain stakeholder engagement and communication.
- Invest in capacity building and staff training to improve adaptive management.
- Monitor key environmental, financial, and social indicators continuously.

7.9.5. Conclusion

Effective risk analysis and cost-benefit evaluation throughout the Victory Farms Ltd project cycle enable informed decision-making, optimize resource use, and maximize both economic and social benefits. By integrating environmental, social, financial, and operational considerations, the project can achieve long-term sustainability while minimizing risks associated with construction, operation, and decommissioning.

7.10. Risk Analysis and Cost-Benefit Evaluation of Victory Farms Ltd Headquarters

The Victory Farms Ltd project, comprising 50 earthen ponds, hatchery, feed mill, warehouse, and staff quarters, presents multiple risks and benefits across construction, operational, and decommissioning phases. Proper risk evaluation ensures that negative outcomes are mitigated, while cost-benefit assessment maximizes financial, social, and environmental returns^{62,8}.

The project's key risk categories are genetic, pathogenic, and socio-ecological, each affecting environmental sustainability, community well-being, and operational success.

Table 23: Risk Analysis Table of the Victory Farms Project

Risk Category	Risk Description	Likelihood	Consequence	Risk Rating	Potential Impact	Mitigation Measures
Genetic Risks	Escape and interbreeding with wild Nile tilapia	Medium	High	High	- Loss of genetic diversity - Reduced fitness of wild stocks - Alteration of local tilapia gene pool	- Use native or locally adapted stocks - Install pond containment systems (nets, barriers) - Monitor wild fish populations genetically - Prepare emergency response for fish escape
	Uncontrolled hatchery/pond release to the lake	Low	High	Medium	Sudden influx of non-native genes into wild populations	- Strict operational protocols - Controlled stocking and release - Environmental monitoring
Pathogenic Risks	Introduction of exotic pathogens with fingerlings	Medium	High	High	- Disease outbreaks in farmed and wild stocks - Potential zoonoses	- Quarantine incoming stock - Regular health checks - Biosecurity protocols - Responsible use of veterinary medicines
	Disease amplification and spread from farm to wild fish	Medium	Medium	Medium	- Reduced wild fish populations - Fish mortalities	- Water treatment and effluent management - Monitor pond discharge - Staff training on hygiene and disease control
Socio-Ecological Risks	Competition for fishing grounds and navigation space	High	Medium	High	- Displacement of artisanal fishers - Navigational hazards	- Community engagement and conflict resolution - Allocate safe navigational routes - Stakeholder consultations

	Reduced access to landing sites	Medium	Medium	Medium	Reduced income for artisanal fishers	- Compensation programs - Improve community landing facilities - Shared access agreements
	Cultural disruption & loss of heritage access	Low	Medium	Low–Medium	Loss of community trust and cohesion	- Consult local leaders and cultural custodians - Integrate cultural heritage considerations in planning
	Localized nutrient enrichment affecting wild catches	Medium	Medium	Medium	- Decline in water quality - Change in fish community composition	- Treat effluent before discharge - Monitor water quality regularly - Implement integrated pond management

Sources: FAO (2022); De Silva & Turchini (2019); World Bank (2020).

Table 24: Cost-Benefit Evaluation Table of the Project

Project Phase	Key Benefits	Key Costs/Risks	Mitigation/Enhancement Measures
Construction	- Job creation and income generation - Skills transfer to local labour - Improved access roads and utilities	- Occupational hazards - Noise and dust pollution - Temporary disruption to local communities	- Safety training and PPE use - Dust and noise control - Community engagement and local hiring programs
Operation	- Fish production and feed supply - Local economic growth through SMEs and supply chains - Government revenue through taxes	- Pathogen spread - Genetic introgression - Water pollution	- Biosecurity and quarantine - Use of native species - Wastewater treatment and monitoring
Decommissioning	- Salvage of reusable infrastructure - Potential land restoration - Environmental rehabilitation	- Habitat disturbance - Residual waste disposal costs	- Decommissioning plan - Ecosystem restoration - Community consultation on land reuse

Sources: FAO (2022); World Bank Group (2007); De Silva & Turchini (2019).

Table 25: Impact Significance Matrix for the Victory Farms Hatchery and Pond Project

Impact	Project Phase	Nature of Impact	Magnitude	Duration	Extent	Significance Before Mitigation	Significance After Mitigation
Land disturbance and soil erosion	Construction	Negative	Medium	Short-term	Site-specific	Moderate	Low
Water abstraction	Operation	Negative	Medium	Long-term	Local	Moderate	Low
Water pollution from effluent	Operation	Negative	High	Long-term	Local/Downstream	High	Moderate–Low
Solid and liquid waste generation	Both	Negative	Medium	Long-term	Site-specific	Moderate	Low
Dust and noise emissions	Construction	Negative	Low–Medium	Short-term	Local	Low–Moderate	Low
Occupational health and safety risks	Both	Negative	Medium	Continuous	Site-specific	Moderate	Low
Disease transmission and biosecurity risks	Operation	Negative	High	Long-term	Local/Regional	High	Moderate
Employment creation	Both	Positive	Medium	Long-term	Local	High	High
Improved fish production and food security	Operation	Positive	High	Long-term	County/Regional	High	High

8. CHAPTER EIGHT: CLIMATE RISK AND VULNERABILITY ASSESSMENT

8.1. Introduction

Climate change is one of the greatest threats facing the world in the 21st century. If not addressed, it will have significant and long-lasting impacts on the lives of people around the globe. Taking action to mitigate and adapt to climate change is therefore not optional, but an urgent necessity. While the effects of climate change are already being observed, it is generally accepted that if the global temperature rise reaches 1.5°C above pre-industrial levels, the impacts on natural and human systems will be severe and potentially irreversible. These impacts include: -

- Loss of ecosystems, sea-level rise, and more frequent,
- Severe weather events, such as droughts, and
- Heatwaves, and storms,

The adoption of the Paris Agreement on Climate Change, followed by its signing by nearly 200 countries, marked a historic turning point in global climate action. Under the Paris Agreement, signatory nations committed to limiting the average global temperature increase to well below 2°C, aiming for 1.5°C. In line with this global goal, Kenya has committed to developing and implementing an ambitious Climate Action Plan (CAP) under C40's Deadline 2020 programme. This plan will align with international climate targets and contribute to mitigating climate change impacts at both the national and global levels.

8.2. Kenya Climate

Kenya's climate is highly diverse, with variations primarily influenced by altitude. The highlands experience a moderate mean annual temperature of around 15°C, while the lowland areas in northern and eastern Kenya can reach temperatures as high as 29°C. In contrast, the coastal region and the shores of Lake Victoria in the far west enjoy a tropical climate, with temperatures typically ranging between 23°C and 27°C. Annual precipitation in Kenya varies significantly across the country, with amounts ranging from as low as 200mm in the arid northern and eastern regions, characterized by steppe landscapes, to more than 1,600 mm in the western areas. The highland regions of Kenya experience a more moderate climate, with annual precipitation totals ranging between 800 mm and 1,000 mm.

Kenya has two rainy seasons (bimodal precipitation regime) – a major one from March to May and a minor one from October to December⁷⁰.

8.2.1. Projected Climate Changes

In response to rising greenhouse gas (GHG) concentrations, air temperatures over Kenya are projected to increase by 1.2 to 3.2°C (very likely range) by 2080, relative to the baseline year of 1876. The extent of this temperature rise will depend on the future GHG emissions scenario (Figure 5 below). Compared to pre-industrial levels, median climate model projections indicate a temperature increase of approximately 1.4°C by 2030, and 1.7°C by both 2050 and 2080, under the low emissions scenario (RCP2.6). Under the medium to high emissions scenario (RCP6.0), median temperature increases are projected to reach 1.3°C by 2030, 1.6°C by 2050, and 2.2°C by 2080.

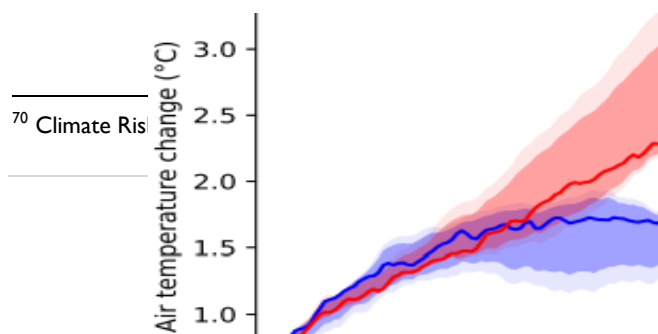


Figure 5: Air temperature projections for Kenya for different GHG emissions scenarios.

8.2.2. Very Hot Days

In line with rising mean annual temperatures, the annual number of very hot days (days with daily maximum temperature above 35°C) is projected to rise substantially and with high certainty, in particular over central and eastern Kenya. Under the medium/high emissions scenario RCP6.0, the multi-model median, averaged over the whole country, projects 25 more very hot days per year in 2030 than in 2000, 36 more in 2050 and 59 more in 2080. In some parts, especially in northern and eastern Kenya, this amounts to about 300 days per year by 2080.

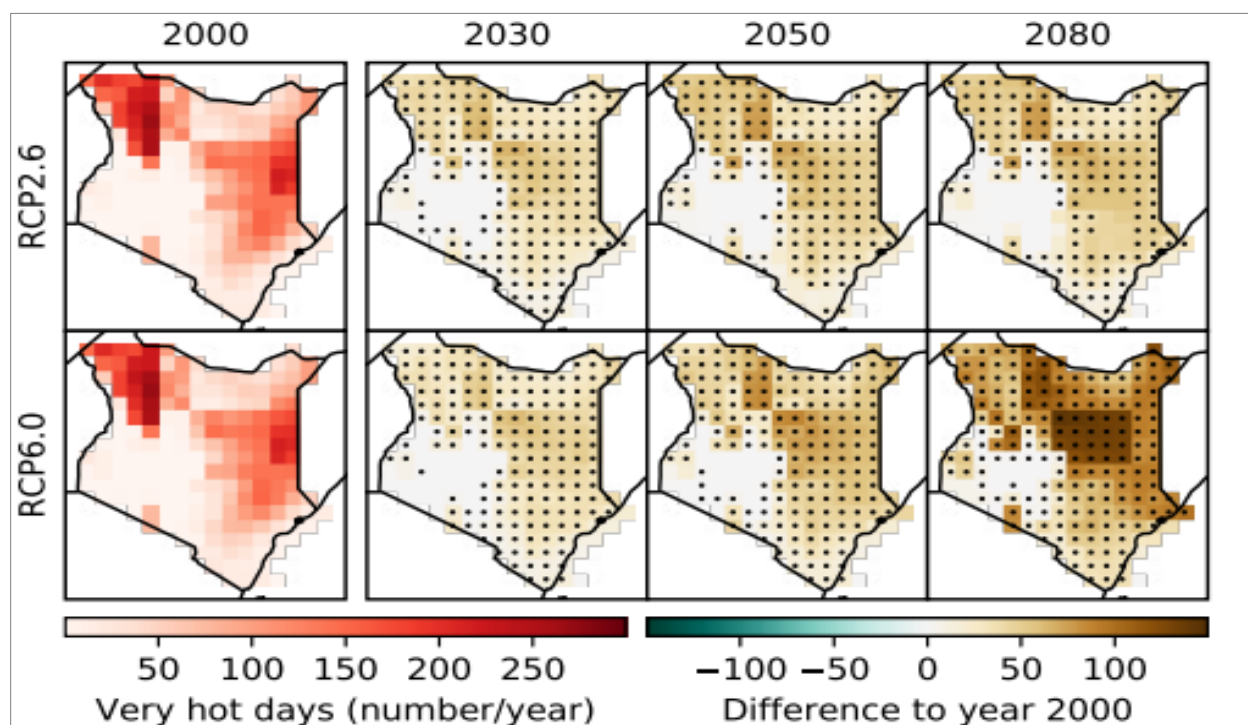


Figure 6: Projections of the annual number of very hot days (daily maximum temperature above 35 °C) for Kenya for different GHG emissions scenarios.

8.2.3. Sea Level Rise

In response to globally increasing temperatures, the sea level off the coast of Kenya is projected to rise (Figure 5). Until 2050, very similar sea levels are projected under both emissions scenarios. Under RCP6.0 and compared to year 2000 levels, the median climate model projects a sea level rise by 10 cm in 2030, 21 cm in 2050, and 40 cm in 2080. This threatens Kenya's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs.

8.2.4. Precipitation

Future projections of precipitation in Kenya are less certain than those for temperature change, primarily due to the high natural year-to-year variability in rainfall patterns. Among the three climate models used for this analysis, one model predicts either no change or a slight decrease in mean annual precipitation under the RCP6.0 scenario, while the other two models project an increase under the same emissions scenario. For the RCP2.6 scenario, median model projections suggest a slight increase in precipitation towards 2030, followed by an overall decrease towards the end of the century. Under RCP6.0, however, the projected increase in precipitation is expected to intensify after 2050, with an estimated rise of 53 mm per year by the end of the century, compared to 2000 levels. Higher emissions pathways indicate an overall wetter future for Kenya, with increased rainfall likely in certain regions.

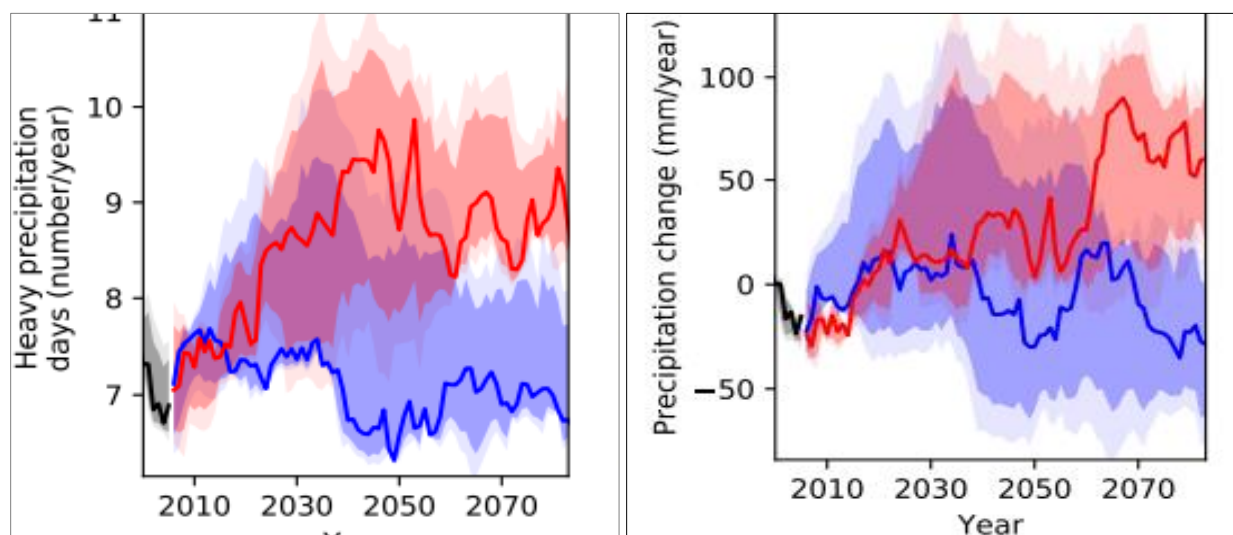


Figure 7: Projections of the number of days with heavy precipitation over Kenya for different GHG emissions scenarios, relative to the year 2000

In response to global warming, heavy precipitation events are expected to become more intense in many parts of the world due to the increased water vapour holding capacity of a warmer atmosphere. At the same time, the number of days with heavy precipitation events is expected to increase. This tendency is also found in climate projections for Kenya as outlined in the Figure 7 above, with climate models projecting an increase in the number of days with heavy precipitation, from 7 days per year in 2000 to 9 days per year in 2080 under RCP6.0. Under RCP2.6, the number of days with heavy precipitation remains unchanged.

8.3. Climate Change Impacts to Key Sectors

8.3.1. Infrastructure

Climate change is projected to severely impact Kenya's transport infrastructure through extreme weather events like floods and droughts. High precipitation and temperatures will cause infrastructure damage, leading to increased maintenance costs. Since road transport is vital for agriculture, trade, and

access to services, especially in rural areas, investing in climate-resilient road networks is essential. Additionally, road transport accounts for 99% of non-aviation transport GHG emissions in Kenya.

Extreme weather events will have devastating impacts on human settlements and economic sites, particularly in densely populated urban areas like Nairobi and Mombasa. Informal settlements, which often lack stable infrastructure and are built in high-risk areas such as riverbanks and coastal zones, are especially vulnerable. These areas experience severe flooding, leading to loss of housing, water contamination, and even death. Residents, who typically have low adaptive capacity due to poverty and lack of infrastructure, are particularly affected. In Nairobi's Kibera settlement, for instance, over 50% of residents reported flooding during the 2015 rainy season, resulting in deaths, disease outbreaks, and destruction of property.

8.3.2. Ecosystems

Climate change is expected to significantly impact tropical ecosystems, though the exact extent remains uncertain. Rising temperatures, more frequent and intense droughts, and changing conditions are putting wetlands, river systems, and forests at risk of transformation. These changes can lead to habitat loss for both plants and animals, disrupt forest succession, and increase the spread of invasive species. Additionally, factors such as low agricultural production and population growth may drive further agricultural expansion, leading to deforestation, land degradation, and forest fires, which will negatively affect biodiversity.

8.3.3. Agriculture

Smallholder farmers in Kenya face growing challenges due to the unpredictability of weather patterns caused by climate change. Since most crops rely on rainwater, yields are increasingly affected by erratic rainfall, while the limited use of irrigation (only 28% of the potential irrigated area in 2003) further exacerbates the situation. This is due to poor extension services, irrigation management, lack of credit, and technical equipment. The primary irrigated crops are vegetables, fruit, coffee, rice, and maize. The uncertainty in water availability projections translates into high variability in drought predictions. According to median projections, the national crop land area exposed to drought annually will only slightly increase due to global warming, though other models predict a much stronger rise. Under RCP6.0, the range of drought exposure for crop land widens from 0-0.8% in 2000 to 0-1.6% in 2080, with the very likely range increasing from 0-1.9% to 0-9.8%. Some models project a fivefold increase in drought exposure, while others show no change. Climate change will have a negative impact on yields of millet and sorghum.

8.3.4. Water Resources

Current projections of water availability in Kenya show high uncertainty, with median models suggesting an increase under RCP6.0 and no change under RCP2.6. However, when factoring in population growth (SSP2 projections), per capita water availability is projected to decline significantly by 73% under RCP2.6 and 63% under RCP6.0 by 2080, compared to 2000 levels. While population growth is the primary driver, these projections emphasize the need for investment in water-saving measures. Regional projections show varying trends: under RCP2.6, water availability will decrease by up to 25% in western Kenya and increase by up to 25% in southern Kenya by 2080. Under RCP6.0, the focus shifts to eastern Kenya, where water availability is expected to increase by up to 80%.

8.3.5. Homa-Bay County Administrative Boundary

Homabay County lies between latitudes 00 15 North and 00 52 South, and between longitudes 340 East and 350 West. The County covers an estimated area of 4,267.1 km² constituting 2,696 km² of land area

and 1,227 Km2 is covered by Lake Victoria. The County is located in Southwestern Kenya, and it borders Kisumu and Siaya counties to the North, Kisii and Nyamira counties to the East, Migori County to the South and the Republic of Uganda to the West. Whereas the proposed project site is located in Koderia Karabach, Kasipul Division in, Rachuonyo South Sub County.

8.3.6. Homabay County Current Situation

Climate change vulnerability is the degree to which geophysical, biological and socio-economic systems are susceptible to, and unable to cope with adverse impacts of climate change (IPCC, 2010). On the other hand, climate change risk in the context of climate change impacts, result from dynamic interactions between climate-related hazards with the exposure and vulnerability of the affected human or ecological system to the hazards (Reisinger et al., 2020). Thus, vulnerability to climate change increases the risk of adverse impacts because of the occurrence of climatic hazards. Time series analysis of temperature data for Homabay County show little variations between the maximum and minimum temperatures and between average monthly temperatures as shown in the Figure 8 below.

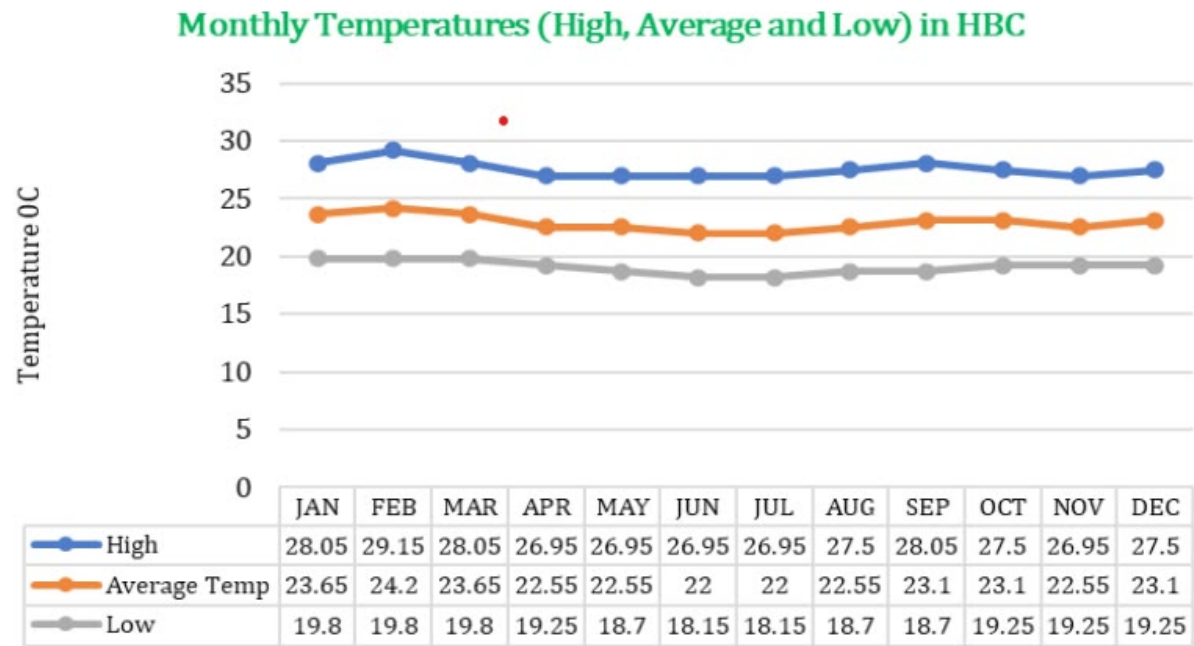


Figure 8: Source: Metrological Department Kenya

8.4. Current and Future Projections

The hottest months in Homabay County are January and March, when mean monthly temperatures average 23.65 °C, with maximum temperatures reaching approximately 28.05 °C. The coolest months are June and July, with mean monthly temperatures averaging 22.0 °C and minimum temperatures dropping to about 18.15 °C. Historical records since 1981 indicate an increase of approximately 1.0 °C in mean annual temperatures across the County. Climate projections for the period 2021–2065 suggest a further rise of about 0.4 °C. This anticipated warming is expected to exacerbate drought risk by increasing evapotranspiration rates, reducing soil moisture retention, and placing additional stress on agricultural systems, freshwater resources, and ecosystem stability.

8.4.1. Precipitation

Homabay County lies within the equatorial climatic zone, characterized by a bimodal rainfall pattern influenced primarily by the Intertropical Convergence Zone (ITCZ) and local lake-land breeze systems from Lake Victoria. The long rainy season typically occurs from March to May, while the short rains are experienced between October and December. Average annual precipitation in the County is approximately 1,100 mm, with significant spatial and temporal variability. The highest monthly rainfall is recorded in April, averaging 198.1 mm, while the lowest occurs in July, averaging 38.1 mm. Historical data since 1981 indicate marked interannual fluctuations in rainfall patterns. Periods of reduced precipitation have been linked to recurrent drought hazards, adversely affecting agriculture, fisheries, and water availability. Conversely, years with above-average rainfall have been associated with increased flood incidences, particularly in low-lying riparian zones and areas adjacent to river floodplains.

Climate projections for the period 2021–2065 indicate an estimated 0.7 percent increase in mean annual precipitation. While this increase appears modest, its potential impacts are significant, particularly when coupled with existing drainage constraints and land-use pressures. The projected change is expected to elevate the frequency and severity of flood hazards, thereby intensifying risks to infrastructure, livelihoods, and ecosystem stability.

8.5. Climate Change Risks, Hazards and Vulnerabilities in Homabay County

A hazard refers to the potential occurrence of a climate-related physical event or long-term climatic trend that may cause adverse impacts, including damage to infrastructure, loss of livelihoods, and degradation of ecosystems. In Homabay County, communities and community-based organizations as well as researchers have identified floods and droughts as the most frequent and significant climate-related hazards. As outlined in earlier sections of this report, precipitation and temperature are the key climatic variables driving the occurrence of these hazards. The interaction between these climatic variables and the County's exposed human and ecological systems results in identifiable climate change risks as outlined in the Table below.

Precipitation variability can lead to either drought or flood hazards, depending on magnitude and intensity. Low precipitation is typically associated with drought conditions, which in turn increase the likelihood of water scarcity, reduced agricultural productivity, and disease outbreaks. Conversely, high or extreme precipitation events contribute to flooding, which may cause property damage, displacement of communities, and a rise in Lake Victoria's water levels. Temperature increases are primarily linked to drought hazards, as elevated temperatures intensify evapotranspiration rates and reduce soil moisture, leading to more frequent and severe drought episodes. Temperature extremes also disrupt aquatic ecosystems, including fish breeding cycle.

Table 26: Climate Variables, Associated Hazards, and Climate Change Risks in Homabay County

Climatic Variable	Magnitude	Climatic Hazard	Climate Change Risks
Precipitation	Low	Drought	• Occurrence of droughts • Disease outbreaks • Irregular fish breeding patterns
	High	Floods	• Increased flooding incidences • Rise in Lake Victoria water levels • Disease outbreaks
Temperature	Elevated	Drought	• Increased drought incidence • Disruption of fish breeding patterns

8.5.1. Climate Change Vulnerabilities in Homabay County

Climate change vulnerabilities heighten the likelihood and severity of climate-related impacts by diminishing the adaptive capacity of human and ecological systems. In Homabay County, these vulnerabilities manifest in various forms, including decreased crop production, loss of income, emergence of new and aggressive insect species, pests and diseases, erosion of livelihoods, and loss of life. The specific vulnerabilities associated with each identified climate change risk are outlined in Table 27 below.

Table 27: Climate Change Risks and Associated Vulnerabilities in Homabay County

Climatic Variable	Climate Change Risks	Associated Vulnerabilities
Precipitation (High)	• Flooding • Rise in Lake Victoria water levels	• Decreased crop production • Food scarcity • Emergence of new and aggressive insects and pests • Loss of income • Low milk productivity • Livestock diseases • Loss of livelihoods • Inadequate water supply • Spread of infectious and contagious diseases • Loss of life
Temperature (Elevated)	• Droughts • Airborne diseases	• Decreased agricultural productivity • Emergence of aggressive and invasive insects and pests • Loss of productive agricultural land • Loss of income • Declining livestock productivity • Loss of livelihoods • Inadequate water for human and livestock use • Loss of life • Spread of infectious and contagious diseases

8.6. Sectoral Climate Change Analysis in Homabay County

8.6.1. Vulnerable Sectors to Climate Change

Agriculture (covering crops, livestock, and fisheries), water resources, and health have been identified as the sectors most vulnerable to the impacts of climate change in Homabay County. Within these sectors, the assets at risk are categorized into five key groups: natural assets (e.g., arable land, water bodies, biodiversity), physical assets (e.g., irrigation systems, fishing gear, health facilities), human assets (e.g., farming and fishing skills, health workforce), social assets (e.g., community networks, farmer cooperatives), and financial assets (e.g., household incomes, savings, access to credit). Damage or disruption to these assets through floods, droughts, or other climate-related hazards undermines sector performance, reduces resilience, and heightens the county's overall climate vulnerability.

Table 28: Sectoral Climate Change Vulnerabilities in Homabay County

Sector	Asset Category	Examples of Vulnerabilities
Agriculture (Crops, Livestock, Fisheries)	Natural Assets	Loss of arable land due to erosion and flooding; reduced soil fertility from prolonged drought; degradation of pastureland; decline in fish stocks due to rising lake temperatures and altered breeding patterns.
	Physical Assets	Damage to irrigation canals, storage facilities, and fishing equipment from floods; destruction of crop fields; collapse of livestock shelters during extreme weather events.
	Human Assets	Loss of skilled agricultural labor due to migration; reduced

Sector	Asset Category	Examples of Vulnerabilities
		farming and fishing productivity due to heat stress; limited adaptive capacity from lack of training on climate-smart practices.
	Social Assets	Weakening of farmer cooperatives and fishing groups due to reduced yields; breakdown of community-based resource management structures; reduced sharing of traditional knowledge.
	Financial Assets	Loss of household income from crop and livestock failures; reduced access to markets; increased debt burdens; decline in investment in farm inputs.
Water Resources	Natural Assets	Reduced water availability due to drought; contamination of water sources from flooding; decline in groundwater recharge.
	Physical Assets	Damage to boreholes, wells, and water distribution systems from floods; siltation of reservoirs; breakdown of pumping systems.
	Human Assets	Loss of skilled water management personnel; reduced community knowledge on sustainable water use.
	Social Assets	Weakening of water user associations; conflicts over scarce water resources; reduced cooperation in water sharing.
	Financial Assets	Increased cost of water access; reduced funds for maintenance of water infrastructure; economic losses in water-dependent businesses.

8.6.2. Risks Implications for the Proposed Project

The identified climate trends, hazards, and vulnerabilities in Homabay County have direct implications for the design, construction, introduction and operation of the proposed aquaculture project in Homa Hills area and the wider Lake Victoria basin. The key considerations include:

- a) Increased Flood Risk
 - Project infrastructure located in low-lying, or lakeshore areas may be exposed to inundation during periods of high precipitation, leading to damage of cage systems, feed storage facilities, and access roads.
 - Flood events could result in higher turbidity and nutrient loading in Lake Victoria, adversely affecting water quality and fish health.
- b) Drought and Water Scarcity
 - Prolonged dry periods combined with elevated temperatures may reduce water levels in the lake and feeder rivers, impacting fish breeding and growth rates.
 - Water scarcity could also limit the availability of clean freshwater for operational activities such as hatchery management, fish handling, and cleaning processes.
- c) Temperature Extremes
 - Elevated temperatures may alter dissolved oxygen levels in the water, stressing fish and potentially increasing mortality rates.
 - Heat stress could exacerbate the spread of aquatic diseases and invasive species, requiring enhanced biosecurity and monitoring measures.
- d) Livelihood Impacts and Social Conflicts

- Climate-related disruptions to agriculture and fisheries in the wider community may increase dependence on the project for employment and income, potentially intensifying competition for resources and access to fishing areas.
- Increased disease outbreaks (human and animal) during floods or droughts may affect workforce availability and operational continuity.

8.7. Climate Change Risks Adaptation

The table below presents the climate-related risks identified for the proposed Victory Farms Ltd headquarters in Homa Hills, Kanam B, which comprises 50 earthen ponds, a hatchery, feed mill, warehouse, and staff quarters. It outlines the potential impacts of these climate hazards on project infrastructure, fish production, water resources, and personnel. In addition, the table provides targeted adaptation measures designed to strengthen the project's resilience, integrating both immediate operational safeguards and long-term climate adaptation strategies. These measures aim to minimize disruptions from flooding, drought, temperature fluctuations, extreme weather, and emerging disease risks, while promoting sustainable aquaculture practices, safeguarding worker health, and supporting community livelihoods. By proactively addressing climate vulnerabilities, the project ensures continued productivity, environmental protection, and social acceptability, aligning with national regulatory frameworks and international best practices for sustainable aquaculture development^{8,62}.

Table 29: Climate Risks, Potential Impacts, and Adaptation Measures for Victory Farms Ltd Headquarters, Homa Hills, Kanam B

Climate Risk	Potential Impacts on Project	Adaptation Measures
Flooding and Extreme Rainfall	• Damage to pond embankments and hatchery infrastructure • Sediment runoff causing pond siltation and reduced water quality • Contaminant wash-off affecting feed and nutrient balance • Disruption of staff access, warehouse, and feed mill operations	• Reinforce pond embankments and elevate critical facilities • Construct sediment traps and retention basins • Design drainage channels to divert floodwaters • Maintain emergency storage for feed, fingerlings, and equipment in elevated areas
Increased Water Temperature	• Reduced dissolved oxygen in ponds causing fish stress and mortalities • Altered feeding efficiency and growth rates of tilapia • Higher susceptibility to pathogens and algal blooms	• Install pond aeration systems to maintain oxygen levels • Schedule feeding during cooler periods (early morning/evening) • Monitor water temperature and quality daily • Implement early warning protocols for algal blooms
Drought and Reduced Water Availability	• Limited freshwater for ponds, hatchery, and feed mill • Concentration of nutrients leading to poor water quality • Reduced water exchange affecting growth and survival	• Harvest and store rainwater in tanks for hatchery and operational use • Optimize pond stocking densities seasonally • Use recirculation or water reuse systems where feasible
Extreme Weather Events (storms, high winds)	• Breach or erosion of pond embankments • Damage to staff quarters, warehouse, and feed mill • Worker safety risks during	• Design embankments and buildings to withstand high winds and rainfall • Establish emergency response protocols • Halt outdoor operations during severe

	maintenance and harvesting	weather alerts
Emergence of New Pests, Parasites, and Fish Diseases	• Increased fish mortalities reducing production yields • Higher treatment costs and operational risk	• Implement quarantine and biosecurity measures for incoming fingerlings • Conduct regular pond health monitoring • Train staff on early disease detection and best management practices • Rotate ponds or fallow ponds to break disease cycles
Changes in Seasonal Rainfall Patterns	• Unpredictable pond water levels affecting production cycles • Potential delays in fingerling stocking and harvesting	• Develop flexible production schedules • Maintain backup feed and water reserves • Diversify pond harvesting windows
Community Livelihood Shifts due to Climate Change	• Increased dependence of local communities on project employment • Potential conflicts over water or land resources	• Prioritize local hiring and capacity building • Support climate-resilient community livelihoods • Establish transparent grievance redress mechanisms
Heat Stress and Worker Safety Risks	• Reduced productivity of staff • Increased health incidents in pond management and feed mill operations	• Provide shaded work areas, hydration stations, and rest breaks • Implement flexible working hours during extreme heat events

Homa Hills in Kanam B, the proposed site for Victory Farms Ltd headquarters, is increasingly experiencing climate variability, including rising air and water temperatures, more frequent extreme rainfall events, prolonged droughts, and unpredictable storms^{43,62}. These climatic shifts have direct and indirect implications for pond-based aquaculture operations, affecting water quality, fish growth, pond integrity, and onshore infrastructure such as the hatchery, feed mill, warehouse, and staff quarters⁸.

Projected changes in temperature may reduce dissolved oxygen levels, alter nutrient cycling in ponds, and increase the risk of harmful algal blooms⁴³. Variations in rainfall intensity and patterns are expected to cause fluctuating pond water levels, increased sedimentation, and heightened risks of flooding and water scarcity. Extreme weather events, including heavy storms and high winds, threaten the structural integrity of ponds, embankments, and buildings, while changing environmental conditions could promote the emergence of new fish diseases and parasites^{61,8}.

To address these challenges, the project will adopt a Climate-Resilient Aquaculture Framework tailored to the Homa Hills context. This framework integrates engineering design standards, operational best practices, and ecological management measures to safeguard production, protect the surrounding environment, and maintain socio-economic benefits for local communities⁶⁹. Key interventions include:

- **Engineering resilience:** Reinforced pond embankments, flood-resistant buildings, and secure storage for feed, equipment, and fingerlings⁸.
- **Water resource management:** Rainwater harvesting, hatchery water recirculation, and optimization of pond stocking densities during low-water periods^{8,62}.
- **Environmental safeguards:** Vegetative buffer zones, sediment control, and early-warning protocols for algal blooms^{43,8}.

- **Biosecurity and fish health management:** Regular health monitoring, staff training, and controlled movement of fingerlings and pond water⁶¹.
- **Adaptive operational planning:** Use of real-time meteorological data, seasonal forecasts, and water-quality monitoring to inform production decisions^{62, 33}.

By implementing these measures, the project will enhance its adaptive capacity, ensuring that climate-related hazards do not compromise fish survival, pond and infrastructure integrity, or the livelihoods of local communities. These interventions align with Kenya's Climate Change Act (2023)⁷¹, the National Adaptation Plan, the Kenya Climate Smart Agriculture Project (KCSAP), and FAO's Climate-Smart Aquaculture principles, positioning the project as a model for sustainable and climate-resilient pond aquaculture in Homa Hills and the broader region^{8,69}.

⁷¹ Climate Change (Amendment) Act. (2023). Laws of Kenya. Government Printer.

9. CHAPTER NINE: ENVIRONMENTAL & SOCIAL MANAGEMENT PLAN (ESMP)

9.1. Introduction

This section outlines the Environmental and Social Management Plan (ESMP) for the proposed Victory Farms Ltd Headquarters at Homa Hills, Homabay County. The project comprises development of 50 aquaculture ponds, a hatchery, corporate offices, a feed mill, and a cold storage facility. The ESMP provides a structured framework for managing environmental and social risks and impacts associated with the construction and operational phases of the aquaculture and agribusiness complex.

Chapter 7 identifies the significant potential environmental and social impacts of the proposed development and proposes practical mitigation measures, monitoring mechanisms, and implementation strategies to avoid, minimize, or offset adverse impacts. The ESMP covers mitigation and monitoring requirements for both the construction phase (site preparation, civil works, installation of equipment and utilities) and the operational phase (fish production, feed processing, storage, waste management, and logistics).

The plan has been prepared in conformity with the EMCA, 1999 (Revised 2015) and relevant regulations administered by the NEMA, as well as sector-specific guidelines under the Blue Economy framework (Republic of Kenya, 2015; Food and Agriculture Organization of the United Nations⁶⁴). This ESMP will serve as a guiding and compliance framework to ensure environmental sustainability, occupational health and safety, resource efficiency, and social inclusion throughout all stages of project implementation.

9.2. Objectives

The ESMP identifies the environmental and social issues associated with the proposed Victory Farms Ltd Headquarters project and prescribes targeted management strategies to mitigate potential adverse impacts. It further defines the environmental and social parameters within which the project must operate to ensure sustainability and regulatory compliance.

Implementation of the ESMP will ensure compliance with applicable national legislation, county regulations, and international best practices in aquaculture and agro-processing⁶⁴. The ESMP will:

- Act as a commitment and reference document for project planners and implementers, including compliance with NEMA approval conditions;
- Provide detailed specifications for managing and mitigating activities that could negatively impact the biophysical and socio-economic environment;
- Address necessary capacity-building requirements within the proponent's team, including environmental health and safety (EHS) training;
- Provide instructions to relevant project personnel regarding procedures for environmental protection, pollution prevention, occupational health and safety, and emergency response, thereby supporting the project goal of minimal or zero incidents; and
- Guide environmental and social monitoring activities, supporting periodic audits, reporting obligations, and adaptive management measures.

9.3. Organizations and Their Responsibilities for ESMP Implementation

Implementation of the ESMP will require coordinated participation from multiple stakeholders, each with clearly defined roles and responsibilities. The project proponent, Victory Farms Ltd, will bear primary

responsibility for overall ESMP implementation, compliance monitoring, reporting, and resource allocation to ensure effective environmental and social performance.

Key stakeholders shall include, but not be limited to:

- a) NEMA – Regulatory oversight, review and approval of the ESIA/ESMP, environmental compliance audits, and enforcement of EMCA provisions.
- b) State Department for Fisheries, Aquaculture and the Blue Economy (SDF&BE) – Technical oversight on aquaculture development, hatchery operations, fish health standards, and alignment with national fisheries policy⁷².
- c) County Government of Homabay – Issuance of relevant county permits, land-use approvals, public health inspections, and local development oversight.
- d) Kenya Fisheries Service (KeFS) – Regulation of aquaculture operations, biosecurity standards, fish movement permits, and quality control compliance.
- e) Community Representatives and Local Leadership – Facilitation of community engagement, grievance redress mechanisms, and social monitoring.
- f) Relevant Non-Governmental Organizations (NGOs) and Civil Society Organizations – Support in environmental conservation, community sensitization, and social accountability processes.
- g) Project Affected Persons (PAPs) and Local Communities – Participation in stakeholder engagement processes, environmental stewardship, and monitoring of social commitments.
- h) Through coordinated implementation of the ESMP, Victory Farms Ltd will ensure that the Homa Hills Headquarters project contributes positively to local economic development while safeguarding environmental integrity and social well-being.

⁷² State Department for Fisheries, Aquaculture and the Blue Economy. (2017). *Kenya Aquaculture Development Strategy (2017–2022)*. Government of Kenya.

Table 30: ESMP – Construction Phase (Victory Farms Ltd Headquarters, Homa Hills)

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency
Construction Waste Generation (solid, hazardous & sanitary waste)	- Segregate construction waste at source into recyclable, reusable, hazardous, and non-recyclable categories. - Reuse excavated material where feasible (e.g., pond embankments and landscaping). - Dispose of non-recyclable waste at approved disposal sites designated by the County Government of Homabay. - Store hazardous waste (e.g., used oil, paint containers, fuel residues) in labelled, leak-proof containers and hand over to NEMA-licensed handlers. - Provide adequate portable sanitation facilities for workers and ensure regular servicing by licensed providers. - Prohibit open burning and indiscriminate dumping of waste on-site.	- Waste segregation records. - Waste transfer notes/disposal receipts. - Cleanliness of site. - Availability and servicing records of sanitary facilities.	Project Contractor; Site Environmental Officer	Weekly
Soil Erosion and Sedimentation (pond excavation & earthworks)	- Install silt fences, sediment traps, and diversion drains around excavation areas. - Phase earthworks to limit exposed surfaces. - Stabilize embankments through compaction and vegetation immediately after construction. - Avoid construction during heavy rainfall where possible. - Rehabilitate disturbed areas promptly after works completion.	- Presence of erosion control structures. - Evidence of sediment runoff. - Re-vegetation success rate.	Contractor; Project Engineer	Weekly (and after heavy rains)
Water Contamination (runoff, fuels, lubricants, wastewater)	- Designate fuelling and equipment maintenance areas with impermeable surfaces and spill containment measures. - Provide spill kits and train workers on spill response procedures. - Prevent discharge of untreated wastewater into natural watercourses. - Collect and dispose of wastewater through approved channels. - Ensure proper storage of cement, chemicals, and fuels	- No visible oil spills or contaminated runoff. - Spill incident records. - Water quality inspection reports (visual checks).	Contractor; Site Supervisor	Weekly

	away from drainage lines.			
Air Pollution (dust and emissions)	▪ Regularly sprinkle water on exposed surfaces and access roads to suppress dust. ▪ Cover trucks transporting fine materials. ▪ Maintain construction machinery to minimize exhaust emissions. ▪ Limit vehicle speeds within the project site. ▪ Provide masks to workers in high-dust areas.	▪ Dust suppression logs. ▪ Visual dust levels. ▪ Equipment maintenance records.	Contractor	Daily
Noise and Vibration	▪ Restrict noisy activities to daytime working hours. ▪ Maintain equipment to manufacturer standards. ▪ Provide hearing protection to workers operating high-noise machinery. ▪ Notify nearby receptors (offices or communities) of scheduled high-noise activities in advance.	▪ Noise level spot checks (where necessary). ▪ PPE usage records. ▪ Community complaints register.	Contractor; Health & Safety Officer	Daily
Occupational Health and Safety Risks	▪ Provide appropriate PPE including hard hats, reflective vests, steel-toed boots, gloves, eye protection, and hearing protection. ▪ Conduct safety induction training for all workers prior to site engagement. ▪ Clearly mark hazardous areas and install warning signage. ▪ Provide first aid kits and trained first aiders on site. ▪ Develop and communicate emergency response procedures (fire, injury, chemical spill). ▪ Ensure safe scaffolding, trench support, and machinery operation practices.	▪ PPE availability and usage records. ▪ Incident/accident reports. ▪ Safety training attendance sheets. ▪ Availability of first aid kits and emergency contacts.	Contractor; Health & Safety Officer	Continuous
Community Health and Safety (traffic, dust, restricted access)	▪ Install signage and barriers around active construction zones. ▪ Develop a traffic management plan for delivery trucks and machinery. ▪ Restrict unauthorized access to the construction site. ▪ Engage local leadership to communicate construction schedules and potential disruptions. ▪ Ensure drivers adhere to speed limits and road safety requirements.	▪ Traffic incident records. ▪ Community complaints log. ▪ Presence of warning signage and barriers.	Contractor; Project Proponent	Weekly
Employment and Labor-Related Impacts	▪ Prioritize local labour where skills are available. ▪ Ensure compliance with national labour laws and fair working conditions. ▪ Provide written contracts and clear terms of	▪ Employment records (local vs. non-local). ▪ Signed contracts. ▪ Grievance records.	Project Proponent; Contractor	Monthly

	- employment. - Establish a grievance redress mechanism for workers.			
Vegetation Clearance and Habitat Disturbance	- Limit site clearance strictly to the approved project footprint (ponds, hatchery, feed mill, offices, cold storage). - Avoid unnecessary removal of mature trees where feasible. - Stockpile and reuse topsoil for landscaping and rehabilitation. - Restore temporarily disturbed areas after construction.	- Area cleared versus approved footprint. - Topsoil stockpile records. - Evidence of site rehabilitation.	Contractor; Environmental Officer	Weekly

Table 31: ESMP – Operation Phase (Victory Farms Ltd Headquarters, Homa Hills)

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency
Water Quality Degradation (nutrients, DO, turbidity, effluent discharge)	- Implement optimal stocking densities in ponds to prevent overloading. - Apply precise feeding regimes to minimize feed wastage and nutrient loading. - Regularly monitor pond water quality (DO, pH, temperature, ammonia, nitrates). - Install and maintain sedimentation ponds or wastewater treatment systems before discharge. - Avoid routine use of antibiotics and chemicals; any treatment must be veterinarian-prescribed and recorded. - Maintain stormwater drainage systems to prevent contamination of natural watercourses.	- Nitrogen & phosphorus levels. - Dissolved Oxygen (DO) levels. - Turbidity readings. - Effluent quality test results.	Farm Manager; Environmental Officer	Monthly
Sediment Accumulation and Organic Loading (pond sludge & effluent)	- Periodically remove and properly dispose or reuse pond sludge (e.g., composting for agriculture where appropriate). - Maintain proper pond lining and embankment stability. - Avoid overfeeding and maintain feed conversion efficiency. - Monitor sediment quality indicators where effluent	- Sludge removal records. - Sediment quality reports. - Feed conversion ratio (FCR) records.	Aquaculture Manager; Environmental Officer	Bi-annually

	discharge occurs. Ensure effluent discharge complies with standards set by the National Environment Management Authority.			
Fish Disease and Biosecurity Risks (hatchery & ponds)	- Source broodstock and fingerlings from certified disease-free suppliers. - Enforce quarantine procedures for new stock. - Establish controlled access points with footbaths and equipment disinfection stations. - Conduct routine fish health assessments by qualified personnel. - Maintain a documented Fish Health and Biosecurity Management Plan. - Record and report unusual mortality events to the KeF) where required.	- Fish mortality rates. - Fish health inspection records. - Biosecurity compliance logs.	Farm Veterinarian; Aquaculture Manager	Monthly
Solid Waste Generation (dead fish, packaging, feed bags, office waste)	- Segregate waste at source (organic, recyclable, hazardous). - Dispose of fish mortalities through approved methods (e.g., burial, rendering, composting). - Recycle feed bags and packaging materials where feasible. - Store waste in covered, leak-proof bins. - Maintain waste tracking logs and engage licensed waste handlers approved by the County Government of Homabay.	- Waste tracking logs. - Disposal receipts. - Odor or pest complaints.	Site Manager; Environmental Officer	Weekly
Air Emissions and Odor (feed mill & cold storage operations)	- Install dust control systems in the feed mill (cyclones/filters). - Maintain machinery to manufacturer standards to reduce emissions. - Ensure proper ventilation systems in feed mill and cold storage areas. - Implement housekeeping measures to prevent accumulation of feed dust. - Monitor generator emissions and ensure compliance with national standards.	- Equipment maintenance records. - Visible dust levels. - Community complaints.	Feed Mill Manager; Operations Manager	Monthly
Noise Pollution (machinery, generators, feed mill)	- Restrict high-noise operations to daytime hours where feasible. - Install noise dampening devices and silencers on generators. - Provide hearing protection to workers.	- Noise level spot checks. - PPE usage records. - Complaints log.	Operations Manager; H&S Officer	Quarterly

	▪ Maintain equipment regularly to minimize excessive noise.			
Fuel and Oil Spills (generators, vehicles, machinery)	▪ Store fuel in designated bunded areas with secondary containment. ▪ Train staff on safe fuel handling procedures. ▪ Provide spill kits at fuel storage and generator areas. ▪ Maintain an Oil Spill Response Plan and incident reporting system. ▪ Conduct preventive maintenance of vehicles and generators.	▪ Spill incident logs. ▪ Inspection records of storage areas. ▪ Evidence of spill kits on-site.	Operations Manager	Monthly
Occupational Health and Safety (ponds, hatchery, feed mill, cold storage)	▪ Provide task-specific PPE (boots, gloves, ear protection, dust masks, cold storage protective wear). ▪ Conduct regular safety training and toolbox talks. ▪ Install clear safety signage in operational areas. ▪ Maintain first aid kits and emergency response equipment. ▪ Implement fire safety measures including extinguishers and evacuation plans. ▪ Conduct routine safety audits.	▪ Incident/accident reports. ▪ PPE issuance records. ▪ Safety audit reports.	Health & Safety Officer; Department Managers	Continuous
Community Health and Social Conflicts (traffic, employment concerns)	▪ Maintain regular stakeholder engagement forums. ▪ Prioritize local employment where skills are available. ▪ Implement a grievance redress mechanism accessible to community members. ▪ Manage truck movements to minimize road congestion and dust. ▪ Communicate operational schedules transparently.	▪ Grievance records. ▪ Employment statistics (local hires). ▪ Community feedback reports.	Community Liaison Officer; Project Management	Quarterly
Energy and Resource Consumption (water, electricity)	▪ Promote energy-efficient equipment in feed mill and cold storage. ▪ Install water-saving devices and monitor abstraction volumes. ▪ Conduct periodic resource efficiency reviews. ▪ Explore renewable energy options where feasible.	▪ Water abstraction records. ▪ Electricity consumption logs. ▪ Resource efficiency audit reports.	Operations Manager; Environmental Officer	Quarterly

9.4. Monitoring

The purpose of monitoring is to systematically evaluate the effectiveness of the mitigation measures outlined in this ESMP; ensure full compliance with applicable national environmental laws, regulations, and standards; detect emerging environmental and social risks; and support adaptive, evidence-based decision-making throughout the project lifecycle^{73,64}.

For the proposed Victory Farms Ltd Headquarters at Homa Hills—comprising 50 aquaculture ponds, a hatchery, feed mill, corporate offices, staff quarters, cold storage facilities, and associated support infrastructure (internal roads, drainage systems, water supply, power installations, and waste management systems)—monitoring will be comprehensive, continuous, and component-specific. Monitoring will be undertaken in accordance with the EMCA, Cap 387 (Revised 2015), administered by the National Environment Management Authority, and in line with international best practices for sustainable aquaculture and agro-processing^{73,64}.

Monitoring activities will focus on, but not be limited to, the following key areas:

- **Water Quality Monitoring:** Routine assessment of pond water, influent and effluent discharge quality (e.g., dissolved oxygen, pH, temperature, ammonia, nitrates, phosphates, turbidity) to ensure compliance with discharge standards and prevent downstream pollution⁷³.
- **Soil and Sediment Quality:** Periodic inspection of pond embankments, sludge accumulation, and soil stability around operational areas to prevent erosion, contamination, or land degradation.
- **Air Quality and Dust Control:** Monitoring of dust levels from internal roads and feed mill operations, as well as emissions from generators and processing equipment, in compliance with national air quality standards⁷³.
- **Noise Levels:** Periodic measurement of noise from feed mill machinery, generators, cold storage compressors, and vehicular movement, particularly near staff quarters and administrative offices.
- **Waste Management Performance:** Tracking volumes and disposal methods for solid waste (feed bags, packaging, office waste), hazardous waste (used oil, chemical containers), and organic waste (fish mortalities, sludge). Waste handling will comply with requirements of the County Government of Homabay and NEMA⁷³.
- **Occupational Health and Safety (OHS):** Continuous monitoring of workplace safety conditions across ponds, hatchery, feed mill, cold storage, corporate offices, and staff quarters, including PPE usage, accident reporting, fire safety preparedness, and emergency response readiness, in line with applicable occupational safety standards.
- **Energy and Water Resource Use:** Monitoring abstraction rates, water recycling efficiency, and electricity consumption to promote resource efficiency and sustainability⁶⁴.
- **Community and Social Indicators:** Documentation and review of grievances, employment statistics (with emphasis on local hiring), stakeholder engagement activities, and any community health and safety concerns.

Monitoring responsibilities will be clearly assigned to the Environmental Officer, Farm Manager, Feed Mill Manager, Health & Safety Officer, and Corporate Management, with defined reporting lines and timelines. Monitoring results will be documented in monthly and quarterly reports and used to guide corrective actions where necessary.

⁷³ Republic of Kenya. (2015). *Environmental Management and Coordination Act (EMCA), Cap 387 (Revised 2015)*. Nairobi: Government Printer.

Through structured and continuous monitoring, Victory Farms Ltd will ensure that environmental integrity, social responsibility, and regulatory compliance are maintained across all components of the Homa Hills headquarters project ^{73,64}.

Table 32: Environmental Monitoring Plan – Victory Farms Ltd Headquarters, Homa Hills

Monitoring Item	Phase	Parameters to Monitor	Method	Frequency	Responsible Party	Reporting Format
Water Quality (Ponds & Effluent Discharge)	Operation	Dissolved Oxygen (DO) pH Temperature Ammonia, Nitrates (N) Phosphates (P) Turbidity	Water sampling (in-situ meters) & laboratory analysis	Monthly	Farm Manager; Environmental Officer	Monthly Water Quality Monitoring Report
Effluent Compliance (Discharge Points)	Operation	BOD, COD Total Suspended Solids (TSS) N & P levels Oil & Grease	Laboratory analysis of effluent samples	Quarterly	Environmental Officer	Quarterly Compliance Report (submitted to NEMA if required)
Soil & Sediment Quality (Pond Sludge & Surroundings)	Operation	Organic matter content Sludge depth Signs of contamination	Sediment sampling, visual inspection, lab analysis where necessary	Bi-annually	Aquaculture Manager	Biannual Soil & Sludge Monitoring Report
Fish Health (Hatchery & Grow-out Ponds)	Operation	Mortality rates Signs of disease Growth rates Parasite load	Daily visual checks; periodic veterinary diagnostics	Weekly (visual) Monthly (detailed review)	Farm Veterinarian; Hatchery Manager	Fish Health Monitoring Log
Feed Mill Emissions & Dust Levels	Operation	Dust levels Equipment emissions Odor levels	Visual inspection; maintenance logs; spot air quality checks	Monthly	Feed Mill Manager	Feed Mill Environmental Log
Noise Levels (Feed Mill, Generators, Cold Storage)	Operation	Noise levels (dB) Community complaints	Noise meter readings (where necessary); complaint records	Quarterly	Operations Manager; H&S Officer	Noise Monitoring Report
Solid & Hazardous Waste Management	Both	Waste volumes (organic, recyclable, hazardous)	Site inspections; waste tracking logs; disposal receipts	Weekly	Site Manager; Environmental Officer	Waste Tracking Sheets

		Disposal records Dead fish disposal practices				
Fuel & Chemical Storage/Use	Both	Storage conditions Spill incidents Fuel consumption	Site inspection; fuel logbooks; spill records	Monthly	Operations Manager	Fuel & Chemical Usage Log
Occupational Health & Safety (All Facilities)	Both	PPE usage Accident/incident rates Fire safety compliance	Safety audits; toolbox talk records; incident reports	Continuous (records) Monthly (review)	Health & Safety Officer	OHS Monthly Report
Energy & Water Resource Use	Operation	Water abstraction volumes Electricity consumption Generator fuel use	Meter readings; utility bills review	Monthly	Operations Manager	Resource Efficiency Report
Community Concerns & Grievances	Both	Grievances received Conflict indicators Local employment statistics	Grievance redress mechanism; stakeholder meetings	Ongoing (recorded) Quarterly (review)	Community Liaison Officer	Grievance Register & Quarterly Social Report
Visual & Landscape Impacts (Headquarters & Infrastructure)	Operation	Changes in landscape Facility footprint Community feedback	Photographic documentation; stakeholder feedback	Quarterly	Corporate Administration; Environmental Officer	Photographic Records & Monitoring Log
Staff Quarters & Sanitation Facilities	Operation	Wastewater management Solid waste handling Sanitation conditions	Site inspection; sanitation maintenance logs	Monthly	Estate Manager	Facilities Inspection Report

9.5. Decommissioning Phase

Decommissioning of the Victory Farms Ltd Headquarters at Homa Hills will constitute a critical phase requiring structured planning and environmentally responsible implementation. The objective of decommissioning will be to safely dismantle infrastructure, restore the site to an environmentally stable condition, and prevent residual environmental or social risks^{73, 64}.

The decommissioning phase may generate impacts similar to those experienced during construction, including soil disturbance, erosion, sedimentation, dust emissions, noise, waste generation, and potential contamination of surface and groundwater resources. There may also be socio-economic considerations such as workforce demobilization and changes in local economic activity. These risks will be managed through adherence to national environmental regulations, including the EMCA, Cap 387 (Revised 2015), administered by the National Environment Management Authority, and applicable county requirements under the County Government of Homabay⁷³.

Key decommissioning activities will include:

- **Preparation of a Decommissioning Plan:**
Development of a detailed, site-specific Decommissioning and Rehabilitation Plan prior to closure, outlining timelines, responsibilities, dismantling procedures, waste handling protocols, and site restoration targets⁷³.
- **Controlled Dismantling of Infrastructure:**
Systematic removal of pond liners (where applicable), drainage systems, hatchery equipment, feed mill machinery, cold storage systems, office fittings, staff housing utilities, water supply systems, electrical installations, and support infrastructure. All dismantling will follow occupational health and safety standards to prevent accidents and environmental contamination.
- **Waste Management and Material Recovery:**
Segregation of reusable, recyclable, hazardous, and non-recyclable materials. Hazardous waste (e.g., oils, refrigerants, chemical residues) will be handled by licensed waste contractors in compliance with NEMA regulations. Salvageable materials will be reused or recycled where feasible to minimize waste generation⁷³.
- **Soil and Water Protection Measures:**
Implementation of erosion and sediment control measures during dismantling activities to prevent runoff into adjacent land or water bodies. Any contaminated soils identified will be assessed and remediated appropriately.
- **Rehabilitation and Site Restoration:**
Re-grading of disturbed areas, stabilization of pond embankments (if converted to alternative land use), replacement of topsoil where necessary, and re-vegetation using suitable indigenous species to restore ecological stability and prevent erosion⁶⁴.
- **Environmental Monitoring Post-Decommissioning:**
Continued monitoring of soil quality, surface water, groundwater (if applicable), and vegetation recovery for a defined period after closure to confirm environmental restoration objectives have been achieved⁷³.
- **Social Transition Measures:**
Advance notification to employees and stakeholders regarding closure timelines; compliance with

labour laws in relation to staff contracts and benefits; and engagement with local authorities and community leaders to manage socio-economic transition impacts.

The decommissioning process will be implemented in accordance with regulatory approvals and closure requirements issued by the NEMA and other relevant authorities⁷³.

Through careful planning, responsible dismantling, proper waste management, and ecological restoration, Victory Farms Ltd will ensure that closure of the Homa Hills headquarters project does not result in long-term environmental degradation or adverse social impacts^{73, 64}.

Table 33: Decommissioning ESMP – Victory Farms Ltd Headquarters, Homa Hills

Potential Impact	Mitigation Measures	Responsibility	Monitoring Indicators	Monitoring Frequency
Soil Disturbance, Sediment Runoff & Increased Turbidity	- Schedule decommissioning activities during dry seasons to minimize runoff and erosion. - Install silt fences, sediment traps, and diversion channels around dismantling areas (ponds, feed mill, hatchery, staff quarters). - Minimize heavy machinery movement on exposed soils. - Stabilize dismantled pond embankments immediately after earthworks.	Project Proponent (Victory Farms Ltd); Environmental Consultant	- Visual turbidity levels in nearby drainage paths. - Presence and integrity of erosion control structures.	Weekly during active dismantling
Erosion and Land Degradation	- Regrade disturbed areas to stable contours. - Reinstate topsoil and establish vegetation cover using suitable indigenous species. - Install temporary bunds or slope stabilization measures where necessary. - Monitor rehabilitated areas for signs of gulying or slope failure.	Project Proponent; Site Engineer	- Evidence of erosion features post-works. - Vegetation establishment success rate.	Weekly during works; Monthly post-decommissioning (for 3–6 months)
Contamination from Equipment, Fuel & Hazardous Materials	- Decommission and decontaminate hatchery systems, feed mill machinery, cold storage refrigerants, generators, and fuel storage tanks prior to removal. - Safely drain and dispose of oils, fuels, and refrigerants using licensed handlers. - Segregate hazardous and non-hazardous waste. - Prohibit dumping or burning of waste on-site.	Project Proponent; Licensed Waste Contractor	- Waste disposal records and transfer notes. - Absence of visible contamination on soil. - Hazardous waste handling documentation.	Continuous during works
Solid Waste Generation (demolition debris, scrap materials)	- Sort demolition waste into reusable, recyclable, and residual waste streams. - Salvage usable materials (metal, timber, equipment components). - Dispose of residual waste at approved disposal facilities recognized by the County Government of Homabay.	Project Proponent; Site Manager	- Waste tracking sheets. - Disposal receipts. - Clean site conditions.	Weekly during dismantling

	▪ Maintain waste tracking logs.			
Water Quality Degradation (surface & groundwater)	▪ Monitor water quality parameters (DO, turbidity, pH, nutrients) where pond drainage or effluent discharge occurs. ▪ Avoid uncontrolled discharge of pond water; drain gradually and through sediment control systems. ▪ Suspend works if monitoring indicates exceedance of permissible limits. ▪ Implement corrective measures immediately where degradation is detected.	Environmental Consultant; Environmental Officer	▪ Water quality monitoring data. ▪ Compliance with regulatory standards set by the NEMA.	Weekly during active drainage and dismantling
Loss of Habitat & Vegetation	▪ Limit dismantling footprint strictly to project infrastructure areas (50 ponds, hatchery, feed mill, corporate offices, staff quarters). ▪ Avoid unnecessary clearing of surrounding vegetation. • Restore site through re-vegetation and landscaping post-removal. ▪ Conduct pre- and post-decommissioning site assessments.	Environmental Consultant; Project Proponent	▪ Vegetation cover restoration. ▪ Photographic records before and after closure.	Before, during, and after decommissioning
Air Pollution (Dust & Emissions)	▪ Sprinkle water on exposed areas to control dust. ▪ Cover trucks transporting debris. ▪ Maintain dismantling equipment to minimize exhaust emissions. ▪ Restrict high-emission activities to daytime hours.	Contractor; Site Supervisor	▪ Visible dust levels. ▪ Equipment maintenance records. ▪ Community complaints.	Daily during active dismantling
Noise & Occupational Health and Safety Risks	▪ Enforce PPE use (helmets, gloves, boots, masks, hearing protection). ▪ Develop and implement a Decommissioning Safety Plan. ▪ Secure work zones with signage and barriers. ▪ Provide first aid kits and emergency response arrangements. ▪ Conduct safety briefings prior to	Project Proponent; Health & Safety Officer	▪ Incident/accident reports. ▪ PPE compliance records. ▪ Safety audit reports.	Continuous during works

	dismantling activities.			
Social Disruption & Workforce Transition	▪ Notify employees, local authorities, and community representatives of decommissioning timelines. ▪ Comply with labour laws regarding staff contracts and benefits. ▪ Maintain grievance redress mechanism throughout closure phase. ▪ Engage stakeholders on future land use plans where applicable.	Project Proponent; Community Liaison Officer	▪ Records of community notifications. ▪ Grievance register. ▪ Staff demobilization records.	Weekly review during decommissioning

10. CHAPTER TEN: CONCLUSION AND RECOMMENDATIONS

10.1. Conclusion

A Full Study EIA has been undertaken for the proposed Victory Farms Ltd Headquarters at Homa Hills, Homabay County, comprising 50 aquaculture ponds, a hatchery, corporate offices, a feed mill, and a cold storage facility. The assessment has been conducted in strict conformity with the EMCA, Cap 387 (Revised 2015) and applicable subsidiary regulations administered by the NEMA, as well as relevant sectoral guidelines governing aquaculture and agro-processing in Kenya.

The EIA report provides a detailed description of the project components, design considerations, construction activities, and operational processes. It further presents a comprehensive baseline characterization of the receiving environment at Homa Hills, including physical (soil, hydrology, climate, air quality), biological (flora, fauna, aquatic ecosystems), ecological, and socio-economic conditions. The assessment applied recognized impact identification and evaluation methodologies, including matrix analysis, expert judgment, stakeholder consultations, and compliance screening against national standards and international best practices.

Both positive and adverse environmental and social impacts were identified and evaluated in terms of their magnitude, spatial extent, duration, reversibility, and significance. Anticipated positive impacts include employment creation, enhanced fish production capacity, value addition through feed milling and cold storage, strengthened food security, and contribution to the Blue Economy agenda. Potential adverse impacts include soil erosion during construction, increased water abstraction and effluent discharge, solid and organic waste generation, noise and dust emissions, occupational health and safety risks, and localized socio-economic pressures.

All identified adverse impacts have been systematically analyzed, and significance criteria rigorously applied to prioritize management responses. In response, a detailed Environmental and Social Management Plan (ESMP) has been developed. The ESMP outlines practical mitigation, monitoring, and reporting measures; assigns institutional responsibilities; defines monitoring indicators and frequency; and establishes corrective action procedures to ensure adaptive and responsive environmental management throughout the project lifecycle.

Based on the findings of this assessment, and subject to full implementation of the ESMP and compliance with all statutory requirements, the proposed project is considered environmentally and socially viable.

10.2. Recommendations

In light of the findings from the EIA, the following recommendations are proposed to ensure sustainable implementation of the Victory Farms Ltd Headquarters project while safeguarding environmental integrity and social well-being:

a) Strict Compliance with Regulatory Requirements:

The proponent should obtain and maintain all relevant licenses and permits from the NEMA, County Government of Homabay, KeFS, and other relevant authorities prior to construction and operation. All approval conditions must be strictly adhered to.

b) Sustainable Water Resource Management:

Implement efficient water abstraction, use, and discharge systems to prevent over-extraction and downstream impacts. Effluent from ponds, hatchery operations, feed mill, and cold storage facilities

should be treated to meet applicable discharge standards before release into the environment. Regular monitoring of parameters such as dissolved oxygen, pH, temperature, nutrients (nitrogen and phosphorus), and turbidity should be conducted.

c) Integrated Waste Management Plan:

Adopt environmentally sound waste management practices, including segregation, recycling, safe disposal of solid waste, and proper handling of organic waste and fish mortalities. Efforts should be made to minimize feed wastage and organic loading. Opportunities for composting sludge or utilizing waste for agricultural purposes should be explored where feasible.

d) Soil Erosion and Stormwater Control:

During construction, appropriate erosion and sediment control measures (e.g., silt traps, drainage channels, and revegetation of exposed areas) should be implemented to prevent sedimentation and land degradation.

e) Occupational Health and Safety (OHS):

Develop and implement a comprehensive OHS Plan in line with national legislation. Provide PPE, regular safety training, clear signage, and emergency preparedness procedures to safeguard workers in the ponds, hatchery, feed mill, and cold storage facilities.

f) Biosecurity and Fish Health Management:

Establish robust biosecurity protocols within the hatchery and pond systems to prevent disease outbreaks. Routine health inspections, quarantine procedures for broodstock and fingerlings, and controlled access to production areas should be strictly enforced.

g) Community Engagement and Grievance Redress Mechanism:

Maintain continuous engagement with local communities and stakeholders to promote transparency and mutual benefit. A functional grievance redress mechanism should be established to address concerns promptly and fairly.

h) Capacity Building and Environmental Awareness:

Provide ongoing training for management and staff on environmental compliance, efficient resource use, pollution prevention, emergency response, and best aquaculture practices to strengthen internal capacity for ESMP implementation.

i) Regular Environmental Audits and Reporting:

Undertake annual environmental audits as required under EMCA and submit reports to NEMA and other relevant authorities. Monitoring results should be documented and used to inform adaptive management and continuous improvement.

j) Emergency Preparedness and Contingency Planning:

Develop and operationalize contingency plans for potential environmental emergencies such as disease outbreaks, chemical spills, fire incidents in the feed mill, refrigeration failure in the cold storage facility, or extreme weather events. Roles, communication channels, and response procedures should be clearly defined.

By implementing the above recommendations and strictly adhering to the ESMP, Victory Farms Ltd will significantly minimize potential environmental and social risks while enhancing positive outcomes such as employment creation, food security, and regional economic development.

It is therefore the professional opinion and strong recommendation of this assessment that the proposed Victory Farms Ltd Headquarters project at Homa Hills be granted approval and licensed by the relevant authorities, subject to full compliance with the prescribed ESMP, statutory requirements, and applicable environmental standards.

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APPENDICES

[Annex 1: NEMA Practicing License](#)

