iPlan CONSULT (Intl) LTD.
'Innovative Spatial Use - Planning for the Future
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ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT FOR THE PROPOSED RESIDENTIAL APARTMENTS ON PLOT L.R. NO. 12715/529 & 12715/530 (AMALGAMETED) ALONG SYOKIMAU AIRPORT ROAD, IN SYOKIMAU AREA, MAVOKO SUB-COUNTY, MACHAKOS COUNTY.

COORDINATES 1°21'29.1"S 36°55'16.7"E

PROPONENT

SUNPARK LIMITED

P.O.BOX 32705-00600

NAIROBI.

APRIL 2025

DOCUMENT AUTHENTICATION

This Environmental Impact Assessment Study report has been prepared by **iPlan Consult (Int'l) LTD.** (NEMA Reg. No. **7597**) under the Environmental Management and Coordination Act (EMCA) 1999 and the Environmental (Impact Assessment) and Audit Regulations 2003 which requires that every development project must have an EIA report prepared for submission to the National Environmental Management Authority (NEMA). We, the undersigned, certify that the particulars in this report are correct and righteous to the best of our knowledge.

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For and on behalf of SUNPARK LIMITED
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Name……

Designation……

Signature……Date……

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PROJECT TEAM

Name/Organization	**Role/Designation**
Sunpark Limited	Project Proponent
iPlan Consult (Int l) Ltd.	EIA Lead Consultant (Firm)
Shadrack K. Mbuta	Lead EIA/EA Expert
Obadiah o. Karinga	EIA/EA Expert
Lorine Akinyi	EIA/EA Expert/Sociologist

ACRONYMS

EIA **ESIA**	**Environmental Impact Assessment** **Environmental and Social Impact Assessment**
EMCA	**Environmental Management Coordination Act**
EMP	**Environmental Management Plan**
EMS	**Environmental Management System**
Ha	**Hectare**
HFCs	**Hydro fluorocarbons**
ICT	**Information Communication Technology**
IEA	**Initial Environmental Audit**
KPLC	**Kenya Power and Lighting Company**
KRA	**Kenya Revenue Authority**
MDGs	**Millennium Development Goals**
NEAP	**National Environment Action Plan**
NEC	**National Environment Council**
NEMA	**National Environment Management Authority**
NPEP	**National Poverty Eradication Plan**
EHS	**Environment Health & Safety**
TOR	**Terms of Reference**
UNFCCC	**United Nations Framework Convention on Climate Change**
WRMA	**Water Resources Management Authority**
WSB	**Water Services Board**
WSRB	**Water Services Regulatory Board**

PROJECT DATA SHEET

ITEM	**DESCRIPTION**
Project Title	Sunpark Phase III Residential Development
Location	Plot L.R. No. 12715/529 & 12715/530 (Amalgamated), Syokimau, Mavoko Sub-County, Machakos County
Coordinates	1°21'29.1"S, 36°55'16.7"E
Proponent	Sunpark Limited
Postal Address	P.O. BOX 32705-00600, Nairobi
EIA Consultant	iPlan Consult (Int l) Ltd. (NEMA Reg. No. 7597)
Lead Expert	Shadrack K. Mbuta (NEMA Reg. No. 6315)
Type of Project	Residential Apartments (High-density)
Number of Blocks	19 (8 blocks – 2 BR, 11 blocks – 3 BR)
Total Units	456 units (264 x 3-BR, 184 x 2-BR, 8 x 1-BR)
Project Cost	619, 709, 308.00
Amenities	Shops, 539 parking slots, a gym, a swimming pool, a community hall, landscaping
Power Supply	Kenya Power grid connection
Water Supply	Borehole, rainwater harvesting, private supplier
Sewerage System	On-site waste treatment plant
Solid Waste Management	Licensed NEMA waste handler per 2022 regulations
Fire Safety	Hydrants, extinguishers, fire alarm systems
Security	Perimeter wall, alarms, entry control, security personnel
Project Benefits	Affordable housing, employment, local economic stimulation
Anticipated Impacts	Dust, noise, traffic, waste, soil erosion, water demand
Mitigation Measures	Dust suppression, proper waste handling, noise control, stormwater management

Legal Compliance	EMCA 2015, EIA/Audit Regulations 2003, Physical Planning Act, others
Planning Approval	Machakos County Government
Public Participation	Conducted; strong support from community with no objections.

EXECUTIVE SUMMARY

This Environmental Impact Assessment (EIA) study report evaluates the proposed construction and operation of Sunpark Estate, a residential development project located on plot L.R. No. 12715/529 & 12715/530 (amalgamated) in the Syokimau area of Mavoko Sub-County, Machakos County. The project, promoted by Sunpark Limited, aims to meet the growing demand for quality urban housing and aligns with Kenya's national housing goals under Vision 2030.

The development will comprise of 19 blocks, with a total of 456 residential units (consisting of one, two, and three-bedroom apartments), along with associated amenities such as shops, 539 parking spaces, a community hall, a gym, a swimming pool, and landscaped areas. The construction will also include utility infrastructure, such as a water supply through boreholes and harvested rainwater, a private waste treatment plant, and a connection to Kenya Power's electricity grid.

The EIA was conducted in compliance with the Environmental Management and Coordination Act (EMCA), 1999 (amended in 2015), and the Environmental (Impact Assessment and Audit) Regulations, 2003. The primary objective of the assessment was to identify and evaluate potential environmental and social impacts, both positive and negative arising from the project and to propose mitigation measures to prevent or minimize adverse effects.

The assessment involved a comprehensive baseline study of the biophysical and socio-economic conditions of the project area, stakeholder engagement through public participation, and a review of relevant legal and institutional frameworks. The findings indicate that the project will yield significant socio-economic benefits, including the provision of much-needed housing, the creation of employment opportunities, stimulation of local businesses, and enhancement of infrastructure in the area.

However, several potential environmental concerns were identified, particularly during the construction phase. These include soil erosion, dust and noise pollution, generation of solid and liquid waste, pressure on water resources, increased traffic, and occupational health and safety risks. The report provides a detailed

Environmental Management Plan (EMP) outlining practical mitigation strategies such as proper waste handling and disposal, dust suppression, noise control, use of personal protective equipment (PPE), soil conservation techniques, and efficient water use.

Alternative project options, including the no-project scenario, alternative sites, land uses, technologies, and waste management approaches, were also considered. The analysis confirms that the current site and proposed development plan offer the most viable option both economically and socially.

The public participation process revealed overwhelming community support for the project, with residents highlighting the need for affordable housing, employment creation, and improved neighborhood amenities. No major objections were raised.

In conclusion, the proposed Sunpark Phase III development is environmentally and socially viable, provided the recommended mitigation measures are fully implemented. The project is in alignment with national development objectives and sustainable development goals. It is, therefore, recommended that NEMA grant the necessary environmental approvals for the project to proceed.

CHAPTER ONE: INTRODUCTION

1.1 Rationale

The housing market in Kenya has recently become one of the most lucrative businesses, many development companies and individuals are now putting up modern housing units for rental and sale, this has become possible by the many banks and financial institutions which are now offering loans and mortgages to both developers and home buyers at subsidized rates. The proposed residential development is privately owned and is targeted for rental/ sale purposes. The Architectural and structural drawings for the proposed development have been approved by the Machakos County Government as well as the change of use. The report gives in detail the project background, its goal and objectives, scope, project justification and cost, baseline information, Policy- legal and institutional framework governing the exercise, identification of impacts and their respective mitigation measures, a clear description of the project's alternatives and a comprehensive environmental management plan to avert or minimize the anticipated impacts

1.2 Justification

1.3 National Housing Policy and Housing Needs in Kenya

In August 2003, the government of Kenya, through a Sessional Paper, spelt out a Housing Policy whoseoverall goal was to facilitate the provision of adequate shelter and a healthy living environment at an affordable cost to all socio-economic groups in Kenya in order to foster sustainable human settlements.The aim is to minimize the number of citizens living in shelters that are below habitable living conditions.

Among other things, the policy aims at facilitating increased investment by the formal and informal private sector in the provision of housing units for low and middle-income dwellers. The estimated current urban needs are 250,000 units per year, which can be achieved if the existing resources are fullyutilized by the private sector with the enabling hand of the government. It is estimated that the current production of new housing in urban areas is only 50,000 units annually, giving a shortfall of over 200,000 units per annum. The shortfall in housing has been met through the proliferation of squatter and informal settlements and overcrowding.

To alleviate the huge shortfall of urban housing mentioned above and to curb the mushrooming of informal settlements/slums, various interventions and strategies have to be adopted. In the Policy Paper,the government correctly accepts the fact that it cannot meet the housing shortfall on its own and that the best policy is to encourage the private sector (like the proponent) to chip in while the government provides an enabling environment for development. The government will provide an enabling environment by doing the following:

- Using research findings as well as innovative but cheap conventional building materials andtechnologies to improve the production of housing units.
- Harmonizing the Banking Act, the Building Society Act, the Insurance Act, and the various Actsthat have so far proved to be a hindrance to the sourcing of housing finance.
- Generally easing the path of funds from the private investor/government to the developmentproject.
- Issuing workable guidelines on Estate Management and maintenance.

The promotion of this development is therefore well within the government's current and long-term policies of ensuring housing for all by 2030 (Vision 2030). The housing policy does not address the demand for affordable residential houses, which is addressed by this report.

1.4 Terms of Reference

- A decisive look at the objectives of the project.
- The proposed location of the project site.
- Description of the baseline information, national environmental legislative and regulatory framework, and any other relevant information related to the project.
- Assessment of the technology, procedures, and processes to be used in the implementation of the project.
- Assessment of materials to be used in the construction and implementation of the project and their sources.
- Evaluation and analysis of the anticipated potential environmental effects, which are categorized into physical, ecological/biological, and socio-economic aspects; this can be further classified as direct, indirect, cumulative, irreversible,

short-term, and long-term effects.

- Evaluation of the products, by-products, and wastes to be generated by the project.
- To recommend a specific environmentally sound and affordable solid waste management system
- Evaluation and analysis of alternatives, including the proposed project, project alternative, project site, design, and technologies.
- An Environmental Management Plan (EMP), proposing the measures for eliminating/minimizing or mitigating adverse impacts on the environment. `
- Propose measures to prevent health and safety hazards and to ensure security in the working environment for the employees, residents, and management in case of emergencies. This encompasses prevention and management of the foreseeable accidents and hazards during both the construction and occupational phases. Any other matters which may be required by NEMA.

This project report provides relevant information and environmental considerations on the project proponent's intention to seek approval from NEMA for the construction of the proposed project.

1.5 Objective and Scope of Study

1.5.1 General Objectives

The main objective is to carry out an ESIA study in accordance with EMCA and the ESIA/EA regulation and submit the ESIA report to NEMA for approval.

The overall purpose of this study is to ensure that all the environmental concerns are integrated into the implementation of the project in order to contribute to the sustainable development of the general project area. This is to ensure compliance with Section 58 of the Environmental Management and Coordination Act (EMCA), cap 387 of the laws of Kenya, which requires that a proponent of any project under the second schedule of the Act carry out an ESIA study for approval by NEMA and be issued with an ESIA license. The second schedule of EMCA covers the project under section 3: Transportation, whereby the Act lists 'Water Transportation' as an entry under the section.

1.5.2 Specific Objectives

To identify potential environmental impacts, both direct and in direct.

a) To assess the significance of the impacts
b) To assess the relative importance of the impacts of relative plan designs, and
c) sites
d) To propose preventive mitigating and compensative measures for the significant negative impacts of the project on the environment
e) To generate baseline data for monitoring and evaluation of how well the mitigating measures are being implemented during the project cycle
f) To present information on project alternatives
g) To present the results of the ESIA that can guide informed decision-making and
h) To prepare an ESMP for the proposed project and decommissioning plan.

1.5.3 Scope of Study

The Kenya Government policy on all new projects, programmes, or activities requires that an environmental social impact assessment is carried out at the planning stages of the proposed project to ensure that significant impacts on the environment are taken into consideration during the design, construction, operation, and decommissioning of the facility. The scope of this full study, therefore, covered the following:

- The baseline environmental conditions of the area,
- Description of the proposed project,
- Provisions of the relevant environmental laws,
- Identification and discussion of any adverse impacts to the environment anticipated from the proposed project,
- Appropriate mitigation measures,
- Provision of an environmental and social management plan outline.

1.4.5 Methodology

To carry out the study, a study team was formed to determine the scope of the study and carry out the study as well as prepare the report. The team interacted with other stakeholders, including community members, institutions, and local leaders. KRCs

situated at Voi worked very closely with the team in sharing information as well as in Site visits. The team did the following: -

1. Environmental scoping that provided the key environmental issues and extent of study required.
2. Desktop review of all relevant information, including legal and policy framework.
3. Physical inspection of the site and surrounding areas during the site visit.
4. Public participation by the use of questionnaires, interviews, focus group discussion, as well as oral interviews.
5. Reporting writing.
6. Submission of Draft report to the client for comments
7. Submitting the final report to NEMA for review.

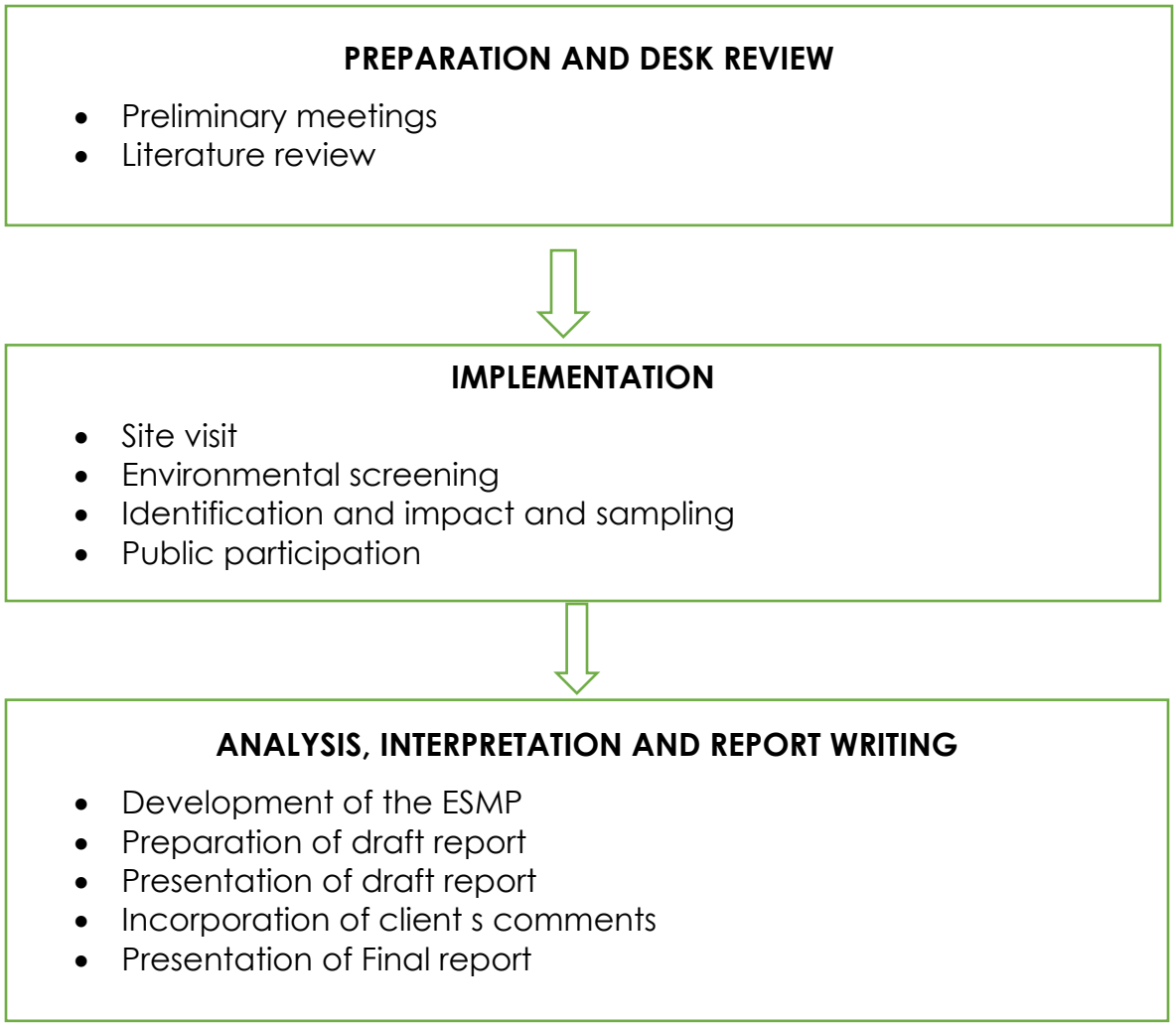

Chart: 1 Methodology Chart

CHAPTER TWO: PROJECT DESCRIPTIONS, DESIGN, & CONSTRUCTION.

2.1 Project Description

The proposed development will have a total of 19 blocks, comprising of Eight (8) blocks of two (2) bedrooms and eleven (11) blocks of three (3) bedrooms each with a ground floor and five typical floors. On the ground floor of each of the two-bedroom blocks, there will be one one-bedroom unit. There will be a total of four (4) units on each floor on either blocks with other associated amenities. There will be a total of two hundred sixty-four (264) units of three (3) bedrooms, one hundred and Eighty four (184) units of two bedrooms & Eight (8) units of one bedroom totaling to four hundred fifty-six units (456), shops, five hundred thirty-nine (539) parking, community hall, gym, swimming pool and other associated amenities.

Electrical system

There will be a connection to the existing electricity main line of the Kenya Power and Lighting Company, which will be used in all phases of the project. The necessary guidelines and precautionary measures relating to the use of electricity shall be adhered to.

Water Reticulation System

Water from private suppliers will be used during the construction and operation phases. There will be water storage tanks to increase the water supply to various components of the houses. The developers will drill a borehole on site and also harvest rain water to improve on water supply.

Sewerage

The area has no existing sewer line. The proposed development will be connected to a waste treatment plant for the disposal of liquid waste.

Solid Waste

Solid waste management will consist of dustbins stored in cubicles protected from rain and animals. The waste will then be collected by a NEMA-licensed private waste management company and be composited, palletized, or recycled depending on the waste management strategy to be adopted in line with the Environmental Management and Coordination (Sustainable Waste Management) Regulations, 2022.

Security

There will be a main entrance for easy security operations around the compound, a boundary wall connected with security alarms, entry control, and quick response systems will be used within the project area.

Fire Safety

The development will provide for firefighting facilities, such as fire extinguishers in the form of hydrants and carbon dioxide gas extinguishers. Fire breaks have also been provided.

Perimeter Fence

A concrete perimeter wall will be erected around the project site.

Landscaping

The site will be landscaped after construction, using plant species available locally. This will include the establishment of flower gardens and lush grass lawns to improve the visual quality of the site where pavements will not have taken space.

Buildings Construction

The technology used in the design and construction of the Houses will be based on international standards, which have been customized by various housing units in Kenya. The buildings will be constructed as per the respective structural engineer's detail as provided for in the drawings presented in the Appendix. The building structures will consist of concrete appropriately reinforced with metal (steel and iron). The roof will consist of structural timber and steel members and roofing tiles. The buildings will be provided with a well-designed concrete staircase for every house.

The buildings will be provided with facilities for drainage of storm water from the roof through peripheral drainage systems into the drainage channels provided and out into the natural drainage channel/system. Drainage pipes will be of the PVC type and will be laid under the buildings, and the driveway will be encased in concrete. This is a sparsely built area, and there is no need for a public drainage channel. The buildings will have adequate natural ventilation through the provision of permanent vents in all habitable rooms, adequate natural and artificial light, piped water stored in above-ground water tanks, and firefighting facilities.

2.2 Project Implementation

Preconstruction phase

This involves the study of the project area, the design of the construction drawings, and getting approvals for the same from the respective Local authority, NEMA, Physical Planning, County Lands officer, and any other relevant authority. Soil tests are also done at this stage; soil tests provide the bearing capacity of the soil, thus determining the type of foundation to be laid.

Site Construction

The construction of the units will be based on applicable international building standards. Other building standards, including the Building Code and the British Building Standards, which include BS 8110, BS 5950, BS4449, and BS4461, will be incorporated. The constructions will also incorporate environmental guidelines and health and safety measures.

Implementation activities include the following: -

Site clearing and Excavation of the Foundations and Space for Underground Foundations: This entails the removal of unwanted vegetation from the site and excavation of the projects' foundations. The few shrubs on the site will be cleared to pave the way for excavation activities; the excavation of the site will not involve much machinery since the soil on site is light and well-drained.

Civil works: Civil works involve: -

- Procurement of construction materials from approved dealers.
- Transportation of construction materials to the site and disposal of the resulting flora waste using light machinery.
- Storage of the construction materials.
- Laying and construction of the foundations.
- Disposal of the existing debris/ materials.

Electrical works: Electrical works involve the installation of the Power Distribution Box, control panel, and all power supplying cables and equipment. All electrical works are done by qualified electricians so as to avoid faulty connections that may later cause fire outbreaks and short circuiting of the site equipment.

2.4 Construction Inputs (Materials and Equipment)

The project inputs include the following:

Construction inputs/ raw materials: These include, i.e., sand, cement, machine cut stones, crushed rock (gravel/ ballast), steel metal bars, and paint/painting materials, among others. All these will be obtained from licensed dealers, especially those that have complied with the environmental management guidelines and policies.

Construction machines: These include machinery such as trucks, concrete mixers, masonry tools, and other relevant construction equipment. These will be used for the clearing of vegetation and transportation of raw materials and the resulting construction debris. Most of the machinery will use diesel or petrol as a source of power.

Labour force: Both skilled and non-skilled workers will be required at all phases of the project. The labour force will require services such as energy, water supply, and sanitation facilities. Large volumes of water will also be required during the civil works.

2.5 Project Outputs

There will be little waste generated from the proposed project; this is due to the nature of the materials used and the magnitude of the project. Most of the waste materials generated will be reused, while the non-reusable waste will be disposed of in the appropriate manner as described in the management plan illustrated in this report. Some of the anticipated waste materials include pieces of Wood, Papers, Empty Tins, Electric cables, Plant materials, pieces of metal rods, etc.

Waste will also be generated during the operation phase of the project; the anticipated waste will include:

- Waste wasters/sewage: This will be directed to the waste treatment plant.
- Product/material wrappings: These materials will be sorted and disposed off appropriately. Waste bins will be placed strategically within the compound for dumping this form of waste.

2.6 Public participation

Public participation basically involves engaging members of the public to express their views about a certain project. Public participation tries to ensure that due

consideration will be given to public values, concerns, and preferences when decisions are made. Public participation in this project was facilitated through interviews and questionnaires. The purpose of public involvement is to:

- Inform the stakeholders about the proposal and its likely effects;
- Canvass their inputs, views, and concerns; and
- Take account of the information and views of the public in the EIA and decision-making.

CHAPTER THREE: BASELINE INFORMATION

This chapter has information on the location and the bio-physical, social, and economic aspects of the project area. These are thoroughly discussed to identify areas likely to be affected by project activities. This study, therefore, considered the physical location, climatic data, geology, drainage, infrastructure, demography, and socioeconomic information.

3.1 Project Location

The project site is situated in the Syokimau area, within Mavoko Sub-County, Machakos County, approximately 20 km southeast of the Nairobi Central Business District (CBD). It lies near Syokimau Airport Road, offering proximity to Jomo Kenyatta International Airport (JKIA) and key transport corridors such as Mombasa Road (A109) and the Nairobi Expressway.

The area is characterized by relatively flat to gently undulating terrain with an elevation of about 1,600–1,650 meters above sea level. This topography supports easy site preparation and infrastructure development.

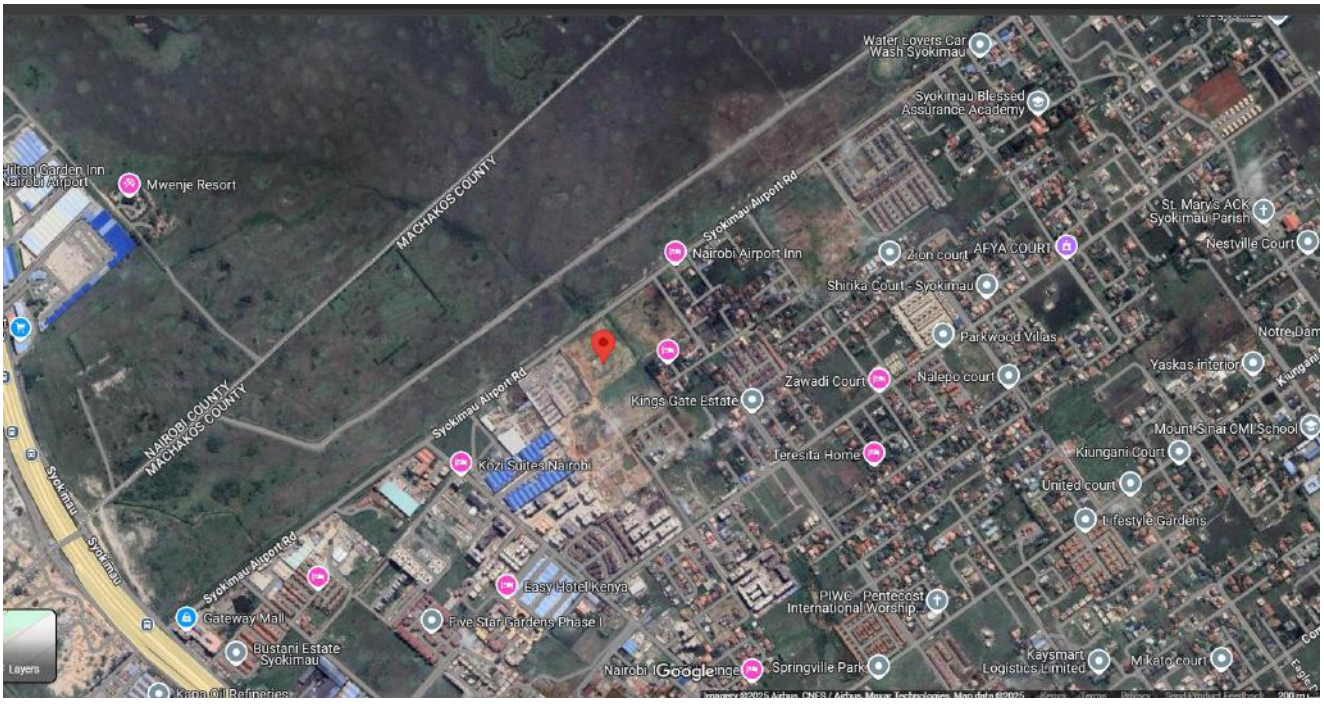

Plate 1: Location of the proposed project

3.2 Climate

Syokimau experiences a semi-arid to sub-humid climate, with bimodal rainfall distribution, long rains between March and May and Short rains October to December.

Average annual rainfall ranges between 600–900 mm, with temperatures ranging from 12°C (minimum) to 28°C (maximum). Wind speeds tend to be moderate but can increase due to the open terrain and proximity to the airport.

3.3 Geology and Soils

The area is predominantly covered by black cotton soils (vertisols) with moderate to low permeability, prone to waterlogging during heavy rains. The underlying geology is mainly volcanic rocks, particularly phonolites and tuffs, offering good foundation conditions but requiring proper soil stabilization and drainage during construction.

3.4 Hydrology and Drainage

There is a river near the site with seasonal surface runoff during heavy rains, and stormwater tends to accumulate due to poor drainage and flat terrain. Proper stormwater management is crucial for development.

3.5 Air Quality and Noise

Being close to JKIA, the area experiences relatively high ambient noise levels due to,

- Aircraft take-offs and landings
- Vehicular traffic from Mombasa Road and Syokimau Airport Road
- Nearby construction activities

Air quality is moderately affected by vehicular emissions, dust, and occasional industrial emissions from neighboring zones, though generally within National Environment Management Authority (NEMA) limits.

3.6 Biological Environment

Flora

The project site and surrounding area are highly urbanized with scattered vegetation mainly consisting of:

- Grasses (couch grass, star grass)
- Shrubs (lantana, acacia saplings)

- Planted ornamental species within residential plots

There are no known endangered or protected plant species on site. Vegetation is sparse due to ongoing development and land clearing.

Fauna

Due to the urban setting and human activity, wildlife is minimal. Occasionally observed fauna includes:

- Small mammals (squirrels, mongeese)
- Birds (pigeons, weaver birds, egrets)
- Reptiles (agamas, house geckos)

There are no critical wildlife habitats or migratory corridors within the immediate vicinity of the site.

3.7 Socio-Economic Environment

Land Use

The area is transitioning from low-density residential and undeveloped plots to high-density mixed-use developments. Common land uses include Residential apartments, Commercial buildings, Light industrial and warehousing, and Institutional facilities (schools, churches, clinics). The plots (L.R. No. 12715/529 & 530) are designated for residential development under the local physical planning framework.

Infrastructure and Utilities

- The site is accessible via Syokimau Airport Road, connecting to Mombasa Road and the Nairobi Expressway.
- Water is supplied by private boreholes and Mavoko Water and Sewerage Company (MAVWASCO).
- Most developments use septic tanks or bio-digesters; MAVWASCO sewer lines are gradually being expanded.
- Supplied by Kenya Power, with nearby transformers and power lines.
- Mobile network coverage is strong; fiber internet services are available.

Demographics

Syokimau is a growing middle-class neighborhood with diverse residents working in Nairobi, Machakos, and Kajiado Counties. The population is characterized by young professionals, Families, and business owners.

Demand for quality housing is high due to urban sprawl and proximity to key employment hubs.

3.7 Institutions and Social Services

Nearby amenities include:

Notre Dame School, Viraj Int. School; Kitengela International School (Syokimau), Syokimau Blessed Academy, Syokimau Health Centre, Veterans Hospital in Syokimau, Various churches and mosques, Gateway Mall, small supermarkets, and shops.

Plate: Neighbourhood developments

CHAPTER FOUR: RELEVANT ENVIRONMENTAL POLICIES; LEGISLATIVE AND REGULATORY FRAMEWORK.

4.1 Introduction

There is a growing concern in Kenya and at a global level that many forms of development activities cause damage to the environment. Development activities have the potential to damage the natural resources upon which the economy is based. EIA is a valuable tool for the protection of the environment from the negative effects of development activities. It is now accepted that development projects must be economically viable, socially acceptable, and environmentally sound. According to Sections 58 and 138 of the Environmental Management and Coordination Act (EMCA) No. 5 of 2015 and Section 3 of the Environmental (Impact Assessment and Audit) Regulations 2003

(Legal No. 101), requires an EIA project/study report prepared and submitted to the National Environment Management Authority (NEMA) for review and eventual Licensing before the development commences. This was necessary as many forms of developmental activities cause damage to the environment, and hence, the greatest challenge today is to maintain sustainable development through sustainable use of natural resources without interfering with the environment.

4.2 Global policies

The development of this project has been benchmarked against UN and International guidelines.

4.2.1. The World Commission on Environment and Development

The commission, commonly referred to as the Brundtland Commission, is focused on the environmental aspects of development. Economically sustainable development is development for which progress towards environmental and social sustainability occurs within available financial resources. Social sustainable development maintains the cohesion of a society and its ability to help its members work together to achieve common goals while at the same time meeting individual needs for health and well-being, adequate nutrition, shelter, cultural expression, and political involvement.

4.2.2. The Rio Declaration on Environment and Development

The Rio Declaration on Environment and Development was adopted by more than 178 governments at the United Nations Conference on Environment and Development, known as the Earth Summit, held in Rio de Janeiro, Brazil from 3rd to 14th June 1992.

Under Agenda 21, Principle No. 10 of the declaration underscores that environment. Issues are best handled with the participation of all concerned citizens at all relevant levels. At the national level, everyone shall have appropriate access to information concerning the environment that is held by public authorities. States shall encourage and facilitate public participation by making information widely available. Effective access to judicial and administrative proceedings, including redress and remedy, shall be provided. The foregoing discussion is relevant to the proposed development because Kenyan legislation demands that the public must be involved before any development project that is likely to have adverse impacts on the environment is initiated by a project proponent. The Environment Act has further established a public complaints committee (PCC) where the issues raised by the public regarding any proposed development can be addressed

4.2.3 Sustainable Development Goals (SDGs)

On September 25th, 2015, countries adopted the United Nations Sustainable Development Goals (SDGs) of the United Nations Conference on Sustainable Development, Rio+20, which took place in Rio de Janeiro, Brazil, on 20-22 June 2012. The SDGs aimed at contributing towards ending poverty, protecting the planet, and ensuring prosperity for all as part of a new sustainable development agenda. The SDGs have very significant implications for investment needs, and the role of the public sector is fundamental and pivotal. At the same time, the contribution of the private sector is indispensable. The proponent has committed to the SDGs through the proposed development.

4.3 National Policies

There are several policies that are pertinent to this project, the chief of which is the constitution of Kenya. A brief description of the policies is given below:

4.3.1 The Constitution of Kenya 2010

The Constitution of Kenya is the supreme law of the Republic of Kenya and binds all persons and all State organs at all levels of government. It provides the broad framework regulating all existence and development aspects of interest to the people of Kenya, and along which all national and sectorial legislative documents are drawn. About environment, Article 42 of Chapter 4, the Bill of Rights, confers to every person the right to a clean and healthy environment, which includes the right to have the environment protected for the benefit of present and future generations through legislative measures, particularly those contemplated in Article 69, and to have obligations relating to the environment fulfilled under Article 70. Chapter 5 of the new constitution provides the main pillars on which the 77 environmental statutes are hinged and covers "Land and Environment" and includes articles 69 and 70. Part 1 of the Chapter dwells on land, outlining the principles informing land policy, land classification, and land use and property. Part 2 of the Chapter directs focus on the environment and natural resources. It provides a clear outline of the state's obligation concerning the environment. The Chapter seeks to eliminate processes & activities likely to endanger the environment.

There are further provisions on the enforcement of environmental rights as well as the establishment of legislation relating to the environment in accordance with the guidelines provided in this Chapter. In conformity with the Constitution of Kenya 2010, every activity or project undertaken within the Republic of Kenya must be in tandem with the state's vision for the national environment as well as in adherence to the right of every individual to a clean and healthy environment. The proposed development project is a development activity that will utilize sensitive components of the physical and natural resources, hence the need for an environmental management plan to curb probable adverse effects to the environment.

4.3.2 Kenya Vision 2030

Kenya Vision 2030 is the country's development blueprint, which aims at making Kenya a newly industrializing middle-income country providing high quality life for all its citizens by the year 2030. The vision has been developed through an all-inclusive stakeholder consultative process involving Kenyans from all parts of the country. The

vision is based on three pillars, namely, the Economic Pillar, the Social Pillar, and the Political Pillar. The Kenya Vision 2030 economic pillar aims at providing prosperity for all Kenyans through an economic development programme aimed at achieving an average GDP growth rate of 10% per annum over the next 25 years from the year 2008. The social pillar seeks to build a just and cohesive society with social equity in a clean and secure environment. On the other hand, the political pillar aims at realizing a democratic political system founded on issue–based politics that respects the rule of law and protects the rights and freedoms of every individual in the Kenyan society.

The proposed project is in line with the economic and social pillars of Kenya Vision 2030, and therefore, its implementation will contribute to Kenya's realization of the objectives set in the Kenya Vision 2030.

4.3.3 Public Health Policy

The prevailing public health policy calls upon the project proponent to ensure that buildings are adequately provided with utilities so that they are fit for human habitation. The proposed development has been designed by professional architects and engineers and, as such, will have all amenities/utilities that are essential for safeguarding public health for all people using the facilities during the construction, operational, and decommissioning phases of the project.

4.4 Institutional Framework

There are different institutions that deal with environmental issues in Kenya. Some of the key institutions include the National Environmental Management Authority (NEMA), the Department of Resource Surveys and Remote Sensing (DRSRS), the Water Department, the Kenya Forest Service (KFS), and the Kenya Forestry Research Institute (KEFRI), among others. While implementing the project, both the proponent and the contractor will have to work in liaison with a number of these institutions when dealing with issues within the jurisdiction of the institutions.

Structure

4.4.1 National Environmental Management Authority (NEMA)

The objective and purpose for which NEMA was established is to exercise general supervision and co-ordinate over all matters relating to the environment and to be

the principal instrument of the government in the implementation of all policies relating to the environment.

However, the NEMA mandate is designated to various committees. The contractor and the client will work in liaison with NEMA in getting various permits, licenses, approvals, and generally in complying with the provisions of EMCA 2015 and any other subsidiary legislation under EMCA 2015.

4.4.2 National Environmental Action Plan (NEAP)

The NEAP was a deliberate policy effort to integrate environmental considerations into the country's economic and social development. The integration process was to be achieved through a multi-sectorial approach to develop a comprehensive framework to ensure that environmental management and conservation of natural resources are an integral part of societal decision making. The NEAP has indicated how resources within sections of the country should be managed in order to ensure their sustainable utilization.

4.4.3 National Environmental Tribunal (NET)

This tribunal guides the handling of causes related to environmental offences in the Republic of Kenya. If disputes to the proposed project arise, they are supposed to be presented here for hearing and legal direction.

4.5 Legal Framework

Kenya has several statutes that govern environmental standards and quality. Most of these statutes are sector-specific, covering issues such as public health, planning, air quality, agriculture, water quality, and land use. This section seeks to bring to light statutes and legislation pertinent to the development of the proposed development, herein referred to as the proposed project.

4.5.1 Environment Management and Coordination (Amendment) Act, 2015

The Environmental Management and Co-ordination (Amendment) Act, 2015, is an act of Parliament enacted by the Parliament of Kenya to amend the Environmental Management and Co-ordination Act. It commenced on 17th June 2015 No. 5 of 2015 and it provides a legal and institutional framework for the protection and conservation of the environment (in line with Article 42 of the constitution), as well as providing the

necessary mechanism to monitor that, which include Environmental Impact Assessment, Environmental Auditing and Monitoring as prescribed by Article 69 of the Constitution. Section 58 (1) of the Act states —Notwithstanding any approval, permit or license granted under this Act or any other law in force in Kenya, any person, being a proponent of a project, shall, before financing, commencing, proceeding with, carrying out, executing or conducting or causing to be financed, commenced, proceeded with, carried out, executed or conducted by another person any undertaking specified in the Second Schedule to this Act, submit a project report to the Authority, in the prescribed form giving the prescribed information. The project report should be conducted or prepared by individual experts or a firm of experts authorized by NEMA, which maintains a register of all experts authorized to carry out Environmental Impact Assessment studies and reports as Section 58(5) stipulates. It acknowledges the Consultation and Public Participation Process as a policy requirement for the purpose of achieving the fundamental principles of sustainable development. In fulfilment of this requirement, the proponent engaged a firm of experts to carry out the EIA and conduct public participation.

EMCA 2015 has several subsidiary legislations that were enacted to ensure effective implementation of the Act. A few regulations that are pertinent to the proposed project are described below:

4.5.1.1 The Environmental Management and Coordination (Water Quality) Regulations

The Regulations provide for sustainable management of water resources, including prevention of water pollution and protection of water sources (lakes, rivers, streams, springs, wells, and other water sources). It is an offence under Regulation No.4 (2) for any person to throw or cause to flow into or near a water resource any liquid, solid, or gaseous substance or deposit any such substance in or near it, as to cause pollution. Regulation No. 11 further makes it an offence for any person to discharge or apply any poison, toxic, noxious, or obstructing matter, radioactive waste or other pollutants or permit the dumping or discharge of such matter into the aquatic environment unless such discharge, poison, toxic, noxious or obstructing matter,

radioactive waste or pollutant complies with the standards for effluent discharge into the environment.

Regulation No. 14 (1) requires every licensed person generating and discharging effluent into the environment to carry out daily effluent discharge quality and quantity monitoring and to submit quarterly records of such monitoring to the Authority or its designated representatives.

The proponent will ensure that appropriate measures to prevent pollution of underground and surface water sources are implemented throughout the project cycle.

4.5.1.2 The Environmental Management and Coordination (Waste Management) Regulations

The regulations provide details on the management (handling, storage, transportation, treatment, and disposal) of various waste streams, including:

- Domestic waste
- Industrial waste,
- Hazardous and toxic waste
- Pesticides and toxic substances
- Biomedical wastes
- Radioactive waste

Regulation 4 (1) makes it an offense for any person to dispose of any waste on a public highway, street, road, recreational area, or in any public place except in a designated waste receptacle.

Regulation 5 (1) provides categories of cleaner production methods that should be adopted by waste generators to minimize the amount of waste generated.

The proponent will ensure that all waste is segregated before being transported to a designated waste treatment facility by a contracted NEMA-licensed waste Transporter. Regulation 6 requires waste generators to segregate waste by separating hazardous waste from non-hazardous waste for appropriate disposal. Regulation 14 (1) requires every trade or industrial undertaking to install at its premises anti-pollution equipment for the treatment of waste emanating from such trade or industrial undertaking. Regulation 17 (1) makes it an offence for any person

to engage in any activity likely to generate any hazardous waste without a valid Environmental Impact Assessment license issued by NEMA.

During the construction phase of the project, the Proponent shall ensure that the main contractor implements the above-mentioned measures as necessary to enhance sound environmental management of waste.

4.5.1.3 The Environmental (Impact Assessment and Audit) Regulations

The EIA exercise under the Act is guided by the Environmental (Impact Assessment and Audit) Regulations, which was given under legal notice no. 101. The regulations stipulate the ways in which EIA and audits should be conducted. The project falls under the second schedule of EMCA, 2015, section 58 (1), (4) that requires an EIA be conducted. As stipulated by the legal notice No. 101, 2003, PART V, Section 31 (3((a) (i) and (ii), it is required that an environmental assessment be undertaken to provide baseline information upon which subsequent environmental control audit shall be based. *It is in the wake of these regulations that the proponent commissioned iplan consult Firm of Experts to carry out an EIA exercise, write a report, and submit it to NEMA with an aim of being awarded an EIA license.*

4.5.1.4 Environmental Management and Coordination (Noise and Excessive Vibrations Regulations

The regulations define noise as any undesirable sound that is intrinsically objectionable or that may cause adverse effects on human health or the environment. The regulations prohibit any person from making or causing to be made any loud, unreasonable, unnecessary, or unusual noise that annoys, disturbs, injures, or endangers the comfort, repose, health, or safety of others and the environment. Article 13 2(d) of the regulations allows for construction work at night for public utility construction, construction of public works, projects exclusively relating to roads, bridges, airports, public schools, and sidewalks, provided noise generated is not caused within a residential building or across a residential real property boundary where such noise interferes with the comfort, repose, or safety of the members of the public. The second Schedule of the Regulations provides for the maximum permissible level of noise at construction sites.

The proponent shall take into concern the provisions of the Local Authority Act to ensure that the development complies with the provisions of the Act.

4.5.1.5 The Environmental Management and Coordination (Air Quality) Regulations

The objective is to provide for the prevention, control, and abatement of air pollution to ensure clean and healthy ambient air. It provides for the establishment of emission standards for various sources, including mobile sources, motor vehicles, and stationary sources (industries) as outlined in the EMCA, 2015. It also covers any other air pollution source as may be determined by the Cabinet Secretary in consultation with the Authority. Emission limits for various areas and facilities have been set. The regulations provide the procedure for designating controlled areas and the objectives of air quality management plans for these areas. The following operations (provided they are not used for the disposal of refuse) are exempt from these regulations:

a) Back-burning to control or suppress wildfires.
b) Firefighting rehearsals or drills conducted by the Fire Service Agencies, and Traditional and cultural burning of savannah grasslands.
c) Burning for purposes of public health protection.

The Proponent shall observe policy and regulatory requirements and implement the mitigation measures proposed in this document to comply with the provisions of these.

Regulations on abatement of air pollution.

4.5.2 The Occupational Safety and Health Act

The Act makes provision for the health, safety, and welfare of persons employed in factories and other places of work. The provision requires that all practicable measures be taken to protect persons employed in the factory and other places of work from any injury. The provisions of the act are also relevant to the management of hazardous and non-hazardous wastes, which may arise at the project site. The act provides that all measures should be taken to ensure the safety, health, and welfare of all the stakeholders in the workplace.

Workers' and occupants' safety will be given priority during both the construction and operation phases of the project. The proponent will appoint a reputable

contractor who will be responsible for enforcing the requirements during construction and subsequent repairs and maintenance after project completion. He will avail fire extinguishers and means of escape, which shall be adequate and suitable in case of fire out breaks for the employees and occupants.

4.5.3 The Public Health. Act (Cap. 242)

Section 115 of the Act states that no person/institution shall cause a nuisance or conditions likely to be injurious or dangerous to human health. Section 116 requires local Authorities (currently County governments) to take lawful, necessary, and reasonably practicable measures to maintain areas under their jurisdiction clean and sanitary to prevent the occurrence of nuisance or conditions liable for being injurious or dangerous to human health. Such nuisance or conditions are defined under Section 118 waste pipes, sewers, drains refuse pits in such a state, situated, or constructed as in the opinion of the medical leer of health to be offensive or injurious to health. Any noxious matter or wastewater discharged from any premises into a public street or the gutter, side channel, watercourse, irrigation channel, or bed not approved for discharge is also termed as a nuisance. Other nuisances are accumulation of materials or refuse which, in the opinion of the medical officer of health, is likely to harbor rats or other vermin. The proponent will be required to abide by these provisions throughout the project cycle.

Part XII Section 136 states that all collections of water, sewage, rubbish, refuse, and fluids that permit or facilitate the breeding or multiplication of pests shall be termed nuisances and are liable to be dealt with in the manner provided by this Act.

The proponent will be required to contract a licensed solid waste collector to collect all solid waste from the site to an approved dumping site. Sewage from the site will be discharged into a waste treatment plant.

4.5.4 Physical and Land Use Planning Act.

An ACT of Parliament to make provision for the planning, use, regulation and development of land and for connected purposes.

Section 57 (1): A person shall not carry out development within a county without a development permission granted by the respective county executive committee member.

A person who commences any development without obtaining development permission commits an offence and is liable on conviction to a fine not exceeding five hundred thousand shillings or to imprisonment for a term not exceeding two months or to both.

A county executive committee member shall require a person who has commenced a development without obtaining development permission to restore the land on which the development is taking place to its original condition or as near to its original condition as is possible and that such restoration shall take place within ninety days.

Section 59 (1): A person applying for development permission shall ensure that any documents, plans, and particulars that are provided to the respective county executive committee member while applying for development permission have been prepared by the relevant qualified, registered, and licensed professionals.

Section 65: A county executive committee member may impose conditions or impose a fine to be prescribed in regulations on an applicant for development permission for building works where that applicant fails to complete the building works within five years.

According to the Third Schedule Development Control,

Section 4. Planning authorities shall require applications for major developments to be subjected to environmental and social impact assessment.

Compliance with this legislation

The architectural plans of the proposed development have been submitted to the county government of Machakos and approved.

The proponent will ensure that the land is utilized in an eco-friendly manner and is restored to its original condition once the project is decommissioned.

Ensure the development does not in way have an injurious impact on the environment and that a developmental footprint of less than 50% is maintained.

The proponent has complied with this provision by appointing EIA/Audit experts to prepare and submit this EIA project report to NEMA.

4.5.5 County Government Act, 2012

The main purpose of the enactment of this Act was to give effect to Chapter Eleven of the Constitution; to provide for county governments' powers, functions, and responsibilities to deliver services and for connected purposes. Functions that were carried out by local governments were effectively transferred to the county governments. The Act gives counties the responsibility of planning and coordinating all developments within their areas of jurisdiction. Part XI (sections 102-115) of the Act provides for planning principles and responsibilities of the county governments. The land use and building plans provided for in the Act are binding on all public entities and private citizens operating within the particular county. The proposed project is within the Machakos City County Government, and thus there will be a need for working in liaison with the County Government. The plans for the proposed project must be approved by the County Government, and the County government may also issue directives and authorizations on various aspects such as waste management and fire emergency preparedness, among others.

The proponent will work in liaison with the Machakos County Government and, in particular, the Department of Environment and Natural Resources.

4.5.6 Penal Code Act (Cap.63)

Section 191 of the penal code states that any person or institution that voluntarily corrupts or foils water for public springs or reservoirs, rendering it less fit for its ordinary use, is guilty of an offence. Section 192 of the same Act says a person who makes or vitiates the atmosphere in any place to make it noxious to the health of persons /institution, dwelling or business premises in the neighbourhood or those passing along public way, commits an offence.

The Proponent will be required to ensure strict adherence to the Environmental Management Plan throughout the project cycle to mitigate against any possible negative impacts

4.5.7 The Registration of Titles Act (Chapter 281)

According to section 23 (1) of this Act, the certificate of title issued by the registrar to a purchaser of land upon a transfer or transmission by the proprietor thereof shall be taken by all courts as conclusive evidence that the person named therein as

proprietor of the land is the absolute and indefeasible owner thereof, subject to the encumbrances, easements, restrictions and conditions contained therein or endorsed thereon, and the title of that proprietor shall not be subject to challenge, except on the ground of fraud or misrepresentation to which he is proved to be a party.

A copy of land ownership documents is attached to this EIA Project Report.

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

Section 5 of the Act outlines the Functions of the Commission, under Article 67(2) of the Constitution as follows 5(1):

- To manage public land on behalf of the national and county governments.
- To recommend a national land policy to the national government.
- To advise the national government on a comprehensive programme for the
- registration of title in land throughout Kenya.
- To conduct research related to land and the use of natural resources and make recommendations to appropriate authorities.
- To initiate investigations, on its initiative. Or, on a complaint, into present or historical land injustices, and recommend appropriate redress;
- To encourage the application of traditional dispute resolution mechanisms in land conflicts.
- To assess tax on land and premiums on immovable property in any area designated by law; and
- To monitor and have oversight responsibilities over land use planning throughout the country

4.5.9 Water Act, 2016

This Act of Parliament provides for the management, conservation, use and control of water resources and for the acquisition and regulation of rights to use water; to provide for the regulation and management of water supply and sewerage services; to repeal the Water Act (Cap. 372) and certain provisions of the Local Government Act.

Section 25 (1) states that a permit shall be required for any of the following purposes: -

a) Any use of water from a water resource, except as provided by section 26;
b) The drainage of any swamp or other land.
c) The discharge of a pollutant into any water resource.
d) Any purpose, to be carried out in or about a water resource, which is prescribed by rules made under this Act to be a purpose for which a permit is required.

4.5.10 Energy Act, 2020

The Energy Act establishes an Energy Regulatory Commission (ERC) mandated to perform all function that pertains to energy production, transmission, setting and enforcing of energy policies, public education and enforcing energy conservation strategies, prescribing the energy licensing process and issuing of licenses that pertain to the energy sector in Kenya.

Section 30 of the Act provides the factors that shall be taken into consideration prior to issuance of license. It states the need and expression of an entity to conserve and protect the environment and natural resources by the EMCA 2015. Moreover, the Act gives provisions for the need to protect the health and safety of users of energy by providing an enabling environment of operation that protects the health and safety of users of the service for which the license or permit is required and other members of the public affected by the undertaking.

4.5.11 National Construction Authority Act, 2011

The act is set to streamline, overhaul, and regulate the construction industry in Kenya for sustainable development. The NCA establishes the authority and confers on its power to register contractors within the construction industry. The act requires all contractors, both foreign and local, to be registered with the authority. The act also regulates the practices of foreign contractor by limiting their work to only tender work. The foreign contractors are licensed for only a specific period, and once they satisfy, they are in Kenya for that specific time.

CHAPTER FIVE: IMPACT IDENTIFICATION, PREDICTION & MITIGATION.

5.1 Description of the Existing and Anticipated Impacts

5.1.1 Existing Impacts.

There are no existing environmental concerns on the site and the surrounding area. The site has no vegetation of value; only grass, which is covering the site, will be cleared for the new development.

5.1.2 Anticipated Impacts.

Impacts can either be positive or negative, direct or indirect. The magnitude of each impact is described in terms of being significant, minor or negligible, temporary or permanent, long-term or short-term, specific/localized or widespread, and reversible or irreversible.

5.2 Positive Impacts of the Proposed Project

The proposed development will have numerous positive impacts on the area's residents and on the general area. Some of the anticipated benefits include the following:

Provision of Housing Units

The rate of urban sprawl has and continues to increase in Kenya today; this has been aggravated by an increase in population as a result of natural growth or as a result of urban-rural migration. The proposed project will, therefore, provide adequate housing units to the increasing population, especially the middle class (Working), which forms a significant percentage of the Urban population and urban families.

Creation of Employment Opportunities

Several employment opportunities will be created for construction workers during the construction phase of the project and operators during the operation phase of the project. This will have a significant impact since unemployment is currently quite high in the country in general.

Provision of Market for Supply of Building Materials

The project will require a supply of large quantities of building materials, most of which will be sourced locally and from the surrounding areas. This provides a ready

market for building material suppliers such as quarrying companies, hardware shops, and individuals with such materials.

Increased Business Opportunities

The large number of project staff required provides a ready market for various goods and services, leading to several business opportunities for small-scale traders, such as food vendors, around the construction site.

5.3 Negative Impacts of the Proposed Project

There are a few negative impacts anticipated from the proposed project; these negative impacts, however, are not major enough to cause any major impact to the environment. They are also few compared to the anticipated positive impacts. The anticipated negative impacts include: -

Increased Soil Erosion

Land and excavation works will lead to increased soil erosion at the project site and the release of sediments into the drainage systems and, ultimately, into water bodies. Uncontrolled soil erosion can have adverse effects on the local water bodies, such as sedimentation, introduction of nutrients into the water bodies, and discoloration of water affecting the penetration of sunlight into the water.

Solid gaseous and liquid Waste Generation.

The three forms of waste will be generated at the site during the construction and operation phases of the project's infrastructure. Such waste will consist of metal cuttings, rejected materials, surplus materials, spoilt or excavated materials, waste oils and grease, pieces of tires, paper bags, empty cartons, empty paint and solvent containers, and broken glass, among others. Such solid waste materials can be injurious to the environment through blockage of drainage systems, choking of water bodies, and negative impacts on human and animal health. This may be accentuated by the fact that some of the waste materials contain hazardous substances such as oils and grease, paints, cement, adhesives, and cleaning solvents, while some of the waste materials, including metal cuttings and plastic containers, are not biodegradable and can have long-term and cumulative effects on the environment. They also pose danger to the safety of the public in case of accidental cutting or injury.

Extraction and Use of Building Materials

Building materials such as hardcore, ballast, cement, rough stone, and sand required for construction of the project will be obtained from quarries, hardware shops, and sand harvesters who extract such materials from natural resource banks such as rivers and land. Since substantial quantities of these materials will be required for the construction of the project, the availability and sustainability of such resources at the extraction sites will be negatively affected, as they are not renewable in the short term. In addition, the sites from which the materials will be extracted may be significantly affected in several ways, including landscape changes, removal of vegetation, poor visual quality, and opening of depressions on the surface, leading to several human and animal health risks and associated impacts.

Dust Emissions

During construction, the project will generate substantial quantities of dust at the construction site and its surroundings. The sources of dust emissions will include leveling works, excavation, and, to some extent, transport vehicles delivering building materials. The emission of large quantities of dust may lead to significant impacts on construction workers and residents, which will be accentuated during dry weather conditions.

Exhaust Emissions.

The trucks used to transport various building materials from their sources to the project site will contribute to increases in emissions of C02, NO, and fine particulate along the way as a result of diesel combustion. Such emissions can lead to several environmental impacts, including global warming and adverse human health impacts; the same can be experienced from the vehicles visiting the facility. Because large quantities of building materials are required, some of which are sourced outside the site area, such emissions can be enormous and may affect a wider geographical area. The impacts of such emissions can be greater in areas where the materials are sourced and at the construction site as a result of frequent

gunning of vehicle engines, frequent vehicle turning, and slow vehicle movement in the loading and offloading areas.

Noise and Vibration

The construction works, delivery of building materials by heavy trucks, and the use of machinery/equipment, including generators, metal grinders, and concrete mixers, will contribute a high level of noise and vibration within the site and the surrounding area. Elevated noise levels within the site can affect project workers and the residents, passers-by, and other persons within the vicinity of the project site.

Risks of Fire Accidents and Injuries to Workers

Because of the intensive engineering and construction activities, including erection and fastening of roofing materials, metal grinding and cutting, concrete work, steel erection, and welding, among others, construction workers will be exposed to risks of accidents and injuries. Such injuries can result from accidental falls from high elevations, injuries from hand tools, construction equipment cuts from sharp edges of metal sheets, and collapse of building sections, among others. Fire accidents are also prone in such a facility, proper care should be taken during the implementation and operation phases of the project.

Energy Consumption

The project will consume fossil fuels (mainly diesel) to run transport vehicles and construction machinery. Fossil energy is non-renewable, and its excessive use may have serious environmental implications on its availability, price, and sustainability. The combustion of fossil fuels in engines leads to the production of carbon dioxide, a greenhouse gas associated with global warming.

Oil and fuel Spills

The machines on site may contain moving parts, which will require continuous oiling to minimize the usual corrosion or wear and tear. The possibility of such oils spilling and contaminating the soil and water on site is real. Waste oils and greases should be disposed of in the designated oil receptors.

5.4 Issues of Concern and their Respective Mitigation Measures

Soil Erosion

Soil erosion is the loss of topsoil through agents of soil erosion like wind and water (rain). During the implementation phase of the project, light machinery under use will loosen the soil, making it susceptible to soil erosion. In this particular project, soil erosion will not be a major environmental issue of concern since there is hardly any major excavation or levelling to be done. However, it is important to note that the project will involve excavation and burying of underground fuel tanks, digging of foundation trenches, and hence soil disturbance, which will expose and set the soils loose to the agents of soil erosion.

Mitigation measures

- Avoid unnecessary movement of soil materials from the site.
- Use of heavy machinery, which will loosen the soil, should be discouraged.
- Control construction activities, especially during rainy/wet conditions.

Noise and Public Disturbances

Noise is an unwanted/undesirable sound that can affect job performance, safety, and health. Psychological effects of noise include annoyance and disruption of concentration. Physical effects include loss of hearing, pain, nausea, and interference with communication when the exposure is severe. As explained earlier, construction activities will generate some noise. Such noise will mainly emanate from the construction machinery and equipment, which include concrete mixers and compactors, and noise that will emanate from the workers on site.

Mitigation measures

- Construction works should be carried out only during the specified time of 0800 hrs to 1700 hrs.
- Machinery should be maintained regularly to reduce noise levels.
- Workers should be provided with protective materials when operating noisy machinery and when in a noisy environment. E.g., ear muffs.

Water

The proposed project will need a lot of water since construction activities are known to be a lot, the various structures will require water; construction workers will create additional demand to the supply in some ways. Once the project is complete, water will also be required. The site is also not located near a water source thus, no pollution is anticipated. The contractor will also have storage tanks onsite to store water; thus, no waste will be experienced.

Mitigation measures

- The contractor should install water tanks on-site to conserve water for construction activities, especially during periods of high water demand, which will mainly be during civil works.
- Encourage water reuse/recycling, mostly during construction, to avoid water wastage.
- Keep the water taps off when not in use.
- Install tanks to tap rainwater to increase the water reserve.

Air Quality

The construction activities on the site will result in increased dust and gas emissions. Some Construction machinery and trucks generate hazardous exhaust fumes such as Carbon Oxides (CO2), Sulphur Oxides (SO2), and Nitrogen Oxides (NO2). Dust, as caused by vibrations of machines and vehicle movement, is suspended in the air mostly during dry spells. Such dust and gases have a direct negative impact on the quality of air.

Mitigation measures

- Provide protective equipment and materials and clothing such as nose masks and goggles
- Regular and prompt maintenance of construction machinery and equipment. This will minimize the production of hazardous gases.

- Areas generating dust particles should be sprinkled with water to reduce dust blowing out over the area and should be enclosed where possible to mitigate the effects of wind on them.
- Workers should go for regular health check-ups to ascertain their health standards and should be encouraged to take milk regularly as this will control the level of congestion of dust in their chests.
- The generator exhaust should be directed away from the facility to avoid smoke clouding.

Oil Leaks and Spills

Oil spills are prevalent in construction sites. Though this may not be common, it is wise to control and observe the little leaks and spills that will occur, especially during maintenance of the involved machinery and vehicles.

Mitigation measures

- All machinery should be keenly observed not to leak oils on the ground. This can be ensured through regular maintenance of the construction machines and equipment.
- Maintenance should be carried out in a well-designed and protected area and where oils/grease is completely restrained from reaching the ground. Such areas should be covered to prevent stormwater from carrying away oils into the soil/water systems.
- All oils/grease and materials should be stored in a site store, which is usually located in the contractor's yard/site office.

Solid Waste

- Construction activities result in increased solid waste within the site. Such waste materials include stones, pieces of metal rods, pieces of iron, pieces of pipes, papers, equipment wrappings, etc.
- On completion, the property management should adopt a waste management system to handle any waste that will be generated from various operations.

Flora and Fauna

Removal and disposal of such refuse and other related wastes come in handy in this project.

Mitigation measures

- The waste materials should be properly segregated and separated to encourage the recycling of some of them, such as concrete debris, which can be used as backfills with the approval of the site engineer. The site has minimal vegetation, which has no conservation value. Some temporary and permanent disturbances will be caused to small animals.
- Flora and fauna on site should be conserved.

Construction Materials

They include stones, sand, cement, ballast, and steel rods for the raft, walls, and columns. They should be of good quality.

Mitigation measures

- Should be sourced only from licensed dealers and suppliers.
- Quality should be thoroughly monitored through regular tests, e.g., cube tests.
- Recycling of raw materials should be encouraged, e.g., pieces of stones and construction waste can be used for backfilling.

Occupational Health and Safety (OHS)

During construction, there will be increased dust, air, and noise pollution. These are considered negative impacts. The residents and workforce involved will be more subjected to these environmental hazards. Food for the construction workforce is usually provided by mobile vendors, most of which operate without health licenses. This can compromise the health of the workers, especially if such foodstuffs are prepared in unhygienic conditions. Falls from high heights are also a common risk in such works, and proper protective gear is of importance during the erecting of the walls.

Mitigation measures

- All workers should be provided with full protective gear. These include working boots, safety harnesses, overalls, helmets, goggles, masks, and gloves.

- People preparing food for the workers on-site should be monitored to ensure that food is hygienically prepared.
- A first aid kit should be provided within the site. This should be fully equipped at all times, site workers should also be trained in basic First Aid Skills.
- Some tasks require one to be in very good health; workers should be subjected to medical examinations before starting work. This will ensure that only medically fit persons are engaged for such tasks.
- The site workers should be warned of drugs and alcohol since they might affect their concentration at work, causing accidents.
- Sanitary facilities should be provided on site during construction and should be kept clean at all times.

Security

Security is a fundamental aspect to consider in any development. Good security ensures that materials and equipment are not stolen or vandalized from the site and that construction activities are not disrupted during normal working hours.

Mitigation measures

- A site office should be constructed on-site to store materials and equipment while not in use.
- The site should be enclosed using suitable walls to beef up security and control movement in and out of the site.
- Lighting as well as security alarms should be installed on site after completion.
- There should be a security guard stationed on-site to monitor the movements of people in and out of the site area.

Fire Safety

Fire safety measures should be considered in any development plan. Fire outbreaks are common occurrences in many premises, mainly due to the poor installation of electric devices or poor handling of fire equipment or flammable substances. In this development proposal, proper care will be taken into account during and after the implementation phase so as to minimize the chances of fire outbreaks.

Mitigation measures

- Fire alarm and fire fighting equipment should be installed within the facility once it is complete.
- A "No smoking" notice should be placed strategically on-site.
- Ensure that all firefighting equipment installed on the site once it is complete is regularly maintained and serviced.
- Dry sand buckets should be placed in strategic places in case of fire.
- The facility operators should be trained on how to use various firefighting devices.
- Emergency chart numbers should be placed strategically in case of any emergency.

Traffic Density

Heavy traffic will be generated during the construction phase; this will be caused by construction trucks ferrying materials and equipment to the site. Stringent measures should be adapted to minimize or avert any vehicular congestion which may occur.

Mitigation measures

- The traffic should be controlled during implementation and operation phases and mostly when large trucks for delivery of materials, this will control or prevent accidents.
- Transportation of materials should be done between 8.00AM-5.00AM and on the weekends only when the vehicles are few.
- The acceleration and deceleration lanes getting in and out of the facility should be wide enough and with no obstruction to avoid any vehicular snarl up.
- Signs of '**MEN AT WORK'** should be placed on the side of the road to warn incoming vehicles.

Public Participation

The project will not be implemented without participation of the local people; public opinion was sought before the beginning of the project. The idea behind the distribution of questionnaires was to get the perception the community has towards the proposed project. In principle, the project was wholly accepted by the

community, there was no objection raised by the community towards the implementation of this project. Reasons which led to acceptance of the project by the community include: -

- **Provision of housing units**: The proposed development will provide the community around with additional housing units; the similar existing facilities cannot meet the demand.
- **Social cohesion**: The implementation of the project will involve people from diverse cultural backgrounds, this will enhance social cohesion.
- **Employment/income**: The project will demand both skilled and non-skilled labour force, the required labour force will be provided by the local community; closely related to this is the source of income to the Machakos County Government in form of statutory payments.

CHAPTER SIX: ALTERNATIVES AND PROPOSED ACTION

6.0 Introduction.

This section explains alternatives to construction of this Residential apartment in terms of the site, products, materials, technology and waste management. Also, impacts of each alternative are identified, discussed and compared with those of this development proposal. With such information, reviewers have basis for decision making.

6.1 No Project Alternative.

This option implies that the existing situation prevail i.e., no construction/development activity to take place. This option is mostly applicable in situations where the proposed project area is in ecologically sensitive areas. The land in which the building is to be constructed is in a stable environment and therefore will not be affected by this development activity.

The No Project Option is the least preferred from the socio-economic and partly environmental perspective since if the project is not done: -

The economic benefits especially during constriction i.e., provision of jobs for skilled and non-skilled workers will not be realized.

- There will be no generation of income by the developer and the Government.
- The social-economic status of Kenyans and local people would remain unchanged.

From the analysis above, it becomes apparent that the No Project Alternative is not the appropriate alternative to the local people, Kenyans, and the Government of Kenya.

This alternative describes a situation where the proposed development fails to be implemented. In case this happens, positive impacts associated with the proposed development will not accrue to the stakeholders including the residents to be, the development consultants, contractors and suppliers of materials. However, from an

environmental conservation perspective, this alternative will be beneficial in the sense that any potential negative impacts associated with the project will be avoided. The "No Action Alternative" should not be adopted, as we need to encourage development so long as it is undertaken on a sustainable basis as per the environmental management plan developed in this report.

6.2 Alternative Site.

Currently, there is no other alternative site available to the proponent for the proposed development in the Syokimau Area. Looking for the land to accommodate the scale and size of the project and completing official transactions on it may take a long period. In addition, it is not a guarantee that such land would be available even at the cost he purchased the land for. It's also worth noting that the said project is already underway in terms of seeking development approvals in various government departments.

The project proponent would spend another long period of time on design and approvals of the plans by the relevant government departments. The project design and planning before the stage of implementation would call for cost; already incurred in the proposed development, i.e., whatever has been done and paid to date would be counted as a loss to the proponent.

6.3 Alternative Land Use Activities

The area is in a residential/commercial zone. Alternative land use activities such as farming, grazing land, and heavy industries will conflict with surrounding land use activities. For uniformity purposes, the proponent is interested in the construction of a commercial building.

6.4 Alternative Construction Materials and Technology

There is a wide range of construction and furnishing materials that can be sourced locally and internationally. In this construction, certified raw materials/equipment and modern technology will be used. Also, electrical appliances that save energy will be given first priority. The concrete pillars and walls will be made using locally sourced

stones, cement, sand (washed and clean), metal bars, and fittings that meet the Kenya Bureau of Standards requirements.

6.5 Solid Waste Management Alternatives

Throughout construction, the project will produce wastes such as soil, wood chips, metal scraps, and paper wrappings, among other. Wastes generated during the operation phase are mainly domestic. The Proponent is expected to observe EMCA (Waste Management Regulations, 2006). Priority will be given to the reduction of waste, recycling, and reuse. This will minimize environmental pollution. The proponent can use the Machakos County trucks to transport and dispose waste of hire private NEMA licensed solid waste collectors.

6.7 Alternative Access Road to the site

The proposed site is accessed via Limuru Road off City Park Drive. The road is tarmacked and will be used during transportation of materials to and from the proposed site.

6.8 Alternative Source of Power

Currently the general area is supplied with electricity from Kenya Power. The proponent will also apply for connection once the construction of the proposed project is complete. Alternatively, the proponent can use solar power, especially in lighting and heating water, to reduce the costs incurred in paying for electricity bills.

6.9 Alternative Sources of Water Supply

The development will be connected with water from the Machakos Water and Sewerage Company. Alternatively, the proponent can sink a borehole, which will then provide adequate water supply to the residents. Also, they can install an underground or overhead tank of adequate capacity to increase water supply to the tenants to be that can be sourced from a borehole.

CHAPTER SEVEN: PUBLIC CONSULTATION

7.1. Introduction

Public Participation is one of the national values and principles of governance enshrined in the Constitution of Kenya, 2010. It is also a mandatory procedure as stipulated by EMCA 2015 section 58 on EIA for the purpose of achieving the fundamental principles of sustainable development. Views from the residents, stakeholders, and development partners who in one way or another would be affected or rather interested in the proposed project were sought through administering of questionnaires and interviews

7.2 Policy and Legislative Provisions

7.2.1 International Policy

1. Agenda 21

Chapter 23: Strengthening the role of Major Groups gives the right to access information regarding their environmental and social wellbeing

2 Rio Declaration on Environment and Development

Principle 10 provides that "Environmental issues are best handled with participation of all concerned citizens, at the relevant level".

7.2.2 National legislations

1. The constitution of Kenya (Cap 5, part II: Environment 69(1d)

The legal rights availed to all Kenyan citizens and residents to be included in any project that involves characteristic alterations to their environment.

2 The Environmental Management and Coordination Act (Cap 387)

The participation of the concerned community is a necessity for any development through the general principles section (part II, 5a).

3. Environmental (Impact Assessment and Audit) Regulations section 17

It provides that all EIA studies should undertake Public Consultation as part of the study.

7.3 Objectives of the Public Participation

The objectives of the public participation exercise were to:

a) Disseminate and inform the stakeholders about the project with special reference to its key components and location.
b) Create awareness among the public on the need for the EIA for the proposed
c) project.
d) Gather comments, suggestions, and concerns of the interested and affected parties.
e) Incorporate the information collected in the EIA study.

7.3 Methodology used in the public participation

The Public Participation (PP) Process is a policy requirement by the Government of Kenya and a mandatory procedure stipulated by EMCA cap 387 of the laws of Kenya on Environmental Impact Assessment to achieve the fundamental principles of sustainable development. The public participation was conducted in April 2025. The exercise was conducted in different ways, namely;

a. Meetings with the proponent.
b. Interviews and discussion,
c. Field surveys and observations
d. Administering of questionnaires,
e. Validation of findings.

The purpose of such interviews was to identify the positive and negative impacts and subsequently promote proposals on the best practices to be adopted and mitigate the negative impacts, respectively. It also helped in identifying any other miscellaneous issues that may bring conflicts in case project implementation proceeds as planned.

7.4 Analysis of the Public Consultation Findings

While carrying out the public participation exercise, residents and neighbors expressed a variety of concerns with regard to the proposed project. Some of the concerns raised were as follows: -

Positive Issues

1. Creation of employment opportunities

2. Increase and enhance property values in the neighborhood
3. Improve security in the area
4. Creation of business opportunities
5. Market for supply of building materials

Negative Issues

Residents raised the following concerns about the proposed development;

i. Dust emission

ii. Noise and vibrations

iii. Increased population in the area

iv. Pressure on the available water supplied by Mavoko water supply

v. Security in the area

7.5. Suggestions to the Proponent

Those interviewed and consulted made the following suggestions to the proponent:

- A proper solid waste management plan to be put in place during the construction and operational phases
- Give priority to local youth in employment opportunities.
- They suggested that dust covers be used during the construction and transportation of materials like cement and sand.
- Replanting of any trees and/or vegetation that would be cut down during construction.
- Provide the workers with the right PPEs to prevent accidents

CHAPTER EIGHT: ENVIRONMENTAL MANAGEMENT PLAN

8.0 Introduction

Integrating environmental issues in business management, such as those related to real estate development, increases efficiency while enhancing the project proponent's financial andenvironmental management. These issues, which are normally of financial concern, are costs, productquality, investments, level of productivity, and planning.

Environmental planning and management as a concept seek to improve and protect environmental quality for both the project site and the neighbourhood through the segregation of environmentally incompatible activities. Environmental planning and management integrate land use structure, social systems, regulatory law, environmental awareness, and ethics.

An environmental management plan (EMP) for development projects such as the proposed residential apartment complex development is aimed at providing a logical framework within which identified negative environmental impacts can be mitigated and monitored. In addition, EMP assigns responsibilities for action to various actors and provides a time frame within which mitigation measurescan be done.

EMP is a vital output for an environmental impact assessment as it provides a checklist for project monitoring and evaluation. A number of mitigation measures are already incorporated into the projectdesign.

8.1 Environmental Monitoring and Evaluation

Environmental monitoring and evaluation are essential in the project lifespan as they are conducted toestablish if the project implementation has complied with the set environmental management standards as articulated in the Environmental Management and Coordination Act (EMCA) No. 8 of 1999 and its attendant Environmental (Impact Assessment and Audit) Regulations, 2003.

In the context of the proposed project, the design has made provisions for an elaborate operational monitoring framework for the following, among others:

a) Disruption of natural environment and modification of microclimate

b) Air and noise pollution
c) Proliferation of kiosks
d) Worker's accidents and health infections during construction process.

8.2. Objectives

The objectives for the Environmental Management Plan are:

a) To guide the proponent on the likely impacts of the projects of the project, when theyare likely to occur, mitigation measures and the monitoring of the measures.
b) It assigns responsibilities of actions to various actors and provides a timeframe within which mitigation measures and monitoring can be done.
c) To guide the developer and proponent in allocating adequate resources for theimplementation of the mitigation measures

8.3 Environmental Management Roles and Responsibilities

Once an action is approved, the approval holder is responsible for complying with the conditions of approval, including the commitments made in environmental management plans. The plan should define the roles and responsibilities of personnel in charge of theenvironmental management of the project. The roles and responsibilities of each relevant position should be documented, including the responsibilities of subcontractors. The names of the responsible personnel do not need to be included. Identification of the position titles, roles and responsibilities is sufficient. If the roles and responsibilities are expected to change over time the long-term variations should also be documented.

Environmental Monitoring

The environmental management plan should specify how the effectiveness of environmental management measures will be monitored. It should include the methodology, frequency, and duration of monitoring activities. It should also include trigger values or conditions under which corrective actions are taken.

The plan should also specify if, and when, follow-up action is required and how monitoring records will be maintained.

Environmental Training

All people involved with the project should receive relevant environmental training to ensure they understand their responsibilities when implementing the environmental management plan. People to be trained include those at the site/s of all project activities and operations, including contractors, subcontractors, and visitors. The training should be tailored to the role of the individual in the project.

The environmental management plan should describe the training to be implemented and could include:

Site inductions

Understanding the requirements of the environmental management plan and theindividual's role.

environmental incident emergency response procedures

site environmental controls

Implementation Period

The EMP clearly indicates the impacts that will be anticipated during the implementation phase and the mitigation measures. The environmental consultant will be required to continuously engage the contractor and the developer to ensure the EMPis fully implemented.

ENVIRONMENTAL IMPACT	MITIGATION MEASURES	RESPONSIBILITY	COST(KES) ESTIMATE	MONITORING MEASURES
Commissioning of the Construction Works	- Site hand-over and Groundbreaking	Project team (Lead Consultant/ Architect, contractor, and Proponent)	Part of/Covered in the Project Cost	Presence of the project Team
Securing the Construction Site	- Construction of Perimeter Wall andHoarding	Contractor	Part of/Covered in the Project Cost	Presence of Perimeter Fence
Security for ConstructionMaterial	- Construction of Site Stores - Construction materials to be delivered in small quantities to minimize storage problems	Contractor	500,000	Presence of Site store
Extraction and Use of Building Materials	- The availability and sustainability of the extraction sites as they are non-renewable in the short term - Landscape changes e.g. displacement of animals and vegetation, poor visual quality and opening of depressions on the surface	Contractor/Proponent/ project team	Part of/Covered in the Project Cost	Material site rehabilitation
Collapse of Building during Construction	- Ensuring Building Strength and stability - Use of appropriate construction materials	Contractor/project team	Part of/Covered in the Project	Presence of the project Team

	and reinforcements as per specifications - Ensuring building components are as per designs - Proper supervision - Ensure proper timelines are followed, e.g., curing time		Cost	
Disturbance of	- Proper signage	Contractor/Project team and	800,000	- Presence of site

Traffic flow during construction	- Awareness creation - Education for truck drivers - The proponent has come up with a traffic management plan	general public		Notice Board /Hoarding - Presence of Security guards tocontrol traffic - warning signs
CONSTRUCTION PHASE				
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Soil Excavation leading to site disturbance	- Excavate only areas to be affected bybuildings - Dumping of excess excavated materials tosites designated by NEMA and County	Contractor	4,000,000	Landscaping after completion of construction

	- Restoration of sites excavated			
Soil Erosion	- Create and maintain soil traps andembankments. - Landscaping after completion ofconstruction	Contractor/Proponent, Architect/Site Engineer, Landscape Architect	1,000,000	Lack/Absence ofSoil Erosion
Noise Pollution and Vibration	- Ensure use of serviced and greasedequipment - Switch off engines not in use - Construction work is to be confined between 7 am to 5 pm - Ensure the use of earmuffs by machineoperators	Proponent and Contractor	Part of Routine operation procedure	Lack of complaints from the immediate neighbours
Air Quality	- Water sprinkling of driveways or the use of biodegradable hydrant, e.g. Terrasorb polymer, will reduce dust emission during construction - Ensure servicing of vehicles regularly	Proponent and Contractor	1,000,000	Lack of complaints Workers wearing protective clothing andearmuffs

Risks of Accidents and Injuries to Workers	- Education and awareness for allconstruction workers - Ensure use of appropriate personalprotective clothing - Provide First Aid Kits on site - Ensuring Building Strength and stability - Proper supervision	Proponent/Contractor	800,000	- Presence of well-equipped First Aid kit Presence of Security Guards on site Presence of a Register on thesite
Health and Safety	- Provide First Aid Kits on site - Proper signage and warning to the public ofheavy vehicle turning - Ensuring Building Strength and stability - Provide clean water and food to theworkers - The contractor is to abide by all constructionconditions, especially clause B12, which stipulates health safety and workforce welfare	Proponent/Contractor	1,000,000	- Well-equipped first Aid kit - Presence of Security Guardson site - Presence of a register on thesite
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**

Solid Waste Generation	- Ensure waste materials are disposed of onCounty and NEMA approved sites - Ensure re-use of materials that can be re-used - Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent Contractor	1,000,000	- Absence of Solid waste on the site
Energy Consumption	- Use electricity sparingly since high consumption of electricity negatively impacts on these natural resources and theirsustainability - Use of Standby Generators	Proponent Contractor	1,000,000	- Presence of KPLC powerlines - Presence of Generators
Excessive Water Use	- Excessive water use may negatively impact on the water source and its	Proponent	1,000,000	- Metering of water

	sustainability - Consider drilling a borehole to supplement the NAWASCO supply	Contractor		
OCCUPATION PHASE				
Architectural incompatibility leading to distortion of neighborhood aesthetic image	- Harmonize building scale with existing developments in the neighborhood. - Harmonize detail, material, and finishes for roofs and walls with existing development in the neighborhood.	Architect /Proponent Contractor	Part of/Covered in the Project Cost	- Compatibility with the neighbourhood
Solid Waste Generation and Management	- Regular inspection and maintenance of the waste disposal systems during operation phase - Establish a collective waste disposal andmanagement system - Provide waste disposal bins to each suite well protected from adverse weather and animals - Ensure waste materials are disposed off onCounty approved sites - Engage a NEMA licensed waste handler	Proponent/Contractor	1,500,000	- Presence ofNEMA registered waste management companies - Presence of waste handlingbins - Absence ofwastes

	totransport the waste - Use of the 3rs – Reduce, Re-use, Re-cycle			
Liquid Waste Generation and Management	-Regular inspection and maintenance of the waste disposal systems during the operationphase - Establish a waste treatment system	Proponen t Contract or	1,000,000	- Absence of liquid wastes
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Increased loading on Infrastructure services	- Have paved private access road andwalkway system - Have paved road drainage system	Contractor Proponent	1,000,000	- Absence of run-off - Presence of
- Increased vehicular and/or pedestrian traffic - Increased demand on water, sanitation	- Encourage rainwater harvesting - Provision of increased water storagecapacity - Provide adequate storm water drainagesystem			good roads - Pavements and drainage channels

services				
Traffic	- Come up with a traffic management plan - Provide adequate parking facilities withinthe project site - Construction of private access road	Contractor Proponent	Routine operation procedure	- Presence of ample parking onthe premises
Increased socialconflict	- Increased economic activities – employment generation and incomeearnings - Encourage good relation with the neighbors through neighborhood associations	Contractor/ Proponent		-Good relationship with neighbours -absence ofconflicts
Storm Water impacts	- Provide roof gutters to collect and directroof water to drains - Construct drains to standard specifications - Develop a storm water drainage systemand linkage to natural drains	Prop onen t Contr actor	900,000	Absence of Flooding and dampness in thepremise

Disruption of existing natural environment and modification of micro-climate: - Increased development density - Increased glare/solarreflection - Reduced natural ground cover/surfacerunoff - Obstruction of ventilating winds	- Development is restricted to follow zoning policy/approved density – building line, plotcoverage, and plot ratio. - Careful layout and orientation of buildings to respect wind and sun direction. - Adequate provision of green and openspace planted with grass, shrubs, and treecover. - Minimum use of reflective building material and finishes for roof, wall, andpavement. - The balconies should have a garden	Project team (Contractor Proponent, Architect or LeadConsultant, etc.)	2, 000,000	Proper orientation planted trees/ Landscaping
ENVIRONMENTAL IMPACT	**MITIGATION MEASURES**	**RESPONSIBILITY**	**COST (KES)**	**MONITORING MEASURES**
Insecurity	- Secure the premises with a perimeter walland an electric fence - Installation of CCTV cameras at strategicpoints - Have an entry point that is manned 24 hours.	Contractor/ Proponent	2, 000,000	Presence of perimeter wall Presence of day and night securityguards

DECOMMISSIONING PHASE				
Building Safety	Assess the condition of buildings to ascertain usefulness	Engineer/ propone nt	1,000,000	Engineer and Tests on the building
Land and Building use	Ascertain the Planning development policy	County Physical Planner	900,000	Consultants present
Accidents/Injuries	Securing the Site by fencing off	Contractor Proponent	1,000,000	Presence of perimeter fence
Un-disconnected	Ensure disconnection of all services	Contractor	2,000,000	Absence of
Services, e.g., Power, Water, telephone, sewer, etc.	Remove all surface and underground cablesand wiring.			cabling
Solid Waste Generation (demolition waste)	Ensure waste materials are disposed of on County and NEMA-approved sites. Ensure re-use of materials that can be re-used -Use of the 3rs – Reduce, Re-use, Re-cycle	Proponent/Contractor	2,000,000	Absence ofDebris
Noise and Vibration	- Ensure use of serviced equipment - Switch off engines not in use - Demolition work is to be confined tobetween 8 am and 5 pm - Ensure the use of earmuffs by workers	Proponent/Contractor	900,000	Lack of complaints from the neighbors

CHAPTER NINE: ENVIRONMENTAL HEALTH AND SAFETY

The EHS is a broader and holistic aspect of protecting the worker, the workplace, the tools/ equipment, and the biotic environment. It is an essential tool in determining the EIA study. The objective of the EHS on the proposed project is to develop rules that will regulate environmentally instigated diseases and occupational safety measures during the construction and operation phases of the proposed project by:

1. Avoidance of injuries
2. Provision of a safe and healthy working environment for workers' comfort to enhance maximum output
3. Control losses and damages to plants, machines, equipment, and other products.
4. Enhance environmental sustainability through developing sound conservation measures

9.1 Policy, Administrative, and Legislative Framework

It is the primary responsibility of the contractor to promote a safe and healthy environment at the workplace and within the neighborhood in which the proposed project will be constructed by implementing effective systems to prevent occupational diseases and ill health and to prevent property damage. The EHS Management Plan, when completed, will be used as a tool and a checklist by the contracted engineers in the planning and development of the construction of this project.

9.2 Organization and implementation of EHS Management Plan

The contractor shall use the EHS plan at the proposed project site both during construction and operation. The engineer will use it during the construction phase with the assistance of an EHS consultant, who shall enforce its provision throughout the life of the project.

9.3 The Guiding Principles to be adopted by the contractor

The company will be guided by the following principles:

a) It will be a conscious organization committed to the promotion and

maintenance of high standards of health and safety for its employees, the neighboring population, and the public at large.

b) Ensuring that EHS activities are implemented to protect the environment and prevent pollution.
c) Management shall demonstrate commitment and exercise constant vigilance in order to provide employees, neighbors of the project, and the environment with the greatest safeguards relating to EHS.
d) Employees will be expected to take personal responsibility for their safety, the safety of colleagues, and the general public as it relates to the EHS management plan.

9.4 EHS management strategy to be adopted by the contractor

The following strategies will be adopted to achieve the above objectives:

- Create an Environment Health and Safety Management Committee and incorporate EHS as an effective structure at various levels and units to manage and oversee EHS programs in all construction and operation phases of the project.
- Maintain an effective reporting procedure for all accidents.
- Provide appropriate tools and protective devices for the success of the project.
- Encourage, motivate, reward, and support employees to take personal initiatives and commit to EHS.

9.5 Safety Agenda for both the proponent and contractor

There will be a permanent EHS agenda during construction.

(a) Contractors

The EHS management plan code of practice shall apply to the contractors working on the premises and shall be read and signed. It shall be incorporated into the contract to perform work. This should also remind the contractor of his/her responsibility.

Legal requirements.

Statutory obligations

Obligation to lay down a system for reporting accidents

The responsibility to ensure that his/her employees are supplied with personal protective equipment and where applicable as per the EHS management plan for the whole project.

Responsibilities as it relates to contracting an EHS consultant in liaison with the proponent

Obligation to ensure that he obtains details of jobs and areas where permit-to-work must be issued

(b) All residents and workers' responsibility

• Know the location of all safety equipment and learn to use it efficiently

9.6 Safety requirement at the project site during construction and operation Period

(a) The Contractor

The contractor will ensure that:

- Safe means of entry and exit at the proposed project site.
- Ensure adequate briefing of the job at hand on the safe system of work before commencement of work.
- The EHS coordinator must attend all times throughout the project.
- The EHS consultant must maintain constant assessment of the risk involved as the work progresses
- A safety harness must be worn before entry into all confined spaces
- An EHS consultant must be posted at the entrance of the project site to monitor the progress and safety of the persons working at the construction site

(b)The Drivers

Within the construction premises, the following traffic rules will be observed: -

Observe speed limits and all other signs, and obey traffic rules.

Use the vehicle for the purpose to which it is intended only

(c) Fire hazards at the construction site

- Workers at the site shall ensure that: -
- Oxy-acetylene cylinders are not contaminated with grease or oil.
- Oxy-acetylene cylinders are not subjected to direct sunlight or heat.
- Oxy-acetylene cylinders are not to be used or stored standing in a vertical position.

- When in use, ensure the inclination should never be over 30° from the vertical

9.7 Welding at the construction site

It is the responsibility of the contractor during construction to:

- Ensure that the welding clamp is fixed such that no current passes through any moving parts of any machine.
- Ensure that all welding clamps are in good operating condition and conduct current without arcing at the point of contact.
- Ensure that welding clamps are free from any contact with explosive vapors, for example. Oil spillage, Fuel tanks, Coal dusts, and miscellaneous combustible material
- (for example, Cotton rags filter bags, rubber belting, and wood shavings)
- Ensure that any slag or molten metal arising from welding activities does not start up Fires by clearing combustible material to a distance of at least 3 meters away from the working area

An appropriate fire extinguisher is to be kept always available for immediate use.

9.8 Emergency procedure during construction and operation

An emergency means an unforeseen happening resulting in serious or fatal injury to employed persons or the Neighboring communities. Fire or explosion, Natural catastrophe. In the event of such an emergency during construction, the workers shall:

- Alert other persons exposed to danger.
- Inform the EHS coordinator. Do a quick assessment of the nature of the emergency.
- Call for ambulance on standby; when an emergency is over, the EHS coordinator shall notify the workers by putting out a message: "ALL CLEAR."

CHAPTER TEN: CLIMATE CHANGE AND VARIABILITY

10.1 Introduction

Climate change refers to long-term alterations in temperature, precipitation, wind patterns, and other aspects of the Earth's climate system. In Kenya and across the globe, climate variability is already influencing the development sector, with key implications for water availability, infrastructure resilience, health, and biodiversity. For construction projects such as the proposed Sunpark Phase III residential apartments in Syokimau, climate change presents a range of environmental and socio-economic risks that need to be factored into planning, design, implementation, and operation.

10.2 Regional Climate Trends

The Syokimau area lies within a semi-arid to sub-humid agro-climatic zone characterized by bimodal rainfall (March–May and October–December), with average annual precipitation ranging from 600–900 mm. Over recent years, the region has experienced,

- Increased unpredictability in rainfall patterns;
- More frequent and prolonged drought periods;
- Intense rainfall episodes leading to flooding;
- Fluctuations in temperatures with rising annual means.

These observed changes are consistent with broader regional climate projections for East Africa, which include increased temperature, altered rainfall distribution, and greater frequency of extreme weather events.

10.3 Implications of Climate Change on the Proposed Project

Climate change has several implications for the sustainability, safety, and functionality of the proposed Sunpark Phase III development:

Increased Flood Risk

Due to the poor drainage and flat terrain in Syokimau, extreme rainfall events could overwhelm the stormwater drainage systems, causing localized flooding, erosion, and water damage to structures and infrastructure.

Mitigation Measures

- Adoption of climate-resilient drainage systems, including oversized culverts and stormwater retention tanks;
- Installation of permeable pavements and bio-swales to enhance infiltration;
- Landscaping with drought- and flood-tolerant vegetation.

Water Stress and Supply Challenges

Climate variability may reduce groundwater recharge rates and affect the reliability of water supply from boreholes and MAVWASCO, particularly during prolonged droughts.

Mitigation Measures

- Integration of rainwater harvesting systems on rooftops;
- Installation of water-efficient fixtures and appliances;
- Promotion of greywater recycling for landscape irrigation and toilet flushing.

Increased Ambient Temperatures

Rising temperatures may affect indoor comfort, energy demand for cooling, and the overall livability of residential units.

Mitigation Measures

- Use of passive solar design principles (e.g., orientation, shading, natural ventilation);
- Installation of reflective roofing materials and high-performance glazing;
- Urban greening through tree planting and rooftop gardens to create cooling effects.

Structural Integrity Under Climate Extremes

Prolonged exposure to intense sun, heat, or extreme storms can accelerate material degradation and compromise the structural performance of buildings and infrastructure.

Mitigation Measures

- Use of durable, weather-resistant materials in construction;
- Regular maintenance of critical infrastructure;
- Design to international climate-resilient construction standards (e.g., BS/Eurocodes).

Public Health Risks

Climate change may increase the incidence of vector-borne diseases (e.g., malaria), heat stress, and respiratory issues due to dust and poor air quality.

Mitigation Measures

- Provision of shaded public spaces and adequate ventilation in all units;
- Promotion of proper waste management and clean water access;
- Incorporation of green areas to reduce heat island effects.

Contribution of the Project to Climate Change

While the project itself is not a high greenhouse gas (GHG) emitter, construction and operational activities will contribute to emissions primarily through,

- Fossil fuel consumption by machinery and vehicles;
- Cement and steel production (carbon-intensive);
- Energy use during the operational phase (lighting, heating, appliances).

Proposed Low-Carbon Interventions

- Encourage the use of solar photovoltaic panels for common areas and water heating;
- Promote energy-efficient appliances and LED lighting;
- Source locally available and environmentally certified materials;
- Implement waste minimization and recycling strategies during construction and operation.

10.4 Policy and Regulatory Alignment

The proposed project aligns with several national and international climate change policies, including:

- **Kenya Climate Change Act, 2016,** emphasizes mainstreaming climate resilience in development planning;
- **National Climate Change Action Plan (NCCAP) 2018–2022** Calls for climate-smart urban planning and infrastructure development;
- **United Nations Sustainable Development Goals (SDGs),** specifically Goal 13: *Take urgent action to combat climate change and its impacts*;

CHAPTER ELEVEN: CONCLUSION AND RECOMMENDATIONS.

11.1 Conclusion

The project under consideration in this report is a residential apartment. It has met all requirements in terms of design and space, and all the safety measures have also been put into consideration. The project is not expected to have any negative impact on the environment, especially due to its location; the area is quite secure and has all the basic facilities. It is our considered opinion that the proposed development is a timely venture and will supplement considerably to the government policy. It is thus our recommendation that the project is allowed to go ahead with the strict implementation of the mitigation measures provided to minimize anticipated environmental impacts. More focus shall be put on minimizing the occurrence of impacts that will degrade the environment while exploiting those impacts that are positive.

Finally, the project proponent has promised to work closely with environmental experts, residents, local authority, local County Environment committees and NEMA to ensure smooth facilitation of the issues that touch on environment to include; water supply, effluent disposal, solid waste management, air pollution but to mention a few. This will ensure that environmental concerns are integrated into the project process.

11.2 Recommendations

Recommendation for the prevention and mitigation of adverse impacts is presented as follows:

1. The proponent will ensure that the development has been approved by the relevant regulatory departments as the Department of Physical planning, Ministry of Lands and Settlement, health, NEMA etc. the proponent should therefore follow guidelines as set by the government to safeguard EMP principles during the construction and operation phases of the proposed project.
2. It is important that warning information signage is erected strategically at the site. This will indicate the operation hours and work that are likely to start and be

completed. The signage will be positioned in a way that both pedestrians and motorists will see it.

3. All solid waste and debris resulting from the construction activities must be disposed off at approved dumpsites.
4. All construction materials, sand, gravel, hardcore, metals, and treatment chemicals must be sourced from known and approved dealers or manufacturers who have environment sign of quality.
5. Ensure that construction activities must be undertaken only during the day i.e. 0800 hours to 1700 hours. This will minimize anticipated disturbance and nuisance to the residents of adjacent properties and the general public.
6. The service road to the site be well maintained even after use by the heavy machinery e.g. Lorries.
7. Traffic along nearby roads should be controlled and informed during construction hours especially of heavy turning Lorries and plant in and out. This will minimize potential accidents from unsuspecting motorists.
8. The contractor will ensure that loose soils must be covered to prevent erosion. Other soil erosion preventive measures including watering during dry season to prevent wind erosion will be implemented. Any stockpiles of earth will be enclosed or covered to reduce dust to the neighbors.
9. Once earth works have been done, restoration of the worked areas should be carried out immediately through backfilling by experienced landscape experts. This will include planting trees and grass, flowers etc.
10. Drainage system will be properly designed, installed, and regularly maintained to prevent storm water runoff.
11. Used and new oils from the motor vehicles and plant will be handled and stored properly. Due care on leakages and accidental spills will be taken.
12. Workers should be provided with complete personal protective equipment (PPE) and safety gear. They should be provided with safety boots, overalls, gloves, helmets, ear plugs and muffs, goggles etc. A fully equipped first aid kit must be within reach.

13. The contractor must have workman compensation cover. He or she must comply with Workman Compensation Act as well as other ordinances that apply to the workers. Where the workers have a union, the Collective Bargaining Agreement (CBA) shall be observed.
14. A complete firefighting system with water hydrants must be provided after completion of the project. A fire response emergency plan shall be designed and communicated to be used in situations of fire outbreak.
15. Due diligence should be exercised by the contractor or the project agent during the construction phase to safeguard and ensure that all the mitigation measures are adhered to the letter

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