

ENVIRONMENTAL IMPACT ASSESSMENT STUDY REPORT

FOR

**PROPOSED MIXED USE DEVELOPMENT ON L.R NO. 16670/2, ALONG CHADY ROAD,
SYOKIMAU, MAVOKO CONSTITUENCY, MACHAKOS COUNTY.**

GPS COORDINATES: [LATITUDE -1.364584, AND LONGITUDE 36.921040](#)



SUBMITTED TO

NATIONAL ENVIRONMENTAL MANAGEMENT AUTHORITY (NEMA)

PROPONENT
VANILLA VISTA GARDENS LIMITED
P.O BOX 1-00515,
BURU BURU, KENYA

AUGUST 2026

DECLARATION

This Environmental and Social Impact Assessment (ESIA) has been prepared by a duly registered EIA/EA Expert in accordance with the Environmental Management and Co-ordination Act (EMCA) Cap 387, the Environmental (Impact Assessment and Audit) Regulations (Legal Notice No. 101), and the EIA Technical Guidelines. All information contained herein is accurate to the best of the expert's knowledge and professional judgment.

The expert takes full responsibility for the contents of this report and affirms that the assessment was conducted objectively and without undue influence.

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Date: <u>12th August 2026.</u>	Date: <u>12th August, 2026</u>

CONSULTANCY TEAM

This Study Report was prepared by a team of qualified and NEMA-registered environmental professionals, who applied the requisite professional competence, sound technical judgement, and the highest standards of ethical practice throughout the conduct of this assignment

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ACRONYMS AND ABBREVIATIONS

Acronym/Abbreviation	Meaning
ASL	Above Sea Level
CBD	Convention on Biological Diversity
CPP	Consultation and Public Participation
dB(A)	A-weighted Decibel
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
EMP	Environmental Management Plan
ESIA	Environmental and Social Impact Assessment
ESMP	Environmental and Social Management Plan
EHS	Environmental, Health and Safety
FGD	Focus Group Discussion
GDP	Gross Domestic Product
G+1	Ground Floor plus One Upper Floor
I&APs	Interested and Affected Parties
JKIA	Jomo Kenyatta International Airport
KCAA	Kenya Civil Aviation Authority
KPLC	Kenya Power and Lighting Company PLC
KShs	Kenya Shillings
MAVWASCO	Mavoko Water and Sanitation Company Limited
NCA	National Construction Authority
NEAP	National Environmental Action Plan
NEMA	National Environment Management Authority
PPE	Personal Protective Equipment
SOPs	Standard Operating Procedures
SGR	Standard Gauge Railway
SDGs	Sustainable Development Goals
SRA	Syokimau Residents Association
UNFCCC	United Nations Framework Convention on Climate Change
VOC	Volatile Organic Compounds
WRA/WARMA	Water Resources Authority
WHO	World Health Organization
WWTP	Wastewater Treatment Plant
EPR	Extended Producer Responsibility
OSHA	Occupational Safety and Health Act 2007

EXECUTIVE SUMMARY

Project Description

Vanilla Vista Gardens Limited, hereinafter referred to as the Proponent, proposes to develop a mixed-use residential development in Syokimau, Mavoko Municipality, Machakos County. The proposed development will comprise four (4) blocks with a total of 264 residential apartment units (114 studio units, 110 one-bedroom units and 40 two-bedroom units) and eight (8) commercial shops. The development will include associated parking lots, internal access roads, landscaping, and children rooftop playing areas, water supply and storage facilities, onsite wastewater treatment, stormwater drainage, electricity, solid-waste management, security, fire-safety facilities and other supporting infrastructure.

The project is intended to optimize the use of available urban land while contributing to the growing demand for residential accommodation and supporting commercial services in Syokimau. The development will be implemented in accordance with applicable environmental, physical planning, building, occupational health and safety, water, waste-management and other statutory requirements.

Scope, Objectives and Criteria of the Environmental Impact Assessment Study

The Environmental Impact Assessment (EIA) Study was undertaken to identify and assess the potential environmental and social impacts associated with the proposed development and to establish appropriate mitigation, monitoring and enhancement measures. The assessment considered the project location, proposed development activities, construction materials and technologies, water and wastewater requirements, solid-waste management, stormwater management, occupational health and safety, traffic, infrastructure, neighbouring properties, public health, socio-economic conditions and eventual decommissioning.

The assessment also considered applicable national environmental legislation, policies, regulations and standards, relevant international commitments, project alternatives and the concerns raised through stakeholder consultation and public participation. An Environmental and Social Management Plan (ESMP) has been developed to guide implementation, monitoring and management of identified impacts throughout the project life cycle

Anticipated Environmental and Social Impacts

The project is expected to generate significant positive impacts, including creation of employment and business opportunities, increased availability of housing, provision of supporting commercial facilities, improved utilization of urban land, increased government revenue, stimulation of the construction and service sectors, skills and technology transfer, and contribution to the continued planned development of Syokimau.

Potential adverse impacts include vegetation and soil disturbance, construction waste, dust and exhaust emissions, noise and vibration, increased traffic and road-safety risks, occupational accidents, increased

demand for water and energy, wastewater generation, stormwater runoff, potential drainage and flooding impacts, soil and groundwater contamination, and pressure on existing infrastructure. Other concerns include privacy of neighbouring properties, security, negative social interactions, and increased development density, changes in neighbourhood character, urban heat-island effects, lightning risks and building-height considerations associated with the proximity to JKIA.

These impacts are expected to be manageable through proper project planning, compliance with approved designs, effective construction controls, appropriate drainage and wastewater systems, waste management, traffic and security measures, occupational health and safety procedures, landscaping, stakeholder engagement and implementation of the ESMP.

To mitigate the anticipated negative impacts and enhance the positive impacts, the following measures were proposed: implementation of appropriate waste, wastewater and stormwater management systems; dust, noise and traffic control; occupational health and safety measures; proper solid-waste segregation and disposal; water and energy conservation; landscaping and urban greening; privacy and security measures; fire and lightning protection; compliance with approved development and KCAA height requirements; and effective stakeholder engagement and grievance management. The project will also promote local employment, business opportunities, skills and technology transfer, and the use of local materials and services. All measures will be implemented and monitored through the ESMP throughout the project life cycle.

Alternatives Adopted by the Study

The study assessed alternatives for site, scale and design, construction materials and technology, water supply, wastewater treatment, solid-waste management and stormwater management. The proposed site and general development design were retained as the most viable options. Conventional concrete and masonry were adopted for structural construction, with sustainable technologies incorporated where feasible. The borehole was adopted as the primary water source, complemented by MAVWASCO supply. A 120 m³/day onsite wastewater treatment system was adopted due to the absence of a suitable public sewer connection and limited land for constructed wetlands. A combined stormwater-management approach involving controlled drainage and attenuation was preferred. Integrated Solid waste management based on waste reduction, segregation, reuse, recycling and proper disposal was adopted.

Public/Stakeholder Consultations

Public consultation and stakeholder participation identified both support for the socio-economic benefits of the development and concerns regarding its scale and intensity. Key concerns included development density and building height, traffic and parking, stormwater drainage, wastewater management, construction dust and noise, solid-waste management, privacy, security, infrastructure capacity and potential changes to the existing neighbourhood character. The Proponent will address these concerns through the recommended mitigation measures and continued engagement with affected stakeholders

Conclusion and Recommendations

The proposed mixed-use residential development is expected to provide important socio-economic benefits through increased housing provision, employment creation, business opportunities, improved land utilization and increased economic activity. Although the project may result in environmental and social impacts during construction and operation, the assessment has established that these impacts can be effectively managed through implementation of the proposed mitigation measures and ESMP.

It is therefore recommended that the project be permitted to proceed subject to obtaining all applicable statutory approvals, compliance with approved planning and engineering designs, KCAA height requirements, and full implementation of the recommended environmental, social, health and safety mitigation measures and monitoring programme. Continuous environmental monitoring, stakeholder engagement and periodic environmental auditing should be undertaken to ensure that the development remains compliant and environmentally and socially sustainable

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CHAPTER ONE

1.0 INTRODUCTION

1.1 Background and Rationale of Environmental Impact Assessment Study

This Environmental Impact Assessment (EIA) Study Report has been prepared for the proposed mixed-use residential development comprising four blocks, including three residential blocks and one commercial block to accommodate convenience shops serving the residents, on Plot L.R. No. 16670/2 located along Chady Road in Syokimau, Mavoko Constituency, Machakos County. The proposed development will comprise modern residential apartments together with ancillary facilities and supporting infrastructure, including internal access roads, parking areas, water supply systems, sewerage infrastructure, stormwater drainage, solid waste management facilities, landscaping, electrical installations, and other utilities necessary for the efficient occupation and operation of the development.

The project site is situated within an established urban neighbourhood characterized by a well-defined land-use pattern comprising light industries, high-rise apartment developments, medium-rise residential buildings, townhouses, standalone residential units, and supporting commercial establishments. According to the Mavoko Municipality planning framework, the area is designated for high-density residential development, making the proposed project compatible with the existing and planned land uses. The neighbourhood is served by essential infrastructure, including road networks, electricity supply, telecommunications, educational institutions, health facilities, security services, and commercial centres. However, rapid urbanization has placed increasing pressure on drainage infrastructure, particularly stormwater management systems, underscoring the need for sustainable stormwater management measures within new developments.

Syokimau has experienced significant population growth over the past decade owing to its strategic proximity to Nairobi City, the Standard Gauge Railway (SGR) terminus, Jomo Kenyatta International Airport (JKIA), and major transport corridors such as Mombasa Road and the Nairobi Expressway. This growth has generated increasing demand for quality housing, commercial services, and supporting infrastructure. Consequently, well-planned residential developments are essential to meet housing demand while promoting sustainable urban growth and efficient land utilization.

Notwithstanding the anticipated socio-economic benefits, construction and operation of the proposed development have the potential to generate environmental and social impacts, including increased traffic, construction noise and dust emissions, stormwater runoff, solid and liquid waste generation, increased demand for water and energy resources, occupational health and safety risks, and potential disturbances to neighbouring properties. These impacts require systematic identification, prediction, evaluation, and mitigation to ensure that the project is implemented in an environmentally sustainable and socially responsible manner (Glasson, Therivel and Chadwick, 2013).

Pursuant to the Environmental Management and Co-ordination Act (EMCA), Cap. 387 and the Environmental (Impact Assessment and Audit) Regulations, 2003 ;Second Schedule (Amendment, 2019), the proposed project falls under High risk project Schedule 3(g), which includes the establishment of new

housing estate developments exceeding one hundred housing units. Consequently, the project is required to undergo a comprehensive Environmental Impact Assessment Study and obtain an Environmental Impact Assessment Licence from the National Environment Management Authority (NEMA) before commencement of construction.

The Environmental Impact Assessment process provides a structured framework for integrating environmental and social considerations into project planning and decision-making. It facilitates the identification of potential impacts at an early stage, evaluates project alternatives, recommends appropriate mitigation and monitoring measures, enhances stakeholder participation, and ensures compliance with applicable environmental legislation and good international practice (UNEP, 2018).

The selection of the proposed site was informed by several considerations, including:

- Its strategic location within the rapidly developing Syokimau urban area.
- Compatibility with the approved land-use zoning for high-density residential development.
- Increasing demand for quality residential housing and neighbourhood commercial services.
- Availability of adequate land to accommodate the proposed development.
- Accessibility to existing infrastructure, including roads, electricity, water supply, telecommunications, and public transport.
- Continued urban expansion and favourable socio-economic growth within the Mavoko Municipality.
- Availability of investment capital and the anticipated long-term economic viability of the development.

The proposed development is expected to contribute to addressing the increasing demand for quality housing within the Nairobi Metropolitan Area while supporting sustainable urban development, employment creation, increased investment, and improved utilization of land. Following the acquisition of the necessary planning approvals from the relevant authorities, the Proponent is seeking an Environmental Impact Assessment Licence from the NEMA as required under the EMCA, Cap. 387 before implementation of the proposed project.

1.2 EIA Study Objectives

The overall objective of the Environmental Impact Assessment (EIA) Study was to evaluate the potential environmental and social implications of the proposed development and to ensure that the project is planned, designed, constructed, operated, and decommissioned in an environmentally sustainable manner in compliance with the Environmental Management and Co-ordination Act (EMCA), Cap. 387, and other applicable legal and regulatory requirements.

The specific objectives of the study were to:

- Identify and assess the existing environmental and socio-economic conditions of the project area.

- Identify, predict, and evaluate the potential positive and negative environmental and social impacts associated with the planning, construction, operation, and decommissioning phases of the proposed development.
- Assess the project's compliance with applicable environmental legislation, regulations, policies, standards, and planning requirements.
- Evaluate the suitability of the proposed site and determine the compatibility of the proposed development with the surrounding land uses and zoning requirements.
- Propose practical and cost-effective mitigation and enhancement measures to avoid, minimise, remedy, or compensate for adverse environmental and social impacts.
- Develop an Environmental and Social Management Plan (ESMP) outlining mitigation measures, monitoring requirements, institutional responsibilities, implementation schedules, and estimated costs.
- Ensure that concerns, views, and recommendations raised by neighbouring communities, government agencies, and other stakeholders are identified, documented, and incorporated into project planning and environmental management measures.
- Assess potential occupational health and safety risks and recommend appropriate measures to safeguard workers, neighbouring communities, and the general public.
- Evaluate the adequacy of the proposed infrastructure and utility services, including water supply, wastewater management, stormwater drainage, solid waste management, traffic circulation, and energy supply.
- Recommend sustainable environmental management practices and appropriate technologies that enhance resource efficiency, pollution prevention, climate resilience, energy conservation, and sustainable development.
- Establish an environmental monitoring and reporting framework to facilitate effective implementation of mitigation measures and ensure continual compliance with statutory requirements.
- Advise the Proponent on environmental best practices and statutory obligations necessary for obtaining and maintaining compliance with the Environmental Impact Assessment Licence and other regulatory approvals.

1.3 Scope of the EIA

The scope of this EIA Study encompassed the assessment of the proposed development and its potential environmental and social impacts throughout the project lifecycle, including the planning, construction, operation, and decommissioning phases. The study specifically covered:

- A detailed description of the proposed project, its components, activities, and implementation processes.
- Collection and documentation of baseline physical, biological, and socio-economic environmental conditions within the project area.
- Stakeholder engagement through questionnaires, interviews, focus group discussions, consultative meetings, and site observations to obtain views and concerns regarding the proposed development.

- Identification and assessment of the potential positive and negative environmental and social impacts associated with the project and propose appropriate mitigation measures.
- Evaluation of the project's compliance with applicable environmental legislation, regulations, standards, and planning requirements.
- Analysis of project alternatives, including site, design, technology, and the no-project option.
- Environmental and Social Management Plan (ESMP), including monitoring indicators, institutional responsibilities, implementation timelines, and emergency preparedness measures.
- Formulation of recommendations to promote environmentally sustainable project implementation and continual regulatory compliance

1.4 Terms of Reference (TORs) for the EIA process

The Terms of Reference (TORs) provided by the Proponent guided the environmental assessment and preparation of the EIA report. The key activities included appraisal of the project site and proposed development; establishment of baseline environmental and socio-economic conditions; identification and assessment of potential environmental, health and safety impacts; assessment of waste generation and management requirements; evaluation of project alternatives, including site, design, scale, technologies and resource-management options; and development of appropriate mitigation, enhancement and monitoring measures.

The assessment also incorporated public and stakeholder consultation and participation, involving relevant stakeholders including neighbouring residents and the Syokimau Residents Association (SRA), to identify concerns, expectations and recommendations for consideration in the EIA.

The TORs further required review of applicable environmental legislation, policies, standards and regulatory requirements, and preparation of an Environmental and Social Management Plan (ESMP) to guide implementation and monitoring. A detailed TOR was submitted to the NEMA and approved under Reference No. NEMA/ENVIS/EIA/TOR/Approval_0280. The approved TOR document is attached to this EIA Study report.

1.5 Methodology

The EIA methodology comprised environmental screening, physical site inspection and reconnaissance of the project site and surrounding area. Desktop review of relevant legislation, technical reports, project designs and other available information was undertaken. Stakeholder consultations, questionnaires and interviews were conducted with the Proponent, consultants, neighbours, the Syokimau Residents Association (SRA) and other relevant stakeholders. The assessment then identified and evaluated the potential environmental and social impacts associated with the proposed project and developed appropriate mitigation and monitoring measures.

1.6 EIA Study Organization and structure

The Environmental Impact Assessment (EIA) Study was undertaken through a collaborative and consultative process involving the EIA consultants, the Proponent, the project design team, and relevant stakeholders. Throughout the study, continuous consultation and feedback were maintained to facilitate the provision of project information, clarification of technical issues, and validation of study findings.

The Proponent and the project consultants provided the technical documentation, design information, and logistical support necessary for the successful completion of the study. Information obtained through site inspections, stakeholder consultations, baseline environmental assessments, and review of relevant project

documents formed the basis for the preparation of this EIA Study Report.

The report is structured in accordance with the EMCA, Cap. 387, and the Environmental (Impact Assessment and Audit) Regulations, 2003 (as amended), and presents the project description, baseline environmental conditions, legal and institutional framework, assessment of potential impacts, stakeholder engagement outcomes, proposed mitigation measures, Environmental and Social Management Plan (ESMP), and conclusions and recommendations.

CHAPTER TWO

2.0 PROJECT DESCRIPTION

2.1 Introduction

This chapter provides a detailed description of the proposed mixed-use residential development on Plot L.R. No. 16670/2, located along Chady Road in Syokimau, Mavoko Sub-County, Machakos County. It outlines the project location, the Proponent, project components, justification, design characteristics, construction activities, utility requirements, and supporting infrastructure. The chapter also describes the project lifecycle, from pre-construction through construction, operation, and eventual decommissioning, providing the basis for the subsequent assessment of environmental and social impacts.

2.2 Project Proponent

The Proponent for the proposed development is Vanilla Vista Gardens Limited, the registered owner of Plot L.R. No. 16670/2. The company is responsible for the planning, financing, implementation, operation, and maintenance of the proposed development.

Proponent Details

Table 1 Proponent Details

Item	Description
Proponent	Vanilla Vista Gardens Limited
Status	Registered Property Owner
Postal Address	P.O. Box 1–00515, Buru Buru, Kenya
Email Address	vanillavista75@gmail.com

2.3 Project Location

The proposed development is located on Plot L.R. No. 16670/2 along Chady Road, in Syokimau Ward, Mavoko Municipality, Machakos County. The site lies within a rapidly developing mixed-use residential neighbourhood characterized by high-rise apartments, low-rise residential developments, commercial establishments, and supporting social amenities.

The geographical coordinates of the project site are approximately Latitude -1.364584° and Longitude 36.921040°, placing the development within the Nairobi Metropolitan Region.

The site is readily accessible via Chady Road, which connects to the wider road network including Mombasa Road (A8) and the Nairobi Expressway, providing convenient access to Nairobi City, Jomo Kenyatta International Airport (JKIA), the Standard Gauge Railway (SGR) Terminus, and other surrounding areas. The area is also served by public transport and is supported by existing infrastructure including electricity, water supply, sewerage, and telecommunication services.

A site location map of the proposed development is provided below.

Proposed Site L.R No. 16670/2



Figure 1 Google Map of the proposed site Source (Google Map August 2026)

2.4 Project Justification

The proposed development is justified by the following factors:

Growing Housing Demand: The project seeks to address the increasing demand for quality and affordable housing arising from rapid urbanization and population growth within Syokimau and the Nairobi Metropolitan Region (KNBS, 2019).

Strategic Location: The site is strategically located within Syokimau, providing convenient access to Nairobi City, making it an attractive residential location.

Proximity to Key Transport Infrastructure: The development is located near JKIA, the SGR Terminus, the Nairobi Expressway, and Mombasa Road, enhancing accessibility and connectivity.

Proximity to Industrial and Commercial Areas: The site is within reasonable proximity to Nairobi's Industrial Area, Athi River Industrial Zone, and other major commercial centres, making it suitable for professionals and business owners.

Rapid Urban Development: Syokimau has experienced significant residential, commercial, and infrastructure development over the past decade, making it one of the fastest-growing satellite towns within the Nairobi Metropolitan Region (Government of Machakos County, 2022).

Availability of Infrastructure: The area is served by essential infrastructure and utilities, including all-weather roads, electricity, telecommunication networks, potable water supplied by MAVWASCO, and stormwater drainage.

Availability of Investment Capital: The Proponent has adequate financial capacity to undertake, operate, and maintain the proposed development.

Compatibility with Physical Planning: The proposed development conforms to the approved zoning and physical planning framework for Syokimau, where high-density mixed-use developments are encouraged.

Socio-economic Benefits: The project will create employment opportunities, stimulate local businesses, increase property values, generate government revenue, and contribute to sustainable urban development within Mavoko Municipality.

2.5 Project Objectives

The overall objective of the proposed project is to develop a modern, safe, and sustainable mixed-use residential development comprising 264 apartment units and 8 convenience shops, with the residential units being availed to the market for sale. The project seeks to provide quality housing and supporting commercial facilities while promoting efficient urban land use and contributing to the socio-economic development of Syokimau and the Nairobi Metropolitan Region.

2.6 Project Components

Table 2: Project Components

Block	Building Height	Studio	1-Bedroom	2-Bedroom	Shops	Total
Block 1	G+10	60	20	—	—	80
Block 2	G+9	54	54	—	—	108
Block 3	G+10	—	36	40	—	76
Block 4	G+1	—	—	—	8	8
Total	—	114	110	40	8	272

Table 3: Other Proposed Project Components

Component	Description
Internal Road Network	Interconnected internal access roads and driveways designed to facilitate safe and efficient vehicular circulation throughout the development.
Water Supply System	Water supply through a proposed on-site borehole, complemented by storage tanks and the public water supply network.
Wastewater Treatment System	A proposed on-site wastewater treatment plant with a 120,000 litres per day, designed to serve a maximum projected population treatment capacity of 720 persons based on an average water consumption of 100 litres per person per day. The treated effluent will comply with applicable discharge standards.
Stormwater Drainage	An engineered stormwater drainage system designed to collect and convey runoff through the existing drainage network, ultimately discharging towards the downstream attenuation point and to the greater Athi Catchment.
Electrical Installations	Electricity supply from the Kenya Power distribution network, including internal electrical reticulation, external lighting, standby power provisions, and associated electrical infrastructure.
Fire Safety Installations	Fire detection and alarm systems, fire hydrants, hose reels, portable fire extinguishers, emergency exits, emergency lighting, fire water storage, and other fire protection facilities in accordance with applicable building and fire safety standards.
Landscaping and Recreational Facilities	Landscaped green areas, ornamental planting, and a children's play area located on the rooftop of the commercial block, together with a jogging track running around the perimeter of the development.
Solid Waste Management	A designated solid waste holding bay for segregation and temporary storage of waste prior to collection and disposal by licensed waste handlers.
Security Facilities	Perimeter wall, controlled entrance gate, gatehouse, CCTV surveillance, security lighting, visitor management system, and access control facilities.

Other Ancillary Infrastructure	Pedestrian walkways, drainage structures, water storage tanks, utility rooms, signage, boundary improvements, and other supporting infrastructure necessary for the operation of the development.
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2.7 Project Activities

2.7.1 Pre-Construction stage/project approvals

The pre-construction stage comprises all activities undertaken prior to the commencement of physical construction works. These activities included project conceptualization, feasibility assessment, site investigations, project planning, architectural and engineering design, and preparation of the necessary technical documentation.

The proposed development has received the requisite development approvals from the Machakos County Government in accordance with the applicable planning and development control requirements. In compliance with EMCA, Cap. 387, the Proponent is seeking an Environmental Impact Assessment (EIA) License from the National Environment Management Authority (NEMA) before commencement of construction.

The pre-construction phase also involved engagement and coordination with key project stakeholders, including architects, engineers, quantity surveyors, environmental consultants, contractors, suppliers, and relevant government agencies. These engagements facilitated project planning, statutory compliance, resource mobilization, procurement planning, and the establishment of implementation arrangements necessary for successful project execution.

2.7.2 Construction Works Stage

Construction activities will commence upon issuance of an EIA License by NEMA and receipt of all other statutory approvals required for the project. The works will be undertaken in accordance with approved architectural and structural drawings, the Building Code, relevant Kenyan Standards (KS), the Occupational Safety and Health Act, 2007, and other applicable legal and regulatory requirements. The Contractor shall also implement environmental, occupational health and safety, and quality management measures outlined herein throughout the construction period.

The principal project inputs during construction will include:

- **Construction materials:** Cement, sand, ballast, hardcore, natural stone, aggregates, steel reinforcement, timber, masonry blocks, roofing materials, glass, pipes, electrical fittings, paints, finishes, and other building materials. All materials shall be sourced from licensed and reputable suppliers operating in compliance with applicable environmental and legal requirements.
- **Construction equipment:** Excavators, trucks, cranes, concrete mixers, compactors, vibrators, generators, hoists, water bowsers, and other construction machinery. These equipment will primarily operate on diesel fuel and electricity.
- **Utilities:** Water and electricity will be required for construction activities, including concrete works, dust suppression, equipment operation, and domestic use by workers.

- **Labour:** The project will engage both skilled and unskilled labour, including engineers, architects, quantity surveyors, site supervisors, environmental, health and safety officers, artisans, machine operators, and general labourers. Preference will, where practicable, be given to local employment.

The construction phase will also involve engagement of qualified and registered consultants to provide professional supervision and ensure compliance with design specifications, statutory requirements, and environmental and social safeguards. A project signboard displaying the project details, approvals, emergency contacts, and the contractor's information shall be erected at the site before commencement of construction.

The major construction activities will include:

- Site establishment, fencing, and installation of temporary site offices, workers' welfare facilities, sanitation facilities, and storage areas.
- Site clearance, setting out, excavation, earthworks, and foundation preparation.
- Procurement, transportation, handling, and storage of construction materials.
- Construction of foundations, reinforced concrete works, masonry works, structural framework, roofing, and external finishes.
- Installation of plumbing, sewerage, drainage, electrical, mechanical, fire protection, and communication systems.
- Construction of internal access roads, parking areas, stormwater drainage systems, boundary walls, and other ancillary infrastructure.
- Landscaping, paving, external works, and site restoration upon completion of construction.
- Collection, segregation, transportation, and disposal of construction waste and excavated materials at sites approved by the relevant authorities.
- Implementation of occupational health and safety measures, dust and noise control, traffic management, erosion and sediment control, pollution prevention, and emergency preparedness throughout the construction period.

All construction works shall be undertaken by qualified and experienced personnel under the supervision of registered professionals and in accordance with the approved project specifications and applicable statutory requirements. Appropriate environmental management measures shall be implemented throughout the construction phase to minimise adverse environmental and social impacts.

2.7.3 Operation Phase

Upon completion of construction and commissioning, the proposed development will become operational and accommodate residential occupants together with the convenience shops. The operation phase will involve the normal use, occupation, and management of the residential and commercial facilities, together with the associated infrastructure and utilities. During this phase, the Proponent or

appointed property Management Company will be responsible for the operation, maintenance, and environmental management of the development.

The principal operational activities will include:

- **Residential and commercial occupancy:** Occupation of the residential units and operation of the convenience shops, resulting in routine domestic and commercial activities.
- **Water supply and energy consumption:** Continuous use of water, electricity, and other utility services to support the daily operations of the development.
- **Solid waste and wastewater management:** Domestic and commercial solid waste will be generated and temporarily stored in designated waste collection facilities before collection by licensed waste handlers for transportation to approved disposal or recovery facilities. Wastewater generated from the development will be treated by a proposed waste water treatment system, while stormwater will be conveyed through the on-site drainage network and discharged into designated public stormwater drainage systems.
- **Cleaning and housekeeping:** Routine cleaning of residential units, common areas, parking spaces, access roads, walkways, drainage channels, and landscaped areas using water, detergents, and appropriate cleaning agents to maintain acceptable environmental hygiene and public health standards.
- **Inspection, maintenance, and repairs:** Regular inspection and maintenance of buildings, electrical and plumbing systems, firefighting equipment, lifts, drainage systems, water supply infrastructure, boundary walls, paved areas, landscaping, and other common facilities to ensure safe, efficient, and continuous operation of the development.
- **Security and facility management:** Provision of security services, controlled access, routine inspections, and management of common areas to ensure the safety, comfort, and well-being of residents, visitors, and businesses operating within the development.

2.7.4 Decommissioning Stage

The proposed development is expected to remain operational throughout its design life, subject to routine maintenance. Decommissioning may be undertaken at the end of the development's useful life or where redevelopment is proposed.

The decommissioning phase will involve:

- Preparation of a decommissioning plan.
- Disconnection of utility services.
- Removal of fixtures, fittings, and reusable materials.
- Demolition of buildings and associated infrastructure.
- Segregation, recycling, transportation, and disposal of demolition waste through licensed waste handlers.
- Implementation of dust, noise, traffic, and occupational health and safety control measures.
- Site clearance, rehabilitation, and restoration for future use.

All decommissioning activities will be carried out in compliance with applicable environmental, health and safety, and waste management regulations to minimise environmental and social impact

2.8 Project Cost

The proposed project will cost **KES 853,239,000.00** to read: **Kenya Shillings Eight Hundred and Fifty Three Million, Two Hundred and Thirty Nine Thousand Only** according to the bill of quantities developed by the project Quantity Surveyor. Certified Bills of Quantities attached herein.

CHAPTER THREE

METHODOLOGY AND BASELINE INFORMATION

3.1 Study Methodology

The EIA Study was undertaken using a multidisciplinary approach involving desktop review, field investigations, stakeholder engagement, and professional analysis. The methodology complied with the EMCA, Cap. 387, and the Environmental (Impact Assessment and Audit) Regulations, 2003 (as amended). Both scientific and socio-economic methods were employed to establish baseline environmental conditions, identify potential impacts, and develop appropriate mitigation measures.

3.1.1 Desktop Literature Review

A review of relevant secondary information was undertaken to obtain background information on the proposed project and the project area. The review covered applicable environmental legislation, regulations, policies, planning documents, published reports, maps, technical literature, the Kenya National Population and Housing Census, county planning documents, and other relevant reference materials. This information provided the basis for understanding the legal framework, environmental setting, and socio-economic characteristics of the study area.

3.1.2 Site Reconnaissance and Field Surveys

Site reconnaissance and field surveys were conducted to establish the existing physical, biological, and socio-economic conditions of the project area. The exercise involved observation and documentation of land use, topography, drainage patterns, vegetation, surrounding developments, accessibility, public utilities, and environmentally sensitive features. The field surveys also verified information obtained through desktop review.

3.1.3 Stakeholder Consultation and Public Participation

Stakeholder consultation and public participation were undertaken in accordance with the Environmental Management and Coordination Act (EMCA), Cap. 387 and the applicable Environmental (Impact Assessment and Audit) Regulations, 2003, as amended. The process aimed to inform Interested and Affected Parties (I&APs), Project Affected Persons (PAPs) and other relevant stakeholders about the proposed development and to obtain their views, concerns, expectations and recommendations for consideration in the EIA Study.

Consultations were undertaken through meetings with the Proponent and project consultants, and engagements with the Syokimau Residents Association (SRA) and other relevant stakeholders. The consultations provided an opportunity for stakeholders to understand the proposed development and to raise environmental, social, infrastructure, traffic, drainage, privacy, security and other concerns associated with the project.

To facilitate wider public participation, a notice of the proposed development was published in the Standard Newspaper on 14 July 2026, inviting stakeholders, PAPs and other Interested Parties to

participate in the public consultation meeting. The meeting provided a platform for stakeholders to present their views and seek clarification from the Proponent and project team.

Minutes documenting the deliberations, issues raised, responses provided and recommendations arising from the consultation process were prepared and are attached to this EIA Report as supporting documentation.

3.1.4 Data Collection Methods

Both primary and secondary data collection methods were employed during the study. Primary data were collected through site observations, stakeholder consultations, interviews, and photographic documentation of the project site and surrounding environment. Secondary data were obtained from relevant legislation, government publications, technical reports, planning documents, and other published literature. The combined data sources provided a comprehensive baseline for the impact assessment.

3.1.5 Impact Identification and Evaluation

Potential environmental and social impacts were identified by comparing the proposed project activities with the existing baseline conditions throughout the project lifecycle, including the pre-construction, construction, operation, and decommissioning phases. The impacts were evaluated based on their nature, magnitude, duration, extent, reversibility, likelihood of occurrence, and significance. Appropriate mitigation measures were then proposed to avoid, minimize, or compensate for adverse impacts while enhancing the anticipated positive impacts.

3.1.6 Study Limitations

The study was undertaken based on the information available at the time of assessment and findings from site investigations and stakeholder consultations. No significant limitations were encountered that would compromise the validity of the assessment. Minor constraints related to data availability or stakeholder participation were adequately addressed through field verification, consultation with the relevant stakeholders, and review of relevant secondary information.

3.2 Baseline Information

3.2.1 Climate and Meteorology

The project area experiences a tropical sub-humid climate typical of the Nairobi Metropolitan Region. Rainfall is bimodal, with the long rains occurring between March and May and the short rains between October and December. Average annual rainfall ranges between 700 mm and 1,000 mm, while temperatures generally range from 15°C to 28°C (Kenya Meteorological Department, 2023).

The area experiences predominantly easterly to south-easterly winds, with average wind speeds ranging between 9 and 15 km/h (2.5–4.2 m/s) depending on the season. These prevailing winds facilitate the

dispersion of dust, vehicle emissions, and other airborne pollutants, particularly during the construction phase (Muthama, 2017).

Recent climate variability has resulted in irregular rainfall patterns and occasional high-intensity storm events, increasing the potential for localized flooding within rapidly urbanizing areas such as Syokimau. Consequently, effective stormwater management, erosion control, and climate-resilient infrastructure have been incorporated into the project design to enhance resilience to extreme weather events (Kenya Meteorological Department, 2023).

3.2.2 Topography

The project site lies at an elevation ranging between approximately 5,330 and 5,337 feet (1,625–1,627 m) above sea level. The site exhibits a gentle natural gradient towards the road reserve, where stormwater discharges at approximately 5,330 feet ASL. The topography is generally suitable for the proposed development, although adequate stormwater management measures will be required to control runoff and prevent flooding.

3.2.3 Soils and Geology

The project site is underlain by approximately 1.5 m (5 feet) of expansive black cotton soil overlying porous volcanic rock, a geological formation characteristic of the Syokimau area. Black cotton soils are highly plastic and undergo significant shrink-swell behaviour with changes in moisture content, making them susceptible to differential settlement if not properly managed (Zhang *et al.*, 2018).

The expansive nature of the upper soil layer presents engineering challenges for foundation stability and construction. Consequently, the proposed structures should be founded on competent strata or supported using appropriate engineered foundation systems as recommended in the geotechnical investigation. The underlying volcanic rock provides a stable foundation with good bearing capacity for the proposed development.

During construction, the black cotton soils may become soft and difficult to work during wet conditions and hard during dry periods, requiring proper moisture control, drainage, and compaction of engineered fill.

3.2.4 Hydrology and Drainage

The proposed development lies within the Athi Basin Area and forms part of the Nairobi Sub-Region catchment under the Water Resources Authority (WRA) basin classification. Hydrologically, the project area drains towards the Athi River system through the Syokimau–Katani catchment. Rapid urbanization within this sub-catchment has increased impervious surfaces, resulting in higher stormwater runoff volumes and peak flows during rainfall events. Consequently, effective stormwater management is a key design consideration for the proposed development.

The proposed development is not located within a river, wetland, or riparian reserve. Surface runoff from the site follows the natural ground slope towards the adjoining road reserve before entering the existing public stormwater drainage system.

The hydrological assessment informed the design of an appropriate stormwater management system incorporating roof water collection, surface drains, controlled discharge, and erosion control measures to regulate runoff and protect downstream infrastructure. Potable water will be supplied by a proposed

borehole and supplemented by supply from Mavoko Water and Sanitation Company Limited (MAVWASCO).

3.2.5 Biological Environment

The biological environment is typical of a highly urbanized setting with limited natural vegetation. Existing vegetation mainly comprises shrubs, grasses, and scattered planted species of *Acacia Xanthophloea* (Murera) within residential compounds and road reserves. No environmentally sensitive ecosystems or protected flora and fauna were observed within the project site.



Figure 2 A photograph of the site showing the site biodiversity (Source Field Survey July 2026)

3.2.6 Land Use and Neighbouring Developments

The project site is located within an area zoned for high-density residential development. Surrounding land uses comprise a mixture of light industries, high-rise apartment blocks, low-rise residential developments, standalone houses, convenience shops, educational institutions, and other commercial establishments. The proposed development is compatible with the existing land-use pattern and ongoing urban development within Syokimau.



Figure 3 A photograph of the existing mixed use developments from the proposed site (Source Field Survey July 2026)



Figure 4 Photograph showing ongoing development within the neighborhood (Source Google Street 2024)

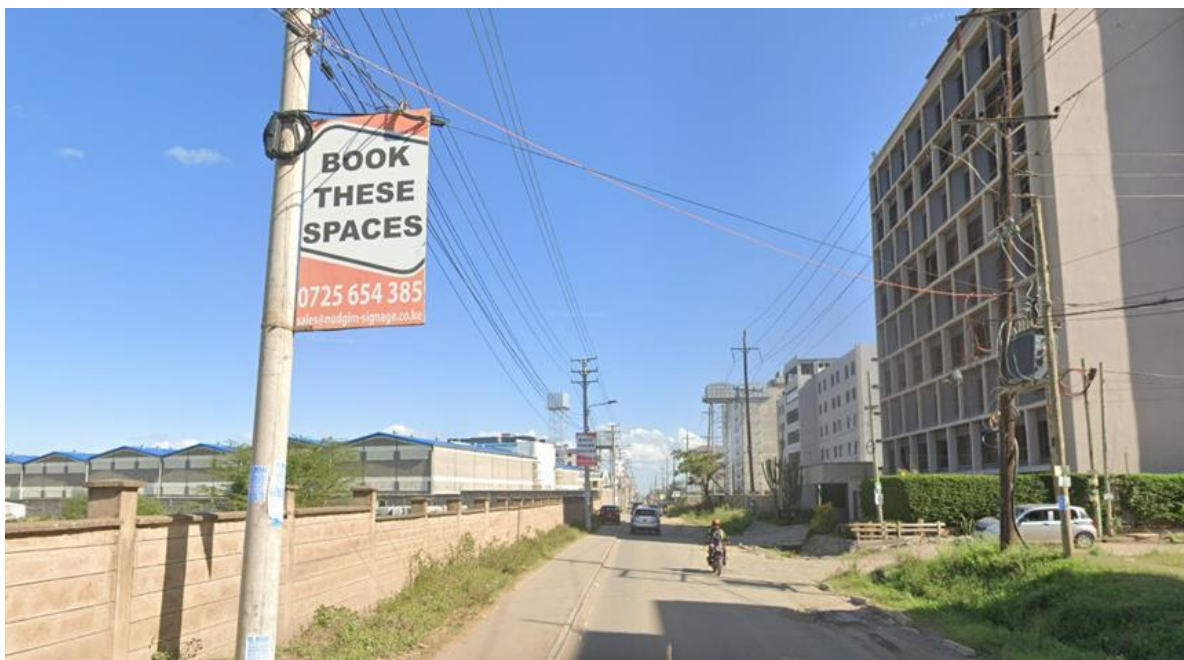


Figure 5 A street view of the Chady road from airport road as you approach the proposed site.

3.2.7 Socio-economic Environment

Syokimau is a rapidly growing residential area within the Nairobi Metropolitan Region, located in Mavoko Sub-County, Machakos County. Its strategic proximity to Nairobi City, Jomo Kenyatta International Airport (JKIA), the Standard Gauge Railway (SGR) Terminus, the Nairobi Expressway, and Mombasa Road has attracted significant residential, commercial, and real estate development (KNBS, 2019).

The area is predominantly occupied by middle- and upper-middle-income households, with the local economy supported by trade, transport, real estate, professional services, hospitality, education, and small-scale businesses. The continued expansion of residential developments has stimulated investment in commercial centres, schools, healthcare facilities, and other social amenities, contributing to employment creation and economic growth.

Syokimau is well served by essential infrastructure, including road networks, electricity, water supply, sewerage, telecommunications, public transport, educational institutions, healthcare facilities, shopping centres, and security services.

3.2.8 Security and Street Lighting

The neighbourhood enjoys good security supported by nearby police Station, private security services, community policing initiatives, and controlled residential developments. The main access roads are fitted with street lighting, enhancing security and visibility during night-time.



Figure 6 A photograph showing the current status of the road and the street lighting infrastructure

3.2.9 Population

According to the 2019 Kenya Population and Housing Census, Machakos County had a population of 1,421,932 persons, while Athi River Sub-County (Mavoko) recorded a population of approximately 322,499 persons (KNBS, 2019). The area has experienced significant population growth due to its proximity to Nairobi and its role as an industrial and residential centre.

3.2.10 Air Quality and Noise Environment

The baseline air quality within the project area is generally good, with localized deterioration occurring along Airport Road and nearby access roads due to vehicular traffic, construction activities from neighbouring developments, and wind-blown dust during dry periods. There are no major industrial facilities within the immediate vicinity that are likely to affect ambient air quality significantly.

Ambient noise levels are characteristic of a developing urban residential neighbourhood and are primarily generated by road traffic, residential activities, commercial establishments, and ongoing construction projects. Noise levels are generally higher during daytime and reduce considerably at night. The proposed development is not expected to introduce significant long-term air quality or noise impacts, provided appropriate mitigation measures are implemented during the construction and operational phases.

3.3 Existing Infrastructure and Services

The proposed project site is well served by existing physical infrastructure and public utilities that support residential and commercial developments within Syokimau. The site is accessible through Chady Road, which connects to the wider road network, including Mombasa Road and the Nairobi

Expressway, providing efficient access to Nairobi City, Jomo Kenyatta International Airport (JKIA), and other key destinations. The road network is generally in good condition and supports both transport.

The area is served by an existing stormwater drainage system comprising roadside drains and natural drainage channels that convey surface runoff downstream and others along Mwananchi Road down to the stream. However, continued urbanization has increased stormwater runoff due to the expansion of impervious surfaces, making proper on-site stormwater management an important consideration for new developments. The proposed development has therefore incorporated an engineered stormwater drainage system to regulate runoff and prevent localized flooding.

Potable water is supplied through the MAVWASCO distribution network, supplemented in some developments by private boreholes to improve supply reliability. Wastewater generated within the area is managed individually by the respective establishments as there is no existing sewerline within the area.

The project area is also served by a reliable electricity supply from the national grid and extensive telecommunication infrastructure provided by major mobile network operators, ensuring adequate voice and data communication services. Other supporting infrastructure includes street lighting, solid waste collection services by licensed waste handlers, emergency response services, educational institutions, healthcare facilities, shopping centres, religious institutions, and security services. The availability of these utilities and services demonstrates that the area possesses the necessary infrastructure to support the proposed mixed-use residential development.

CHAPTER FOUR

4.0 LEGAL FRAMEWORK

4.1 Introduction

The implementation of the proposed mixed-use residential development on Plot L.R. No. 16670/2, Syokimau, Mavoko Municipality, Machakos County, is governed by various national laws, regulations, policies, standards, and international environmental agreements. These legal and institutional frameworks provide the basis for environmental protection, sustainable land use planning, occupational health and safety, pollution prevention, public participation, and the prudent management of natural resources. Compliance with these requirements is essential throughout the project lifecycle, including planning, construction, operation, and eventual decommissioning. This chapter outlines the key legal and policy instruments applicable to the proposed development and demonstrates the Proponent's commitment to implementing the project in accordance with the applicable statutory requirements.

4.2 The Constitution of Kenya

The Constitution of Kenya, 2010 is the supreme law of the Republic of Kenya and provides the overarching legal framework for environmental management and sustainable development. The Constitution recognizes that the environment is a national heritage and, in its Preamble, affirms that the people of Kenya are "respectful of the environment, which is our heritage, and determined to sustain it for the benefit of future generations." This commitment underscores the need for all development activities to be planned and implemented in a manner that safeguards environmental integrity while promoting sustainable socio-economic development.

The proposed development shall therefore be implemented in conformity with the following constitutional provisions:

- **Article 10 – National Values and Principles of Governance:** Requires all State organs, public officers, and persons to uphold national values including sustainable development, public participation, good governance, transparency, accountability, equity, and inclusiveness in decision-making and project implementation.
- **Article 42 – Right to a Clean and Healthy Environment:** Guarantees every person the right to a clean and healthy environment, including the right to have the environment protected for the benefit of present and future generations through legislative and other appropriate measures.
- **Article 69 – Obligations in Respect of the Environment:** Requires the State and every person to protect and conserve the environment, ensure sustainable exploitation and utilization of natural resources, encourage public participation in environmental management, eliminate activities that are likely to endanger the environment, and establish systems for environmental monitoring and assessment.
- **Article 70 – Enforcement of Environmental Rights:** Provides any person with the right to seek legal redress where the right to a clean and healthy environment has been denied, violated, infringed, or threatened. Consequently, the proposed development has been subjected to an Environmental Impact Assessment to identify, evaluate, and mitigate potential environmental and social impacts before implementation.

4.3 Environmental Management Legislation

4.3.1 The Environmental Management and Coordination (Amendment) Act Cap 387

The Environmental Management and Coordination Act (EMCA), Cap. 387 is the principal legislation governing environmental management and conservation in Kenya. The Act establishes the NEMA as the lead agency responsible for coordinating environmental management and ensuring sustainable development. It requires projects likely to have significant environmental and social impacts to undergo an Environmental Impact Assessment (EIA) before implementation. The proposed mixed-use residential development falls under projects listed in the Second Schedule of the Act and therefore requires an EIA Licence before commencement. EMCA further provides for environmental planning, pollution control, environmental restoration, public participation, environmental monitoring, compliance, and enforcement to ensure that development activities are undertaken in an environmentally sustainable manner

This act forms the basis for this report hence compliance has been achieved.

4.3.2 The Environment (Impact Assessment and Audit) Regulations, 2003

On June 13th 2003, the then Minister of Environment, Natural Resources and Wildlife promulgated the Environment (Impact Assessment and Audit) regulations 2003 (EIA/EA Regulations) under section 147 of the EMCA. These regulations provide the framework for carrying out EIAs and EAs in Kenya.

These Regulations shall apply to all policies, plans, programmes, projects and activities specified in Part IV, Part V and the Second Schedule of the Act. (1) No proponents shall implement a project -

- (a) likely to have a negative environmental impact; or
 - (b) for which an environmental impact assessment is required under the Act or these Regulations; unless an environmental impact assessment has been concluded and approved in accordance with these Regulations.
- (2) No licensing authority under any law in force in Kenya shall issue a license for any project for which an environmental impact assessment is required under the Act unless the applicant produces to the licensing authority a license of environmental impact assessment issued by the Authority under these Regulations.
- (3) No licensing authority under any law in force in Kenya shall issue a trading, commercial or development permit or license for any micro project activity likely to have cumulative significant negative environmental impact before it ensures that a strategic environmental plan encompassing mitigation measures and approved by the Authority is in place.

4.3.3 Environmental Management and Co-ordination (Waste Management) Regulations, 2024 Legal Notice No.178

The Regulations apply to the handling, segregation, storage, transportation, treatment, recycling, recovery, and disposal of waste. They place responsibility on every waste generator to minimize waste generation through cleaner production methods, segregate waste into appropriate categories, and ensure

environmentally sound disposal. Waste must be placed in clearly labelled and colour-coded receptacles, and hazardous waste must be separated from non-hazardous waste.

Transportation of waste can only be undertaken by NEMA-licensed waste transporters, and operators of waste storage, processing, treatment, or disposal facilities must obtain the relevant licenses and maintain records and reports for NEMA. The Regulations also provide detailed requirements for the handling, packaging, storage, transportation, treatment, and disposal of hazardous waste.

For the proposed mixed-use residential development, the key implications are the establishment of a designated waste holding bay, segregation of organic, recyclable, and general waste, engagement of licensed waste handlers, maintenance of proper waste records where required, and disposal of waste only at approved facilities in compliance with NEMA requirements. These measures support pollution prevention, public health protection, and sustainable waste management.

4.3.4 Environmental Management and Coordination (Air Quality) Regulations, 2024

The Air Quality Regulations, 2024 provide for the prevention, control, and monitoring of air pollution arising from construction, industrial, commercial, and other activities. The Regulations prescribe emission standards for stationary and mobile sources and require proponents to implement measures that minimize dust, smoke, fumes, and gaseous emissions. During construction, the proposed development will control fugitive dust through regular water sprinkling, proper storage and covering of construction materials, controlled vehicle speeds within the site, routine maintenance of construction machinery, and good housekeeping practices. These measures will help protect workers, neighbouring residents, and the surrounding environment from adverse air quality impacts while ensuring compliance with the Regulations.

4.3.5 The Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009

Section 3. On General Prohibitions. Under this Act, except as otherwise provided in these regulations, no person shall make or cause to be made any loud, unreasonable, unnecessary or unusual noise which annoys, disturbs, injures or endangers the comfort, repose, health or safety of others and the environment.

Section 4. on Excessive vibrations.

(1) Except as otherwise provided in these Regulations, no person shall- (a) make or cause to be made excessive vibrations which annoy, disturb, injure or endanger the comfort, repose, health or safety of others and the environment; or (b) cause to be made excessive vibrations which exceed 0.5 centimetres per second beyond any source property boundary or 30 metres from any moving source; (2). Any person who contravenes the provisions of this Regulation commits an offence.

These regulations outlined the maximum acceptable noise in a construction site as shown in the table below

Maximum Permissible Noise Levels for Construction Sites

(Measurement taken within the facility)

Table 4 Maximum Permissible Noise Levels for Construction Sites

			Maximum noise level permitted (Leq) in dB(A)
Facility			Night
(i)	Health facilities, educational institutions, homes for disabled		35
(ii)	Mixed use s		35
(iii)	Areas other than those prescribed in (i) and (ii)		65

Time frame: day 6.01 a.m. – 6.0p.m. (Leq, 14 h)

Night 6.01 p.m. – 6.00 a.m. (Leq, 14 h)

In compliance with this act, the construction work should be done from 0800hrs to 1800hrs on weekdays and 0800hrs to 1300hrs on Saturdays. The contractor will also ensure that the machines that produce a lot of noise are installed with mufflers and are well maintained to ensure that the noise produced will be at a minimum and it doesn't interfere with the neighboring activities.

4.3.6 Sustainable Waste Management Act, 2022

The Sustainable Waste Management Act, 2022 establishes the legal framework for sustainable waste management in Kenya by promoting the waste management hierarchy of waste prevention, reduction, reuse, recycling, recovery, and environmentally sound disposal. The Act seeks to minimize adverse impacts of waste on human health and the environment while advancing the principles of a circular economy and sustainable resource utilization.

The Act places responsibility on waste generators to minimize waste generation at source, segregate waste into appropriate streams, and ensure that waste is collected, transported, treated, recycled, or disposed of by licensed waste service providers. It also assigns county governments the responsibility for developing and implementing integrated waste management systems, including waste collection, transportation, material recovery, recycling, treatment, and disposal facilities.

For the proposed mixed-use residential development, the Act requires the Proponent to implement an effective waste management system throughout the construction and operational phases. This includes waste segregation at source, establishment of a designated waste holding bay, promotion of reuse and recycling, safe handling of construction and domestic waste, engagement of licensed waste collectors,

and disposal of residual waste at approved facilities. Compliance with the Act will contribute to pollution prevention, protection of public health, resource efficiency, and sustainable environmental management.

4.3.7 Environmental Management and Co-Ordination (Management of Toxic and Hazardous Chemicals and Materials) Regulations, 2024

These Regulations govern the storage, handling, labelling and disposal of hazardous substances and will apply chiefly to the construction phase of the development, where fuels, lubricants, paints, solvents, bituminous products and water/wastewater treatment chemicals will be present on site. The contractor will be required to maintain safety data sheets, provide secondary containment (bundling) for fuel and chemical storage, and dispose of chemical waste through NEMA-licensed handlers. During operation, the Regulations remain relevant to the management of chemicals used in the wastewater treatment all of which must be stored and managed in a manner that prevents soil or water contamination.

4.3.8 Environmental Management and Coordination (Sand Harvesting) Regulations, 2024

Sand and aggregate for concrete, mortar and blockwork used in construction must be sourced from suppliers operating under valid sand harvesting permits issued in accordance with these Regulations, which establish sustainable extraction limits, rehabilitation obligations and licensing requirements for sand harvesting sites. Given the documented environmental degradation, the developer and contractor should require proof of compliant sourcing from all sand and aggregate suppliers as part of the project's procurement and environmental management procedures, to avoid indirectly contributing to unsustainable extraction practices in the surrounding catchment.

4.4 Water Resources and Sanitation

4.4.1 Water Act 2016

Part II, section 18, of the water Act provides for national monitoring and information systems on water resources. Following on this, sub-section 3 allows the Water Resources Authority to demand from any person or institution, specified information, documents, samples or materials on water resources. Under these rules, specific records may require to be kept by a facility operator and the information thereof furnished to the authority.

Section 73 of the act allows a person with license (licensee) to supply water to make regulations for purposes of protecting against degradation of water sources. Section 75 ,sub-section 1 allows the licensee to construct and maintain drains, sewers and other works for intercepting, treating or disposing of any foul water arising or flowing upon land for preventing pollution of water sources within his/her jurisdiction.

4.4.2 Water Quality Regulations 2024

According to these regulations, every person shall refrain from any act that directly or indirectly causes or may cause immediate or subsequent water pollution. It shall be immaterial whether or not the water resource was polluted before the act's enactment.

No person shall throw or cause to flow into or near a water resource and liquid, solid or gaseous substance or deposit any such substance in or near, as to cause pollution.

No person shall:

- a) Discharge, any effluent from sewerage treatment works industry or other point source into aquatic environment without a valid effluent discharge license issued per the provisions of the act.
- b) Abstract groundwater or carry out any activity near any lakes, rivers, steam, springs and wells that are likely to have any adverse impact on the quantity and quality of the water without an Environment Impact Assessment license issued per the provisions of the Act; Or
- c) Cultivate or undertake development activity within a minimum of six meters and a maximum of thirty meters from the highest ever recorded flood level, on either side of a river or stream, and as may be determined by the authority from time to time.

The regulations outline the minimum permissible parameters to be disposed of into the environment and the waste water system shall adhere to the standards.

4.5 Land Administration and Physical Planning

4.5.1 The Physical and Land Use Planning Act 2019

An Act of Parliament to provide for the preparation and implementation of physical development plans and for connected purposes. The Physical Planning Act has provisions to control the development and use of land in particular areas, especially where a project may involve subdivisions or amalgamation of land parcels, or located in an area otherwise reserved for other uses. The following sections of the Act need to be considered:-

30. (1) No person shall carry out development within the area of a local authority without development permission granted by the local authority.

31. Any person requiring development permission shall make an application in the form prescribed in the Fourth Schedule, to the clerk of the local authority responsible for the area in which the land concerned is situated.

4.5.2 Urban Areas and Cities Act, 2011

Local authorities are given power to control or prohibit all developments which, by reason of smoke, fumes, chemicals, gases, dust, smell, noise, vibration or other cause, may be or become a source of danger, discomfort or annoyance to the neighborhoods, and to prescribe the conditions subject to which such developments shall be carried on. These powers were previously granted by The Local Authority Act, Cap 265 which is now repealed by this Act as indicated in Part VIII, Section 55 that states “All rights, assets and liabilities accrued in respect of the properties vested in the local authorities Established under the Local Government Act (Cap. 265) which shall stand repealed after the first election under the Constitution shall be dealt with as provided by law.”

4.6 Public Health, Labour and Occupational Safety

4.6.1 Employment Act – No. 11 of 2007

This is an Act of Parliament to repeal the Employment Act, declare and define the fundamental rights of employees, to provide basic conditions of employment of children, and to provide for matters connected with the foregoing.

Section 3 (1) states that, this Act shall apply to all employees employed by any employer under a contract of service. (6) States that, subject to the provisions of this Act, the terms and conditions of employment set out in this Act shall constitute minimum terms and conditions of employment of an

employee and any agreement to relinquish vary or amend the terms herein set shall be null and void. Section 9 of this Act defines the general provision of contract of service as outlined in subsection 1 below;-(1) A contract of service—for a period or a number of working days which amount in the aggregate to the equivalent, of three months or more; or

(a) which provides for the performance of any specified work which could not reasonably be expected to be completed within a period or some working days amounting in the aggregate to the equivalent of three months, shall be in writing.

4.6.2 Work Injury Benefits Act No. 13 of 2007

This is an Act of parliament that was enacted to provide a platform for compensation to employees for work-related injuries and occupational diseases contracted in the course of their employment or related training.

Part II on Obligations of Employers (1) Every employer shall obtain and maintain an insurance policy, with an insurer approved by the Minister in respect of any liability that the employer may incur under this Act to any of his employees.

The proponents and contractors shall provide insurance cover for their employee in case of an occurrence of an accident or contracting an occupational disease

Part III under Right to Compensation (1) an employee who is involved in an accident resulting in the employee's disablement or death is subject to the provisions of this Act, and entitled to the benefits provided for under this Act.

The proponents and the contractors shall provide appropriate PPEs for the workers and a fully stocked First Aid kit that should be managed by an individual trained in first aid.

4.6.3 Occupational Safety and Health Act (OSHA) - No. 15 of 2007

This is an act of Parliament to provide for the safety, health and welfare of workers and all persons lawfully present at workplaces. Section 6. (1) Every occupier shall ensure the safety, health and welfare at work of all persons working in his workplace. Section 7 also requires that the occupier develops a safety policy for the workplace and ensure that all workers know of it therefore the contractor shall ensure that a safety policy is in place during both the decommissioning and construction phases.

Section 9. (1) Every occupier shall establish a safety and health committee at the workplace following regulations prescribed by the Minister if— (a) there are *twenty or more persons* employed at the workplace; or (b) the Director directs the establishment of such a committee at any other workplace.

Section 44. (1) Before any person occupies or uses any premises as a workplace, he shall apply for the registration of the premises by sending to the Director a written notice containing the particulars set out in the Fourth Schedule.

The proponents or the contractor should ensure that the construction site for the proposed development is registered with the Directorate of Occupational Health and Safety. All other requirements of this act shall be complied with as outlined within the EMP of this report.

4.6.4 Penal Code Act (Cap.63) Revised Edition 2009

Section 191 of the penal code states that if 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 violates the atmosphere in any place to make it noxious to health of persons /institution, dwelling or business premises in the neighborhood or those

passing along public way, commit an offence.

Section 219 states that it is the duty of every person who has in his charge or under his control anything, that in the absence of care or precaution in its use or management, could endanger the life, safety or health of any person, to use reasonable care and take reasonable precaution to avoid danger. Whether the object is living or inanimate, moving or stationery, the individual will have been deemed to have caused any consequences which adversely affect the life or health of any person by reason of any omission to perform that duty. This therefore means that the proponents will have a duty of care under this Act.

There is no water body in close proximity to the site but the proponents has made arrangements for proper management of effluent which will be discharged. The proponents shall ensure zero tolerance to environmental polluting activities and equipment.

4.6.5 Public Health Act Cap. 242.

Under this Act, every local authority or health authority is mandated to take all lawful, necessary and reasonable practicable measures to prevent all injurious conditions in premises, construction conditions or manner of use of any trade premises. Nuisances under this act include any noxious matter or wastewater, flowing or discharged from any premises wherever situated, into any public street, or into the gutter or side channel of any street or watercourse, or any accumulation or deposit of refuse or other offensive matter. Every council and every urban area council may make by-laws as to buildings and sanitation.

4.7 County Government Framework

4.7.1 County Governments Act, 2012

The County Governments Act, 2012 operationalizes Chapter Eleven of the Constitution of Kenya, 2010 by establishing county governments and defining their functions in planning, service delivery, and sustainable development. Under Section 104, every county government is required to prepare integrated development plans that guide land use, infrastructure development, environmental conservation, and the provision of public services. Section 110 further requires that county planning be participatory, ensuring that residents and stakeholders are involved in development decision-making. In accordance with the Fourth Schedule of the Constitution, county governments are responsible for county planning, development control, public works, refuse removal, solid waste management, county roads, water and sanitation services, and environmental management at the county level. Consequently, the proposed mixed-use residential development has obtain the requisite approvals from the County Government of Machakos and must comply with the County's physical planning requirements, building regulations, public health standards, and environmental management provisions throughout the project lifecycle.

4.7.2 The Machakos County Environmental Management Act, 2022

The Machakos County Environmental Management Act, 2022 provides the legal framework for environmental governance and sustainable development within Machakos County. The Act complements EMCA, Cap. 387 by strengthening environmental management at the county level and promoting the conservation, protection, and sustainable use of natural resources. It requires all

development activities to be planned and implemented in a manner that safeguards environmental quality, public health, and the well-being of present and future generations.

The Act empowers the County Government to regulate activities relating to solid waste management, pollution control, stormwater management, environmental sanitation, protection of water resources, conservation of biodiversity, climate change adaptation, and restoration of degraded environments. It also promotes sustainable land use planning, environmental education, public participation, and collaboration between the County Government, NEMA, and other lead agencies in environmental management.

For the proposed mixed-use residential development, the Act requires compliance with county environmental requirements relating to waste segregation and disposal, wastewater management, drainage systems, dust and noise control during construction, environmental restoration, and maintenance of a clean and healthy environment. The Proponent shall therefore implement the Environmental and Social Management Plan (ESMP), obtain all relevant county approvals, and adopt appropriate pollution prevention and resource efficiency measures throughout the project lifecycle to ensure compliance with the provisions of the Act.

4.8 Building and Construction Legislation

4.8.1 The Standards Act Cap. 496

The Act is meant to promote the standardization of the specification of commodities, to provide for the standardization of commodities and codes of practice; to establish a Kenya Bureau of Standards, to define its functions and to provide for its management and control. Code of practice is interpreted in the Act as a set of rules relating to the methods to be applied or the procedure to be adopted in connection with the construction, installation, testing, sampling, operation or use of any article, apparatus, instrument, device or process.

4.8.2 National Construction Authority Act, 2011

The National Construction Authority (NCA) Act, 2011 establishes the National Construction Authority to regulate, streamline, and build capacity within Kenya's construction industry. The Act requires the registration of construction projects, contractors, and skilled construction workers, and promotes compliance with approved construction standards, quality assurance, and occupational safety. The proposed development shall be undertaken by NCA-registered contractors and professionals in compliance with the provisions of the Act.

4.8.3 Energy Act, 2019

The Energy Act, 2019 provides the legal framework for the generation, transmission, distribution, supply, and efficient use of energy in Kenya. The Act requires electrical installations to be designed, installed, tested, and maintained in accordance with approved safety standards while promoting energy efficiency and conservation. The proposed development shall incorporate safe electrical installations, energy-efficient lighting, and other energy-saving technologies in compliance with the Act.

4.9 National Policies

4.9.1 National Environment Policy, 2013

The National Environment Policy, 2013 provides the policy framework for managing Kenya's environment and promoting sustainable development. It emphasizes environmental impact assessment, pollution prevention, and sustainable use of natural resources, public participation, and integration of environmental considerations into development planning (Republic of Kenya, 2013). The policy is relevant to the proposed development because construction and operation may generate solid waste, wastewater, dust, noise and increased stormwater runoff. The project will therefore incorporate pollution prevention, waste management, stormwater control, landscaping and implementation of the ESMP.

4.9.2 National Land Policy, 2009

The National Land Policy, 2009 provides a framework for sustainable land administration, planning and utilization in Kenya. It promotes efficient land use, environmentally sustainable development, secure land tenure and appropriate planning of urban settlements (Republic of Kenya, 2009). The policy is relevant to the project because the proposed development involves intensive residential and commercial use of land in a rapidly urbanizing area of Syokimau. Compliance with approved planning and zoning requirements will promote orderly and sustainable utilization of the project site.

4.9.2 National Environmental Action Plan (NEAP)

The National Environmental Action Plan (NEAP) provides a framework for identifying and addressing environmental issues arising from development activities in Kenya. It promotes the integration of environmental considerations into national and sectoral development planning and emphasizes sustainable utilization of natural resources, pollution prevention, environmental conservation and participation of stakeholders in environmental management (Republic of Kenya, 1994).

The NEAP is relevant to the proposed mixed-use residential development because the project may generate environmental pressures including construction waste, wastewater, dust, noise, increased stormwater runoff and pressure on local infrastructure. The project will therefore incorporate appropriate measures for waste management, wastewater treatment, stormwater management, pollution control, landscaping and environmental monitoring in line with the principles of the NEAP.

4.9.3 National Climate Change Action Plan (NCCAP) III (2023–2027)

The National Climate Change Action Plan provides measures for enhancing Kenya's resilience to climate change while supporting low-carbon development. It promotes climate-resilient infrastructure, resource efficiency, sustainable waste management and reduction of greenhouse-gas emissions (Ministry of Environment and Forestry, 2023). The proposed development will incorporate climate-resilient measures including effective stormwater drainage, landscaping, energy-efficient installations, appropriate waste management and measures to reduce construction-related emissions.

4.9.4 Kenya Vision 2030

Kenya Vision 2030 is Kenya's long-term development blueprint aimed at creating a globally competitive and prosperous country with a high quality of life in a clean and secure environment (Government of Kenya, 2007). The proposed mixed-use residential development supports the Vision through provision of housing, private-sector investment, employment creation, improved urban infrastructure and economic activity. The project's environmental management measures will further support the Vision's objective of balancing economic development with environmental sustainability.

4.10 International Conventions and Agreements

4.10.1 Rio Declaration on Environment and Development, 1992

The Rio Declaration established key principles for sustainable development, including the precautionary principle, public participation, environmental protection and integration of environmental considerations into development decisions (United Nations, 1992). Its principles are relevant to the project through the EIA process, stakeholder consultation, impact assessment and implementation of mitigation measures.

4.10.2 Convention on Biological Diversity (CBD)

The Convention on Biological Diversity promotes conservation of biological diversity, sustainable use of biological resources and equitable management of genetic resources (United Nations, 1992). Although the project site is predominantly urbanized, the CBD is relevant because construction may affect existing vegetation and urban biodiversity. Retention or enhancement of vegetation through landscaping and green spaces will help minimize such impacts.

4.10.3 United Nations Framework Convention on Climate Change (UNFCCC)

The UNFCCC establishes the international framework for addressing climate change through mitigation of greenhouse-gas emissions and adaptation to climate impacts (UNFCCC, 1992). Its principles are relevant to the project through energy efficiency, responsible resource consumption, landscaping, waste reduction and climate-resilient stormwater infrastructure.

4.10.4 Paris Agreement

The Paris Agreement provides a legally binding international framework for strengthening climate action and seeks to keep global temperature increase well below 2°C while pursuing efforts to limit it to 1.5°C above pre-industrial levels (UNFCCC, 2015). The project can support these objectives through energy-efficient building systems, efficient electrical installations, waste reduction, landscaping and measures that improve resilience to flooding and other climate-related risks. (UNFCCC)

4.10.5 Sustainable Development Goals (SDGs)

The SDGs provide a global framework for achieving sustainable development by 2030, integrating economic development, social well-being and environmental protection (United Nations, 2015). (United Nations) The proposed development is particularly relevant to SDG 6 (Clean Water and Sanitation), SDG 8 (Decent Work and Economic Growth), SDG 9 (Industry, Innovation and Infrastructure), SDG 11 (Sustainable Cities and Communities), SDG 12 (Responsible Consumption and Production), and SDG 13 (Climate Action) through provision of housing, employment, wastewater treatment, sustainable infrastructure, responsible waste management and climate-resilient development.

CHAPTER FIVE

5.0 CLIMATE RISKS AND VULNERABILITY ASSESSMENT

5.1 Introduction

This chapter presents an assessment of climate-related risks and the vulnerability of the proposed mixed-use development to current and projected climate hazards over its construction and operational lifecycle. The assessment is prepared in fulfilment of the requirement under Section 58 of the Environmental Management and Co-ordination Act (EMCA), Cap 387, that climate change considerations be mainstreamed into environmental impact assessments, and in line with the Climate Change Act, No. 2 of 2016 and climate change regulations 2024, which obligates public and private entities to integrate climate risk management into planning and development decisions.

The objectives of this chapter are to:

- (i) Establish the baseline climate profile of the project area
- (ii) Identify climate hazards relevant to the site and surrounding locality
- (iii) Assess the exposure, sensitivity and adaptive capacity of the proposed development to these hazards
- (iv) Assign risk ratings to guide design and management decisions
- (v) Propose adaptation and resilience measures to be incorporated into the project design, Environmental Management Plan (EMP) and construction traffic and site management protocols.

5.2 Regulatory and Policy Context

The climate risk assessment is anchored in the following legal and policy instruments:

- The Climate Change Act, No. 2 of 2016, which establishes a regulatory framework for climate risk management, mitigation and adaptation, and requires State and non-State actors to mainstream climate considerations into their operations;
- The Environmental Management and Co-ordination Act (EMCA), Cap 387, and its subsidiary Climate Change Regulations, 2024, which require identification of climate change vulnerability as part of the EIA process;
- Kenya's updated Nationally Determined Contribution (NDC) to the Paris Agreement (2020), which prioritizes climate-resilient infrastructure and water resource management;
- The National Climate Change Action Plan (NCCAP) 2023–2027, which identifies flooding, drought and heat stress as priority climate risks for the Nairobi metropolitan region, including Machakos County;
- The Machakos County Integrated Development Plan (CIDP) and County Climate Change Fund framework, which flag Mavoko Sub-County – including the Mlolongo/Syokimau ward – as flood-prone and requiring climate-resilient urban planning;
- The Water Act, 2016, which governs riparian reserves, water resource management and abstraction, relevant to on-site water security and drainage design; and
- The Disaster Risk Management framework of the National Government (aligned with the Sendai Framework for Disaster Risk Reduction), relevant to flood early-warning and emergency response planning for the development.

5.3 Climate

The area falls within a semi-arid to sub-humid transitional agro-ecological zone at an elevation of approximately 1,600 metres above sea level. Rainfall in the locality follows Kenya's characteristic bimodal pattern, with long rains occurring between March and May and short rains between October and December, punctuated by pronounced dry spells. Mean annual rainfall in the wider Machakos/Mavoko area is estimated at 500–900 mm, with high inter-annual and intra-seasonal variability; short-duration, high-intensity storms are increasingly characteristic of the short-rains season. Mean annual temperatures range from approximately 18°C to 25°C, with a discernible warming trend over the past two decades consistent with regional and national climate records.

Soils in the Syokimau/Mavoko area are predominantly black cotton soils (vertisols), which exhibit low infiltration capacity, poor natural drainage and pronounced shrink–swell behaviour with changes in moisture content.

5.4 Observed Climate-Related Events

Syokimau and the wider Mavoko Sub-County have experienced repeated and well-documented flash-flooding events in recent years, providing direct empirical evidence of the area's exposure to extreme rainfall. Multi-agency assessments conducted attribute the flooding primarily to encroachment on riparian land, blockage and diversion of natural waterways, and the erection of structures on riparian reserves, compounded by inadequate and poorly maintained storm drainage infrastructure. The Nairobi–Namanga Road (bordering the wider Mavoko area) and internal Syokimau roads, including Katani and Chad Roads, have on multiple occasions been rendered impassable, with residents marooned in their homes and requiring evacuation by county disaster response teams and the Kenya Red Cross.

The Machakos County Participatory Climate Risk Assessment (PCRA) identifies Athi River, Muthwani, Tala and Mlolongo/Syokimau wards specifically as flood-prone, and links flooding episodes in the county to secondary public health risks, including cholera and other water-borne disease outbreaks. These findings confirm that flood risk in the immediate vicinity of the project site is not a hypothetical or purely projected hazard, but an established and recurring feature of the local climate and drainage environment that must be actively designed for.

5.5 Climate Change Projections

National and regional climate projections for the greater Nairobi/Machakos region indicate a continuation and intensification of the trends already observed:

Temperature: a projected increase in mean annual temperature of approximately 1.0–2.5°C by mid-century relative to historical baselines, with a higher frequency of hot days and warm nights

Rainfall intensity: while projected changes in total annual rainfall are less certain, there is high confidence in an increase in the frequency and intensity of extreme, short-duration rainfall events, elevating flash-flood risk even where seasonal totals remain similar to historical norms

Rainfall variability: more erratic onset and cessation of the long- and short-rains seasons, complicating water resource planning and increasing the likelihood of both flood and drought conditions occurring within the same year

Dry-spell frequency: an increased likelihood of prolonged dry spells between rainfall events, elevating water security risk for developments reliant on a single water source.

5.6 Climate Hazard Identification

Based on the baseline profile, observed events and regional projections above, the following climate hazards have been identified as relevant to the project:

- Flash flooding and surface water inundation, arising from high-intensity rainfall combined with constrained natural and constructed drainage
- Overloading of on-site and downstream stormwater drainage infrastructure
- Heat stress and elevated cooling/energy demand associated with rising ambient temperatures
- Water scarcity and drought stress affecting potable water supply reliability
- Wind and storm events of moderate intensity, typical of the Nairobi metropolitan area
- Secondary public health risk from water-borne and vector-borne disease following flood events, consistent with documented cholera risk in flood-affected Machakos County wards

5.7 Vulnerability Assessment Methodology

Vulnerability is assessed as a function of three components, consistent with IPCC-aligned climate risk assessment practice:

- Exposure: the degree to which the project's people, assets and infrastructure are situated in harm's way of a given hazard
- Sensitivity: the degree to which the project would be adversely affected if exposed
- Adaptive Capacity: the ability of the developer, estate management and residents to anticipate, cope with and recover from hazard impacts

Each hazard identified is rated qualitatively (Low/Medium/High) against these three components, and combined with a likelihood/consequence risk matrix to derive an overall inherent risk rating and a residual risk rating following implementation of the adaptation measures.

5.8 Project-Specific Exposure and Sensitivity

Sensitivity is elevated by three site-specific factors:

- The prevalence of black cotton soils with low infiltration capacity, which increases surface runoff volumes and can compromise pavement and foundation performance if not properly engineered
- The extensive impervious cover typical of medium- to high-density residential and commercial development, which further increases runoff generation relative to the pre-development condition
- Dependence on a limited number of access roads connecting to the wider Syokimau road network, which – as demonstrated by recent flooding events on Katani and Chad Roads – are themselves vulnerable to inundation and closure, with consequent implications for emergency access.

Adaptive capacity is currently assessed as Medium: the project is still at the design and licensing stage, meaning resilience measures can be built into the engineering design from the outset rather than retrofitted, and the developer has the financial and institutional capacity to implement and maintain the mitigation measures proposed in this chapter. Adaptive capacity is expected to move to High upon implementation of the measures.

5.9 Climate Risk Assessment Matrix

The table summarizes the inherent risk rating for each identified hazard (prior to mitigation) and the anticipated residual risk rating following implementation of the adaptation measures proposed.

Climate Hazard	Likelihood	Consequence	Inherent Risk	Residual Risk
Flash flooding / surface water inundation	High	High	High	Medium
Stormwater drainage system overload	High	Medium	High	Low–Medium
Heat stress / rising ambient temperature	Medium–High	Medium	Medium	Low
Water scarcity / drought stress	Medium	Medium–High	Medium–High	Medium
Wind / storm events	Low–Medium	Low–Medium	Low	Low

5.10 Climate Adaptation and Resilience Measures

5.10.1 Flooding and Stormwater Management (Priority Hazard)

Given the well-documented flood history of Syokimau and the surrounding Mavoko area, flood risk management is treated as the priority climate adaptation theme for this project. The following measures shall be incorporated:

- Commissioning of a site-specific hydrological and drainage study, including a stormwater master plan, prior to the commencement of construction, to be undertaken by a qualified engineer and shared with the Water Resources Authority (WRA) and Mavoko Water and Sewerage Company (MAVWASCO) for input on downstream capacity
- Design of on-site attenuation/detention facilities sized to accommodate at least a 1-in-25 to 1-in-50-year storm event, with an additional climate change allowance of 20–30% applied to design rainfall intensities
- Adoption of Sustainable Urban Drainage System (SUDS) principles, including permeable paving in parking areas and pedestrian walkways, bioswales and vegetated buffer strips, to reduce peak runoff and promote infiltration where soil conditions allow
- Setting of finished floor levels for ground-floor units and commercial shops with a minimum freeboard allowance above the highest recorded/predicted local flood level and above the crown of the adjoining access road
- Strict avoidance of construction or encroachment on any riparian reserve or natural drainage line traversing or adjoining the site, maintaining the statutory riparian setback as determined by WRA – directly addressing the encroachment cause identified by county officials as a principal driver of flooding in the wider Syokimau area
- Installation of silt traps, catch pits and a regularly maintained network of perimeter and internal storm drains discharging into an approved public drainage system, engineered so as not to increase flood risk to neighbouring properties

5.10.2 Heat Stress Mitigation

- Building orientation and layout designed to maximize natural cross-ventilation and minimize direct solar heat gain into habitable rooms
- Retention and enhancement of tree cover and landscaped green space within the development to reduce localized urban heat island effects and improve micro-climatic comfort in common areas.

5.10.3 Water Security and Drought Resilience

- Primary connection to the MAVWASCO piped water supply network, supplemented by an on-site borehole as a backup source
- Greywater recycling for landscape irrigation, and specification of water-efficient fittings and fixtures throughout the residential and commercial units

5.10.4 Wind and Structural Resilience

- Structural design in accordance with the wind-loading provisions of the Kenya Building Code and applicable Kenya Standards
- Secure storage and tie-down of loose construction materials and site facilities during the construction phase to minimize wind-related hazards

5.10.5 Public Health Resilience

- Provision of a functional, appropriately sized wastewater treatment to prevent contamination of surface water during flood events
- Elimination of stagnant-water breeding sites within the development to reduce vector-borne disease risk

5.11 Climate Monitoring, Reporting and Institutional Responsibility

Implementation of the above measures shall be tracked through the project's Environmental Management Plan (EMP), with the following monitoring arrangements:

- The appointed Estate/Facilities Manager shall conduct routine inspection and maintenance of all stormwater and drainage infrastructure, with heightened inspection frequency ahead of and during the long- and short-rains seasons;
- Rainfall and any localized flooding incidents on site shall be logged, with records made available to NEMA during compliance monitoring and audits;
- The performance of the stormwater attenuation system shall be reviewed annually and after any significant storm event, with remedial works undertaken as required
- The developer shall maintain liaison with the Machakos County Government's disaster management and climate change units to remain informed of area-wide early-warning information and county-led drainage improvement initiatives in Mavoko Sub-County.

5.12 Conclusion

The project site lies within a locality with a well-established and recurring exposure to flash flooding, driven primarily by intense rainfall events interacting with constrained natural drainage, black cotton soils and historical riparian encroachment in the wider Syokimau/Mavoko area. Provided the flood and stormwater management measures are rigorously incorporated at the detailed engineering design stage – in particular, adequately sized attenuation infrastructure, raised finished floor levels, and strict avoidance of riparian encroachment – the residual climate risk to the proposed development is assessed as manageable. The hydrogeological report shall be attached herein.

CHAPTER SIX

6.0 TRAFFIC MANAGEMENT PLAN AND SITE ACCESS ARRANGEMENTS

6.1 Introduction and Objectives

This chapter presents the Traffic Management Plan (TMP) and site access arrangements for the proposed development. The chapter assesses the anticipated traffic generated by the development, sets out the proposed site access, internal circulation and parking design, and specifies traffic management measures for both the construction and operational phases, in fulfilment of NEMA's requirement that developments likely to generate significant traffic demonstrate adequate access and traffic impact mitigation as part of the EIA process.

6.2 Regulatory Framework

- The Traffic Act, Cap 403, and associated road safety regulations
- The Kenya Roads Act, 2007, establishing the respective mandates of the Kenya National Highways Authority (KeNHA), Kenya Urban Roads Authority (KURA) and Kenya Rural Roads Authority (KeRRA) over the classified road network relevant to the site
- The Physical and Land Use Planning Act, 2019, and Machakos County spatial planning and development control standards, governing access, parking and plot coverage requirements
- The National Construction Authority Act, 2011, governing contractor registration and construction site management, including construction traffic
- The Occupational Safety and Health Act, 2007, relevant to site traffic safety for workers and the public during construction

6.3 Existing Road Network and Baseline Traffic Conditions

The project site is located within the Syokimau locality of Mavoko Sub-County, in close proximity to the Nairobi–Mombasa Highway (Mombasa Road/A8) and the Nairobi–Namanga Road, both of which carry substantial commuter traffic between Nairobi and the Athi River/Mavoko/Kajiado corridor as well as significant heavy commercial traffic associated with the Mombasa port corridor and the adjoining industrial areas of Mavoko. The locality is also served by the Nairobi Commuter Rail/SGR Syokimau station and by public service vehicle (matatu) routes operating along Mombasa Road and into the Syokimau estates, providing an existing base of public and mass-transit capacity that can absorb a portion of development-generated trips.

Internal roads within Syokimau, including Airport Road and Chady Road, are in poor condition in places, with inadequate and partly uncovered drainage that has contributed to repeated flood-related closures.

6.4 Development Traffic Generation

The trip generation estimates below are indicative, planning-stage figures derived by applying trip rates typically adopted for medium-density urban residential and neighbourhood retail development in the Nairobi metropolitan area. It is recommended, and shall be treated as a condition of this assessment, that a full formal Traffic Impact Assessment (TIA) be undertaken by a registered traffic/transportation engineer at the detailed design stage, incorporating site-specific traffic counts on the access road and adjoining Mombasa Road/Syokimau junctions, to confirm and refine these figures ahead of NEMA licensing and County development approval.

Basis	Trip Applied	Rate	Daily (Low)	Trips	Daily (High)	Trips
On-site parking provision	2–3 trips/day		206		309	

On this basis, the development is estimated to generate approximately 206–309 vehicle trips per day at full parking occupancy. Applying a typical peak-hour proportion of 10–15% of daily traffic for mixed residential/commercial development, this translates to an indicative peak-hour flow (AM or PM) of approximately 21–46 vehicle trips (two-way) at the site access.

6.5 Pedestrian, Cyclist and Non-Motorized Transport (NMT) Provisions

- Continuous, obstruction-free paved footpaths along all internal roads and the site frontage
- Clearly marked, raised or textured pedestrian crossing points at all points where the internal footpath network intersects vehicular circulation routes; and
- Secure parking provided at or near the commercial block

6.6 Construction-Phase Traffic Management

The appointed contractor shall prepare a detailed Construction Traffic Management Plan (CTMP), to be approved by the developer's Environmental/Site Manager prior to mobilization and made available to NEMA and the County on request. The CTMP shall address, at minimum:

- Designated haul/truck routes to and from Mombasa Road, avoiding narrow residential streets and sensitive receptors such as schools and health facilities wherever practicable
- Restriction of heavy vehicle (concrete, aggregate and material delivery) movements to defined hours outside the morning and evening school-run and commuter peaks (avoiding approximately 0630–0800hrs and 1500–1700hrs)
- Deployment of trained flag persons/traffic marshals and temporary warning signage at the site entrance during periods of concentrated vehicle movement, particularly concrete pours and major deliveries
- Secure hoarding around the site perimeter with clearly marked, protected pedestrian routing around the construction boundary

6.7 Conclusion and Recommendations

Provided the access, circulation, parking and construction-phase measures set out in this chapter are implemented the traffic impact of the development is considered manageable. It is recommended that a formal Traffic Impact Assessment by a registered traffic engineer be commissioned as a condition precedent to detailed design approval and NEMA licensing, to validate and refine the indicative figures presented in this chapter.

CHAPTER SEVEN

7.0 ANTICIPATED ENVIRONMENTAL AND IMPACTS AND THEIR MITIGATION MEASURES

7.1 Introduction

The proposed mixed-use residential development is expected to generate both positive and negative environmental and social impacts during the pre-construction, construction, operational and eventual decommissioning phases. The impacts may vary in magnitude, duration, extent and significance depending on the nature and intensity of project activities.

This chapter identifies and evaluates the anticipated impacts associated with the proposed development and provides appropriate mitigation and enhancement measures. The assessment considers direct, indirect, cumulative, short-term and long-term impacts, including impacts on the physical environment, biological environment, socio-economic conditions, public health and safety.

The assessment has considered the project's key components, including the residential blocks, commercial/convenience shops, construction activities, 103 parking spaces, internal roads, proposed borehole, wastewater treatment system, stormwater drainage, solid waste holding area, landscaping and recreational facilities. The identified mitigation measures shall be implemented through the Environmental and Social Management Plan (ESMP) and monitored throughout the project lifecycle.

Positive impacts such as employment creation, investment, provision of housing, improved land utilization and stimulation of local economic activities will be enhanced, while adverse impacts such as dust, noise, construction waste, occupational hazards, wastewater, stormwater runoff and traffic-related risks will be minimized through appropriate management measures.

The environmental Impacts of the project and the mitigation measures of the negative impacts are listed in below:

7.2 Positive Environmental and Social Impacts and Enhancement Measures

Table 5 Positive Environmental and Social Impacts and Enhancement Measures

No	Anticipated Positive Impact	Justification / Significance	Measures to Enhance the Positive Impact
1	Provision of housing	The development will provide 264 residential units for sale, contributing to the growing demand for planned housing in Syokimau and the wider Nairobi Metropolitan Region.	Deliver quality, safe and appropriately serviced residential units; comply with approved building and planning standards; provide adequate water, sanitation, parking, security and recreational facilities.
2	Optimal utilization of urban land	The proposed high-density development makes efficient use of land within an already urbanizing area, reducing pressure for scattered development on undeveloped land.	Maintain the approved development density and footprint
3	Employment creation	Construction will create direct employment for skilled, semi-skilled and unskilled workers, while operation will generate jobs in security, cleaning, maintenance, property management and other services.	Give qualified local residents priority where practicable; use fair recruitment procedures; provide skills development and occupational safety training.
4	Local economic development	Construction expenditure will stimulate demand for construction materials, transport, food, accommodation, professional services and other local businesses.	Source suitable materials and services locally where economically and technically feasible; engage local suppliers and service providers.
5	Investment and capital development	The project represents private investment in the built environment and will increase the productive use and economic value of the property.	Ensure timely implementation, proper maintenance and professional management of the development to protect the investment and surrounding property values.
6	Improved property values	A well-planned and properly maintained development can improve the quality and attractiveness of the surrounding built environment.	Maintain high construction standards, landscaping, cleanliness, security, drainage and waste management.
7	Improved urban infrastructure	The project will introduce and/or improve internal roads, stormwater drainage, water storage, security and other supporting infrastructure.	Design infrastructure to adequate capacity; maintain systems regularly; ensure stormwater and wastewater facilities remain functional throughout the project's operational life.
8	Improved landscaping and urban greening	Landscaping will enhance visual quality, provide green space and contribute to urban ecological functions within an otherwise developed environment.	Use suitable indigenous or climate-resilient plant species; maintain landscaped areas; maximize vegetated surfaces where practicable.

9	Improved security	Controlled access, security facilities, lighting and surveillance will improve safety within the development and potentially contribute to neighbourhood security.	Provide functional access control, security lighting, CCTV where appropriate and trained security personnel; maintain clear sightlines around the premises.
10	Government revenue generation	The project will contribute to public revenue through applicable statutory fees, approvals, licenses, rates, taxes and other charges.	Ensure timely compliance with statutory obligations and payment of applicable county and national government charges.
11	Support to professional services	The project creates demand for architects, engineers, environmental experts, surveyors, contractors, quantity surveyors, legal practitioners and other professionals.	Engage appropriately qualified and registered professionals in accordance with applicable Kenyan requirements.
12	Promotion of sustainable construction	Incorporating energy-efficient systems, wastewater treatment, waste segregation, landscaping and stormwater management provides an opportunity to demonstrate environmentally responsible urban development.	Apply resource-efficient technologies, energy-efficient lighting, water conservation measures, sustainable materials and environmentally responsible construction practices.
13	Improved quality of the built environment	Replacement or development of the site in accordance with approved plans can contribute to orderly urban growth and improve the visual and functional character of the neighbourhood.	Maintain architectural quality, appropriate landscaping, cleanliness, building maintenance and compliance with approved development plans.
14	Contribution to sustainable urban development	The project integrates residential, convenience commercial and recreational facilities within one development, reducing the need for residents to travel for some daily services.	Maintain the mixed-use character within the approved scope and provide safe pedestrian access between residential, commercial and recreational facilities.
15	Technology and skills transfer	The project will provide opportunities for local workers, technicians and contractors to gain practical experience in modern construction methods, building services, wastewater treatment, electrical installations, stormwater management, occupational safety and environmental management. This will strengthen local technical capacity and improve the employability of workers beyond the project.	Prioritize engagement of suitably qualified local workers; provide structured on-the-job training, toolbox talks and technical demonstrations; encourage experienced engineers, technicians and specialists to mentor local personnel; document good construction and environmental practices; and provide training on operation and maintenance of the wastewater treatment, electrical, fire safety, stormwater and other building systems.
16	Adoption of modern construction and environmental technologies	The development provides an opportunity to demonstrate efficient technologies such as wastewater treatment, energy-efficient electrical systems, controlled stormwater	Select appropriate, efficient and maintainable technologies; train operators and maintenance personnel; monitor system performance; and incorporate

		management, waste segregation and modern building services.	lessons learned into future maintenance and development activities.
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7.2.1 Overall Enhancement Approach

The positive impacts should be actively enhanced and sustained throughout the project lifecycle rather than being treated as incidental benefits. The Proponent should prioritize local employment and procurement, maintain high-quality infrastructure, implement efficient water and energy management, maintain the wastewater and stormwater systems, preserve landscaped areas, and provide safe recreational facilities. These measures will increase the project's contribution to housing provision, local economic development, environmental sustainability and orderly urban growth in Syokimau.

7.3 Anticipated Negative Environmental and Social Impacts and Mitigation Measures

Significance criteria: Magnitude = intensity of change; Extent = geographical area affected; Duration = period of impact; Reversibility = ability of the environment to recover; Likelihood = probability of occurrence; Significance = overall importance of the impact before and after mitigation.

Table 6: Anticipated Negative Environmental and Social Impacts and Mitigation Measures

S/N	Impact / Aspect	Phase	Magnitude	Extent	Duration	Reversibility	Likelihood	Significance Before Mitigation	Key Mitigation / Management Measures	Significance After Mitigation
1	Vegetation clearance and habitat disturbance	Construction	Low–Moderate	Site	Short-term	High	High	Moderate	Restrict clearance to approved footprint; retain existing vegetation where practicable; undertake landscaping and re-vegetation using suitable indigenous species.	Low
2	Soil disturbance and erosion	Construction	Moderate	Site/Local	Short-term	High	Moderate	Moderate	Phase excavation; stabilize exposed surfaces; cover stockpiles; provide temporary drainage, silt traps and erosion-control measures; reinstate disturbed areas promptly.	Low
3	Soil sealing and reduced infiltration	Construction/ Operation	Moderate–High	Site	Long-term	Low	High	High	Minimize unnecessary paving; retain landscaped areas; use permeable surfaces where feasible; provide adequate stormwater	Moderate

									attenuation, drainage and infiltration measures.	
4	Increased stormwater runoff and flash-flood effect	Construction/ Operation	High	Site/Down stream	Long-term	Moderate	High during heavy rainfall	High	Design drainage based on appropriate stormwater flows; provide adequate channels, attenuation and controlled discharge; maintain drains; install silt traps; avoid directing runoff onto neighbouring properties; inspect drainage before rainy seasons.	Moderate–Low
5	Impact on downstream drainage system	Operation	Moderate	Local/Down stream	Long-term	Moderate	Moderate	Moderate–High	Control peak runoff from the development; provide attenuation/controlled discharge; prevent sediment and solid waste from entering drains; regularly maintain the drainage network.	Low–Moderate
6	Wastewater generation and treatment	Construction/ Operation	Moderate	Site/Local	Long-term	High if controlled	High	High	Operate the proposed 120,000 L/day wastewater treatment system effectively; provide competent operators; undertake routine maintenance and effluent monitoring; prevent untreated discharge.	Low–Moderate
7	Groundwater contamination	Construction/ Operation	Moderate	Local	Long-term	Moderate	Low–Moderate	Moderate	Protect the proposed borehole; properly manage wastewater, fuels and chemicals; use bunded storage; provide spill-response facilities; monitor groundwater where necessary.	Low
8	Solid waste generation	Construction/ Operation	Moderate	Site/Local	Long-term	High	High	Moderate	Establish the proposed waste holding bay; segregate waste; promote reuse and recycling; engage licensed waste handlers; maintain clean storage areas and dispose of residual waste at approved facilities.	Low

9	Dust from construction activities	Construction	Moderate	Local	Short-term	High	High	Moderate–High	Water exposed surfaces; cover soil and material stockpiles; provide wheel-cleaning where necessary; enforce low vehicle speeds; cover trucks transporting loose materials; avoid unnecessary idling.	Low
10	Dust from dump trucks and material-delivery vehicles	Construction	Moderate	Local/Neighbourhood	Short-term	High	High	Moderate–High	Require all trucks carrying soil, sand and other loose materials to be covered; enforce controlled speeds; use designated access routes; clean mud/dust from roads; schedule deliveries appropriately; investigate complaints from neighbours.	Low
11	Noise and vibration	Construction	Moderate	Local	Short-term	High	High	Moderate–High	Restrict noisy activities to approved working hours; maintain equipment; avoid unnecessary idling; use well-maintained machinery; provide hearing protection; notify neighbours of unusually noisy works.	Low
12	Occupational health and safety	Construction	High	Site	Short–Medium	High	Moderate	High	Implement a site-specific OHS plan; provide PPE; conduct induction and toolbox talks; secure excavations; provide first aid; control machinery; install warning signs and emergency procedures.	Low–Moderate
13	Public health and safety	Construction/Operation	Moderate–High	Local	Medium–Long	High	Moderate	Moderate–High	Secure the site; control access; fence excavations; provide safe pedestrian movement; manage construction traffic; maintain sanitation and emergency arrangements.	Low
14	Traffic and road safety	Construction/Operation	Moderate	Local	Medium–Long	High	High	Moderate–High	Implement a traffic management plan; control site access; schedule heavy deliveries; use competent drivers; provide adequate internal parking; prevent obstruction of	Low

									Chady Road and neighbouring access routes.	
15	Privacy infringement to Amani Court	Construction/ Operation	Moderate	Immediate neighbour hood	Long-term	Low– Moderate	High	High	Provide appropriate building setbacks; orient windows and balconies sensitively; avoid direct overlooking of neighbouring private spaces; incorporate screening, landscaping and privacy measures; comply with approved planning requirements.	Moderate– Low
16	Visual intrusion from high-rise buildings	Operation	Moderate	Local	Long-term	Low	High	Moderate– High	Maintain approved building height and setbacks; use appropriate architectural design; provide landscaping and visual screening; ensure compliance with county planning requirements.	Moderate
17	Height-related aviation hazard to JKIA operations	Construction/ Operation	Potentially High	Regional/ Aviation	Long-term	Low	Project-specific	Potentially High	Obtain and retain the required aviation/height clearance and approvals from the relevant aviation authorities before construction; strictly comply with approved maximum building height; install any required aviation warning/lighting systems; do not exceed approved height.	Low, subject to approval
18	Urban Heat-Island Effect	Operation	Moderate	Site/Local	Long-term	Low– Moderate	High	Moderate– High	Increase tree and landscape cover; provide shaded areas; use suitable reflective/low-heat roofing and paving materials; maximize natural ventilation; provide green areas and reduce unnecessary hard surfaces.	Low– Moderate
19	Climate-change contribution	Construction/ Operation	Moderate	Local/Glo bal	Long-term	Low	High	Moderate	Minimize material wastage; promote energy efficiency; use efficient lighting and equipment; consider renewable energy; encourage waste reduction and	Low

									recycling; maintain vegetation and green areas.	
20	Climate-change vulnerability	Operation	Moderate–High	Site/Local	Long-term	Moderate	High	High	Design drainage for intense rainfall events; provide adequate stormwater capacity and attenuation; use climate-resilient landscaping; incorporate water conservation and emergency preparedness measures.	Moderate–Low
21	Water demand	Construction/Operation	Moderate	Local	Long-term	High	High	Moderate	Use water-efficient fixtures; repair leaks; monitor consumption and borehole abstraction; promote rainwater harvesting and appropriate reuse of treated water.	Low
22	Energy consumption	Construction/Operation	Moderate	Site/Local	Long-term	Moderate	High	Moderate	Use energy-efficient lighting and equipment; maximize natural lighting and ventilation; use efficient pumps; consider solar systems where feasible.	Low
23	Fire risk	Construction/Operation	High	Site/Local	Long-term	High	Moderate	High	Install fire detection, alarms, extinguishers and fire-fighting systems; maintain emergency exits and access; conduct fire drills; inspect electrical and LPG installations regularly.	Low–Moderate
24	Soil and groundwater contamination from spills	Construction/Operation	Moderate	Site/Local	Short–Long	Moderate	Moderate	Moderate	Store fuels and chemicals securely on impermeable/bunded surfaces; provide spill kits; train workers; prohibit discharge onto the ground; promptly contain and remediate spills.	Low
25	Construction material and embodied-carbon impacts	Construction	Moderate	Regional	Medium-term	Low	High	Moderate	Minimize material wastage; reuse/recycle where practicable; source materials responsibly; use locally available materials where appropriate; consider lower-carbon alternatives.	Low

26	Social disturbance and community conflict	Construction	Moderate	Local	Short–Medium	High	Moderate	Moderate	Maintain stakeholder engagement; implement a grievance mechanism; enforce workers' code of conduct; control working hours; address complaints promptly.	Low
27	Structural failure/safety risks	Construction/ Operation	High	Site	Long-term	Low	Low–Moderate	High	Engage registered professionals and competent contractors; comply with approved structural designs and Building Code requirements; use certified materials; undertake inspections and maintenance.	Low
28	Wastewater treatment-system failure	Operation	High	Local/Downstream	Long-term	Moderate	Low–Moderate	High	Preventive maintenance; competent operators; regular effluent testing; standby arrangements; emergency response procedure; maintain treatment and maintenance records.	Low
29	Cumulative pressure on local infrastructure	Operation	Moderate	Local	Long-term	Moderate	High	Moderate–High	Ensure adequate capacity of water, wastewater, drainage, parking and waste-management infrastructure; maintain facilities; coordinate with relevant authorities and service providers.	Low–Moderate
30	Light pollution and night-time disturbance	Operation	Low–Moderate	Local	Long-term	High	Moderate	Low–Moderate	Use appropriately directed security lighting; avoid excessive illumination of neighbouring properties; use energy-efficient lighting and controls.	Low

7.3.1 Impact Significance Interpretation

The significance of anticipated impacts was assessed based on magnitude, spatial extent, duration, reversibility, likelihood of occurrence and overall significance. The assessment considered the nature and sensitivity of the receiving environment, including neighbouring residential developments, existing drainage systems, groundwater resources, road infrastructure and the urban setting of Syokimau.

Impacts assessed as high significance before mitigation include stormwater and potential flash-flood effects, wastewater treatment failure, occupational and public safety risks, fire hazards, soil sealing, climate-change vulnerability, and potential aviation/height risks associated with the proximity of Jomo Kenyatta International Airport (JKIA). The potential privacy and visual impacts on neighbouring low-density developments, including Amani Court, are also considered important due to the proposed building height and density.

Most construction-related impacts, including dust, noise, erosion, waste generation and traffic, are expected to be short- to medium-term and largely reversible. With effective implementation of the proposed mitigation measures, monitoring and compliance with approved designs and statutory requirements, these impacts can generally be reduced to low or low-to-moderate residual significance.

Particular emphasis should be placed on stormwater management, wastewater treatment, building height and aviation clearance, privacy protection, occupational safety and climate resilience throughout the project lifecycle.

CHAPTER EIGHT

8.0 ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

8.1 Introduction

The Environmental and Social Management Plan (ESMP) provides a practical framework for implementing, monitoring and reviewing the mitigation measures identified in Chapter Five. It translates the identified environmental and social impacts into specific management actions, assigns responsibilities and provides a basis for allocating adequate resources for environmental, social, health and safety management throughout the project lifecycle.

The objectives of the ESMP are to:

- Guide the Proponent, consultants, contractors and other project implementers in incorporating environmental and social considerations into project planning, construction and operation.
- Provide clear mitigation measures for the anticipated adverse environmental and social impacts.
- Identify the timing, responsibility and institutional arrangements for implementing mitigation measures.
- Provide a framework for environmental and social monitoring and performance evaluation.
- Ensure adequate financial, human and technical resources are allocated for implementation of the mitigation measures.
- Promote compliance with EMCA, Cap. 387, the EIA & EA Regulations, 2003 (as amended) and other applicable national and county requirements.
- Provide measures for occupational health and safety, public safety, emergency preparedness and pollution prevention.
- Ensure effective management of wastewater, solid waste, stormwater, dust, noise and other project-related environmental risks.
- Promote stakeholder engagement, grievance management and good relations with neighbouring communities.
- Enhance positive project benefits such as local employment, skills development, technology transfer, landscaping and improved housing.
- Provide a basis for monitoring the effectiveness of mitigation measures and undertaking corrective action where required.

The ESMP shall be implemented as a continuous management process, with the measures reviewed and improved in response to monitoring results, complaints, incidents, changes in project activities and environmental conditions.

8.2 ESMP Implementation and Responsibility

Implementation of the ESMP will require coordinated participation by the Proponent, project consultants, contractor, environmental and social personnel, workers, facility management and relevant government agencies.

The Proponent shall have overall responsibility for ensuring that adequate resources are provided for implementation of the ESMP. During construction, the contractor shall be responsible for implementing day-to-day environmental, social, health and safety measures under the supervision of the relevant consultants and the Proponent.

During operation, responsibility shall progressively shift to the development/property management team, which shall maintain the wastewater treatment system, stormwater drainage, waste-management facilities, fire-safety installations, landscaping and other environmental infrastructure.

8.3 ESMP Costing

The ESMP includes mitigation and monitoring measures whose implementation will require financial, technical and human resources. Where practicable, the estimated costs of individual mitigation measures should be incorporated into the project budget.

Some mitigation measures may not require separate cost allocations because they form part of normal construction or operational activities. For example, the cost of PPE, equipment maintenance, site housekeeping, water sprinkling and waste handling may be incorporated into the contractor's general construction costs.

However, specific environmental infrastructure and activities including stormwater drainage and attenuation, wastewater treatment, waste holding facilities, landscaping, fire-safety systems, environmental monitoring, occupational safety measures and environmental audits should be adequately budgeted and maintained throughout the project lifecycle.

The ESMP cost estimates should therefore be treated as indicative provisions and reviewed during detailed design, procurement and construction planning.

8.4 ESMP Implementation Period

The ESMP shall cover the pre-construction, construction, operational and, where applicable, decommissioning phases of the proposed development.

During construction, environmental and social performance should be monitored regularly to identify non-compliance and emerging impacts. At completion of construction, an Environmental Audit (EA) should be undertaken as required under the applicable regulatory framework to assess compliance with the approved EIA conditions and the effectiveness of the implemented mitigation measures.

During operation, environmental management should continue through routine inspections, monitoring, maintenance, record keeping and periodic environmental audits. Where monitoring identifies new or inadequately controlled impacts, corrective measures shall be introduced.

8.5 Environmental and Social Monitoring

Monitoring will provide an early warning mechanism for determining whether mitigation measures are effective. Key parameters to be monitored will include:

- **Stormwater:** drainage condition, blockages, erosion, runoff accumulation and flooding incidents.
- **Wastewater:** treatment-system performance, effluent quality, system capacity, maintenance and discharge arrangements.
- **Solid waste:** quantities, segregation, storage, collection and disposal.
- **Air quality:** visible dust, dust complaints, vehicle emissions and effectiveness of dust suppression.
- **Noise:** construction noise, equipment condition, working hours and community complaints.
- **Water:** consumption, borehole abstraction and water quality where applicable.
- **Soil:** erosion, contamination, spills and exposed surfaces.
- **Occupational health and safety:** accidents, incidents, PPE compliance, toolbox talks and emergency preparedness.
- **Public safety:** site access, excavations, traffic management and complaints.
- **Fire safety:** alarms, extinguishers, emergency exits, fire equipment and drills.
- **Landscaping:** vegetation establishment, tree survival and maintenance of green spaces.
- **Social issues:** grievances, community complaints, worker conduct and stakeholder concerns.
- **Climate resilience:** drainage performance during heavy rainfall, heat exposure and water availability.

Monitoring results shall be documented and used to initiate corrective action where necessary.

8.6 Environmental and Social Management Plan (ESMP) Matrix

Environmental and Social Aspect/Impact	Project Phase	Proposed Measures	Mitigation	Responsibility for Mitigation	Monitoring Means	Recommended Frequency of Monitoring	Estimated Cost (Kshs.)
Vegetation clearance and disturbance of existing grass cover	Pre-construction/Construction	Restrict vegetation clearance to the approved footprint; retain vegetation where practicable; avoid unnecessary disturbance; undertake landscaping and re-vegetation after construction.		Proponent/Contractor/EHS Officer	Site inspection; photographic records	Weekly during clearance; monthly thereafter	30,000.
Soil disturbance, erosion and sedimentation	Construction	Phase excavation; stabilize exposed soils; cover stockpiles; provide temporary drainage and silt traps; avoid leaving excavated surfaces exposed for prolonged periods; reinstate disturbed areas.		Contractor/EHS Officer	Visual inspection; erosion checklist	Weekly and after heavy rainfall	Within Project Construction Budget
Soil sealing and reduced infiltration	Construction/Operation	Minimize unnecessary hard surfacing; retain landscaped areas; use permeable paving where practicable; provide adequate stormwater attenuation and drainage; maintain open/green areas.		Proponent/Architect/Contractor/Property Manager	Site inspection; approved drawings; drainage inspection	Monthly during construction; quarterly operation	300,000
Increased stormwater runoff and flash-flood effects during heavy downpours	Construction/Operation	Design drainage for anticipated peak flows; provide adequately sized drains and controlled discharge; provide attenuation where necessary; prevent discharge onto neighbouring properties; maintain drainage channels and remove blockages.		Proponent/Engineer/Contractor/Property Manager	Drainage inspection; rainfall/flooding records; complaints register	Weekly during construction; before and after major rainfall; quarterly operation	1,000,000
Downstream impact on drainage system	Construction/Operation	Control runoff from the development; prevent sediment and solid waste entering drains; provide controlled discharge; maintain drainage infrastructure and erosion protection.		Contractor/Engineer/Property Manager	Inspection of discharge points; drainage records	Monthly and after heavy rainfall	Within Project Construction/operation Budget

Dust from excavation, material handling and construction activities	Construction	Regularly water exposed surfaces; cover stockpiles; minimize drop heights during material handling; control vehicle speeds; avoid unnecessary idling; provide appropriate PPE.	Contractor/OHS & Environmental Officer	Visual inspection; complaints register	Daily during dusty activities	250,000
Dust from dump trucks and material delivery vehicles	Construction	Require trucks carrying soil, sand and other loose materials to be covered; enforce low speeds; use designated access routes; clean affected roads; avoid overloading vehicles; schedule deliveries appropriately. Dedust dusty roads due to dump tracks impacts	Contractor/Transport Supervisor/EHS Officer	Vehicle inspection; site inspection; complaints register	Daily during deliveries	150,000
Noise and vibration from construction equipment	Construction	Restrict noisy activities to approved working hours; maintain machinery; avoid unnecessary idling; use well-maintained equipment; notify neighbours of unusually noisy activities; provide hearing protection.	Contractor/OHS Officer	Noise observations/measurements; complaints register	Daily observations; measurements when necessary	Within Project Construction/operation Budget
Construction traffic and road safety	Construction	Prepare traffic management procedures; control site entry and exit; use competent drivers; schedule heavy deliveries; provide signage; prevent obstruction of public roads; provide safe pedestrian movement.	Contractor/Traffic Supervisor	Traffic inspection; incident records	Daily	100,000
Occupational health and safety risks	Construction	Provide PPE; undertake worker induction and toolbox talks; secure excavations; provide safe working platforms; install warning signs; conduct risk assessments; provide first aid and emergency facilities. Register the site with DOSH. Secure a WIBA Insurance policy	Contractor/EHS Officer	PPE inspections; training records; incident register	Daily/weekly	400,000
Public health and safety risks	Construction	Secure the construction site; fence hazardous areas; restrict unauthorized access; secure excavations; provide	Contractor/Security/EHS Officer	Site inspection; complaints and	Daily	250,000

		warning signs and safe pedestrian routes; maintain sanitation. Secure a third-party insurance policy covering public injury.		incident records		
Generation of construction solid waste	Construction	Segregate waste; reuse suitable materials; provide designated storage areas; prevent indiscriminate dumping; engage licensed waste handlers; maintain disposal records.	Contractor/Environmental Officer	Waste inspection; waste transfer/disposal records	Weekly	Within Project Construction Budget
Generation of domestic and commercial solid waste	Operation	Establish and maintain the proposed waste holding bay; segregate waste; promote recycling; engage licensed waste handlers; prevent accumulation of waste.	Property Management/Waste Contractor/Home Owners/Tenants	Waste inspection; disposal records	Weekly	80,000 Monthly
Wastewater generation	Construction/Operation	Provide adequate temporary sanitation during construction; operate the proposed 120,000-litre/day wastewater treatment system; undertake routine maintenance; prevent untreated discharge; maintain treatment records.	Contractor/Proponent/Property Manager/Plant Operator	Plant inspection; effluent testing; maintenance records	Routine; monthly/quarterly testing as applicable	300,000
Failure of wastewater treatment system	Operation	Establish preventive maintenance; employ competent operators; provide standby arrangements; monitor effluent quality; establish emergency procedures for plant failure.	Property Manager/Plant Operator	Effluent analysis; plant performance records; maintenance log	Daily operational checks; monthly review	300,000 annually
Groundwater contamination	Construction/Operation	Protect the proposed borehole; maintain sanitary separation; prevent wastewater, fuel and chemical contamination; provide appropriate drainage around the borehole; monitor water quality.	proponent/Contractor/Property Manager	Borehole inspection; water-quality testing	Quarterly and after significant incidents	20,000 annually

Increased water demand	Construction/Operation	Install water-efficient fixtures; repair leaks; monitor consumption; control borehole abstraction; promote rainwater harvesting and appropriate reuse of treated water where feasible.	Contractor/Property Manager	Meter readings; borehole records; water audits	Monthly	Within Project Construction/operation Budget
Energy consumption and greenhouse-gas emissions	Construction/Operation	Use energy-efficient equipment and lighting; maximize natural lighting and ventilation; maintain electrical systems; use efficient pumps; consider solar/renewable energy where feasible.	Proponent/Contractor/Property Manager	Energy bills/meters; energy inspections	Monthly	Within Project Construction/operation Budget
Climate-change contribution	Construction/Operation	Minimize material wastage; promote reuse/recycling; use energy-efficient systems; consider renewable energy; maintain vegetation; encourage low-carbon construction practices.	Proponent/Contractor/Property Manager	Energy/waste records; site inspections	Quarterly	Within Project Construction/operation Budget
Climate-change vulnerability	Construction/Operation	Design drainage to accommodate intense rainfall; provide adequate stormwater capacity; maintain green areas; implement water conservation; prepare for extreme weather events.	Proponent/Engineer/Property Manager	Drainage inspection; flood/heat records	Before rainy seasons and after extreme events	Within Project Construction/operation Budget
Urban Heat-Island Effect	Operation	Increase tree and landscape cover; provide shaded areas; reduce unnecessary paved surfaces; use appropriate roofing/paving materials; maximize natural ventilation.	Proponent/Architect/Property Manager	Landscaping inspection; site observations	Monthly/quarterly	Within Project Construction/operation Budget

Privacy infringement/overlooking of Amani Court and neighbouring properties	Construction/Operation	Maintain approved setbacks; sensitively orient windows and balconies; provide screening, boundary landscaping and privacy features; avoid unnecessary direct overlooking of neighbouring private spaces.	Proponent/Architect/Contractor	Approved drawings; site inspection; complaints register	At design/construction stages; quarterly operation	Within Project Construction/operation Budget
Visual intrusion from proposed high-rise development	Construction/Operation	Implement approved architectural design; maintain setbacks; provide landscaping and visual screening; prevent unauthorized alterations or additional floors.	Proponent/Architect/Contractor	Planning inspections; architectural review	Monthly construction; annually operation	Within Project Construction/operation Budget
Potential aviation/height hazard associated with proximity to JKIA	Pre-construction/Construction/Operation	Obtain the required aviation/height clearance and approvals before construction; comply strictly with approved building height; install aviation warning/lighting systems to the buildings and the construction cranes; prohibit unauthorized height increases.	Proponent/Architect/Engineer/KCAA	Approval documents; construction inspections; as-built verification	Before construction; at key construction stages; final inspection	50,000
Fire risk	Construction/Operation	Install fire detection and alarm systems, extinguishers, fire-fighting equipment and emergency exits; maintain fire access; conduct drills; inspect electrical installations.	Contractor/Fire Safety Officer/Property Manager	Fire inspection; equipment checklist; drill records	Monthly; drills periodically	500,000
Emergency and disaster risks	Construction/Operation	Prepare emergency response and evacuation procedures; establish assembly points; provide first aid and emergency contacts; conduct drills; maintain emergency equipment.	Contractor/EHS Officer/Property Manager	Emergency drills; inspection; incident records	Monthly inspections; periodic drills	200,000

Soil contamination from fuel, oils and chemicals	Construction/Operation	Store chemicals and fuels in secure bunded areas; provide spill kits; train workers; use impermeable surfaces; prohibit disposal onto the ground; immediately contain and remediate spills.	Contractor/EHS Officer/Property Manager	Spill inspections; chemical inventory; incident records	Weekly; after every incident	Within Project Construction/operation Budget
Structural failure and building safety risks	Construction/Operation	Engage registered professionals; comply with approved structural designs and applicable building standards; use certified materials; undertake inspections and maintenance; prohibit unauthorized structural modifications.	Proponent/Architect/Structural Engineer/Contractor	Inspection certificates; construction records; structural inspections	At critical construction stages; periodic operation	Within Project Construction/Consultancy Budget
Social conflict and community disturbance	Construction	Maintain communication with neighbours; control working hours; manage traffic and noise; enforce workers' code of conduct; maintain a grievance mechanism.	Proponent/Contractor/Community Liaison Personnel	Grievance register; stakeholder meetings	Monthly and as complaints arise	Within Project Construction/operation Budget
Worker influx and social interaction	Construction	Prioritize local employment where feasible; enforce workers' code of conduct; prohibit harassment and discrimination; provide worker/community awareness programmes.	Contractor/HR/EHS Officer	Employment records; training records; grievances	Monthly	Within Project Construction/operation Budget
Technology and skills transfer	Construction/Operation	Provide on-the-job training, mentorship and technical demonstrations in construction, wastewater treatment, electrical systems, fire safety, stormwater management and environmental management.	Contractor/Consultants/Property Manager	Training records; attendance sheets; competency assessments	Monthly during construction; quarterly operation	150,000

Cumulative pressure on water, roads, drainage and waste infrastructure	Operation	Maintain adequate internal infrastructure; promote water conservation; maintain wastewater and drainage systems; provide sufficient parking and solid waste facilities; coordinate with relevant authorities and service providers.	Proponent/property Manager/Relevant Authorities	infrastructure inspections; service records; complaints	Quarterly	Within Project Construction/ operation Budget
Light pollution and disturbance to neighbours	Operation	Direct security lighting towards required areas; avoid excessive illumination of neighbouring properties; use efficient lighting and automatic controls where appropriate.	Property Manager	Night-time inspection; complaints register	Quarterly	100,000
Landscape degradation and loss of green areas	Operation	Maintain trees, grass and landscaped areas; replace dead plants; prevent unnecessary conversion of green areas into hard surfaces; maintain children's play area and jogging track.	Property Manager	Landscaping inspection	Monthly	200,000 annually
Lightning strikes, electrical surges and associated safety risks	Construction/Operation	Install a professionally designed lightning protection especially the construction tower and the open ground on the site and earthing system; provide surge protection devices; ensure proper bonding of metallic and electrical systems; undertake periodic testing and maintenance; display appropriate thunderstorm safety procedures and restrict exposed outdoor activities during severe storms.	Proponent/Contractor/ Electrical Engineer/Property Manager	Inspection and testing certificates; earthing resistance tests; maintenance records	During installation; annually and after major lightning events	100,000

8.7 Environmental Audit, Monitoring and ESMP Review

The implementation of the ESMP shall be subject to continuous monitoring and periodic review. Monitoring results shall be documented through inspection checklists, photographs, waste records, wastewater monitoring results, training records, incident

registers, grievance records, water and energy consumption records and maintenance reports. The Proponent shall ensure that an Environmental Audit (EA) one year after the license issuance is undertaken in accordance with the applicable requirements under EMCA, Cap. 387 and the EIA & EA Regulations, 2003 (as amended).

Where monitoring demonstrates that a mitigation measure is ineffective, the Proponent shall introduce corrective measures, assign responsibility and establish a reasonable completion period. The ESMP shall therefore operate as a continuous improvement cycle:

Impact Identification → Mitigation → Monitoring → Evaluation → Corrective Action → Review → Improved Management.

This approach ensures that environmental and social management remains responsive to actual site conditions throughout the pre-construction, construction, operation and eventual decommissioning phases of the proposed development.

8.8 Decommissioning Phase

Decommissioning is a controlled process undertaken when the proposed development reaches the end of its useful or economic life, becomes obsolete, or is earmarked for redevelopment. The objective is to ensure that the closure, dismantling, demolition and removal of the development and its associated infrastructure are undertaken in a manner that protects human health, occupational and public safety, neighbouring properties and the environment.

At the end of the development's lifespan, the Proponent shall prepare an appropriate Decommissioning Plan and obtain any approvals required by the relevant authorities before commencing demolition or removal works. The plan shall identify the structures and infrastructure to be removed, demolition methods, waste-management arrangements, health and safety requirements, rehabilitation measures and the intended future use of the site.

The following measures shall be implemented:

- Occupants, tenants, neighbouring residents and other affected stakeholders shall be notified at least two (2) months before commencement of decommissioning, where practicable.
- Electricity supply shall be safely disconnected in consultation with Kenya Power, and all electrical installations shall be isolated before demolition.
- Water supply and other utility connections shall be terminated in consultation with the relevant service providers.
- A detailed demolition and decommissioning plan shall be prepared by qualified professionals and implemented by competent contractors.
- Structural assessments shall be undertaken before demolition to identify potential collapse and other structural hazards.
- Workers shall receive appropriate induction and training and shall be provided with suitable PPE, including helmets, safety footwear, gloves, eye and respiratory protection and other task-specific equipment.
- The demolition area shall be securely fenced and access restricted to authorized personnel. Appropriate warning and safety signage shall be installed.
- Demolition activities shall be undertaken in a controlled manner to minimize risks to neighbouring properties, roads, utilities and the public.
- Dust generated during demolition and loading shall be controlled through appropriate water suppression and other suitable measures.
- Noise and vibration shall be controlled by using appropriate equipment, maintaining machinery and restricting excessively noisy activities to approved working hours.
- Reusable materials such as doors, windows, steel, fittings and other components shall be salvaged where technically and economically feasible.
- Construction and demolition waste shall be segregated, reused or recycled where possible, with residual waste transported by licensed waste handlers to approved disposal facilities.

- Hazardous materials, if identified, shall be separately handled, stored, transported and disposed of in accordance with applicable environmental and occupational health and safety requirements.
- Fuels, oils, chemicals and other potentially polluting substances shall be appropriately managed to prevent soil and groundwater contamination.
- Stormwater drains shall be protected from demolition debris, sediments and other waste.
- Any contaminated soil or areas affected by spills shall be investigated and appropriately remediated.
- After demolition, foundations, slabs, underground utilities and other redundant infrastructure shall be removed or safely secured as appropriate to the approved future land use.
- The site shall be graded and stabilized to prevent erosion, uncontrolled runoff and water ponding.
- Disturbed areas shall be landscaped and revegetated using appropriate vegetation to restore the site's environmental quality and visual amenity.
- A final inspection shall be undertaken to confirm removal of waste, hazardous materials and unsafe structures and to verify that the site has been satisfactorily rehabilitated.
- A decommissioning completion report shall be prepared and maintained as evidence of compliance and to document rehabilitation measures undertaken.

The decommissioning process shall apply the principles of waste minimization, reuse, recycling and environmentally sound disposal, while ensuring that the site is left in a safe, stable and environmentally acceptable condition suitable for its approved future use.

CHAPTER NINE

9.0 ANALYSIS OF PROJECT ALTERNATIVES

9.1 Introduction

This chapter evaluates reasonable alternatives considered for the proposed mixed-use residential development in Syokimau, Mavoko Municipality, Machakos County. The alternatives are assessed in relation to environmental performance, technical feasibility, economic viability, land-use compatibility, resource efficiency, public safety and social considerations. The assessment considers the No-Project Alternative, Site Relocation Alternative, Construction Materials and Technology, Wastewater Management, Water Supply, Stormwater Management and Solid Waste Management.

The preferred alternatives are those that provide an appropriate balance between environmental protection, technical suitability, economic feasibility and the objectives of the proposed development.

9.2 No-Project Alternative

The No-Project Alternative would maintain the site in its existing condition and the proposed development would not be implemented. From a strictly environmental perspective, this option would avoid construction-related impacts such as vegetation disturbance, dust, noise, soil disturbance, and increased stormwater runoff and construction waste.

However, the option would also forgo the potential economic and social benefits associated with the development. The available land would remain underutilized, while opportunities for employment, investment, local procurement, skills development and increased economic activity would not be realized.

The No-Project Alternative would therefore result in:

- Failure to optimize the use of land in a rapidly developing urban area;
- Loss of direct and indirect employment opportunities;
- Loss of investment and associated economic benefits;
- Failure to contribute additional residential accommodation to the growing urban population;
- Loss of opportunities for local suppliers, contractors and service providers;
- Loss of potential revenue through development-related economic activities and statutory charges; and
- Continued underutilization of strategically located private land.

Although the No-Project Alternative eliminates the environmental impacts associated with construction and operation, the identified impacts of the proposed project can be substantially reduced through appropriate planning, mitigation and implementation of the ESMP.

The No-Project Alternative is therefore considered less preferable from the socio-economic and development perspective, while the proposed project with appropriate mitigation is considered the preferred option.

9.3 Site Relocation Alternative

The proposed development site is located in Syokimau, Mavoko Municipality, Machakos County, within an area experiencing rapid residential and mixed-use development. The site benefits from proximity to major transport and economic facilities, including JKIA, the SGR, Nairobi and major industrial and commercial areas.

Relocating the project would require identification and acquisition of another suitable site with comparable accessibility, infrastructure and planning characteristics. This would result in additional costs associated with land acquisition, design, and feasibility studies, planning approvals, environmental assessment and infrastructure provision.

Relocation could also introduce new environmental and social impacts at the alternative location, which would require a separate assessment.

The existing site is already intended for development and the proposed project can be implemented subject to compliance with applicable planning, environmental, aviation, building and other statutory requirements.

The site relocation alternative is therefore considered technically and economically less viable than implementing the project at the proposed site.

9.4 Alternative Construction Materials and Technology

Alternative construction materials and technologies were considered to determine options that could provide adequate structural performance while reducing resource consumption, construction waste and environmental impacts. The assessment considered structural suitability, durability, availability of materials and skilled labour, construction cost, embodied energy, construction speed and potential contribution to sustainable development. The following alternatives were considered.

9.4.1 Conventional Reinforced Concrete and Masonry – Preferred Option

Conventional reinforced concrete and masonry construction remains the most suitable primary construction technology for the proposed multi-storey residential development. The system uses reinforced concrete columns, beams, slabs and foundations, together with masonry walling and conventional finishes. Its principal advantage is its established structural performance and suitability for multi-storey buildings, where considerable attention must be given to load-bearing capacity, durability and resistance to environmental and operational stresses. Concrete and masonry materials are also widely available in Kenya, while local contractors, engineers and artisans have extensive experience in their application. This

improves construction practicality, quality control and access to technical expertise. The technology also provides flexibility in architectural design and allows integration of other sustainable technologies, including energy-efficient lighting, solar systems, water-efficient fittings and rainwater harvesting (National Construction Authority, 2020).

The principal disadvantages are the relatively high embodied energy and carbon emissions associated with cement and steel production. Cement manufacture is energy intensive and contributes significantly to global greenhouse-gas emissions. Conventional construction also requires substantial quantities of water and generates dust, noise, off-cuts and construction waste if materials are poorly managed (UNEP, 2023). Despite these limitations, conventional reinforced concrete and masonry are considered the preferred structural option because of their proven suitability for the proposed building height and the availability of established construction expertise. Environmental impacts can be reduced through efficient material specification, reuse of suitable excavated materials, recycling of construction waste and incorporation of energy- and water-efficient technologies.

9.4.2 Interlocking Stabilized Soil Blocks (ISSBs)

Interlocking Stabilized Soil Blocks are manufactured by mechanically compressing suitable soil, usually with a relatively small quantity of cement or another stabilizing agent. Their principal environmental advantage is the potential reduction in cement and mortar requirements compared with conventional masonry. The interlocking configuration can also reduce mortar consumption and construction waste while improving construction efficiency. Where locally suitable soil is available, ISSBs can reduce transportation requirements and may provide a lower-carbon alternative to conventional walling materials (UN-Habitat, 2012).

However, ISSBs have limitations for the proposed development. Their suitability depends on soil characteristics, block quality, stabilization, manufacturing equipment and construction workmanship. They may also require specialized production equipment and trained personnel. Most importantly, their application to the structural components of a high-rise development would require confirmation by a qualified structural engineer and compliance with applicable standards. Consequently, ISSBs could potentially be considered for suitable non-structural applications, but they are not preferred as the principal structural technology for the proposed multi-storey development.

9.4.3 Precast and Modular Construction

Precast and modular construction involves manufacturing structural or architectural components in a controlled factory environment before transporting and assembling them at the project site. A major advantage is improved quality control because components can be manufactured under controlled conditions with standardized processes. The approach can reduce onsite construction time, minimize material wastage and reduce the duration of disturbance to neighbouring properties. Factory-based

production can also improve worker safety by moving some construction activities away from the active construction site (UNEP, 2023).

The disadvantages include higher initial investment in specialized equipment, manufacturing facilities, transportation and lifting equipment. Large components may also create logistical challenges, particularly where access roads, delivery times or site storage capacity are constrained. Changes to the architectural design after manufacturing can be costly, while the availability of specialized suppliers may influence project costs and programme. For the proposed project, selected precast elements may be incorporated where technically and economically feasible, although a fully modular system is not considered necessary as the primary construction approach.

9.4.4 Recycled and Reclaimed Construction Materials

The use of recycled and reclaimed materials provides an opportunity to reduce demand for virgin raw materials and divert waste from disposal facilities. Recycled steel, recycled aggregates, reclaimed timber and other recovered materials can contribute to a circular construction approach where they meet the required technical standards. Recycling construction materials can reduce resource extraction, energy consumption and waste generation over the project life cycle (UNEP, 2023).

The main disadvantage is that the availability and quality of recycled materials can be inconsistent. Materials intended for structural applications require appropriate testing and certification to demonstrate that they meet the required performance specifications. There may also be limitations in local supply chains and additional costs associated with sorting, processing and transportation. Accordingly, recycled and reclaimed materials should be incorporated where their quality, safety, certification and availability are confirmed, rather than being used indiscriminately.

9.4.5 Green Building Technologies

Green building technologies provide an opportunity to reduce the environmental footprint of the development throughout its operational life. These technologies may include solar photovoltaic systems, solar water heating, rainwater harvesting, energy-efficient lighting, water-saving sanitary fixtures, natural lighting and ventilation, low-VOC paints, efficient pumps, appropriate insulation and landscaping. Such measures can reduce electricity and water consumption, improve indoor environmental quality and reduce long-term operating costs (UNEP, 2023).

The main limitation is that some technologies require higher initial capital expenditure and specialist design, installation and maintenance. Their effectiveness also depends on appropriate building design and continued maintenance. Nevertheless, the long-term savings in energy and water consumption, together with improved climate resilience and reduced environmental impacts, can justify their incorporation. Green technologies are therefore recommended as complementary measures to the conventional structural system rather than as an alternative to the structural technology itself.

9.4.6 Preferred Construction Approach

Following the assessment, conventional reinforced concrete and masonry construction is retained as the preferred primary structural technology because it provides the required structural performance for the proposed multi-storey development and is supported by established local materials, standards and technical expertise. However, this choice does not preclude sustainable construction practices. The project should incorporate appropriate elements of the alternative technologies, including recycled materials where certified, efficient material use, waste recovery, energy-efficient systems, solar energy, rainwater harvesting, water-efficient fittings and environmentally preferable finishes.

This combined approach provides a practical balance between structural safety, economic feasibility, environmental performance, resource efficiency and long-term sustainability.

9.5 Domestic Wastewater Management Alternatives

Considering the proposed development's maximum occupancy of approximately persons 679 and the proposed wastewater treatment capacity of approximately 120,000 litres/day, appropriate wastewater management is critical.

9.5.1 Connection to Public Sewer

Connection to a public sewer system was considered as a potential wastewater-management alternative. A sewer connection would ordinarily provide centralized collection and treatment of wastewater and could reduce the need for extensive onsite treatment infrastructure. However, there is currently no public sewer network serving the immediate project area, and therefore the proposed development cannot rely on a public sewer connection as its primary wastewater-management option.

Given the absence of an available sewer network, extending a sewer connection to the site would require substantial additional infrastructure and would depend on the availability, capacity and approval of the relevant water and sanitation service provider. The option is therefore not presently feasible for the proposed development and has been ruled out as the primary wastewater-management alternative.

9.5.2 Septic Tank/Soak-Away System

A septic system provides onsite treatment but may require frequent desludging and adequate land for effective operation. Given the scale and density of the proposed development, this option may present groundwater protection and land-use concerns and is therefore less preferable.

9.5.3 Onsite Wastewater Treatment System — Preferred Alternative

The proposed development will utilize an onsite wastewater treatment system with a stated treatment capacity of approximately 120,000 litres/day (120 m³/day). The system is considered appropriate subject

to detailed engineering design, confirmation of treatment performance, regulatory approval and provision for proper operation and maintenance.

The proposed development has an estimated maximum occupancy of 679 persons, comprising 663 residential occupants and 16 occupants associated with the eight commercial shops. Based on the adopted water-consumption rate of 119 litres/person/day, the estimated daily water demand is:

$$Q_w = 679 \times 119 = 80,801 \text{ litres/day}$$

For purposes of estimating wastewater generation, an 86% return factor has been adopted based on the upper end of the greywater-generation range reported in the critical review by Roshan and Kumar (2020), which found greywater generation to range from 54% to 86% of total indoor household water consumption.

Accordingly:

$$Q_{ww} = 80,801 \times 0.86 \quad Q_{ww} = 69,489 \text{ litres/day}$$

The estimated wastewater generation is therefore approximately 69.49 m³/day.

Compared with the proposed treatment capacity of 120 m³/day, the available additional treatment capacity is:

$$120 - 69.49 = 50.51 \text{ m}^3/\text{day}$$

Thus, approximately 50.51 m³/day, equivalent to 42.1% of the installed treatment capacity, remains available as a design and operational buffer. This provides additional capacity to accommodate variations in occupancy, water-use patterns, peak flows and wastewater contributions from common areas and other ancillary uses.

The treatment system shall be designed to meet the applicable effluent-quality requirements and shall incorporate appropriate provisions for operation, maintenance, sludge management and monitoring.

9.5.4 Constructed Wetlands

Constructed wetlands were considered as an alternative onsite wastewater-treatment technology. Although constructed wetlands can provide effective biological treatment and have environmental benefits, they require a relatively large land area for the treatment beds, flow distribution systems and associated infrastructure.

The proposed development is a high-density mixed-use residential development with limited available open land, which is required for buildings, internal circulation, parking, landscaping, children's play areas and other essential infrastructure. Allocating sufficient land for a constructed wetland would therefore be impractical and would compromise the efficient use of the site.

9.6 Water Supply Alternatives

The project requires a reliable water source for both construction and operational requirements.

9.6.1 Public Water Supply – Mavoko Water and Sanitation Company Limited (MAVWASCO)

Connection to the Mavoko Water and Sanitation Company Limited (MAVWASCO) public water-supply network will serve as a supplementary and backup source to the proposed borehole. Where a suitable connection is available, MAVWASCO supply will enhance the reliability and resilience of the development's water-supply system, particularly during periods of reduced borehole yield, maintenance or increased demand.

The Proponent shall engage MAVWASCO to confirm the availability and adequacy of the public water connection and obtain the necessary approval before connection. The public supply will complement, rather than replace, the proposed borehole as the primary water source.

The combination of the approved borehole as the primary source and MAVWASCO as a supplementary source will improve water-supply reliability and reduce dependence on a single source. The final water-supply system should therefore be designed to accommodate at least the estimated 80.80 m³/day baseline occupancy-related water demand, together with additional requirements for common areas, landscaping, cleaning, maintenance and other ancillary uses.

The final design capacity of the water-supply infrastructure should be confirmed by the project's water-services and engineering professionals and should be consistent with the approved development design and applicable requirements of the relevant authorities.

9.6.2 Proposed Borehole

The proposed development will primarily rely on a borehole to be sunk within the project site to meet the anticipated water requirements. The borehole will serve as the main source of water for the development, subject to confirmation of adequate groundwater availability and sustainable abstraction through the required hydrogeological assessment.

For purposes of estimating water demand, the assessment adopts a consumption rate of 119 litres/person/day, based on the empirical water-consumption rate reported for Prudential Estate, Nairobi by Otieno (2005). The proposed development comprises 264 residential units, consisting of 114 studio, 110 one-bedroom and 40 two-bedroom apartments, together with eight commercial shops.

The adopted occupancy assumptions are 2 persons per studio, 2.5 persons per one-bedroom apartment, 4 persons per two-bedroom apartment and 2 persons per commercial shop. Accordingly, the estimated population is calculated as follows:

$$(114 \times 2) + (110 \times 2.5) + (40 \times 4) + (8 \times 2) = 228 + 275 + 160 + 16 = 679 \text{ persons}$$

The estimated daily water demand is therefore:

$$Q = P \times q \quad Q = 679 \text{ persons} \times 119 \text{ litres/person/day} \quad Q = 80,801 \text{ litres/day}$$

Therefore, the estimated occupancy-related water demand is approximately 80,801 litres/day (80.80 m³/day).

This figure represents the estimated water demand associated with the residential occupants and commercial shop occupants.

Before development of the borehole, the Proponent shall undertake the necessary hydrogeological assessment and obtain all applicable permits and approvals from the relevant authorities. The borehole shall be appropriately designed, constructed, protected and maintained to minimize the risk of groundwater contamination and ensure sustainable abstraction.

9.6.3 Rainwater Harvesting

Rainwater harvesting was considered as a supplementary source of water for the proposed development. However, the option is not considered feasible in the current project design. The proposed development incorporates a flat roof that is intended to accommodate hanging and clothes-drying bays, meaning that the roof will not provide a dedicated or suitably configured rainwater-collection surface. Introducing a rainwater-harvesting system would require modifications to the approved roof-use arrangement, additional collection and storage infrastructure and appropriate water-treatment facilities.

There are also potential water-quality concerns associated with collecting runoff from a roof used for hanging and drying activities. The harvested water may require treatment before it can be used for certain purposes, increasing the complexity, capital cost and maintenance requirements of the system. In addition, adequate storage capacity and a suitable distribution system would be required to make the option practically useful.

The rainwater-harvesting alternative is therefore ruled out for the current project design. The development will instead rely primarily on the MAVWASCO public water-supply network, supplemented by the proposed appropriately approved borehole, subject to confirmation of water availability, abstraction requirements and the necessary regulatory approvals.

9.7 Stormwater Management Alternatives

Stormwater management is a critical consideration for the proposed development because construction of buildings, paved parking areas and internal access roads will increase the proportion of impervious surfaces and consequently increase surface runoff. The stormwater-management alternatives considered for the project are as follows.

9.7.1 Conventional Stormwater Drainage

This option involves collecting runoff from roofs, paved areas, parking areas and internal roads through a network of properly designed drains and directing the collected water towards the existing downstream drainage system. The approach is relatively simple, familiar to local contractors and effective in conveying stormwater away from the development.

However, conventional drainage mainly focuses on rapid conveyance and may increase peak discharge downstream if runoff is released without adequate flow control. It may therefore contribute to erosion, localized flooding and increased pressure on downstream drainage infrastructure during intense rainfall events.

9.7.2 Stormwater Attenuation and Controlled Discharge

This alternative involves temporarily retaining stormwater within appropriately designed attenuation facilities before releasing it at a controlled rate. The approach reduces peak flows and can help prevent sudden increases in downstream runoff during heavy rainfall.

Its main limitation is the requirement for additional space and appropriately designed storage and flow-control structures. Regular inspection and maintenance are also necessary to prevent blockage and loss of storage capacity.

9.7.3 Sustainable Drainage Measures

Sustainable drainage measures seek to manage stormwater closer to where it falls through measures such as landscaped areas, permeable surfaces, infiltration features and other nature-based drainage interventions. These measures can reduce runoff volumes, promote infiltration and improve the environmental performance of the development.

Given the proposed development's relatively intensive use of the available land, not all sustainable drainage measures may be practically applicable thus ruled out.

9.7.4 Combined Stormwater Management Approach – Preferred Alternative

A combined approach is considered the most appropriate alternative for the proposed development. It will integrate conventional internal drainage with controlled discharge, appropriate flow attenuation, landscaping and other practicable runoff-management measures. This approach provides greater control over both the volume and peak rate of runoff than reliance on conventional drainage alone.

The stormwater system should therefore be designed to safely collect runoff from the development, control peak discharge and convey flows to the existing downstream drainage route without adversely affecting

neighbouring properties or downstream infrastructure. Drainage channels and discharge points should be regularly inspected and maintained, particularly before and after periods of heavy rainfall.

Preferred option: The combined stormwater-management approach is preferred because it provides a practical balance between the site's physical constraints, the need for effective drainage and the need to minimize increased peak runoff and downstream environmental impacts.

9.8 Solid Waste Management Alternatives

The project will generate both construction and operational solid waste. The preferred approach should follow the waste-management hierarchy:

Waste avoidance → Reduction → Reuse → Recycling → Recovery → Treatment → Safe disposal.

During construction, excavated material that is suitable for reuse should be retained for approved site applications. Metals, timber, packaging and other recyclable materials should be segregated and transferred to appropriate recycling/recovery facilities.

During operation, the proposed waste holding bay shall facilitate temporary storage and segregation. Residents and commercial occupants should be encouraged to separate recyclable and non-recyclable waste at source.

Licensed waste handlers should collect residual waste and transport it to approved disposal or treatment facilities.

Preferred Alternative

An integrated solid-waste management system incorporating source segregation, waste reduction, reuse, recycling, recovery and licensed disposal is preferred over reliance on disposal alone.

9.9 Alternative Scale and Design

The proposed development comprises four residential blocks providing 264 residential apartment units and eight commercial/convenience shops, together with parking spaces, internal access roads, wastewater-treatment facility, stormwater drainage, landscaping, children's play facilities and other ancillary infrastructure. Alternative development scales were considered to determine whether reducing or increasing the proposed scale would provide environmental, social or economic advantages.

9.9.1 Retaining the Status Quo of the Proposed Design

This alternative involves implementing the development substantially in accordance with the current proposed design, comprising the four blocks, 264 residential units and eight commercial shops, subject to the conditions and approvals issued by the relevant authorities.

Retaining the proposed design provides the most practical balance between optimal land utilization, housing provision, investment requirements and available infrastructure. The design has already been developed around the physical characteristics of the site and incorporates parking, internal circulation, wastewater treatment, stormwater management, landscaping and other supporting facilities.

The proposed building height and configuration are also subject to the applicable planning requirements and the Kenya Civil Aviation Authority (KCAA) height clearance requirements, which are particularly relevant given the development's proximity to JKIA. The approved height parameters therefore provide an important constraint against arbitrary increases in building height.

Retaining the current design also avoids unnecessary redesign, additional professional costs, delays in statutory approvals and potential disruption to the Proponent's existing financing arrangements.

This is therefore the preferred scale and design alternative, subject to compliance with all conditions imposed by the relevant authorities and implementation of the mitigation measures contained in the ESMP.

9.9.2 Downscaling the Development

Downscaling would involve reducing the number of residential units, reducing the building footprint, reducing the number of floors or otherwise decreasing the intensity of development.

Although downscaling could reduce some potential impacts, such as population pressure, traffic generation, water demand, wastewater generation and solid-waste production, it would result in less efficient utilization of the available urban land. The Proponent has invested in land acquisition, architectural and engineering design, environmental assessment, planning and other preparatory activities based on the proposed development scale.

A significant reduction in scale would require redesign of the architectural, structural, drainage, wastewater, parking and other supporting infrastructure, followed by submission of revised designs and obtaining the necessary approvals. This would increase the project cost and implementation period.

Downscaling would also reduce the number of residential units available to the market and consequently reduce the expected return on the investment. It may therefore make the development economically less providing viable while not necessarily proportionate environmental benefits.

9.9.3 Upscaling the Development

Upscaling would involve increasing the number of residential units, increasing the number of floors, increasing the building footprint or increasing the overall development density.

Although upscaling could increase the number of housing units and potentially improve the financial return from the site, it would significantly increase the population density and demand for water, wastewater treatment, electricity, parking, solid-waste management, transport and other infrastructure.

Furthermore, increasing the building height beyond the parameters permitted under the applicable KCAA aviation/height clearance would not be permissible. The proximity of the site to JKIA makes compliance with aviation safety requirements particularly important. Any substantial increase in height would therefore require fresh technical assessment and approval and could potentially be prohibited by the applicable aviation restrictions.

Upscaling would also require additional investment in infrastructure and project components. The Proponent does not presently have the additional funding required to finance such an expansion. Increasing the number of occupants beyond the level contemplated by the current design could also place additional pressure on existing roads, drainage, water supply, wastewater management, solid-waste services and other infrastructure within the surrounding area.

In addition, a significant increase in development density could conflict with applicable zoning and planning requirements for the area and would require comprehensive redesign and fresh statutory approvals.

CHAPTER TEN

10.0 PUBLIC PARTICIPATION

10.1 Introduction

Public participation formed an integral part of the EIA process for the proposed mixed-use residential development in Syokimau. The process was undertaken to provide interested and affected parties (I&APs), neighbouring residents, local administration, community representatives and other stakeholders with an opportunity to understand the proposed development, express their views and raise concerns regarding its potential environmental and social impacts.

The consultation process also enabled the Project Proponent and the EIA team to obtain local knowledge, identify potential conflicts and incorporate appropriate mitigation measures into the project ESMP.

10.2 Objectives of Public Consultation and Participation

The public participation process sought to:

1. Inform stakeholders about the proposed mixed-use residential development, its location, components and anticipated activities.
2. Obtain views, concerns, recommendations and expectations from neighbouring residents and other I&APs.
3. Identify potential environmental, social, traffic, infrastructure and community-related impacts.
4. Provide an opportunity for stakeholders to seek clarification from the Proponent and project consultants.
5. Establish an effective communication channel between the Proponent, neighbouring community, local administration, consultants and relevant authorities.
6. Incorporate legitimate stakeholder concerns into the project impact assessment and ESMP.
7. Promote transparency, accountability and harmonious coexistence between the development and surrounding properties.

10.3 Background and Methodology

The public participation process involved identification of potentially affected and interested stakeholders within the project neighbourhood, including adjacent property owners and Syokimau Resident Association (SRA), local administration and other relevant parties.

The consultation process involved public notices and invitations, stakeholder engagement, questionnaires and public consultative meetings. Stakeholders were provided with information concerning the proposed development and were given an opportunity to raise concerns and make recommendations.

The consultations generated both positive and negative views. While stakeholders recognized the potential benefits associated with additional housing, employment and local economic activity, concerns

were raised regarding the scale of development, traffic, stormwater, wastewater management, construction activities, open spaces and compatibility with the surrounding neighbourhood.

The main steps included:

- Identification of I&APs and neighbouring properties;
- Issuance of public notices via SRA and invitations;
- Administration of stakeholder questionnaires;
- Direct engagement with neighbouring residents and other stakeholders;
- Public consultative meetings;
- Recording and analysis of stakeholder concerns; and
- Incorporation of relevant concerns into the EIA and ESMP.

10.4 Key Issues Raised by Stakeholders

Stakeholders raised a range of issues concerning both the construction and operational phases of the proposed development. The concerns were particularly focused on traffic and access, wastewater management, stormwater drainage, development density, construction activities and environmental management, green/open spaces.

10.5 Positive Issues Raised

10.5.1 Increased Housing Opportunities

Stakeholders recognized that the proposed development would contribute additional residential accommodation within the rapidly developing Syokimau area. The provision of 264 residential apartments comprising 40 two-bedroom, 110 one-bedroom and 114 studio units will increase the supply of housing within the area and provide accommodation options for different household and income categories.

10.5.2 Employment Creation

The construction phase is expected to create direct and indirect employment opportunities for skilled, semi-skilled and unskilled workers. Additional employment and service opportunities are expected during operation through property management, security, cleaning, maintenance and other support services.

10.5.3 Increased Local Business Opportunities

The development is expected to increase demand for goods and services during construction and operation. Local suppliers, transporters, artisans, retailers and service providers may benefit from expenditure associated with construction activities and the future residential population.

10.5.4 Improved and Planned Infrastructure

The development will incorporate internal roads, parking, drainage, water supply, wastewater treatment, solid-waste storage, security and other supporting infrastructure. Proper implementation of these facilities is expected to contribute to an orderly and serviced development.

10.5.5 Increased Property and Investment Value

The development is expected to contribute to the continued growth of the Syokimau property market. Investment in planned residential and supporting infrastructure may contribute to increased economic activity and property values within the wider neighbourhood.

10.6 Negative Issues and Stakeholder Concerns

10.6.1 Traffic Generation and Road Safety

One of the key concerns raised was the potential increase in traffic resulting from construction activities and the eventual occupation of the residential units. Stakeholders expressed concern that construction trucks, delivery vehicles and future residents could increase congestion on surrounding roads, particularly during peak hours.

The concern was also associated with the movement of construction materials and heavy vehicles along local access roads. The Proponent should therefore implement a traffic-management plan, control construction-vehicle movements, avoid unnecessary obstruction of access roads and ensure that vehicles do not park or load materials in ways that inconvenience neighbouring properties.

10.6.2 Parking Pressure

Stakeholders raised concerns regarding the parking. The parking provided should be managed to ensure that parking associated with the project does not spill over onto neighbouring roads or interfere with access to adjacent properties.

Parking arrangements should be clearly marked and managed during both construction and operation.

10.6.3 Wastewater Management

Wastewater management was identified as a significant concern, particularly the need to ensure that wastewater from the development does not discharge onto neighbouring properties or contaminate the surrounding environment.

The development proposes an onsite wastewater-treatment system with a design capacity of approximately 120,000 litres per day. The system shall be appropriately designed, approved, operated and maintained to ensure that wastewater is adequately treated before any approved discharge or reuse. The Proponent should ensure that no untreated wastewater or effluent is discharged onto neighbouring properties, roads, drainage channels or other unauthorized locations. Regular inspection, maintenance and monitoring of the treatment system should be undertaken.

10.6.4 Stormwater Drainage and Flooding

Stakeholders expressed concern about the management of stormwater, particularly because the development will increase impervious surfaces through buildings, parking and internal access roads.

The project should ensure that stormwater generated within the property is collected and safely conveyed to the established downstream drainage route, while avoiding uncontrolled discharge onto neighbouring properties.

The drainage system should be designed to accommodate intense rainfall events, control peak flows and prevent erosion, ponding and localized flooding. Regular maintenance of drainage channels, catch pits and discharge points should also be undertaken.

10.6.5 Development Density and Building Height

Stakeholders raised concerns regarding the intensity and height of the proposed development in relation to the surrounding neighbourhood. It was noted during the consultations that no neighbouring development has attained the height proposed for the project, with the highest observed development in the immediate area being approximately eight (8) floors. Stakeholders expressed concern that a substantially taller development could alter the existing character of the neighbourhood and increase pressure on roads, parking, water supply, wastewater management, stormwater drainage and other supporting infrastructure.

In view of these concerns, the Proponent shall ensure that the proposed development remains within the applicable planning and zoning requirements and does not exceed the height permitted by the relevant authorities. Given the proximity of the project to JKIA, the Proponent shall obtain and comply with the required KCAA height clearance/approval before implementation of the proposed building height. Any change in building height or development intensity shall be subjected to the applicable statutory review and approval processes.

The Proponent shall also implement the proposed infrastructure and environmental safeguards to ensure that the development does not impose unacceptable additional pressure on surrounding services or adversely affect neighbouring properties.

10.6.6 Security and Negative Social Interaction

Stakeholders raised concerns regarding security and potential negative social interactions that may arise during both the construction and operational phases of the development. During construction, the presence of workers, contractors, delivery vehicles and other temporary personnel may increase movement within the neighbourhood and could create concerns relating to unauthorized access, disturbance, theft and conflicts with neighbouring residents if not properly managed.

During the operational phase, stakeholders expressed concern about the potential for increased social activity associated with a relatively high-density residential development. The proposed development comprises 114 studio apartments and 110 one-bedroom apartments. The predominance of studio and one-bedroom units may result in a residential population that is less oriented towards larger family households than a development dominated by larger multi-bedroom units. Stakeholders therefore expressed concern that the resulting occupancy pattern could influence the social character of the neighbourhood.

The Proponent shall implement appropriate security measures, including controlled access points, adequate security personnel, lighting of common areas, visitor management and appropriate surveillance systems. During construction, workers should be properly identified and managed, with clear site-access controls and a code of conduct governing interaction with neighbouring residents.

During operation, the property management should enforce appropriate house rules covering noise, use of common areas, visitor access, and waste management. A functional grievance redress mechanism should also be maintained to allow residents and neighbouring stakeholders to raise and resolve complaints promptly.

These measures will help minimize security risks, prevent avoidable social conflicts and promote harmonious coexistence between the development and the surrounding community.

10.6.7 Construction Dust and Air Quality

Stakeholders expressed concern about dust generated during excavation, movement of construction materials and movement of construction vehicles. Dust could affect neighbouring homes, pedestrians, road users and workers.

The Proponent and contractor should control dust through appropriate watering of exposed surfaces, covering of trucks transporting loose materials, speed control, proper storage of construction materials and maintenance of machinery. Construction vehicles should avoid unnecessary idling and should be maintained in good operating condition.

10.6.8 Construction Noise and Vibration

Noise from excavation, concrete works, machinery, delivery vehicles and other construction activities was identified as a potential disturbance to neighbouring residents.

Construction activities shall be restricted to approved working hours, noisy equipment should be properly maintained, unnecessary idling should be avoided and particularly noisy activities should be controlled. Where necessary, temporary acoustic screening should be provided. The structural engineer to take data of the surrounding building foundations in case of a foundation compromise during the excavations works

10.6.9 Solid Waste Generation

Stakeholders raised concerns regarding construction waste and the need to prevent illegal dumping within the neighbourhood. Construction activities will generate excavated materials, packaging materials, timber off-cuts, metal, cement bags and other wastes.

The Proponent should implement the ESMP and the applicable waste-management requirements, emphasizing waste minimization, reuse, segregation, recycling and disposal through appropriately licensed waste handlers.

During operation, the proposed solid-waste holding bay should be properly managed, with waste collected regularly and transferred through authorized waste-management service providers.

10.6.10 Green Areas and Children's Play Space

Stakeholders raised concerns regarding the availability of adequate green space and recreational areas within the development. The project design should therefore retain the proposed landscaping and children's play area and ensure that these spaces are not converted into additional parking or built-up areas without appropriate approval.

The proposed landscaping should contribute to visual screening, reduction of heat accumulation and improvement of the general environmental quality of the development.

10.6.11 Construction Traffic and Damage to Local Roads

The movement of heavy construction vehicles was identified as a potential source of road deterioration, dust and inconvenience to residents. Construction traffic should therefore be managed through designated access routes and appropriate scheduling of deliveries.

Any damage to public infrastructure directly attributable to construction activities should be assessed and appropriately addressed in consultation with the relevant authorities.

10.7 Stakeholder Expectations and Commitments

The consultations indicated that stakeholders generally expect the Proponent to implement the project responsibly and ensure that the benefits of the development do not occur at the expense of neighbouring residents.

The key expectations include:

- Compliance with all approved planning, environmental, building and other statutory requirements.
- Effective wastewater treatment with no uncontrolled discharge to neighbouring properties.
- Adequate management of stormwater and prevention of flooding or erosion.
- Adequate onsite parking to prevent parking spillover onto surrounding roads.
- Effective management of construction dust, noise and traffic.
- Protection of neighbouring residents' privacy.
- Retention and enhancement of landscaping and recreational areas.
- Proper management and disposal of construction and operational waste.
- Protection of existing roads and other public infrastructure.
- Provision of employment and business opportunities where practicable to local residents.
- Maintenance of a functional communication and grievance-redress mechanism throughout the project lifecycle.

10.8 Conclusion

The public participation process provided an important platform for incorporating local knowledge and stakeholder concerns into the EIA. The consultations demonstrated that while the proposed mixed-use residential development is expected to provide housing, employment, investment and local economic benefits, stakeholders are particularly concerned about traffic, parking, wastewater, stormwater, development density, privacy, construction disturbance, waste management and preservation of neighbourhood character.

These concerns have been incorporated into the impact assessment and corresponding ESMP. The Proponent is expected to maintain continuous engagement with neighbouring residents, the SRA and other I&APs throughout construction and operation and to implement the agreed mitigation measures to promote harmonious coexistence between the development and the surrounding community.

CHAPTER ELEVEN

11.0 CONCLUSION AND RECOMMENDATIONS

11.1 Conclusion

The proposed mixed-use residential development in Syokimau is considered a viable development that will contribute to the provision of additional housing and complementary commercial facilities within a rapidly urbanizing area. The project is expected to generate employment, support local businesses, promote investment and improve the utilization of available urban land.

The assessment has identified potential environmental and social impacts associated mainly with construction activities, increased population and infrastructure demand, traffic, stormwater, wastewater, waste generation, noise, dust, security and interaction with neighbouring properties. These impacts can be effectively managed through implementation of the proposed mitigation measures and the ESMP.

The Proponent shall implement the project in accordance with the approved designs and all applicable environmental, planning, building, occupational health and safety, water, waste-management and aviation requirements, including obtaining the necessary approvals from NEMA, the County Government, NCA, KCAA and other relevant authorities.

Overall, subject to strict compliance with the recommended mitigation measures, monitoring requirements and statutory conditions, the project is considered environmentally and socially manageable and beneficial.

11.2 Recommendations

The project is recommended for implementation subject to:

1. Obtaining and maintaining all required statutory approvals and permits.
2. Full implementation of the ESMP throughout construction and operation.
3. Proper management of wastewater, stormwater, solid waste, dust, noise and construction traffic.
4. Compliance with approved development density, building height and planning requirements, including KCAA height clearance.
5. Protection of neighbouring properties, privacy, access and security.
6. Provision and proper maintenance of adequate water, parking, drainage, wastewater and waste-management infrastructure.
7. Continuous stakeholder engagement and operation of an effective grievance-redress mechanism.
8. Regular environmental monitoring and submission of the required environmental audits and compliance reports.

The Proponent, contractor and future property management should allocate adequate financial, technical and human resources to ensure that the identified mitigation measures are effectively implemented throughout the project life cycle.

REFERENCES

- Glasson, J., Therivel, R. and Chadwick, A. (2013) *Introduction to Environmental Impact Assessment*. 4th edn. London: Routledge.
- Government of Kenya (2003) *Environmental (Impact Assessment and Audit) Regulations, 2003*. Nairobi: Government Printer.
- Government of Kenya (2007) *Kenya Vision 2030*. Nairobi: Government of Kenya.
- Government of Kenya (2019) *Environmental Management and Co-ordination Act (Cap. 387): Second Schedule (Amendment), 2019*. Nairobi: Government Printer.
- Government of Kenya (2019) *Physical and Land Use Planning Act, 2019*. Nairobi: Government Printer.
- Government of Kenya (2019) *Energy Act, 2019*. Nairobi: Government Printer.
- Government of Kenya (2022) *Sustainable Waste Management Act, 2022 (Cap. 387C)*. Nairobi: Government Printer. ([Kenya Law](#))
- Government of Kenya (2024) *Environmental Management and Co-ordination (Air Quality) Regulations, 2024*. Nairobi: Government Printer. ([Kenya Law](#))
- Government of Kenya (2024) *Environmental Management and Co-ordination (Water Quality) Regulations, 2024*. Nairobi: Government Printer. ([Kenya Law](#))
- Government of Kenya (2024) *Environmental Management and Co-ordination (Waste Management) Regulations, 2024*. Nairobi: Government Printer. ([Kenya Law](#))
- Government of Machakos County (2022) *Machakos County Integrated Development Plan (CIDP) 2023–2027*. Machakos: Government of Machakos County.
- Kenya National Bureau of Statistics (KNBS) (2019) *2019 Kenya Population and Housing Census, Volume I: Population by County and Sub-County*. Nairobi: Kenya National Bureau of Statistics.
- National Construction Authority (2020) *National Building Code and Construction Standards*. Nairobi: National Construction Authority.
- Otieno, A. (2005) *Domestic Water Consumption Patterns in Prudential and Umoja II Estates, Nairobi*. MA research project. University of Nairobi. Available at: [University of Nairobi Digital Repository](#) (Accessed: 9 August 2026).
- Republic of Kenya (1994) *National Environmental Action Plan (NEAP)*. Nairobi: Government of Kenya.
- Republic of Kenya (2009) *National Land Policy*. Nairobi: Ministry of Lands.
- Republic of Kenya (2013) *National Environment Policy, 2013*. Nairobi: Ministry of Environment, Water and Natural Resources.
- Republic of Kenya (2016) *Water Act, 2016*. Nairobi: Government Printer.
- Roshan, A. and Kumar, M. (2020) 'Water end-use estimation can support the urban water crisis management: A critical review', *Journal of Environmental Management*, 268, 110663. Available at: [ScienceDirect](#) (Accessed: 9 August 2026).
- United Nations (1992a) *Convention on Biological Diversity*. Rio de Janeiro: United Nations.
- United Nations (1992b) *Rio Declaration on Environment and Development*. Rio de Janeiro: United Nations.

United Nations (2015) *Transforming Our World: The 2030 Agenda for Sustainable Development*. New York: United Nations.

United Nations Environment Programme (UNEP) (2018) *Assessing Environmental Impacts—A Global Review of Environmental Impact Assessment Practice*. Nairobi: UNEP.

United Nations Environment Programme (UNEP) (2023) *Building Materials and the Climate: Constructing a New Future*. Nairobi: UNEP.

United Nations Framework Convention on Climate Change (UNFCCC) (1992) *United Nations Framework Convention on Climate Change*. New York: United Nations.

United Nations Framework Convention on Climate Change (UNFCCC) (2015) *Paris Agreement*. Paris: UNFCCC.

UN-Habitat (2012) *Sustainable Housing for Sustainable Cities: A Policy Framework for Developing Countries*. Nairobi: United Nations Human Settlements Programme.

Zhang, L. *et al.* (2018) ‘Mineral abundances quantification to reveal the swelling property of the black cotton soil in Kenya’, *Applied Clay Science*, 161, pp. 524–532.

ANNEXES:

- Evidence of Public Consultation
- Approved Architectural Drawings
- Plot Ownership Details
- Project BoQ and QS License
- Proponents Details
- Change Of Use Approval
- Geotechnical Report