

**ENVIRONMENTAL SOCIAL IMPACT STUDY REPORT
FOR
A HIGH RISE RESIDENTIAL DEVELOPMENT
ON PLOT NO. 26756/MN
NYALI, MOMBASA COUNTY**



TOR APPROVAL: [NEMA/ENVIS/EIA/TOR/Approval_0146](#)

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CERTIFICATION AND SIGNING PAGES

By study Team of Experts

This Environmental Impact Assessment (EIA) Report has been prepared in accordance with the **Environmental Management and Coordination Act (EMCA), 1999 (as amended in 2015)** and the **Environmental (Impact Assessment and Audit) Regulations, 2003**.

We, the undersigned, hereby certify that the information provided in this report is true and correct to the best of our knowledge and belief.

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Carried out by Air Sense East Africa

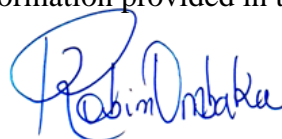
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By project proponent

This Environmental Impact Assessment (EIA) Report has been prepared in accordance with the **Environmental Management and Coordination Act (EMCA), 1999 (as amended in 2015)** and the **Environmental (Impact Assessment and Audit) Regulations, 2003**

I, the undersigned, hereby certify that the information provided in this report is true and correct to the best of our knowledge and belief



For and on behalf of Junieur's Palace Limited

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DEFINITION OF TERMS

Environmental Impact Assessment (EIA): A systematic examination conducted to determine whether or not a project will have any adverse impacts on the environment.

Environmental and Social Management Plan (ESMP): A detailed plan that outlines the mitigation, monitoring, and institutional measures to be taken during project implementation to avoid or offset adverse environmental and social impacts.

Project Affected Persons (PAPs): Any person who, as a result of the implementation of the project, may find their right of property, land, or use of resources adversely affected (e.g., neighboring hotel guests or residents).

Sewage Treatment Plant (STP): An onsite biological and mechanical system designed to treat domestic wastewater to NEMA-prescribed standards before reuse or discharge.

Borehole Water Reticulation: The system of pipes and pumps used to distribute water extracted from a borehole to the various units within the high-rise.

Coral-Rag Terrain: The specific geological formation of Nyali, characterized by porous coral limestone, which influences foundation design and drainage considerations.

Occupational Health and Safety (OHS): The standards and practices aimed at protecting the safety, health, and welfare of the workforce on the construction site.

Climate Change Resilience: The capacity of the building to absorb stresses and maintain function in the face of external stresses imposed by climate change (e.g., heatwaves or sea-level rise).

Grievance Redress Mechanism (GRM): A formal, legal-administrative procedure through which stakeholders can lodge complaints regarding the project's impacts.

Skyline Impact: The visual change to the horizon of a neighborhood (Nyali) caused by the height and massing of the proposed structure.

Plot Ratio: The ratio of the total floor area of a building to the size of the land of that location

Plot Coverage: The percentage of the total plot area that is covered by the building footprint at ground level

Greywater: Relatively clean wastewater from baths, sinks, washing machines, and other kitchen appliances, which will be recycled in this project for landscaping.

Black water: Wastewater from toilets and urinals that contains faecal matter and requires intensive treatment via the STP.

ACKNOWLEDGEMENTS

The preparation of this Environmental Impact Assessment (EIA) study for the proposed **Juniour's Palace Mixed Residential Development** would not have been possible without the support and cooperation of various stakeholders within the Nyali ecosystem.

We wish to sincerely acknowledge the Project Proponent, **Juniour's Palace Limited**, for their commitment, openness, and timely provision of architectural designs, master plans, and technical details to the EIA experts. Their dedication to sustainable urban densification and collaboration greatly facilitated the smooth execution of this study.

Special appreciation is extended to the **Nyali community**, including the neighboring hotel managements, residents, and the **honourable wananchi**, for their active participation during the stakeholder engagement process. Their constructive input regarding privacy, architectural harmony, and environmental conservation was invaluable in shaping the mitigation strategies of this report, ensuring that the project respects the unique character of the Nyali hospitality and residential corridor.

We also thank the **Mombasa County Government** authorities, specifically the departments of Physical Planning and Environment, along with relevant regulatory agencies such as **NEMA** and the **National Construction Authority (NCA)**. Their guidance, policy documents, and technical advice were instrumental in aligning the high-rise design with statutory requirements and urban zoning best practices.

Finally, we express gratitude to all individuals and groups, including local artisans and service providers, who contributed their time, knowledge, and insights via our digital and physical consultation platforms. Their cooperation and support were instrumental in the

EXECUTIVE SUMMARY

Project Proponent

The project proponent is **Juniour's Palace Limited**, a registered company in the Republic of Kenya.

The Proponent intends to undertake a high-rise residential apartment development on Plot No. 26756/MN located along Mt. Kenya Road in Nyali, Mombasa County.

Project Location

The proposed project is located in Nyali, within Mombasa County, approximately within a fully urbanized mixed-use zone characterized by residential apartments, hospitality facilities, and commercial developments.

The project site measures approximately 0.4465 hectares and is currently vacant. The surrounding environment is serviced with road infrastructure, electricity, water supply, and stormwater drainage systems.

No wetlands, riparian reserves, forests, protected areas, or ecologically sensitive habitats were identified within the project footprint.

Nature and Scope of the Project

The proposed development comprises:

- Multi-storey development comprising 140 units mixed one and Two Bedroomed apartments.
- Two (2) basement parking levels
- Swimming pool and clubhouse
- Internal access roads and pedestrian pathways
- Stormwater drainage systems
- Underground and overhead water storage tanks
- Standby generator
- Solid waste management facilities
- Landscaping

Project Phases

1. Construction Phase (Estimated 24–30 months)
2. Operational Phase (Long-term residential occupation)
3. Decommissioning Phase (Conceptual provisions included)

The project incorporates energy-efficient systems, water conservation measures, and climate-resilient infrastructure suitable for coastal conditions.

Table 1: Summary of key impacts and mitigation measures

Impact Category	Key Mitigation & Management Measures
1. Waste Management	<ul style="list-style-type: none"> • Minimize material wastage through accurate planning. • Segregate waste at source and provide labelled bins. • Engage licensed waste collectors approved by National Environment Management Authority. • Proper handling and disposal of hazardous waste (e.g., used oil). • Connect to approved sewer system / install compliant treatment system.
2. Pressure on Public Infrastructure & Utilities	<ul style="list-style-type: none"> • Provide adequate on-site roads, drainage, parking and sewer systems. • Install standby power and supplementary solar systems • Adopt green building technologies and rainwater harvesting.
3. Soil Disturbance & Erosion	<ul style="list-style-type: none"> • Control excavation works and compact soils properly • Install drainage and erosion control structures. • Landscape and rehabilitate disturbed areas promptly.
4. Air Quality (Dust & Emissions)	<ul style="list-style-type: none"> • Install dust screens and sprinkle water on exposed surfaces. • Cover transported materials. • Maintain machinery to reduce emissions. • Comply with Environmental (Air Quality) Regulations, 2014.
5. Noise & Vibration	<ul style="list-style-type: none"> • Restrict construction to daytime hours (8:00am–5:00pm). • Maintain equipment and install temporary noise barriers where necessary. • Provide ear protection to workers • Obtain noise permits where required.
6. Resource Efficiency & Sustainability	<ul style="list-style-type: none"> • Install solar water heating systems • Use water-efficient fixtures and rainwater harvesting • Design for natural lighting and ventilation. • Promote responsible electricity and water use.
7. Public Health & Occupational Safety	<ul style="list-style-type: none"> • Provide PPE and insurance cover for workers. • Install fire detection and suppression systems • Develop and implement Emergency Response Plan. • Maintain first aid facilities and trained personnel • Comply with Occupational Safety and Health Act, 2007.
8. Traffic Management	<ul style="list-style-type: none"> • Conduct Traffic Impact Assessment where required. • Implement Traffic Management Plan • Schedule deliveries during off-peak hours. • Install signage and deploy traffic marshals as necessary.
9. Climate Change & Carbon Management	<ul style="list-style-type: none"> • Promote energy efficiency and renewable energy use. • Implement rainwater harvesting • Monitor and reduce project carbon footprint in line with national climate objectives.

Conclusion and Recommendation

Based on the findings of this Environmental and Social Impact Assessment Study, the proposed Junour's Palace High-Rise Residential Development on Plot No. 26756/MN, Nyali, Mombasa County, is considered environmentally and socially acceptable.

The assessment confirms that all identified impacts are site-specific, manageable, and capable of being mitigated to acceptable levels through implementation of the prescribed Environmental and Social Management Plan (ESMP).

It is therefore recommended that the project be approved, subject to strict adherence to the ESMP, full compliance with all applicable statutory requirements, and observance of any conditions that may be imposed by the National Environment Management Authority. Continuous environmental monitoring, periodic audits, and prompt corrective actions shall be undertaken to ensure sustained compliance throughout the project lifecycle.

CHAPTER ONE: INTRODUCTION

1.1 Risk Classification of High-Rise Residential Development Projects

This report presents the findings of an Environmental Impact Assessment (EIA) study for the proposed high-rise residential development along Mt. Kenya Road in Nyali, Mombasa County.

High-rise residential developments fall under projects requiring Environmental Impact Assessment in accordance with the Environmental Management and Coordination Act (EMCA) and its subsidiary legislation, including Legal Notice No. 31 of 30th April 2019 which amended the Second Schedule of EMCA.

Urban development projects **involving over 100 units multi-dwelling housing units**, high-rise buildings, and large-scale residential developments are categorized as **high-risk projects due to their potential impacts on infrastructure, traffic, waste generation, water demand, and public utilities.**

This Environmental Impact Assessment has therefore been prepared in compliance with Section 58 (2) of EMCA, the Environmental (Impact Assessment and Audit) Regulations, 2003, and other relevant national and county regulatory frameworks governing urban development in Kenya.

1.2 Project Definition

The proposed project entails the development of a high-rise residential apartment complex along Mt. Kenya Road in Nyali, Mombasa County. The development will comprise multi-storey residential units designed to accommodate modern urban housing demand within Nyali's rapidly growing residential zone.

The project will include:

- Construction of residential apartment units (high-rise structure)
- Basement and/or ground-level parking facilities
- Internal access roads and paved walkways
- Stormwater drainage systems
- Water storage facilities (underground and elevated tanks)
- Standby generator and electrical installations
- Landscaping and recreational areas
- Solid waste management facilities

The development is intended for residential occupation and will not involve industrial or, manufacturing, or hazardous processing activities.

1.3 Suitability of Nyali for the Proposed Project

Nyali is one of the most established and rapidly developing residential suburbs within Mombasa County. The location along Mt. Kenya Road offers strategic urban advantages, infrastructural support, and compatibility with surrounding land uses.

1.3.1 Strategic Location and Accessibility

- Nyali is located within Mombasa Island’s northern mainland and is well connected via major roads including Links Road and the Nyali Bridge corridor.
- Mt. Kenya Road provides direct connectivity to commercial centers, schools, hospitals, and recreational facilities.
- The area is already served by established road infrastructure capable of supporting residential traffic.

1.3.2 Established Residential Character

- Nyali is predominantly a residential neighborhood characterized by apartments, gated communities, and townhouses.
- The proposed high-rise development is consistent with the emerging vertical urban growth trend in the area.
- Several existing multi-storey residential developments demonstrate planning compatibility.

1.3.3 Mixed Land Use Compatibility

- The area comprises residential, hospitality, institutional, and limited commercial uses.
- The proposed project aligns with zoning patterns and urban density growth policies within Mombasa County.
- The development supports optimal land utilization in a high-demand urban area.

1.3.4 Availability of Infrastructure and Utilities

- The area is connected to the municipal water supply and electricity grid.
- Stormwater drainage infrastructure exists along the road corridor.
- Telecommunication and emergency response services are readily accessible.

1.3.5 Environmental Suitability

- The project site is not located within protected forests, marine reserves, wetlands, or designated environmentally sensitive ecosystems.
- The site is situated within an already developed urban setting, reducing risks associated with ecological disturbance.
- Environmental risks associated with the project are primarily construction-related and manageable through mitigation measures.

1.4 Project Proponent, Scope, and Objectives

1.4.1 Project Proponent

The project proponent is a registered property development entity operating within the Republic of Kenya. The proponent seeks to develop a high-rise residential complex in Nyali to meet increasing demand for quality housing in Mombasa County.

The development is intended to provide modern, safe, and environmentally responsible housing units within a planned and serviced urban environment.

1.4.2 Project Objectives

The overall objective of the proposed project is to develop a sustainable high-rise residential complex that complies with national environmental and safety standards.

The specific objectives are to:

- a) Provide quality residential housing units within Nyali.
- b) Optimize land use through vertical development.
- c) Enhance urban infrastructure and planned development.
- d) Generate employment during construction and operational phases.
- e) Implement environmental, health, and safety (EHS) best practices.
- f) Ensure compliance with environmental and planning regulations.

1.4.3 Project Scope

The scope of the proposed project includes:

- a) Site preparation and excavation works.
- b) Construction of reinforced concrete high-rise residential structures.
- c) Installation of lifts, plumbing, electrical, and fire safety systems.
- d) Installation of stormwater drainage and wastewater management systems.
- e) Provision of parking, landscaping, and common recreational spaces.
- f) Installation of standby generator and backup systems.
- g) Solid waste storage and management infrastructure.
- h) Operational management and environmental monitoring.
- i) Eventual decommissioning and safe structural dismantling at end of project life cycle.

1.5 Terms of Reference (TOR) approval for the EIA

The study was approved vide Licences No. NEMA/ENVIS/EIA/TOR/Approval 0146

1.6 Impacts Identification and Evaluation

The study identifies both positive and negative impacts associated with the proposed development across its lifecycle.

Positive Impacts Include:

- Employment creation during construction and operation.
- Increased housing supply within Nyali.
- Enhanced property value and local economic growth.
- Revenue generation through taxes and service charges.
- Improved infrastructure within the project vicinity.

Potential Negative Impacts Include:

- Dust, noise, and vibration during construction.
- Increased traffic congestion along Mt. Kenya Road.
- Increased demand for water and electricity.

- Solid and liquid waste generation.
- Occupational health and safety risks.
- Stormwater runoff and drainage pressure.
- Visual and aesthetic impacts due to building height.

Mitigation measures have been proposed, including dust suppression, traffic management plans, proper waste handling, structural safety controls, noise reduction measures, and compliance with fire safety and building codes.

1.7 Extent of Study Period

The EIA covers the entire project life cycle:

Construction Phase

- Site clearing and excavation
- Foundation and structural works
- Installation of utilities and finishes

Operation Phase

- Residential occupation
- Waste management
- Energy and water consumption
- Maintenance of lifts, fire systems, and utilities

Decommissioning Phase

- Safe demolition procedures
- Disposal of construction debris
- Site rehabilitation and restoration

The study examined the following key aspects:

- a) Physical environment (soil stability, drainage, air quality, noise).
- b) Urban flora and limited fauna within built-up environment.
- c) Land use compatibility and zoning compliance.
- d) Socio-economic factors including employment and housing demand.
- e) Public health and occupational safety.
- f) Fire safety and emergency preparedness.
- g) Cumulative impacts considering ongoing high-rise developments in Nyali.

CHAPTER TWO: EIA BACKGROUND, METHODOLOGY, AND CONTEXT

2.1 EIA Background

Environmental Impact Assessment (EIA) is a preventive environmental management tool designed to identify, predict, and evaluate the likely environmental and social consequences of a proposed development before implementation. Rather than addressing environmental problems after they occur, EIA integrates environmental considerations into project planning and decision-making from the outset. Munn (1979) defines EIA as “the process to identify and predict the impact on the environment and on man’s health and well-being of legislative proposals, policies, programs, projects and operational procedures, and to interpret and communicate information about the impacts.” This definition emphasizes EIA as both a scientific assessment process and a policy-support mechanism.

In Kenya, the EIA process is anchored in the Environmental Management and Coordination Act (EMCA), which makes environmental assessment mandatory for projects listed in the Second Schedule of the Act. High-rise residential developments fall within urban development projects requiring environmental review due to their potential impacts on land use, infrastructure demand, traffic, waste generation, drainage, and public utilities. The regulatory oversight body responsible for reviewing and licensing EIA reports is the National Environment Management Authority (NEMA).

Globally, EIA originated under the National Environmental Policy Act (NEPA) in the United States, which established the first formal requirement for environmental assessments. Europe adopted EIA directives in 1985, and the framework later expanded across Africa. In Kenya, EMCA (1999, revised 2015), the Environmental (Impact Assessment and Audit) Regulations, 2003 (Revised 2016), and Legal Notice No. 31 of 2019 guide EIA implementation and project risk classification.

For the proposed high-rise residential development along Mt. Kenya Road in Nyali, this EIA has been prepared as a full Study Report (SR), considering the scale of development, the urban setting, and anticipated environmental and social interactions.

2.2 Purposes of EIA

The Environmental Impact Assessment for the Nyali high-rise project serves several interrelated purposes aimed at promoting sustainable urban development and regulatory compliance. The main purposes include:

- a) **Environmental Protection** – Identifying, avoiding, and mitigating adverse impacts such as construction dust, noise, waste generation, increased stormwater runoff, and infrastructure strain.
- b) **Decision Support** – Providing scientifically grounded information to NEMA and Mombasa County authorities to guide approval decisions.
- c) **Risk Reduction** – Anticipating structural, safety, drainage, traffic, and service-demand challenges before construction begins.
- d) **Public Participation** – Ensuring affected residents, businesses, and institutions along Mt. Kenya Road are informed and consulted.
- e) **Human Health and Safety** – Identifying and mitigating occupational and community health risks associated with high-rise construction and operation.

- f) **Sustainable Development** – Supporting vertical urban growth while balancing environmental conservation and infrastructure capacity in Nyali.

2.3 Evolution of EIA Globally and in Kenya

The EIA process has evolved from a simple environmental screening tool into a comprehensive planning framework. After its establishment under NEPA (1969) in the United States, EIA systems were adopted in Europe and later institutionalized in African countries.

In Kenya, EMCA (1999) entrenched EIA into national law. Implementation began in 2003 with the operationalization of NEMA.

Today, the EIA process is guided by:

- a) EMCA (1999, revised 2015)
- b) Environmental (Impact Assessment and Audit) Regulations, 2003 (Revised 2016)
- c) Legal Notice No. 31 of 2019 (Classification of Projects by Risk Level)

Urban development projects such as high-rise residential buildings are classified as medium-risk developments, requiring submission of a Comprehensive Project Report or, where necessary, a full Study Report depending on site sensitivity and project scale.

2.4 Terms of Reference (TORs)

The Terms of Reference (TORs) define the scope and depth of this EIA study. For the Nyali high-rise project, the TORs include:

- a) Description of the proposed residential development and site characteristics.
- b) Review of relevant policy, legal, and institutional frameworks.
- c) Collection and analysis of baseline environmental and socio-economic conditions in Nyali.
- d) Identification and evaluation of potential positive and negative impacts.
- e) Analysis of project alternatives, including design and “no-project” options.
- f) Stakeholder engagement and public participation.
- g) Development of mitigation and enhancement measures.
- h) Preparation of an Environmental and Social Management and Monitoring Plan (ESMMP).
- i) Compilation of a Comprehensive Project Report for submission to NEMA.

2.5 Methodology of the EIA Study

This EIA followed a systematic and multidisciplinary methodology integrating desk studies, field investigations, stakeholder consultations, and impact analysis.

2.5.1 Scoping

Scoping is the process of determining the focus and scope of the assessment. It ensures that only the most relevant environmental and social issues are considered in detail.

This step usually involves:

- a) **Defining project boundaries** in terms of space (project area and area of influence) and time (construction, operation, decommissioning).
- b) **Identifying environmental receptors** that may be affected, such as water bodies, communities, sensitive habitats, or cultural sites.
- c) **Determining key issues** through preliminary consultations with stakeholders, regulators, and technical experts.
- d) **Setting Terms of Reference (ToR)** for the EIA study, which guide subsequent data collection and analysis.

By clearly identifying priorities, scoping prevents unnecessary effort on insignificant issues and ensures focus on matters of significance.

For the Nyali project, priority issues included:

- a) Traffic congestion along Mt. Kenya Road
- b) Construction noise and dust
- c) Stormwater drainage and flooding risks
- d) Wastewater management
- e) Solid waste generation
- f) Visual and aesthetic impacts
- g) Occupational safety

The scoping process ensured that significant issues received focused analysis.

2.5.2 Desk Review

The desk review stage involves gathering and analyzing existing information to form a basis for the assessment. This entails:

- **Reviewing legislative and policy frameworks**, including environmental, health and safety, land use, and sector-specific laws.
- **Collecting secondary environmental data**, such as climate records, hydrological reports, geological surveys, and biodiversity inventories.
- **Examining planning and development documents**, including county development plans, zoning regulations, and land tenure records.
- **Drawing lessons from previous studies** undertaken for similar projects in the area or sector.

Desk review provides a comprehensive understanding of the legal, institutional, and environmental context within which the project is situated.

2.5.3 Field Visits and Baseline Surveys

Field investigations and surveys are critical for obtaining site-specific data.

They typically cover the following areas:

- a) **Physical environment**: soil sampling and classification, topography, land stability, surface and groundwater resources, drainage patterns, and climate.

- b) **Biological environment:** vegetation surveys, identification of flora and fauna species, mapping of habitats, and noting the presence of rare, endangered, or protected species.
- c) **Air quality and noise:** measurement of baseline levels using portable monitors to establish background conditions.
- d) **Socio-economic environment:** household surveys, interviews, and observations to gather information on livelihoods, demographic characteristics, community services, and cultural features.
- e) **Land use mapping:** documentation of existing infrastructure, settlements, institutions, and other activities in and around the project area.
Baseline data provide the reference conditions against which project-induced changes are predicted and measured.

2.5.4 Stakeholder Engagement

Stakeholder engagement ensures that those affected by or interested in a project have an opportunity to express their views.

It typically includes:

- **Identification of stakeholders**, including government agencies, local communities, businesses, religious and cultural institutions, NGOs, and vulnerable groups.
- **Engagement methods** such as public meetings (barazas), focus group discussions, interviews, workshops, and structured questionnaires.
- **Communication strategies** that ensure inclusivity, such as using local languages, simplifying technical information, and providing adequate notice for consultations.
- **Documentation of concerns and expectations**, which are analysed and integrated into impact assessment and mitigation planning.
This process enhances transparency, builds trust, and helps avoid conflicts during project implementation.

2.5.5 Impact Prediction and Evaluation

This stage involves analyzing how project activities are likely to interact with environmental and social systems. It generally includes:

- **Identification of potential impacts** across all project phases (construction, operation, decommissioning).
- **Classification of impacts** as direct, indirect, cumulative, or residual.
- **Assessment criteria**, including magnitude (scale of change), extent (geographic area affected), duration (short, medium, or long-term), reversibility (whether impacts can be undone), probability (likelihood of occurrence), and overall significance.
- **Use of assessment tools** such as impact matrices, checklists, modeling techniques, and expert judgment.
- **Consideration of alternatives**, including alternative designs, sites, and technologies, to determine the most environmentally sound option.
This stage provides a systematic evaluation of the project's likely consequences and informs decision-making.

2.5.6 Impact Significance Assessment Using the Weighted Likert Model

This Environmental and Social Impact Assessment (ESIA) adopts a structured **5-Point Weighted Likert Model** to determine the significance of identified environmental and social impacts. The objective of this approach is to enhance analytical rigor, ensure transparency in decision-making, and provide a defensible basis for impact prioritization.

Unlike purely qualitative narrative descriptions, the Likert-based model assigns standardized numerical values to defined criteria and applies weighting to emphasize consequence severity and likelihood. This ensures that high-risk and irreversible impacts—particularly those affecting life safety, structural integrity, and long-term environmental quality—are appropriately prioritized in line with precautionary principles.

All impacts were evaluated using five criteria: Magnitude, Extent, Duration, Reversibility, and Probability. Each parameter was scored on a 1–5 scale, and a weighted formula was applied to compute a Total Significance Score (TSS).

2.5.7 Mitigation Planning

Mitigation planning is the process of developing measures to address potential adverse impacts identified in the assessment.

It entails:

- a) **Applying the mitigation hierarchy:** first avoiding impacts where possible, and then minimizing unavoidable effects, rehabilitating or restoring affected environments, and finally compensating for residual impacts.
 - b) **Designing technical measures,** such as dust suppression systems, noise barriers, wastewater treatment facilities, spill containment, and safe waste disposal systems.
 - c) **Developing management strategies,** including occupational health and safety programs, traffic management, and emergency preparedness plans.
 - d) **Ensuring community safeguards,** such as grievance redress mechanisms and community awareness campaigns.
- Mitigation measures are designed to be practical, cost-effective, and capable of integration into project

2.5.8 Environmental and Social Management and Monitoring Plan (ESMMP)

The ESMMP is a framework for implementing mitigation and monitoring measures throughout the project lifecycle.

It generally includes:

- a) **Roles and responsibilities:** assigning specific tasks to the project proponent, contractors, environmental officers, and government agencies.
- b) **Monitoring indicators:** measurable parameters such as water and air quality, waste management practices, noise levels, vegetation condition, and community feedback.
- c) **Monitoring schedules:** specifying frequency (daily, weekly, quarterly) and methods for data collection.

- d) **Reporting mechanisms:** outlining formats for internal monitoring reports and external compliance submissions to regulatory bodies.
- e) **Capacity and resources:** ensuring budget allocation and training of personnel to implement monitoring activities.
- f) **Adaptive management:** reviewing monitoring results periodically to adjust mitigation measures and improve environmental performance.

2.6 The EIA Team and Roles

The study was conducted by a NEMA-registered Lead Expert supported by a multidisciplinary team comprising:

1. **Environmental Specialist** – Baseline surveys and impact analysis.
2. **Civil/Structural Engineer** – Assessment of building safety and drainage systems.
3. **Occupational Health and Safety Expert** – Evaluation of construction and operational risks.
4. **Sociologist/Community Liaison** – Stakeholder engagement and social impact assessment.
5. **GIS Specialist** – Mapping of land use and sensitive receptors.
6. **Lead Expert (Team Leader)** – Coordination, regulatory compliance, and report compilation.
7. **NEMA Accredited laboratory** - Carrying out ambient baseline measurements.

CHAPTER THREE: ENVIRONMENTAL POLICY, LEGAL & INSTITUTIONAL FRAMEWORK

3.1 National Environmental Policies

The project is guided by high-level national blueprints that prioritize sustainable growth and a clean environment.

Table 2: Summary of National Environmental Policies

National Environmental Policies	Relevance to the project/license or permit required/ or activity requiring regulation
1. National Environmental Action Plan (NEAP)	The proponent should comply with NEAP policies regarding preventing, controlling, or mitigating adverse impacts. Issues of environmental integrity will be addressed through project-level Environmental Impact Assessments (EIAs).
2. Kenya's Vision 2030	The project facilitates the production of housing units, aligning with the vision to provide high quality of life. Stakeholders must ensure the principle of sustainable development is respected at all stages.
3. National Environment Policy, 2012 (Revised Draft #4)	The ESIA study has developed an environment and social management and monitoring plan (ESMP) to mitigate impacts during construction and operation. This tool aims to protect sensitive ecosystems.
4. Environmental and Development Policy (Sessional Paper No. 6 1999)	The project offers housing units to the people of Nyali, supporting the policy goal of a better quality of life through sustainable resource management.

3.2 Environmental Institutional Framework

The following institutions are responsible for the oversight, regulation, and enforcement of environmental standards during the project life cycle.

Table 3: Summary of Institutional frameworks

Environmental Institution	Relevance to the Project / License or Regulatory Role
National Environment Council (NEC)	Established under EMCA (Part III, Section 4), NEC formulates national environmental policies, sets environmental goals and priorities, and provides policy direction. The project must comply with national environmental policies and priorities established by NEC.
National Environment Management Authority (NEMA)	Principal government agency responsible for environmental supervision and coordination under EMCA. The Proponent is required to engage a licensed EIA expert, submit an ESIA Study Report, and obtain an EIA License prior to commencement of construction. NEMA also oversees compliance during construction, operation, and decommissioning phases.
County Environment Committee – Mombasa County	Responsible for environmental management at the county level and development of County Environmental Action Plans. The project is subject to site inspections, report reviews, and local environmental oversight within Mombasa County.
National Environment Complaints Committee (NECC)	Established under Sections 31–36 of EMCA as an environmental ombudsman. Investigates public complaints regarding environmental degradation. The project may be subject to inquiry in case of environmental

Environmental Institution	Relevance to the Project / License or Regulatory Role
	grievances raised by the public.
National Environment Action Plan Committee	Develops and reviews the National Environment Action Plan, including climate change strategies. The project must align with national environmental sustainability goals and the Climate Change Act, 2016.
Standards and Enforcement Review Committee (SERC)	Technical committee under NEMA responsible for formulation of environmental standards (water quality, noise, waste, effluent discharge, air quality). Monitors compliance and advises on mitigation measures. The project must comply with prescribed environmental quality standards.
National Environment Tribunal (NET)	Established under Section 125 of EMCA to hear and determine appeals arising from NEMA decisions, including issuance, denial, or revocation of EIA licenses. Provides legal recourse in environmental disputes related to the project.

3.3. National Environment Legislative Framework

Table 4: Summary of National legislative framework

Legislation / Legal Instrument	Relevance to the Project / License or Regulatory Requirement
The Constitution of Kenya, 2010 (Articles 42, 69, 70)	<ul style="list-style-type: none"> • Guarantees every person the right to a clean and healthy environment. • Requires the proponent to ensure ecological, economic, and social sustainability. • Entitles the proponent to fair administrative processes from National Environment Management Authority and other State organs. • Obligates compliance with duties to protect and conserve the environment for present and future generations.
County Government Act, 2010	<ul style="list-style-type: none"> • Vests responsibility on County Governments to plan and manage development projects within their jurisdiction. • Requires proponent engagement with Mombasa County Government for approvals, permits, and integration of national and local planning principles. • Ensures protection of minority and marginalized groups, promotion of equity, and sustainable resource use.
Environmental Management and Coordination Act (EMCA), 1999 (Revised 2015)	<ul style="list-style-type: none"> • Provides the legal and institutional framework for environmental management and protection in Kenya. • Requires proponent to implement environmental management plans and monitoring measures to mitigate negative impacts and enhance positive project outcomes • Compliance ensures alignment with national environmental standards and regulations.

3.4. International Environmental Management Agreements

Table 5: Summary of International Environmental Management Agreements

International Environmental Management Agreements / Conventions and Protocols	Relevance to the Project / License or Permit Required / Activity Requiring Regulation
1. The United Nations Declaration on the Rights of Indigenous Communities	The developer must engage indigenous communities throughout the project cycle and adhere to minimum standards for survival, dignity, and well-being.
2. The Rio Declaration - Agenda 21	Environmental protection must constitute an integral part of the development process; the developer must ensure sustainable development practices.

International Environmental Management Agreements / Conventions and Protocols	Relevance to the Project / License or Permit Required / Activity Requiring Regulation
3. World Commission on Environment and Development (1987)	The developer must consider social, political, and physical atmospheres to pursue sustainable development and ameliorate the common environment.
4. The Ramsar Convention on Wetlands	The developer must ensure the project has no impact on wetlands. Wastes must be properly disposed of and never directed into water bodies.
5. Basel Convention (Hazardous Wastes)	The developer must minimize the amount and toxicity of hazardous wastes and ensure environmentally sound management near the source of generation.
6. United Nations Framework Convention on Climate Change (UNFCCC)	The project must minimize atmospheric pollution and greenhouse gas emissions as far as is practically possible.
7. Rotterdam (PIC) Convention	Promotes shared responsibility and open information exchange regarding the importation and safe handling of hazardous chemicals and pesticides.
8. Stockholm Convention (Persistent Organic Pollutants - POPs)	The developer must ensure all POPs are properly disposed of to protect human health and the environment from long-term chemical accumulation.
9. UNCCD: Convention on Desertification (1995)	Soil conservation measures must be strictly implemented throughout the project implementation period to combat land degradation.
10. World Heritage Convention	Requires international cooperation to conserve and identify cultural and natural heritage that may be affected by development.
11. Montreal Protocol (Ozone Layer Protection)	The developer is required to use only materials and substances that are safe and do not lead to the depletion of the Ozone layer.
12. Sofia Protocol (NOx Protocol)	The proponent is requested to introduce pollution control measures for nitrogen oxides based on the best available and economically feasible technologies.

3.5. Institutional Structure of the Housing Sector

Table 6: Institutional Structure of the Housing Sector

Institutional Structure	Relevance to the project/license or permit required/ or activity requiring regulation
1. National Housing Corporation (NHC)	The project aligns with NHC's vision of a "decently housed nation."
2. National Housing Development Fund (NHDF)	The Finance Act 2018 mandates 1.5% contributions from both employer and employee (capped at Kshs. 5,000).

3.6. Legislations and institutional arrangements

Table 7: Summary of Legislations and institutional arrangements

Legislation / Regulation	Relevance to Project / License or Regulatory Requirement
EMCA (Waste Management) Regulations, 2006	Ensure proper handling, storage, and disposal of solid and hazardous waste (e.g., used oil) through NEMA-licensed waste handlers.
Air Quality Regulations, 2014 (LN 34)	Control dust and emissions during construction via dust screens, PPE, and suppression measures to meet legal limits.
Water Quality Regulations, 2006 (LN 120)	Ensure wastewater effluent meets Schedule III standards; hazardous substances handled to prevent pollution.
EMCA (Controlled Substances) Regu-	Prohibit use of Ozone Depleting Substances throughout the project

Legislation / Regulation	Relevance to Project / License or Regulatory Requirement
lations, 2007	lifecycle.
EMCA (Wetlands, Riverbanks, Lakeshore & Seashore) Regulations, 2009	Prevent environmental degradation of wetlands or coastal areas; no disposal of construction waste into stormwater drains.
EMCA (Conservation of Biological Diversity) Regulations, 2006	Protect endangered species; ensure community consultation and conservation of local biodiversity.
Noise & Excessive Vibration Pollution Regulations, 2009 & 2010	Limit construction noise (60 dB day / 35 dB night); restrict work to 0800–1700 hrs; maintain equipment; obtain noise permits if necessary.
Environmental (Impact Assessment & Audit) Regulations, 2003 (Amended 2019)	Ensure ESIA is conducted and approved prior to construction.
EMCA (Fossil Fuel Emission Control) Regulation, 2006	Use only NEMA-approved fuel catalysts to reduce emissions from machinery and vehicles.
Use of Poisonous Substances Act, Cap 247	Protect workers from chemical exposure; enforce employer duties for workplace safety.
Water Act, 2002 (Revised 2016) & Water Resources Management Rules, 2007	Obtain permits for water abstraction, borehole construction, and sewage/effluent management.
Forests Act, Cap 375	Obtain permits for tree cutting; undertake reforestation/tree planting post-construction.
Physical & Land Use Planning Act, 2019	Obtain County Government approvals; comply with zoning, plot coverage, and public utility requirements.
Public Health Act, Cap 242	Ensure proper drainage, sanitary conditions, and safe sewer connections.
Penal Code, Cap 63	Prevent release of foul air or noxious substances; use licensed waste handlers.
Workmen’s Injury and Benefits Act (WIBA), 2007	Provide compensation and insurance for work-related injuries and diseases.
Employment Act, 2007	Prohibit child labor; comply with employment terms and workers’ rights.
Traffic Act, Cap 203	Ensure vehicles transporting materials or personnel are registered and licensed.
Standards Act, Cap 496	Use materials and equipment that meet quality and safety standards.
Occupiers Liability Act, Cap 34	Ensure safety of workers and residents on the site.
Occupational Safety and Health Act (OSHA), 2007	Register workplace; implement safety measures, PPE, ventilation, and training.
Factories & Other Places of Work (Noise Rules, 2005)	Provide noise control and PPE to workers.
Electricity Power Act, 1997 & Energy Act, 2019	Electrical works done by licensed contractors; implement renewable energy (solar) measures.
Surveys Act, Cap 299	Ensure accurate land surveys, boundaries, and benchmarks.
Hazardous Substances Rules, 2007 (LN 60)	Limit chemical exposure to workers according to schedules.
Land Act, 2012 & Land Planning / Land Titles Acts	Ensure site is registered and has a valid title deed; comply with land management procedures.
National Land Commission (NLC) Act, 2012	Conduct public participation; adhere to land use planning policies.
Environment & Land Court Act, 2011	Comply with court rulings on environmental and land disputes; offences subject to fines or imprisonment.
Land Acquisition Act, Cap 295	Follow legal procedures if additional land is required for the project.
National Construction Authority	Ensure all contractors are registered and certified.

Legislation / Regulation	Relevance to Project / License or Regulatory Requirement
(NCA) Act, 2011	
Valuers Act, Cap 532	Engage only registered valuers for project assessments.
Sessional Paper No. 1 of 2017 (National Land Use Policy)	Incorporate sustainable land use and economic productivity principles into project planning.

3.7. Climate Change Legal Framework

Table 8: Summary of Climate Change Legal Framework

Legislation / Policy	Key Provisions / Mandates	Relevance to Project / Regulatory Compliance
Climate Change Act, No. 11 of 2016	<ul style="list-style-type: none"> • Public and private entities must mainstream climate actions into project lifecycles. • Monitoring & reporting of GHG emissions may be required. • Projects must align with National Climate Change Action Plan (low-carbon development). 	Proponent must implement climate adaptation measures (e.g., efficient drainage, flood resilience) and mitigation measures (e.g., energy-efficient lighting, solar water heating). ESMP must address coastal flooding and heat stress risks in Nyali.
Climate Change (Amendment) Act, 2023	Regulates carbon markets and emphasizes community benefits from climate-related projects.	Opportunity to register carbon credits if project includes green spaces or renewable energy systems (e.g., solar installations).
Energy Act, 2019 & Solar Water Heating Regulations	Mandates solar water heating for buildings with daily hot water demand >100 liters.	Supports compliance with Climate Change Act goals by reducing grid dependence and lowering the residential carbon footprint.
EMCA (Fossil Fuel Emission Control) Regulations, 2006	Controls emissions from vehicles and machinery to limit pollutants.	Requires maintenance of construction vehicles and machinery to minimize Black Carbon and other emissions.
Water Resources Management Rules, 2007	Regulates groundwater abstraction, borehole licensing, and aquifer protection.	Ensures borehole design accounts for long-term sustainability and climate-induced water table changes.

3.8. Greenhouse Gas (GHG) Emissions Framework

Table 9: Summary of GHC framework

Regulation / Act	Key Requirements	Relevance to Project / Compliance Measures
Climate Change Act, 2016 (Sections 3 & 4)	Defines "emissions" as GHGs attributable to human activity.	Project must adopt a low-carbon approach: minimize construction machinery emissions and optimize building design to reduce long-term carbon footprint.
EMCA (Air Quality) Regulations, 2014 (Schedule 2)	Classifies GHGs as priority air pollutants; prohibits exceeding ambient air pollution limits.	Monitor emissions from heavy machinery and generators; ensure all equipment has valid NEMA emission certificates; control particulate matter during construction.
Energy (Solar Water Heating) Regulations, 2012	Mandates solar water systems in residential buildings.	Reduces indirect (Scope 2) emissions by displacing electricity/fossil fuel use; aligns project with Kenya's Nationally Determined Contributions (NDCs).
Climate Change (Monitoring, Reporting & Verification) Regulations	Requires registered entities to monitor and report GHG emissions to the Climate Change Directorate.	Large-scale residential projects should estimate annual carbon footprint for Environmental Audits; supports adaptation and mitigation reporting.

CHAPTER FOUR: BASELINE ENVIRONMENTAL AND SOCIAL CONDITIONS

4.1 Introduction

This chapter describes the existing environmental and socio-economic conditions of the project area prior to implementation of the proposed mixed-use commercial development.

The baseline assessment provides the reference framework against which potential environmental and social impacts were identified and evaluated. It covers:

- Physical environment
- Biological environment
- Socio-economic environment
- Land use and planning context

The study area included the project site and its immediate surroundings within approximately a 1-kilometre radius, where indirect impacts such as traffic, noise, and air emissions may be experienced.

4.2 Physical Environment

4.2.1 Location and Administrative Setting

The project site is located in Nyali, within Mombasa County, along the northern mainland of the Kenyan coast. Nyali is a rapidly developing urban zone characterized by residential estates, hospitality facilities, commercial establishments, and institutional developments.

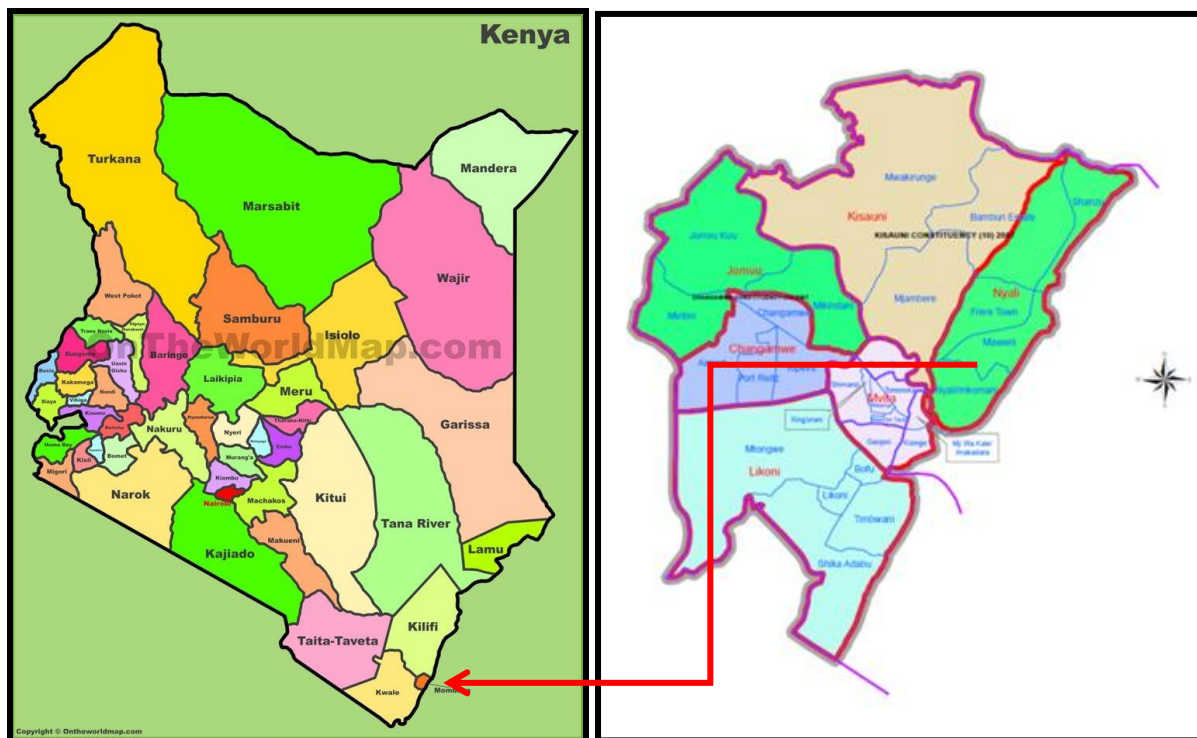


PLATE 1: Project location in Kenya (Source, Google Maps 2026)

The area falls under the jurisdiction of the County Government of Mombasa and relevant national regulatory authorities.

PLATE 3: Developments behind proposed site (Source, Field study 2026)



PLATE 2: Developments across the proposed site (Source, Field study 2026)



PLATE 4: Project Site & Surroundings (Source, Google Maps, 2026)



4.2.1 Summary of land use surrounding proposed project site

The **Juniour's Palace** project area is characterized by a mixed urban land-use pattern, comprising:

4.2.1.1 Tourism and Hospitality Zone

A significant cluster of **hotels, resorts, restaurants, and entertainment venues** exists along the **coastal frontage east of the site**, including:

- Voyager Beach Resort
- Sun Africa Hotel
- Cocoa Boutique Hotel
- Lookout Bar

This indicates that the project is located within a **tourism-sensitive environment**, where **visual aesthetics, noise levels, and traffic conditions** are important considerations.

4.2.1.2 Residential Neighbourhoods

The western and south-western sections contain **residential estates and apartment developments**, including:

- Nyali Luxury Apartments
- Green Heights residential area

These represent **permanent receptors** that may experience impacts from:

- Construction noise
- Dust emissions
- Increased vehicle movement

4.2.1.2 Institutional / Health Facility

The presence of **Chiromo Medical Group** immediately adjacent to the site makes healthcare services a **critical sensitive receptor**, requiring:

- Controlled construction noise
- Unobstructed emergency access
- Effective dust management

4.2.1.3 Ongoing Urban Development

The nearby **ongoing development (NEMA/EIA/PSR/4888)** suggests **rapid urbanization in the area**, meaning cumulative environmental impacts should be considered, especially:

- Traffic congestion
- Construction noise overlap

- Infrastructure demand

4.2.1.4 Sensitive Environmental and Social Receptors

The following facilities require **special consideration during construction and operation**:

a) High Sensitivity

- **Chiromo Medical Group** (healthcare operations)
- **Nearby residential apartments and estates**
- **Tourism hotels and beachfront resorts**

b) Medium Sensitivity

- Restaurants and hospitality businesses
- Mixed-use residential-commercial establishments

c) Environmental Sensitivity

- **Coastal shoreline and beach ecosystem** east of the site, requiring proper **storm-water drainage, erosion control, and waste management**.

4.3 Climate and Meteorological Conditions

Nyali experiences a tropical coastal climate characterized by:

- High temperatures throughout the year (average 24°C – 32°C)
- High relative humidity
- Bimodal rainfall pattern:
 - Long rains: April to June
 - Short rains: October to December

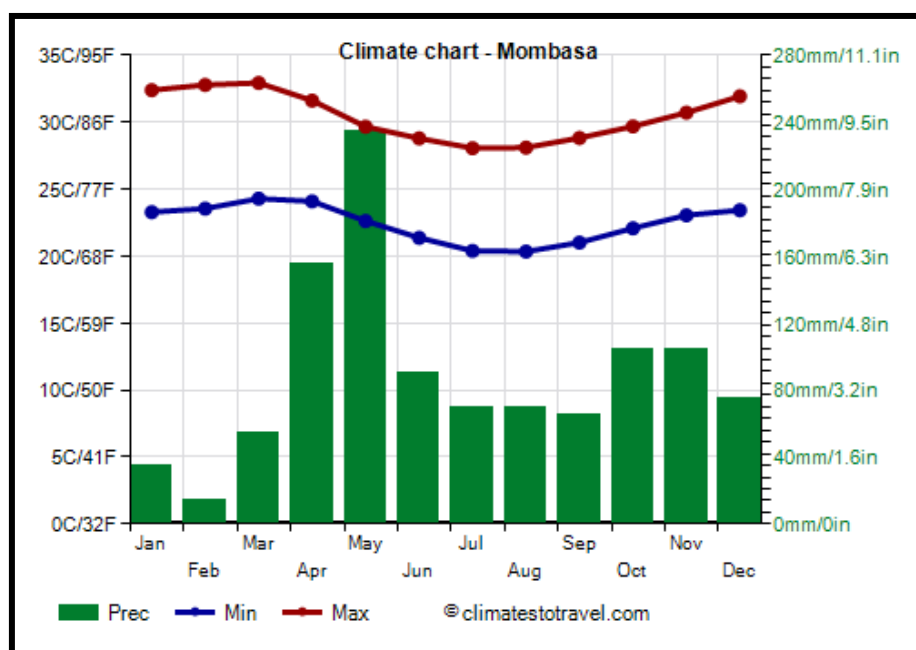


PLATE 5: Rainfall trends, Mombasa County Source, Met Dept)

The prevailing wind direction is generally influenced by monsoon systems:

- Northeast Monsoon (December–March)
- Southeast Monsoon (May–October)

Wind movement is a key consideration for dispersion of dust, exhaust emissions, and noise propagation.

4.4 Topography and Drainage

The terrain in Nyali is generally flat to gently undulating, typical of coastal plains. Elevation is relatively low above sea level.

Surface drainage in the area is influenced by:

- Natural coastal slope gradients
- Stormwater channels
- Urban drainage infrastructure

During heavy rainfall, localized surface runoff may occur if drainage systems are blocked or undersized.

4.5 Geology, Soils and Geotechnical Conditions

4.5.1 Regional Geological Setting

The project site (Plot No. 26756/MN, Nyali) is located within the coastal sedimentary formation of the northern mainland of Mombasa County. The area forms part of the raised coral reef complex characteristic of the Kenyan coastal belt.

The regional geology is dominated by:

- **Pleistocene coral limestone (coralline reef complex)**
- Coastal calcareous sands
- Sandy loam topsoil overlying limestone substratum

These formations are typical of Nyali and the broader northern coastal mainland, where ancient coral reef deposits have undergone uplift and exposure, forming relatively shallow limestone bedrock overlain by variable sandy deposits.

The presence of coral limestone indicates:

- Relatively competent substratum for structural foundations
- Variable depth to rock across short horizontal distances
- Potential need for mechanical excavation methods during substructure works

4.5.2 Local Soil Characteristics

Field observations and secondary geological references indicate that soils within the project site are predominantly sandy to sandy loam in texture. The soils exhibit moderate to high permeability due to their granular structure and low clay content.

Table 10: Typical Soil Characteristics in Nyali Area

Parameter	Observed / Typical Range	Environmental Implication
Soil Texture	Sandy to sandy loam	Rapid drainage
Permeability	Moderate to High	High infiltration rates
Erosion Susceptibility	Moderate to High (when exposed)	Requires erosion control during construction
Depth to Coral Rock	Approx. 0.5 m – 2.5 m (varies locally)	Mechanical excavation likely for basement works

The soils are generally well-drained under natural conditions; however, once vegetation cover is removed and soils are exposed, they become vulnerable to erosion, particularly during heavy rainfall events typical of the coastal climate.

4.5.3 Geotechnical Investigation

A detailed geotechnical investigation was undertaken by a qualified and accredited laboratory to determine subsurface conditions, bearing capacity, and foundation suitability for the proposed high-rise residential development.

The geotechnical scope included:

- Trial pits and/or borehole drilling
- Soil sampling and laboratory testing
- Determination of allowable bearing capacity
- Assessment of groundwater conditions
- Recommendations on foundation type and depth

The findings confirmed the presence of sandy soils overlying coral limestone substratum at variable depths. The limestone layer provides adequate structural support subject to proper foundation design.

4.6 Air Quality

The baseline air quality within the Nyali area was influenced primarily by:

- Vehicular traffic along Mt. Kenya Road
- Ongoing construction activities within surrounding developments
- Commercial and hospitality operations

The area did not host heavy industrial operations; therefore, background air pollution levels were considered moderate. However, traffic-related emissions were noticeable during peak hours.

4.6.1 Applicable Environmental Air Quality Standards

Air quality standards applicable to the project were prescribed under the Environmental Management and Coordination (Air Quality) Regulations, 2014, administered by the **National Environment Management Authority**.

Table 11: Applicable Ambient Air Quality Standards

Pollutant	Averaging Period	Permissible Limit
PM₁₀	24-hour	100 µg/m ³
PM_{2.5}	24-hour	35 µg/m ³
SO₂	24-hour	125 µg/m ³
NO₂	1-hour	200 µg/m ³
CO	8-hour	10 mg/m ³
Total Suspended Particulates (TSP)	24-hour	200 µg/m ³

4.6.2 Baseline Air Quality Monitoring

A NEMA-accredited laboratory was appointed to undertake baseline ambient air quality monitoring at the project site.

The assessment included:

- 24-hour sampling for particulate matter (PM₁₀ and PM_{2.5})
- Measurement of selected gaseous pollutants
- Recording of meteorological parameters

Certified laboratory results were to be attached to the final ESIA report as annexures.

4.7 Noise Environment

The ambient acoustic environment of the project area was characteristic of a mixed residential-commercial setting. The primary sources of noise were identified as:

- Vehicular traffic
- Commercial establishments
- Hospitality facilities
- Ongoing construction activities

Noise levels were generally higher during daytime business hours and lower at night, although hospitality operations occasionally contributed to elevated evening noise levels.

4.7.1 Applicable Environmental Noise Standards

Noise standards applicable to the project were prescribed under the Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Regulations, 2009.

Table 12: Applicable Environmental Noise Standards

Zone Classification	Daytime Limit (6:00am–10:00pm)	Night-time Limit (10:00pm–6:00am)
Mixed Residential/Commercial Area	60 dB(A)	35 dB(A)
Commercial Zone	65 dB(A)	55 dB(A)

Given the land use characteristics of Nyali, the project site was considered to fall within a mixed-use/commercial zone.

4.7.2 Baseline Noise Monitoring

A NEMA-accredited laboratory was engaged to conduct baseline noise measurements at the site. The monitoring included:

- 24-hour continuous sound level monitoring
- Determination of Leq (Equivalent Continuous Sound Level)
- Daytime and night-time noise profiling

The certified baseline noise monitoring results were to be appended to the ESIA report as annexures.

4.8 Water Resources and Supply

The project area was served by municipal water supply systems managed by the **Mombasa Water Supply and Sanitation Company** within Mombasa County.

Water supply in Nyali was characterized by:

- Intermittent municipal distribution
- Supplementary private borehole abstraction
- Seasonal variability in supply pressure

Groundwater abstraction was prevalent within the area. Over-extraction had the potential to result in:

- Saline intrusion from the Indian Ocean
- Lowering of groundwater table levels
- Increased pumping requirements

4.8.1 Applicable Water Quality Standards

Drinking water quality standards applicable in Kenya included the following limits:

Table 13: Applicable Drinking Water Quality Standards

Parameter	Maximum Permissible Limit
pH	6.5 – 8.5
Total Dissolved Solids (TDS)	1,200 mg/L

Parameter	Maximum Permissible Limit
Nitrates	50 mg/L
Fluoride	1.5 mg/L
Total Coliforms	0 per 100 ml

4.8.2 Baseline Water Quality Monitoring

A NEMA-accredited laboratory was appointed to conduct baseline water quality analysis, including:

- Physico-chemical parameters
- Bacteriological analysis
- Groundwater quality profiling (where applicable)

The certified laboratory results were to be attached to the ESIA report as annexures.

4.9 Biological Environment

4.9.1 Vegetation

The project site is located within a highly urbanized environment. Existing vegetation is characterized by:

- Ornamental landscaping
- Scattered shrubs
- Planted trees
- Coastal grasses

No critical habitats, protected forests, or ecologically sensitive ecosystems were identified within the immediate project footprint.

4.9.2 Fauna

Faunal presence within the site and its immediate surroundings is limited to:

- Common bird species
- Small mammals
- Reptiles typical of urban coastal settings

No endangered or protected wildlife species were observed within the project area during baseline assessment.

4.9.3 Environmentally Sensitive Areas

No gazetted protected areas, marine reserves, or wetlands were identified within the immediate project footprint. However, the broader coastal ecosystem of Mombasa County is environmentally sensitive, and cumulative urban pressure remains a concern.

4.10 Socio-Economic Environment

4.10.1 Population and Settlement Patterns

The project site was located in Nyali, a rapidly urbanizing and high-density mixed-use area within **Mombasa**. Nyali functioned as one of the prime residential and commercial zones of Mombasa County and exhibited a dynamic population structure characterized by both permanent and transient populations.

According to the Kenya Population and Housing Census conducted by the **Kenya National Bureau of Statistics**, Mombasa County had:

Table 14: Mombasa County-Level Demographic Overview

Indicator	Value
Total Population	1,208,333 persons
Male Population	610,257
Female Population	598,046
Intersex	30
Number of Households	378,422
Average Household Size	3.1 persons
Population Density	Approx. 5,604 persons/km ²
Annual Growth Rate	Approx. 3%

Mombasa County was among the most densely populated counties in Kenya due to its relatively small land area (approximately 229.7 km² excluding water bodies) and its economic importance as a port city and tourism hub.

4.10.2 Sub-County Context – Nyali Area

Nyali formed part of Kisauni Sub-County, which had a high concentration of residential estates, commercial centers, educational institutions, and hospitality facilities.

The settlement pattern within Nyali was characterized by:

- Gated residential estates
- High-rise apartment developments
- Stand-alone villas and maisonettes
- Hotels, guesthouses, and serviced apartments
- Retail complexes and office blocks
- Recreational facilities and beaches

Land subdivision patterns reflected medium to high plot coverage ratios, particularly along major access roads such as Mt. Kenya Road.

4.10.3 Population Structure

The demographic structure of Mombasa County showed:

- A youthful population profile, with a significant proportion under 35 years

- A substantial working-age population (15–64 years), supporting commercial and service-sector activities
- A growing middle-income residential segment in Nyali

Nyali specifically attracted:

- Middle- and high-income permanent residents
- Expatriates
- Business professionals
- Seasonal tourists
- Short-term business visitors

The presence of hotels, beach resorts, and commercial centers contributed to fluctuations in daytime and seasonal population densities.

4.10.4 Urbanization and Housing Trends

The area had experienced accelerated vertical development over the past decade, driven by:

- Population growth
- Demand for serviced apartments
- Expansion of commercial activities
- Tourism sector growth

This had resulted in:

- Increased demand for infrastructure (water, sewer, roads)
- Higher traffic volumes along arterial roads
- Increased demand for solid waste management services

The proposed Juniors Palace Limited development was therefore situated within an already urbanized and commercially active settlement zone.

4.10.5 Population and Settlement Patterns

Nyali is a high-density, mixed-income urban area with:

- Residential estates
- Apartments
- Hotels and guesthouses
- Retail and commercial facilities

The area hosts both permanent residents and transient populations (tourists and business visitors).

4.11 Land Use and Planning Context

Land use in Nyali is mixed and includes:

- Residential developments

- Hospitality establishments
- Commercial complexes
- Institutional facilities
- Service-oriented businesses

The proposed mixed-use commercial development is consistent with prevailing land use patterns in the area.

4.11.1 Infrastructure and Utilities

The area is served by:

- Electricity supplied by Kenya Power and Lighting Company
- Road infrastructure connected to major urban routes
- County and private waste collection services
- Telecommunication networks

Traffic congestion is occasionally experienced during peak hours due to commercial density.

4.11.2 Economic Activities

The dominant economic activities in Nyali include:

- Hospitality and tourism
- Retail trade
- Professional services
- Transport services
- Real estate development

The proposed project is expected to integrate into this commercial-economic structure.

4.11.3 Public Health and Safety Context

The area hosts:

- Health facilities
- Emergency response services
- Fire response units

However, increased construction and urban density may heighten risks associated with:

- Traffic accidents
- Fire hazards
- Occupational safety incidents

4.12 Cultural and Heritage Considerations

No known archaeological or cultural heritage sites were identified within the project site. However, chance-find procedures will be implemented during excavation works in accordance with national requirements.

4.13 Summary of Baseline Sensitivities

The baseline assessment identified the following key environmental and social sensitivities:

- Urban traffic congestion
- Noise propagation in mixed residential-commercial setting
- Dust generation during construction
- Groundwater abstraction pressure
- Fire safety risks in high-density commercial zones

These baseline conditions form the reference framework for impact prediction and mitigation planning in subsequent chapters.

CHAPTER FIVE: PROJECT DESIGN AND ACTIVITIES

5.1 Project Design

This chapter describes the proposed design, construction methodology, and operational activities for the Junieur’s Palace Limited Residential Development located on Plot No. 26756/MN along Mt. Kenya Road, Nyali, Mombasa. The project site occupies 0.4465 hectares and is designed to provide high-quality residential accommodation alongside modern recreational facilities.

The project will comprise:

- Multi-storey residential apartment blocks.
- Two (2) levels of underground parking (Basement 1 and Basement 2).
- A swimming pool and residents’ clubhouse.
- Supporting infrastructure, including internal access roads, pedestrian walkways, and landscaped areas.

The design adheres to the Physical and Land Use Planning Act (2019), the Environmental Management and Coordination Act (EMCA), and the Occupational Safety and Health Act (OSHA, 2007).

5.2 Pre-Construction Phase Activities

The pre-construction phase involves critical preparatory works required before physical construction commences.

5.2.1 Detailed Survey and Setting-Out

The proponent will conduct a detailed topographical survey of the 0.4465-hectare site to confirm boundaries and set out the building footprints, basement excavation zones, and communal areas. This phase also includes identifying existing underground utilities and installing site hoarding and safety signage to secure the site.

5.2.2 Design Finalization and Approvals

The project team will finalize all architectural, structural, and MEP (Mechanical, Electrical, and Plumbing) drawings. Key regulatory steps include:

- Obtaining development approval from the County Government of Mombasa.
- Securing an Environmental Impact Assessment (EIA) License from NEMA.
- Registering the construction site with the Directorate of Occupational Safety and Health Services (DOSHS).

5.3 Construction Phase Activities

Construction is expected to span 24–30 months, implemented in sequential stages with rigorous oversight.

5.3.1 Site Clearance and Bulk Excavation

Bulk excavation will be undertaken for the two underground basement levels. This involves controlled shoring and slope stabilization to prevent collapse and ensure the safety of adjacent properties. Suitable excavated material will be stockpiled for reuse, while excess material (spoil) will be disposed of through licensed handlers.

5.3.2 Basement and Superstructure Development

Basement construction involves casting reinforced concrete slabs and retaining walls, coupled with high-grade waterproofing membranes. The superstructure will consist of reinforced concrete columns and beams designed to withstand coastal wind loads. Masonry and finishing works will follow, utilizing high-quality materials to ensure long-term durability in the saline Mombasa environment.

5.3.3 Sourcing and Management of Construction Materials

The Proponent will ensure that all construction materials are sourced from licensed and legally compliant suppliers within Kenya. Quarry materials, sand, ballast, and hard-core will be obtained from NEMA-approved extraction sites. Timber will be sourced from certified suppliers, and reinforcement steel will be procured from recognized manufacturers.

The objective will be to ensure responsible sourcing, safe handling, minimal waste generation, and reduced environmental footprint throughout the construction lifecycle.

All suppliers will be required to provide proof of:

- Valid operating licenses
- NEMA compliance (where applicable)
- Material Safety Data Sheets (MSDS) for chemical products
- Transportation compliance certification

Material storage areas on site will be designated, clearly marked, and protected from weather exposure and surface runoff contamination.

Table 15: Environmental Management Requirements for Construction materials

Material	Primary Application	Key Environmental Risks	Management & Mitigation Measures
Sand & Ballast	Concrete production, masonry	Illegal extraction impacts; dust; siltation of storm drains	Source from licensed quarries; cover trucks; wet suppression during offloading; install silt traps
Cement	Binding agent in concrete/mortar	High alkalinity; dust emissions; soil contamination from runoff	Store in dry, raised areas; use PPE (respirators, gloves); prevent mixing near drainage channels
Reinforcement Steel	Structural columns, beams, slabs	Scrap metal waste; corrosion; sharp-edge injuries	Store off ground; collect scrap for recycling; enforce PPE use
Quarry Blocks / Ma-	Walling works	Breakage leading to	Order accurate quantities;

Material	Primary Application	Key Environmental Risks	Management & Mitigation Measures
sonry Units		solid waste	reuse broken blocks as hard-core
Timber (Formwork)	Slab casting, scaffolding	Deforestation pressure; fire risk; waste generation	Source from certified suppliers; reuse formwork multiple times; store away from ignition sources
PVC Pipes & Fittings	Plumbing & drainage	Non-biodegradable off-cuts	Segregate plastic waste; send to licensed recyclers
Electrical Cables	Internal wiring	Copper waste; fire hazard	Minimize off-cuts; store safely; recycle scrap metals
Paint & Solvents	Finishing works	VOC emissions; hazardous waste from containers	Use lead-free paints; store in ventilated area; treat empty tins as hazardous waste
Tiles (Ceramic/Porcelain)	Flooring and wall finishes	High breakage; slurry runoff clogging drains	Precise cutting; contain tile slurry; dispose as inert waste
Water	Mixing, curing, dust control	Resource wastage; runoff erosion	Implement controlled curing methods; avoid discharge onto public roads

5.5 Summary of Project Inputs, Machinery and Waste Streams

The following table consolidates project inputs and outputs across construction and operational phases.

Table 16 : Project Inputs, Machinery, and Associated Waste Streams

Phase	Machinery & Systems	Key Inputs	Waste Streams / Emissions	Environmental Controls
Construction Phase	Excavators, Backhoes, Tower Crane, Concrete Mixers, Vibrators, Hoists, Diesel Generators, Water Tankers	Sand, ballast, cement, steel, blocks, timber, PVC pipes, cables, tiles, paint, water	Excavated spoil; broken blocks; timber off-cuts; scrap metal; empty cement bags; tile fragments; dust (PM ₁₀); exhaust gases (CO ₂ , NO _x); noise; silt runoff	Dust suppression; spoil reuse; licensed waste handlers; equipment maintenance; sediment control
Operational Phase	Lifts (Elevators), Booster Pumps, Sump Pumps, Pool Filtration System, Standby Generator, Fire Hydrant System, CCTV	Municipal water (MOWASSCO), electricity (Kenya Power), pool chemicals (chlorine, pH adjusters), cleaning agents, generator fuel	Domestic solid waste (organic, plastics, glass); sewage (black water & grey-water); pool backwash water; used oil; spent batteries; e-waste; generator emissions	Waste segregation; sewer connection or approved treatment; licensed hazardous waste disposal; preventive maintenance of generator

5.6 Material–Environment Interaction Overview

Construction materials will interact with the environment primarily through:

- Dust emissions
- Runoff and sedimentation
- Solid waste generation
- Occupational health risks
- Chemical exposure (paints, pool chemicals during operation)

These risks will be managed through:

- Source control (licensed suppliers)
- Engineering controls (silt traps, proper storage areas)
- Administrative controls (EMP implementation, waste registers)
- Personal protective equipment (PPE)
- Engagement of licensed waste handlers

5.4 Operational Phase Activities

Upon completion and occupancy, the development will transition into the operational phase. This phase will focus on sustainable resource use, infrastructure maintenance, environmental compliance, and resident safety.

Operational activities will be managed by an appointed Estate Management Company responsible for utilities, waste management, safety systems, and environmental monitoring.

5.4.1 Operational Systems and Environmental Management Framework

The table below summarizes key operational components, associated environmental aspects, and management measures.

Table 17: Operational Phase Activities and Environmental Management Measures

Operational Component	Key Inputs / Activities	Environmental Risks	Management & Control Measures
Water Supply System	Municipal water (MOWASSCO); supplementary borehole (if required); booster pumps	Over-abstraction of groundwater; leakages; high consumption	Install water meters per unit; routine leak detection; water-saving fixtures; borehole abstraction permit compliance
Wastewater Management	Domestic sewage (black water & greywater); pool backwash water	Sewer overload; effluent discharge; contamination of soil/groundwater	Connect to municipal sewer where available; if on-site treatment is used, operate NEMA-approved system; routine desludging; maintain effluent records
Stormwater Management	Roof runoff; paved area runoff; basement ramp drainage	Flooding; siltation of drainage systems	Maintain engineered drainage channels; install silt traps; periodic cleaning; ensure no blockage of public drains
Solid Waste	Household waste (or-	Poor segregation; ille-	Implement waste segregation

Operational Component	Key Inputs / Activities	Environmental Risks	Management & Control Measures
Management	ganic, plastics, paper, glass); packaging waste	gal dumping; odour and pest attraction	at source; provide color-coded bins; contract licensed waste handlers; maintain waste collection register
Basement Parking Operations	Vehicular parking; ramp circulation; mechanical ventilation	Exhaust emissions (CO ₂ , NO _x); oil drips; confined air quality issues	Install mechanical ventilation systems; routine air quality checks; oil spill trays; proper drainage to oil interceptor
Swimming Pool Operations	Water circulation; filtration; chlorination; chemical dosing	Chemical handling risks; discharge of backwash water	Store chemicals in ventilated area; trained personnel for dosing; controlled backwash discharge into sewer
Clubhouse Operations	Social gatherings; recreational activities	Noise disturbance; increased water & energy use	Establish operational guidelines; noise control measures; limit event hours; enforce estate management rules
Energy Consumption	Grid electricity (Kenya Power); standby generator	High energy demand; generator emissions; used oil waste	Promote LED lighting; preventive maintenance of generator; safe storage and licensed disposal of used oil
Landscaping & Green Areas	Irrigation; fertilizer use; lawn maintenance	Excessive water use; chemical runoff	Use drought-resistant plants; drip irrigation systems; minimal fertilizer application
Occupational Health & Safety	Maintenance works; cleaning; security operations	Slips, falls, electrical hazards	Maintain fire extinguishers and hydrants; conduct safety audits; display emergency signage; maintain first-aid kits

5.4.2 Resource Efficiency and Sustainability Measures

During the operational phase, the estate management will implement the following sustainability measures:

- Installation of energy-efficient lighting systems (LED technology).
- Use of low-flow plumbing fixtures to reduce water consumption.
- Routine inspection of basement sump pumps and drainage systems.
- Preventive maintenance schedule for lifts and mechanical systems.
- Environmental awareness programs for residents on waste segregation and water conservation.

5.4.3 Environmental Monitoring During Operation

The following monitoring activities will be implemented:

- Monthly water consumption monitoring.
- Quarterly inspection of drainage and silt traps.
- Annual environmental audit as required by the **National Environment Management Authority**.
- Waste management record keeping and contractor license verification.

5.7 Conceptual Decommissioning Phase

Although the proposed residential development is intended for long-term use, a conceptual decommissioning framework will be implemented at the end of the project's economic life or in the event of redevelopment.

Decommissioning activities will be undertaken in compliance with the Environmental Management and Coordination Act (EMCA), 1999 (as amended), and under the supervision of the **National Environment Management Authority**.

5.7.1 Pre-Decommissioning Planning

Prior to commencement of demolition works, the Proponent will:

- Notify relevant regulatory authorities, including NEMA and the County Government of Mombasa.
- Prepare a Decommissioning and Demolition Management Plan (DDMP).
- Conduct a structural assessment to determine safe demolition methodology.
- Undertake environmental screening to identify any hazardous materials (e.g., asbestos-containing materials, chemical storage residues, fuel tanks if any).
- Secure the site to prevent unauthorized access.

5.7.2 Controlled Demolition Activities

Demolition will be conducted using controlled mechanical methods to minimize environmental and safety risks.

Activities will include:

- Systematic dismantling of non-structural components (doors, windows, fixtures).
- Removal of electrical, plumbing, and mechanical installations.
- Controlled structural demolition using hydraulic breakers and jackhammers.
- Progressive floor-by-floor dismantling where necessary to maintain stability.

Dust suppression measures (e.g., water spraying) will be implemented to control particulate emissions. Noise-generating activities will be restricted to approved working hours.

5.7.3 Waste Segregation and Management

All demolition debris will be segregated at source into recyclable and non-recyclable streams.

Recyclable Materials:

- Reinforcement steel
- Structural steel components
- Aluminium and copper cables
- Timber elements (where reusable)

Non-Recyclable / Inert Waste:

- Concrete rubble
- Masonry blocks
- Ceramic tiles

Concrete rubble may be crushed and reused as hard-core material where feasible. All residual waste will be transported by licensed waste handlers to designated disposal facilities approved by the County Government.

Hazardous waste, if identified (e.g., used oils from generators, batteries, chemical residues), will be handled separately and disposed of through NEMA-licensed hazardous waste handlers.

A waste register will be maintained throughout the decommissioning process.

5.7.4 Environmental Protection during Decommissioning

The following environmental safeguards will be implemented:

- Installation of temporary barriers to control dust dispersion.
- Proper drainage control to prevent silt-laden runoff.
- Noise control measures.
- Occupational safety compliance under OSHA, 2007.
- Use of appropriate PPE by all demolition personnel.

5.7.5 Site Restoration and Closure

Upon completion of demolition and debris removal, the site will be restored to a stable condition through:

- Backfilling and compaction of excavated areas.
- Regrading to natural contours or approved redevelopment levels.
- Landscaping and re-vegetation to prevent soil erosion.
- Removal of temporary facilities and fencing.

A post-decommissioning environmental audit will be conducted and submitted to NEMA for compliance confirmation.

CHAPTER SIX: ANTICIPATED IMPACTS & PROPOSED MITIGATION MEASURES

6.1 Introduction

This Chapter presents a comprehensive evaluation of anticipated environmental, social, occupational, and public safety impacts associated with the proposed **Juniour’s Palace Residential Development** in Nyali, Mombasa County.

The impact analysis was undertaken in accordance with:

- Environmental Management and Coordination Act (EMCA), Cap 387
- Environmental (Impact Assessment and Audit) Regulations, 2003
- Occupational Safety and Health Act (OSHA), 2007
- Environmental (Waste Management) Regulations, 2006
- Environmental (Air Quality) Regulations, 2014
- Environmental (Noise and Excessive Vibration Pollution Control) Regulations, 2009
- Water Act, 2016
- County Physical and Land Use Planning Regulations

The assessment applied:

- Weighted Likert-based significance scoring
- Mitigation hierarchy principle
- Climate resilience screening
- Cumulative impact considerations for Nyali’s high-density growth

Impacts were categorized as:

1. Biophysical Environment
2. Socio-Economic Environment
3. Occupational Health & Safety
4. Public Health & Safety
5. Climate & Resource Efficiency

6.1.1 Impact Rating Methodology

Each impact was evaluated using a **5-parameter Likert scoring system**, with magnitude and probability double-weighted:

Table 18: Five parameter Likert Scoring criteria

Parameter	Description	Score (1–5)
Magnitude (M)	Severity of change	1 = Negligible 2=Minor Change 3=Moderate Change 4=Major Change 5 = Severe/Catastrophic
Extent (E)	Spatial influence	1 = Site-specific 2 =Immediate surroundings 3=Local neighbourhood 4=Sub County level

Parameter	Description	Score (1–5)
		5 = County/Regional
Duration (D)	Temporal persistence	1 = Very short (Days Weeks) 2 =Short term (<1year) 3 =Medium-term (1–5 years) 4 =Long-term (5–15 years) 5 = Permanent(>15 years)
Reversibility (R)	Recovery potential	1 = Easily reversible 2 =Reversible with minimum intervention 3 =Partially reversible 4 =Difficult to reverse 5 = Irreversible
Probability (P)	Likelihood	1 = Rare 2 =Unlikely 3 =Possible 4 =Very likely 5 = Almost certain

To ensure that high-consequence risks are not underestimated, Magnitude and Probability were assigned higher weighting factors.

The Total Significance Score (TSS) was calculated as follows:

$$TSS = (2M) + E + D + R + (2P)$$

Significance Levels:

Table 19: Summary of significance levels

TSS Range	Significance Level
5 – 14	Low
15 – 24	Moderate
25 – 35	High / Significant

Residual TSS is calculated post-mitigation using **revised M and P values** to show effectiveness of mitigation.

6.2 Anticipated Positive Impacts

6.2.1 Creation of Employment Opportunities

The development will generate significant direct and indirect employment. During construction, the project will employ architects, engineers, foremen, and hundreds of skilled and unskilled labourers.

This presents a vital opportunity for local youth and women to gain temporary income and practical experience. In the operational phase, the project will generate permanent jobs for facility managers, security personnel, and maintenance staff, fostering long-term economic uplift for the community.

Table 20: Employment Opportunities Matrix

Impact Source	Benefit Type	Pre-Mitigation TSS	Proposed Enhancement Measure	Post-Mitigation TSS	Residual Risk
Construction Phase	Direct/Temporary Labor	25 (High)	Priority recruitment of local youth & women	20 (Moderate)	Low
Operational Phase	Indirect/Permanent Labor	18 (Moderate)	Continuous professional training for staff	14 (Low)	Low

Key Measures: Local content sourcing, skill transfer programs, mentorship.

6.2.2 Provision of High-Density Housing Stock

The high-rise design maximizes land use, contributing to national housing goals and reducing urban sprawl. This addresses the acute housing shortage in Nyali by offering **safe, modern, and affordable residential units**, supporting families across income levels. The vertical design ensures minimal land footprint while maintaining open spaces and communal amenities, enhancing both social cohesion and urban aesthetics.

Table 21: High-Density Housing Stock Matrix

Impact Source	Benefit Type	Pre-Mitigation TSS	Proposed Enhancement Measure	Post-Mitigation TSS	Residual Risk
High-Rise Design	Optimized Land Use	25 (High)	Varied unit sizes and income brackets	22 (High)	Low

Key Measures: Affordable unit configurations, high-quality architectural finishes.

6.2.3 Economic Stimulus and Increased Revenue

The project will **stimulate the local economy** through procurement of materials (cement, steel, timber, glass) from local suppliers, supporting manufacturers and small-scale service providers.

Additionally, revenue generation via statutory fees, VAT, and future land rates will contribute to both county and national government coffers, enabling reinvestment in public services and infrastructure.

Table 22: Economic Stimulus Matrix

Impact Source	Benefit Type	Pre-Mitigation TSS	Proposed Enhancement Measure	Post-Mitigation TSS	Residual Risk
Material Sourcing	Market Growth	25 (High)	Prioritize Kenyan manufacturers	20 (Moderate)	Low
Statutory Fees	Fiscal Revenue	18 (Moderate)	Timely payment of permits and levies	14 (Low)	Low

Key Measures: Supply chain localization, integration of local service providers.

6.2.4 Improvement of Local Infrastructure

The project will require and fund upgrades to **access roads, sewer lines, and street lighting**, which will benefit both residents and the general public. These improvements will enhance connectivity, reduce flooding risks, and improve communal safety. Coordination with the County Government ensures that infrastructure upgrades integrate seamlessly into the wider municipal network.

Table 23: Local Infrastructure Improvement Matrix

Impact Source	Benefit Type	Pre-Mitigation TSS	Proposed Enhancement Measure	Post-Mitigation TSS	Residual Risk
Site Logistics	Road / Drainage Upgrades	18 (Moderate)	Construct upgrades to standards for public handover	14 (Low)	Low

Key Measures: Collaborate with County Government; extend street lighting & CCTV coverage.

6.2.5 Adoption of Green Building Technologies

By integrating solar PV panels, LED lighting, onsite STP, and waste recovery systems, the project demonstrates a commitment to sustainable urban living. Resource efficiency is enhanced, water consumption is optimized, and overall carbon footprint is reduced.

Reuse of greywater and energy-efficient systems ensures long-term environmental benefits for the site and surrounding neighborhood.

Table 24: Green Building Technologies Matrix

Impact Source	Benefit Type	Pre-Mitigation TSS	Proposed Enhancement Measure	Post-Mitigation TSS	Residual Risk
Green Systems	Resource Efficiency	18 (Moderate)	Greywater reuse, solar PV, integrated waste management	12 (Low)	Low

6.2.6 Key Recommendations for enhancement of Positive Impacts

1. Employment Opportunities

- Prioritize hiring local youth, women, and vulnerable groups for both skilled and unskilled positions.
- Implement on-the-job training and mentorship programs to enhance technical capacity.
- Establish a transparent recruitment process coordinated with local administration.

2. High-Density Housing Provision

- Provide a mix of unit sizes and affordability levels to cater to diverse households.

- Ensure modern, safe, and high-quality finishes to enhance the local housing stock.
 - Maintain architectural quality to positively contribute to the Nyali skyline.
3. **Economic Stimulus & Local Revenue**
- Source construction materials locally to support “Buy Kenya, Build Kenya” initiatives.
 - Engage small-scale local suppliers and service providers in logistics and support activities.
 - Ensure timely payment of statutory fees, permits, and levies to support county and national revenue collection.
4. **Local Infrastructure Improvement**
- Collaborate with the County Government to integrate road, drainage, and street lighting upgrades into municipal networks.
 - Extend external security lighting and CCTV coverage to improve neighborhood safety.
 - Maintain infrastructure to public standards for eventual handover.
5. **Green Building Technologies & Sustainability**
- Install solar water heaters, LED lighting, and PV panels for common areas to reduce energy demand.
 - Reuse greywater from STP for irrigation and cleaning.
 - Implement an integrated solid waste management system, including recovery and recycling, to minimize environmental footprint.

6.3 Anticipated Negative Impacts

6.3.1 Occupational Health & Safety (OHS)

Construction at height and use of heavy machinery presents serious risks including **falls, being struck by objects, and lifting accidents**.

Unmitigated, these hazards could result in fatalities or permanent disabilities.

Proactive adherence to OSHA standards, use of safety equipment, and emergency preparedness are essential to protect both workers and the public.

Table 25: OHS Impacts Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Work at Height	Fatalities / Permanent Disability	27 (High)	Fall arrest harness, guardrails	15 (Moderate)	Low
Dropped Objects	Injuries to workers & neighbors	27 (High)	Outrigger catch-fans, toe-boards	14 (Low)	Low
Lifting Operations	Crane collapse / Load sway	27 (High)	3rd party certification, wind shut-downs	15 (Moderate)	Low

6.3.2 Fire Safety & Emergency Risks

The accumulation of flammable materials during construction and the vertical layout of the building in operation increase fire hazards and evacuation challenges. The project will implement automated fire suppression, redundant escape routes, and fire-resistance engineering controls to minimize casualties and property loss.

Table 26: Fire Safety Risks Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Construction Phase	Site-wide fire outbreak	27 (High)	Temporary dry risers, Hot Work permits	14 (Low)	Low
Operational Phase	Entrapment / Mass casualties	27 (High)	Fire alarm, sprinklers, redundant stairwells	15 (Moderate)	Low

6.3.3 Noise and Vibration Impacts

Construction activities such as piling, excavation, and machinery operation will generate **high levels of noise and ground-borne vibrations**. This can lead to **psychological stress for nearby residents**, disturbance to local schools or hospitals, and even **structural cracking** in adjacent buildings. Chronic exposure may reduce the livability of the neighborhood if not mitigated. Effective mitigation includes **temporal restrictions, acoustic shielding, and vibration monitoring**.

Table 27: Noise and Vibration Impacts Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Structural Piling	Cracking in adjacent houses	21 (Moderate)	Low-vibration bored piling; boundary seismic monitoring	13 (Low)	Low
General Machinery	Noise nuisance (>55dB night)	21 (Moderate)	Acoustic barriers, restrict work to daytime	12 (Low)	Low

6.3.4 Air Pollution (Dust and Emissions)

Excavation, masonry, and vehicular movement will **generate particulate matter (PM10/PM2.5)**, which poses a **respiratory health risk** to workers and neighboring residents. High-rise wind effects can accelerate dust dispersion. Mitigation requires **dust suppression, encapsulation of scaffolding, vehicle tarping, and wheel washes**.

Table 28: Dust and Emissions Impacts Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Fugitive	Respiratory	22 (Moderate)	Scaffold encapsulation,	11 (Low)	Low

Dust	illness / Soiling	ate)	water misting, vehicle wheel wash		
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6.3.5 Traffic Congestion and Infrastructure Stress

The project will result in increased construction and operational traffic, including trucks, concrete mixers, and supply vehicles. This could cause localized congestion, pedestrian safety risks, and accelerated road deterioration. Coordination with the County, use of trained traffic marshals, and scheduling deliveries during off-peak hours can minimize these impacts.

Table 29: Traffic Impacts Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Construction Vehicles	Local congestion & road wear	22 (Moderate)	Traffic marshalling, repair damaged infrastructure	14 (Low)	Low

6.3.6 Overshadowing, Loss of Privacy, and Solar Glare

The vertical scale of the high-rise development will cast shadows over neighboring properties, reduce natural light, and interfere with existing solar installations. Upper floors may allow line-of-sight into private yards, causing privacy concerns.

Strategic building setbacks, stepped design, obscured glass, and solar glare control can reduce these effects.

Table 30: Overshadowing, Privacy, and Solar Glare Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Building Mass/Height	Blocking sunlight	26 (High)	Architectural setbacks, stepped upper floors	23 (Moderate)	Moderate
Window Orientation	Loss of privacy	26 (High)	Frosted glass, louvers, strategic balcony placement	14 (Low)	Low
Glass Façade	Reflective solar glare	20 (Moderate)	Non-reflective glazing, matte finishes	12 (Low)	Low

6.3.7 Solid Waste and Liquid Waste / Effluent

High-density residential operations will generate **substantial solid waste** and **effluent**, potentially causing **sewer blockages**, **groundwater contamination**, and **public health hazards**. Implementing **onsite STPs**, **waste segregation**, and **proper disposal mechanisms** reduces these risks significantly.

Table 31: Waste and Effluent Matrix

Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
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Impact Source	Potential Impact	Pre-Mitigation TSS	Mitigation Commitment	Post-Mitigation TSS	Residual Risk
Solid Waste	Accumulation, odor, pests	27 (High)	Segregation, waste chutes, onsite waste room	13 (Low)	Low
Liquid Waste	Sewer contamination	28 (High)	Onsite STP, grease interceptors, controlled discharge	14 (Low)	Low

6.3.8 Structural Failure and Building Collapse

In light of recent building collapses within the region, the risk of structural failure is a significant concern. Such failures will lead to catastrophic loss of life, total destruction of property, and severe legal liabilities for the proponent.

The primary causes of such failures include poor geotechnical surveying, the use of sub-standard construction materials (counterfeit cement or underweight steel), unprofessional workmanship, and the premature removal of formwork before concrete has achieved the required design strength.

To neutralize the risk of structural failure, the proponent **shall implement** the following "Fail-Safe" measures:

- a) **Geotechnical Investigation:** A detailed sub-soil analysis shall be conducted by a registered geologist to determine the soil bearing capacity. The foundation design (e.g., raft or piled foundation) will be strictly based on these empirical results.
- b) **Structural Integrity Audits:** The structural engineer shall provide "Form B" certificates at every critical stage (foundation, columns, and slabs). No subsequent floor shall be cast until the previous level has been inspected and cleared in writing.
- c) **Material Quality Assurance:** All batches of cement and reinforcement steel will be sourced from ISO-certified manufacturers. Random samples shall be taken for independent laboratory "crush tests" to ensure they meet the approved strength requirements.
- d) **Concrete Curing & Formwork:** Formwork shall not be struck (removed) prematurely. The contractor will adhere to a strict curing schedule (minimum 21–28 days for load-bearing slabs) to ensure the concrete reaches its maximum structural density.
- e) **Regulatory Oversight:** The project shall be registered with the National Construction Authority (NCA), and the site will be open for ad-hoc inspections by the Board of Registration of Architects and Quantity Surveyors (BORAQS) and County structural engineers.
- f) **Structural Health Monitoring:** During the operational phase, the building shall undergo periodic structural audits every year to check for signs of fatigue, settlement cracks, or unapproved structural modifications by tenants

Table 32: Structural Failure Matrix

No.	Impact Source	Potential Structural Impact	L	S	Pre-Mitigation TSS	Risk Level	Mitigation Commitment	L	S	Post-Mitigation TSS	Residual Risk
1	Sub-standard Materials	Structural collapse / reduced load capacity	5	6	30	Critical	ISO-certified suppliers, batch testing, cube tests, material approval register	3	6	18	Moderate–Low
2	Poor Soil Bearing Capacity	Foundation failure / excessive settlement	5	6	30	Critical	Detailed geotechnical investigation, pile foundation design, load testing	3	6	18	Moderate–Low
3	Inadequate Structural Design	Progressive collapse / instability	5	6	30	Critical	Independent peer review, compliance with Eurocode /KS standards, structural certification	3	6	18	Moderate–Low
4	Poor Workmanship	Weak joints, cracking, structural defects	5	5	25	High	Full-time qualified supervision, NCA inspections, QA/QC system	3	5	15	Low
5	Coastal Salinity (Corrosion Risk – Nyali)	Reinforcement corrosion, durability failure	4	6	24	High	Sulphate-resistant cement, epoxy-coated rebar, adequate concrete cover	3	5	15	Low
6	High Water Table	Basement uplift / water ingress / instability	4	6	24	High	Dewatering system, subsoil drainage, waterproof membranes	3	5	15	Low
7	Wind Loading (Coastal Exposure)	Lateral instability / structural sway	4	6	24	High	Wind load modeling, shear walls, lateral bracing design	3	5	15	Low
8	Seismic Activity	Structural cracking / collapse	3	6	18	High	Seismic-compliant design per building code	2	5	10	Moderate–Low
9	Poor Concrete Curing	Reduced compressive strength	4	5	20	High	Controlled curing procedures, cube strength verification	3	4	12	Moderate
10	Unauthorized Design Alterations	Compromised structural load path	4	6	24	High	Strict change control protocol, engineer approval required	2	5	10	Moderate–Low
11	Overloading (Change of Use)	Structural overstress	3	6	18	High	Occupancy limits, structural compliance checks before change of use	2	5	10	Moderate–Low
12	Inadequate Drainage / Erosion	Soil weakening / differential settlement	4	5	20	High	Perimeter drainage, stormwater management system	2	4	8	Low
13	Fire Exposure	Structural weakening / spalling	4	6	24	High	Fire-rated materials, fire engineering design, sprinklers	2	5	10	Moderate–Low
14	Vibration from Adjacent Construction	Cracking / structural fatigue	3	5	15	Moderate	Vibration monitoring, controlled piling methods	2	4	8	Low
15	Contractor Capacity Risk	Systemic construction defects	4	6	24	High	Prequalification, NCA registration, performance bond	2	5	10	Moderate–Low

6.3.9 Key recommendations for mitigating negative impacts.

- 1) Occupational Health & Safety (OHS)**
 - a. Enforce mandatory use of Class A fall-arrest harnesses and certified guardrails for work at height.
 - b. Implement vertical rescue plans and first-aid stations for emergency response.
 - c. Maintain an onsite Safety Ledger in compliance with OSHA 2007.
- 2) Fire Safety & Emergency Preparedness**
 - a. Install automated fire detection and suppression systems in compliance with BS 9999.
 - b. Provide redundant fire-rated stairwells and clearly marked egress routes.
 - c. Implement “Hot Work” permits and temporary risers during construction.
- 3) Noise and Vibration Management**
 - a. Limit construction activities to daytime hours (08:00–18:00 weekdays; 08:00–13:00 Saturdays).
 - b. Use low-vibration piling methods and acoustic barriers along the site perimeter.
 - c. Conduct seismic and vibration monitoring at boundaries.
- 4) Air Quality Management**
 - a. Encapsulate scaffolding and apply regular water misting on unpaved surfaces.
 - b. Tarp all transport vehicles and install wheel-wash stations to prevent dust dispersion.
- 5) Traffic and Infrastructure Management**
 - a. Employ trained traffic marshals to coordinate site vehicle movement.
 - b. Repair any public roads or infrastructure damaged during construction.
 - c. Schedule deliveries during off-peak hours to minimize congestion.
- 6) Overshadowing, Privacy, and Solar Glare**
 - a. Design stepped upper floors and architectural setbacks to minimize shadows.
 - b. Use obscured glass, louvers, or planter boxes to protect neighbors’ privacy.
 - c. Apply non-reflective, high-performance glazing on facades.
- 7) Waste and Effluent Management**
 - a. Implement internal waste chutes and onsite segregation for solid waste.
 - b. Treat all liquid waste via onsite Sewage Treatment Plant (STP) or approved municipal systems.
 - c. Reuse greywater for irrigation to reduce water demand.
- 8) Structural Integrity and Building Safety**
 - a. Conduct comprehensive geotechnical surveys and design foundations based on stable strata.
 - b. Perform material testing (cement, steel) for each batch prior to use.
 - c. Provide Form B structural certification at each construction stage.
 - d. Register the project with NCA for regular oversight inspections.
- 9) Community and Socio-Economic Benefits**
 - a. Prioritize local employment, skill transfer, and inclusion of women and youth.
 - b. Procure construction materials from local suppliers to support “Buy Kenya, Build Kenya” initiatives.
 - c. Collaborate with the County Government for infrastructure improvements benefiting the broader community.
- 10) Sustainability and Resource Efficiency**
 - a. Integrate solar water heating, LED lighting, and PV panels for common areas.

- b. Implement an integrated solid waste management system with recovery and recycling options.
- c. Monitor and optimize water and energy consumption during operation.

6.4 Quantitative Impact Rating Matrix (Pre-Mitigation)

Table 33: Pre mitigation impact assessment

Impact	M	E	D	R	P	TSS	Rating
Occupational Health & Safety	5	2	4	3	4	$(2 \times 5) + 2 + 4 + 3 + (2 \times 4) = 27$	High
Fire Safety Risks	5	3	4	4	3	27	High
Noise & Vibration	3	2	3	2	4	21	Moderate
Air Pollution (Dust)	3	3	3	2	4	22	Moderate
Overshadowing / Privacy	3	2	5	4	5	26	High
Traffic Congestion	3	3	3	2	4	22	Moderate
Solid Waste Generation	4	2	5	2	5	27	High
Liquid Waste / Effluent	4	3	5	3	4	28	High
Water & Energy Demand	3	2	5	2	5	25	High
Structural Failure & Building Collapse	5	3	5	5	2	28	High (Critical)

Interpretation (Pre-Mitigation)

The highest-ranked impacts are:

1. Structural Failure / Building Collapse – 28
2. Liquid Waste / Effluent – 28
3. OHS / Fire / Solid Waste – 27

Even with low probability (P=2), building collapse ranks highest due to irreversible consequences (R=5) and catastrophic magnitude (M=5).

6.5 Residual Impact Rating (Post-Mitigation)

After implementation of engineered controls, statutory compliance (including the Occupational Safety and Health Act), and structural approvals by the National Construction Authority, scores are recalculated primarily through reduction in Magnitude and Probability.

Table 34 Post mitigation impact assessment

Impact	Revised M	E	D	R	Revised P	TSS	Final Rating
Occupational Health & Safety	3	2	3	2	2	15	Moderate
Noise & Vibration	2	2	2	1	3	13	Low
Air Pollution (Dust)	2	2	2	1	2	11	Low
Overshadowing / Privacy	3	2	5	4	4	23	Moderate
Solid Waste Generation	2	2	4	1	2	13	Low
Liquid Waste / Effluent	2	2	4	2	2	14	Low
Structural Failure & Collapse	3	2	5	4	1	18	Moderate-Low

6.6 Summary of all Pre- and Post-Mitigations

Table 35: Summary of pre and post mitigations impacts rating

Impact Category	Impact	Pre-Mitigation TSS	Rating	Post-Mitigation TSS	Residual Risk
OHS	Work at height / Dropped objects	27	High	15	Low
Fire Safety	Fire outbreak / Entrapment	27	High	15	Low
Noise & Vibration	Piling, machinery	21–22	Moderate	12–13	Low
Air Pollution	Dust, PM10/PM2.5	22	Moderate	11	Low
Traffic	Construction vehicles	22	Moderate	14	Low
Overshadowing & Privacy	Shadows, glare, loss of privacy	26	High	14–23	Low–Moderate
Solid Waste	Accumulation, pests	27	High	13	Low
Liquid Waste / Effluent	Sewer contamination	28	High	14	Low
Water & Energy Demand	Consumption increase	25	High	15	Low
Structural Failure	Collapse risk	28	High/Critical	18	Low

6.7 Conclusions and recommendations

The rating analysis confirms that while the "Raw" impacts of a high-rise development are significant, over 80% of these impacts are highly responsive to engineering and management interventions. The transition from high pre-mitigation scores to low residual

CHAPTER SEVEN: PROJECT ALTERNATIVES

7.0 Introduction

In this chapter we examine the analysis of various alternatives which serve as a critical decision-making tool to ensure that the proposed development is not just a result of convenience, but the most sustainable choice among various possibilities.

The primary objective is to examine different ways of achieving the project's goals while minimizing adverse impacts on the environment and the surrounding community—in this case, the sensitive tourism and residential ecosystem of Nyali.

By systematically evaluating options such as different locations, scales, technologies, or even the "No Project" scenario, the developer demonstrates transparency and "due diligence." This process allows for the identification of a balanced "Middle Ground" where economic viability, social harmony with neighboring hotels, and ecological preservation intersect, ultimately justifying why the chosen high-rise model is the most responsible path forward

7.1. Alternative 1: The “No Project” Option

This option assumes the status quo is maintained and the site remains in its current state.

- **Environmental Perspective:** While this avoids construction-phase noise and dust, it is an **active threat** to urban hygiene. In Nyali, vacant plots often become "blind spots" for illegal dumping of solid waste and provide breeding grounds for rodents and mosquitoes due to uncontrolled vegetation.
- **Economic Perspective:** The "Opportunity Cost" is massive. The Mombasa County Government loses out on **Land Rates** and **Construction Approval Fees**, and the National Government loses **VAT on materials** (estimated at millions of shillings).
- **Social Perspective:** It does nothing to alleviate the housing deficit in Mombasa. Furthermore, an empty lot tucked between active hotels can become a **security liability**, providing cover for criminal activity that could negatively impact the safety ratings of neighboring resorts.

7.2. Alternative 2: The Proposed High-Rise Residential (Preferred Option)

This alternative proposes a vertical development (e.g., 10+ floors) to maximize the utility of the 0.5–1.0 acre plot.

- **Environmental Perspective:** By building "Up" instead of "Out," the project maintains a **smaller building footprint**. This allows for more "Soft Landscaping" (grass and trees) which facilitates natural groundwater recharge—critical in Nyali's coral-rag terrain.
- **Social Perspective:** Once operational, a residential community is a **passive neighbor**. Unlike a club or mall, residents typically adhere to community rules regarding noise, making this the most compatible neighbor for the adjacent hotels.
- **Economic Perspective:** High-rise units provide the "Economy of Scale" necessary to fund high-end mitigation technology, such as a **Modular Sewage Treatment Plant (STP)**, which ensures zero discharge of raw effluent into the nearby Indian Ocean ecosystem.

7.3. Alternative 3: Luxury Villa Development (Low Density)

This involves subdividing the land for standalone mansions.

- **Environmental Perspective:** This is ironically **more damaging** to the local drainage. Multiple villas require extensive paving for individual driveways, gatehouses, and swimming pools. This creates a high "Non-Permeable Surface Area," leading to increased storm-water runoff that can flood neighboring lower-lying hotel properties.
- **Social Perspective:** It caters only to the "Ultra-Rich," failing to contribute meaningfully to the broader housing demand for the professional middle class in Mombasa.
- **Technical Flaw:** Individual villas rarely install advanced STPs; they typically rely on **Septic Tanks/Soak pits**. In the porous coral limestone of Nyali, this leads to the leaching of nitrates into the groundwater, eventually reaching the shoreline and damaging the coral reef.

7.4. Alternative 4: Mixed-Use Commercial & Hospitality Hub

This option proposes a combination of offices, retail shops, and a boutique business hotel.

- **Environmental Perspective:** This creates the highest **Solid Waste** footprint. Commercial packaging, food waste from restaurants, and office paper create a massive logistical burden for local waste management systems.
- **Social Perspective (The Hotel Conflict):** This is the **most aggressive alternative** for neighboring hotels. A mixed-use hub brings high "Ambient Noise" (public address systems, background music, and rooftop bars). It also creates "Privacy Intrusion," where office workers or shoppers have a direct view into the private pool decks of neighboring luxury hotels.
- **Traffic Perspective:** Nyali's internal roads are already strained. A commercial hub would introduce constant "Peak Hour" traffic, potentially blocking guest shuttles and tour buses from accessing the neighboring hotels.

7.5 Comparative project alternatives analysis matrix.

The following matrix evaluates the alternatives on a scale of **1 (Least Desirable)** to **5 (Most Desirable)**.

Table 36: Comparative project alternatives analysis matrix

Impact Parameter	No Pro- ject	High-Rise (Pro- posed)	Luxury Vil- las	Mixed-Use Hub
Land Use Efficiency	1	5	2	4
Revenue Generation (Taxes)	1	5	3	5
Compatibility with Hotels	5	4	5	1
Traffic/Infrastructure Load	5	3	4	1
Environmental Protection (STP/Drainage)	2	5	2	3
Contribution to Housing Goals	1	5	2	2
TOTAL SCORE	15	27	18	16

The High-Rise Residential option achieves the highest score by balancing urban density with long-term neighbor compatibility and superior environmental infrastructure.

7.6 Conclusion and justification

The High-Rise Residential Development is the most sustainable option for Nyali. While the construction phase presents a temporary challenge to neighboring hotels, the long-term benefits of high-efficiency sewage treatment, low-noise residential occupancy, and optimized land use far outweigh the alternatives.

The "Mixed-Use" and "Villa" options, while profitable, either impose too much permanent noise/traffic on the hotels or fail to protect the groundwater through inferior sanitation methods.

CHAPTER EIGHT: CONSULTATION AND PUBLIC PARTICIPATION (CPP)

8.1 Introduction

Public Consultation and Public Participation (CPP) formed an integral component of the Environmental Impact Assessment (EIA) study process for the proposed high rise residential project. The process was undertaken in compliance with the Environmental Management and Co-ordination Act (EMCA) and the Environmental Impact Assessment and Audit Regulations, which require project proponents to meaningfully engage Project Affected Parties (PAPs) prior to submission of an EIA Study Report.

PLATE 6: Public Consultation meeting (Source, Field study 2026)



The CPP process ensured that stakeholders were informed about the nature, scope, and potential environmental and social implications of the proposed development. It also provided a structured platform through which stakeholders expressed concerns, expectations, and recommendations. The information gathered during consultations was systematically analysed and incorporated into the project design, impact assessment, and Environmental Management Plan (EMP).

The consultation process was conducted transparently and in a culturally appropriate manner, ensuring that all affected groups had an opportunity to participate.

8.2 Objectives of Public Consultation and Participation

The consultation process was undertaken with the following objectives:

- To identify stakeholders likely to be directly or indirectly affected by the project.

- To assess stakeholder interests, concerns, and influence levels.
- To disseminate accurate and sufficient information regarding project location, design, capacity, risks, and safeguards.
- To obtain stakeholder input on anticipated environmental, social, economic, and safety impacts.
- To enhance project design through integration of community views and locally relevant mitigation measures.
- To promote transparency, accountability, and regulatory compliance in accordance with NEMA requirements.
- To build trust and foster constructive relationships between the proponent and the surrounding community.

PLATE 7: Public Consultation meeting (Source, Field study 2026)



8.3 Principles Guiding the CPP Process

The CPP process was guided by established stakeholder engagement principles to ensure procedural fairness and inclusivity.

These principles included:

a) Inclusivity

All categories of stakeholders, including residents, business operators, transporters, regulatory agencies, women groups, youth groups, and institutional stakeholders, were identified and given opportunity to participate.

b) Transparency

Clear, accurate, and non-technical explanations of the project were provided.

Stakeholders were informed about the potential risks associated with high rise project, including fire hazards, traffic impacts, and environmental concerns, as well as proposed mitigation measures.

PLATE 8: Public Consultation meeting (Source, Field study 2026)



c) Timeliness

Consultations were undertaken during the EIA study phase before finalization of the report, allowing stakeholder input to meaningfully influence project planning.

d) Responsiveness

Issues raised were documented, evaluated, and addressed within the EIA and EMP. Where applicable, clarifications were provided during interviews and meetings.

e) Cultural Sensitivity

Engagement respected local leadership structures, language preferences (English and Kiswahili), and community norms.

8.4 Stakeholder Identification and Mapping

Stakeholders were categorized based on geographic proximity, potential impact severity, and influence level.

PLATE 9: Categorization of PAPs (Source, Field Study 2026)



8.4.1 Directly Affected Stakeholders (0–50 metres)

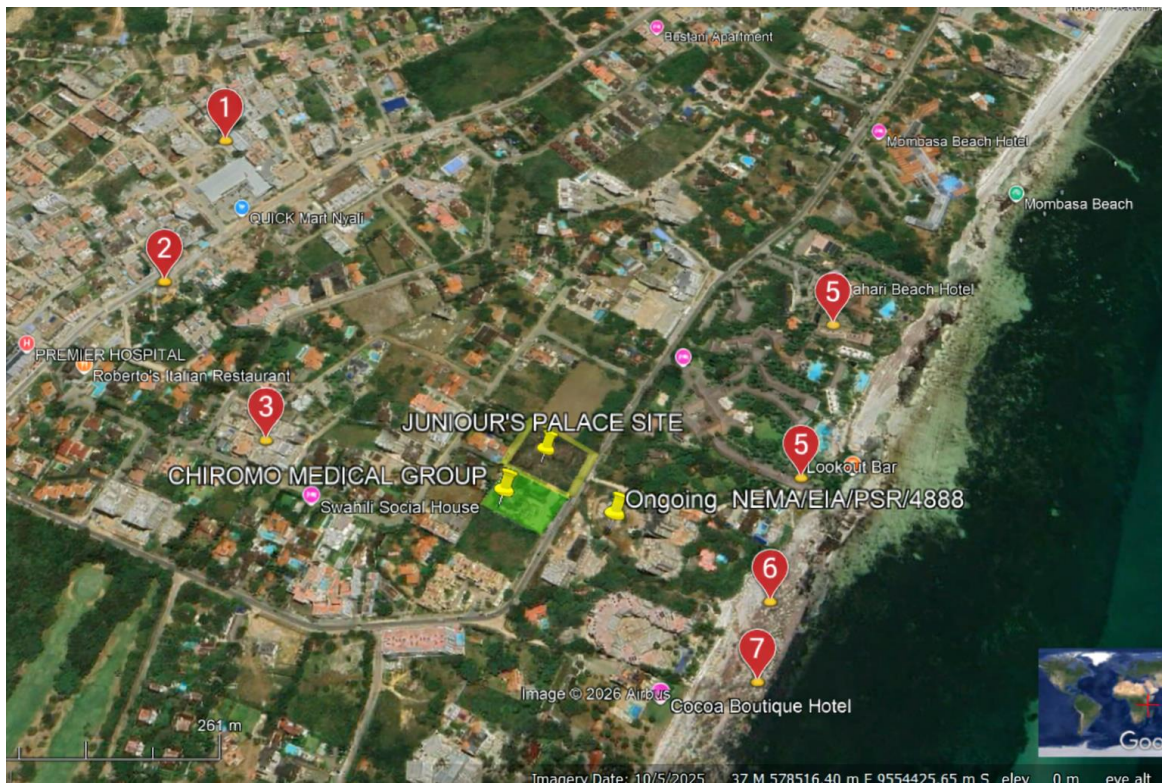
These stakeholders were located within immediate proximity to the proposed site and were likely to experience direct impacts related to construction activities, traffic movement, and safety risks.

They included:

- Adjacent landowners and tenants
- Immediate residential neighbors
- Nearby businesses and garages
- County government planning and licensing departments

These stakeholders were consulted through interviews, questionnaires, and targeted meetings.

PLATE 10: Project CPP poster locations



8.4.2 Secondary Affected Stakeholders (50–500 metres)

These stakeholders were indirectly affected through traffic changes, noise, and economic interactions.

They included:

- Residents within 50–100 metres
- Schools and learning institutions
- Religious institutions
- Local traders and vendors
- Transport operators and fuel suppliers

Consultation methods included barazas, interviews, and structured questionnaires.

8.4.3 Wider Area Stakeholders (500 metres and beyond)

These stakeholders were less directly impacted but expressed interest in environmental performance, economic opportunities, and housing supply reliability.

They included:

- Road users and commuters
- Environmental NGOs
- General public within the broader locality

Engagement occurred through public notices and stakeholder communication where applicable.

Table 37: Stakeholder and Neighbouring Facilities around Junour's Palace Site

No.	Name of Facility	Type of Stakeholder	Approx. Distance from Project Site (m)	Direction from Site	Relevance to ESIA
1	Voyager Beach Resort	Hotel / Hospitality	~250 m	North-East	Sensitive tourism receptor; construction noise, dust and traffic may affect guest comfort and hotel operations.
2	Arena Bahari	Restaurant / Recreation	~300 m	North	Hospitality facility attracting visitors; may be affected by increased traffic and construction disturbance.
3	Chiromo Medical Group	Medical Facility / Clinic	~80 m	South	Very sensitive receptor; healthcare operations require quiet surroundings and reliable access.
4	Ongoing Development (NEMA/EIA/PSR/4888)	Construction Project	~100 m	South-East	Potential cumulative construction impacts including noise, traffic congestion and dust generation.
5	Lookout Bar	Bar / Hospitality	~350 m	East	Hospitality venue that may experience indirect disturbance from construction activities and traffic.
6	Maroc Swahili Cuisine	Restaurant	~400 m	East	Commercial hospitality establishment relying on visitor experience and accessibility.
7	Sun Africa Hotel	Hotel / Hospitality	~450 m	South-East	Tourism-sensitive receptor potentially affected by construction noise and visual disturbance.
8	Cocoa Boutique Hotel	Hotel / Hospitality	~500 m	South-East	Hospitality facility located near the beachfront; guest experience could be affected by construction activities.
9	Nyali Luxury Apartments	Residential Apartments	~300 m	South-West	Permanent residential receptor sensitive to noise, dust, and in-

No.	Name of Facility	Type of Stakeholder	Approx. Distance from Project Site (m)	Direction from Site	Relevance to ESIA
					creased construction traffic.
10	Midview Hotel Nyali	Hotel	~350 m	South-West	Hospitality establishment potentially affected by construction disturbances.
11	Swahili Social House	Residential / Hospitality Facility	~250 m	West	Mixed-use or hospitality-related establishment; may experience temporary disturbance during construction.
12	Green Heights	Residential Estate	~350 m	North-West	Residential neighbourhood sensitive to construction noise, dust, and traffic impacts.
13	Mt. Kenya Road	Major Access Road	Adjacent	West/East of site	Primary access route for construction materials, workers, and future residents; traffic management required.
14	Nyali Beach / Indian Ocean Shoreline	Natural Coastal Environment	~250–300 m	East	Environmentally sensitive coastal ecosystem; requires stormwater and erosion control measures.

8.5 Monitoring and Documentation of the CPP Process

A Stakeholder Engagement Log was maintained throughout the study.

The log recorded:

- Date and location of engagement
- Stakeholder category
- Method of consultation
- Issues raised
- Proposed responses and commitments

The documentation ensured traceability of concerns and demonstrated integration of stakeholder input into the EIA findings.

8.6 Methodology Applied During the CPP Process

A multi-method consultation approach was adopted to ensure comprehensive stakeholder coverage and reliable data collection. The methodologies applied are described below.

8.6.1 Administration of Structured Questionnaires

Structured questionnaires were administered to individuals and businesses located near the project site.

The target respondents included:

- Adjacent landowners and tenants
- Local residents
- Garage operators
- Retail traders and service providers
- Transport operators

The questionnaires captured quantitative and qualitative data on:

- Awareness of the proposed project
- Perceived environmental and safety risks
- Anticipated socio-economic benefits
- Concerns regarding traffic, fire hazards, and emissions
- Recommendations for mitigation and community engagement

Responses were compiled, analysed, and summarized to identify recurring themes and risk perceptions.

8.6.2 Key Informant and Personal Interviews

Face-to-face interviews were conducted with selected stakeholders, including local administrators, business leaders, institutional representatives, and industrial neighbors.

These interviews provided deeper insight into:

- Regulatory expectations
- Land use compatibility
- Emergency preparedness considerations
- Industrial safety coordination
- Infrastructure capacity

The interviews allowed clarification of technical issues and ensured accurate documentation of stakeholder views.

8.6.3 Open-Ended Questioning Approach

The consultation tools incorporated open-ended questions to allow respondents to freely express concerns and recommendations.

This approach ensured that stakeholder feedback was not restricted to predefined categories and enabled identification of location-specific risks and expectation

8.6.4 Newspaper Advertisement

In accordance with regulatory requirements for high-risk developments, a public notice was placed in a nationally circulated newspaper

PLATE 11: CPP public notice (Source, Star Newspaper)



In accordance with regulatory requirements for high-risk developments, a public notice was placed in a nationally circulated newspaper.

The notice provided:

- Project description
- Location details
- Nature of proposed development
- Contact information for submission of comments

This approach ensured broader public awareness beyond the immediate project vicinity.

8.6.5 Digital Consultation Tools

To improve accessibility and participation rates, the study utilized digital consultation platforms.

Questionnaires were converted into mobile-friendly Google Forms and disseminated through:

- QR codes displayed at the site office
- Local WhatsApp community groups
- Email circulation lists

This approach facilitated participation by stakeholders who were unable to attend in-person consultations due to occupational or time constraints.

8.7 Summary of Stakeholder Concerns and Responses

The consultation process indicated general acceptance of the project, provided that adequate environmental, safety, and traffic management measures were implemented.

Table 38: Summary of stakeholder concerns and discussed mitigations

No.	Stakeholder Concern Raised	Stakeholder Category	Project Phase	Risk Significance (Pre-Mitigation)	Integrated Mitigation / Design Response	Responsible Party	Residual Risk (Post-Mitigation)	Monitoring Indicator
1	Construction noise affecting neighboring residences	Adjacent residents (0–50m)	Construction	High	<ul style="list-style-type: none"> - Restrict works to daytime hours (8am–5pm) - Use low-noise equipment - Install temporary acoustic barriers where feasible - Advance notification of high-noise activities 	Contractor	Low–Moderate	Noise levels within NEMA permissible limits; no. of complaints logged
2	Dust emissions impacting air quality	Adjacent residents & businesses	Construction	High	<ul style="list-style-type: none"> - Regular water sprinkling - Cover trucks transporting materials - Wheel washing at exit - Hoarding around site perimeter 	Contractor	Low	Visible dust control; particulate monitoring where necessary
3	Increased traffic congestion in Nyali area	Residents, transport operators	Construction & Operation	High	<ul style="list-style-type: none"> - Traffic Management Plan (TMP) - Staggered material deliveries - Dedicated basement parking (2 levels) - Designated entry/exit points 	Contractor / Proponent	Moderate	Traffic flow observations; absence of road obstruction incidents
4	Fire safety risks in high-rise building	Residents & nearby property owners	Operation	High	<ul style="list-style-type: none"> - Fire detection & alarm systems - Automatic sprinkler system - Fire hydrants & hose reels - Emergency staircases compliant with Building Code - Coordination with County Fire Department 	Proponent / Property Manager	Low	Fire safety inspection certificates; emergency drill records
5	Structural safety of high-rise development	Adjacent property owners	Construction & Operation	High	<ul style="list-style-type: none"> - Geotechnical investigation conducted - Structural design by li- 	Proponent / Structural Engineer	Low	Approved structural drawings; site inspection reports

No.	Stakeholder Concern Raised	Stakeholder Category	Project Phase	Risk Significance (Pre-Mitigation)	Integrated Mitigation / Design Response	Responsible Party	Residual Risk (Post-Mitigation)	Monitoring Indicator
					<ul style="list-style-type: none"> censed engineers - Independent structural review - Compliance with approved architectural & structural drawings 			
6	Stormwater drainage & flooding risk	Residents	Construction & Operation	Moderate-High	<ul style="list-style-type: none"> - Site drainage plan integrated - Controlled runoff channels - Roof water harvesting - Connection to approved stormwater infrastructure 	Contractor / Proponent	Low	No off-site flooding; functional drainage system
7	Solid waste management during occupancy	Local residents	Operation	Moderate	<ul style="list-style-type: none"> - Designated waste storage rooms - Segregation at source - Contract with licensed waste collector - Recycling where feasible 	Property Manager	Low	Waste collection records; cleanliness of waste storage area
8	Loss of privacy / visual intrusion	Immediate neighbors	Operation	Moderate	<ul style="list-style-type: none"> - Architectural orientation to minimize direct overlooking - Strategic landscaping - Balcony screening where necessary 	Architect / Proponent	Low-Moderate	Visual screening installed; no formal complaints
9	Employment opportunities for local residents	Local youth & businesses	Construction	Positive Impact	<ul style="list-style-type: none"> - Prioritize local labor where qualified - Engage local suppliers - Transparent recruitment process 	Contractor / Proponent	Positive Impact Enhanced	% of local workforce engaged
10	Emergency access during construction	Residents & emergency responders	Construction	Moderate	<ul style="list-style-type: none"> - Maintain clear access roads - No obstruction of public right-of-way - Emergency contact signage on site 	Contractor	Low	Clear access maintained; emergency contact displayed

8.7.1 Key Issues Raised

Stakeholders raised the following principal concerns:

- Increased traffic and road safety risks
- Noise during construction
- Dust emissions
- Waste management and pollution control
- Security and unauthorized access
- Employment opportunities for local residents

8.7.2 Proponent's Responses

The project design incorporated the following commitments:

- Provision of firefighting equipment and trained personnel
- Scheduling deliveries during off-peak hours
- Deployment of traffic marshals
- Installation of perimeter fencing and CCTV surveillance
- Engagement of licensed waste handlers
- Provision of PPE and worker safety training
- Compliance with NEMA, DOSHS, and County regulatory requirements
- Development of CSR initiatives benefiting local communities

8.7.3 Statistical Analysis of Questionnaire Responses (Online Google forms)

PLATE 12: Summary of respondents' gender (Source, Field Study 2026)

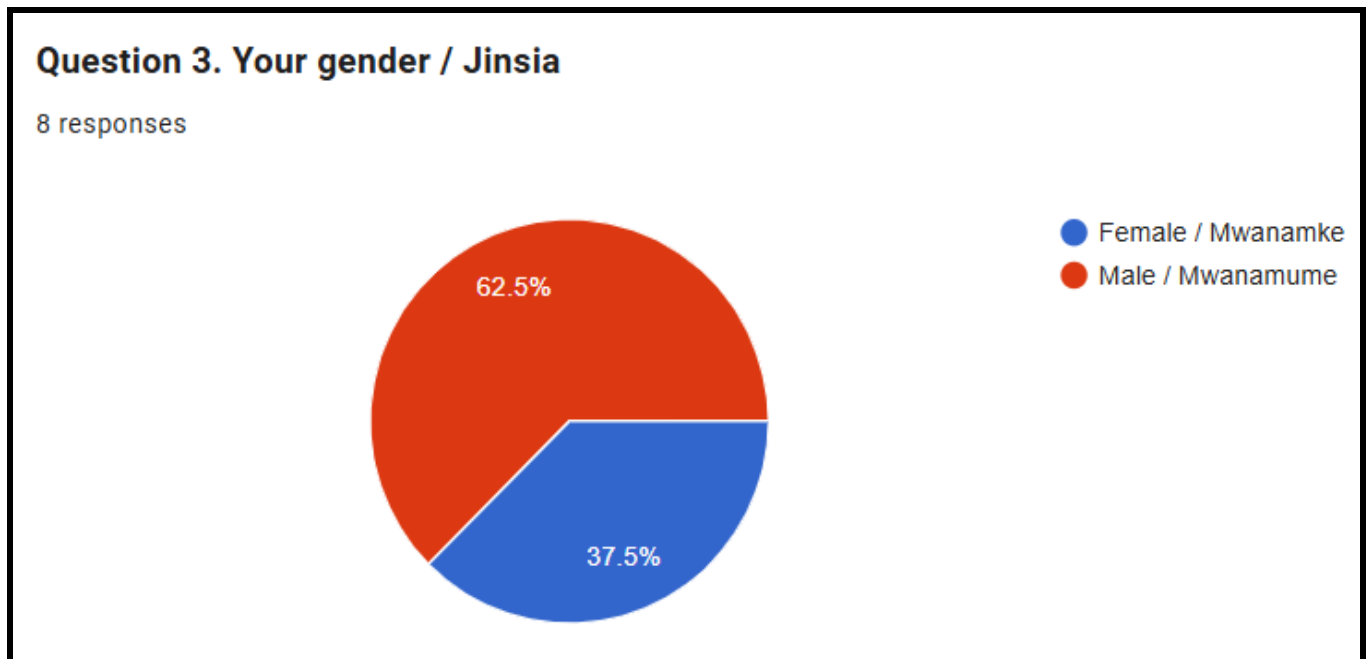


PLATE 13: Summary of respondents' age group (Source, Field Study 2026)

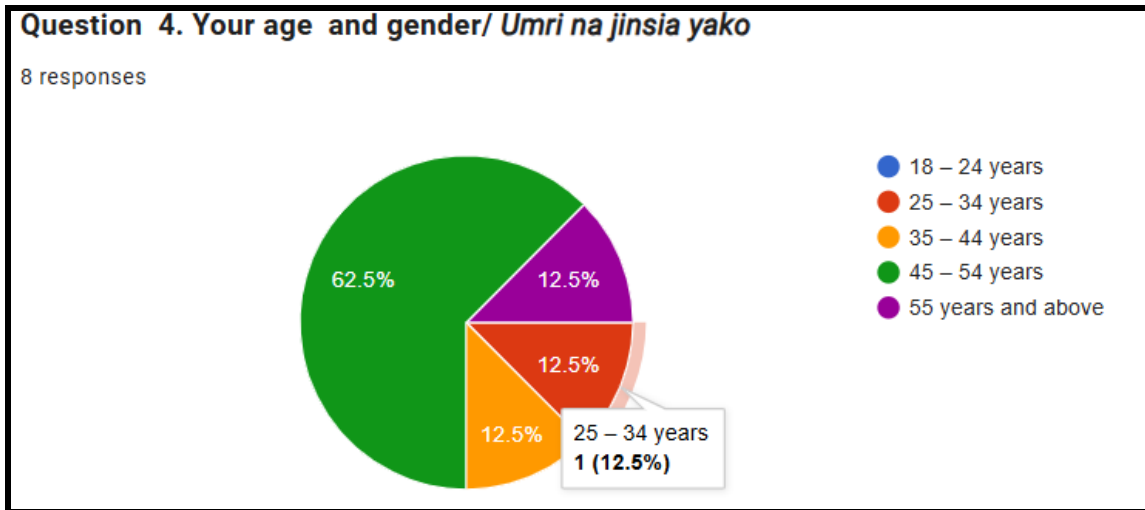


PLATE 14: Summary of respondents' relationship to project site (Source, Field Study 2026)

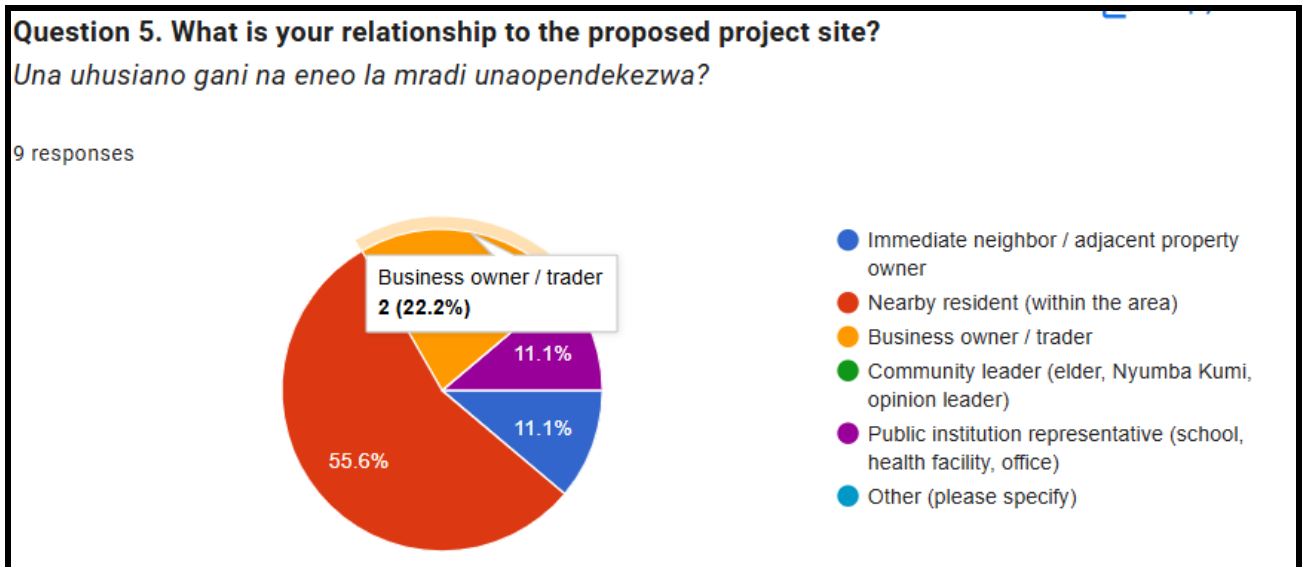


PLATE 15 : Summary of respondents' distance to project site (Source, Field Study 2026)

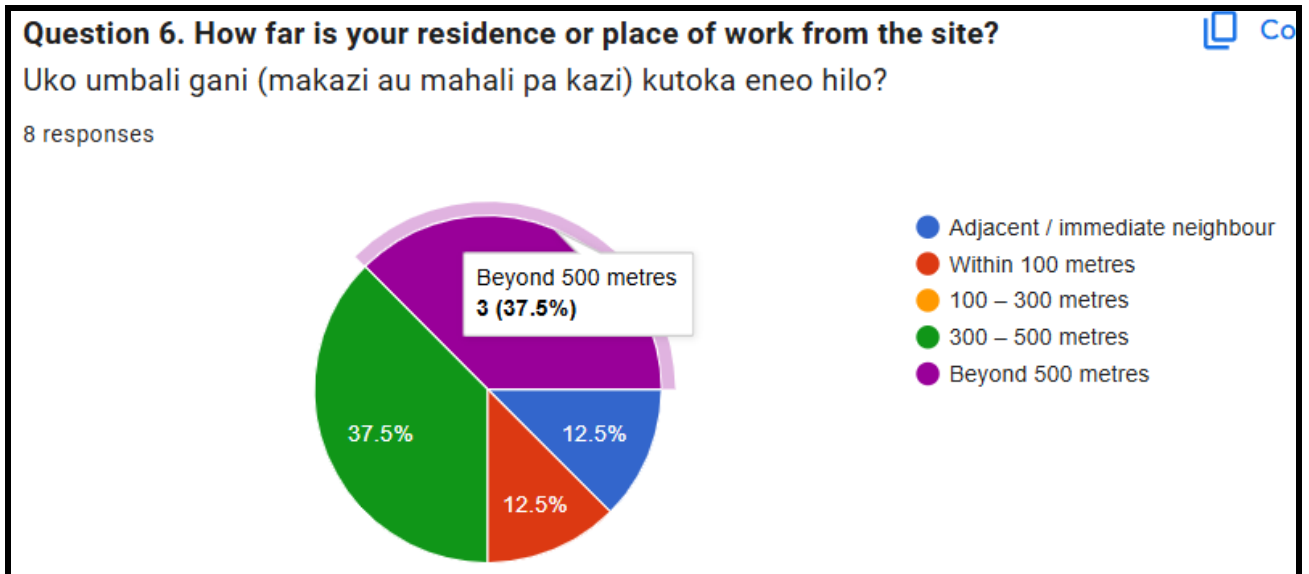


PLATE 16: Summary of respondent awareness of similar projects within the area (Source, Field Study 2026)

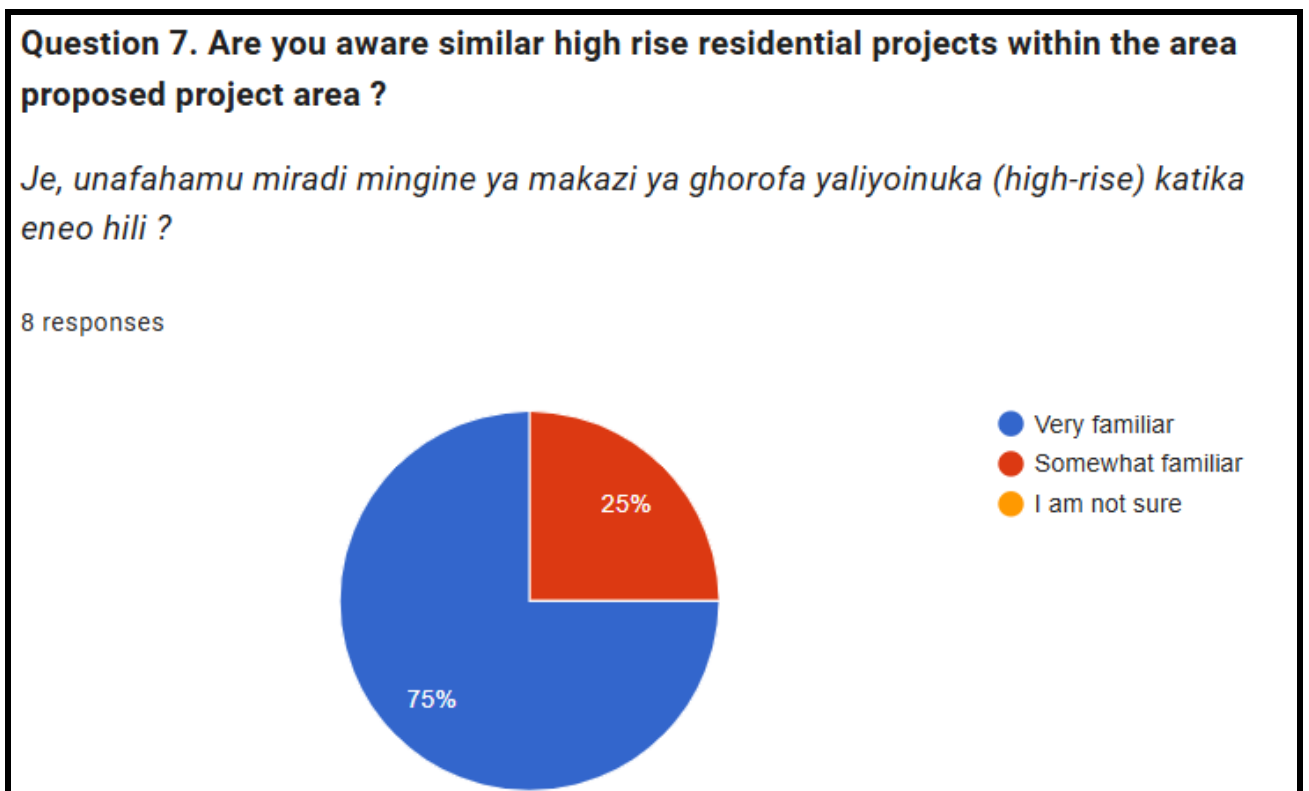


PLATE 17: Summary of overall perception of proposed project (Source, Field study 2026)

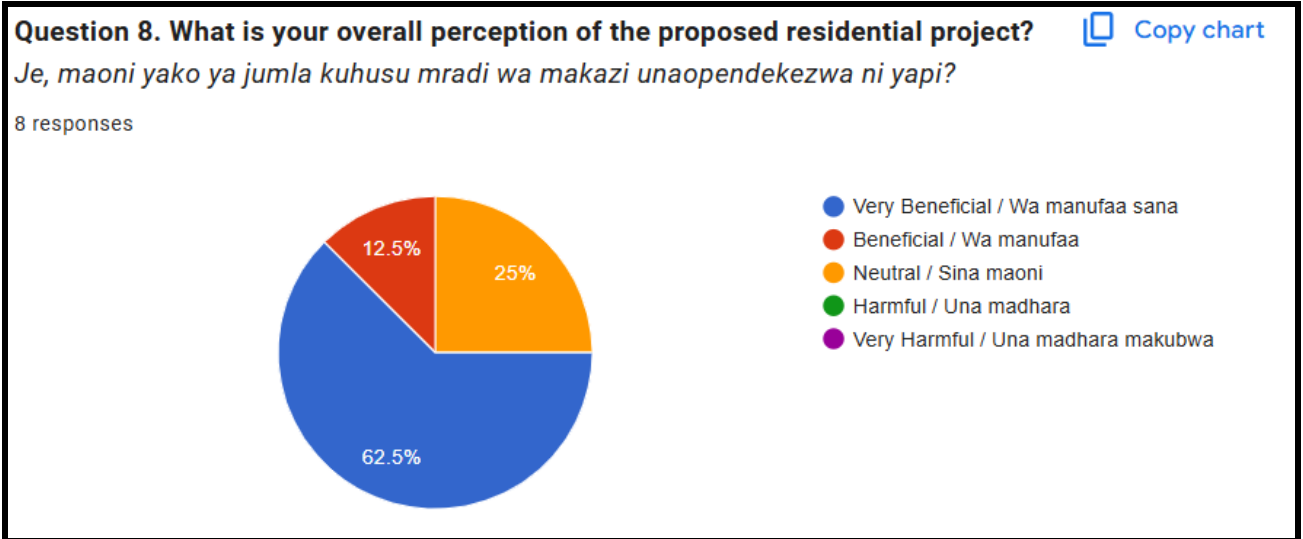
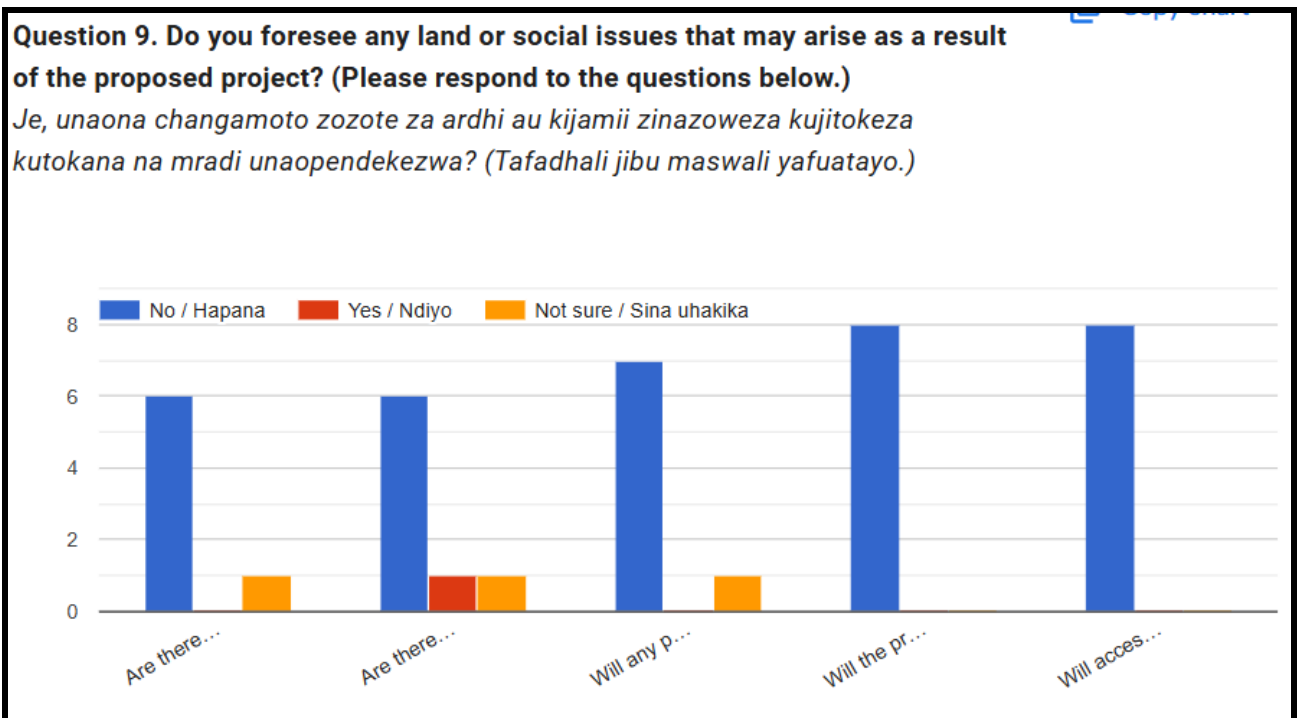


PLATE 18: Summary of respondents perception on EHS issues (Source, Field Study, 2026)



Question 10. What POSITIVE impacts/concerns do you foresee arising from the project?

Ni manufaa gani unazoziona kutokana na mradi?

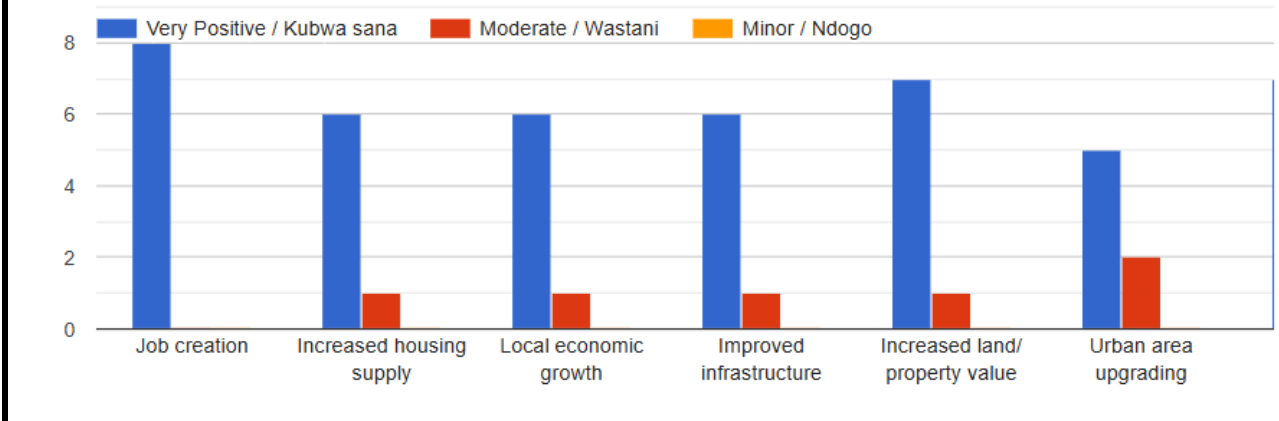
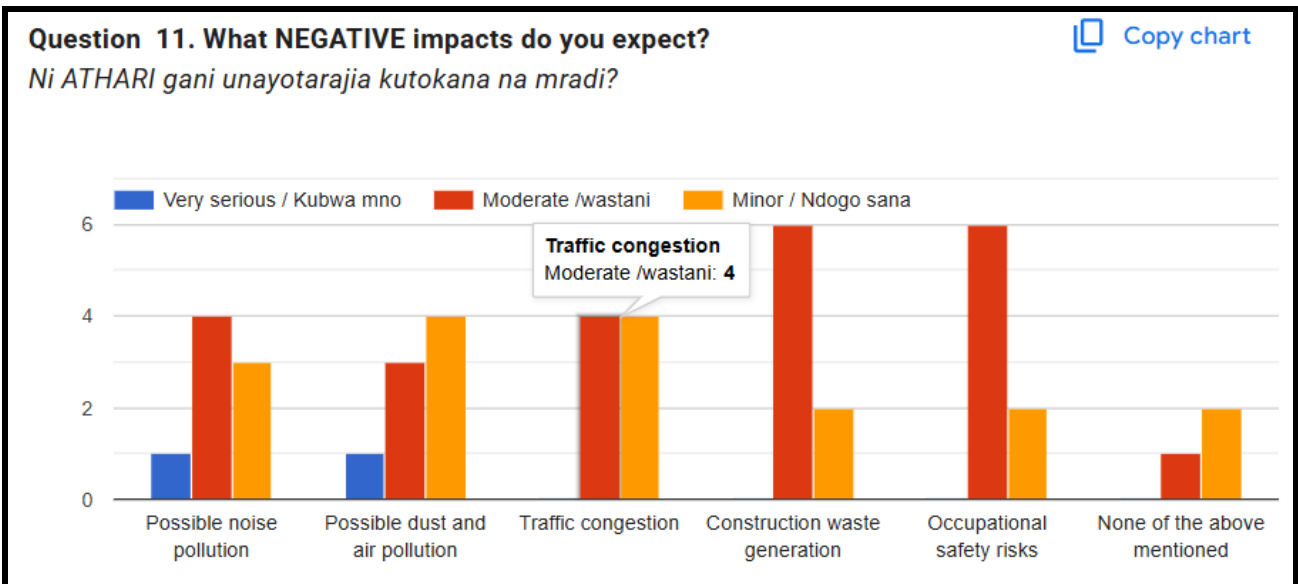


PLATE 19: Summary of respondents' perception of positive impacts (Source, Field study, 2026)

PLATE 20: Summary of respondent's perception of negative impacts (source, Field Study 2026)



Question 12 .Would you support the project if safeguards are in place?

Je, ungeunga mkono mradi huu iwapo hatua za usalama na mazingira zitachukuliwa?

8 responses

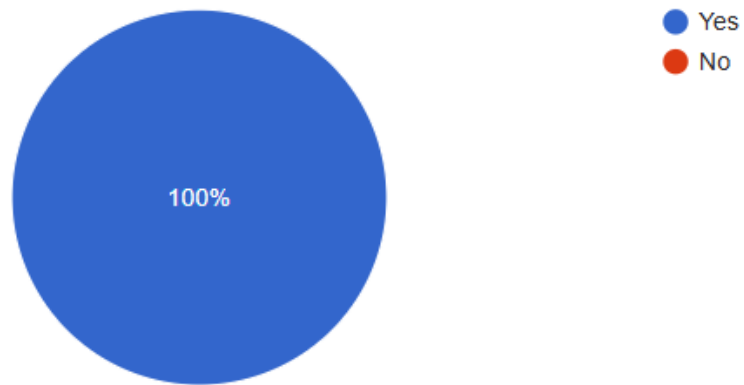
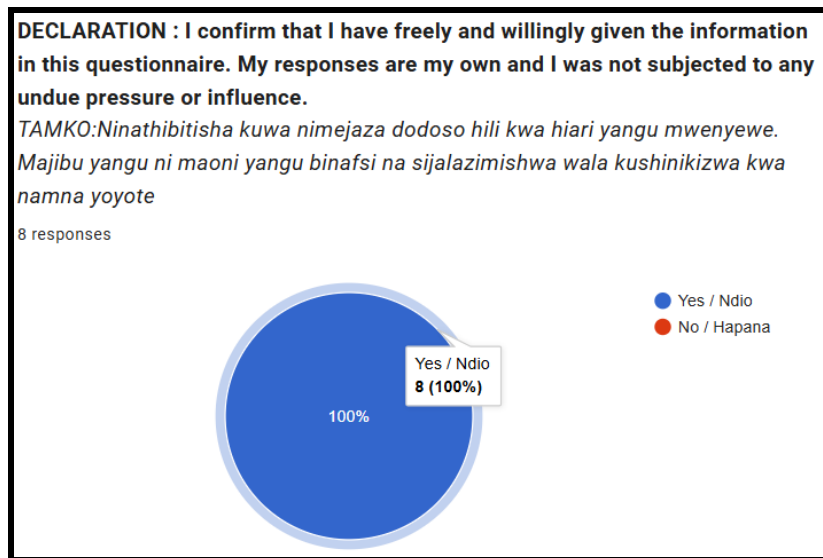


PLATE 21: Summary of how many respondents support the project (Source, Field Study, 2026)

PLATE 22: Summary of respondents' free consent to participate (Source, Field Study 2026)



8.8 Outcomes of the Consultation Process

8.8.1 Participation Levels

Due to the urban and predominantly commercial nature of the project location, the consultation process recorded a relatively low physical turnout during in-person engagements. Many stakeholders operate within structured work schedules, and residential density in the immediate vicinity is limited compared to peri-urban settings.

However, digital consultation tools, direct interviews, and targeted stakeholder engagements ensured that key Project Affected Parties (PAPs), regulatory institutions, and neighboring businesses were adequately consulted.

The combination of structured questionnaires, key informant interviews, media disclosures, and digital platforms ensured that the consultation process remained representative, accessible, and compliant with statutory requirements despite lower-than-anticipated physical attendance.

The CPP process achieved the following outcomes:

- Enhanced stakeholder awareness of the proposed development.
- Identification of key environmental and safety risks requiring mitigation.
- Integration of stakeholder concerns into the Environmental Management Plan (EMP).
- Strengthened trust between the proponent and the surrounding community.
- Overall, the consultation process contributed to improved environmental planning, social acceptability, and regulatory compliance for the proposed high rise project.

8.8.2 Non-Responsive Neighbouring Premises

As part of the stakeholder identification process, immediate neighbouring premises within the project's zone of influence were mapped and directly approached for consultation. A number of adjacent properties were physically visited and formally invited to participate through issuance of structured questionnaires and verbal briefings regarding the proposed development.

While all contacted parties acknowledged receipt of the consultation materials and were informed of the submission timelines, no completed questionnaires were returned within the reporting period. Follow-up communication was undertaken to provide additional opportunity for submission; however, no written responses were received prior to finalization of this report.

In addition, one neighbouring institutional facility attended the public consultation meeting and participated in the deliberations. However, written feedback had not been submitted at the time of report compilation despite subsequent follow-up.

The absence of written submissions is therefore recorded as **non-response rather than exclusion**, as reasonable effort was made to inform, engage, and provide opportunity for participation.

It is important to note that:

- All immediate neighbours were adequately notified.
- No formal objections to the proposed development were lodged during the consultation period.
- The consultation window remained open during report preparation.
- Any future concerns raised during project implementation will be addressed through the project grievance redress mechanism and ongoing stakeholder engagement framework.

The Proponent remains committed to maintaining open communication channels with surrounding premises throughout the construction and operational phases in accordance with adaptive environmental management principles.

8.9 Grievance Redress Mechanism (GRM)

To ensure effective management of concerns arising during construction and operation phases, Junour's Palace Limited will establish and operationalize a structured Grievance Redress Mechanism (GRM). The GRM will provide accessible, transparent, and timely procedures for receiving, recording, resolving, and monitoring complaints from stakeholders.

The mechanism will function throughout the project lifecycle and will be aligned with the requirements of the Environmental Management and Co-ordination Act and its subsidiary regulations.

8.9.1 Grievance Redress Structure

The project will prioritize resolution of complaints at the lowest possible level to ensure timely response and minimize disruption to neighboring properties and hotel operations. The grievance redress structure will operate as follows:

Level 1: Site Management

The aggrieved party (e.g., hotel manager, resident, business operator, or employee) will submit a complaint through:

- A Digital Grievance Form (Google Form),
- Email communication,
- Written submission, or
- Direct reporting to the Site Manager or Construction Engineer.

Upon receipt, the Site Management team will acknowledge the complaint within 48 hours and initiate preliminary review and corrective action where feasible.

Level 2: Grievance Redress Committee (GRC)

If the issue remains unresolved at Level 1, it will be escalated to the Grievance Redress Committee (GRC), which will comprise:

- A representative of Junour's Palace Limited (Proponent),
- The Lead Contractor's Project Manager,
- The Site Environmental, Health and Safety (EHS) Officer,
- A Community Liaison Officer

The GRC will review the complaint, investigate facts, and determine appropriate corrective actions.

Level 3: Local Administration

Where the complainant remains dissatisfied with the GRC's determination, the matter will be referred to the Nyali Assistant County Commissioner or the Chief's Office for mediation. This level will provide neutral third-party intervention to ensure fairness and transparency.

Level 4: Legal Redress

As a final recourse, the complainant will retain the right to seek redress through the National Environment Tribunal or a competent Court of Law.

8.9.2 Determination of Corrective Action

Upon receipt of a grievance, the following procedures will apply:

- The complaint will be logged into the Digital Grievance Register.
- The GRC will convene (physically or virtually) to deliberate on the matter.
- A proposed resolution will be developed within **seven (7) working days** of formal registration.

If the matter requires extended technical investigation, the complainant will be notified in writing, explaining the reasons for delay and providing a revised resolution timeline.

All corrective actions will be documented, assigned responsible persons, and tracked until completion.

8.9.3 Mechanisms for Adjudicating Grievances and Appeals

To ensure systematic handling, grievances will be categorized under defined themes such as:

- Noise and vibration
- Dust and air emissions
- Traffic and access obstruction
- Safety risks
- Worker conduct or community relations
- Environmental pollution

If the complainant is dissatisfied with the GRC’s resolution within the prescribed seven-day response window, they may submit a formal appeal to the Local Administration level.

The appeal mechanism will ensure that potential power imbalances between the project proponent and affected individuals are addressed through independent mediation.

All appeal outcomes will be formally documented and communicated in writing.

8.9.4 Closure of a Grievance

A grievance will be formally closed and archived under the following conditions:

- **Acceptance:** The complainant provides written or digital confirmation accepting the resolution.
- **Non-Response:** The complainant fails to respond within twenty-one (21) days after receipt of the proposed resolution.
- **Expiration of Appeal Period:** No appeal is filed within fourteen (14) days following issuance of the GRC’s determination.

Upon closure, the grievance record will be archived for audit and monitoring purposes.

8.9.5 Sample Complaint Log Form (Conceptual Framework)

To enhance accountability and traceability, Juniou’s Palace Limited will implement a standardized grievance recording template.

The form will include the following fields:

Complainant Details

- Full Name
- Contact Information (Phone/Email)
- Affiliation (e.g., Resident, Hotel Manager, Business Owner, Employee)

Nature of Grievance

- Date and time of incident
- Location of occurrence
- Detailed description of the issue

Evidence Submission

- Option to upload supporting documentation (e.g., photographs, videos, documents)

Proposed Resolution

- Description of what the complainant considers a fair and reasonable resolution

Internal Tracking Section

- Date received
- Assigned officer
- Investigation findings
- Corrective actions taken
- Date of resolution
- Status (Open / Under Review / Closed)

The grievance log will be maintained in digital format and will be reviewed periodically to identify recurring trends and systemic issues requiring preventive measures.

8.10 Post ESIA Report Expanded Media Disclosure

In compliance with the Environmental Management and Co-ordination Act (EMCA) and the Environmental (Impact Assessment and Audit) Regulations, the proponent will undertake additional statutory public disclosure measures to enhance transparency and broaden outreach.

These will include:

- **Publication of a Notice in the Kenya Gazette** notifying the public of the proposed high rise residential development and inviting submission of comments.
- **Advertisement in two (2) daily newspapers of nationwide circulation** providing:
 - Project description and location
 - Nature and capacity of the proposed high rise residential development.
 - Contact details for submission of written comments
 - Timeline for receipt of public representations
- **Radio announcements on local FM stations** to reach stakeholders who may not regularly access print or digital media platforms.

These additional disclosure mechanisms are intended to ensure regulatory compliance, maximize stakeholder awareness, and provide adequate opportunity for participation from both directly and indirectly affected persons.

CHAPTER NINE: ENVIRONMENTAL AND SOCIAL MANAGEMENT PLAN (ESMP)

9.1 Introduction

The **Environmental and Social Management Plan (ESMP)** for the proposed Nyali High-Rise Residential Development provides a logical framework for the implementation of the mitigation measures identified in Chapter Five.

It assigns responsibilities, defines monitoring indicators, and estimates the budgetary requirements for compliance.

This ESMP is designed to be a "living document" that the Project Manager, Contractor, and Environmental Health and Safety (EHS) Officer will use to ensure that the project remains within the legal thresholds of **EMCA 1999** and **OSHA 2007**.

9.1.1. Scope and Objectives of the ESMP

The Environmental Management Plan will focus on mitigating the impacts identified during the environmental and social assessment. It is an instrument that will allow developers, beneficiary communities and other key stakeholders to integrate environmental components during the various phases of the project. This plan is meant to establish measures and procedures to control the analysed impacts and monitor their progress. It will achieve the following in the long run:

- (i) Provide the National Environment Management Authority (NEMA) with a tool to ease the evaluation of the objectives at different phases of the project, taking into account the Kenyan environmental legislation;
- (ii) Provide clear and mandatory instructions to the proponent, beneficiary communities and other key stakeholders with regard to their environmental responsibilities in all phases of the project;
- (iii) Ensure continuous compliance of the Residential Development, beneficiary communities and other key stakeholders with Kenyan legislation and policies regarding the environment;
- (iv) Assure the regulators and interested and affected parties the satisfaction of their demands in relation to environmental and social performance

9.1.2. Applicable Legislation

The developed ESMP will be in line with legislation applicable to the project. International normative instruments concerning the environment, as well as international best practice have also been considered.

9.1.3. Principles of Environmental Management Plan

The project should be implemented taking into account the need to minimize potential negative impacts and maximize its potential positive impacts on the biophysical and socio-

economic environment as well as health and safety of workers and the public. This commitment must be made at various levels, from the senior management level of the proponent to the levels of all parties involved in the implementation of the project.

9.2. Recommendations/Commitments of the ESIA

The ESIA document contains a series of recommendations related to mitigation measures, monitoring and management. A key role of the ESMP is to put them all in a single framework.

For each identified impact in the ESIA, the ESMP provides in a tabular format the following:

- (i) A list of mitigation measures (activities) that the proponent and other key stakeholders will implement in accordance with each phase and activity of the project, to ensure that the mitigation objectives are met in full;
- (ii) The role and responsibility of each of the stakeholders to ensure full implementation of mitigation measures; and
- (iii) The timetable of implementation/monitoring activities.

9.3. Responsibility

The proponent assumes full responsibility for implementing and monitoring the required measures to mitigate or enhance the environmental impacts. The effectiveness of mitigation measures should be evaluated by the proponent and the contractor.

9.4. Environmental Awareness

The proponent will be sensitive to the needs of the environment so as not to degrade (or degrade to a minimum) the existing environmental conditions. It is the proponent's primary responsibility to ensure that all parties that are directly involved in the construction and operation phases of the project, including managers and employees are aware of the need to prevent or minimize environmental degradation.

The awareness activities will be guided by the following issues:

- (i) Prevention of pollution of surface water and groundwater;
- (ii) Prevention of air quality degradation
- (iii) Prevention of increased noise levels
- (iv) Prevention /reduction of social and economic disruptions
- (v) Prevention of risks to health and safety of workers and the general public.

9.5. Mitigation

All activities related to the lifecycle of the project will be subjected to appropriate mitigation measures to ensure that negative impacts are properly mitigated and managed. Mitigation involves identifying the best options to be adopted to minimize or eliminate negative impacts, highlighting the benefits associated with the proposed project and the protection of public and individual rights.

Practical measures are therefore sought to reduce adverse impacts or enhance the beneficial impacts of the project.

9.6. Monitoring

The key objectives of monitoring are:

- (i)** To ensure that the EMP is implemented;
- (ii)** To evaluate the effectiveness of the mitigation measures;
- (iii)** To verify predicted impacts;
- (iv)** To provide feedback to licensing authorities

9.7 Environmental and Social Management Plans (All Phases)

The Pre-Construction, Construction, Operational, and Decommissioning Phase Environmental and Social Management Plans (**Tables 37, 38, 39 and 40 respectively**) present a comprehensive framework for managing environmental, social, health, and safety risks throughout the entire project lifecycle. These tables translate the impacts identified in Chapter Five into structured mitigation measures, with clearly defined responsibilities, estimated costs, and measurable indicators to enable effective monitoring and performance tracking.

The proposed measures are aligned with the requirements of the National Environment Management Authority under the Environmental Management and Coordination Act (EMCA), as well as relevant County Government approvals and applicable sectorial regulations. Collectively, the Management Plans function as practical implementation and compliance tools to ensure that construction activities, routine operations, and eventual decommissioning are undertaken in a manner that protects environmental quality, safeguards public and occupational safety, maintains infrastructure integrity, and promotes sustainable community wellbeing.

Table 39: Statutory Pre-Construction Compliance Matrix Plan

Regulatory Requirement	Legal Basis	Responsibility	Estimated Cost (KES)	Compliance Indicator
Registration of Project & EIA Licensing	Environmental (Impact Assessment and Audit) Regulations, 2003 under EMCA, 1999 (as amended)	Proponent	Covered in ESIA Cost	Valid EIA License issued by National Environment Management Authority
Contractor Registration	National Construction Authority Act, 2011	Contractor	As per NCA fee schedule	Valid registration certificate from National Construction Authority
Workplace Registration	Occupational Safety and Health Act (OSHA), 2007	Contractor	As per DOSHS fee schedule	Site registration certificate issued by Directorate of Occupational Safety and Health Services
WIBA Insurance Cover	Work Injury Benefits Act (WIBA), 2007	Contractor / Proponent	Premium dependent on workforce size	Valid WIBA insurance policy covering all employees
Building Plan Approval	Physical and Land Use Planning Act, 2019	Proponent	County approval fees	Approved building plans from Mombasa County Government
Fire Safety Approval	Fire Risk Reduction Rules, 2007 (under OSHA framework)	Proponent	Inspection and certification fees	Fire clearance certificate from County Fire Department
Borehole Permit (if applicable)	Water Act, 2016	Proponent	As per WRA fee schedule	Valid abstraction permit from Water Resources Authority
Sewer Connection Approval	Water Act, 2016	Proponent	Utility connection fees	Sewer connection approval from Mombasa Water Supply and Sanitation Company
Waste Transport Licensing	EMCA (Waste Management) Regulations, 2006	Contractor / Waste Handler	As per NEMA licensing fees	Valid waste transport license issued by National Environment Management Authority

Regulatory Requirement	Legal Basis	Responsibility	Estimated Cost (KES)	Compliance Indicator
Noise Compliance (Construction Phase)	Environmental Management and Coordination (Noise and Excessive Vibration Pollution) Regulations, 2009	Contractor	Permit fees (if night works required)	Noise permit (where applicable) and absence of violation notices
Electrical Installation Approval	Energy Act, 2019	Proponent / Contractor	As per EPRA approval fees	Electrical installation compliance certificate from Energy and Petroleum Regulatory Authority

Table 40: Construction Phase Management Plan

Activity	Environmental / Social Aspect	Potential Impact	Mitigation & Control Measures	Responsibility	Timeframe	Est. Cost (KES)	Indicators	Monitoring Frequency
Site Mobilization & Handover	Site preparation	Uncoordinated commencement, regulatory non-compliance	<ul style="list-style-type: none"> Formal site handover minutes signed Approved drawings available on site Environmental induction for workers Display EIA License & approvals 	Proponent / Contractor / Lead Consultant	Before commencement	Administrative	<ul style="list-style-type: none"> Signed handover report EIA license displayed Induction register 	Once before works begin
Establishment of Workers Camp	Temporary structures	Sanitation issues, waste generation	<ul style="list-style-type: none"> Construct temporary sanitary facilities Provide waste bins Ensure clean water supply Decommission camp after use 	Contractor	Mobilization stage	200,000	<ul style="list-style-type: none"> Functional toilets Waste bins provided No open dumping 	Weekly inspection

Activity	Environmental / Social Aspect	Potential Impact	Mitigation & Control Measures	Responsibility	Timeframe	Est. Cost (KES)	Indicators	Monitoring Frequency
Storage of Materials	Construction materials storage	Theft, material degradation, contamination	<ul style="list-style-type: none"> • Construct lockable site store • Proper stacking of materials • Covered cement storage 	Contractor	Throughout construction	100,000	<ul style="list-style-type: none"> • Secure store present • No material spillage 	Weekly
Extraction & Use of Building Materials	Resource sourcing	Degradation at borrow sites	<ul style="list-style-type: none"> • Source from licensed quarries • Maintain delivery records • Ensure rehabilitation of extraction sites 	Contractor / Proponent	Throughout construction	Part of project cost	<ul style="list-style-type: none"> • Receipts from licensed suppliers • Quarry rehabilitation evidence 	Monthly
Structural Works	Structural integrity	Building collapse risk	<ul style="list-style-type: none"> • Adherence to structural drawings • Use certified materials • Supervision by registered engineer • Observe curing timelines 	Contractor / Structural Engineer	Throughout structural phase	Part of project cost	<ul style="list-style-type: none"> • Engineer supervision reports • Concrete test results 	Continuous supervision
Excavation & Earthworks	Soil disturbance	Land degradation, visual scarring	<ul style="list-style-type: none"> • Excavate only designated areas • Stockpile topsoil separately • Restore and landscape disturbed areas • Dispose excess soil at approved sites 	Contractor	Excavation phase	200,000	<ul style="list-style-type: none"> • No illegal dumping • Restored areas • Landscaping completed 	Weekly

Activity	Environmental / Social Aspect	Potential Impact	Mitigation & Control Measures	Responsibility	Timeframe	Est. Cost (KES)	Indicators	Monitoring Frequency
Soil Erosion Control	Surface runoff	Sedimentation of drainage systems	<ul style="list-style-type: none"> • Install silt traps • Temporary embankments • Protect stockpiles • Landscaping after works 	Contractor / Site Engineer	During earthworks	400,000	<ul style="list-style-type: none"> • No visible rills/gullies • Functional silt traps 	After heavy rains & weekly
Noise & Vibration	Equipment operation	Nuisance to neighbours	<ul style="list-style-type: none"> • Restrict work to 8am–5pm • Maintain machinery • Switch off idle engines • Provide PPE (earmuffs) 	Contractor	Throughout construction	Routine OPEX	<ul style="list-style-type: none"> • No formal complaints • PPE compliance >95% 	Weekly
Air Quality (Dust Emissions)	Movement of vehicles & materials	Respiratory irritation, nuisance dust	<ul style="list-style-type: none"> • Sprinkle water on exposed surfaces • Cover trucks transporting materials • Limit vehicle speeds 	Contractor	Throughout construction	150,000	<ul style="list-style-type: none"> • No visible excessive dust • Covered trucks 	Daily
Traffic Management	Movement of trucks	Road congestion, accidents	<ul style="list-style-type: none"> • Install warning signage • Appoint traffic marshal • Schedule material delivery off-peak • No obstruction of public roads 	Contractor	Throughout construction	100,000	<ul style="list-style-type: none"> • Signage installed • Traffic marshal present • No recorded traffic incidents 	Daily

Activity	Environmental / Social Aspect	Potential Impact	Mitigation & Control Measures	Responsibility	Timeframe	Est. Cost (KES)	Indicators	Monitoring Frequency
Occupational Health & Safety (OHS)	Construction hazards	Worker injuries	<ul style="list-style-type: none"> • Mandatory PPE • Toolbox talks weekly • First aid kits on site • Incident reporting register • Emergency contacts displayed 	Contractor / Proponent	Throughout construction	Routine OPEX	<ul style="list-style-type: none"> • PPE compliance rate • Incident register • First aid kit availability 	Daily inspection; Weekly review
Public Safety	Open excavations, materials	Injury to public	<ul style="list-style-type: none"> • Secure hoarding • Restrict unauthorized access • Warning signage • Security guards on site 	Contractor	Throughout construction	Included in security cost	<ul style="list-style-type: none"> • Intact hoarding • Guard presence • No public injury reports 	Daily
Solid Waste Generation	Construction debris	Land pollution	<ul style="list-style-type: none"> • Segregate waste • Reuse recyclable materials • Dispose at approved facilities • Maintain waste transfer records 	Contractor	Throughout construction	200,000 annually	<ul style="list-style-type: none"> • Waste bins available • Disposal receipts • No scattered waste 	Weekly
Energy Use	Electricity & generator use	Resource consumption	<ul style="list-style-type: none"> • Efficient equipment use • Switch off idle equipment • Maintain generators 	Contractor	Throughout construction	300,000 annually	<ul style="list-style-type: none"> • Fuel consumption records • Electricity bills 	Monthly
Water Use	Construction water demand	Strain on supply	<ul style="list-style-type: none"> • Meter water usage • Avoid wastage • Harvest rainwater where feasible 	Contractor	Throughout construction	250,000 annually	<ul style="list-style-type: none"> • Water meter readings • No leakage observed 	Weekly

Table 41: Operational Phase Management Plan

Environmental Aspect	Mitigation Measures	Responsibility	Cost (KShs)	Indicators of Success
Traffic Management	<ol style="list-style-type: none"> 1. Maintain a single controlled entry/exit point manned 24 hours. 2. Provide adequate on-site parking to prevent roadside parking. 3. Designate pedestrian walkways separate from vehicle access. 4. Install and maintain clear traffic signage. 5. Install warning signage at driveways and blind spots. 6. Provide designated public vehicle drop-off/staging area where applicable. 7. Maintain footpaths and public verges free from obstruction. 	Proponent / Estate Management / Residents Association	Routine operational cost	<ul style="list-style-type: none"> • No obstruction of public roads. • Adequate marked parking bays. • Functional security at gate • No traffic-related complaints recorded. • Clearly visible road signage.
Solid Waste Generation & Management	<ol style="list-style-type: none"> 1. Contract a licensed waste collection company approved by the National Environment Management Authority. 2. Implement waste segregation at source (organic, recyclable, general waste). 3. Provide covered waste bins for each unit. 4. Maintain waste collection schedule and disposal records. 5. Promote 3Rs (Reduce, Reuse, Recycle). 	Proponent / Estate Managers	70,000 monthly	<ul style="list-style-type: none"> • Valid waste collection contract. • Waste transfer notes available • Segregation bins labelled and in use. • No illegal dumping within premises.
Liquid Waste Generation & Management	<ol style="list-style-type: none"> 1. Connect to approved sewer system or maintain septic tank/bi digester. 2. Routine inspection and desludging by licensed handlers. 3. Maintain sludge disposal records. 4. Prevent leakages and overflows. 5. Immediate repair of blockages. 	Proponent / Estate Managers	40,000 monthly	<ul style="list-style-type: none"> • Functional sewer/septic system • No overflow incidents • Sludge / sewer disposal certificates. • Valid NEMA-licensed exhauster records.
Storm Water Management	<ol style="list-style-type: none"> 1. Install roof gutters and downpipes. 2. Construct drainage channels to approved standards. 3. Regular cleaning of drains to prevent blockage. 4. Direct stormwater to natural drainage systems without causing erosion. 5. Provide soak pits where necessary. 	Proponent / Estate Managers	340,000 one off	<ul style="list-style-type: none"> • No flooding during heavy rains. • Clean, unobstructed drainage channels. • No standing water within compound.

Infrastructure Loading (Water, Roads, Utilities)	<ol style="list-style-type: none"> 1. Maintain paved access roads and pedestrian walkways. 2. Install adequate water storage tanks. 3. Encourage rainwater harvesting. 4. Maintain internal utility systems. 5. Avoid illegal utility connections. 	Proponent / Estate Managers	Included in contract cost	<ul style="list-style-type: none"> • Functional paved roads • Adequate water pressure. • Water storage tanks installed • No utility disruption complaints.
Energy Consumption	<ol style="list-style-type: none"> 1. Install energy-efficient lighting (LED). 2. Encourage responsible electricity use. 3. Maintain standby generator where necessary. 4. Promote use of renewable energy options (e.g., solar lighting for common areas). 	Proponent / Estate Managers	Operational budget	<ul style="list-style-type: none"> • Reduced electricity bills. • Functional solar/efficient lighting. • Generator maintenance records.
Occupational Health & Safety (Estate Staff)	<ol style="list-style-type: none"> 1. Provide PPE for maintenance staff. 2. Maintain first aid kits at common areas. 3. Display emergency contacts. 4. Conduct periodic fire drills. 5. Install and service fire extinguishers. 	Proponent / Estate Managers	Operational budget	<ul style="list-style-type: none"> • Serviced fire extinguishers. • First aid kits stocked • Incident register maintained. • Fire drill records available.
Community Wellbeing & Socio-Economic Benefits	<ol style="list-style-type: none"> 1. Promote local employment for estate services. 2. Support local suppliers for maintenance works. 3. Maintain harmonious relations through Residents Association meetings. 4. Implement grievance redress mechanism. 	Proponent / Estate Managers / Residents Association	Administrative	<ul style="list-style-type: none"> • Employment records • Grievance register maintained • Minutes of residents meetings • No unresolved disputes.
Micro-Climate & Environmental Aesthetics	<ol style="list-style-type: none"> 1. Maintain landscaped green areas. 2. Plant and maintain indigenous trees. 3. Maintain open spaces as per approved master plan. 4. Minimize reflective surfaces where possible. 5. Comply with zoning and density approvals from Mombasa County Government. 	Proponent / Estate Managers	50,000 annually	<ul style="list-style-type: none"> • Thriving landscaped areas. • Tree survival rate above 80%. • Compliance with approved building plans. • No zoning violation notices.

9.5 Decommissioning Phase Plan

Though the project has a lifespan of 50+ years, a decommissioning plan will be required if the building has to be brought down.

Table 42: Conceptual Decommissioning Plan

Environmental Concern	Mitigation Measures	Responsibility	Cost (KShs)	Indicators
Building Structural Safety	<ol style="list-style-type: none"> 1. Conduct structural integrity assessment by a registered structural engineer. 2. Undertake material strength testing where necessary. 3. Prepare demolition method statement and safety plan. 4. Obtain demolition approval from relevant authorities before commencement. 	Registered Structural Engineer / Proponent	600,000	<ul style="list-style-type: none"> • Structural assessment report available. • Approved demolition method statement • Engineer's certification prior to works.
Land and Building Use Compliance	<ol style="list-style-type: none"> 1. Confirm zoning and land use compliance with approved Physical Development Plan. 2. Obtain demolition permits from County authorities. 3. Engage registered Physical Planner where necessary. 	County Physical Planning Office / Physical Planner / Proponent	650,000	<ul style="list-style-type: none"> • Valid demolition permit. • Planning compliance letter • Consultant engagement records.
Accidents and Injuries (Public & Workers)	<ol style="list-style-type: none"> 1. Secure site with perimeter fencing/hoarding. 2. Install warning signage and restrict unauthorized access. 3. Provide PPE for demolition workers. 4. Appoint safety officer on site. 5. Maintain first aid kits and emergency contacts. 	Contractor / Proponent	500,000	<ul style="list-style-type: none"> • Intact perimeter fence. • Warning signage displayed. • PPE compliance records. • Incident register maintained.
Disconnection of Utilities	<ol style="list-style-type: none"> 1. Disconnect electricity, water, sewer, and communication lines prior to demolition. 2. Remove all surface and underground cables safely. 3. Obtain confirmation letters from service providers before works begin. 	Contractor / Utility Service Providers	600,000	<ul style="list-style-type: none"> • Written disconnection confirmations. • Absence of live cables. • No utility-related accidents reported.
Solid Waste Generation (Demolition Waste)	<ol style="list-style-type: none"> 1. Segregate demolition waste (concrete, metals, timber, and hazardous materials). 2. Dispose waste at sites approved by the National Environment Management Authority. 3. Maintain waste transfer notes and disposal receipts. 	Proponent / Contractor	200,000	<ul style="list-style-type: none"> • Waste disposal receipts available. • Waste segregation evident on site. • No debris left on site after completion.

Environmental Concern	Mitigation Measures	Responsibility	Cost (KShs)	Indicators
	<ol style="list-style-type: none"> 4. Re-use or recycle salvageable materials. 5. Apply 3Rs principle (Reduce, Re-use, and Re-cycle). 			<ul style="list-style-type: none"> • Clean and restored project site.
Dust and Air Quality During Demolition	<ol style="list-style-type: none"> 1. Sprinkle water on demolition surfaces to suppress dust. 2. Cover trucks transporting debris. 3. Restrict demolition to daytime hours. 4. Provide dust masks to workers. 	Contractor	150,000	<ul style="list-style-type: none"> • Minimal visible dust emissions • Covered debris trucks. • No dust-related complaints recorded.
Noise and Vibration	<ol style="list-style-type: none"> 1. Restrict demolition to approved hours (8am–5pm). 2. Use well-maintained machinery. 3. Notify neighbors prior to demolition activities. 	Contractor / Proponent	Routine operational cost	<ul style="list-style-type: none"> • No formal noise complaints • Equipment maintenance records. • Community notification records.
Site Restoration After Demolition	<ol style="list-style-type: none"> 1. Clear all debris from site. 2. Level and compact ground safely. 3. Landscape or secure site to prevent erosion and illegal dumping. 	Contractor / Proponent	Included in project cost	<ul style="list-style-type: none"> • Site cleared and levelled. • No open pits or hazards. • No illegal dumping observed post-demolition.

CHAPTER TEN: CLIMATE CHANGE VULNERABILITY, ADAPTATION, AND MITIGATION MEASURES

10.1 Introduction

Climate change poses significant risks to coastal high-rise developments through sea-level rise, increased ambient temperatures, extreme storm surges, and saline corrosion. The Nyali High-Rise Residential Project requires climate-resilient design and operations to safeguard structural integrity, ensure thermal comfort, and protect residents' well-being.

This chapter presents:

1. Climate profile of the project area;
2. Vulnerability assessment to climate hazards;
3. Adaptation and mitigation measures to enhance resilience and minimize greenhouse gas emissions;
4. Thermal comfort, ventilation, and humidity management strategies;
5. Institutional arrangements and monitoring & evaluation framework.

All measures align with:

- Environmental Management and Coordination Act (EMCA), 1999
- EIA/EA Regulations, 2003
- Kenya Climate Change Act, 2016
- Energy Management Regulations, 2012
- Mombasa County Climate Change Policy, 2017

10.2 Climate Profile of the Project Area: Nyali, Mombasa

The project site is within a tropical wet and dry climate zone, influenced by the Indian Ocean, with the following characteristics:

Table 43: Climate Profile, Nyali Mombasa

Parameter	Description	Source
Humidity	70–85% year-round	Kenya Meteorological Dept. (KMD), 2023
Temperature	24°C – 33°C	KMD, 2023
Rainfall	Bimodal: Long rains (Apr–Jun), Short rains (Oct–Nov)	KMD, 2023
Coastal Dynamics	Salt-laden winds, storm surge potential	IPCC 2023, Mombasa County Climate Policy
Climate Projections	Rising mean sea level; increased heatwaves; intensified cyclones	IPCC 2023, KCCP 2017

Implications:

- Increased rainfall variability may overwhelm drainage and cause localized flooding.
- Higher temperatures increase cooling demand.
- Sea-level rise and storm surges may threaten basement structures.
- Salt-laden winds accelerate corrosion of M&E systems.

10.3 Climate Change Vulnerability Assessment

A structured vulnerability assessment evaluates the project’s sensitivity to climate hazards, following NEMA guidelines.

Table 44: Climate Change Vulnerability Assessment Matrix

Aspect	Potential Climate Risks	Potential Impact on Project	Vulnerability Level	Likelihood	Consequence	Risk Rating (L×C)
Rainfall Variability & Flooding	Intense rainfall, flash floods	Drainage overflow, property damage, soil erosion	High	High	High	High
Temperature Rise	Heatwaves, higher daytime temperatures	Increased cooling demand, thermal discomfort	Medium	Medium	Medium	Medium
Soil Erosion	Heavy rains on exposed soils	Loss of topsoil, foundation instability	Medium	Medium	Medium	Medium
Water Scarcity	Prolonged dry periods	Reduced domestic water availability	High	High	High	High
Vegetation Loss	Land clearing during construction	Reduced carbon sequestration and biodiversity	Medium	Medium	Medium	Medium
Saline Exposure	Salt-laden coastal winds	Accelerated corrosion of external structures	High	High	High	High

10.4 Climate Change Adaptation Measures

Adaptation measures enhance resilience to identified risks. Each measure includes implementation stage and responsible entity.

Table 45: Climate Change Adaptation Measures

Category	Adaptation Measure	Expected Benefit	Implementation Stage	Responsible Entity
Infrastructure & Design	Elevated building above flood levels; reinforced drainage	Reduced flood risk	Design & Construction	Contractor / Developer
Infrastructure & Design	Permeable pavements and infiltration pits	Improved groundwater recharge, reduced runoff	Construction	Contractor

Category	Adaptation Measure	Expected Benefit	Implementation Stage	Responsible Entity
Infrastructure & Design	Rainwater harvesting & storage	Increased water availability during dry periods	Construction & Operation	Developer / Property Management
Infrastructure & Design	Reflective roofing, optimized natural ventilation	Reduced indoor heat gain	Design & Operation	Architect / Contractor
Soil & Erosion Control	Silt traps, grassing, terracing	Minimized soil erosion	Construction	Contractor
Water Management	Low-flow fixtures, greywater reuse	Water conservation	Operation	Property Management
Vegetation & Landscaping	Indigenous tree planting, green buffers	Carbon absorption, improved microclimate	Construction & Operation	Landscape Contractor
Institutional Measures	Climate Risk Management Plan & awareness programs	Enhanced local resilience	Operation	Developer / Property Management

10.5 Climate Change Mitigation Measures

Mitigation measures aim to minimize greenhouse gas emissions during construction and operation.

Table 46: Climate Change Mitigation Measures

Category	Mitigation Measure	Environmental Benefit	Implementation Stage	Responsible Entity
Energy Efficiency	Solar PV & LED lighting	Reduced grid electricity consumption	Operation	Property Management
Energy Efficiency	Solar water heating	Reduced fossil fuel dependence	Construction & Operation	Contractor / Property Management
Sustainable Construction	Low-carbon local materials (interlocking blocks, blended cement)	Lower embodied carbon	Construction	Contractor
Sustainable Construction	Machinery maintenance; avoid idling	Reduced fuel emissions	Construction	Contractor
Waste Management	Segregation, reuse, recycling	Reduced landfill emissions	Construction & Operation	Property Management
Landscaping	≥30% green cover; drought-resistant trees	Carbon sequestration, microclimate cooling	Construction & Operation	Landscape Contractor
Transport Efficiency	Pedestrian walkways, bicycle parking	Reduced vehicular emissions	Operation	Developer / Property Management

10.6 Thermal Comfort, Ventilation, and Humidity Management

10.6.1 Passive Cooling & Aerodynamic Design

- Pressure-driven cross-ventilation: Floor plates designed to allow airflow from windward to leeward sides.

- Wing walls & casement windows: Capture Kaskazini/Kusini monsoon winds for natural ventilation.
- Venturi corridors: Accelerate airflow in common areas.
- High Solar Reflectance Index (SRI) roofs and light-colored facades: Reduce solar heat gain.

10.6.2 Advanced Building Envelope Technologies

- Spectrally selective glazing (SHGC < 0.35): Maximizes daylight, minimizes heat.
- Thermal break frames: Reduce heat conduction from aluminium window frames.
- External shading (Brise-Soleil): Horizontal & vertical fins on North/West elevations.

10.6.3 Mechanical Cooling & Dehumidification

- VRF systems: Optimize refrigerant flow per room, reducing energy by ~40%.
- Dedicated Outdoor Air Systems (DOAS): Dehumidifies fresh air before supply.
- Condensate water recovery: Reuse AC condensate for irrigation and cooling towers.

10.6.4 High-Rise Microclimate & Landscaping

- Sky gardens & green balconies: Evaporative cooling.
- Vertical shading with salt-tolerant plants: Protects western-facing balconies.
- Permeable hardscapes: Reduce heat absorption from parking and surrounding areas.

Table 47: Coastal Thermal Management Options

Strategy	Technical Description	Expected Benefit
Active Dehumidification	Integrated HVAC humidity sensors	Prevents mold & salt-dampness
Low-E Coating	Metal oxide layers on glass	Blocks 70% solar heat, maintains view
High-volume Ceiling Fans	DC-motor fans in primary areas	Improves perceived cooling by ~3°C
Thermal Mass Management	Lightweight internal partitions	Limits heat storage within building

Expected Outcomes:

1. Reduce AC Energy Demand: ~35% lower than conventional coastal high-rise benchmarks.
2. Enhance Occupant Health: Prevent Sick Building Syndrome.
3. Climate Resilience: Maintain habitable conditions during heatwaves or power outages.

10.6.5 Saline Corrosion Prevention

- **Anti-corrosive coil coatings (Blygold / Heresite):** For outdoor AC units and heat pumps.
- **Stainless Steel Grade 316:** For external fixtures, balcony railings, and lightning arrestors.
- **Enclosed switchgear:** IP-rated, climate-controlled enclosures for electrical panels.

10.7 Institutional Arrangements for Climate Action

Table 48: Roles and Responsibilities

Entity	Role & Responsibility
Developer / Proponent	Procure climate-resilient materials (Sulphate-resistant cement, Low-E glass)
Lead Consultant / Architect	Design optimal wind-flow; ensure green building standards
Contractor	Implement erosion control, STP & desalination systems installation
Property Management	Oversee Energy & Water Management Plans; maintain solar PV & desalination filters
Residents' Association	Participate in water conservation & waste segregation programs

Note: Regular training and awareness programs will be conducted for all stakeholders to ensure climate-resilient operations.

10.8 Monitoring and Evaluation (M&E) Framework

10.8.1 Key Performance Indicators (KPIs)

Table 49: Key Performance Indicators (KPIs)

KPI	Target / Threshold	Monitoring Frequency	Responsible Entity
Energy Intensity Index	≤120 kWh/m ² /year	Quarterly	Property Management
Potable Water Self-Sufficiency	≥50% via rainwater & desalination	Quarterly	Property Management
Carbon Sequestration Rate	≥90% survival of planted greenery	Annual	Landscape Contractor
Indoor Air Quality (Humidity)	40–60% in common areas	Quarterly	Property Management

10.8.2 Evaluation Schedule

- Construction Phase: Monthly audits on low-carbon materials, dust suppression, and erosion control.
- Operational Phase: Annual energy and water audits per Energy Management Regulations (2012).
- Strategic Review (Every 3 Years): Re-assess sea level rise and storm surge data to update flood defences and adaptation strategies.

CHAPTER ELEVEN: KNOWLEDGE GAPS AND UNCERTAINTIES

The preparation of this Environmental Impact Assessment (EIA) for the proposed high-rise residential development in Nyali, Mombasa, was informed by site-specific primary data, including accredited laboratory analysis and professional engineering surveys.

However, the complexity of the coastal environment and the vertical nature of the development introduce certain long-term uncertainties and data limitations that must be acknowledged to ensure adaptive management.

11.1 Data Strengths and Remaining Baseline Gaps

Unlike many preliminary assessments, this study utilized an **accredited laboratory** to establish a robust baseline for **ambient noise, soil quality, and water chemistry**. Furthermore, a **Geotechnical Analysis** was conducted to determine the site's bearing capacity.

Despite these strengths, the following gaps remain:

a) Temporal Variations in Baseline Data: While the laboratory measurements provide an accurate "snapshot" of the site, they do not reflect seasonal variations. For instance, noise levels and air quality in Nyali fluctuate significantly between the peak tourism seasons and off-peak periods.

b) Deep Aquifer Dynamics: Although water quality was tested, the long-term "sustainable yield" of the local aquifer under the pressure of a high-density high-rise population remains an estimate. The exact rate of potential **saltwater intrusion** over a 20-year horizon is influenced by regional extraction rates beyond the Proponent's control.

11.2 Marine and Coastal Ecological Uncertainties

Due to the project's proximity to the Indian Ocean shoreline, certain ecological dynamics are difficult to quantify within the study period:

- **Marine-Terrestrial Interaction:** The impact of high-intensity "Light Spill" from a high-rise building on nocturnal marine-adjacent fauna (such as nesting sea turtles or migratory coastal birds) remains qualitatively assessed rather than quantitatively modelled.
- **Sub-Surface Marine Impacts:** While construction occurs on land, the indirect impact of treated effluent discharge or storm-water runoff on nearby coral rag ecosystems and sea grass beds involves complex hydrodynamic variables that were not subject to computer modeling in this stage.

11.3 Absence of Micro-Climatic and Wind Tunnel Modeling

For a high-rise structure, the physical presence of the building alters the immediate atmosphere. Specific gaps include:

- **Wind Channeling (The Venturi Effect):** No computational fluid dynamics (CFD) modeling was conducted to predict how the building's mass will redirect coastal winds into neighboring low-rise properties or public spaces.

- **Urban Heat Island Contribution:** While mitigation measures are proposed, the precise degree to which the building’s thermal mass will contribute to the localized Nyali microclimate remains an area of uncertainty.

11.4 Cumulative Regional Impacts

Nyali is currently undergoing a rapid transition from low-density bungalows to high-rise apartments.

Infrastructure Stress: The cumulative "loading" on the municipal sewer systems (MOWASSCO) and the primary road network (e.g., Links Road or Fidel Odinga Road) by multiple concurrent high-rise developments is difficult to quantify without a centralized County-led Cumulative Impact Assessment.

Utility Reliability: Uncertainty exists regarding the long-term capacity of Kenya Power (KPLC) to meet the exponential growth in demand for AC-heavy developments without regional grid upgrades.

11.5 Climatic and Policy Uncertainties

Sea-Level Rise (SLR) Projections: The assessment relies on international IPCC projections for sea-level rise. However, localized tectonic subsidence or specific coastal erosion rates in this section of the Mombasa coastline are not documented with high-resolution historical data.

Evolving Blue Economy Regulations: As Kenya strengthens its "Blue Economy" policies, new maritime or coastal setbacks may be introduced during the project’s operational life, potentially altering compliance requirements for shoreline management

Table 50: Summary of Knowledge Gaps and Uncertainties

Aspect	Identified Knowledge Gap	Potential Implication	Recommended Action
Aquifer Longevity	Long-term salt-water intrusion rates under high-density pumping.	Risk of borehole "salting" and loss of potable water supply.	Install automated Salinity (TDS) sensors; implement a water-balance monitoring log.
Marine Biodiversity	Effects of high-rise light pollution on coastal/marine fauna.	Disruption of migratory or nesting patterns for sensitive species.	Implement "Dark Sky" lighting protocols; use shielded, low-lumen external fixtures.
Structural Salinity	Rate of chloride ion penetration in concrete over 50 years.	Potential "Concrete Cancer" and loss of structural integrity.	Conduct bi-annual structural audits focusing on salt-corrosion markers.
Micro-	Localized wind-tunnelling and shading	Reduced comfort in surrounding public spaces	Integrate "soft-edge" landscaping and wind-breaking vegeta-

Aspect	Identified Knowledge Gap	Potential Implication	Recommended Action
Climate	effects on neighbors.	or properties.	tion on mid-level balconies.
Cumulative Traffic	Total impact of concurrent Nyali developments on road nodes.	Gridlock during peak hours at major Nyali intersections.	Collaborate with the County Government on a joint Traffic Management Plan for the area.
Policy Change	Future shifts in Coastal Zone Management (CZM) laws.	Risk of new setbacks or discharge standards being applied retroactively.	Maintain active membership in the Kenya Property Developers Association (KPSA) for policy alerts.

11.7 Summary and Recommendations

The inclusion of **accredited laboratory data** and **geotechnical surveys** provides a high level of confidence in this SPR. The identified gaps are primarily associated with the long-term operational phase and regional environmental trends.

To maintain the project’s sustainability, the Proponent shall:

1. **Validate Predictions:** Use the first 12 months of construction to compare real-time noise and dust data against the accredited baseline.
2. **Monitor Groundwater:** Implement monthly testing of borehole water to detect early signs of saltwater intrusion.
3. **Adaptive Maintenance:** Establish a rigorous maintenance schedule for the Sewage Treatment Plant (STP) to ensure effluent always exceeds NEMA coastal discharge standards.
4. **Engage Neighbors:** Maintain an open grievance mechanism to address micro-climatic concerns (e.g., wind or shade) from immediate neighbors as the building rises.

CHAPTER ELEVEN: FINDINGS, CONCLUSIONS AND RECOMMENDATIONS

11.1 Findings

The Environmental Impact Assessment (EIA) for the proposed High-Rise Residential Development in Nyali, Mombasa, established the following key findings:

11.1.1 Zoning and Land Use

The project site is located within an upscale, rapidly densifying residential zone in Nyali. The transition from low-rise to high-rise structures is consistent with current urban trends in Mombasa County, provided infrastructure capacity is matched.

11.1.2 Environmental Baseline

Site-specific tests by accredited laboratories confirm that current ambient noise, soil quality, and groundwater parameters are within acceptable limits, though groundwater shows early indicators of salinity common to coastal aquifers.

11.1.3 Geotechnical Stability

The professional geotechnical analysis indicates the coral rag and sub-surface limestone are capable of supporting a high-rise structure, provided specialized foundation engineering is applied to resist saline-induced degradation.

11.1.4 Coastal-Specific Impacts

Unlike inland projects, the primary negative impacts involve potential saline corrosion of materials, high energy demand for cooling, and the risk of nutrient loading into the marine ecosystem via untreated effluent.

10.1.5 Short-term Impacts

Construction-phase impacts—such as vibration from piling, dust, and heavy machinery noise—are significant but temporary and manageable through the implemented Environmental Management and Monitoring Plan (EMMP).

11.1.6 Socio-Economic Benefits

The project will provide high-quality housing units, create significant direct and indirect employment for the Mombasa youth, and increase the County's revenue base through rates and permits.

11.2 Conclusions

The EIA study concludes that the proposed high-rise residential project:

11.2.1 Environmental Viability

Will not cause significant or irreversible environmental degradation, provided the specialized coastal mitigation measures (e.g., on-site STP and Desalination) are operationalized

11.2.2 Strategic Alignment

Directly supports the **Mombasa County Integrated Development Plan (CIDP)** and the National **Blue Economy** agenda by promoting sustainable, organized urban growth in a coastal context.

11.2.3 Technical Readiness

Is supported by robust primary data from accredited laboratories and geotechnical experts, ensuring that design assumptions are based on the actual physical conditions of the Nyali site

11.2.4 Overall Acceptability

Is environmentally, socially, and economically sound and is therefore recommended for approval by NEMA and the County Government of Mombasa.

11.3 Recommendations

To ensure environmentally sound and sustainable project implementation, the following coastal-specific recommendations are made:

11.3.1. Occupational Health & Safety (OHS) and Coastal Safety

- Provide all workers with high-standard PPE, with specific emphasis on UV protection and hydration due to the high coastal heat index.
- Implement strict safety protocols for **high-altitude work**, including certified safety harnesses, debris nets, and wind-speed monitoring for crane operations.
- Ensure all staff are trained in emergency evacuation procedures tailored for high-rise structures.

11.3.2. Marine-Sensitive Sanitation & Wastewater

- Install and maintain an **on-site Sewage Treatment Plant (STP)** with the capacity to handle peak residential loads.
- **Effluent Testing:** Conduct monthly laboratory analysis of treated wastewater for Nitrogen and Phosphorus levels before any discharge or reuse in landscaping to prevent "algal blooms" in the nearby marine environment.

11.3.3. Groundwater and Salinity Management

- Establish a **monitoring borehole** to track the "Saltwater Interface" and prevent over-abstraction that could lead to permanent aquifer salinization.
- Operate the **Desalination Plant** in strict accordance with manufacturer specifications, ensuring the safe disposal of brine.

11.3.4. Energy Efficiency & Thermal Comfort

- Install energy-efficient **VRF (Variable Refrigerant Flow) Air Conditioning** systems and LED lighting to reduce the building's carbon footprint.
- Integrate solar water heating as per the **Energy (Solar Water Heating) Regulations**.

11.3.5. Coastal Material Integrity & Maintenance

- Utilize **Sulphate-Resisting Cement** for all sub-structure works and **Grade 316 Stainless Steel** for all external architectural finishes to resist saline corrosion.
- Establish a mandatory "Preventative Maintenance Schedule" for all mechanical plants to prevent premature failure due to salt-air exposure.

11.3.6. Traffic, Access, and Public Safety

- Deploy trained traffic marshals during the construction phase to manage heavy vehicle movement on Nyali's narrow feeder roads.
- Provide a dedicated "Silo Parking" structure within the building to ensure no "on-street" parking occurs, which would otherwise obstruct local traffic.

11.3.7. Site Restoration and Coastal Landscaping

- Implement a landscaping plan using **salt-tolerant indigenous flora** (e.g., Casuarina, palms, and coastal shrubs) to reduce the heat island effect.
- Maintain a minimum 30% green cover on the plot through a combination of ground-level gardens and vertical "Sky Forests."

11.3.8. Monitoring and Reporting

- Conduct **Annual Environmental Audits** and submit reports to NEMA as per the EMCA (1999) requirements.
- Maintain a continuous dialogue with the Nyali Residents' Association to address any emerging social or environmental concerns.

11.4 Overall Recommendation

Based on the findings and the detailed baseline data provided by accredited laboratories and geotechnical surveys, it is the professional opinion of the Environmental Assessment Team that the proposed **High-Rise Residential Project in Nyali** is environmentally sound and technically feasible.

The project is recommended for licensing and implementation, subject to strict adherence to the EMMP and the coastal-specific mitigation strategies outlined in this report.

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5. Coastal Engineering & Green Building Literature

- **CIBSE (2020):** *Guide L: Sustainability (Climate Change and Building Design in Tropical Latitudes).*
- **Structural Engineering Institute (SEI):** *Guidelines for Corrosion Protection of Reinforced Concrete Structures in Marine Environments.*
- **Green Africa Foundation:** *The Green Marks Standard for Sustainable Buildings in Kenya.*

11.2 Appendices

The following supporting documents are attached to this report and form an integral part of the Environmental Impact Assessment documentation for the proposed project:

Table 51: Summary of Appendix documents

Appendix No.	Description
Appendix 1	Copy of the Project Proponent's Land Ownership Documents
Appendix 2	Architectural and Structural Drawings
Appendix 3	NEMA EIA/Audit Registration Certificate of Lead Expert – Mr OBAE T. B (Lead Expert No. 5095)
Appendix 4	Filled and Signed Stakeholder Questionnaires (English and Kiswahili Versions)
Appendix 5	Attendance Sheet from Public Consultation Meetings
Appendix 6	Location Map, Topographical Map, and Site Layout Plan
Appendix 7	Photographic Record of the Project Site area
Appendix 8	Curriculum Vitae of the EIA Team Members and Technical Experts

13.3 Declaration

This Environmental Impact Assessment Report has been prepared in accordance with the **Environmental Management and Coordination Act (EMCA), Cap 387**, and the **Environmental (Impact Assessment and Audit) Regulations, 2003**.