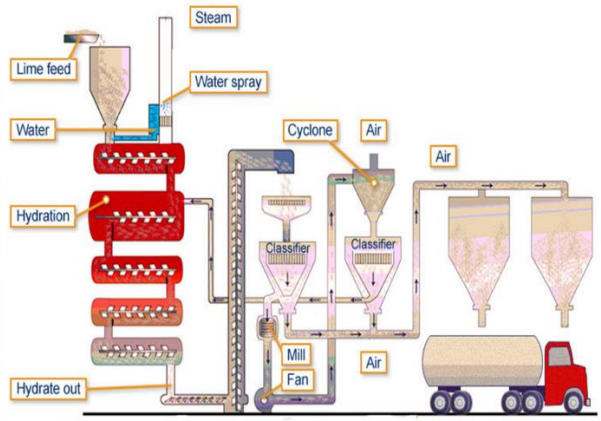
ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY REPORT FOR THE PROPOSED CONSTRUCTION & OPERATION OF A LIME PROCESSING PLANT WITH ASSOCIATED QUARRYING ON PLOT L.R NO: MUTOMO/SIMISI/148, EKANI AREA, SIMISI LOCATION, KITUI SOUTH SUB COUNTY, KITUI COUNTY



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Submitted To:

National Environment Management Authority (NEMA) In accordance with EMCA Cap 387 and Legal Notice No. 101 of 2003 (as amended)

April 2026

Document Certification

This Environmental and Social Impact Assessment (ESIA) Full Studt Report is hereby submitted to the National Environment Management Authority (NEMA) in strict compliance with the Environmental Management and Coordination Act (EMCA), Cap 387, and the Environmental (Impact Assessment and Audit) Regulations, 2003. The report presents a comprehensive and independent evaluation of the potential environmental and social impacts associated with the Proposed Construction and Operation of a Lime Processing Plant with Associated Quarrying and auxiliary facilities in Ekani area, Kitui County, Kenya.

The information presented herein represents a true, complete, and accurate account of the findings and analyses conducted regarding the proposed development. The assessment was undertaken using scientifically accepted methodologies and is based on documentation, data, and information provided by the project proponent, as well as findings from site inspections, stakeholder consultations, and expert evaluations carried out during the study period. We, the undersigned, hereby confirm that this Environmental and Social Impact Assessment (ESIA) Full Study Report faithfully presents the findings, assessments, and recommendations arising from the EIA study undertaken for the project.

Firm Of Experts

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Signed:_ __**Date/:**_13/4/2026

Non-Technical Summary

Kenya is endowed with significant limestone deposits distributed across various regions, providing a strong resource base for lime production. These deposits form the raw material for the manufacture of agricultural and industrial lime products. Despite this resource availability, the lime processing industry remains underdeveloped relative to its potential, although it is increasingly gaining prominence due to rising demand in agriculture, construction, water treatment, and food processing sectors. The demand for agricultural lime in Kenya has been steadily increasing, driven by the need to address widespread soil acidity, particularly in high rainfall areas. Additionally, the use of lime in industrial and food-related applications has contributed to market expansion. National production of lime was estimated at approximately 98,357.4 tonnes in 2024, reflecting gradual growth in the sector.

Regionally, the lime market is projected to experience significant expansion over the forecast period, with Kenya expected to register strong growth driven by increased agricultural intensification and industrial utilization. Market projections indicate a substantial growth trajectory, with an anticipated annual growth rate of approximately 18.42% by 2027. Within the African context, key producers and markets include Egypt, South Africa, Ethiopia, Algeria, and Nigeria, positioning Kenya as an emerging player in the regional lime value chain.

In response to the growing demand and the need to enhance local production capacity the proposed lime processing plant seeks to utilize locally available limestone resources to produce high-quality lime products for agricultural and industrial use. Given the nature of lime processing operations which typically involve *quarrying, crushing, milling, and sometimes calcination* there is a need to assess potential environmental and social impacts associated with the project. These may include air emissions (dust), noise, land disturbance, water use, and occupational health and safety concerns. Based on these impacts, it is necessary to undertake a comprehensive Environmental Impact Assessment (EIA) Full Study Report (FSR) to identify potential impacts and incorporate appropriate mitigation measures into the design and operation of the proposed plant. In this regard, the proponent herein referred as **Ndovu Rocks Limited** engaged **Lakers Consultancy Limited**, a NEMA-registered environmental consultancy (**NEMA/ENVIS/ELi/F0046**) firm, to undertake an Environmental and Social Impact Assessment for the proposed Lime processing plant in accordance with the Environmental Management and Coordination Act (EMCA), Cap. 387, and the Environmental (Impact Assessment and Audit) Regulations, 2003.

Project Proponent

Ndovu Rocks Limited is a duly registered Private Limited Company incorporated in Kenya and operating within the manufacturing sector. The company specializes in cement manufacturing and lime processing, serving the growing demand for construction and industrial raw materials within Kenya and the wider East African region. The company's core business activities include the extraction, processing, and manufacture of cement and lime products for use in construction and infrastructure development.

Proponent and Objectives

The proposed project by **Ndovu Rocks Limited** will involve the establishment and operation of a Limestone Processing Facility designed to convert raw limestone into various value-added end products (Quicklime). The project will entail the reception of limestone from approved quarries, crushing, grinding, calcination (where applicable), packaging, and distribution of finished products. The overall objective of the proposed project is to process limestone into various end products for use in construction, industrial, and agricultural applications. The key specific objectives include, but are not limited to:

- To produce high-quality "**Lime Products**" {(Calcium Oxide CaO) and hydrated lime (Calcium Hydroxide $Ca(OH)_2$)} that meet applicable industry standards for construction, industrial, and agricultural use.

Location

The proposed project site is located on **Land Reference No. Mutomo/Simisi/148**, within Ekani Village, Kitui South Sub-County, Kitui County, along the Ikutha–Nguuni Road. The site lies within a semi-arid rural setting characterized by scattered settlements and small-scale commercial activities. A key notable feature in the vicinity is the Kyanganga Shopping Centre. Geographically, the proposed project site is georeferenced by coordinates **Latitude -2.026758S** and **Longitude 38.287288E**.

Project Design/Components and Infrastructures

The proposed project will involve the installation and establishment of a Lime Processing Plant and the construction of an associated supports amenity. The lime processing component will comprise the installation of key plant equipment, including:

- **Processing Plant (Hydrated Lime Plant):** Crushing, screening, calcination, cooling, and hydration units housed in a purpose-built industrial shed,
- **Kiln Section**: [Vertical shaft kilns or rotary kilns] with associated pre-heaters, coolers, and emission control systems (e.g., bag filters/ESP for dust and wet scrubbers for SO_2. The kiln(s) will be equipped with automated feeding, firing, and discharge systems, refractory lining, and advanced process controls for temperature (900–1,200°C) and residence time.
- **Storage and Handling**: Raw material stockpiles, finished lime silos/hoppers, and covered product storage.
- **Ancillary Facilities**: Administrative block, laboratory, workshops, weighbridge, fuel storage (diesel), effluent treatment system, septic tanks/soak pits, internal access roads, security fencing, and green buffer zones,
- **Utilities:** National grid-connectivity electricity (with standby generators), borehole water supply, and fire-fighting system.

Raw Materials, Utilities, and Inputs

- **Raw Material**: The main raw materials shall include limestone ($CaCO_3$) approximately 140–155 MT/day (sourced from on-site quarry or licensed local quarries) Quicklime (CaO) and/or Hydrated Lime ($Ca(OH)_2$.
- **Water Sources:** 40–80m³/day (for dust suppression, cooling, hydration process if producing hydrated lime, and domestic use). The water requirement shall be sourced from onsite borehole.
- **Electricity:** 400–700 kVA connected load (including crushers, conveyors, blowers, and auxiliaries). Supplied via Kenya Power grid with diesel generator backup.

Project Production Capacity

The proposed Lime Processing Plant is designed with a production capacity of 80 metric tonnes per day (MT/day) of finished lime products. This capacity will depend on market demand and operational configuration. The plant will operate approximately 330-days per year (allowing for maintenance and downtime), resulting in an annual production capacity of approximately 24,000-26,400 MT/year (Annual Production Capacity).

Operation Activities

Production Process (Lime Processing)

A lime processing plant is an industrial facility designed to convert limestone (calcium carbonate $CaCO_3$) into usable lime products through controlled thermal and mechanical processes. The primary objective of the plant is to produce quicklime (calcium oxide CaO) and hydrated lime (calcium hydroxide Ca $(OH)_2$) for various industrial. The lime production will follow a standard thermal decomposition and hydration process and available best available technology. These activities will range from:

- **Crushing and Screening**: Limestone shall be fed into a primary jaw crusher, then secondary cone/hammer mill crushers to reduce size to <50 mm. The material shall then be screened and conveyed to storage hoppers. The oversize shall then be recirculated.

- **Calcination (Core Process)**: Crushed limestone shall be fed into the kiln(s) and heated to 900–1,200°C using fuel. The chemical reaction is: $CaCO_3 \rightarrow CaO$ (quicklime) + CO_2 (Dolomitic limestone may also be produce MgO.) Residence time in the kiln is approximately 2–6 hours depending on kiln type. Exhaust gases shall pass through heat recovery and air pollution control systems.

- **Packaging and Dispatch**: Finished quicklime or hydrated lime shall be packed in 25–50 kg bags or delivered in bulk tankers to consumers and for industrial use as a raw material.

A simplified process flow is as follows: Quarry→ Crushing/Screening→ Kiln (Calcination)→ Cooling→ (Hydration)→ Storage/Packaging→ Market.

Project Construction Activities

The construction phase of the proposed lime processing plant and associated site office will involve a series of civil, structural, and engineering works. The key activities to be undertaken are outlined below:

- **Site Clearance and Preparation**: This will involve clearing vegetation, removal of debris, stripping of topsoil, and leveling of the site to prepare it for construction activities. Topsoil will be stockpiled for later use in landscaping and site restoration.
- **Excavation and Backfilling**: Excavation works will be undertaken to prepare foundations for buildings and plant equipment. This will include normal soil excavation and subsequent filling with hardcore and compacted material to provide stable ground for structural works.
- **Foundation Slab Construction and Walling**: Construction of reinforced concrete foundation slabs to support plant machinery and building structures will be carried out. Masonry works for walls of the processing plant structures and site office will follow.
- **Machine Assembly and Installation**: Delivery, positioning, and mechanical assembly of processing equipment including crushers, kilns, conveyors, and associated systems will be undertaken in accordance with engineering specifications.
- **Electrical Installations**: Installation of electrical systems including wiring, control panels, transformers, lighting systems, and equipment connections to support plant operations**.**

Summary of Project Impacts

Positive Impacts

a) **Employment Opportunities:** The project is expected to create significant direct employment opportunities during the construction and operation phase, with a peak workforce of approximately 600 personnel. This will comprise mainly unskilled and semi-skilled labor, sourced preferentially from the local community where possible, to support site preparation, civil works, mechanical assembly, and general labor tasks. In addition, the proposed development will indirectly generate employment opportunities through the engagement of service providers, maintenance contractors, waste handlers, and local suppliers, thereby stimulating the regional economy and supporting livelihoods during both the construction and operational phases of the project.

a) **Stimulation of Local Economy:** The project is expected to stimulate the local economy by creating demand for a wide range of goods and services, including construction materials, housing for workers, and other related services. This increased demand will create opportunities for local businesses to expand and diversify their operations. Additionally, the project will contribute to both local and national revenue through the payment of taxes, levies, and statutory fees, thereby supporting public infrastructure development and improved service delivery.

Enhancement Measures

To ensure that business and socio-economic opportunities generated by the project are maximized, the following enhancement measures will be implemented:

- **Local Employment:** The Proponent will incorporate provisions for local employment to ensure that contractors recruit personnel in accordance with the proponent's recruitment policy and the requirements stipulated in applicable labour policies and statutory laws.
- **Promotion of Local Enterprises**: As part of the Stakeholder Engagement Plan (SEP), the Proponent will aggressively encourage local businesses to participate, where appropriate. Throughout the project lifecycle, the SEP will be updated and improved frequently to guarantee ongoing and significant participation.

The table below provides a concise summary of the key potential impacts associated with the proposed Lime Processing Plant (, including limestone quarrying). Impacts are categorized by project phase, with an indication of significance level before mitigation (based on typical Kenyan lime/limestone projects) and recommended mitigation measures that reduce most residual impacts to low or negligible levels when fully implemented.

Project Phase	Description of Impact	Significance (Before Mitigation)	Key Mitigation Measures	Residual Significance (After Mitigation)
Construction Phase	Air Quality & Dust	Moderate to High	– Application of water (or water with chemical additives) to wet surfaces and suppress airborne dust particles, – Enclose silos/bays with bin-vent filters for products; tarpaulins or roofing for large limestone piles – Provision and mandatory use of appropriate PPE against residual dust exposure, – Ensure pre-employment and periodic medical examinations focusing on respiratory function and skin conditions, –	Low
	Noise & Vibration	Moderate	– Schedule high-noise construction activities (e.g., blasting, primary/secondary crushing, heavy truck movements, and major maintenance) strictly between 08:00 and 18:00 hours on weekdays, – Fit high-efficiency silencers and mufflers on all exhaust systems of diesel engines, generators, compressors – Develop and implement a Community Notification Protocol as part of the Stakeholder Engagement Plan, – Notify nearby households, schools, and community leaders at least 48–72 hours in advance of any scheduled high-noise activities, – Establish a Grievance Redress Mechanism (GRM) specifically for noise-related complaints, with timely investigation and response, – Provision and mandatory use of hearing protection (earmuffs or earplugs) for workers in areas where noise exceeds 85 dB(A), –	Low
	Soil & Land Degradation	Moderate	– Installation of permeable geotextile barriers to intercept and filter sediment-laden runoff, – Strip only the required depth (typically 15–30 cm or as per soil, – Install silt fences before any clearing or earthworks begin, – Create contour berms or swales to direct runoff to sediment traps; avoid steep uninterrupted slopes, – Limit clearing and striping to the area required for immediate works (phased construction) to minimize the duration of exposed soil, especially during rainy seasons. –	Low

Project Phase	Description of Impact	Significance (Before Mitigation)	Key Mitigation Measures	Residual Significance (After Mitigation)
	Vegetation & Biodiversity	Low to Moderate	– Restrict vegetation clearing strictly to the minimum area required for construction and operations, – Identify and completely protect ecologically sensitive zones (e.g., wetlands, mature trees), – Conduct detailed pre-construction ecological walk-down; demarcate sensitive zones with “No-Go” fencing or signage, – Establish and maintain vegetated buffer zones around the project site using indigenous or fast-growing native species, – Plant native trees, shrubs, and grasses immediately after construction in designated buffer areas; use species suitable for local soil, – Educate workforce on biodiversity protection and “No-Go” zones.	Low
	Waste Generation	Moderate	– A waste register will be maintained on site, documenting waste type, quantity, segregation status, recycling/disposal route, and manifests, – Waste management facilities (bins, skips, storage areas) will be established before construction activities commence, – Educate workforce on proper waste handling procedures (Include waste management in induction training and weekly toolbox talks), – Locate waste storage areas away from drainage lines and sensitive receptors; cover skips to prevent wind-blown litter and rainwater infiltration, –	Low
	Occupational Health & Safety	Moderate to High	– Comprehensive training and awareness programs to equip workers with knowledge of hazards, safe work procedures, and emergency response shall be undertaken, – Mandatory induction training upon arrival; weekly toolbox talks on task-specific hazards (e.g., excavation, working at height, heavy machinery); – Provision of appropriate PPE (hard hats, safety boots, high-visibility vests, dust masks/respirators, gloves, eye protection, hearing protection, harnesses for working at height); enforce mandatory use, – Provision of fully equipped first aid facilities and trained personnel for immediate response to injuries or illnesses, – Conduct Job Safety Analysis (JSA) or Hazard	Low

Project Phase	Description of Impact	Significance (Before Mitigation)	Key Mitigation Measures	Residual Significance (After Mitigation)
			Identification and Risk Assessment (HIRA) before starting each major task, – Establish a functional Safety and Health Committee and daily supervision, – Report all incidents to DOSHS within required timelines.	
Operation	Air Quality & Emissions	Moderate to High	– Install fabric bag filters (or Electrostatic Precipitators systems) on kiln and process vents, – Install venturi or packed-bed wet scrubbers to capture particulate matter, acid gases (SO_2, HCl), and soluble pollutants, – Scheduled preventive and corrective maintenance of all air pollution control equipment and process units to sustain efficiency, – Fully or partially enclosed material transport systems to contain dust at transfer points, – Install active and passive methods to wet or contain fugitive dust at source, and – Optimize kiln feed size and combustion; minimize material drop heights. –	Low to Moderate
	Noise and Vibration	Moderate	– Develop and strictly follow a preventive maintenance schedule for all noise-generating equipment, including crushers (jaw, cone, hammer mills), screens, conveyors, kiln fans/blowers, tipper trucks, and standby generators, – Conduct monthly noise mapping and baseline measurements (using calibrated sound level meters) to identify equipment that exceeds permissible limits and prioritize repairs, – Procure and use only modern, low-noise equipment models during plant design and future replacements – Night-time or extended operations (if unavoidable for continuous kiln processes) will be restricted to low-noise activities only, with enhanced mitigation, – Implement worker rotation/shift systems to reduce individual exposure time in high-noise zones (e.g., limit exposure in crusher areas to, – Fit high-efficiency silencers and mufflers on all exhaust systems of diesel engines, generators, compressors, and kiln blowers/fans, – Install acoustic enclosures or soundproof barriers around major noise sources such as crushers, screens, and conveyor drive motors, – Position noisy equipment (crushers, kilns) away from site	Low

Project Phase	Description of Impact	Significance (Before Mitigation)	Key Mitigation Measures	Residual Significance (After Mitigation)
			boundaries and sensitive receptors, using natural topography or planted greenbelts as additional buffers.	
	Water Use & Quality	Moderate	– Implement recovery and reuse of process water to minimize freshwater abstraction and reduce effluent volume, – Install on-site wastewater treatment facility to ensure effluent meets discharge standards before release or reuse, – Regular sampling and analysis of groundwater from dedicated monitoring borehole to detect any contamination from plant operations, – Install bunded areas with impermeable floors (110–150% capacity of largest tank); use drip trays and spill kits; seal drainage systems with valves, – Design separate clean stormwater drains leading to retention ponds or natural discharge, – Install flow meters on main abstraction and recycling lines; –	Low
	Solid Waste & By-Products	Moderate	– Segregate waste at source using labelled bins; store in designated, covered, and bunded areas; transport only by NEMA-licensed waste handlers; – Locate storage away from drainage lines and sensitive receptors; use covered skips or containers; maintain good housekeeping, – Store in labelled, bunded, and secure areas; disposal shall only be through NEMA-licensed hazardous waste handlers, – Install dust collection systems (bag filters) at all major dust generation points	Low
	Community Health & Safety	Moderate	– Establish a multi-tier GRM (site level management external mediation); – Develop and implement a Traffic Management Plan; enforce speed limits (≤30 km/h on site, ≤50 km/h on public access roads); – Regular monitoring of community and worker health to detect and address project-related health issues early, – Conduct community awareness sessions (barazas) for education and sensitization programs for communities; – Develop and test an integrated Emergency Response Plan; train local community volunteers; conduct annual drills with participation of nearby residents, – Prioritize local hiring and implement community development initiatives.	Low

Project Phase	Description of Impact	Significance (Before Mitigation)	Key Mitigation Measures	Residual Significance (After Mitigation)
	Greenhouse Gas Emissions	Moderate to High	– Use of modern, thermally efficient vertical shaft kiln technology (Select kilns with heat recovery systems (preheating and cooling zones); – Optimization of fuel type, combustion efficiency, and operational parameters to minimize fuel consumption and associated CO_2 emissions, – Install heat exchangers or recuperators to preheat combustion air or limestone feed; and – Implement real-time process monitoring (temperature profiles, gas composition). –	Moderate (long-term)
Decommissioning	Site Restoration & Waste	Moderate	– Prepare a detailed Decommissioning Plan as part of this ESIA and submit to NEMA for approval; – Segregate waste at source; recycle metals, concrete rubble (as fill material), and any recoverable kiln dust; – Dispose of hazardous and non-recyclable waste only through NEMA-licensed contractor, – Implement progressive rehabilitation (e.g., backfill worked-out quarry sections, re-vegetate slopes, restore topsoil) throughout the operational life, –	Low
	Socio-Economic	Moderate (Negative)	– Retrenchment support, skills training for alternative livelihoods	Low
	Cumulative & Climate Considerations	Moderate	– Establish a greenbelt of vegetative buffers around the project site using indigenous tree species to act as windbreakers, reduce dust emissions, enhance carbon sequestration, and improve local microclimate conditions. – Adoption of efficient and clean technologies: Utilization of energy-efficient machinery and processes to minimize energy consumption and greenhouse gas emissions, – Climate-adaptive infrastructure design; Incorporation of drainage systems, erosion control measures, and flood-resistant structures to withstand extreme weather events.	Low

Conclusion

The Environmental and Social Impact Assessment (ESIA) study for the proposed Lime Processing Plant with a production capacity of 80 metric tonnes per day (MT/day) of quicklime (CaO) and/or hydrated lime ($Ca(OH)_2$), including associated limestone quarrying and auxiliary facilities, has comprehensively evaluated the potential environmental, social, and economic implications of the project. The proposed project is considered important and beneficial to the national and local economy. It will contribute towards industrial development in line with Kenya's Vision 2030 (Economic and Macro Pillar) and the National Industrialization Policy by adding value to locally available limestone resources. Key positive impacts will include but not limited:

- Creation of direct and indirect employment opportunities (approximately 60–100 permanent jobs during operation and more during construction),
- Stimulation of socio-economic growth in the project area through increased income, skills transfer, and market opportunities for local goods and services,
- Supply of essential lime products to support key sectors such as construction, agriculture (soil liming), water treatment, sugar processing, and environmental applications, and
- Generation of revenue for the proponent, county, and national government through taxes.

The project site has been selected considering accessibility, proximity to raw material sources, and avoidance of highly sensitive ecosystems. Baseline studies indicate that the anticipated negative impacts primarily related to dust emissions, noise and vibration (from quarrying, crushing, and kiln operations), air quality (particulate matter and kiln gases), water use, solid waste (including kiln dust), quarry landscape alteration, and minor socio-economic issues such as community health and safety are mostly site-specific, temporary to medium-term, and of low to moderate significance.

These potential adverse impacts can be effectively minimized or mitigated to acceptable levels through the implementation of the comprehensive Environmental and Social Management Plan (ESMP) detailed in this report. In addition, the proposed project shall incorporate best available technologies (e.g., efficient vertical shaft kilns with dust control systems such as bag filters), dust suppression measures, waste recycling where possible, occupational health and safety protocols, and ongoing community engagement. Public participation exercises conducted during the ESIA process revealed general support for the project, with stakeholders expressing interest in local employment, infrastructure improvements including learning institutions, water provisions, healthcare systems, and benefit-sharing mechanisms. All concerns raised have been adequately addressed through mitigation measures and the proposed Corporate Social Responsibility (CSR) activities.

Recommendation

It is highly recommended that the National Environment Management Authority (NEMA) approves the proposed project and issues the Environmental Impact Assessment License, subject to the following conditions:

a) The proponent shall fully implement the Environmental and Social Management Plan (ESMP) presented in this report, including all mitigation measures, monitoring schedules, and reporting requirements,

b) All necessary permits and approvals from other relevant agencies must be obtained and complied with prior to commencement of activities. These include:

    - Quarry mining license from the State Department of Mining,
    - Compliance with occupational health and safety standards under the Occupational Safety and Health Act, 2007, and
    - Water abstraction and use permit from the Water Resources Authority (WRA).

c) Regular environmental and social performance monitoring and annual environmental audits shall be conducted as required by NEMA, with corrective actions implemented promptly where needed,

d) The proponent shall establish and maintain an effective Grievance Redress Mechanism (GRM) accessible to affected communities and workers throughout the project lifecycle.

This ESIA Study Report has been prepared in full compliance with the Environmental Management and Coordination Act (EMCA) Cap 387, the Environmental (Impact Assessment and Audit) Regulations 2003, and relevant NEMA guidelines for mining and industrial projects. On the basis of the findings and analysis contained in this report, it is our considered opinion that the proposed Lime Processing Plant can proceed with minimal residual adverse impacts, provided the outlined mitigation measures and monitoring programs are strictly adhered to. The project will promote sustainable industrial development while safeguarding the environment and enhancing community livelihoods.

Acronym and Abbreviations

ACC	Assistant County Commissioner
AOI	Area of Influence
BOQ	Bill of Quantity
CAP	Climate Action Plan
CIDP	County Integrated Development Plan
CPP	Consultation and Public Participation
EIA	Environmental Impact Assessment
EMCA	Environmental Management and Coordination Act
ESMP	Environment and Social Management Plan
GHG	Green House Gas
GIS	Geographic Information System
GoK	Government of Kenya
NCA	National Construction Authority
NCCAP	National Climate Change Action Plan
NCCRS	National Climate Change Response Strategy
NEMA	National Environment Management Authority
NGO	Nongovernmental Organization
OSHA	Occupational Safety and Health Act
PPE	Personal Protective Equipment
TDS	Total Dissolved Solids
ToR	Terms of Reference
WMP	Waste Management Plan

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CHAPTER 1: INTRODUCTION

1.1. Industry Overview

Kenya is endowed with significant limestone deposits distributed across various regions, providing a strong resource base for lime production. These deposits form the raw material for the manufacture of agricultural and industrial lime products. Despite this resource availability, the lime processing industry remains underdeveloped relative to its potential, although it is increasingly gaining prominence due to rising demand in agriculture, construction, water treatment, and food processing sectors. The demand for agricultural lime in Kenya has been steadily increasing, driven by the need to address widespread soil acidity, particularly in high rainfall areas. Additionally, the use of lime in industrial and food-related applications has contributed to market expansion. National production of lime was estimated at approximately 98,357.4 tonnes in 2024, reflecting gradual growth in the sector.

Regionally, the lime market is projected to experience significant expansion over the forecast period, with Kenya expected to register strong growth driven by increased agricultural intensification and industrial utilization. Market projections indicate a substantial growth trajectory, with an anticipated annual growth rate of approximately 18.42% by 2027. Within the African context, key producers and markets include Egypt, South Africa, Ethiopia, Algeria, and Nigeria, positioning Kenya as an emerging player in the regional lime value chain.

In response to the growing demand and the need to enhance local production capacity the proposed lime processing plant seeks to utilize locally available limestone resources to produce high-quality lime products for agricultural and industrial use. Given the nature of lime processing operations which typically involve *quarrying, crushing, milling, and sometimes calcination* there is a need to assess potential environmental and social impacts associated with the project. These may include air emissions (dust), noise, land disturbance, water use, and occupational health and safety concerns. Based on these impacts, it is necessary to undertake a comprehensive Environmental Impact Assessment (EIA) Full Study Report (FSR) to identify potential impacts and incorporate appropriate mitigation measures into the design and operation of the proposed plant. In this regard, the proponent herein referred as **Ndovu Rocks Limited** engaged **Lakers Consultancy Limited**, a NEMA-registered environmental consultancy (**NEMA/ENVIS/ELi/F0046**) firm, to undertake an Environmental and Social Impact Assessment for the proposed Lime processing plant in accordance with the Environmental Management and Coordination Act (EMCA), Cap. 387, and the Environmental (Impact Assessment and Audit) Regulations, 2003.

1.2. Project Proponent

Ndovu Rocks Limited is a duly registered Private Limited Company incorporated in Kenya and operating within the manufacturing sector. The company specializes in cement manufacturing and lime processing, serving the growing demand for construction and industrial raw materials within Kenya and the wider East African region. The company's core business activities include the extraction, processing, and manufacture of cement and lime products for use in construction and infrastructure development.

1.3. Project Objective

The proposed project by **Ndovu Rocks Limited** will involve the establishment and operation of a Limestone Processing Facility designed to convert raw limestone into various value-added end products (Quicklime). The project will entail the reception of limestone from approved quarries, crushing, grinding, calcination (where applicable), packaging, and distribution of finished products. The overall objective of the proposed project is to process limestone into various end products for use in construction, industrial, and agricultural applications. The key specific objectives include, but are not limited to:

- Produce high-quality "**Lime Products**" {(Calcium Oxide CaO) and hydrated lime (Calcium Hydroxide $Ca(OH)_2$)} that meet applicable industry standards for construction, industrial, and agricultural use, and
- Support the growth of Kenya's manufacturing sector, adding value to locally sourced raw materials, and enhancing domestic production capacity in line with Vision 2030's industrialization goals.

1.4. Scope and Objectives of EIA

Under Section 2 (Interpretation) of the Environmental Management and Coordination Act, Cap. 387 (EMCA, 1999), an Environmental Impact Assessment (EIA) is defined as "a systematic examination conducted to determine whether or not a programme, activity, or project will have any adverse impacts on the environment." In broader terms, an EIA is a vital planning and decision-making tool used to identify, predict, and evaluate the potential positive and negative environmental and social impacts associated with a development project, both in the short and long term. It considers the physical, chemical, biological, economic, cultural, and social dimensions of the environment, ensuring that all likely changes are systematically assessed and mitigated where necessary.

The requirement to conduct an EIA is further provided under Section 58(1) of EMCA Cap. 387, which mandates that no proponent shall undertake a project likely to have a significant impact on the environment without the prior approval of the National Environment Management Authority (NEMA). The procedures, standards, and requirements for preparing and submitting EIA reports are detailed in the Environmental (Impact Assessment and Environmental Audit) Regulations, 2003 (as amended). The scope of this Environmental Impact Assessment (EIA) was defined in accordance with the Terms of Reference (TOR) approved by NEMA and covers all phases of the project, from planning and design through construction, operation, and eventual decommissioning. Specifically, the assessment addressed:

- Baseline studies-Documentation of the current status of the natural and socio-economic environment within the project area, including baseline environmental quality parameters.
- Positive impacts-Identification and evaluation of potential environmental and social benefits associated with the proposed development.
- Negative impacts – Identification, screening, and prediction of possible adverse impacts likely to occur during the construction, operation, and decommissioning phases.
- Mitigation measures – Formulation of strategies to prevent, minimize, or offset identified adverse effects.
- Stakeholder mapping and engagement;
- Environmental and Social Management Plan (ESMP)-Development of a comprehensive ESMP outlining mitigation, monitoring, and reporting measures to ensure effective environmental and social safeguards throughout the project lifecycle.
- Final development of Comprehensive Project (EIA) report for NEMA submission and eventual EIA license issuance.

1.5. Methodology

The Environmental Impact Assessment (EIA) process was undertaken using a range of methodologies in full compliance with Section 58 of the Environmental Management and Coordination Act (EMCA), Cap 387, and the Environmental (Impact Assessment and Audit) Regulations, 2003. The study was further guided by the approved Scope and Terms of Reference (ToR) issued by the National Environment Management Authority (NEMA). Both primary and secondary data collection methods were applied to ensure a comprehensive assessment of the project's potential environmental and social impacts. The methodologies employed included, but were not limited to, the following:

a) **Desktop Literature Review:** A comprehensive review of existing information was undertaken using published literature, project-specific documents, government reports, and relevant policy and legislative frameworks. This process established the environmental and socio-economic context of the project area, identified potential environmental and social issues, and informed the design of field studies and stakeholder engagement activities.

b) **Geospatial Mapping and GIS Analysis:** Satellite imagery, topographic maps, and Geographic Information System (GIS) tools were utilized to accurately delineate the project location, identify sensitive environmental features, analyze existing land use patterns, and define potential impact zones. This spatial analysis provided a precise geographic framework to support environmental baseline assessments, impact prediction, and the integration of mitigation measures into project planning.

c) **Field Surveys and Site Inspections:** On-site reconnaissance was conducted to assess the physical, biological, and socio-economic conditions within and adjacent to the project area. These surveys served to verify baseline environmental parameters, ground-truth secondary data, and identify site-specific features or constraints that could influence project design, implementation, and impact mitigation.

d) **Stakeholder Engagement and Public Consultation:** Structured consultations were conducted with project-affected persons (PAPs), government agencies, and other relevant stakeholders to identify concerns, capture local knowledge, and incorporate stakeholder perspectives into project planning. Three public consultation meetings were conducted to inform affected persons about the proposed development and its potential environmental and social impacts. The consultations provided a platform for stakeholders to express their views, concerns, and expectations regarding the project. Feedback obtained during these engagements was documented and presented as annexure.

The engagement process was primarily facilitated through the active involvement of the local administration (Area Chief), who played a pivotal role in mobilizing residents, providing local context, and coordinating communication between the project team and the community/project affected persons during the public participation phase.

1.6. Impact Identification

The impacts associated with the proposed project were classified according to their **Effect Level.** Each identified adverse impact will be systematically categorized and analyzed to ensure a transparent and consistent assessment framework. Impacts will first be assigned an **Effect Level Classification** categorized as *Low/Negligible, Minor, Moderate, or Major/High* considering feasible mitigation measures. This means that impacts are evaluated not only in their raw form but also in terms of their **residual effect** once mitigation is applied. In order to determine the significance of each impact, two overall factors were considered:

- The importance and/or sensitivity of the environmental and social receiving parameter, as determined during the assessment of baseline conditions; and
- Magnitude and Nature of the impacts.

1.6.1. Sensitivity of the Receiving Parameter

The sensitivity of receiving parameters was determined using information gathered from the baseline description, including the importance, significance, or value of the social or environmental component under assessment. Data was obtained through field visits, site observations, baseline analysis and feedback from community engagements. Understanding the sensitivity of each receiving parameter is critical, as it reflects the adaptability and resilience of the environmental or social component to an identified impact. For the purposes of this assessment, the following categories of sensitivity were applied to evaluate potential effects systematically:

Significance	Narrative
High	The environmental parameter/receptor is fragile, and an impact is likely to leave it in an altered state from which recovery would be difficult or impossible.
Medium	The parameter/receptor has a degree of adaptability and resilience and is likely to cope with the changes caused by an impact, although there may be some residual modification as a result
Low	The parameter/receptor is adaptable and is resilient to change

1.6.2. Magnitude and Nature of the Impact

The magnitude of the impact is the scale of change which the impact may cause compared to the baseline and how this change relates to accepted thresholds and standards. The following categories were applied to the assessment of the anticipated project impacts:

Table 1: Impact Criterion

Criteria	Category	Description
Magnitude of Impact	*High*	A large change compared to variations in the baseline. Potentially a clear breach of accepted limits.
	Medium	Change which may be noticeable and may breach accepted limits.
	Low	When compared with the baseline, change may only just be noticeable. Existing thresholds would not be exceeded.
Type of Impact	*Positive*	Impacts that have a beneficial environmental result, such as enhancement of existing environmental and social conditions.
	Negative	Impacts that have a harmful aspect, such as loss or degradation of environmental resources.
Type of Effect	*Direct*	Impacts clearly and directly attributed to a particular environmental or social parameter (e.g., generation of dust directly impacts air quality).
	Indirect	Impacts associated with or subsequent to a particular impact on a certain parameter (e.g., high dust levels leading to nuisance and health effects to workers).
Duration	*Short Term*	Effects disappear within 1 year or once construction activities are completed.
	Medium Term	Effects disappear within a 5-year period.
	Long Term	Effects last for more than 5 years.
Reversibility	*Reversible*	Impact significance will reduce and disappear over time (naturally or artificially) once the impacting activity ceases.
	Irreversible	Impact significance will not reduce or disappear over time, even after the activity ceases.

A qualitative assessment was conducted using professional experience, judgment, and available knowledge, and including the consideration of stakeholder views. Where there are limitations to the data, and/or uncertainties, these were recorded in the relevant chapters in the EIA report, along with any assumptions that were taken during the assessment.

1.6.3. Impacts Scoping

Potential impacts as per the Leopold matrix were identified in relation to their effects on potential receptors. These steps facilitated the elimination and scoping out irrelevant impacts taking into consideration the following:

- Type of project
- Location
- Characteristics of the surrounding environment.
- Receptor sensitivity or importance depends on its nature, value, scarcity etc.

There are three types of receptors:

- On site receptors encompassing soil and workplace.
- Receptors surrounding the site such as ambient air, humans, plants and animals.
- Final sinks/receptors such as surface and groundwater/wetlands

1.6.4. Assessing the Significance of the Impacts

The concept of ‘significance’ is central to the EIA process and aids the identification and categorization of environmental and social effects. As noted, in order to determine impact significance, the sensitivity of each environmental and social parameter/receptor is considered in combination with the magnitude of the impact. The table below demonstrates how these parameters were considered in the assessment of significance.

Table 2: Assessment of the Significance of the Impact

Significance of the Impact		Magnitude and Nature of the Impact		
		Low	Medium	High
Sensitivity of Receptors	Low	Not significant	Minor	Minor
	Medium	Minor	Minor	Moderate
	High	Minor	Moderate	Major

1.7. Rationale and Justification

The proposed project is considered important and beneficial to both the national and local economy. It is aligned with Kenya's development agenda, particularly the Economic and Macro Pillar of Kenya Vision 2030 and the National Industrialization Policy, which emphasize industrial growth, value addition, and sustainable utilization of locally available resources. By processing locally available limestone, the project will enhance value addition within the country, reduce reliance on imported lime products, and strengthen the domestic manufacturing sector. The project is expected to generate significant socio-economic benefits. It will create both direct and indirect employment opportunities, with approximately 60–100 permanent jobs during the operational phase and additional employment during construction. This will contribute to improved livelihoods and poverty reduction within the surrounding communities. In addition, the project will stimulate local economic growth through increased incomes, skills development, and the creation of market opportunities for local goods and services such as transport, supplies, and maintenance.

The production of lime will support key sectors of the economy, including construction, agriculture, water treatment, sugar processing, and environmental management. In agriculture, lime plays a critical role in improving soil quality and enhancing crop productivity, while in construction it is an essential component in cement and related materials. Its application in water treatment and industrial processes further underscores its importance in supporting both public health and industrial efficiency. In addition, the project will contribute to government revenue generation through taxes, levies, and licensing fees payable to both the county and national governments. It is also likely to catalyze improvements in local infrastructure and services, thereby enhancing overall development in the project area.

In general, the proposed project is justified by its contribution to industrial development, employment creation, economic growth, and sustainable resource utilization, making it a viable and strategic investment within the country's development framework..

1.8. Estimated Project Cost

The estimated cost for the establishment of the proposed (Quicklime Processing Plant) is estimated at approximately Kenya Shillings: [……]. This projected budget encompasses procurement of equipment, installation, and all other associated activities necessary for the successful commissioning and operation of the Lime Processing Plant.

CHAPTER 2: PROJECT DESCRIPTION

2.1. Overview

Accordingly, this chapter provides a comprehensive description of the proposed project, detailing the project design, layout, capacity, and the key technologies to be adopted during construction and operation phases. Additionally, it presents the geographical context of the project by describing its location, site characteristics, land ownership (Land-use), and proximity to key infrastructure and sensitive environmental or social receptors.

2.2. Proposed Location

The proposed project site is located on **Land Reference No. Mutomo/Simisi/148**, within Ekani Village, Kitui South Sub-County, Kitui County, along the Ikutha–Nguuni Road. The site lies within a semi-arid rural setting characterized by scattered settlements and small-scale commercial activities. A key notable feature in the vicinity is the Kyanganga Shopping Centre. Geographically, the proposed project site is georeferenced by coordinates **Latitude -2.026758S** and **Longitude 38.287288E**.

Figure 1: Site Location (Google Map Extract)

2.3. Project Component

The proposed project will involve the installation and establishment of a Lime Processing Plant and the construction of an associated supports amenity (Infrastructures). The lime processing component will comprise the installation of key plant equipment, including:

- **Processing Plant (Hydrated Lime Plant):** Crushing, screening, calcination, cooling, and hydration units housed in a purpose-built industrial shed,
- **Kiln Section**: [Vertical shaft kilns or rotary kilns] with associated pre-heaters, coolers, and emission control systems (e.g., bag filters/ESP for dust and wet scrubbers for SO_2. The kiln(s) will be equipped with automated feeding, firing, and discharge systems, refractory lining, and advanced process controls for temperature (900–1,200°C) and residence time.

- **Storage and Handling**: Raw material stockpiles, finished lime silos/hoppers, and covered product storage.
- **Ancillary Facilities**: Administrative block, laboratory, workshops, weighbridge, fuel storage (diesel), effluent treatment system, septic tanks/soak pits, internal access roads, security fencing, and green buffer zones.

2.4. Raw Materials, Utilities, and Inputs

- **Raw Material**: The main raw materials shall include limestone ($CaCO_3$) approximately 140–155 MT/day (sourced from on-site quarry or licensed local quarries) Quicklime (CaO) and/or Hydrated Lime ($Ca(OH)_2$.
- **Water Sources:** 40–80m³/day (for dust suppression, cooling, hydration process if producing hydrated lime, and domestic use). The water requirement shall be sourced from onsite borehole.
- **Electricity:** 400–700 kVA connected load (including crushers, conveyors, blowers, and auxiliaries). Supplied via Kenya Power grid with diesel generator backup.

2.5. Project Production Capacity

The proposed Lime Processing Plant is designed with a production capacity of 80 metric tonnes per day (MT/day) of finished lime products. This capacity will depend on market demand and operational configuration. The plant will operate approximately 330-days per year (allowing for maintenance and downtime), resulting in an annual production capacity of approximately 24,000-26,400 MT/year (Annual Production Capacity).

2.6. Operation Activities

2.6.1.Production Process (Lime Processing)

A lime processing plant is an industrial facility designed to convert limestone (calcium carbonate $CaCO_3$) into usable lime products through controlled thermal and mechanical processes. The primary objective of the plant is to produce quicklime (calcium oxide CaO) and hydrated lime (calcium hydroxide Ca $(OH)_2$) for various industrial. The lime production will follow a standard thermal decomposition and hydration process and available best available technology. These activities will range from:

- **Crushing and Screening**: Limestone shall be fed into a primary jaw crusher, then secondary cone/hammer mill crushers to reduce size to <50 mm. The material shall then be screened and conveyed to storage hoppers. The oversize shall then be recirculated.
- **Calcination (Core Process)**: Crushed limestone shall be fed into the kiln(s) and heated to 900–1,200°C using fuel. The chemical reaction is: $CaCO_3 \rightarrow$ CaO (quicklime) + CO_2 (Dolomitic limestone may also be produce MgO.) Residence time in the kiln is approximately 2–6 hours depending on kiln type. Exhaust gases shall pass through heat recovery and air pollution control systems.
- **Packaging and Dispatch**: Finished quicklime or hydrated lime shall be packed in 25–50 kg bags or delivered in bulk tankers to consumers and for industrial use as a raw material.

Clinker manufacturing plant:

- **(1) Limestone: - Contains predominantly calcium carbonate (CaCO3) and to use in cement**
- **manufacture, it should have 42-43% lime (CaO) minimum. In cement manufacture it is**
- **prime raw material and its usage would be 90- 93%.**
- **(2) Clay: - It contains more of silica (SiO2) and its usage should be 2 to 3% in cement**
- **manufacture.**
- **(3) Bauxite: - It contains alumina (Al2O3) and it's usage should be 2 to 3% in cement**
- **manufacture.**
- **(4) Iron Ore: - It contains mainly iron oxide (Fe2O3) and it's usage should be 1 to 2% in**
- **cement manufacture. The raw materials mix composition would be 90-93% limestone, 2- 3%**
- **clay, 2-3% Bauxite, 1-2% Iron ore in cement making. Coal is used for burning the raw mix in**
- **powdered form. Normally both**

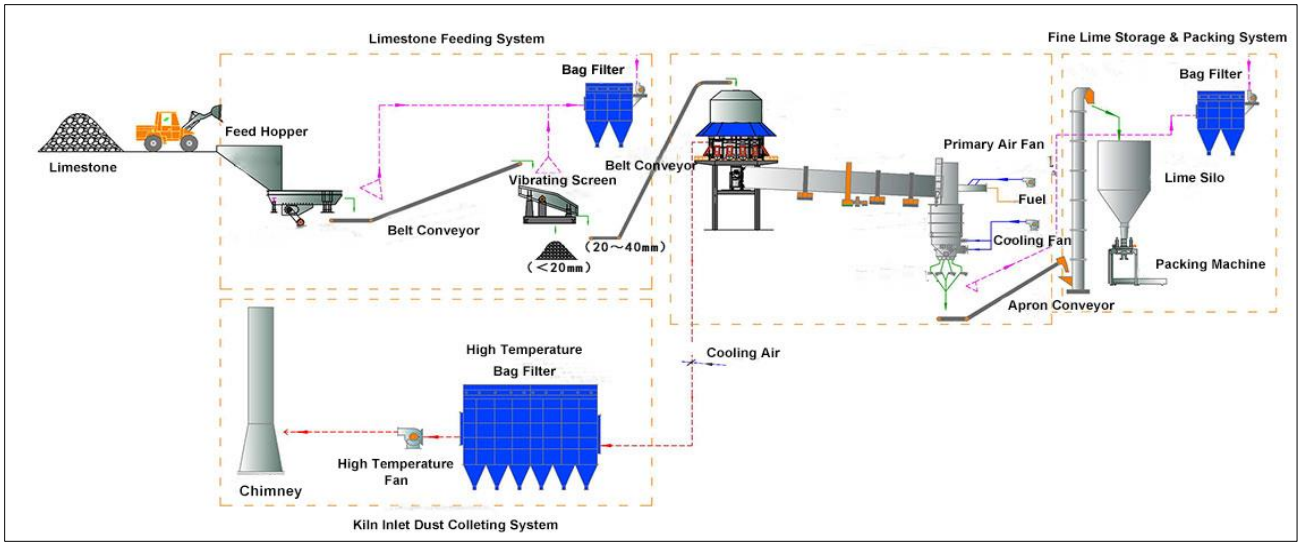


Figure 2: Lime Processing Flow Diagram

A simplified process flow is as follows: Quarry→Crushing/Screening→Kiln (Calcination)→Cooling→ (Hydration)→ Storage/Packaging→ Market.

2.7. Project Construction Activities

The construction phase of the proposed lime processing plant and associated site office will involve a series of civil, structural, and engineering works. The key activities to be undertaken are outlined below:

- **Site Clearance and Preparation**: This will involve clearing vegetation, removal of debris, stripping of topsoil, and leveling of the site to prepare it for construction activities. Topsoil will be stockpiled for later use in landscaping and site restoration.
- **Excavation and Backfilling**: Excavation works will be undertaken to prepare foundations for buildings and plant equipment. This will include normal soil excavation and subsequent filling with hardcore and compacted material to provide stable ground for structural works.
- **Foundation Slab Construction and Walling**: Construction of reinforced concrete foundation slabs to support plant machinery and building structures will be carried out. Masonry works for walls of the processing plant structures and site office will follow.
- **Machine Assembly and Installation**: Delivery, positioning, and mechanical assembly of processing equipment including crushers, kilns, conveyors, and associated systems will be undertaken in accordance with engineering specifications.
- **Electrical Installations**: Installation of electrical systems including wiring, control panels, transformers, lighting systems, and equipment connections to support plant operations.

2.8. Decommissioning Phase

The proposed project is expected to operate for several decades. In the event of decommissioning whether due to lease expiry, operational discontinuation, or other circumstances the proponent will be required to undertake comprehensive demobilization and site restoration activities. This will involve the systematic removal of all plant fixtures, equipment, and temporary structures, including silos, grinders, conveyors, and administrative facilities.

The residual materials will be safely disposed of or recycled in strict compliance with the Environmental Management and Coordination Act (EMCA), Cap. 387, the Environmental Impact Assessment/Environmental Audit Regulations, 2003, and other applicable statutory requirements. Following these activities, the site will be restored to its original or near-original condition, ensuring that no abandoned structures, machinery, or environmental hazards remain, thereby minimizing long-term impacts on the surrounding environment.

Similar to the construction and operational phases, the decommissioning process will involve the use of machinery such as cranes, trucks, and excavators, and will generate both hazardous and non-hazardous wastes. All wastes resulting from decommissioning activities will be managed in accordance with EMCA (Waste Management) Regulations, 2024, and other applicable national standards to ensure safe and environmentally responsible decommissioning.

CHAPTER 3: LEGAL, REGULATORY AND INSTITUTIONAL FRAMEWORK

3.1. Brief Overview

This chapter presents the applicable national and international environmental and social legislation, policies, and institutional frameworks governing energy generation projects in Kenya, with specific reference to the proposed project (Lime Processing Plant). It outlines the key statutory and policy provisions guiding project planning, development, and operation, and identifies relevant international conventions to which Kenya is a signatory. Compliance with these instruments is essential to ensure the project aligns with both domestic regulatory requirements and global environmental and social commitments.

3.2. Kenya Policy Provisions

3.2.1. National Environment Policy Sessional Paper No. 10 of 2014

The main goal of this Sessional Paper is to integrate environmental considerations into Kenya's national planning and management processes, thereby providing a clear policy framework for environmentally sustainable development. It emphasizes the sustainable management of the country's natural resources including unique terrestrial and aquatic ecosystems as a foundation for national economic growth and improved livelihoods.

To achieve this, the Sessional Paper promotes and supports environmental research, capacity development, and the application of innovative management tools. These include economic instruments such as incentives and disincentives, total economic valuation of ecosystem services, the use of indicators for sustainable development, and the full suite of environmental assessment and compliance mechanisms including but not limited to:

- Strategic Environmental Assessments (SEAs),
- Environmental Impact Assessments (EIAs), and Environmental Audits (EAs).

Relevance: *The proposed project aligns directly with the objectives of this Sessional Paper by incorporating environmental considerations into project design, construction, and operation. The EIA process ensures that potential impacts on land, biodiversity, water, and communities are assessed and mitigated. Moreover, the project supports national sustainability goals by generating clean, renewable energy, enhancing energy security, and contributing to green economic growth, while safeguarding sensitive ecosystems and promoting community well-being*.

3.2.2. Vision 2030

The proposed establishment of lime processing plant is fully aligned with Kenya's long-term development blueprint, Vision 2030, which seeks to transform the country into a newly industrializing, middle-income nation that provides a high standard of living for all its citizens in a clean, secure, and sustainable environment. Vision 2030 emphasizes the critical role of industrialization, infrastructure development, and value addition in driving economic growth, creating employment, and improving the overall quality of life. Under the Economic Pillar, the expansion of national infrastructure is identified as a key driver of economic growth and competitiveness. Lime and related products are fundamental to a wide range of industrial, agricultural, and environmental applications, making them essential inputs in modern economic development.

The Environmental Pillar of Vision 2030 emphasizes the importance of sustainable natural resource management, pollution control, and environmental protection as essential components of industrial and economic growth. In line with these objectives, the proposed project will implement environmentally sound practices throughout its operations, including dust suppression measures, noise control, wastewater management, and responsible handling of solid and hazardous waste. These measures will ensure that the establishment of lime manufacturing (Processing) and industrial activities does not compromise environmental quality, while promoting sustainable industrial growth and compliance with national environmental standards.

In addition, the project will create socio-economic benefits in surrounding communities, including employment opportunities, skills development, and support for local businesses, thereby reinforcing the inclusive growth and equitable development goals embedded in Vision 2030. By integrating economic, environmental, and social considerations, the proposed lime processing plant will contribute to Kenya's vision of becoming a modern, industrialized, and environmentally responsible nation.

3.2.3. The Constitution of Kenya, 2010

The Constitution of Kenya, 2010, adopted in August 2010, serves as the supreme legal foundation for environmental and social impact assessments in the country. It establishes a comprehensive framework to guide both current and future development, shaping national and sectoral legislation. Article 42 guarantees every person the right to a clean and healthy environment, including the obligation to safeguard it for the benefit of present and future generations through legislative and other appropriate measures.

The Constitution also embeds public participation as a central principle of governance. Articles 10, 42, and 69 collectively emphasize the involvement of citizens in environmental decision-making, ensuring inclusive management, conservation, and protection of natural resources. Article 10 specifically identifies citizen participation, sustainable development, and the protection of marginalized lands as national values and principles of governance. Article 69 outlines the State's obligations in environmental management, including the sustainable utilization of resources, promotion of public participation, and enforcement of environmental rights. ***Relevance*****:** *These constitutional provisions provide the legal foundation for the Environmental and Social Impact Assessment (ESIA) process for the project. They require that the project be implemented in a manner that safeguards environmental quality, ensures equitable and transparent land use, and incorporates public and stakeholder participation throughout its planning, construction, and operational phases*.

3.3. Relevant National Legal Frameworks

3.3.1. Environmental Management and Coordination Act Cap 387

The Environmental Management and Co-ordination Act (EMCA) is an Act of Parliament that establishes a legal and institutional framework for effective environmental management in Kenya. It serves as an umbrella law aimed at enhancing the coordination of various sectoral statutes related to the environment. As the principal environmental legislation in the country, EMCA affirms that every individual has the right to a clean and healthy environment. If this right is being, or is likely to be, violated, individuals have the right to seek legal redress.

To uphold this right, Part (VI) of the Act (Section 58) mandates that proponents of projects listed in the Second Schedule conduct Environmental Impact Assessment (EIA) and submit the EIA report to the National Environment Management Authority (NEMA) in the prescribed format, including the required information and fee. Additionally, Section 68 of the Act requires operators of existing projects to conduct environmental audits to assess their compliance with the commitments made in the EIA. Both the EIA and environmental audit reports must be submitted to NEMA for review and appropriate action.

3.3.2. Relevant Regulation under EMCA Cap 387

Regulation	Relevance
EMCA Impact Assessment and Audit) Regulations, 2003	The Environmental (Impact Assessment and Audit) Regulations, 2003, as amended, require that Environmental Impact Assessments (EIAs) and Environmental Audits (EAs) be undertaken by a registered lead expert or a firm of experts duly accredited by the National Environment Management Authority (NEMA). Such assessments must be carried out in accordance with approved Terms of Reference (ToR) developed during the scoping phase, ensuring that the scope of work adequately addresses all potential environmental and social impacts of the proposed project. In line with the regulations, the proposed project (Establishment of Lime Processing Plant) has been classified as a **High-Risk** project due to its nature, and potential environmental and social interactions. Consequently, the law requires the preparation of a Comprehensive Environmental and Social Impact Assessment (ESIA) Full Study Report, which must be submitted to NEMA for

Regulation	Relevance
	review and licensing before project implementation can commence. ***Relevance:*** *This ESIA study has been undertaken by a NEMA-registered Environmental Impact Assessment Lead Expert, supported by a multidisciplinary team of sector specialists. The assessment process followed all statutory requirements, including baseline environmental studies, stakeholder consultations, impact identification and evaluation, and the formulation of mitigation and monitoring measures.*
EMCA (Waste Management) Regulations, 2024 (Legal Notice No. 178 of 2024)	The regulation operates under the Environmental Management and Coordination Act to provide a framework for the management of waste and abatement of pollution guaranteed under Article 42 of the Constitution and statutory guarantees of ensuring clean, safe and sustainable environment for all people. The regulations apply to the handling, storage, transportation, segregation and destruction of waste by providing for guidance, procedures and standards for environmental governance to ensure compliance in the waste management sector. **Relevance:** *The proponent will develop and implement the Waste Management Plan in compliance with the provisions of this regulation.*
EMCA (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009	This regulation prohibits any person from causing unreasonable, unnecessary, or unusual noise which annoys, disturbs, injures, or endangers the comfort, repose, health or safety of others and the environment. Part 11 section 6 (1) provides that no person shall cause noise from any source which exceeds any sound level as set out in the First Schedule of the regulations. It gives standards for maximum permissible noise levels for construction sites, mines, and quarries. It also gives maximum permissible noise levels for silent zones, places of worship, residential (indoor/outdoor), mixed residential; and commercial. **Relevance:** *Project work should be planned in a way that limits excessive noise and vibration, especially near sensitive receptors.*
EMCA (Water Quality) Regulations, 2024 (Legal Notice No. 177 of 2024	The regulations provide for the prevention of water pollution and protection of sources of water and apply to drinking water, water used for industrial purposes, water used for agricultural purposes, water used for recreational purposes, water used for fisheries and wildlife and water used for any other purposes. They establish standards for wastewater management to ensure clean and healthy water resources and provision of standards for water for different uses. Section 5. A waste generator shall collect, segregate and dispose the waste in the manner provided in regulation 6 of these Regulations. **Relevance:** *The government shall engage qualified site operators who will conduct periodic site visits and ensure that all environmental and social parameters are effectively monitored in accordance with the Environmental Management Plan (EMP) outlined in this report.*
EMCA (Air Quality) Regulations, 2024 (Legal Notice No. 180 of 2024	The Regulations provide for prevention, control and abatement of air pollution to ensure clean and healthy air. They apply to internal combustion engines, premises, places, processes, operations or works to which the provisions of the EMCA and the Regulations made apply. The regulation is a significant improvement of the 2014 Regulations and introduces various improvements including emission testing from mobile sources. **Relevance:** *The project implementers shall ensure full compliance with the applicable Air Quality Regulations by conducting regular maintenance of machinery and equipment, as well as routine monitoring and measurement of atmospheric emissions to ensure adherence to permissible limits.*

3.3.3. The Water Act, 2016

The Water Act, 2016 operationalizes Articles 43 and 62 of the Constitution of Kenya, providing the framework for the regulation, management, and conservation of water resources, and the provision of

water and sanitation services. It establishes the Water Resources Authority (WRA) as the principal regulator of water resources in Kenya, with the mandate to ensure sustainable, equitable, and efficient utilization of water. Under the Act, any abstraction of surface or groundwater, construction of water works, or discharge of effluent into a water body requires a water use permit from the WRA. The Act also provides guidelines for the protection of water catchments and riparian reserves to maintain ecological integrity. Section 94(1) of the Water Act, 2016 provides that: *"Nothing in this Act shall deprive any person or community of water services on the grounds only that provision of such services is not commercially viable."*

This clause reinforces the constitutional right to accessible and adequate water (Article 43(1)(d) of the Constitution of Kenya, 2010) and safeguards communities particularly those in underserved rural or arid areas from being excluded from water services purely on economic grounds. In relation to the proposed project in Kyanganga village, Kitui County, this provision will ensure that:

- Any water use for the project will not limit or restrict existing community access to water sources.
- Where project water abstraction is necessary, priority will be given to sustaining local domestic, livestock, and wildlife needs before other use.
- The project will adopt water conservation technologies (e.g., dry panel cleaning where feasible) to minimize water demand, thereby safeguarding the community's water security.
- Engagement with the Water Resources Authority (WRA) and local water service providers will ensure that water supply arrangements are equitable and sustainable.

By aligning with Section 94(1), the project will not only comply with statutory provisions but also upholds social responsibility commitments to protect community welfare.

3.3.4. The Occupational Safety and Health Act, 2007

The Occupational Safety and Health Act, 2007 (OSHA 2007) is a comprehensive legal framework aimed at ensuring the safety, health, and welfare of all workers and other persons lawfully present at workplaces. It applies to every workplace in Kenya whether temporary or permanent including offices, factories, schools, academic institutions, plantations, and construction sites. The primary objectives of OSHA 2007 are to:

- Secure the safety, health, and welfare of persons at work through the identification, elimination, and control of workplace hazards.
- Protect non-workers from risks to safety and health arising from activities conducted in the workplace.
- Establish an institutional mechanism for enforcement through the National Council for Occupational Safety and Health and the Directorate of Occupational Safety and Health Services (DOSHS).

For the proposed project proponent and its contractors will be obligated to comply fully with OSHA 2007 requirements throughout the project life cycle covering the design, construction, operation, and decommissioning phases. This entails:

- *Conducting initial and periodic workplace risk assessments.*
- *Providing adequate and well-maintained safety equipment and PPE to all personnel.*
- *Training workers on occupational safety, health, and environmental protection.*
- *Ensuring safe working conditions for all subcontractors and visitors to the site.*
- *Reporting any workplace accidents, incidents, or occupational diseases to DOSHS as required by law*.

Compliance with OSHA 2007 not only ensures adherence to legal requirements but also safeguards worker welfare, minimizes operational risks, and enhances project sustainability.

3.3.5. The Physical and Land Use Planning Act, 2019 No. 13 of 2019

This Act of Parliament consolidates laws relating to the planning, use, regulation, and development of land in Kenya. It operationalizes provisions of the Constitution of Kenya, 2010, particularly Articles 60 (principles of land policy) and 66 (regulation of land use), and aligns land-use planning with sustainable development objectives. The Act establishes a clear framework for national, county, and inter-county physical and land use planning through the preparation and approval of plans such as:

- National Physical and Land Use Development Plan – guiding spatial development at the national level.
- County Physical and Land Use Development Plans – integrating land use with infrastructure, environmental protection, and socio-economic needs at the county level.
- Local Physical and Land Use Plans – covering towns, trading centres, rural settlements, and special planning areas.

Key provisions relevant to the proposed project include Section (56) Requirement for Development Permission: Any person intending to carry out development must obtain approval from the relevant County Physical and Land Use Planning authority including amongst others.

a) Public Participation – Planning processes must include meaningful engagement with local communities and stakeholders to ensure inclusivity and transparency.
b) Harmonization with Environmental Laws-Development proposals must integrate environmental management measures and comply with laws such as EMCA, 1999, and its regulations.
c) Special Planning Areas-The County Government may declare certain areas as Special Planning Areas if they have unique environmental, economic, or cultural significance, requiring more detailed planning controls.
d) Enforcement and Compliance-The Act empowers authorities to take action against developments undertaken without approval or in contravention of planning conditions. Project-Specific Compliance Measures will be required to:

    - *Obtain formal development permission from the Kitui County Physical and Land Use Planning Office before construction begins.*
    - *Submit detailed site layout plans, access road alignments, and ancillary facility locations for approval.*
    - *Ensure that project design aligns with the County's Integrated Development Plan (CIDP) and County Spatial Plan.*
    - *Provide for adequate buffer zones, landscaping, and drainage in line with planning consent conditions.*
    - *Participate in public consultation sessions convened by the County to capture community views on land use impacts.*

Compliance with the Physical and Land Use Planning Act 2019 will ensure that the project's land use is well coordinated, environmentally sustainable, and compatible with the long-term spatial development vision Kitui County.

3.3.6. The Employment Amendment Act of 2022

This Act establishes the minimum terms and conditions of employment. The Act sets forth the relationship between an employer and a worker. It defines the benefits, duties and obligations of the employer and the worker, which includes contract of service, prohibition against forced labour, discrimination in employment, sexual harassment, payment of wages, leave, termination, and living amenities.

The Act requires written contracts for jobs longer than three months (Section 9–10), outlining terms like wages, working hours, and duties. Wages must be paid in legal tender and on time, with no unauthorized deductions (Sections 17–20). Employees are entitled to equal pay for equal work (Section 5(5)). (Section 27) and provides for 21 days of annual leave (Section 28), 90 days maternity and 2 weeks paternity leave (Section 29). Termination must be fair and follow due process (Sections 35–46), with notice or pay in lieu. Redundancy requires proper notice and severance pay (Section 40). Child labor is restricted, with strict

limits on work by persons under 18 (Sections 56–61). Disputes are handled by the Employment and Labour Relations Court (Sections 87–90), and employers must keep records for at least five years (Section 74). Penalties apply for violations of the Act. **Relevance:** *During the project implementation phase, the proponent will engage a combination of full-time and casual workers to support various project activities. In line with national labor laws and international labor standards, the contractor shall be required to strictly observe the prevailing basic minimum conditions of employment, as provided under the Employment Act, 2022 to prevent Child labour*.

3.3.7. The Work Injury Benefits Act of (WIBA), 2007

The Work Injury Benefits Act, 2007 is legislation enacted to provide compensation to employees who suffer injuries, diseases, or death arising out of and during the course of employment. It applies to all employees in Kenya, whether employed on a permanent, casual, or contract basis, except members of the armed forces. (Section 7) Employers are required to obtain and maintain an insurance policy covering all their employees against work-related injuries and diseases. Failure to do so is an offence. Sections 10–13; An employer must report any workplace injury or accident to the Director of Occupational Safety and Health Services (DOSHS) within seven days. In the event of death, notification must be immediate. Sections 6, 16–24; Compensation is payable when an employee is injured, disabled, or dies due to work. Types of compensation include:

- Medical expenses
- Temporary or permanent disability benefits
- Compensation to dependents in the event of death

Disability compensation depends on the degree of incapacity. For permanent total disability, the employee is entitled to 80% of monthly earnings for up to 96 months, subject to limits. ***Relevance:*** *The proponent will ensure all employees are cover under life insurance cover and full compliance with the provisions of this Act*.

3.4. Social Risks Legislations

Table 3: Relevant Social Risks Legislations

Legislation	Relevance
The Sexual Offences Act 2006	The Sexual Offences Act, 2006 provides a comprehensive legal framework for the prevention, prosecution, and punishment of all forms of sexual offences in Kenya. It criminalizes a wide range of sexual violations, including rape, defilement, sexual harassment, exploitation, and indecent acts. Under the Act, employers, including contractors and implementing agencies, have a duty to: • Prevent and respond to any form of sexual offence occurring within the project environment • Implement Codes of Conduct for all workers prohibiting SH/SEA • Establish confidential and accessible Grievance Redress Mechanisms (GRMs) for reporting sexual offences The Act is particularly relevant during the construction and implementation phases of the project, where interactions between project workers and local community members especially vulnerable groups such as women, girls, and children may expose individuals to the risk of Sexual Harassment (SH), Sexual Exploitation and Abuse (SEA), and Gender-Based Violence (GBV).
HIV/AIDS Prevention and Control Act (Act No.14 of 2006, Revised in 2012)	The HIV and AIDS Prevention and Control Act (HAPCA), Act No. 14 of 2006, is a key piece of legislation in Kenya aimed at addressing the HIV/AIDS epidemic. It was revised in 2012 to enhance its provisions and align them with evolving public health needs and human rights standards. The Act mandates the government to promote public awareness about HIV/AIDS through comprehensive educational campaigns. These campaigns are to be conducted in schools, workplaces, prisons, and communities, focusing on scientifically proven approaches and encouraging HIV testing. The Contractor will make provision for Voluntary Counselling and Testing (VCT) services for employees and locals, as well as conduct training on HIV/AIDS awareness programmes throughout project lifecycle.

3.5. County Governments Act, 2012

The County Governments Act, 2012 is a foundational law that operationalizes the devolution provisions of Kenya's Constitution (2010). The Act outlines the roles, powers, and functions of county governments in governance, planning, service delivery, and development control within their respective jurisdictions. The Act mandates each county to prepare a County Integrated Development Plan (CIDP), which guides all development activities, including infrastructure, housing, and environmental conservation.

Under Part XI, the county governments have the authority to regulate land use, approve development applications, and monitor compliance with environmental and physical planning laws. The Act supports sustainable development and empowers counties to enforce policies that promote ecological sustainability, conservation of natural resources, and climate adaptation within urban environments. ***Relevance:*** *The County Government Act is highly relevant in several respects. First, the Act empowers the County Government of Kitui to oversee and regulate land use, environmental conservation, and economic activities within its jurisdiction. This includes issuing permits, enforcing local by-laws, and coordinating development initiatives that impact natural resources. Therefore, the proponent shall seek all relevant approvals before commencement of works.*

3.6. Relevant Institutional Framework

Several government and regulatory institutions are mandated to oversee various components of environmental management, land use planning, water and sanitation services, Safety, and public infrastructure all of which are central to the proposed project. Outlined below represent institutions and their relevance but not limited to

Table 4: Relevant Institution

Institution	Mandate and Relevance
National Environment Management Authority (NEMA)	The National Environment Management Authority (NEMA) is a statutory agency established under the Environmental Management and Coordination Act (EMCA), Cap 387, as the principal instrument of the government in the implementation and coordination of all matters relating to the environment. The NEMA core mandate includes: • Formulating and implementing environmental policies and guidelines. • Supervising and coordinating environmental impact assessments and audits. • Enforcing environmental laws and standards. • Monitoring the state of the environment and issuing Environmental Impact Assessment (EIA) licenses. • Coordinating environmental protection activities at the national and county levels. NEMA plays a regulatory and oversight role, particularly in ensuring that all project activities are compliant with environmental laws and are sustainably implemented.
County Government of Kitui	As a devolved unit under the Constitution of Kenya, 2010, the County Government of Kitui holds significant jurisdiction over critical aspects of the proposed project. This includes authority over land use planning, local licensing, development approvals, and community engagement processes within its administrative boundaries. The County Government is mandated to: • *Formulate and implement County-level legislation and policies that guide sustainable development in alignment with national objectives;*

Institution	Mandate and Relevance
	• *Approve and regulate local development activities, including aquaculture, through development control mechanisms such as zoning, physical planning approvals, and building permits;* • *Facilitate public participation and stakeholder engagement, ensuring that the voices of local communities and interest groups are integrated into project planning and implementation;* • *Support local economic development, including job creation and value chain development within the fisheries and aquaculture sectors;* • *Ensure the integration of environmental considerations into local development decisions, particularly through collaboration with agencies such as NEMA.* The proposed project must align with the county's County Integrated Development Plan (CIDP), which outlines the medium-term development agenda, sectoral priorities, and resource allocation for the county. Compliance with the CIDP ensures that the project supports local socio-economic goals, environmental sustainability, and spatial planning strategies.
Department of Geology and Mines	The State Department for Mining was created under the re-organization of the Government of the Republic of Kenya vide Executive Order No. 1 of January 2023. Previously under the Ministry of Petroleum and Mining, is currently under the Ministry of Mining, Blue Economy and Maritime Affairs. The State Department was established to provide leadership in the management of the extractives sector in the Country. The mandate includes: • Development of mining and mining policies, • Inventory and Mapping of mineral resources and • Building capacity for effective management of programmes and projects in the mining sector. The proponent will seek necessary approvals from the department before commencement of processing work.

CHAPTER 4: BIOPHYSICAL AND SOCIO-ECONOMIC BASELINE INFORMATION

2.1. General Overview

This chapter presents a detailed description of the existing physical and biological conditions of the proposed project site and its surrounding areas that may be directly or indirectly affected by the project. Establishing these baseline conditions is essential for accurately predicting potential environmental impacts and for developing appropriate mitigation measures. The baseline characterization provides a benchmark against which any future changes to environmental quality, attributable to the project, can be measured. Data collection was therefore guided by the need to:

- Identify sensitive environmental receptors within and around the project area;
- Quantify existing environmental quality parameters; and
- Provide a scientifically defensible reference for impact prediction and management.

2.2. Administrative Setting of Kitui County

Kitui County is one of the 47 counties in Kenya. The County is the sixth largest in terms of size and covers an area of 30,520 square kilometers. It lies between latitudes 0°10 and 3°0 South and longitudes 37°50 and 39°0 East. Kitui County shares its borders with seven counties: Tharaka-Nithi and Meru to the north, Embu to the northwest, Machakos and Makueni to the west, Tana River to the east and southeast, and Taita-Taveta to the south. The County is divided into eight sub counties namely; Kitui Central, Kitui West, Kitui East, Kitui South, Kitui Rural, Mwingi North, Mwingi Central, and Mwingi West which are further subdivided into 40 electoral wards and 241 villages. The proposed project falls under Kitui South sub-County (Mutomo), Kanziko Ward, Simisi Location.

2.3. Project Location

The proposed project site is located on **Land Reference No. Mutomo/Simisi/148**, within Ekani Village, Kitui South Sub-County, Kitui County, along the Ikutha–Nguuni Road. The site lies within a semi-arid rural setting characterized by scattered settlements and small-scale commercial activities. A key notable feature in the vicinity is the Kyanganga Shopping Centre. Geographically, the proposed project site is georeferenced by coordinates **Latitude -2.026758S** and **Longitude 38.287288E**.

Plate 1: Site Location (Source: Fieldwork)

2.4. Physical Environment

2.4.1.Physiography

The Kitui South Sub-County covers an area of approximately 10,030 square kilometres and is characterized by a diverse and undulating landscape. The topography comprises a combination of hilly, rugged uplands and expansive lowland areas, creating a varied terrain across the sub-county. The general landscape is dominated by broad, flat plains that gently slope towards the east and northeast, where elevations decline to approximately 400 meters above sea level. Scattered across these plains are several prominent hills that rise abruptly as inselbergs, reaching elevations of up to about 1,747 meters above sea level. These isolated landforms not only define the visual landscape but also present challenges to communication, accessibility, and transportation both within the sub-county and in relation to neighboring areas.

Within the proposed project area, the terrain is characterized by low lying rolling hills and gentle undulations, interspersed with incised valleys that influence local drainage patterns and land use. Overall, the physiographic features of Kitui County play a significant role in shaping settlement patterns, infrastructure development, and environmental management considerations in the region.

Plate 2: Landform Topographical Features of the Project Area

2.4.2.Geology/Geomorphology

The sub-county is predominantly underlain by basement system rocks, which weather into soils of variable depth and texture. These soils are generally rich in ferromagnesian minerals and are typically deep red in color, reflecting intense weathering processes. Where the parent material consists of quartz-rich gneisses, the resulting soils tend to exhibit lighter orange hues and are characterized by sandy loam to sandy clay loam textures. A common feature of soils developed on basement complex rocks particularly Luvisols, Acrisols, and Arenosols is the tendency to form surface capping or crusting. This characteristic reduces infiltration capacity and increases susceptibility to soil erosion, especially in areas with sparse vegetation cover or under intensive land use practices. Consequently, these soils require careful management to prevent degradation and maintain productivity.

In addition, volcanic rocks associated with the Nuu and Ngomeni volcanic systems occur in parts of the western and northern sections of the sub-county. Soils derived from these volcanic formations are variable in depth, often shallow, and frequently exhibit stony surfaces, which may limit their suitability for

certain types of agriculture and infrastructure development. The area also contains small, scattered pockets of black cotton soils (Vertisols), which are known for their high clay content and pronounced shrink-swell behaviour. These soils expand significantly when wet and contract upon drying, leading to the development of deep cracks. This property poses challenges for building foundations and road construction if not properly manage. Furthermore, the landscape is characterized by occasional rock outcrops, particularly in areas where erosion has exposed the underlying basement rocks. These outcrops contribute to the ruggedness of the terrain.

Plate 3: Basement Rock Outcrop

2.4.3.Climate

The central part of the County is characterized by hilly ridges separated by wide low-lying areas and has a slightly lower elevation of between 600m and 900m above sea level. There are two annual rain seasons. The Long-rains fall between March to May and the Short-rains between October to December. The highest areas in the County are Mumoni Hills, Kitui Central, Mutitu Hills, and Yatta Plateau. Due to their altitudes, they receive more rainfall than other areas in the County and are the most productive areas. On the western side, the main relief feature is the Yatta plateau, which stretches from the north to the south of the County and lies between the Athi and Tiva rivers. The plateau is characterized by plain wide shallow-spaced valleys. Rainfall distribution is erratic and unreliable, ranging from 500mm to 1050mm per annum. Temperature and evaporation rates are generally high with February and September being the hottest months of the year. The maximum mean annual temperature ranges between 26°C and 34°C and the minimum between 14°C and 22°C with July being the coldest month of the year.

2.4.4.Wind Analysis

The climate of the Mutomo area in Mutomo is classified as a semi-arid steppe climate (Köppen-Geiger BSh), with generally low rainfall and high solar radiation throughout the year. Average wind speeds in the region are relatively moderate, but show a clear seasonal pattern. Based on available climatological data, the average monthly wind speeds in Mutomo (Kitui South Sub County) vary between approximately 6.5 km/h and 12 km/h. The highest average wind speeds are observed during the late dry season (around September), reaching approximately 12 km/h, while the calmest conditions occur in December, with average wind speeds around 6.5 km/h..

2.4.5.Hydrology and Hydrogeology

The project area lacks permanent surface water bodies such as rivers or lakes. However, the existing drainage system is largely controlled by the local topography, which directs surface runoff in a general west-to-east flow pattern. This drainage pattern is typical of gently sloping plains and rolling terrain, where water accumulates in seasonal streams and temporary channels during the rainy season.

Approximately 1.2 km from the project site, there is an intermittent river that flows during the rainy periods but remains largely dry during the long dry season. This river acts as a key hydrological feature in the local landscape, contributing to seasonal water availability for both ecological and human uses. Its flow is highly dependent on rainfall patterns, and it often forms temporary pools and wetlands that support livestock watering, small-scale irrigation, and local biodiversity during peak flow periods.

The absence of permanent surface water within the immediate project area emphasizes the community's and ecosystem's reliance on seasonal rainfall and shallow groundwater sources for domestic water supply, agriculture, and livestock. The intermittent river, despite its ephemeral nature, represents a significant water resource in the wider landscape. Any development activities in the project area will need to carefully consider potential impacts on surface runoff and downstream flows to ensure that the hydrological connectivity and seasonal water availability of the intermittent river are not adversely affected.

Plate 4: Existing Intermittent Surface Water Body

2.4.6.Land tenure, Zoning and Use

Land tenure in Kitui County is primarily categorized into two systems: family and individual (private) ownership. Under the family tenure system, access to land is granted based on one's membership within a family lineage, with land typically inherited from previous generations. In contrast, individual tenure provides full ownership rights to the landholder, free from third-party claims or obligations.

Despite these structures, formal land ownership remains limited. According to the County Government of Kitui (2018), only about 25% of landowners in the county possess title deeds. This poses challenges for land security, development planning, and investment. Kitui County comprises two municipalities Kitui and Mwingi which are experiencing rapid population growth and urban expansion. In addition, several emerging urban centers, including Mutomo, Kyuso, Kabati, Nzombe, Nguni, and Mutito/Ndooa, are also growing, contributing to increased demand for secure land tenure and urban infrastructure. The proposed site is under a freehold land tenure system, granting the owners permanent and exclusive rights to the property. The surrounding land use is predominantly a mix of residential developments, agricultural activities, and small-scale retail businesses, reflecting the semi-rural character of the area.

2.5. Biological Resources

The area is home to a rich diversity of plant and animal species, with most of the indigenous tree and shrub species concentrated on hilltops and along riverbeds. Notably, native species such as *Ficus spp*. and *Melia volkensii* are increasingly under threat due to overexploitation for timber. On privately owned land, these species face additional pressure from unsustainable harvesting practices, particularly for timber and charcoal production. Furthermore, cultivation on hilltops poses a significant threat to the conservation of biological biodiversity, as it leads to habitat destruction, soil erosion, and the degradation of critical ecosystems that support both flora and fauna.

2.5.1. Terrestrial Ecology

The proposed project area hosts a variety of indigenous tree species, predominantly are *Acacia tortilis, A. mellifera, Balanites aegyptica, Terminalia brownie, Adansonia digitata and a few Melia volkensii*. However, ongoing human activities, particularly the expansion of agricultural land have led to widespread clearing of these native trees, resulting in gradual degradation of the natural vegetation cover and loss of biodiversity.

Plate 5: Project Site Vegetation Cover

2.5.2. Terrestrial Mammals

The proposed project area is characterized by low faunal diversity, largely attributed to intensive and sustained human activities such as agriculture, deforestation, charcoal production, and settlement expansion. These activities have significantly altered the natural habitats, resulting in the displacement of wildlife and the degradation of ecosystems that would otherwise support a broader range of species. During the field assessment, no notable wildlife species were observed, suggesting a diminished or fragmented habitat that cannot sustain larger or ecologically sensitive fauna. The remaining animal presence is likely limited to small mammals, birds, reptiles, and invertebrates that have adapted to disturbed environments.

2.6. Socio-Economic Baseline Condition

2.6.1. Population and Local Demographics

According to data from the 2019 National Census (KNBS, 2019, Volume II), Kitui County had a population of 1,136,187 people, with a steady annual growth rate of 1.2%. of this population, 549,003 (48%) were male, 587,151 (52%) female, and 33 (0%) intersex individuals. The county had an average population density of 37 people per square kilometre and comprised 262,942 households. Kitui County is predominantly inhabited by the Akamba community, which accounts for approximately 97% of the total population, as reported in the County Integrated Development Plan (CIDP) 2018–2022). However, the county also hosts significant populations from other communities, including the Tharaka in Tharaka Ward and members of the Somali community, particularly in major urban centers. The county has a high dependency ratio, with approximately 54% of the population comprising dependents mainly children, adolescents, and the elderly.

2.7. Infrastructures and Utilities

2.7.1. Water and Sanitation

Water access in Kitui County is limited and highly variable. The county is largely arid to semi-arid, which makes reliable water supply a major challenge for rural households. Many communities depend on multiple sources that are often seasonal, distant, or unreliable:

- A significant proportion of households still rely on surface water from rivers, streams, dams, and shallow wells, with many walking long distances (often more than 2 km) to collect water. Only a small percentage of water sources are available year-round.
- Traditional rural sources such as sand dams, rock catchments, earth dams, and rainwater harvesting systems are heavily used but their availability fluctuates with rainfall patterns.
- In some rural areas, including places similar to *Nguuni (The proposed Project location)*, communities also use riverbed scooping to obtain sub-surface water when rivers flow briefly during rainy seasons.

The main formal water service provider in the county is Kitui Water & Sanitation Company (KITWASCO), which supplies piped water from sources such as Masinga Dam and local boreholes to urban centers and some rural distribution points. However, despite ongoing efforts, only a portion of the population is served by piped water, and coverage remains low relative to demand. The proposed project will source its water requirements from a borehole drilled within the project site or its immediate vicinity.

2.7.2. Transport and other Infrastructure

Kitui County is traversed by two major Class A roads: the A3 Thika–Garissa Road and the A9 Kibwezi–Mutomo–Kitui–Mwingi Road. The recently completed Kibwezi–Kitui–Mwingi Road enhances regional connectivity by linking with the Kitui–Machakos Road, which in turn connects to the Thika–Garissa Highway. In addition to these, several road projects are proposed under the Road Sub-Sector Investment Programme (RISP) 2010–2024. These include:

- D478 Kola to A3 Nguni
- B6 Kitui to A3 Ngooni
- D507 Nuu to A3 Nguni
- D507 Voo to B7 Ikutha
- B7 Chuluni to D507 Mwitika
- E731 Miambani to D509 Mikuyuni

The county also has a network of Class E earth roads, covering approximately 1,172.20 kilometers, which plays a vital role in rural accessibility and local transportation. The proposed site is accessible via the Ikutha–Nguuni-Mutha road, a fairly-maintained murram road. As the area is already served by an existing road network, there will be no need to open up a new access road or trunk route for the project.

Plate 6: Access Road (Ikutha-Nguuni Road)

2.7.3. Energy

The primary source of energy in Kitui County is biomass, predominantly in the form of firewood, especially in rural areas. In urban centers, charcoal produced largely from the same biomass resources is more commonly used and commercially traded. In addition to biomass, other energy sources include petroleum products such as kerosene/paraffin, liquefied petroleum gas (LPG), motor gasoline, diesel, fuel oil, and electricity.

Biomass energy is consumed mainly as firewood and charcoal, but also in other forms such as crop residues, pellets, briquettes, and animal dung. These forms of energy are used for cooking, heating, drying, and, in some cases, electricity generation. Biomass is sourced from a variety of landscapes including closed forests, woodlands, bushlands, grasslands, farmlands, plantations, as well as from agricultural and industrial residues. However, according to the Sustainable Energy Access Forum Kenya (SEAF-K, 2017, p. 43), Kitui County faces a significant imbalance between biomass energy supply and demand, with an estimated deficit of nearly 60%. This deficit is placing growing pressure on forest and vegetation resources and is contributing to land degradation and desertification.

Data from the 2019 Census shows that only about 7.4% of households in Kitui County use improved or clean fuels and cooking technologies. Of the households that use charcoal, 35.4% rely on traditional metallic stoves. Meanwhile, 64.6% of households use some form of improved charcoal stove, with the Kenya Ceramic Jiko being the most popular owned by 87.6% of those using improved cookstoves. Nonetheless, a large proportion (82%) of these households do not use the improved stoves consistently, with the high cost of charcoal cited as the primary barrier (Groots Kenya, 2017.

2.7.4. Economic Activities and Household Income

The economy of Kitui County is predominantly driven by agriculture, which plays a central role in providing rural employment, ensuring food production, and generating household incomes. Agriculture contributes approximately 87.3% of the income earned by the rural population, highlighting its critical role in sustaining livelihoods across the county. Despite this, food security remains a significant challenge, with a food self-sufficiency level of only 57%, and the 2022 Short Rains Assessment Report classifying about 27% of the population as absolutely food insecure. The county's agricultural production is diverse. The main food crops include cereals such as maize, sorghum, and millet; pulses including green grams, cowpeas, and pigeon peas; and root crops like cassava, sweet potatoes, and arrowroots. Industrial crops

cultivated for commercial purposes include cotton, sisal, and sunflower, which provide additional income streams for farmers.

Agriculture in Kitui is largely subsistence-based, with a total of 215,322 households engaged in farming activities. According to the 2019 Kenya Population and Housing Census, 199,459 households are involved in crop production, while 177,701 households engage in livestock keeping. Other agricultural practices, including aquaculture, apiculture, and irrigation, are practiced by 570, 863, and 6,716 households, respectively.

The proposed project is expected to positively contribute to the county's agricultural and economic development. In addition, the project will stimulate local economic activity by creating direct and indirect employment opportunities, facilitating skills transfer, and generating market opportunities for local suppliers of goods and services. In the long term, the project has the potential to strengthen agricultural resilience, improve the productivity of smallholder farms, and support sustainable land management practices in Kitui County.

CHAPTER 5: CONSIDERATION OF ALTERNATIVES

3.1. Introduction

This chapter presents an analysis of the various alternatives considered for the proposed project, including site location, technological, design, and operational options. The objective of the alternatives assessment is to identify the most feasible, cost-effective, and environmentally sustainable approach for achieving the project's objectives. By evaluating the potential environmental, social, and economic impacts of each option, including the no-project scenario, this chapter provides a rationale for the selection of the preferred project design while demonstrating compliance with national and international environmental requirements. The Alternative considerations included:

- No-Project Alternative
- Site Alternatives
- Technological Alternatives

3.2. The No Action Alternative

The "No-Project" alternative refers to the scenario in which the proposed lime processing plant is not developed. Under this option, the growing demand for lime products for industrial, agricultural, and environmental applications in Kenya would remain unmet. Key sectors such as construction, agriculture (soil liming), water treatment, and sugar processing would continue to rely on imported or distant sources, potentially increasing costs and limiting local economic development. The "Do Nothing" alternative is therefore not considered feasible, given the strong rationale for the project and the significant socio-economic benefits it offers. While the development of the lime processing plant will result in some environmental impacts, these can be mitigated through appropriate management measures. In contrast, proceeding with the project is expected to deliver substantial benefits, including the creation of approximately 600 direct employment opportunities during the operational phase, as well as numerous indirect jobs along supply and distribution chains, transport, and related services within the local economy of Kitui South Sub-County, particularly in Kyanganga Village.

The project will also facilitate technology transfer related to the installation, operation, and maintenance of plant equipment, thereby contributing to local skill development and enhancing the technical capacity of the workforce. Additionally, domestic production of lime will reduce reliance on imports, helping to conserve foreign exchange and strengthen Kenya's industrial base.

Under the "Do Nothing" scenario, the proposed investment of approximately Ksh. 2 billion by the project proponents would remain unutilized, and the associated benefits including employment, income generation, skill development, and industrial growth would not be realized. Considering these factors, the development of the lime processing plant represents the preferred and most viable alternative, balancing the potential environmental impacts with substantial socio-economic advantage.

3.3. Site Alternatives

The proposed location for the lime processing plant has been carefully selected based on a combination of technical, logistical, and environmental considerations. The site is strategically located in close proximity to key limestone reserves, which ensures efficient access to raw materials. This proximity reduces the need for long-distance transportation, thereby lowering operational costs, fuel consumption, and associated greenhouse gas and air pollutant emissions. In addition to material accessibility, the site was evaluated for topography, soil stability, and drainage patterns, ensuring suitability for the construction and long-term operation of processing infrastructure. Consideration was also given to minimizing disruption to local communities, cultural sites, and environmentally sensitive areas, while ensuring adequate space for processing units, storage, and auxiliary facilities.

3.4. Technological Alternatives

The proposed lime processing plant will utilize modern, efficient, and environmentally conscious technology to convert locally available limestone into high-quality lime products suitable for industrial, agricultural, and environmental applications. The technology and process design have been selected to optimize production efficiency, product quality, and safety while minimizing environmental impacts.

3.4.1. Rotary Kilns Technology

The core operation of the lime processing plant is the calcination of limestone ($CaCO_3$), a thermal decomposition process in which limestone is converted into quicklime (CaO) and carbon dioxide (CO_2). This process occurs in specially designed kilns under high-temperature conditions, and the choice of kiln technology is a critical determinant of production efficiency, energy consumption, and environmental performance. Rotary kilns are long, cylindrical, slightly inclined furnaces that rotate slowly, allowing limestone to move gradually through the kiln while being uniformly heated. This design ensures:

- Continuous feeding and discharge of raw limestone and finished lime, minimizing production interruptions.
- Uniform calcination, with limestone exposed evenly to high temperatures throughout its passage, which produces a high-quality, reactive quicklime.
- Precise temperature and retention time control, which optimizes the thermal decomposition process and ensures consistent chemical and physical properties in the final product.
- High energy efficiency, as the gradual movement of material allows optimal heat utilization, and modern kilns can incorporate preheaters and waste heat recovery systems to further reduce fuel consumption.
- Emission control, as rotary kilns can be equipped with dust collection systems, bag filters, and scrubbers to capture particulate matter and limit air pollutants.

Rotary kilns operate at calcination temperatures of approximately 900–1,100°C, depending on the limestone composition and moisture content. Automated control systems maintain precise temperature profiles and material flow rates, ensuring optimal fuel usage and consistent lime quality. The technology is also flexible, allowing the plant to adjust production rates in response to market demand without compromising efficiency or product standards.

3.4.2. Vertical Shaft Kilns (Preferred Technology)

Vertical Shaft Kilns (VSKs) are selected as the preferred technology for the proposed lime processing plant due to their suitability for the project scale, energy efficiency, and relatively lower environmental footprint. These kilns are vertical, cylindrical structures in which limestone is charged from the top and moves downward by gravity, while fuel is introduced either centrally or through the sides to facilitate the calcination process. One of the key advantages of Vertical Shaft Kilns is their high thermal efficiency, as heat generated during calcination is effectively retained and utilized within the kiln. This significantly reduces fuel consumption compared to other kiln types, making VSKs a cost-effective option, particularly in areas where fuel resources are limited or expensive. The counter-current heat exchange mechanism where hot gases rise and preheat the incoming limestone further enhances energy conservation.

VSKs are also advantageous in terms of compact design and lower capital investment requirements. Their relatively simple construction and operation make them suitable for installation in areas with limited infrastructure, such as rural settings. Additionally, they require less land area compared to rotary kilns, which is beneficial in minimizing land disturbance and associated environmental impacts. From an operational perspective, Vertical Shaft Kilns are capable of producing good-quality quicklime, particularly when uniform limestone feed and controlled operating conditions are maintained. While the process is typically batch or semi-continuous, modern VSK designs allow for improved control over airflow, temperature distribution, and material residence time, thereby enhancing product consistency.

In terms of environmental performance, VSKs generally produce lower flue gas volumes, which simplifies the design and operation of emission control systems such as cyclones and bag filters. The reduced fuel consumption also contributes to lower greenhouse gas emissions per unit of production. Dust generation can be effectively managed through enclosed feeding systems and appropriate pollution control technologies.

3.4.3. Conclusion

In summary, the adoption of Vertical Shaft Kiln technology shall provide a balanced solution that combines energy efficiency, cost-effectiveness, manageable environmental impacts, and suitability for the project scale. This makes it the most appropriate and sustainable option for the proposed lime processing plant.

CHAPTER 6: PUBLIC CONSULTATION, PARTICIPATION & INFORMATION DISCLOSURE

4.1. Introduction

Public participation is a vital component of the Environmental and Social Impact Assessment (ESIA) process and should be incorporated throughout the entire project lifecycle from design and construction to operation and eventual decommissioning. It provides an opportunity for stakeholders to express their opinions, concerns, and suggestions regarding the proposed project. This consultative and inclusive approach fosters transparency, enhances project acceptability, and ensures that decision-making is informed by the views and interests of the affected and interested parties.

4.2. Objectives of Public Consultation

Kenya, recognized as one of the African countries with a progressive constitution, upholds the public's right to participate in decision-making processes that may affect them. Article 10(2)(a) of the Constitution identifies public participation as a fundamental principle of governance. This commitment is further reflected in the Environmental Management and Coordination Act (EMCA), Cap 387, and the EMCA (Environmental Impact Assessment and Audit) Regulations of 2003, both of which contain clear and stringent provisions mandating public involvement in environmental decision-making processes. The process ensures that all stakeholders are provided with this opportunity as part of a transparent process which allows for a robust and comprehensive environmental study.

Public participation in Environmental and Social Impact Assessments (ESIA) is designed to provide sufficient and accessible information to Interested and Affected Parties (I&APs) in an objective manner, enabling them to understand the potential impacts of proposed projects and to contribute meaningfully to the decision-making process. Key objectives of public participation include but are not limited to:

- Disseminate information about the proposed project to the community members or project affected parties,
- Collect views and concerns to be considered in the ESIA,
- Evaluate community perceptions of the project's positive and negative impacts, and
- Gather concerns regarding Environmental and Social Impacts, as well as potential implementation challenges.

4.3. Approach to Stakeholder Engagement

Stakeholder engagement for the proposed project was conducted using a staged and structured approach, aligned with the various phases of project development. This approach ensured that consultation activities were timely, targeted, and responsive to the evolving information needs and objectives at each stage of the project. It also promoted effective communication, transparency, and meaningful participation of all Interested and Affected Parties (I&APs) throughout the project lifecycle. The engagement process was organized around two primary phases:

1. Design and Feasibility/Due Diligence Engagement: During this initial phase, stakeholders were consulted to identify potential environmental, social, and economic impacts associated with the proposed project. Key objectives included:
    - Informing the community and regulatory authorities about the project concept and scope.
    - Gathering preliminary input on local concerns, expectations, and priorities.
    - Identifying sensitive receptors and potential mitigation measures early in the project design.

    Engagement activities at this stage included site visits, initial public notices, focused group discussions, and meetings with key regulatory agencies. The information collected informed site selection, preliminary design, and feasibility assessments, ensuring that potential impacts were considered before detailed planning.
2. Environmental and Social Impact Assessment (ESIA) Process Engagement: This phase focused on formal consultation in line with EMCA (EIA/EA) Regulations, 2003, ensuring compliance with legal requirements. Objectives included:

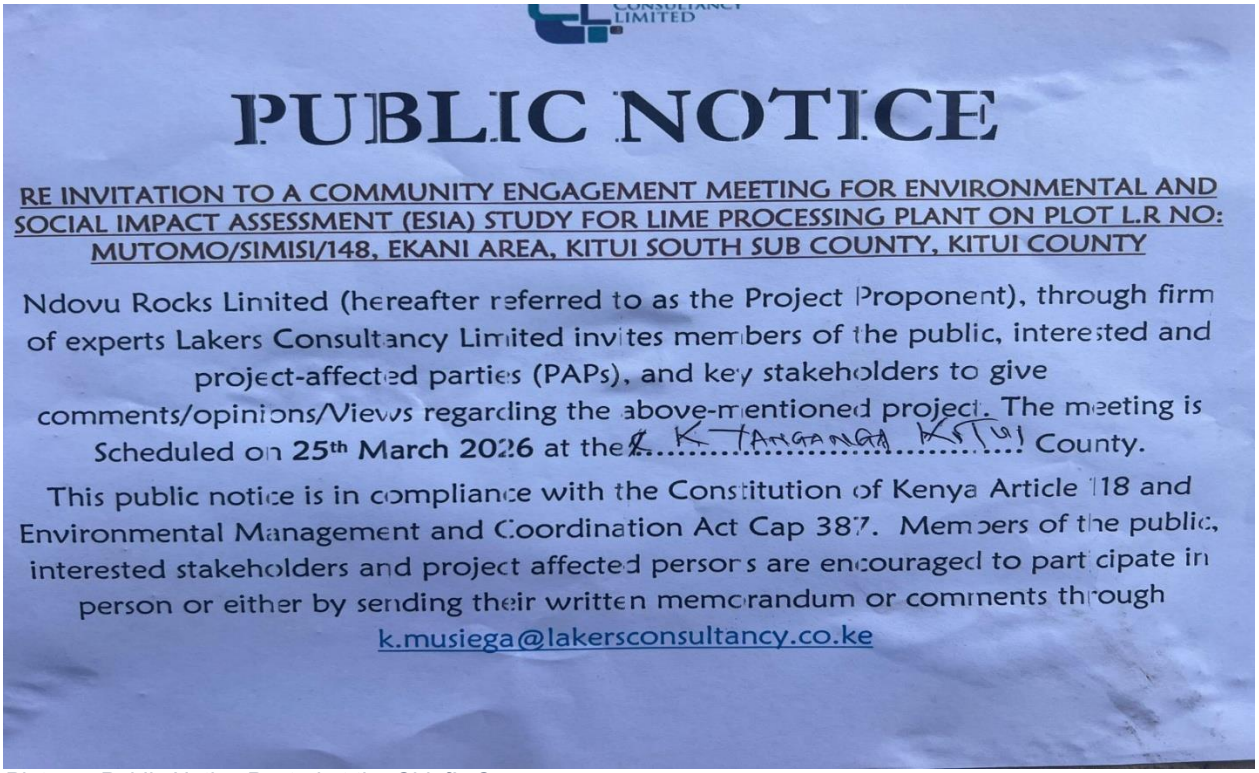
- Sharing detailed information on the plant operations, anticipated environmental and social impacts, and mitigation measures.
- Collecting stakeholder feedback and concerns to refine the Environmental and Social Management Plan (ESMP) and operational procedures.
- Ensuring inclusive participation, allowing all I&APs, including local communities, government agencies, and civil society groups, to provide input. Engagement during the ESIA process included public notices, on-site postings, community meetings, written submissions, and one-on-one consultations with affected parties. The feedback obtained will be documented and integrated into project operational protocols, and mitigation strategies to ensure sustainable and socially responsible operations of the batching plant.

By implementing a phased stakeholder engagement approach, the project ensured that consultation activities were systematic, transparent, and responsive to community needs, regulatory requirements, and operational realities, thereby enhancing project acceptance, minimizing potential conflicts, and promoting sustainable development outcomes.

4.4. ESIA Process Engagement

4.4.1. Notification of Interested and Affected Parties

A3-sized site notices, written in both English and Kiswahili, have been displayed at strategic locations within and around the operational project site, as well as in public areas. These notices informed local communities and Interested and Affected Parties (I&APs) about the plant's operational activities and invited their participation in the Environmental Impact Assessment (EIA) process, in accordance with the requirements of the EMCA (EIA/EA) Regulations, 2003. The notices included technical information on plant operations, production processes, and environmental management measures, and also outlined how I&APs can submit feedback or comments. Following the completion of the EIA study, further stakeholder consultations will be conducted to present the assessment findings, address any concerns, ensure that community and I&AP input is incorporated into the planning of the proposed project.


PUBLIC NOTICE

RE INVITATION TO A COMMUNITY ENGAGEMENT MEETING FOR ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) STUDY FOR LIME PROCESSING PLANT ON PLOT L.R NO: MUTOMO/SIMISI/148, EKANI AREA, KITUI SOUTH SUB COUNTY, KITUI COUNTY

Ndovu Rocks Limited (hereafter referred to as the Project Proponent), through firm of experts Lakers Consultancy Limited invites members of the public, interested and project-affected parties (PAPs), and key stakeholders to give comments/opinions/Views regarding the above-mentioned project. The meeting is Scheduled on 25th March 2026 at the K TANGANGA KITUI County.

This public notice is in compliance with the Constitution of Kenya Article 118 and Environmental Management and Coordination Act Cap 387. Members of the public, interested stakeholders and project affected persons are encouraged to participate in person or either by sending their written memorandum or comments through k.musiega@lakersconsultancy.co.ke

Plate 7: Public Notice Posted at the Chief's Camp

4.4.2.Feedback

Public engagement for the proposed lime processing plant was conducted through a series of public barazas held at the Kyanganga Village. Three consecutive meetings were organized between the **25th and 27th March 2026** providing a platform for meaningful interaction with community members, local leaders, and other stakeholders.

During these sessions, the project team presented details of the proposed development, including its objectives, expected benefits, and potential environmental and social impacts. Community members were encouraged to raise questions, express concerns, and provide input on local priorities (CSR) activities. Feedback collected during the meetings included suggestions for employment opportunities, environmental protection measures, and social infrastructure support. The barazas enabled transparent communication, built trust between the project proponent and the community, and informed the design of mitigation measures to address potential impacts. The outcomes of these engagements have been documented and incorporated into the Environmental and Social Impact Assessment (ESIA), ensuring that the project aligns with community expectations and regulatory requirements.

Plate 8: Proponent Representative (Mr. Gitonga Making a Point)

Plate 9: Community Members During Public Engagement Baraza (CSR Activities Presentation)

Plate 10: Upstanding Community Member Rasing Concern

Based on the feedback received during public engagement, the majority of stakeholders expressed concerns related to the CSR activities. The key issues raised and CSR proposal included:

a) **Education**: Support for the upgrading of the public primary schools (Modern standard), as well as Simisi Polytechnic, and the establishment of scholarship programs for bright but needy students.
b) **Water Supply**: Expansion of existing dams and drilling of boreholes to ensure reliable access to water for domestic to the community.
c) **Health**: Upgrading of the local health centre and consideration for a privately owned company health facility to enhance healthcare services for both the workers and community members.
d) **Employment**: Prioritization of local youth, skilled technocrats, and gender-inclusive employment opportunities. Preference should also be given to community members who sold land for the project site.
e) **Infrastructure**: The community members proposed maintenance of roads and feeder roads to facilitate transportation and access within the community.
f) **Agriculture**: Support in marketing locally grown farm produce, such as cowpeas and green grams, to access better markets and improve income.

On a positive note, stakeholders expressed appreciation for the employment opportunities and broader economic development associated with the proposed project. In addition, several potential corporate social responsibility (CSR) initiatives were discussed, including improving local education facilities and other community support programs. All feedback and concerns have been systematically documented and are presented in detail in the report annexures, including meeting minutes and responses collected through stakeholder questionnaires. These inputs have been carefully considered and have informed the design of appropriate mitigation measures to minimize potential environmental and social impacts during both the construction and operational phases of the proposed project.

CHAPTER 7: ANTICIPATED PROJECT IMPACTS AND MITIGATION MEASURES

5.1. Introduction

The development and operation of the proposed project is associated with a wide range of environmental, social, and economic implications. This chapter, therefore, presents an overview of the anticipated positive and negative impacts that will arise from the proposed project during both construction and operational phases. The assessment considers potential effects on land use, biodiversity, soil and water resources, air quality, noise levels, visual and landscape character, socio-economic conditions, and cultural heritage. The aim of this section is to provide a structured understanding of how the project may influence the surrounding environment and communities, while also highlighting opportunities for environmental enhancement and social benefits. The anticipated impacts outlined here form the basis for proposing appropriate mitigation and management measures discussed in subsequent chapters.

5.2. Impact Assessment Methodological Approach

The methodological approach for assessing potential environmental and socio-economic impacts of the proposed project involves identifying, evaluating, and prioritizing impacts arising during construction and operation, along with associated facilities. The process begins with scoping to determine potential areas of impact, followed by a significance assessment to guide appropriate mitigation, enhancement, and management measures. The assessment considers impacts on environmental, biological, and socio-economic resources within the Project Area of Influence (AoI). Overall, the key steps of the ESIA process included impact identification, evaluation of significance, development of mitigation measures, and integration of these measures into the project's management framework:

Aspect	Narrative
Impact prediction	To determine what could potentially happen to resources or receptors because of the Project and its associated activities – potential impacts are identified during the ESIA scoping phase.
Impact evaluation	To evaluate the significance of the predicted impacts by considering their magnitude and likelihood of occurrence, and the sensitivity, value and/or importance of the affected resource or receptor
Mitigation and enhancement	To identify appropriate and justified measures to mitigate negative impacts and enhance positive impacts
Residual impact evaluation	To evaluate the significance of impacts assuming effective implementation of identified mitigation and enhancement measures

5.2.1. Identification and Characterization of Impacts

An 'impact' is any change to a resource or receptor caused by the presence of a project component or by a project- related activity. Impacts can be negative or positive and are defined in terms of their characteristics, including the impact's type (*direct, indirect, induced, cumulative*) and the impact's spatial and temporal features (i.e. *extent, duration, scale and frequency*). Types of impacts are described as below:

- **Direct:** applies to an impact which can be clearly and directly attributed to a particular environmental or social parameter (e.g. dust generation directly affects air quality).
- **Indirect:** applies to impacts which may be associated with or subsequent to a particular impact on a certain environmental or social parameter (e.g. high levels of dust could entail nuisance and health effects to workers on site).
- **Induced:** applies to impacts that result from other activities (which are not part of the Project) that happen as a consequence of the Project.
- **Cumulative:** applies to impacts that arise as a result of an impact and effect from the Project interacting with those from another activity to create an additional impact and effect.

Table 5: Impact Characterization Criteria

Duration	Short-term: impacts with relatively short duration with respect to the whole duration of the project (e.g. limited to five-year period).	Long-term: Impacts whose effects last longer than a period of five years, but limited to within the project lifetime.	Permanent: Impacts that cause a permanent change in the baseline conditions and therefore also evaluated as irreversible.
Extent	Local: Impact affecting the environment or communities within the Project AoI.	Regional: Impact affecting a wider area or socio- economic asset of importance going beyond the communities in the Project Area of Influence	National: Impact extending to the national level, or affecting assets of national importance
Frequency	One-off/ Occasional: Impacts that occur once only or occasionally.	Intermittent: Impacts that occur periodically or repeatedly	Continuous: Impacts that happen continuously
Intensity/Impact scale	Low: Limited impacts not causing any change or causing change hardly distinguishable from background conditions	Medium: Impacts causing change, but not affecting the core structures/functions of the resource/receptor	High: Impacts causing evident changes of core structures/functions of the resource/receptor
Likelihood	Unlikely: The event is unlikely but may occur at some time during normal operating conditions	Possible: The event is likely to occur at some time during normal operating conditions.	Likely: The event will occur during normal operating conditions (i.e. it is essentially inevitable).

5.2.2.Evaluation of Impacts

A consistent approach to the assessment of impacts was followed to enable environmental and social impacts to be broadly compared across. A set of generic criteria were used to determine impact significance and were applied across the various environmental and social parameters. Environmental and social impacts were quantified as much as possible. For cases where quantification was not possible/applicable, a qualitative assessment was conducted using professional expert judgement, experience and available knowledge, and including the consideration of stakeholder views. Where there were limitations to the data, and/or uncertainties, these were recorded in the relevant sections, along with any assumptions made during the assessment. In order to determine the significance of each impact, two overall factors were considered:

- Magnitude and nature of impacts,
- The importance and/or sensitivity of the environmental and social receiving parameter, as determined during the assessment of baseline conditions

5.2.3.Magnitude of Impact

Once impacts are characterized as per the above table, they are assigned a ‘magnitude’ which is typically a function of some combination (depending on the subject receptor) of the following characteristics:

- *Duration*
- *Extent*
- *Frequency*
- *Scale*.

Magnitude is a continuum from small to large, along which evaluation requires professional judgement and experience. Each impact is evaluated on a case-by-case basis and the rationale for each determination is noted. Magnitude designations for negative effects are *negligible, small, medium and large*. The magnitude designations themselves are universally consistent, but the definition for the designations varies by issue. In the case of a positive impact, no magnitude designation is assigned as it is considered sufficient for the purpose of the impact assessment to indicate that the Project is expected to result in a positive impact.

Table 6: Magnitude Characterization

Impacts/Aspect	Narrative
Negligible Magnitude Impact	These impacts results in changes to the environment that may be immeasurable, undetectable or within the range of normal natural variation. Such changes are regarded as having no impact and characterized as having a negligible magnitude.
Low Magnitude Impact	Affects a specific area, system, aspect (physical), group of localized individuals within a population (biological) and at sufficient magnitude to result in a small increase in measured concentrations or levels. (physical) over a short time period (one plant/animal generation or less but does not affect other trophic levels or the population itself), and localized area.
Moderate Magnitude Impact	Affects a portion of an area, system, aspect (physical), population or species (biological) and at sufficient magnitude to cause a measurable numerical increase in measured concentrations or levels. (physical) and may bring about a change in abundance and/or distribution over one or more plant/animal generations but does not threaten the integrity of that population or any population dependent on it (physical and biological).
High Magnitude Impact	Affects an entire area, system (physical), aspect, population or species (biological) and at sufficient magnitude to cause a significant measurable numerical increase in measured concentrations or levels (physical) or a decline in abundance and/ or change in distribution beyond which natural recruitment (reproduction, immigration from unaffected areas) would not return that population or species, or any population or species dependent upon it, to its former level within several generations (physical and biological). A high magnitude impact may also adversely affect the integrity of a site, habitat or ecosystem.

5.2.4.Assessment of Impact Significance

In order to assess the significance of an impact, the sensitivity of the receiving environmental or social parameter is considered in association with the magnitude of the impact, according to the matrix shown in Table below;

Table 7: Impact Significance Matrix

Significance of the Impact		Magnitude and Nature of the Impact		
		Low	Medium	High
Sensitivity of Receptors	Low	Not significant	Minor	Minor
	Medium	Minor	Minor	Moderate
	High	Minor	Moderate	Major

N/b

Severity Levels	1 (Negligible)	2 (Low)	3 (Moderate)	4 (High)	5 (Very High)

While the above matrix provides a framework for the determination of significance and enables comparison across environmental and social parameters, a degree of professional judgement is required, and some parameter-specific factors considered in making a determination of impact significance.

5.2.5.Mitigation Potential and Residual Impacts

A key objective of an Environmental Impact Assessment (EIA) is to identify and define socially, environmentally and technically acceptable and cost- effective mitigations measures to avoid, reduce, remedy or compensate for potential negative impacts, and to enhance potential environmental and social benefits. Impacts with negligible and low significance usually do not require any additional mitigation measure. This means that these impacts are within acceptable limits because:

- They are very unlikely to happen; and/or
- The sensitivity of receiving environment is very low; and /or
- Project designs have installed sufficient control mechanisms.

For *Negligible* and *Low significance*, impacts should inherent control measures fail, the implementation of additional control measures should ensure impacts remain acceptable. Impacts with medium significance, deemed as significant impacts, require additional mitigation measures to reduce the impacts at acceptable levels. These impacts can be minimized in order to reach negligible or low levels that are also deemed as acceptable level of impacts (using effective control measures). Impact with high significance generally requires imperative mitigation to reduce the significance to lower levels before proceeding with the Project. Positive impacts should be subject to enhancement measures where possible.

5.2.6.Cumulative Impacts

Cumulative impacts result from combination of an impact from the proposed project with an impact from another activity/project. How the impacts and effects are assessed is strongly influenced by the status of the other activities (e.g. already in existence, approved or proposed) and how much data is available to characterize the magnitude of their impacts. The approach for assessing cumulative impacts is to screen potential interactions with other projects based on:

- *Projects that are already in existence and are operating.*
- *Projects that are approved but not yet built or operating.*
- *Projects that are a realistic proposition but are not yet built*.

5.3. Positive Impacts (Construction and Operation) Phases

a) Employment Opportunities: The project is expected to create significant direct employment opportunities during the construction and operation phase, with a peak workforce of approximately 600 personnel. This will comprise mainly unskilled and semi-skilled labor, sourced preferentially from the local community where possible, to support site preparation, civil works, mechanical assembly, and general labor tasks. In addition, the proposed development will indirectly generate employment opportunities through the engagement of service providers, maintenance contractors, waste handlers, and local suppliers, thereby stimulating the regional economy and supporting livelihoods during both the construction and operational phases of the project.

b) Stimulation of Local Economy: The project is expected to stimulate the local economy by creating demand for a wide range of goods and services, including construction materials, housing for workers, and other related services. This increased demand will create opportunities for local businesses to expand and diversify their operations. Additionally, the project will contribute to both local and national revenue through the payment of taxes, levies, and statutory fees, thereby supporting public infrastructure development and improved service delivery.

Enhancement Measures

To ensure that business and socio-economic opportunities generated by the project are maximized, the following enhancement measures will be implemented:

- **Local Employment:** The Proponent will incorporate provisions for local employment to ensure that contractors recruit personnel in accordance with the Proponent's recruitment policy and the requirements stipulated in applicable labour policies and statutory laws.
- **Promotion of Local Enterprises**: As part of the Stakeholder Engagement Plan (SEP), the Proponent will aggressively encourage local businesses to participate, where appropriate. Throughout the project lifecycle, the SEP will be updated and improved frequently to guarantee ongoing and significant participation.

5.4. Negative Impact (Construction Phase)

5.4.1. Habitat Loss and Destruction (Ecology and Biodiversity)

During the construction phase of the proposed lime processing plant in Kyanganga, Kitui County, several site preparation activities will be undertaken, including land clearing, excavation, grading, levelling, and installation of foundations for plant infrastructure. These activities will result in the removal of existing vegetation within the project footprint, including grasses, shrubs, and scattered trees. The clearance of vegetation will lead to localized habitat loss and modification of the existing ecological conditions within the project site. The removal of vegetation may disrupt small terrestrial fauna and bird species that utilize the area for feeding, shelter, or movement. Construction activities and the establishment of infrastructure may also temporarily alter ecological connectivity and wildlife movement patterns within the immediate landscape.

Although these disturbances are expected, the project site is not located within any designated conservation area, protected area, or recognized biodiversity hotspot such as Key Biodiversity Areas (KBAs) or Important Bird and Biodiversity Areas (IBAs). Consequently, the anticipated impacts are considered localized within the project footprint. Nonetheless, vegetation removal and habitat alteration during construction may reduce habitat availability and cause temporary displacement of fauna species present in the area.

Mitigation Measures

- Vegetation clearance will be restricted strictly to designated construction areas to minimize unnecessary habitat loss.
- Sensitive areas, if identified during construction, will be clearly demarcated and protected as "no-go zones."
- Clearing activities will be undertaken in a phased manner to minimize large-scale habitat disturbance at any given time.
- Indigenous vegetation will be replanted in buffer areas and non-operational spaces where feasible.
- A biodiversity monitoring program will be implemented to observe changes in vegetation cover and wildlife presence during construction.
- Workers will receive environmental awareness training to discourage disturbance or hunting of wildlife within and around the project site.
- Where feasible, collaboration with local communities will be encouraged in tree planting and habitat restoration initiatives within surrounding areas.

5.4.2. Soil Disturbance and Erosion

Construction activities associated with the proposed plant will involve excavation, earthworks, grading, and movement of heavy machinery. These activities have the potential to disturb the natural soil structure and expose topsoil to erosion. Excavation and levelling works may destabilize soil profiles and increase susceptibility to erosion, particularly during rainfall events. Movement of heavy construction equipment and vehicles may also lead to soil compaction, reducing soil porosity and infiltration capacity. Reduced infiltration may increase surface runoff and alter localized drainage patterns. Additionally, exposed soil

surfaces during construction may be vulnerable to erosion caused by stormwater runoff and wind action, potentially leading to sediment transport to surrounding areas if not properly managed.

Mitigation Measures

- Earthworks and excavation will be restricted to designated construction areas.
- Construction boundaries will be clearly demarcated to prevent disturbance outside the project footprint.
- Temporary drainage systems such as diversion channels, silt traps, and sediment control structures will be installed to manage runoff and prevent sediment transport.
- Stormwater management measures will be implemented to control surface water flow across the site.
- Stockpiled soils will be stabilized and protected from erosion using appropriate measures such as covering or temporary vegetation.
- Progressive rehabilitation of disturbed areas will be undertaken where construction activities have been completed.
- Regular inspections will be conducted to identify early signs of erosion or sedimentation, particularly after heavy rainfall events.
- Adaptive management measures will be applied where necessary to strengthen erosion control structures and ensure effective soil protection

5.4.3. Disturbance to Flora, Avifauna and Habitats

Construction activities will require land clearing for installation of buildings, processing units, storage areas, internal access roads, utility infrastructure, and other ancillary facilities. These activities will lead to the removal of existing vegetation within the project site. Vegetation clearance will reduce the availability of habitat for plant species, birds, and small terrestrial fauna that currently utilize the area for foraging, nesting, and shelter. The noise and movement associated with construction activities may also temporarily disturb wildlife present in the surrounding environment. Bird species and other fauna may avoid the area during the construction period due to increased human presence, machinery operation, and vegetation disturbance. However, these impacts are expected to remain localized within the project site and its immediate surroundings.

Mitigation Measures

- Vegetation clearance will be limited to the minimum area required for construction activities.
- Environmentally sensitive areas identified during construction will be protected through clear demarcation.
- Where feasible, existing vegetation outside the construction footprint will be retained to maintain ecological stability.
- Buffer zones will be maintained around the project site where possible to preserve vegetation and provide refuge habitats.
- Workers will be prohibited from hunting, trapping, or disturbing wildlife within the project area.
- Environmental awareness training will be provided to all construction personnel.
- Periodic monitoring will be conducted to assess changes in vegetation and wildlife presence during construction.

5.4.4. Air Quality (Air Pollution)

Construction activities associated with the proposed plant are likely to generate temporary air emissions that may affect local air quality. The primary sources of air pollution during construction will include dust generated from land clearing, excavation, grading, and movement of construction vehicles. Dust emissions may arise from exposed soil surfaces, transportation of construction materials, and movement of vehicles along unpaved access roads. In addition, exhaust emissions from construction machinery and

vehicles may contribute to localized air pollution. These emissions may cause temporary nuisance to nearby residents, workers, and road users if not properly controlled.

Mitigation Measures

- Water will be regularly sprayed on exposed surfaces and construction areas to suppress dust generation.
- Internal access roads will be periodically wetted to control dust emissions.
- Construction vehicles will adhere to designated speed limits to minimize dust generation.
- Trucks transporting loose materials will be covered to prevent dust dispersion.
- Construction machinery and vehicles will be regularly serviced and maintained to minimize exhaust emissions.
- Workers exposed to dust will be provided with appropriate personal protective equipment such as dust masks.
- Routine monitoring and visual inspections will be conducted to ensure effective dust control measures are maintained

5.4.5. Traffic Impacts

Construction activities will require the transportation of construction materials, equipment, and workforce to and from the project site. As a result, an increase in vehicular traffic is expected along access roads serving the project area. Heavy trucks transporting construction materials such as cement, aggregates, steel, and machinery may increase traffic volumes on local roads. This increase in traffic could lead to temporary disruptions to normal traffic flow and pose potential safety risks to road users, pedestrians, and nearby communities. Construction vehicles may also contribute to increased noise, dust generation, and wear on existing road infrastructure.

Mitigation Measures

- A Traffic Management Plan will be developed and implemented to regulate vehicle movement during construction.
- Construction vehicles will adhere to designated speed limits to enhance road safety (10-20 Kp/H.
- Drivers will be trained on safe driving practices and compliance with road safety regulations.
- Construction materials will be transported during designated hours to minimize disruption to local traffic.
- Vehicles and equipment will be regularly inspected and maintained to ensure safe operation.
- Appropriate road safety signage will be installed along access routes where necessary and use of traffic Marshall be deployed.

5.5. Socio-Economic Impacts During Construction

5.5.1. Social Disturbance Factors

The introduction of construction activities associated with the proposed plant may lead to temporary social changes within the surrounding communities. These changes may arise from the presence of construction workers and increased economic activity in the project area. An influx of workers and job seekers may increase pressure on local infrastructure and services, including water supply, sanitation, healthcare, and social amenities. There may also be increased risks of social concerns such as petty crime, alcohol and substance abuse, or conflicts between workers and community members if not properly managed. However, the project will also generate employment opportunities during construction, particularly for unskilled and semi-skilled labor from the surrounding communities.

Mitigation Measures

- Preference will be given to hiring local community members for unskilled and semi-skilled positions.
- A Worker Code of Conduct will be developed and enforced to regulate worker behavior on and off the project site.
- Workers will undergo induction training covering acceptable conduct, community relations, and environmental responsibilities.
- A grievance redress mechanism will be established to allow community members to report concerns related to project activities.
- Access to the construction site will be controlled to prevent unauthorized entry.

5.5.2. Impacts from Migrant Workers (Disease Transmission)

The presence of a construction workforce may lead to increased interactions between workers and local communities. In some cases, this may increase the risk of transmission of communicable diseases, including sexually transmitted infections (STIs) such as HIV/AIDS. The risk may arise from increased social interaction, particularly in nearby trading centres where workers may seek accommodation, goods, and services.

Mitigation Measures

- An HIV/AIDS awareness and prevention program will be implemented for all workers,
- Workers will receive health education on disease prevention and responsible behavior,
- Voluntary counselling and testing services will be promoted in collaboration with local health facilities,
- Condoms will be made readily available to workers, and
- The Worker Code of Conduct will prohibit illegal or exploitative activities and promote responsible interactions with local communities

5.5.3. Community Health and Safety

Construction activities may pose potential health and safety risks to workers and nearby communities. These risks may arise from dust emissions, noise from construction equipment, vehicle movements, and the operation of heavy machinery. Activities such as excavation, lifting operations, equipment installation, and transportation of materials may create hazards if not properly managed. Additionally, improper handling of construction materials or hazardous substances could pose risks to both workers and surrounding communities.

Mitigation Measures

- A comprehensive Construction Health and Safety Plan (C-HSP) will be developed and implemented in accordance with the Occupational Health and Safety Act, 2007 and best international practices,
- Workers will receive training on occupational health and safety procedures, including the use of personal protective equipment,
- Appropriate PPE will be provided and mandatory use enforced for all construction personnel,
- Emergency response procedures will be established to address accidents, fires, chemical spills, or medical emergencies, and
- Regular safety inspections and toolbox talks will be conducted to reinforce safe working practices.
- Hazardous materials will be properly stored and handled according to established safety protocols.

5.6. Negative (Bio-Physical Impact) for Operational Phase

Lime processing plant operations, although essential for supporting industrial development, can present a range of potential environmental risks if not properly managed. These impacts may arise from activities such as raw material handling, crushing, kiln operations, and wastewater management. Typical concerns include dust and Flue gas emissions, noise generation, water and soil contamination, and challenges related to waste handling and disposal. However, with the implementation of sound environmental management practices, appropriate site planning, and the application of proven pollution control technologies, these risks can be significantly reduced to acceptable levels. Adherence to best practice in plant design, strict operational controls, and full compliance with regulatory requirements will ensure that the facility operates efficiently while minimizing adverse impacts on the environment and safeguarding the health and well-being of surrounding communities.

5.6.1. Excessive Dust (Air Pollution)

Excessive dust generation is one of the most common environmental challenges associated with lime processing plant operations. Dust is typically produced during the delivery, storage, handling, and transfer of raw materials such as limestone, as well as during key processing stages including crushing, screening, calcination, and product handling. In lime processing, significant quantities of fine particulate matter are generated when limestone is mechanically reduced in size through crushers and screens. Additional dust emissions occur during the loading and unloading of raw materials, movement along conveyor systems, and storage in open stockpiles, especially under dry and windy conditions. The calcination process in kilns also contributes to dust emissions through flue gases, which may contain fine lime particles if not adequately controlled. Furthermore, handling of finished products such as quicklime and hydrated lime particularly during bagging, packaging, and transportation can generate fugitive dust due to the highly reactive and powdery nature of lime.

If not properly managed, dust emissions can have several adverse impacts. These include deterioration of ambient air quality, potential respiratory health risks to workers and nearby communities, and reduced visibility within and around the plant. Dust deposition on vegetation can also affect plant growth by interfering with photosynthesis, while accumulation on soil surfaces may alter soil properties over time.

Mitigation Measure

- The entire plant premises, including driveways, should be paved with hard, impervious materials,
- Natural or artificial wind barriers (trees, fences, landforms) should be installed in accordance with prevailing wind direction to control dust dispersion,
- The movement and handling of fine materials such as lime should be carefully managed to prevent spillage onto paved surfaces and minimize wind-blown particulate emissions,
- Paved surfaces within the batching plant should be regularly cleaned using a mobile vacuum sweeper or water flushing system to remove dust, lime residue, and aggregate spillage, ensuring a tidy and safe working environment,
- Vehicle movements within the plant yard should be restricted to **10–15km/h** to minimize dust generation,
- Minimize dust dispersion by providing special (covered) area for loading /unloading process,
- All aggregate and fine material stockpiles shall be enclosed on at least three sides and the top to minimize wind entrainment and dust dispersion,
- The silo delivery pipe should be fitted with a butterfly or pinch valve, or similar, that enables ‘tight shut off’ to prevent fly ash dust escaping,
- Ensure the high-level sensor alarm is set at a point that prevents the silo from overfilling and automatic shut-down switch is also required to minimize spillage and dust, and
- Lime should only be delivered from suppliers using sealed vehicles equipped with pneumatic transfer systems for silo loading.

5.6.2.Excessive Noise (Noise Pollution)

Excessive noise is another significant environmental concern associated with lime processing plant operations. Noise within the plant can originate from multiple sources, including the delivery and handling of raw materials such as limestone. During loading and unloading, the dropping and movement of materials can generate high-impact sounds, particularly when conducted on hard surfaces or within metallic hoppers, crushers, and storage systems, as well as during crushing and screening activities. Truck movements within the plant especially during loading, idling, and reversing are frequent contributors to overall noise levels. The use of reversing alarms on trucks and heavy machinery, while essential for safety, further increases the cumulative noise within and around the site. In addition, the continuous operation of mechanical equipment such as conveyors, fans, compressors, pumps, and motors produces a constant background noise that may affect both workers and nearby communities.

Another intermittent but notable source of noise arises from maintenance activities, including the cleaning and removal of hardened material deposits from processing equipment, which may involve mechanical impact or scraping. If not properly managed, these noise emissions can pose occupational health risks, particularly hearing impairment among workers, and may also lead to disturbance of nearby receptors and general nuisance.

Mitigation Measures

- All vehicles, machinery, and on-site equipment shall be maintained in good mechanical condition and fitted with appropriate acoustic suppression devices, such as mufflers and silencers, to minimize exhaust emissions and operational noise levels.
- Regular servicing and preventive maintenance programs shall be implemented to ensure optimal engine performance, reduce emissions, and maintain compliance with manufacturer specifications and applicable environmental standards,
- Where feasible, acoustic barriers, noise screens, or vegetative buffers shall be established along the site boundary, particularly on sides adjacent to residential or institutional areas, to help absorb and deflect sound,
- Workers exposed to elevated noise levels shall be provided with appropriate personal protective equipment (PPE) such as earmuffs or earplugs, and work rotation schedules shall be adopted to reduce prolonged exposure,
- Lining steel aggregate bins and hoppers with sound-absorbing material such as industrial rubber where appropriate on a site-specific basis to manage noise, and
- Periodic noise monitoring shall be undertaken at site boundaries and key operational points to ensure compliance with the Environmental Management and Coordination (*Noise and Excessive Pollution Control*) Regulations, 2009.

5.6.3.Surface Water Quality (Pollution)

Wastewater generated from lime processing plant operations can pose a significant environmental risk if not properly managed. This wastewater typically arises from equipment washing, kiln and plant cleaning activities, stormwater runoff from raw material storage areas, and process water overflow. It often contains fine lime particles, dust residues, and other suspended solids that can increase turbidity in nearby water bodies if discharged without treatment. In addition, lime-contaminated water is typically highly alkaline, with elevated pH levels that may adversely affect aquatic life and soil quality by altering the natural chemical balance of receiving environments.

Beyond process-related discharges, the improper storage, handling, or accidental spillage of fuels, lubricants, and other operational chemicals can lead to contamination of both surface and groundwater. Pollutants such as hydrocarbons and chemical residues may infiltrate the soil or be transported by runoff during rainfall events, thereby increasing the risk of environmental degradation. Effective wastewater management and proper handling of hazardous substances are therefore essential to prevent pollution and protect surrounding ecosystems**.**

Mitigation Measures

- Provide separate and dedicated drainage systems for clean and contaminated stormwater, including the installation of a ‘first-flush’ system to capture initial runoff that typically carries higher pollutant loads.
- Minimize the risk of stormwater contamination by implementing effective measures to prevent, contain, and promptly clean up any spillages or accumulated dust within the facility.
- Ensure that all contaminated stormwater and process wastewater are collected, retained on-site, and either treated appropriately or disposed of by a licensed waste handling contractor. Under no circumstances should such wastewater be discharged off-site.
- Design and construct impervious concrete surfaces in all areas that generate wastewater or potentially contaminated stormwater. These surfaces should be properly graded to ensure that all runoff drains into a designated collection and treatment system.
- Settlement ponds used for wash-down water shall be equipped with a sloping sludge interceptor to facilitate the effective separation of sediments from water, thereby enhancing reuse or safe discharge following treatment.

5.6.4.Chemical Impacts (Admixtures)

Fuels and chemicals used in lime processing plant operations must be strictly prevented from entering stormwater drains, seasonal streams, and other water bodies, as they are classified as potential water contaminants that pose significant risks to both the environment and human health. When such substances enter stormwater systems, they can pollute surface water, accumulate in sediments, and harm or eliminate aquatic organisms, thereby disrupting ecosystems and degrading overall water quality. In the context of lime processing, additional risks may arise from lime dust and lime-contaminated runoff, which are typically alkaline and can significantly alter the pH of receiving waters. Elevated pH levels can adversely affect aquatic life and reduce the suitability of water for domestic, agricultural, and ecological uses. Polluted runoff can also impact downstream activities such as livestock watering and small-scale irrigation, which are critical in rural areas.

Furthermore, fuels, lubricants, and other operational chemicals must be prevented from infiltrating the soil, as they can accumulate and eventually leach into groundwater systems. This may result in long-term contamination of groundwater resources, which are often the primary source of water supply in semi-arid areas..

Mitigation Measures

- Maintain an up-to-date inventory of all chemicals stored on-site, including their types, volumes, and storage locations. All chemicals should be clearly identifiable at all times.
- Ensure that all containers of hazardous chemicals are properly labelled with the product name, contents, hazard classification, and appropriate safety warnings.
- Verify that each chemical product purchased or used is accompanied by a Safety Data Sheet (SDS). Where an SDS is missing, it should be promptly obtained from the supplier. The SDS register should be readily accessible to all staff and regularly updated.
- Provide training to all staff on the safe handling, use, and storage of chemicals, and ensure that personnel are familiar with the information on product labels and SDSs.
- Minimize the movement of chemicals within the site to reduce the risk of spills or leaks. Containers should always be handled with care and transported using appropriate equipment.
- Maintain spill response materials, such as spill kits, absorbents, and containment booms, at strategic locations within the facility to allow for immediate response to any accidental releases.
- Develop and implement a comprehensive Chemical Management and Spill Response Plan to guide safe handling practices, minimize environmental risk, and ensure compliance with environmental regulations, thereby reducing the likelihood of committing an environmental offence.

5.7. Socio-Economic Impact for Operational Phase

5.7.1. Inappropriate Disposal of Waste

Improper disposal of waste materials from a lime processing plant presents a significant environmental hazard. Wastes generated during operations may include lime fines and dust, waste oils, chemical residues, contaminated wash water, and other process-related by-products. If these materials are indiscriminately discharged into stormwater drains, open land, or nearby watercourses, they can lead to substantial environmental pollution and long-term ecological degradation. Lime residues, when deposited on land, can accumulate and alter soil properties, reducing permeability and interfering with natural infiltration processes. In addition, lime-contaminated water or slurry is typically highly alkaline, and its release into soils or surface water bodies can elevate pH levels, resulting in harmful conditions for vegetation and aquatic organisms.

Waste oils, fuel residues, and other chemicals used within the plant may introduce hydrocarbons and potentially harmful substances into the environment. These pollutants can infiltrate soils and migrate into groundwater systems, posing risks to water quality and human health.

Mitigation Measures

- Prepare and implement a comprehensive Waste Management Plan (WMP) to identify, quantify, and characterize all waste streams generated during the batching plant's operations. The WMP should outline the sources of each waste stream, methods of handling, storage, transport, and final disposal, in compliance with relevant environmental regulations.
- Concrete truck agitators and chutes shall not be rinsed out near stormwater drains, roadways, or open ground surfaces to prevent contamination of stormwater and surrounding soil. Designated washout areas with impervious surfaces and proper containment should be provided for this purpose.
- All concrete dispatched and returned to the batching plant must be carefully tracked and recorded to ensure that excess or waste concrete is managed responsibly either through reuse in site works (e.g., paving, curbing) or disposal through an approved waste management facility.
- All waste shall be stored in suitable, properly labelled containers that are kept closed except when waste is being added. Each container label should clearly indicate the type of waste, date of generation, and any other relevant safety or handling information.
- Wastes must not be mixed, except where compatibility has been verified (e.g., compatible flammable solvents). Different classes of waste such as hazardous, non-hazardous, and recyclable materials must be segregated to avoid unwanted chemical reactions and facilitate efficient waste management.
- Only licensed and NEMA-approved waste transporters shall be engaged to handle and transport regulated waste. Accurate records, including waste manifests, contracts, and receipts for all waste collection and disposal activities, must be maintained and kept for audit purposes.
- Hazardous waste must never be poured onto the ground, into the sewer system, or placed in general waste bins. Such practices are prohibited under the Environmental Management and Coordination (Waste Management) Regulations, 2024.
- Open burning of waste on-site is strictly prohibited. All waste materials must be handled in an environmentally sound manner to minimize pollution and protect human health.

5.7.2. Occupational Health and Safety

Operation of lime processing plant presents a range of occupational health and safety hazards due to the nature of their operations, machinery use, and material handling activities. One of the primary risks involves dust emissions generated during the delivery, transfer, and storage of raw. Prolonged exposure to respirable dust, particularly crystalline silica found in aggregates, can lead to serious respiratory

illnesses such as silicosis, chronic obstructive pulmonary disease (COPD), and other lung-related complications if effective dust control and personal protective measures are not implemented.

Noise is another major occupational hazard in batching plants, arising from heavy machinery, mixers, compressors, and truck operations. Continuous exposure to high noise levels can cause hearing loss, fatigue, and reduced concentration, increasing the risk of accidents. Additionally, the layout of the plant and the movement of materials create potential tripping and falling hazards, especially around conveyor belts, hoppers, and during maintenance activities. The truck washing area also presents a slipping hazard due to the accumulation of water, concrete slurry, and oils on hard surfaces.

Traffic-related accidents are another concern, particularly where heavy vehicles move within confined plant areas. Poor traffic management, inadequate signage, or operator inattention can lead to collisions or injuries. Furthermore, the presence of electrical systems for powering motors, pumps, and control panels introduces the risk of electric shocks, especially if maintenance practices are inadequate or if moisture is present in work areas. Fire hazards may also arise in administrative and storage areas due to electrical faults, improper storage of fuels or lubricants, or flammable materials.

Mitigation Measures

- Develop and implement a comprehensive Occupational Health and Safety Policy in compliance with the Occupational Safety and Health Act (OSHA), 2007 and related subsidiary legislation. The policy should outline roles, responsibilities, and safe work procedures for all site activities,
- Provide regular training and induction for all employees and subcontractors on safe work practices, hazard identification, emergency response, and proper use of personal protective equipment (PPE). Training should be documented and refreshed periodically,
- Ensure that all workers are provided with and consistently use appropriate PPE, including dust masks or respirators, safety goggles, gloves, ear protection, high-visibility clothing, helmets, and safety boots,
- Minimize dust exposure through dust suppression (e.g., water spraying, enclosure of mixers and conveyors, and proper ventilation). Workers operating in dusty areas should use approved respirators,
- All machinery, conveyors, and mixers shall be fitted with safety guards and emergency stop mechanisms. Regular inspection and preventive maintenance schedules should be implemented to prevent mechanical failures and accidents, and
- Lime, admixtures, fuels, and lubricants shall be handled carefully and stored in clearly labelled containers within bunded and ventilated areas. Safety Data Sheets (SDS) should be accessible, and workers trained in spill prevention and response procedures,
- Maintain first aid kits, fire extinguishers, and spill kits at strategic points within the plant. Designate and train first aiders and fire marshals.
- Develop and display an Emergency Response Plan outlining actions for fire, chemical spills, injuries, or other incidents, and
- Appoint a Safety Officer to oversee implementation of OHS measures and ensure compliance with OSHA, 2007 and other relevant regulations, including NEMA and Directorate of Occupational Safety and Health Services (DOSHS) requirements.

5.7.3. Impact on utilities

The establishment and operation of the proposed plant will place additional demand on existing utility services, particularly water supply. The project area is already characterized by limited water availability, with parts of the locality experiencing periodic water deficits due to low rainfall and limited surface water resources. Consequently, the increased water demand associated with plant operations, including processing activities, dust suppression, equipment cleaning, and domestic use by workers, may exert additional pressure on the existing water supply systems if not properly managed.

Mitigation Measures

- Ensure that plant operations do not compromise water availability or pressure for neighboring residential or commercial users,
- Adopt water-saving measures where possible, including recycling washout water and reusing water for dust suppression,
- Keep records of water and electricity consumption to identify trends, detect anomalies, and plan for future expansions without overloading local infrastructure,
- Consider installation of backup generators to maintain operations during power interruptions and reduce dependence on the public grid,
- Ensure proper collection, containment, and disposal of concrete washout water to prevent contamination of stormwater drains and public sewers,
- Schedule high-water-demand activities, such as equipment cleaning and dust suppression, during periods of stable supply to minimize strain on the network,
- Install buffer storage tanks to maintain a reserve water supply during periods of peak demand or temporary interruptions in municipal supply, and
- Explore rainwater harvesting options to supplement water needs, reduce dependency on the public water network, and enhance the sustainability of plant operations.

5.8. Social Impacts

The establishment and operation of the proposed lime processing plant is expected to result in a range of social impacts within the project area and its surroundings. These impacts may be both positive and negative depending on how the project activities are implemented and managed.

5.8.1. Labour Influx

The construction and operational phases are likely to attract job seekers from outside the immediate project area. This labour influx may occur as individuals move into the surrounding communities in search of employment and other economic opportunities associated with the project. While the project will generate significant employment opportunities and economic benefits, the arrival of additional workers may also place pressure on existing local services and social infrastructure. An increased population within the project area may lead to higher demand for housing, water supply, sanitation facilities, healthcare services, and other basic social amenities. In areas where these services are already limited, the sudden increase in population could strain available resources. In addition, labour influx may contribute to a rise in the cost of living, particularly with regard to rental housing, food prices, and other essential goods and services. This situation may affect vulnerable members of the host community if demand exceeds local supply.

Labour influx can also potentially lead to social challenges such as conflicts between local residents and incoming workers, increased pressure on community infrastructure, and changes in social dynamics. If not properly managed, it may also increase the risk of communicable disease transmission and other social concerns.

Mitigation Measures

- The project proponent will give priority to qualified local residents for employment opportunities, particularly for unskilled and semi-skilled positions, in order to reduce the need for external labour.
- Where external workers are required, the proponent will ensure that appropriate accommodation arrangements are made to avoid unnecessary pressure on local housing facilities
- All project workers will be required to adhere to a strict code of conduct that promotes respectful engagement with local communities and discourages any form of misconduct.
- Continuous engagement with the local community will be undertaken to address emerging concerns and maintain good relations between workers and residents.
- The project will provide adequate facilities within the project site to minimize pressure on community services.

- Awareness programs on public health issues, including prevention of communicable diseases, will be implemented for both workers and the surrounding communities.
- Where feasible, the proponent may collaborate with local authorities and communities to support improvements in key infrastructure and services.

5.8.2. Gender-Based Violence and Harassment (GBVH)

The establishment and operation of the proposed project (Lime processing Plant) may present potential risks related to gender-based violence and harassment (GBVH), particularly during the construction phase when a relatively large workforce may be present in the project area. Labour influx and increased interaction between workers and the local community may sometimes lead to social tensions or inappropriate behavior if proper safeguards are not put in place.

GBVH may include harassment, intimidation, exploitation, or other forms of misconduct directed at women, girls, and other vulnerable groups within the community or workplace. Such risks may arise in situations where workers interact frequently with local residents, particularly in areas where social protection mechanisms and awareness are limited. In addition, unequal power dynamics, economic vulnerability, and the presence of temporary workers may increase the likelihood of harassment or exploitation if not adequately addressed. If such issues occur, they may negatively affect the safety, dignity, and wellbeing of community members, particularly women and girls. They may also undermine social cohesion and trust between the project proponent and the host community. For these reasons, it is important that preventive and responsive measures are put in place to minimize the risk of GBVH associated with the project.

Mitigation Measures

- The project proponent will implement a strict zero-tolerance policy against all forms of gender-based violence, harassment, and exploitation within the workplace and surrounding communities.
- All employees and contractors will be required to sign and adhere to a code of conduct that clearly prohibits harassment, abuse, discrimination, and exploitation.
- Regular training and sensitization programs will be conducted for workers and management on GBVH prevention, respectful workplace behavior, and community relations;
- A confidential and accessible grievance reporting system will be established to enable workers and community members to report cases of harassment or misconduct safely.
- The project will work with local leaders and community members to raise awareness about GBVH risks and available reporting channels.
- The proponent will promote equal employment opportunities for women and ensure that the workplace environment is safe, respectful, and free from discrimination.
- Where necessary, the project will collaborate with local administration and relevant institutions to address any reported cases and ensure appropriate action is taken.

5.8.3. Risk of Disease Transmission Including HIV and AIDS

The construction and operational phases of the plant may increase the risk of disease transmission within the project area and surrounding communities. The presence of a relatively large workforce, including workers from outside the local area, may lead to increased interaction between project workers and members of the host community. Such interactions, combined with population movement and congregation of workers, may increase the likelihood of the spread diseases.

One of the key public health concerns associated with labour influx in large development projects is the potential increase in the spread of HIV and AIDS, as well as other sexually transmitted infections (STIs). The movement of workers into the project area, particularly where workers are separated from their families for extended periods, may increase the risk of high-risk social behavior that could contribute to the transmission of HIV and other infections. If not properly addressed, this may have long-term public health implications for both the workforce and the surrounding community. Without appropriate preventive

measures, these factors may place additional pressure on existing health services and potentially affect the health and wellbeing of both workers and the host community.

Mitigation Measures

- Regular sensitization and awareness campaigns will be conducted for workers and surrounding communities to promote understanding of HIV and AIDS prevention.
- Educational materials on HIV prevention, safe practices, and general health awareness will be distributed at the workplace.
- The project will collaborate with local health authorities and organizations to support HIV testing, counseling, and treatment services;
- Access to condoms and health promotion information will be made available to workers as part of workplace health programs;
- Workers may undergo routine health checks to monitor general health and prevent the spread of communicable diseases;
- Proper sanitation and hygiene facilities will be provided within the project site to reduce the spread of infectious diseases;
- Training programs will emphasize personal hygiene, disease prevention, and responsible social behavior; and
- The project will work closely with community leaders to raise awareness on public health issues affecting the project area.

8. CLIMATE RISK AND VULNERABILITY ASSESSMENT

8.1. Introduction

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

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

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

8.2. Kenya Climate

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

Kenya has two rainy seasons (bimodal precipitation regime) – a major one from March to May and a minor one from October to December[1].

8.2.1. Projected Climate Changes

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

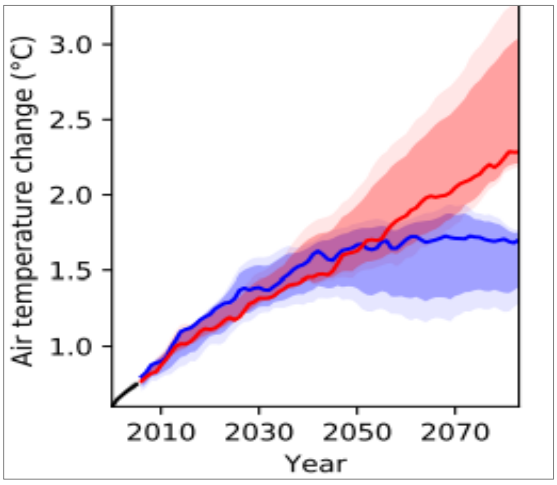


Figure 3: Air temperature projections for Kenya for different GHG emissions scenarios.

[1] Climate Risk Profile: Kenya

8.2.2.Very Hot Days

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

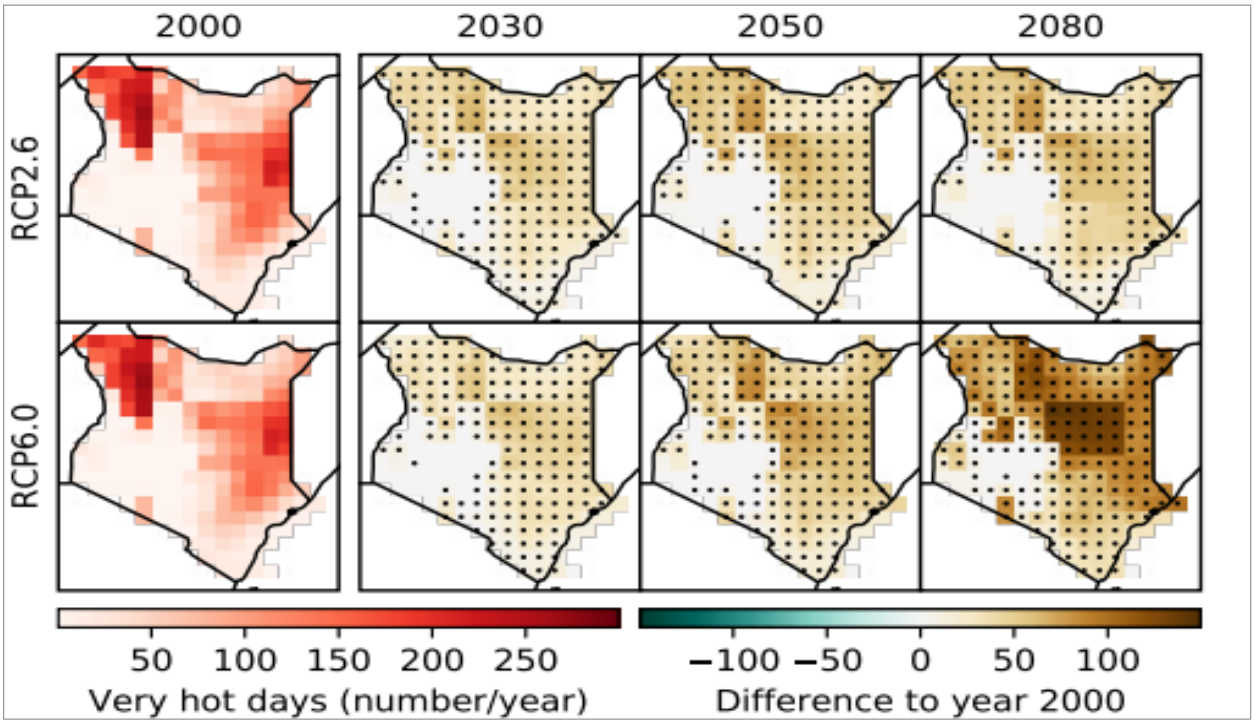


Figure 4: Projections of the annual number of very hot days (daily maximum temperature above 35 °C) for Kenya for different GHG emissions scenarios.

8.2.3.Sea Level Rise

In response to globally increasing temperatures, the sea level off the coast of Kenya is projected to rise (Figure 4). Until 2050, very similar sea levels are projected under both emissions scenarios. Under RCP6.0 and compared to year 2000 levels, the median climate model projects a sea level rise by 10 cm in 2030, 21 cm in 2050, and 40 cm in 2080. This threatens Kenya's coastal communities and may cause saline intrusion in coastal waterways and groundwater reservoirs.

8.2.4.Precipitation

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

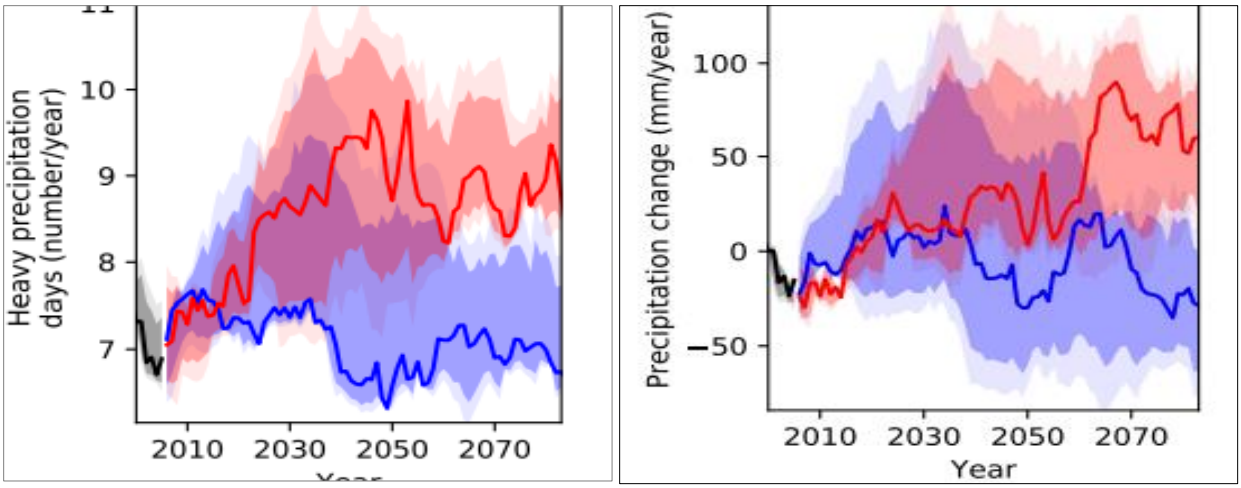


Figure 5: Projections of the number of days with heavy precipitation over Kenya for different GHG emissions scenarios, relative to the year 2000

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

8.3. Climate Change Impacts to Key Sectors

Table 8: Climate Change Impacts to Key Sectors

Sector	Narrative
Infrastructure	Climate change is projected to severely impact Kenya's transport infrastructure through extreme weather events like floods and droughts. High precipitation and temperatures will cause infrastructure damage, leading to increased maintenance costs. Since road transport is vital for agriculture, trade, and access to services, especially in rural areas, investing in climate-resilient road networks is essential. Additionally, road transport accounts for 99% of non-aviation transport GHG emissions in Kenya. Extreme weather events will have devastating impacts on human settlements and economic sites, particularly in densely populated urban areas like Nairobi and Mombasa. Informal settlements, which often lack stable infrastructure and are built in high-risk areas such as riverbanks and coastal zones, are especially vulnerable. These areas experience severe flooding, leading to loss of housing, water contamination, and even death. Residents, who typically have low adaptive capacity due to poverty and lack of infrastructure, are particularly affected.
Ecosystems	Climate change is expected to significantly impact tropical ecosystems, though the exact extent remains uncertain. Rising temperatures, more frequent and intense droughts, and changing conditions are putting wetlands, river systems, and forests at risk of transformation. These changes can lead to habitat loss for both plants and animals, disrupt forest succession, and increase the spread of invasive species. Additionally, factors such as low agricultural production and population growth may drive further agricultural expansion, leading to deforestation, land degradation, and forest fires, which will negatively affect biodiversity.

Sector	Narrative
Agriculture	Smallholder farmers in Kenya face growing challenges due to the unpredictability of weather patterns caused by climate change. Since most crops rely on rainwater, yields are increasingly affected by erratic rainfall, while the limited use of irrigation (only 28% of the potential irrigated area in 2003) further exacerbates the situation. This is due to poor extension services, irrigation management, lack of credit, and technical equipment. The primary irrigated crops are vegetables, fruit, coffee, rice, and maize. The uncertainty in water availability projections translates into high variability in drought predictions. According to median projections, the national crop land area exposed to drought annually will only slightly increase due to global warming, though other models predict a much stronger rise. Under RCP6.0, the range of drought exposure for crop land widens from 0-0.8% in 2000 to 0-1.6% in 2080, with the very likely range increasing from 0-1.9% to 0-9.8%. Some models project a fivefold increase in drought exposure, while others show no change. Climate change will have a negative impact on yields of millet and sorghum.
Water Resources	Current projections of water availability in Kenya show high uncertainty, with median models suggesting an increase under RCP6.0 and no change under RCP2.6. However, when factoring in population growth (SSP2 projections), per capita water availability is projected to decline significantly by 73% under RCP2.6 and 63% under RCP6.0 by 2080, compared to 2000 levels. While population growth is the primary driver, these projections emphasize the need for investment in water-saving measures. Regional projections show varying trends: under RCP2.6, water availability will decrease by up to 25% in western Kenya and increase by up to 25% in southern Kenya by 2080. Under RCP6.0, the focus shifts to eastern Kenya, where water availability is expected to increase by up to 80%.

8.4. Climate Change Risks and Adaptation Measures

Kitui County has arid and semi-arid climate, with erratic and unreliable rainfall distribution and extreme temperature variations. The rainfall received is bimodal with two main seasons namely March – April– May (MAM) long rain season and October – November – December (OND) short rain season. Severe drought events have been recurring in most parts of the county while occasional flash floods have been experienced along major seasonal rivers. The total number of months with average temperature greater or equal to 25°C serves as an indicator of heat stress. The months of January to May, October and November, are months that experience heat stress. (Source: meteorological department, Kitui County Office[2]).

8.4.1. Potential Climate Risks

Kitui County experiences significant climate variability and change, manifested through declining and erratic rainfall patterns, recurrent droughts, rising temperatures, and occasional flash floods. These climatic conditions have adversely affected key sectors of the county's economy, particularly agriculture, water resources, public health, and the natural environment. The increasing frequency and intensity of droughts have led to reduced agricultural productivity, water scarcity, and degradation of ecosystems, while extreme rainfall events often result in flash floods, soil erosion, and damage to infrastructure. Rising temperatures further exacerbate water stress through increased evapotranspiration, thereby reducing water availability for both domestic and agricultural use.

[2] Kitui County Climate Change Action plan 2022-2027

This climate variability, when coupled with rapid population growth, places additional pressure on already limited natural resources, negatively impacting the livelihoods of local communities. The majority of households in the county depend on rain-fed agriculture and natural resource-based activities, making them highly vulnerable to changes in weather patterns. As a result, food insecurity, income instability, and environmental degradation remain persistent challenges in the region.

The impacts of climate change in the county are largely felt by crop and livestock farmers. At the household level, climate change impacts are associated with food insecurity, water scarcity and emergence of livestock and human diseases. In the event of prolonged drought resulting to water scarcity and food insecurity, the most affected vulnerable groups are women, children, youth, elderly, PWD and critically sick.

8.4.2. Impacts of Climate Hazards in the County

Kitui County is predominantly inhabited by agro-pastoral communities whose livelihoods largely depend on rain-fed agriculture and livestock keeping, particularly within the rangeland areas. Most sub-counties in the region are classified as semi-arid, characterized by low and unreliable rainfall, high temperatures, and fragile ecosystems. However, due to the increasing effects of climate change, many areas that were previously suitable for rain-fed agriculture are becoming less productive or entirely unsuitable. As a result, local communities are increasingly adopting mixed farming systems, where resilience is built through diversification of income sources from both crop production and livestock rearing, rather than reliance on a single livelihood activity.

The county is exposed to several key climate-related hazards, including:

- Drought,
- Environmental degradation,
- Flooding, and
- Extreme temperatures.

These hazards have significant and far-reaching impacts on both economic development and human well-being in rural and urban areas. The effects are particularly severe among vulnerable groups such as women, youth, the elderly, low-income households, and marginalized communities, who have limited adaptive capacity.

Among these hazards, drought is identified as the most critical climatic risk in the county. Its impacts are widespread and include water scarcity, food insecurity, reduced pasture and fodder availability, and declining agricultural productivity. Drought conditions also contribute to resource-based conflicts, including human-human conflicts over water and grazing land, as well as human-wildlife and wildlife-wildlife conflicts as animals compete for shrinking resources. In addition, prolonged drought often leads to rural-urban migration, as affected populations move in search of better livelihood opportunities.

Environmental degradation in Kitui County, including deforestation, poor waste management, point-source pollution, and land degradation, has led to loss of biodiversity, drying of water sources, disease outbreaks, human-wildlife conflicts, depletion of natural resources, reduced ecosystem services, and diminished aesthetic value. Flash floods in lowland areas have caused damage to water and road infrastructure, property loss, habitat destruction, creation of new water channels, crop loss, livestock deaths, and occasional human fatalities, while extreme temperatures have negatively impacted crop growth and agricultural productivity.

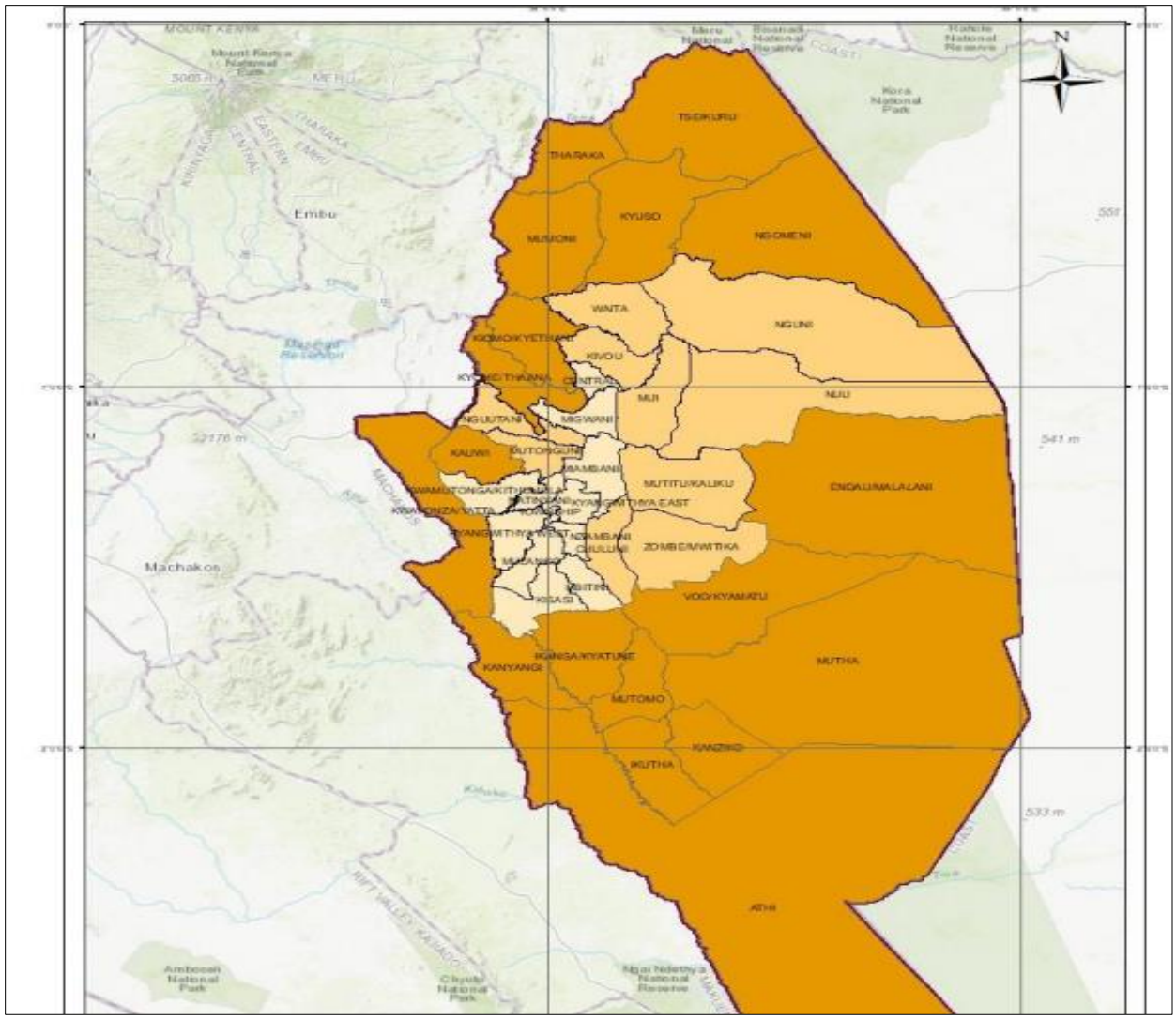


Figure 6: Map of Kitui County Showing Levels of Drought Distribution Across the Wards

8.4.3. Climate Adaptation Measures (Proposed Project)

Given the semi-arid conditions, recurrent droughts, extreme temperatures, flash floods, and environmental degradation in Kitui County, the proposed lime processing plant will incorporate a range of climate-resilient strategies to ensure sustainable operations while minimizing risks to the surrounding environment and communities.

Table 9: Adaptation Measures

Climate Hazard / Risk	Potential Impact on Plant & Environment	Adaptation / Mitigation Measures
Drought / Water Scarcity	Reduced water availability for plant operations; stress on local groundwater; impact on surrounding communities	○ Source water from a dedicated borehole with sustainable yield assessment ○ Install rainwater harvesting and storage tanks for non-process use ○ Implement water recycling within the plant for cleaning and cooling ○ Schedule operations efficiently to optimize water use
Extreme Temperatures	Increased heat stress on	○ Use energy-efficient kilns with heat

Climate Hazard / Risk	Potential Impact on Plant & Environment	Adaptation / Mitigation Measures
	equipment, workers, and materials; Risk of dust dispersion	recovery systems ○ Insulate key equipment and storage areas ○ Provide shaded work areas and heat stress management for workers ○ Maintain dust suppression through water spraying and vegetative buffers
Flash Floods / Heavy Rainfall	Damage to infrastructure, roads, and storage areas; soil erosion and sedimentation; contamination of water sources	○ Construct flood-resistant buildings, roads, and storage areas ○ Install stormwater diversion channels and retention basins ○ Stabilize slopes using terracing, gabions, and vegetation ○ Ensure proper drainage design to protect plant and surrounding land
Environmental Degradation (deforestation, soil erosion, pollution)	Loss of biodiversity, drying of water sources, soil degradation, pollution of surface and groundwater	○ Minimize land disturbance during construction ○ Implement proper waste collection, containment, and disposal systems ○ Rehabilitate disturbed areas with vegetation after construction ○ Establish buffer zones and green belts around the plant
Dust Emissions	Air quality degradation, health risks to workers and nearby communities, vegetation damage	○ Enclose conveyors, crushers, and storage areas ○ Install dust collection systems (bag filters, cyclones) ○ Use water spraying and vegetative barriers to suppress fugitive dust ○ Monitor air quality and maintain equipment regularly
Community Vulnerability / Livelihood Impacts	Loss of income due to climate impacts on agriculture and livestock; social conflicts	○ Provide local employment opportunities and skills training ○ Support community-based climate resilience programs ○ Develop emergency preparedness plans in coordination with local authorities

8.5 Environmental Baselines (Base Air Quality, Soil, Noise, Water Analyses)

8.6 Base Air Quality Analysis

8.6.1 Introduction

CSI International conducted a baseline air quality assessment on 25th March 2026 at the proposed site with land reference no. L.R No: Mutomo/Simisi/148, Ekani Area, Kitui South Sub County, Kitui County in full compliance with standard procedures and applicable regulations. The objective was to establish existing ambient air quality conditions before project operations commence, in line with the requirements of the Environmental Management and Co-ordination (Air Quality) Regulations, 2024, Legal Notice No. 180 of 2024. The monitoring focused on key pollutants specified under the regulations, and results summarized in Table 1 indicate that all measured parameters were within the permissible limits. This implies that the current air quality is satisfactory and poses no immediate risk to public health or the surrounding environment. The findings serve as an important baseline for future comparisons and impact assessments once operations begin. It is noted that results reflect conditions at the time of measurement and may vary with changes in weather or site activities.

8.6.2 Summary of Results

The baseline air quality assessment conducted involved the measurement of a range of critical air pollutants to establish the ambient environmental conditions prior to the start of production. The parameters measured included Carbon Monoxide (CO), Carbon Dioxide (CO_2), Hydrocarbons (CxHy), Nitrogen Monoxide (NO), Nitrogen

Dioxide (NO_2), total Nitrogen Oxides (NO_x), Oxygen (O_2), Ozone (O_3), Particulate Matter (PM_{10} and $PM_{2.5}$), and Sulphur Dioxide (SO_2). Results from the monitoring exercise shown in Table 3 and Table 4 indicated that the concentrations of all the pollutants were within the permissible limits set by the Environmental Management and Coordination (Air Quality) Regulations, 2014. This suggests that the current air quality at the site does not pose any immediate risks to human health or the environment. The findings provide a clean and reliable baseline against which future monitoring can be measured. Furthermore, the results support the company's readiness for regulatory compliance and reinforce its commitment to sustainable and environmentally responsible development. It should be noted that values represent the findings as at that particular time of assessment; hence, they are susceptible to deviation owing to prevailing conditions.

Table 10: Summary of Results

Company	Ndovu Rock Limited - Kitui												
Monitoring Purpose	EM - Residential, Rural & Other area												
Sample Location	CO	CO2	HC	NO	NO2	NO_X	O2	O3	PM10	PM2.5	SO2	H2S	VOC
	mg/m3	ppm	ppb	µg/m3	µg/m3	µg/m3	%	µg/m3	µg/m3	µg/m3	µg/m3	ug/m3	ppb
Ndovu Rock - Kitui	0.17	277.95	0.00	0.0227	0.0147	0.0374	20.91	0.00	34.53	12.51	44.528	0.000	0.00
Limit	4.0	9000.0	NP	NP	0.2	0.8	NP	0.12	75	NP	125	150	NP

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

Table 11: Ambient air quality results

NDOVU ROCK - KITUI				
	Average Pollutant	**Average in Standard units**	**TWA OEL -RL**	**Remarks**
Carbon Monoxide (CO)	0.15 ppm	0.17 mg/m^3	4 mg/m^3**	Within Limit
Carbon Dioxide (CO_2)	277.95 ppm	277.95 ppm	9000 ppm**	Within Limit
Hydrocarbons (C_xH_y)	0.00 ppm	0.00 ppm	NP	Not Provided
Nitrogen Monoxide (NO)	22.68 ppb	0.02 ppm	NP	Not Provided
Nitrogen Oxides (NO_2)	14.72 ppb	0.01 ppm	0.2 ppm	Within Limit
Nitrogen Oxides (NO_x)	37.41 ppb	0.04 ppm	0.8 ppm	Within Limit
Oxygen (O_2)	20.91 %	20.91 %	NP	Not Provided
Ozone (O_3)	0.00 ppb	0.00 ppm	0.12 ppm	Within Limit
Particulate Matter (PM_{10})	34.53 $\mu g/m^3$	34.53 $\mu g/m^3$	75 $\mu g/m^3$**	Within Limit
Particulate Matter ($PM_{2.5}$)	12.51 $\mu g/m^3$	12.51 $\mu g/m^3$	NP	Not Provided
Sulphur Dioxide (SO_2)	44.53 ppb	44.53 $\mu g/m^3$	125 $\mu g/m^3$**	Within Limit
Hydrogen Sulphide (H2S)	0.00 ppb	23.25 $\mu g/m^4$	150 $\mu g/m^3$**	Within Limit
Volatile Organic Compound (VOCs)	0.00 ppb	0.00 ppb	NP	Not Provided
Relative humidity (RH)	64.49 %			
Temperature	23.25 °C			
Wind direction	132.84 °			
Wind speed	5.76 kph			

KEY: $\mu g/m^3$ - microgram per cubic metre, mg/m^3 - milligram per cubic metre, ppm - parts per million, ppb - parts per billion, Values at Standard Temperature and Pressure (STP), * the 24-hour limit may not be exceeded more than three times in one year; ** 24-hour limit may not be exceeded more than three times in one year micrograms/m3, *** Not to be exceeded more than once per year average concentration
Emission limits are as stipulated under EMCA 2024; CO_2 limits are obtained from Occupational Safety and Health Act, of 2007

From the results, the following is recommended:

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

8.6.3 Conclusion

The baseline air quality monitoring conducted successfully established the pre-operational ambient air quality status at the proposed site with the results demonstrating that all measured pollutants, including particulate matter (PM_{10}, $PM_{2.5}$), nitrogen oxides (NO_x), Sulphur dioxide (SO_2), carbon monoxide (CO), carbon dioxide (CO_2) and ozone (O_3) were within the acceptable limits set by the Environmental Management and Coordination (Air Quality) Regulations, 2024. These findings indicate that the current air quality in the assessed area is acceptable and poses minimal risk to public health and the environment. The favorable results provide a solid foundation for planning future developments, ensuring that ongoing monitoring and management practices can maintain these air quality levels and address any potential increases in pollutant concentrations.

8.7 Baseline Noise Assessment

8.7.1 Introduction

Baseline Noise Assessment refers to the measurement of the existing ambient noise levels in an area, serving as a reference point for evaluating future noise impacts from new projects or developments measured in dBA which is the unit on the A scale for quiet sounds

The CSI International carried out baseline noise assessment at the proposed site (Mutomo/Simisi/148, Ekani Area, Kitui South Sub County, Kitui County) with strict adherence to the standard protocols. The aim of the exercise was to establish the current noise levels for future reference and comparison for the control and mitigation of noise pollution at the proposed area before operations begin. The survey was conducted under the provisions of Environmental Management and Coordination (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009. Results shown in Table 1 revealed that the noise levels at the assessed area were within the limits provided in the Noise and Excessive Vibration Pollution Control Regulations, 2009. This indicates that the current noise assessment in the area is acceptable and poses minimal risk to public health and the environment. The noise results submitted herein are as at the time of measurement and may vary based on the activities of the company.

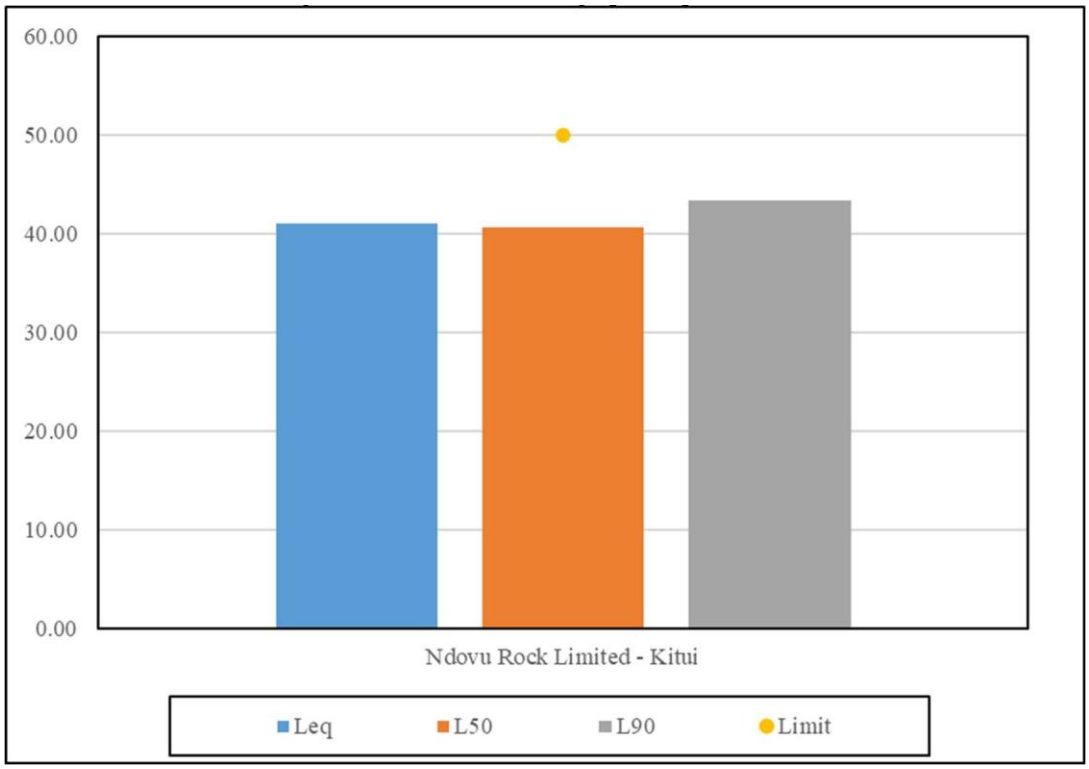
8.7.2 Results Summary and Discussion

The baseline noise levels were benchmarked against the Factories and other Places of Work (Noise Prevention and Control) Rules 2005 and The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009. The summaries of results shown in Table 5 and Figure 2 below shows that the noise levels at the assessed area were within the limits provided in the Noise and Excessive Vibration Pollution Control Regulations, 2009. This indicates that the current noise assessment in the area is acceptable and poses minimal risk to public health and the environment. The noise results submitted herein are as at the time of measurement and may vary based on the activities of the company.

Table 12: Noise monitoring results (standard noise monitor)

Noise Assessment - Ndovu Rock Limited, Kitui										
Purpose:	Baseline Assessment			**Date of assessment**			**3/25/2026**			
Method:	ISO 1996			**Sample duration (min)**			**60**			
Instrument:	Extech Instruments 407750									
	Time and date			**Noise Levels, dB(A)**					**Standard limits, dB (A)**	
Sample Location	**Date**	**Start time**	**End time**	**L_{eq}**	**L_{50}**	**L_{90}**	**L_{max}**	**L_{min}**	**Limit**	**L_{peak} limit**
Ndovu Rock Limited - Kitui	25/03/2026	14:11:18	15:11:35	40.99	40.56	43.30	44.00	37.00	50	140
Legend: The monitoring standards used during assessment was the Factories and Other Places of Work (Noise Prevention and Control) Rules 2005 and The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009; The noise levels are in dB(A).										

Figure 7:Figure 4 Noise assessment graphical presentation



8.7.3 Conclusion

The baseline noise levels measured were within the limits stipulated under the Factories and Other Places of Work (Noise Prevention and Control) Rules 2005 and The Environmental and Coordination (Noise Excessive Vibration Pollution) (Control) Regulations, 2009. This indicates that the current noise assessment in the area is acceptable and poses minimal risk to public health and the environment. The noise results submitted herein are as at the time of measurement and may vary based on the activities of the company.

8.8 Baseline Soil Analysis

The results are tabulated below in the Certificate of Analysis:

Serial Number: CCSI16529

CERTIFICATE OF ANALYSIS

Client:	Ndovu Rock Limited	**Sample Type:**	Potable Water
Contact Details:	Kitui	**Sampled By:**	CSI International Ltd
Sample ID:	Water	**Sampling Date:**	25/03/2026
Lab Batch No.:	26/0192	**Lab. Ref. No.:**	CSI16529
Date Received:	26/03/2026	**Date Analysis Started:**	27/03/2026
Date Analysis Completed:	31/03/2026	**Date Released:**	01/04/2026

Standard Reference: KS EAS 12: 2018-Specification for Potable Water

PARAMETER	METHOD	RESULTS	[1]STANDARD (Max Limits)
Chemical			
[2] pH	CSITP 002	6.69	5.5 - 9.5
[2] Electrical Conductivity, µS/cm	CSITP 004	153.0	2500
[2] Total Dissolved Solids (TDS), mg/L	CSITP 012	77	1500
Suspended Matter, mg/L	**CSITP 007**	**10**	**Not detectable**
[2] Sodium as Na^+, mg/L	CSITP 003	8.95	200
[2] Potassium as K^+, mg/L	CSITP 003	3.68	50
[2] Iron as Fe^{2+}, mg/L	CSITP 003	0.22	0.3
[2] Zinc as Zn^{2+}, mg/L	CSITP 003	0.27	5.0
[2] Calcium as Ca^{2+}, mg/L	CSITP 003	6.18	150
[2] Magnesium as Mg^{2+}, mg/L	CSITP 003	4.62	100
Total Hardness as $CaCO_3$, mg/L	CSITP 003	34.45	600
[2] Lead as Pb^{2+}, mg/L	CSITP 003	<0.01	0.01
[2] Copper as Cu^{2+}, mg/L	CSITP 003	<0.01	1.00
[2] Manganese as Mn^{2+}, mg/L	CSITP 003	<0.01	0.10
[2] Chloride as Cl^-, mg/L	CSITP 017	7.80	250
[2] Sulphates as SO_4^{2-}, mg/L	HACH Method 8051	3.00	400
[2] Nitrate as NO_3^-, mg/L	HACH Method 8039	0.40	45
[2] Fluoride as F^-, mg/L	HACH Method 8029	<0.01	1.5

np - No standard reference for the parameter
<0.01 - Below Detection Level
[1]Standard values quoted are taken from KS EAS 12:2018 Potable water — Specification (Untreated Water)
[2]All parameters are KENAS accredited
All parameters are NEMA accredited.
To maintain the correct history ensure that the next sample sent from this Source is labelled: Water
Uncertainty of Measurement and QA Data will be provided on request.
These results relate to the items sampled.
Sampling Method: CSI/QMS/STIRH/SP 20 - Test Item Receipt, Sampling, and Handling Procedure
History is 30 days

Chemistry Lab:

Masitsa

Gloria Masitsa
Chemical Analyst
01/04/2026

Authorised by:

Isaac Namachi
Quality Assurance Manager
01/04/2026

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8.9 Baseline Water Analysis

Results have been tabulated below in the certificate of analysis:

Serial Number: CCSI16529

CERTIFICATE OF ANALYSIS

Client:	Ndovu Rock Limited	**Sample Type:**	Potable Water
Contact Details:	Kitui	**Sampled By:**	CSI International Ltd
Sample ID:	Water	**Sampling Date:**	25/03/2026
Lab Batch No.:	26/0192	**Lab. Ref. No.:**	CSI16529
Date Received:	26/03/2026	**Date Analysis Started:**	27/03/2026
Date Analysis Completed:	31/03/2026	**Date Released:**	01/04/2026

Standard Reference: KS EAS 12: 2018-Specification for Potable Water

PARAMETER	METHOD	RESULTS	[1]STANDARD (Max Limits)
Chemical			
[2] pH	CSITP 002	6.69	5.5 - 9.5
[2] Electrical Conductivity, µS/cm	CSITP 004	153.0	2500
[2] Total Dissolved Solids (TDS), mg/L	CSITP 012	77	1500
Suspended Matter, mg/L	**CSITP 007**	10	Not detectable
[2] Sodium as Na^+, mg/L	CSITP 003	8.95	200
[2] Potassium as K^+, mg/L	CSITP 003	3.68	50
[2] Iron as Fe^{2+}, mg/L	CSITP 003	0.22	0.3
[2] Zinc as Zn^{2+}, mg/L	CSITP 003	0.27	5.0
[2] Calcium as Ca^{2+}, mg/L	CSITP 003	6.18	150
[2] Magnesium as Mg^{2+}, mg/L	CSITP 003	4.62	100
Total Hardness as $CaCO_3$, mg/L	CSITP 003	34.45	600
[2] Lead as Pb^{2+}, mg/L	CSITP 003	<0.01	0.01
[2] Copper as Cu^{2+}, mg/L	CSITP 003	<0.01	1.00
[2] Manganese as Mn^{2+}, mg/L	CSITP 003	<0.01	0.10
[2] Chloride as Cl^-, mg/L	CSITP 017	7.80	250
[2] Sulphates as SO_4^{2-}, mg/L	HACH Method 8051	3.00	400
[2] Nitrate as NO_3^-, mg/L	HACH Method 8039	0.40	45
[2] Fluoride as F^-, mg/L	HACH Method 8029	<0.01	1.5

np - No standard reference for the parameter
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[2]All parameters are KENAS accredited
All parameters are NEMA accredited.
To maintain the correct history ensure that the next sample sent from this Source is labelled: Water
Uncertainty of Measurement and QA Data will be provided on request.
These results relate to the items sampled.
Sampling Method: CSI/QMS/STIRH/SP 20 - Test Item Receipt, Sampling, and Handling Procedure
History is 30 days

Chemistry Lab:

Masitsa

Gloria Masitsa
Chemical Analyst
01/04/2026

Authorised by:

Isaac Namachi
Quality Assurance Manager
01/04/2026

9. ENVIRONMENTAL AND SOCIAL MANAGEMENT AND MONITORING PLAN (ESMMP)

9.1. Brief Overview

The purpose of the Environmental and Social Management and Monitoring Plan (ESMMP) is to ensure that the social and environmental impacts and risks identified during the Environmental and Social Impact Assessment (ESIA) process are effectively managed throughout the construction, operation, and decommissioning phases of the Project. The ESMP outlines the mitigation and management measures to which the proponent (**Ndovu Rocks Limited**) is committed, and it demonstrates how the Project will allocate organizational capacity and resources to implement these measures.

Furthermore, the ESMMP details the scheduling of mitigation and management activities and ensures that the Project complies with all applicable laws and regulations in Kenya, as well as relevant policies. The key objectives of the ESMP are to:

- Formalize and disclose the program for environmental and social management; and
- Provide a structured framework for implementing environmental and social management initiatives.

In accordance with recognized best practice principles, the ESMP prioritizes proactive measures to minimize, and where feasible, prevent adverse environmental and social impacts, while simultaneously enhancing positive outcomes. These principles have underpinned the development and execution of the ESIA process, ensuring a systematic and evidence-based approach to impact management. The ESMP provides detailed information on the management and mitigation measures that will be implemented to address potential impacts during the following phases of the Project:

- Pre-construction and construction activities;
- Operation; and
- Decommissioning

9.2. Environmental and Social Management Plan (ESMP)

This section outlines the potential adverse impacts, mitigation measures, monitoring and management responsibilities during construction and operation phases of the proposed project. The purpose of ESMP is to:

- Provide an institutional mechanism with well-defined roles and responsibilities for ensuring that measures identified in ESIA designated to mitigation potentially adverse impacts are implemented.
- List all suggested mitigation measures and control technologies, safeguards identified through the ESIA process.
- Provide Project monitoring program for effective implementation of the mitigation measures and ascertain efficacy of the environmental management and risk control systems in place; and
- Assist in ensuring compliance with all relevant legislations at local, County and national level for the Project.

9.3. Monitoring

To implement the ESMP, the on-site team will adhere to a time-bound and action oriented Environmental and Social Action Plan to implement the mitigation measures provided for each of the identified environmental and social impacts. This ESMP will be monitored on a regular basis, quarterly or half-yearly, and all outcomes would need to be audited in accordance with existing EHS and NEMA environmental policies. The monitoring process will cover all stakeholders including contractors, laborers, supplier, and local community impacted by the proposed project activities and associated facilities thereby increasing the effectiveness of suggested mitigations measures

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
Construction Phase					
Habitat Destruction and Disturbance	• Restrict vegetation clearing strictly to the minimum area required for construction and operations, • Identify and completely protect ecologically sensitive zones (e.g., wetlands, mature trees), • Conduct detailed pre-construction ecological walk-down; demarcate sensitive zones with "No-Go" fencing or signage, • Establish and maintain vegetated buffer zones around the project site using indigenous or fast-growing native species, • Plant native trees, shrubs, and grasses immediately after construction in designated buffer areas; use species suitable for local soil, • Educate workforce on biodiversity protection and "No-Go" zones.	% of area cleared vs. approved footprint Hectares rehabilitated with indigenous vegetation Community participation records in restoration/tree planting Biodiversity monitoring reports (species richness, abundance)	Contractor, Proponent	Monthly, with annual biodiversity audits	1,500,000.00
Noise and Vibration	• Schedule high-noise construction activities (e.g., blasting, primary/secondary crushing, heavy truck movements, and major maintenance) strictly between 08:00 and 18:00 hours on weekdays, • Fit high-efficiency silencers and mufflers on all exhaust systems of diesel engines, generators, compressors • Develop and implement a Community Notification Protocol as part of the Stakeholder Engagement Plan, • Notify nearby households, schools, and community leaders at least 48–72 hours in advance of any scheduled high-noise activities, • Establish a Grievance Redress Mechanism (GRM) specifically for noise-related complaints, with timely investigation and response, • Provision and mandatory use of hearing protection (earmuffs or earplugs) for workers in areas where noise exceeds 85 dB(A).	Noise level measurements at nearest receptors; site inspection		Weekly; during noisy operations	
Soil Degradation and Erosion	• Restrict excavation and earthworks to designated project footprints to minimize unnecessary soil disturbance and preserve surrounding areas. • Clearly demarcate and enforce boundaries of working areas using visible markers or fencing to prevent accidental disturbance of soils outside the construction zones • Install temporary drainage structures such as	Visual inspection; erosion tracking	Contractor, Proponent	Weekly	500,000

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
	channels, silt traps, and check dams to effectively manage surface runoff, minimize soil erosion, and control sedimentation during construction • Design and implement site drainage systems that effectively collect stormwater and channel it into a designated reservoir. This approach will minimize uncontrolled surface runoff, reduce erosion risks, and allow harvested water to be stored for potential reuse (e.g., dust suppression, irrigation of rehabilitated areas), • Replant cleared areas and establish buffer zones with indigenous vegetation to stabilize soils, reduce erosion, and promote ecological recovery. • Implement progressive rehabilitation throughout the construction phase, restoring disturbed areas as soon as activities are completed, rather than deferring restoration until project decommissioning • Conduct routine site inspections to identify early signs of soil erosion, sediment deposition, or compaction, particularly after heavy rainfall events. • Adopt adaptive management practices by adjusting or reinforcing mitigation measures (e.g., strengthening drainage structures, reseeding vegetation, or soil aeration) based on monitoring outcomes to ensure continued effectiveness.				
Waste Generation	• A Waste Management Plan (WMP) will be developed for the construction phase, emphasizing waste minimization at source, segregation for reuse, recycling of recoverable materials, and safe disposal of residual waste in compliance with the Waste Management Regulations, 2024, • Provision of adequate colour-coded bins on-site to facilitate segregation of waste streams (organic, recyclable, and hazardous) at the source, • The Contractor shall provide adequate temporary ablution facilities on-site and will be fully responsible for the safe treatment and/or removal of sewage waste to licensed off-site facilities, • The Contractor shall ensure that any company engaged for sewage waste removal is accredited, licensed, and holds the necessary permits from relevant regulatory authorities	Inspection of waste segregation, storage, and disposal records	Contractor, Proponent	Weekly	1,200,000
Occupational Health & Safety	• Develop a comprehensive Construction Health & Safety Plan in compliance with the Occupational	Safety audits; PPE compliance checks;	Contractor, Proponent	Weekly; daily checks for PPE	2,000,000

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
(OHS)	Health and Safety Act, 2007, identifying risks and specifying mitigation protocols, • Provide adequate PPE to all workers and deliver training on proper usage. • Conduct regular site inspections and third-party audits to ensure effective implementation of all health and safety measures, • All workers and contractor personnel involved in the construction of the solar farm shall undergo comprehensive Environmental Health and Safety (EHS) training prior to commencing work including, ○ Safe operation of machinery, working at heights, lifting procedures, and use of personal protective equipment (PPE). ○ Proper handling and disposal of construction waste, dust and noise mitigation, and protection of local flora and fauna. ○ Procedures for accidents, fire incidents, chemical spills, and medical emergencies. ○ Worker–community interactions, prohibitions on illegal activities, and adherence to workplace behavioural standards • Toolbox Talks will be conducted regularly on-site as part of the Environmental, Health, and Safety (EHS) program. These short, focused sessions aim to reinforce safe working practices, raise awareness of environmental and social responsibilities, and provide updates on emerging site risks.	incident reports		use	
Traffic & Access Disruptions	• The Proponent and Contractor shall develop and implement a comprehensive Traffic Management Plan (TMP) that includes: ○ Vehicle safety protocols and designated speed limits on project and public roads. ○ Guidelines for responsible driver and passenger behaviour, including strict prohibitions on drug and alcohol use. ○ Defined hours of operation and mandatory rest periods for drivers. ○ Designated rest stops along transport routes. ○ Procedures for accident reporting, investigation, and corrective actions to minimize recurrence. • All project vehicles shall be regularly serviced and maintained to ensure safe and reliable operation.	Traffic inspections; community feedback	Contractor, Proponent	Daily; during deliveries	To be determined

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
	• Vehicles operating on the project site shall adhere to a speed limit of 20 km/h or less to reduce accident risk and improve safety for workers and nearby communities.				
Community Health & Safety	• The appointed Contractor will develop a worker induction programme that includes a Code of Conduct. The Code will be presented to all workers (including subcontractors and their workers), explained in detail, and signed by each individual to ensure commitment to appropriate behaviour on and off the Site, • All workers will be required to sign the Code of Conduct at the start of their contract. Any worker found in contravention will face disciplinary procedures, which may include dismissal, to ensure compliance and maintain social order, • The contractor will establish and implement an accessible grievance procedure for local communities. This mechanism will allow community members to lodge complaints related to contractor or employee behaviour, with timely and transparent responses provided to ensure accountability and maintain good community relations, • The Proponent, in collaboration with the appointed Contractor, shall develop and implement a monitoring system to control site access. Unauthorized entry will be strictly prohibited, and all visitors will be required to report to the site office for registration and authorization prior to accessing the project area.	Site inspection; community feedback	Contractor, Proponent, and DOSH	Weekly	2,000,000
Labor Influx / Social Impacts	• The project proponent will give priority to qualified local residents for employment opportunities, particularly for unskilled and semi-skilled positions, in order to reduce the need for external labour. • Where external workers are required, the proponent will ensure that appropriate accommodation arrangements are made to avoid unnecessary pressure on local housing facilities • All project workers will be required to adhere to a strict code of conduct that promotes respectful engagement with local communities and discourages any form of misconduct. • Continuous engagement with the local community will be undertaken to address emerging concerns and maintain good relations between workers and	Worker recruitment records; community feedback	Contractor, Proponent, Ministry of Labour	Monthly	To be determined

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
	residents. • The project will provide adequate facilities within the project site to minimize pressure on community services. • Awareness programs on public health issues, including prevention of communicable diseases, will be implemented for both workers and the surrounding communities. • Where feasible, the proponent may collaborate with local authorities and communities to support improvements in key infrastructure and services.				
Gender-Based Violence & Harassment	• The project proponent will implement a strict zero-tolerance policy against all forms of gender-based violence, harassment, and exploitation within the workplace and surrounding communities. • All employees and contractors will be required to sign and adhere to a code of conduct that clearly prohibits harassment, abuse, discrimination, and exploitation. • Regular training and sensitization programs will be conducted for workers and management on GBVH prevention, respectful workplace behavior, and community relations; • A confidential and accessible grievance reporting system will be established to enable workers and community members to report cases of harassment or misconduct safely. • The project will work with local leaders and community members to raise awareness about GBVH risks and available reporting channels. • The proponent will promote equal employment opportunities for women and ensure that the workplace environment is safe, respectful, and free from discrimination. • Where necessary, the project will collaborate with local administration and relevant institutions to address any reported cases and ensure appropriate action is taken.	Records of training and reporting mechanisms	Contractor, Proponent, MoH and County Government	Monthly; quarterly review	2,500,000
Spread of Communicable Diseases (STIs, HIV/AIDS, Waterborne)	• The contractor shall develop and implement a comprehensive HIV/AIDS and disease transmission Policy for all workers directly associated with the Project. The policy will include an information document that: ○ Provides education and awareness on prevention, testing, and treatment.	Health records; sanitation inspections	Contractor, Proponent, MoH and County Government	Monthly	1,500,000

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
	○ Outlines workplace protocols for supporting affected employees without discrimination. ○ Ensures that all workers receive induction training covering HIV/AIDS and disease risks, prevention strategies, and access to healthcare services. ○ Encourages voluntary counselling and testing (VCT) in collaboration with local health facilities. ○ The Proponent and Contractor shall ensure that male and female condoms are made readily available to all employees and contractor workers during both the construction, • The Worker Code of Conduct for all Project personnel shall explicitly outline guidelines governing worker–worker interactions, worker–community interactions, and the development of personal relationships with members of local communities, • The Worker Code of Conduct will explicitly forbid all project personnel from engaging in illegal activities, including but not limited to the use of commercial sex workers and transactional sex, • Accommodation should be provided to external workers in accordance with good international practice on workers' accommodation.				
Cultural & Archaeological Resources	• Stop works if artifacts are discovered. • Inform National Museums of Kenya or relevant authority.	Incident reports; documentation of discoveries	Contractor, Proponent/NMK	As needed	
Operation Phase					
Air Quality (Air Pollution)	• Install fabric bag filters (or Electrostatic Precipitators systems) on kiln and process vents, • Install venturi or packed-bed wet scrubbers to capture particulate matter, acid gases (SO_2 , HCl), and soluble pollutants, • Scheduled preventive and corrective maintenance of all air pollution control equipment and process units to sustain efficiency, • Fully or partially enclosed material transport systems to contain dust at transfer points, • Install active and passive methods to wet or contain fugitive dust at source, and • Optimize kiln feed size and combustion; minimize	Dust levels at site boundary; frequency of spillage incidents; visual cleanliness of paved areas	Environmental Officer / Plant Manager	Weekly	1,500,000.00

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
	material drop heights.				
Noise and Vibration	• All vehicles, machinery, and on-site equipment shall be maintained in good mechanical condition and fitted with appropriate acoustic suppression devices, such as mufflers and silencers, to minimize exhaust emissions and operational noise levels. • Regular servicing and preventive maintenance programs shall be implemented to ensure optimal engine performance, reduce emissions, and maintain compliance with manufacturer specifications and applicable environmental standards, • Where feasible, acoustic barriers, noise screens, or vegetative buffers shall be established along the site boundary, particularly on sides adjacent to residential or institutional areas, to help absorb and deflect sound, • Workers exposed to elevated noise levels shall be provided with appropriate personal protective equipment (PPE) such as earmuffs or earplugs, and work rotation schedules shall be adopted to reduce prolonged exposure, • Lining steel aggregate bins and hoppers with sound-absorbing material such as industrial rubber where appropriate on a site-specific basis to manage noise, and • Periodic noise monitoring shall be undertaken at site boundaries and key operational points to ensure compliance with the Environmental Management and Coordination (*Noise and Excessive Vibration Pollution Control*) Regulations, 2009	Noise measurements at site boundary; PPE usage compliance; maintenance logs	HSE Officer / Plant Manager	Quarterly	300,000.00
Water Quality (Water Pollution)	• Provide separate and dedicated drainage systems for clean and contaminated stormwater, including the installation of a 'first-flush' system to capture initial runoff that typically carries higher pollutant loads. • Minimize the risk of stormwater contamination by implementing effective measures to prevent, contain, and promptly clean up any spillages or accumulated dust within the facility. • Ensure that all contaminated stormwater and process wastewater are collected, retained on-site, and either treated appropriately or disposed of by a licensed waste handling contractor. Under no circumstances should such wastewater be discharged off-site. • Design and construct impervious concrete surfaces in	Water quality test results; functionality of drainage system; Incidents of contaminated runoff	Environmental Officer / Plant Engineer	Quarterly	450,000.00

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
	all areas that generate wastewater or potentially contaminated stormwater. These surfaces should be properly graded to ensure that all runoff drains into a designated collection and treatment system. • Settlement ponds used for wash-down water shall be equipped with a sloping sludge interceptor to facilitate the effective separation of sediments from water, thereby enhancing reuse or safe discharge following treatment.				
Hazardous Material Handling (Chemicals)	• Maintain an up-to-date inventory of all chemicals stored on-site, including their types, volumes, and storage locations. All chemicals should be clearly identifiable at all times. • Ensure that all containers of hazardous chemicals are properly labelled with the product name, contents, hazard classification, and appropriate safety warnings. • Verify that each chemical product purchased or used is accompanied by a Safety Data Sheet (SDS). Where an SDS is missing, it should be promptly obtained from the supplier. The SDS register should be readily accessible to all staff and regularly updated. • Provide training to all staff on the safe handling, use, and storage of chemicals, and ensure that personnel are familiar with the information on product labels and SDSs. • Minimize the movement of chemicals within the site to reduce the risk of spills or leaks. Containers should always be handled with care and transported using appropriate equipment. • Maintain spill response materials, such as spill kits, absorbents, and containment booms, at strategic locations within the facility to allow for immediate response to any accidental releases. • Develop and implement a comprehensive Chemical Management and Spill Response Plan to guide safe handling practices, minimize environmental risk, and ensure compliance with environmental regulations, thereby reducing the likelihood of committing an environmental offence.	Inventory audits; SDS availability; Training attendance records; Incident reports	Environmental Officer / HSE Officer	Quarterly	300,000.00
Waste Management (Inappropriate	• Prepare and implement a comprehensive Waste Management Plan (WMP) to identify, quantify, and characterize all waste streams generated during the	Waste disposal records; waste segregation audits; compliance with	Environmental Officer / Plant Manager	Monthly	200,000.00

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
Disposal)	plant's operations. The WMP should outline the sources of each waste stream, methods of handling, storage, transport, and final disposal, in compliance with relevant environmental regulations. • Concrete truck agitators and chutes shall not be rinsed out near stormwater drains, roadways, or open ground surfaces to prevent contamination of stormwater and surrounding soil. Designated washout areas with impervious surfaces and proper containment should be provided for this purpose. • All concrete dispatched and returned to the batching plant must be carefully tracked and recorded to ensure that excess or waste concrete is managed responsibly either through reuse in site works (e.g., paving, curbing) or disposal through an approved waste management facility. • All waste shall be stored in suitable, properly labelled containers that are kept closed except when waste is being added. Each container label should clearly indicate the type of waste, date of generation, and any other relevant safety or handling information. • Wastes must not be mixed, except where compatibility has been verified (e.g., compatible flammable solvents). Different classes of waste such as hazardous, non-hazardous, and recyclable materials must be segregated to avoid unwanted chemical reactions and facilitate efficient waste management. • Only licensed and NEMA-approved waste transporters shall be engaged to handle and transport regulated waste. Accurate records, including waste manifests, contracts, and receipts for all waste collection and disposal activities, must be maintained and kept for audit purposes. • Hazardous waste must never be poured onto the ground, into the sewer system, or placed in general waste bins. Such practices are prohibited under the Environmental Management and Coordination (Waste Management) Regulations, 2024. • Open burning of waste on-site is strictly prohibited. All waste materials must be handled in an environmentally sound manner to minimize pollution and protect human health.	WMP			

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
Occupational Health and Safety (OSH Risks)	• Develop and implement a comprehensive Occupational Health and Safety Policy in compliance with the Occupational Safety and Health Act (OSHA), 2007 and related subsidiary legislation. The policy should outline roles, responsibilities, and safe work procedures for all site activities, • Provide regular training and induction for all employees and subcontractors on safe work practices, hazard identification, emergency response, and proper use of personal protective equipment (PPE). Training should be documented and refreshed periodically, • Ensure that all workers are provided with and consistently use appropriate PPE, including dust masks or respirators, safety goggles, gloves, ear protection, high-visibility clothing, helmets, and safety boots, • Minimize dust exposure through dust suppression (e.g., water spraying, enclosure of mixers and conveyors, and proper ventilation). Workers operating in dusty areas should use approved respirators, • All machinery, conveyors, and mixers shall be fitted with safety guards and emergency stop mechanisms. Regular inspection and preventive maintenance schedules should be implemented to prevent mechanical failures and accidents, and • Lime, admixtures, fuels, and lubricants shall be handled carefully and stored in clearly labelled containers within bunded and ventilated areas. Safety Data Sheets (SDS) should be accessible, and workers trained in spill prevention and response procedures, • Maintain first aid kits, fire extinguishers, and spill kits at strategic points within the plant. Designate and train first aiders and fire marshals. • Develop and display an Emergency Response Plan outlining actions for fire, chemical spills, injuries, or other incidents, and • Appoint a Safety Officer to oversee implementation of OHS measures and ensure compliance with OSHA, 2007 and other relevant regulations, including NEMA and Directorate of Occupational Safety and Health Services (DOSHS) requirements.	Safety audits; Training records; PPE usage; Incident and near-miss reports	Environmental Officer / HSE Officer	Weekly	1,200,000,00
Impacts on	• Ensure that plant operations do not compromise	Water and electricity	Plant Manager /	Monthly	2,000,000.00

Potential Impact	Mitigation Measures	Monitoring Indicators	Responsible Party	Frequency	Cost Estimate (Ksh)
Utilities	water availability or pressure for neighboring residential or commercial users, • Adopt water-saving measures where possible, including recycling washout water and reusing water for dust suppression, • Keep records of water and electricity consumption to identify trends, detect anomalies, and plan for future expansions without overloading local infrastructure, • Consider installation of backup generators to maintain operations during power interruptions and reduce dependence on the public grid, • Ensure proper collection, containment, and disposal of concrete washout water to prevent contamination of stormwater drains and public sewers, • Schedule high-water-demand activities, such as equipment cleaning and dust suppression, during periods of stable supply to minimize strain on the network, • Install buffer storage tanks to maintain a reserve water supply during periods of peak demand or temporary interruptions in municipal supply, and • Explore rainwater harvesting options to supplement water needs, reduce dependency on the public water network, and enhance the sustainability of plant operations	consumption logs; availability of buffer tanks; Operational continuity	Environmental Officer		

Table 13: Environmental Monitoring Parameters

Environmental/Operational Aspect	Parameters to Monitor	Monitoring Method	Frequency	Threshold / Standard
Air Quality (Dust and Particulates)	PM_{10}, $PM_{2.5}$, total suspended particulates (TSP); visible dust emissions	Ambient air monitoring using dust monitors; visual inspections; complaint records	Weekly	PM10 ≤ 150 µg/m³ (Kenya Ambient Air Quality Standards)
Noise and Vibration	Decibel (dB) levels at plant boundary, nearby residential areas	Sound level meters; periodic noise surveys	Monthly	Max 70 dB(A) for industrial areas (Environmental Management & Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009)
Water Quality (Stormwater & Wastewater)	pH, alkalinity, TSS, dissolved oxygen, heavy metals (if any), hydrocarbons	Grab sampling; laboratory analysis; inspection of drainage and retention ponds	Monthly	Comply with Water Quality Regulations, 2024; treated wastewater standards
Hazardous Material Handling	Chemical storage compliance; spill incidents; SDS availability	Visual inspections; inventory audits; Incident reporting	Quarterly	100% compliance with SDS and storage labeling
Waste Management	Quantity of solid waste generated, type, disposal method; hazardous waste handling	Waste audits; inspection of storage areas; waste transporter records	Monthly	Zero illegal disposal; 100% compliance with WMP
Occupational Health and Safety (OHS)	PPE usage, workplace injuries, incidents related to dust, noise, or chemical exposure.	Safety audits; incident/near-miss reporting; staff training attendance	Weekly / Monthly	Zero fatalities; reduction in reported incidents; 100% PPE compliance
Utilities (Water & Power)	Fuel consumption, kiln efficiency, energy recovery efficiency	Meter readings; pressure gauges; backup generator logs	Monthly	Continuous operations without network disruption; maintain minimum operational pressure

9.4. Decommissioning Phase

The decommissioning phase of the plant involves the planned shutdown, dismantling, and removal of plant equipment, structures, and materials, while ensuring minimal environmental impact and restoration of the site to a safe and stable condition. Proper decommissioning also ensures compliance with NEMA guidelines, Occupational Health and Safety (OHS) requirements, and Kitui County Government environmental regulations and bylaws.

9.4.1. Decommissioning Activities

The decommissioning phase will begin with thorough planning and documentation:

- Decommissioning Plan: the proponent shall develop a detailed plan outlining the scope of work, project schedule, assigned responsibilities, and environmental safeguards. This plan should also address contingency measures for unforeseen circumstances.
- Pre-Decommissioning Site Assessment: Comprehensive site assessment shall be conducted to identify hazardous materials (e.g., fuels, chemicals, admixtures), waste streams, and environmentally sensitive areas, including soil, vegetation, and nearby water bodies.
- Regulatory Notifications: Notification to relevant authorities, including NEMA, and NCCG, and obtain all necessary permits and approvals prior to commencing decommissioning activities. This ensures compliance with national environmental regulations and industrial standards.

9.4.2. Activities

The decommissioning phase will be undertaken at the end of the plant's operational life and will involve the dismantling of structures and equipment, proper waste disposal, site remediation, and restoration to ensure the site is returned to a safe and ecologically stable condition. All planned activities will be executed in accordance with national environmental regulations, NEMA guidelines, and occupational safety standards.

Decommissioning Phase	Key Activities
Equipment and Structure Removal	Dismantling of machinery, silos, conveyors, storage tanks, and ancillary structures
Waste Management	Management of generated waste
Site Remediation and Restoration	Restoration of site to stable and ecologically sound condition
Occupational Health and Safety (OHS)	Protecting workers during decommissioning
Utilities Decommissioning	Safe disconnection and removal of utilities

Table 14: Decommissioning Management Plan

Activity	Description & Mitigation Measures	Responsible Party	Monitoring Indicators	Frequency
Planning and Documentation	– Develop a detailed Decommissioning Plan with scope, schedule, responsibilities, and environmental safeguards – Conduct pre-decommissioning site assessment to identify hazardous materials and sensitive receptors. – Obtain all regulatory approvals from NEMA and other authorities.	Plant Manager / Environmental Officer	Approval documentation; completion of pre-assessment report	Once, prior to decommissioning
Equipment and Structure Removal	– Dismantle machinery, silos, conveyors, storage tanks, and ancillary structures following engineering safety standards. – Salvage and recycle reusable materials (steel, concrete, timber) to reduce waste. – Remove foundations/paved surfaces where necessary; – stabilize remaining areas to prevent erosion.	Plant Engineer / Contractor	Completion checklist; quantity of materials salvaged/recycled	During decommissioning
Waste Management	– Segregate hazardous and non-hazardous wastes. – Engage licensed, NEMA-approved contractors for removal of chemicals, fuels, and contaminated equipment. – Reuse concrete residues where safe or dispose at approved facilities. – Prohibit burning, dumping, or discharge to stormwater or land.	Environmental Officer / Waste Contractor	Waste disposal records; compliance audits; absence of illegal dumping	During decommissioning
Site Remediation and Restoration	– Decontaminate areas used for chemicals, fuel handling, or washout ponds. – Grade and level the site for proper drainage. – Re-vegetate with native plant species. – Remove or neutralize temporary containment structures after site stabilization.	Environmental Officer / Plant Engineer	Soil and water quality tests; successful vegetation establishment; Site stability	During decommissioning / post-decommissioning inspection
Occupational Health and Safety (OHS)	– Provide PPE for all personnel. – Conduct risk assessments for high-risk activities (crane operations, heavy lifting, chemical handling). – Maintain first aid kits, fire extinguishers, and spill kits – Train first aiders and fire marshals.	Safety Officer / HSE Officer	PPE compliance; Incident and near-miss reports; training records	Daily / weekly during decommissioning
Utilities Decommissioning	– Disconnect water, electricity, and fuel connections safely. – Remove storage tanks, pipelines, and pumps	Plant Engineer / Utilities Manager	Verification of safe disconnection; Residual contamination	During decommissioning

Activity	Description & Mitigation Measures	Responsible Party	Monitoring Indicators	Frequency
	after proper cleaning and decontamination.		testing	
Monitoring and Reporting	– Monitor environmental parameters (dust, noise, runoff) during dismantling. – Prepare a Decommissioning Report including all activities, waste handling, and site restoration status. – Submit the report to NEMA.	Environmental Officer / Plant Manager	Monitoring logs; Submission of report; compliance with regulatory standards	Continuous / post-decommissioning

10. CONCLUSION AND RECOMMENDATIONS

10.1. Conclusion

The Environmental and Social Impact Assessment (ESIA) study for the proposed Lime Processing Plant with a production capacity of 80 metric tonnes per day (MT/day) of quicklime (CaO) and/or hydrated lime ($Ca(OH)_2$), including associated limestone quarrying and auxiliary facilities, has comprehensively evaluated the potential environmental, social, and economic implications of the project. The proposed project is considered important and beneficial to the national and local economy. It will contribute towards industrial development in line with Kenya's Vision 2030 (Economic and Macro Pillar) and the National Industrialization Policy by adding value to locally available limestone resources. Key positive impacts will include but not limited:

- Creation of direct and indirect employment opportunities (approximately 60–100 permanent jobs during operation and more during construction),
- Stimulation of socio-economic growth in the project area through increased income, skills transfer, and market opportunities for local goods and services,
- Supply of essential lime products to support key sectors such as construction, agriculture (soil liming), water treatment, sugar processing, and environmental applications, and
- Generation of revenue for the proponent, county, and national government through taxes.

The project site has been selected considering accessibility, proximity to raw material sources, and avoidance of highly sensitive ecosystems. Baseline studies indicate that the anticipated negative impacts primarily related to dust emissions, noise and vibration (from quarrying, crushing, and kiln operations), air quality (particulate matter and kiln gases), water use, solid waste (including kiln dust), quarry landscape alteration, and minor socio-economic issues such as community health and safety are mostly site-specific, temporary to medium-term, and of low to moderate significance.

These potential adverse impacts can be effectively minimized or mitigated to acceptable levels through the implementation of the comprehensive Environmental and Social Management Plan (ESMP) detailed in this report. In addition, the proposed project shall incorporate best available technologies (e.g., efficient vertical shaft kilns with dust control systems such as bag filters), dust suppression measures, waste recycling where possible, occupational health and safety protocols, and ongoing community engagement. Public participation exercises conducted during the ESIA process revealed general support for the project, with stakeholders expressing interest in local employment, infrastructure improvements including learning institutions, water provisions, healthcare systems, and benefit-sharing mechanisms. All concerns raised have been adequately addressed through mitigation measures and the proposed Corporate Social Responsibility (CSR) activities.

10.2. Recommendation

It is highly recommended that the National Environment Management Authority (NEMA) approves the proposed project and issues the Environmental Impact Assessment License, subject to the following conditions:

a) The proponent shall fully implement the Environmental and Social Management Plan (ESMP) presented in this report, including all mitigation measures, monitoring schedules, and reporting requirements,
b) All necessary permits and approvals from other relevant agencies must be obtained and complied with prior to commencement of activities. These include:

    - Quarry mining license from the State Department of Mining,
    - Compliance with occupational health and safety standards under the Occupational Safety and Health Act, 2007, and
    - Water abstraction and use permit from the Water Resources Authority (WRA).

c) Regular environmental and social performance monitoring and annual environmental audits shall be conducted as required by NEMA, with corrective actions implemented promptly where needed, and
d) The proponent shall establish and maintain an effective Grievance Redress Mechanism (GRM) accessible to affected communities and workers throughout the project lifecycle.

This ESIA Study Report has been prepared in full compliance with the Environmental Management and Coordination Act (EMCA) Cap 387, the Environmental (Impact Assessment and Audit) Regulations 2003, and relevant NEMA guidelines for mining and industrial projects. On the basis of the findings and analysis contained in this report, it is our considered opinion that the proposed Lime Processing Plant can proceed with minimal residual adverse impacts, provided the outlined mitigation measures and monitoring programs are strictly adhered to. The project will promote sustainable industrial development while safeguarding the environment and enhancing community livelihoods.

Appendices

Annex (A): Certificate of Incorporation & KRA Pin

Annex (B): Land Lease Agreement

Annex (C) Certified Bill of Quantity (BOQ)

Annex (D): Architectural Drawings

Annex (E) Expert EIA License