

ENVIRONMENTAL AND SOCIAL IMPACT ASSESSMENT (ESIA) FOR THE PROPOSED CEMENT AND CEMENT PRODUCTS MANUFACTURING PLANT, LOCATED ON PLOT L.R NO: NYERI/LUSOI/213, LUSOI SUB-LOCATION, THEGU RIVER WARD, KIENI SUB COUNTY, NYERI COUNT, KENYA



Prepared For

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Submitted To:

National Environment Management Authority (NEMA) In accordance with EMCA Cap 387 and Environmental (Impact Assessment and Audit) Regulations, 2003

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Document Certification

This Environmental and Social Impact Assessment (ESIA) Full Study Report is hereby submitted to the National Environment Management Authority (NEMA) in strict compliance with the Environmental Management and Coordination Act (EMCA), Cap 387, 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 Installation of Cement and Cement Product Manufacturing Plants and associated infrastructure in Lusoi location (**Plot L.R No: Nyeri/Lusoi/213**) Nyeri 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.

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Non-Technical Summary

The cement industry in Kenya has experienced robust growth in recent years, driven by the country's expanding construction and infrastructure development activities. According to ConsTrack360, the Kenyan cement market is projected to grow at an annual rate of 8.5%, reaching Ksh. 543.3 million in 2026. Between 2021 and 2025, the market recorded a compound annual growth rate (CAGR) of 10.3%, fueled by rising demand from residential, commercial, and infrastructure projects. This positive momentum is expected to continue, with the market projected to expand at a CAGR of 7.9% from 2026 to 2030, reaching an estimated Ksh. 736.2 million by the end of 2030.

According to the Kenya National Bureau of Statistics (KNBS), cement production increased by 21.0%, rising to 2,469.7 thousand metric tonnes in the second quarter of 2025, compared to 2,040.4 thousand metric tonnes in the same period of 2024. This growth mirrors the performance of the construction sector, which expanded by 5.7% during the review period, recovering from a 3.7% contraction in the second quarter of 2024. The sector's strong performance was reflected in increased cement consumption and higher imports of construction materials. Cement consumption rose by 23.9%, reaching 2,424.4 thousand metric tonnes in the second quarter of 2025, up from 1,957.1 thousand metric tonnes during the same period in 2024.

In line with these market trends and growth, the proposed establishment of a cement and cement products manufacturing plant in Lusoi Village, Nyeri County aims to meet the growing demand for high-quality cement and related products. The project is anticipated to contribute to local and national economic growth through job creation, support for local businesses, and contributions to government revenues. The establishment and operation of cement and cement products manufacturing plants, together with their associated infrastructure, involve several environmental and social considerations. These include potential impacts such as dust emissions, water consumption, noise generation, increased traffic, and solid waste management as well as occupational health and safety (OHS) risks. As a result, it is necessary to undertake a comprehensive Full Study Environmental Impact Assessment (EIA) to identify potential impacts and incorporate appropriate mitigation measures into the design and operation of the plant.

In this context, **Ndovu Rocks Limited** engaged **Lakers Consultancy Limited**, a NEMA-registered environmental consultancy (**NEMA/ENVIS/ELI/F0046**), to undertake an Environmental and Social Impact Assessment for the proposed development 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 cement and cement products manufacturing plant designed to process raw limestone and other raw materials into high-quality cement and related products. The overall objective of the project is to manufacture cement and value-added cement products for use in construction, infrastructure, and industrial applications. Key specific objectives include, but are not limited to:

- Producing high-quality cement and cement-based products that comply with national and international standards for infrastructure development, building construction, and industrial applications, 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.

Location

The proposed project site is located on the foot slopes of Mount Kenya, within Lusoi Village off the Nyeri–Nanyuki Highway. Administratively, the site falls under Thegu River Ward, Kieni Sub-County, Nyeri County, Kenya. The project site is registered as L.R. No. Nyeri/Lusoi/213. The site is geographically referenced at coordinates **Latitude -0.280526** and **Longitude 37.034144** (WGS 84 datum).

Project Design and Components

The proposed project will involve the installation of a cement and cement products manufacturing plant together with the associated supporting infrastructure and amenities. The development will comprise several key components necessary for the production and handling of cement and related products. These will include limestone crushing units, kilns for calcination, raw material and finished product handling systems, storage silos and warehouses, cement grinding and processing units, packaging and dispatch facilities, internal access roads, utilities such as water and power supply systems, administrative offices, and other auxiliary infrastructure required for efficient plant operations as summarized in the Table below.

| Component | Description | Key Equipment / Features |
|---|--|---|
| Concrete Batching Plant (HZS35) | The facility will be used for the automated weighing and mixing of cement, aggregates, water, and admixtures to produce ready-mix concrete with an estimated production capacity of 35 m³/hour . | Cement silos, aggregate bins, skip hoist/lifting bucket, weighing systems, concrete mixer, water dosing system, computerized control panel, discharge system |
| Cement Grinding Plant | The plant will process clinker, gypsum, and additives into fine cement powder through mechanical grinding in order to achieve the required fineness and quality standards. | Vertical Roller Mill (VRM) or Ball Mill, feed hoppers, rotary air-lock feeders, dynamic separators, hot gas drying system, bag filters or electrostatic precipitators, cement silos |
| Cement Grinding Unit | The unit will grind and blend clinker with gypsum to produce cement powder with controlled particle size and appropriate setting properties. | Clinker storage silos, feeders, grinding mill, dynamic separator, bag filters/ESPs, pneumatic conveying system, packaging machines |
| Lime Processing Plant | The facility will convert limestone (CaCO ₃) into quicklime (CaO) and hydrated lime (Ca(OH)₂ through processes such as crushing, calcination, hydration, and grinding. | Limestone receiving area, crushers, vibrating screens, belt conveyors, rotary/shaft kiln, cooling system, hydrator unit, grinding mill, dust control systems, product silos |
| Concrete Block Manufacturing Unit | The unit will manufacture concrete blocks by mixing cement, aggregates, and water followed by molding, compaction, curing, and finishing processes. | Concrete mixer, block molding machines, hydraulic compaction system, curing chambers, demolding equipment, quality control equipment, storage yard |
| Material Handling and Conveyance Systems | These systems will facilitate the movement of raw materials and finished products between various processing units within the plant. | Belt conveyors, bucket elevators, feeders, transfer chutes |
| Storage and Packaging Facilities | These facilities will provide storage and packaging for cement, lime, and concrete products prior to transportation and distribution. | Storage silos, warehouses, bagging machines, palletizers, bulk loading systems |
| Dust and Emission Control Systems | These systems will be installed to control particulate emissions generated during plant operations and to ensure compliance with environmental standards. | Cyclones, bag filters, electrostatic precipitators, scrubbers, stack monitoring systems |
| Water Supply and Utility Systems | These systems will supply water required for hydration processes, dust suppression, mixing operations, and domestic use within the facility. | Water storage tanks, pumps, pipelines |
| Administrative and Support Facilities | These facilities will provide office space and operational support infrastructure for plant management, staff, and environmental monitoring activities. | Administration block, laboratory and quality control unit, sanitation facilities |
| Internal Roads and | These infrastructures will facilitate the | Access roads, parking areas, drainage |

| Component | Description | Key Equipment / Features |
|------------------------------|---|--------------------------|
| Stormwater Management | movement of vehicles and proper drainage of stormwater within the project site. | channels, sediment traps |

Project Activities

The construction phase of the proposed Cement and Cement Product 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

- 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.
- 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 presents a summary of the anticipated negative impacts associated with the proposed development.

| Potential Impact | Mitigation Measures |
|--|---|
| Air Quality (Dust Emissions) | <ul style="list-style-type: none"> Regularly sprinkle water on exposed surfaces, access roads, and excavation areas to suppress dust Cover trucks transporting soil, sand, and aggregates to prevent dust dispersion. Restrict vehicle speeds (10Kp/h) within the construction site to reduce dust generation. Provide temporary barriers or windbreaks around material storage areas Ensure construction materials such as cement and sand are stored in covered areas. Conduct regular maintenance of construction equipment to minimize emissions. |
| Noise and Vibration | <ul style="list-style-type: none"> Ensure construction machinery and equipment are maintained in good working condition and fitted with appropriate silencers. Limit construction activities to daytime working hours. Provide workers exposed to high noise levels with appropriate PPE such as earplugs and earmuffs. Install temporary noise barriers where construction occurs near sensitive receptors. Inform nearby communities in advance about high-noise activities. |
| Water Pollution | <ul style="list-style-type: none"> Prevent discharge of contaminated water into nearby drainage systems. Install temporary drainage channels to control stormwater runoff. Provide sediment traps and silt fences to prevent soil erosion. Designate specific areas for equipment washing and concrete mixing. Ensure proper management of fuels, oils, and chemicals to prevent spills. |
| Soil Degradation and Erosion | <ul style="list-style-type: none"> Limit vegetation clearing to areas strictly required for construction, Implement erosion control measures such as silt fences and drainage channels, Rehabilitate disturbed areas immediately after construction, Stockpile excavated soil properly and stabilize it where necessary. |
| Waste Generation | <ul style="list-style-type: none"> Develop and implement a Construction Waste Management Plan, Segregate waste into recyclable, reusable, and disposal categories as per the provision of EMCA (Waste Management) Regulation 2024, Provide appropriate waste bins and store waste in designated containers before disposal, Engage NEMA licensed waste handlers for transportation and disposal, Prohibit open burning of construction waste. |
| Occupational Health and Safety Risks | <ul style="list-style-type: none"> Develop and implement an Occupational Health and Safety Plan in accordance with the Occupational Safety and Health Act (OSHA), 2007, Provide PPE such as helmets, gloves, safety boots, dust masks, and reflective jackets, Conduct safety induction and regular training for workers, Install safety signage and warning notices across the site, Maintain first aid kits and emergency response equipment. |
| Traffic and Access Disruptions | <ul style="list-style-type: none"> Develop a traffic management plan for construction vehicles, Schedule delivery of construction materials during off-peak hours, Ensure proper signage and traffic control around the construction site, Maintain safe access roads for surrounding communities. |
| Community Health and Safety Risks | <ul style="list-style-type: none"> Restrict unauthorized access to the construction site through fencing, Provide adequate lighting and security personnel, Conduct community awareness programs regarding construction activities, Maintain clear communication with local authorities and community representatives. |
| Operation Phase | |
| Air Pollution (Dust and Particulate Matter) | <ul style="list-style-type: none"> Pave the entire plant premises including driveways with impervious materials to reduce dust, Install natural or artificial wind barriers such as trees and fences to reduce windblown dust, Enclose aggregate and fine material stockpiles on at least three sides and the top, Install dust collection systems such as bag filters and cyclones in key emission |

| Potential Impact | Mitigation Measures |
|---|--|
| | <p>points of the facility (Install appropriate technology),</p> <ul style="list-style-type: none"> • Clean paved surfaces regularly using vacuum sweepers or water flushing, • Restrict vehicle speeds within the plant to 10–15 km/h, • Ensure cement is delivered using sealed vehicles with pneumatic transfer systems, • Install high-level sensors and automatic shut-off systems in cement silos to prevent overfilling and dust escape, • Conduct regular dust monitoring and air quality assessments in compliance with the provisions of the Environmental Management and Coordination (Air Quality) Regulations, 2024. |
| Noise and Vibration | <ul style="list-style-type: none"> • Maintain machinery and equipment in good condition and install noise suppression devices, • Install acoustic barriers or vegetative buffers along plant boundaries, • Provide PPE such as ear protection to workers exposed to high noise levels, • Line aggregate bins and hoppers with sound-absorbing materials where feasible, • Conduct periodic noise monitoring to ensure compliance with the Environmental Management and Coordination (Noise and Excessive Vibration Pollution Control) Regulations, 2009. |
| Water Pollution | <ul style="list-style-type: none"> • Design and install dedicated drainage systems for clean (rainwater) and contaminated stormwater to prevent cross-contamination. • Install first-flush capture systems at all roof and paved areas to collect the initial runoff, which typically contains higher pollutant loads, before it enters the main drainage. • Construct impervious concrete or asphalt surfaces in areas where wastewater or potentially contaminated stormwater is generated, such as cement storage, batching, grinding, and loading zones. • Provide settlement ponds equipped with sloping sludge interceptors to separate sediments, cement fines, and particulate matter from water before reuse or controlled discharge. • Collect all process wastewater, wash water, and contaminated stormwater for treatment or disposal. Engage licensed waste management contractors to handle disposal when on-site treatment is not feasible. • Ensure no untreated wastewater or cement-laden runoff is discharged into surrounding soil, drains, or water bodies. • Minimize wash water contamination by enclosing material handling areas (cement silos, aggregate storage, batching areas) and controlling dust at source. • Conduct routine water quality monitoring, including pH, turbidity, TSS, and alkalinity, in accordance with EMCA (Water Quality) Regulations, 2024. • Schedule regular cleaning and inspection of drainage channels, first-flush systems, and settlement ponds to maintain efficiency and prevent blockages |
| Hazardous Material Handling Risks | <ul style="list-style-type: none"> • Maintain an up-to-date inventory of all chemicals stored on-site, including cement additives, fuels, lubricants, and cleaning agents. • Ensure all chemical containers are properly labelled with product name, hazard classification, and safety instructions. • Keep Safety Data Sheets (SDS) for all chemicals accessible to staff at all times. • Train all personnel on safe handling, storage, and use of chemicals, as well as emergency response procedures. • Minimize chemical movement within the plant to reduce the risk of spills or leaks; transport chemicals using appropriate handling equipment. • Provide spill kits, absorbents, and containment equipment at strategic locations across the plant. • Develop and implement a Chemical Management and Spill Response Plan to guide safe handling practices, emergency response, and compliance with environmental regulations. • Store chemicals in banded, ventilated areas away from watercourses, drainage, and high-traffic zones. • Conduct periodic inspections of storage areas, containers, and handling procedures to identify potential risks and ensure compliance. |
| Solid and Hazardous Waste Generation | <ul style="list-style-type: none"> • Develop and implement a comprehensive Waste Management Plan (WMP) covering all waste streams generated on-site, including concrete residues, packaging, and hazardous materials. • Provide designated, impervious washout areas for concrete trucks and equipment to prevent contamination of soil and stormwater. |

| Potential Impact | Mitigation Measures |
|--|--|
| | <ul style="list-style-type: none"> Track and record all returned or excess concrete to ensure it is either reused in site works (e.g., paving, curbing) or disposed of safely at licensed facilities. Segregate waste streams into hazardous, non-hazardous, and recyclable categories to prevent contamination and facilitate proper disposal. Store all waste in clearly labelled containers, ensuring they are closed when not in use and handled safely. Engage licensed, NEMA-approved waste transporters for the collection, transportation, and disposal of regulated wastes. Prohibit open burning, illegal dumping, or improper handling of waste materials on-site. Provide training to staff on proper waste handling, segregation, and disposal procedures. Conduct regular inspections of waste storage, handling practices, and disposal records to ensure compliance with environmental regulations. Promote waste minimization and recycling wherever feasible to reduce the environmental footprint of plant operations.. |
| Occupational Health and Safety Risks | <ul style="list-style-type: none"> Develop and implement a comprehensive Occupational Health and Safety (OSH) Policy in accordance with the Occupational Safety and Health Act (OSHA), 2007 and related subsidiary legislation. Provide personal protective equipment (PPE) to all employees and contractors, including respirators, helmets, safety goggles, gloves, high-visibility clothing, and safety boots. Install safety guards, emergency stop mechanisms, and protective barriers on all machinery, conveyors, mixers, and other high-risk equipment. Conduct regular safety training, inductions, and emergency drills for all workers to cover hazard identification, safe work practices, and emergency response procedures. Maintain first aid kits, fire extinguishers, and spill response equipment at strategic locations throughout the plant. Develop, display, and communicate a comprehensive Emergency Response Plan (ERP) for incidents including fire, chemical spills, and injuries. Appoint a Safety Officer to oversee implementation of OSH measures, ensure compliance with OSHA, 2007, and liaise with relevant authorities. Conduct regular site inspections and safety audits to ensure compliance with safety procedures and identify potential risks. Establish a reporting mechanism for near misses, accidents, and unsafe conditions to continuously improve safety management |
| Pressure on Utilities (Water and Power) | <ul style="list-style-type: none"> Adopt water conservation measures including recycling of washout and process water. Implement rainwater harvesting to supplement municipal supply. Schedule high-water-demand activities (equipment cleaning, dust suppression, batching) during periods of stable water availability. Install buffer storage tanks to maintain a reserve supply during peak demand or temporary interruptions. Promote efficient water use practices among staff to minimize unnecessary consumption. Monitor water consumption regularly to detect leaks, abnormal usage, or over-demand. Explore reuse of treated process water for non-potable applications such as dust suppression and equipment washing. Liaise with local authorities to ensure plant operations do not compromise water availability or pressure for neighboring communities. |
| Community and Socioeconomic Impacts | |
| Labor Influx | <ul style="list-style-type: none"> Prioritize recruitment of local workers to reduce large external labor influx, Implement a code of conduct for all workers, covering acceptable behavior on and off-site, Provide orientation and training on community norms, workplace ethics, and social responsibilities, Establish on-site accommodation or regulated transport for external workers to reduce interaction with local communities. |

| | |
|--|--|
| Gender-Based Violence (GBV) and Sexual Harassment | <ul style="list-style-type: none"> • Develop and enforce a Zero Tolerance Policy on GBV and sexual harassment, • Provide GBV awareness and sensitization training for all employees and subcontractors, • Set up confidential reporting mechanisms for GBV cases, including hotlines or designated officer, • Coordinate with local authorities and NGOs for support services, including counseling and protection for victims, • Ensure adequate lighting and security in work and accommodation areas to protect vulnerable groups. |
| Spread of Communicable Diseases (STIs, Waterborne Diseases) | <ul style="list-style-type: none"> • Conduct health screening and regular medical check-ups for all workers, • Provide adequate sanitation facilities, safe drinking water, and handwashing stations on-site, • Promote health education campaigns on disease prevention, including STI awareness, vaccination, and hygiene, • Implement controlled access and health protocols for external labor to minimize community exposure, • Provide first aid facilities and access to local health services for workers and nearby communities. |
| Social Conflicts and Community Tensions | <ul style="list-style-type: none"> • Engage community representatives regularly to communicate project plans and labor policies, • Implement grievance mechanisms for workers and community members to address complaints promptly, • Ensure equitable recruitment and local benefits to avoid community resentment. |

Conclusion

The Environmental and Social Impact Assessment (ESIA) for the proposed cement products manufacturing plant in Lusoi Village, Nyeri County, demonstrates that, with the adoption and implementation of the recommended mitigation measures, the project can proceed in a manner that balances economic development, environmental protection, and social responsibility. The assessment has identified potential impacts across air quality, water resources, noise, waste management, occupational health and safety, and community wellbeing, and has proposed comprehensive strategies to minimize negative effects while enhancing positive outcomes such as local employment, skill development, and economic growth.

The study confirms that the project, when implemented in accordance with Environmental Management and Coordination Act (EMCA), Cap. 387, and the Environmental (Impact Assessment and Environmental Audit) Regulations, 2003, can operate sustainably within the environmental and social context of the area. Through effective monitoring, adherence to regulatory requirements, and ongoing engagement with local stakeholders, the project is expected to contribute meaningfully to the socioeconomic development of the local community while maintaining compliance with environmental standards.

In conclusion, the ESIA provides a robust framework for informed decision-making by the National Environment Management Authority (NEMA) and the project proponent, ensuring that the proposed cement products plant achieves its operational objectives while upholding environmental stewardship and community wellbeing. Approval of the project, coupled with diligent implementation of the recommended mitigation and management measures, will allow the plant to realize its economic potential responsibly and sustainably.

Recommendation

To ensure full compliance with environmental and social regulations and to facilitate the issuance of the ESIA license, the following measures are recommended:

- a) Integration of an Environmental and Social Management Plan (ESMP): All operational activities should be integrated into a formal ESMP that comprehensively addresses air quality, water management, noise control, waste management, occupational health and safety, and climate adaptation measures. This plan will provide a structured framework for implementing mitigation, monitoring, and reporting measures throughout the project lifecycle.
- b) Implementation of Best Practices: The project should adopt best available practices to minimize environmental impacts, including:

- Dust suppression measures, such as water spraying, enclosed material handling, and covered storage areas.
 - Noise reduction strategies, including regular maintenance of machinery, acoustic barriers, and the use of silencers.
 - Responsible waste management through segregation, reuse, recycling, and engagement of licensed waste contractors.
- c) Stakeholder and Community Engagement: The proponent should maintain continuous engagement with the surrounding community and key stakeholders to identify and address potential social and environmental concerns. This includes grievance mechanisms, community awareness programs, and involvement in local development initiatives.
- d) Environmental Monitoring Programs: Robust monitoring programs should be established to track environmental performance, ensuring that emissions, effluents, and waste discharges remain within permissible limits. Regular reporting of monitoring results will demonstrate compliance with regulatory requirements and enable timely corrective actions where needed.

Implementing these measures will ensure that the proposed cement and cement products manufacturing plant operates sustainably, responsibly, and in full compliance with EMCA, Cap. 387, and relevant environmental regulations, thereby facilitating the successful issuance of the ESIA license.

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

The cement industry in Kenya has experienced robust growth in recent years, driven by the country's expanding construction and infrastructure development activities. According to ConsTrack360, the Kenyan cement market is projected to grow at an annual rate of 8.5%, reaching Ksh. 543.3 million in 2026. Between 2021 and 2025, the market recorded a compound annual growth rate (CAGR) of 10.3%, fueled by rising demand from residential, commercial, and infrastructure projects. This positive momentum is expected to continue, with the market projected to expand at a CAGR of 7.9% from 2026 to 2030, reaching an estimated Ksh. 736.2 million by the end of 2030.

According to the Kenya National Bureau of Statistics (KNBS), cement production increased by 21.0%, rising to 2,469.7 thousand metric tonnes in the second quarter of 2025, compared to 2,040.4 thousand metric tonnes in the same period of 2024. This growth mirrors the performance of the construction sector, which expanded by 5.7% during the review period, recovering from a 3.7% contraction in the second quarter of 2024. The sector's strong performance was reflected in increased cement consumption and higher imports of construction materials. Cement consumption rose by 23.9%, reaching 2,424.4 thousand metric tonnes in the second quarter of 2025, up from 1,957.1 thousand metric tonnes during the same period in 2024.

In line with these market trends and growth, the proposed establishment of a cement and cement products manufacturing plant in Lusoi Village, Nyeri County aims to meet the growing demand for high-quality cement and related products. The project is anticipated to contribute to local and national economic growth through job creation, support for local businesses, and contributions to government revenues. The establishment and operation of cement and cement products manufacturing plants, together with their associated infrastructure, involve several environmental and social considerations. These include potential impacts such as dust emissions, water consumption, noise generation, increased traffic, and solid waste management as well as occupational health and safety (OHS) risks. As a result, it is necessary to undertake a comprehensive Full Study Environmental Impact Assessment (EIA) to identify potential impacts and incorporate appropriate mitigation measures into the design and operation of the plant.

In this context, **Ndovu Rock Limited** engaged **Lakers Consultancy Limited**, a NEMA-registered environmental consultancy (**NEMA/ENVIS/ELI/F0046**), to undertake an Environmental and Social Impact Assessment for the proposed development 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 Rock 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 Rock Limited will involve the establishment and operation of a cement and cement products manufacturing plant designed to process raw limestone and other raw materials into high-quality cement and related products. The overall objective of the project is to manufacture cement and value-added cement products for use in construction, infrastructure, and industrial applications. Key specific objectives include, but are not limited to:

- Producing high-quality cement and cement-based products that comply with national and international standards for infrastructure development, building construction, and industrial applications, 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, particularly. 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 applied a range of methodologies in full compliance with Section 58 of the Environmental Management and Coordination Act (EMCA), Cap 387, and the Environmental Assessments and Environmental Audits Regulations, 2003. The approach was further guided by Scope and Terms of Reference (ToR) for the study. 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. This process ensured compliance with the public participation requirements of the Environmental Management and Coordination Act (EMCA) Cap 387 and *Environmental Impact Assessment and Environmental Audit Regulation 2003* and promoted transparency, inclusivity, and social acceptability of the proposed development. The engagement process was primarily facilitated through the active involvement of the 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 | <i>High</i> | A large change compared to variations in the baseline. Potentially a clear breach of accepted limits. |
| | <i>Medium</i> | Change which may be noticeable and may breach accepted limits. |
| | <i>Low</i> | When compared with the baseline, change may only just be noticeable. Existing thresholds would not be exceeded. |
| Type of Impact | <i>Positive</i> | Impacts that have a beneficial environmental result, such as enhancement of existing environmental and social conditions. |
| | <i>Negative</i> | Impacts that have a harmful aspect, such as loss or degradation of environmental resources. |
| Type of Effect | <i>Direct</i> | Impacts clearly and directly attributed to a particular environmental or social parameter (e.g., generation of dust directly impacts air quality). |
| | <i>Indirect</i> | 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 | <i>Short Term</i> | Effects disappear within 1 year or once construction activities are completed. |
| | <i>Medium Term</i> | Effects disappear within a 5-year period. |
| | <i>Long Term</i> | Effects last for more than 5 years. |
| Reversibility | <i>Reversible</i> | Impact significance will reduce and disappear over time (naturally or artificially) once the impacting activity ceases. |
| | <i>Irreversible</i> | 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

Kenya’s construction sector has experienced rapid growth in recent years, driven by large-scale infrastructure projects such as the expansion of road networks, highways, and bridges, as well as residential and commercial developments. Government initiatives promoting affordable housing and the development of supporting infrastructure have further accelerated construction activities, particularly in urban and peri-urban areas.

This expansion has directly translated into a rising demand for cement and cement-based products. According to the KNBS reports indicate that cement production rose by 21.0%, from 2,040.4 thousand metric tonnes in Q2 2024 to 2,469.7 thousand metric tonnes in Q2 2025, reflecting strong industry performance and consistent market demand. With ongoing urbanization, population growth, and continued infrastructure development, the demand for high-quality cement and cement products is projected to remain robust, with a forecasted CAGR of 7.9% between 2026 and 2030, reaching approximately KES 736.2 million by the end of 2030. Given these trends, the proposed cement and cement products manufacturing plant in Lusoi Village, Nyeri County is well-positioned to meet the growing demand for construction materials. The project will enhance domestic production capacity, reduce dependency on imports, and contribute to national infrastructure development, while simultaneously generating employment, supporting local supply chains, and stimulating socioeconomic growth in the surrounding community.

1.8. Estimated Project Cost

The estimated cost for the establishment of the proposed project is approximately Kenya Shillings: [.....]. This projected budget encompasses procurement of equipment, installation, upgrading works, and all other associated activities necessary for the successful commissioning and operation of the cement and cement products manufacturing 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, and proximity to key infrastructure and sensitive environmental or social receptors.

2.2. Proposed Location

The proposed project site is located on the foot slopes of Mount Kenya, within Lusoi Village off the Nyeri–Nanyuki Highway. Administratively, the site falls under Thegu River Ward, Kieni Sub-County, Nyeri County, Kenya. The project site is registered as L.R. No. Nyeri/Lusoi/213. The site is geographically referenced at coordinates **Latitude -0.280526** and **Longitude 37.034144** (WGS 84 datum).

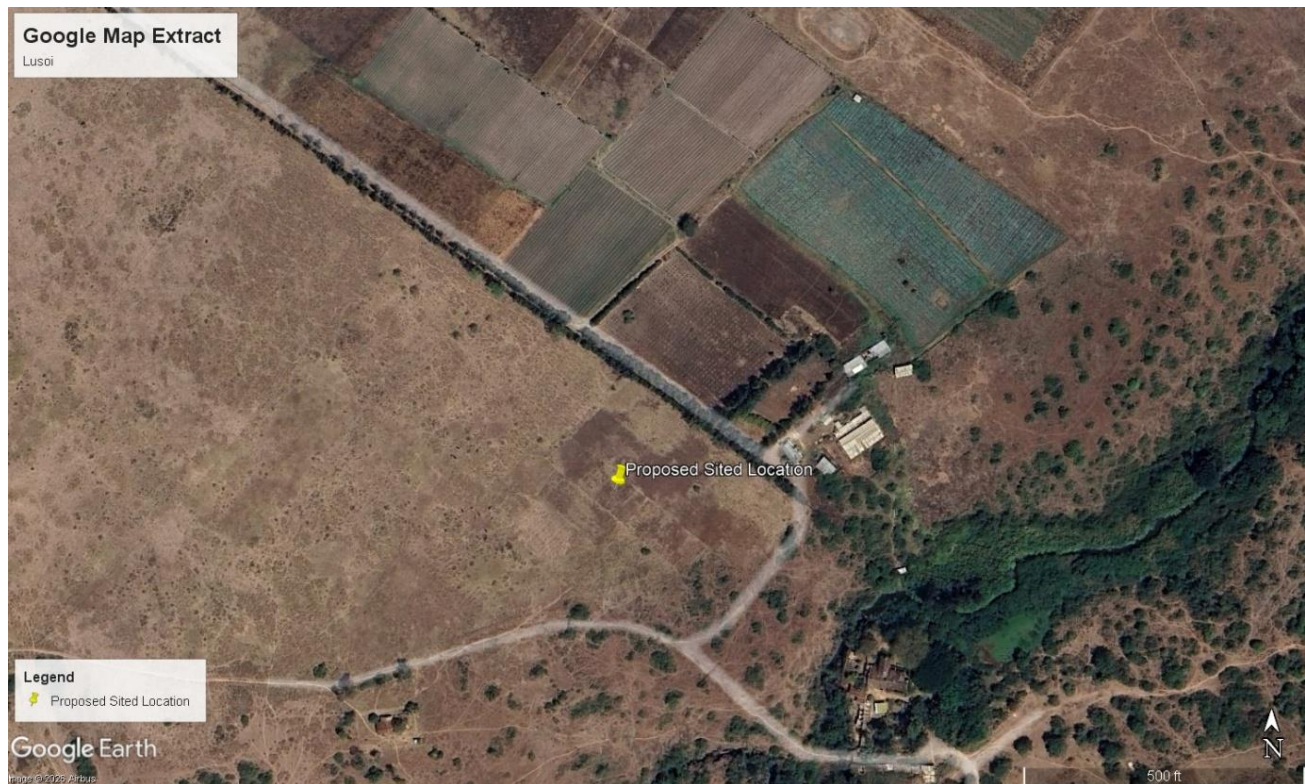


Figure 1: Site Location

2.3. Project Component

The proposed project will involve the proposed Installation of Cement and Cement Products Manufacturing Plants and associated infrastructure amenity. The cement and cement processing plants will comprise the installation of key plant equipment, including limestone crushing units, kilns for calcination, material handling systems, storage facilities, and packaging units.

2.3.1. Concrete Batching Plant

The proposed HZS35 concrete batching plant (Skip hoist/Lifting bucket) will be an ideal solution for small and medium-sized projects. With a production capacity of 35m³/h, it will stand out due to its compact structure and high efficiency. The proposed plant will be widely utilized in various projects, including building construction, road works, precast plants, and block-making operations, among others.

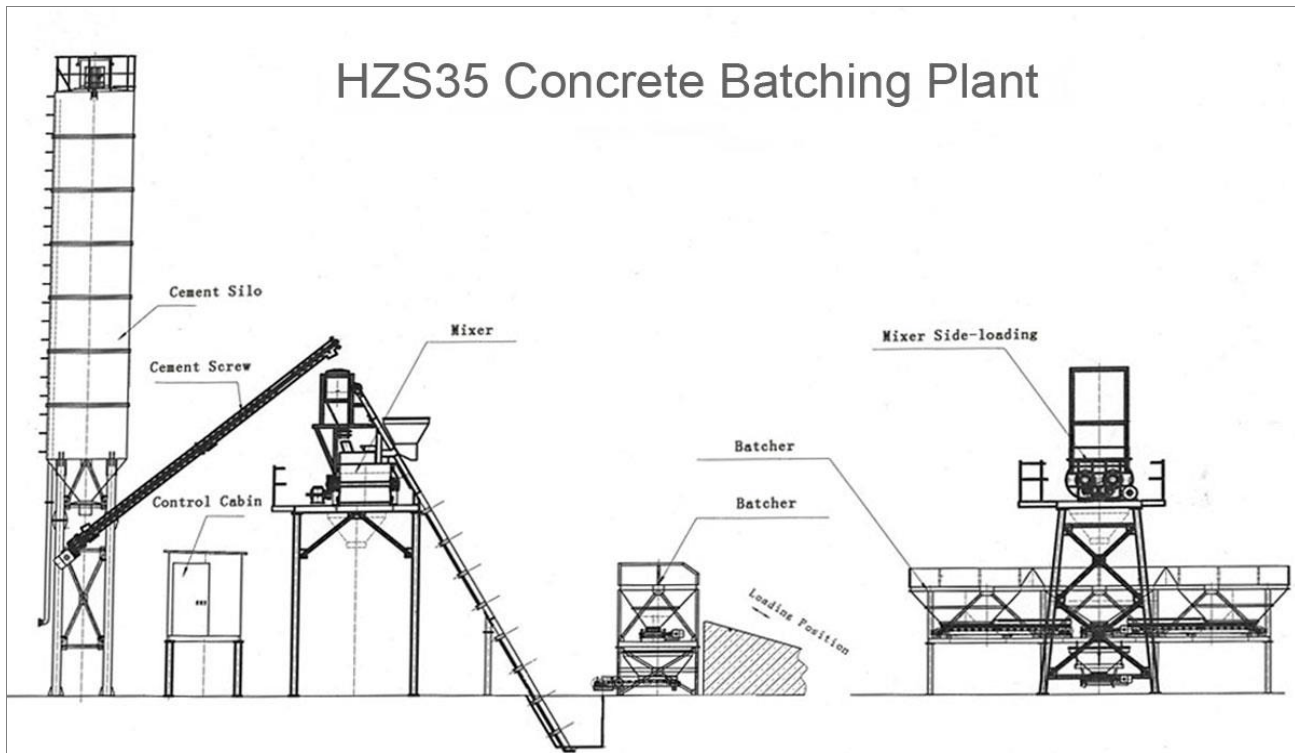


Figure 2: Cross Section of Batching Plant

A concrete batching plant works by automatically weighing and mixing raw materials cement, aggregate (sand, gravel), water, and admixtures in precise, computerized proportions to produce high-quality concrete. The materials are stored in silos and bins, transported via conveyors to a mixer (or directly to a truck), and blended into a homogeneous mixture before discharge.

2.3.2. Cement Grinding Plant

A cement grinding plant converts clinker, gypsum, and other additives into fine cement powder by grinding them in high-energy mills (Vertical Roller Mills or Ball Mills). The material is crushed by rollers or steel balls, dried with hot air, and classified by air-flow, with coarse particles returned for re-grinding to ensure the required fineness.

Key Components and Process Flow:

- **Feeding & Proportioning:** Raw materials—cement clinker (about 95%) and gypsum (about 5%, to control setting time)—are fed from hoppers into the mill via a rotary air-lock feeder.
- **Grinding Mechanisms:**
 - **Vertical Roller Mill (VRM):** Materials fall onto a rotating grinding table, where hydraulic rollers crush the material through pressure and shear.
 - **Ball Mill:** A horizontal rotating cylinder uses tumbling steel balls to impact and grind the material.
- **Drying & Transport:** Hot gases (up to) enter the mill, drying the material while the airflow transports it to the classifier.
- **Classification & Separation:** A separator (or cyclone) separates the ground material by size. Fine particles (finished cement) are carried out, while coarse particles are returned to the table for further grinding.

Collection: Finished cement powder is collected in a bag filter or electrostatic precipitator, then conveyed to storage silos.

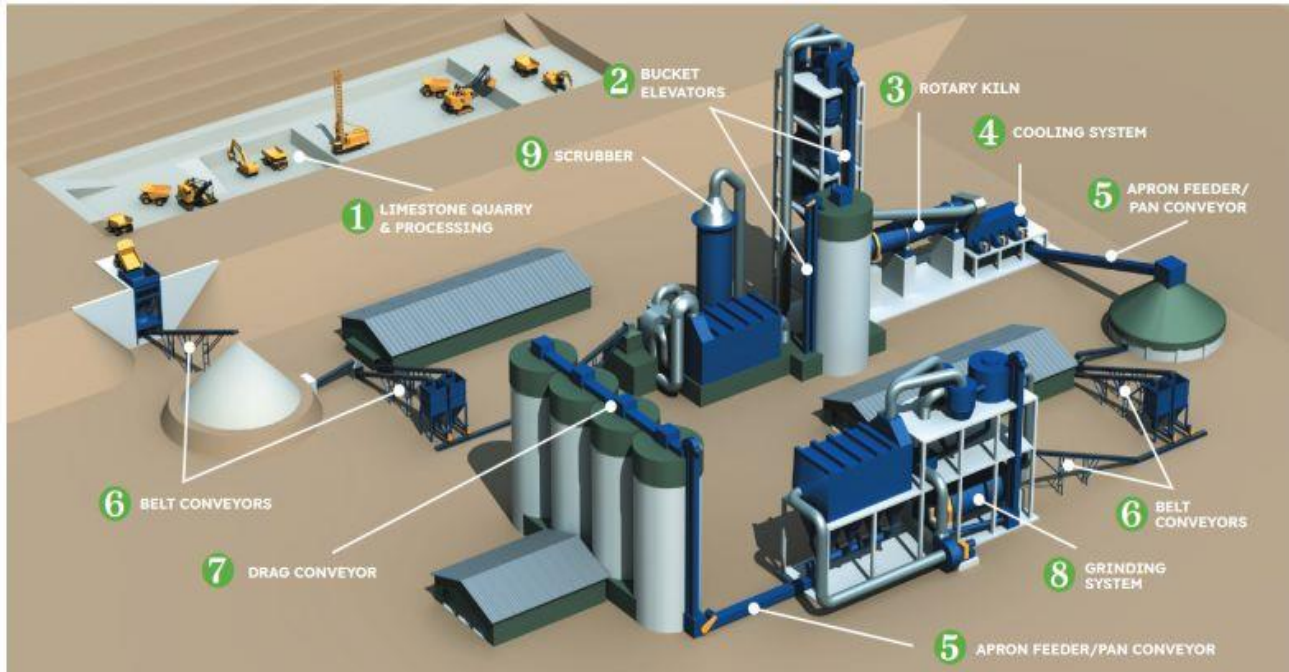


Figure 3: Cement Processing Flow Diagram

Cement Grinding Process

Cement grinding units are integral parts of a cement plant, where clinker (a granular form of cement raw material) is ground into a fine powder and blended with gypsum to create cement. Modern cement grinding units consist of a rotating Ball Mill and Vertical Mill that grind the clinker and gypsum mixture into the fine powder known as cement. Key Components of a Cement Grinding Unit:

- **Clinker Storage and Feeding:** The raw clinker is stored in silos before being fed into the grinding unit. Precise feeding ensures uniform quality and composition of the cement.
- **Grinding Mill:** This is the heart of a cement grinding unit. The grinding mill grinds the clinker to a fine powder. A small amount of gypsum - typically 3-5% - is added to control the setting time of the cement when it is mixed with water.
- **Dynamic Separator:** Modern grinding units incorporate a dynamic separator to ensure proper particle size distribution of the final cement product. The separator separates the fine particles from the coarse ones, sending the coarse material back to the grinding mill for further grinding.
- **Bag Filters or ESPs (Electrostatic Precipitators):** After grinding, the cement powder is conveyed pneumatically and collected using bag filters or ESPs to control emissions and comply with environmental standards.
- **Packing and Dispatch:** Once collected, the cement is either packed into bags or loaded into bulk trucks or silos for distribution to construction sites or further storage.

Process Flow of Cement Grinding Unit:

- a) **Clinker Grinding:** Raw clinker is fed into the mill with additives like gypsum to control the setting properties of cement. The grinding action crushes the clinker into a fine powder.
- b) **Separation:** The ground material passes through a dynamic separator to separate the fine and coarse particles. The fine material is the cement powder ready for packaging, while the coarse material returns to the mill for further grinding.
- c) **Packaging and Dispatch:** The final product is packed into bags or loaded into bulk transport vehicles for delivery to customers.

Importance of Cement Grinding Units:

- **Quality Control:** Grinding units ensure consistent and high-quality cement production by controlling particle size and blending.
- **Energy Efficiency:** Efficient grinding reduces energy consumption per ton of cement produced.

- Environmental Compliance: Incorporation of bag filters or ESPs ensures compliance with emissions regulations.

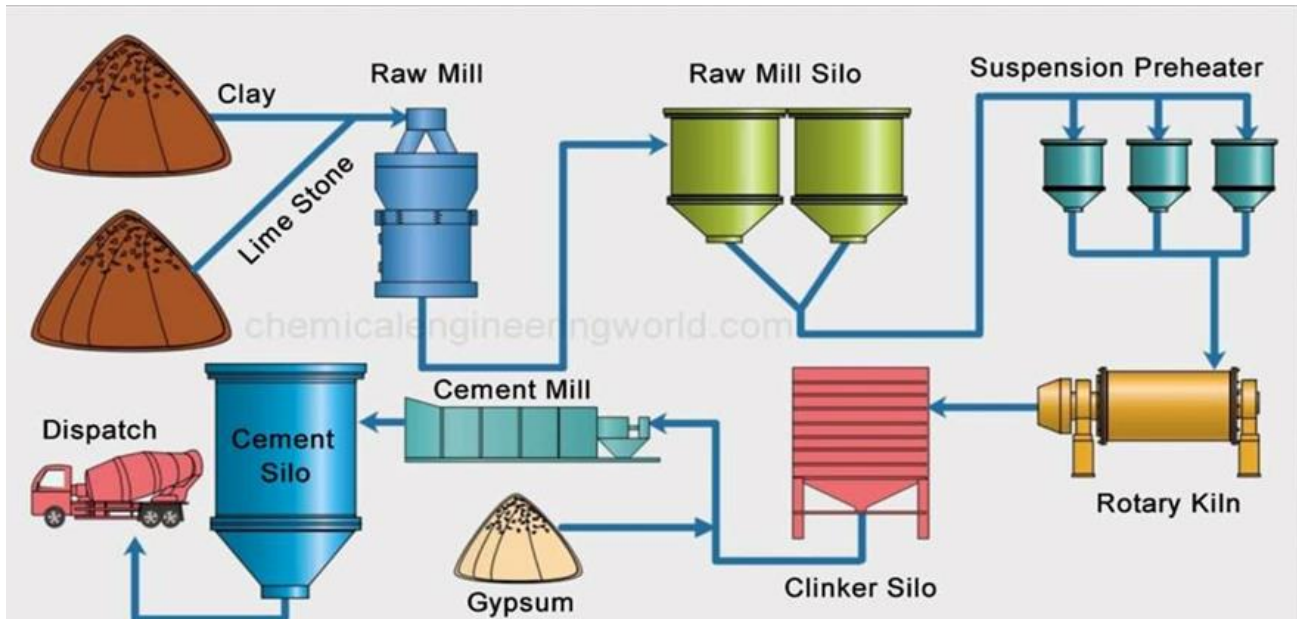


Figure 4: Flow Diagram of Cement Manufacturing Process

2.3.3.Lime Processing Plant

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 $\text{Ca}(\text{OH})_2$) for various industrial, and construction.

Table 3: Component of Lime Processing Plant

| Component | Description | Key Equipment/Features |
|--|---|---|
| Raw Material Receiving Area | Designated area where limestone is delivered from approved quarry sites and offloaded for processing. Designed to accommodate trucks and prevent material loss. | Tipping platform, receiving hopper, weighbridge (where applicable), stockpile yard |
| Crushing Unit | Reduces large limestone rocks into smaller, uniform sizes suitable for calcination. | Primary crusher (jaw crusher), secondary crusher (hammer/impact crusher), vibrating screens |
| Screening System | Separates crushed limestone into required size fractions. Oversized materials are returned for further crushing. | Vibrating screens, conveyor return systems |
| Conveyor and Material Handling System | Transfers limestone between processing stages efficiently and continuously. | Belt conveyors, bucket elevators, feeders |
| Kiln System (Calcination Unit) | Core component where limestone is heated at high temperatures (900–1,200°C) to produce quicklime by driving off CO_2 . | Vertical shaft kiln or rotary kiln, burners, refractory lining, temperature control systems |
| Quicklime Cooling System | Cools hot quicklime exiting the kiln to manageable temperatures before handling and storage. | Air cooling fans, discharge conveyors |
| Hydration Unit (If Applicable) | Converts quicklime into hydrated lime through controlled addition of water. | Hydrator chamber, water dosing system, mixing paddles |

| Component | Description | Key Equipment/Features |
|---|---|--|
| Milling/Grinding Unit | Further refines hydrated lime to achieve required fineness for specific industrial applications. | Pulverizes, ball mills, classifiers |
| Product Storage Silos | Enclosed storage for finished quicklime or hydrated lime before packaging or dispatch. | Steel silos, level indicators, aeration systems |
| Packaging and Dispatch Area | Area where finished products are packed into bags or loaded into bulk tankers for transportation. | Bagging machines, palletizers, bulk loading spouts |
| Dust Collection and Air Pollution Control System | Controls particulate emissions from crushers, kilns, and transfer points. | Cyclones, bag filters, scrubbers, stack monitoring systems |
| Laboratory and Quality Control Unit | Ensures product quality meets industry standards. conducts chemical and physical tests. | Testing equipment, sampling tools |
| Water Supply and Storage System | Supplies water for hydration, dust suppression, and domestic use. | Water tanks, pumps, pipelines |
| Stormwater Drainage System | Manages surface runoff to prevent flooding and sediment transport. | Drainage channels, oil interceptors, sediment traps |
| Site Office and Administrative Block | Houses management, operational staff, and environmental health and safety functions. | Office rooms, sanitation facilities, records storage |
| Internal Access Roads and Parking Area | Facilitates movement of raw materials and finished products within the site. | Compacted or paved roads, parking bays |

2.3.4. Cement Concrete Block Manufacturing

Concrete blocks are manufactured by mixing cement, water, and aggregates (sand/gravel), which are then molded, compacted via vibration and hydraulic pressure, and cured in a controlled environment to ensure durability. The process involves precise batching, molding, drying, and, optionally, finishing.

Key Steps in Manufacturing Concrete Blocks:

- **Mixing:** Cement, aggregate (such as sand or gravel), and water are mixed, often with chemical additives to adjust texture, color, or strength.
- **Molding and Compaction:** The concrete mixture is fed into machines that pour it into molds. Hydraulic pressure and vibration are applied to compact the mixture and remove air voids, creating a dense block.
- **Curing:** The blocks are moved to a curing kiln or area to allow the cement to hydrate and gain strength.
- **Demolding and Finishing:** The blocks are removed from the molds, and any final surface treatments are applied.
- **Quality Control and Storage:** Blocks are inspected for quality, then packaged and stored for shipment.

Typical Materials and Ratios:

Ingredients: Portland cement, water, and aggregates (sand, stone, or gravel). **Mixture:** Common proportions include a 1:3:6 (cement: sand: aggregate) ratio, or sometimes a 1:7 to 1:9 (cement: sand) mixture for specialized, less-dense blocks.

2.4. Major 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.

After the above-mentioned activities the plant will be tested and commissioned for full operation.

2.5. Raw Materials Base

The proposed cement and cement products manufacturing plant will utilize a range of key raw materials required for the production of high-quality cement, lime, and related products. The primary raw materials include but not limited to:

Limestone (Calcium Carbonate – CaCO_3)

- Role: Limestone is the main ingredient in cement production, providing the calcium necessary for clinker formation during calcination.
- Source: The plant will source high-quality limestone from approved quarries, transported to the site via trucks or conveyors.

Clay / Shale (Silica, Alumina, and Iron Oxides)

- Role: Provides silica, alumina, and iron oxides, which are essential for the chemical balance in clinker production.
- Source: Clay will be sourced from licensed quarries, ensuring consistent quality.

Gypsum (Calcium Sulfate – $\text{CaSO}_4 \cdot 2\text{H}_2\text{O}$)

- Role: Gypsum is added during grinding to control the setting time of cement.
- Source: Gypsum will be procured from domestic suppliers or imported from neighboring countries, depending on quality and availability.

Other Additives (e.g., Fly Ash, Pozzolans, Slag)

- Role: Supplementary cementitious materials improve strength, durability, and sustainability of cement products.
- Source: Fly ash and other additives will be sourced from existing coal-fired power plants or industrial by-product suppliers within the region or imported if necessary.

Sand and Aggregates

- Role: Required for concrete and concrete product manufacturing, including blocks, paving, and precast elements.
- Source: Aggregates and sand will be obtained from licensed quarries to ensure consistent quality and compliance with construction standards.

Transport and Supply Considerations:

- Raw materials sourced from other locations will be transported via licensed haulage contractors, ensuring compliance with road safety and environmental regulations.
- Stockpiling and storage will be designed to minimize dust emissions, contamination, and material loss, following best practices in cement manufacturing.

2.6. By-Products

During the operation of the cement and cement products manufacturing plant, overburden, excess rock, and material rejects generated during processing will be carefully managed to minimize environmental impacts. Overburden and excess rock will be stockpiled for later use as fill material, while undersized materials or rejects removed prior to thermal treatment will also be stored for reuse in construction or other site-related

activities. Lime collected from dust collection systems and partially calcined limestone minerals from the lime manufacturing process and emission control systems will be reintegrated into the production process where possible or sold to interested users. In cases where lime kiln dust cannot be reused, it will be disposed of in an authorized non-hazardous landfill in accordance with regulatory requirements. All other waste materials, including domestic and general industrial wastes generated on-site, will be collected, segregated, and managed by licensed NEMA-approved waste handlers to ensure proper disposal and compliance with environmental regulations. This approach will ensure that all waste streams are handled responsibly, supporting sustainable operations and reducing potential impacts on the surrounding environment.

2.7. Water Source

The proposed project will be located in Keini Sub-County, which lies in the relatively dry region of Nyeri County, on the leeward side of Mount Kenya. The area has limited surface water resources; however, a nearby perennial stream, the Nairobi River, will serve as the primary source of water for the plant. In addition, the proponent intends to explore the development of a borehole to supplement water supply and ensure a reliable and sustainable source for the proposed cement and cement products manufacturing operations.

2.8. Power Supply

The power supply for the proposed cement and cement products manufacturing plant will be provided through the Kenya Power and Lighting Company (KPLC). Where necessary, the proponent will undertake upgrades to the existing power infrastructure to ensure a reliable and adequate supply capable of supporting all operational activities, including crushing, grinding, material handling, and packaging.

2.9. 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, mixers, conveyors, and administrative facilities. 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. Typical wastes may include concrete rubble, broken timber, metal scrap, packaging materials, glass, used oils, paints, and other residual chemicals associated with batching operations. All wastes 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 (Cement and Cement Products 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 a cement and cement products manufacturing 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. Cement and related products are fundamental construction materials that underpin the development of roads, bridges, housing projects, commercial buildings, and industrial facilities. By supplying high-quality cement and cement-based products, the project will support national infrastructure projects, facilitate rapid urbanization, and contribute to the realization of Kenya's broader economic development objectives.

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 expansion of cement manufacturing 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 cement and cement products manufacturing 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 | <p>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.</p> <p>In line with the regulations, the proposed project (Establishment of Cement and Cement Products Manufacturing Plant) has been classified as a High-risk project due to its nature, and potential environmental and social interactions.</p> |

| Regulation | Relevance |
|---|---|
| | <p>Consequently, the law requires the preparation of a Comprehensive Environmental and Social Impact Assessment (ESIA) Study Report, which must be submitted to NEMA for review and licensing before project implementation can commence.</p> <p>Relevance: <i>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.</i></p> |
| <p>EMCA (Waste Management) Regulations, 2024 (Legal Notice No. 178 of 2024)</p> | <p>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: <i>The proponent will develop and implement the Waste Management Plan in compliance with the provisions of this regulation.</i></p> |
| <p>EMCA (Noise and Excessive Vibration Pollution) (Control) Regulations, 2009</p> | <p>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.</p> <p>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: <i>Project work should be planned in a way that limits excessive noise and vibration, especially near sensitive receptors.</i></p> |
| <p>EMCA (Water Quality) Regulations, 2024 (Legal Notice No. 177 of 2024)</p> | <p>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.</p> <p>Relevance: <i>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.</i></p> |
| <p>EMCA (Air Quality) Regulations, 2024 (Legal Notice No. 180 of 2024)</p> | <p>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.</p> <p>Relevance: <i>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.</i></p> |

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 Nyeri County Lusoi village, 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 Nyeri 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 Nyeri 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 covered under life insurance cover and full compliance with the provisions of this Act.*

3.4. Social Risks Legislations

Table 4: Relevant Social Risks Legislations

| Legislation | Relevance |
|---|---|
| The Sexual Offences Act 2006 | <p>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:</p> <ul style="list-style-type: none"> • 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 <p>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).</p> |
| HIV/AIDS Prevention and Control Act (Act No.14 of 2006, Revised in 2012) | <p>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</p> |

| Legislation | Relevance |
|-------------|--|
| | 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 Nyeri to oversee and regulate land use, environmental conservation, and economic activities within its jurisdiction. This includes issuing permits, enforcing local bylaws, 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 5: Relevant Institution

| Institution | Mandate and Relevance |
|--|--|
| National Environment Management Authority (NEMA) | <p>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:</p> <ul style="list-style-type: none"> • 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. <p>NEMA plays a regulatory and oversight role, particularly in ensuring that all project activities are compliant with environmental laws and are sustainably implemented.</p> |
| County Government of | As a devolved unit under the Constitution of Kenya, 2010, the County |

| Institution | Mandate and Relevance |
|-------------|--|
| Nyeri | <p>Government of Nyeri 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:</p> <ul style="list-style-type: none"> • <i>Formulate and implement County-level legislation and policies that guide sustainable development in alignment with national objectives;</i> • <i>Approve and regulate local development activities, including aquaculture, through development control mechanisms such as zoning, physical planning approvals, and building permits;</i> • <i>Facilitate public participation and stakeholder engagement, ensuring that the voices of local communities and interest groups are integrated into project planning and implementation;</i> • <i>Support local economic development, including job creation and value chain development within the fisheries and aquaculture sectors;</i> • <i>Ensure the integration of environmental considerations into local development decisions, particularly through collaboration with agencies such as NEMA.</i> <p>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.</p> |

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 Nyeri County

The study area is located in Lusoi Village, Lusoi location, Kieni East Sub-County, Nyeri County. Nyeri county is located in the former Central Province of Kenya about 153km North of Nairobi. The County is composed of 8 sub-counties and 30 wards. The sub-counties include: Kieni East, Kieni West, Mathira East, Mathira West, Nyeri Central, Mukurweini, Tetu and Othaya. Nyeri County is one of the 47 counties in Kenya and is located in the central region of the country. It covers an area of 3,337.2 Km² and is situated between longitudes 36⁰ 38" east and 37⁰ 20" east and between the equator and latitude 0⁰ 380 south. It borders Laikipia County to the north, Kirinyaga County to the east, Murang'a County to the south, Nyandarua County to the west and Meru County to the northeast.

2.3. Project Location

The proposed project site is located on the foot slopes of Mount Kenya, within Lusoi Village off the Nyeri–Nanyuki Highway. Administratively, the site falls under Thegu River Ward, Kieni Sub-County, Nyeri County, Kenya. The project site is registered as L.R. No. Nyeri/Lusoi/213. The site is geographically referenced at coordinates **Latitude -0.280526** and **Longitude 37.034144** (WGS 84 datum).



Plate 1: Site Location (Source: Fieldwork)

2.4. Physical Environment

2.4.1. Physiography

The topography of the area is generally diverse, characterized by steep ridges and valleys, occasionally interrupted by hills such as Karima, Nyeri, and Tumu-Tumu. The northern part of the county is relatively flat, while the southern and western regions feature more pronounced ridges and valleys. The county is flanked by major physical features, including Mount Kenya (5,199 m) to the east and the Aberdare Ranges (3,999 m) to the west. These elevated features influence local climate patterns, particularly rainfall distribution, which in turn affects agricultural practices in different areas. The proposed project site is situated on the expansive plain along the leeward slopes of Mount Kenya, where the terrain is mostly gentle with no pronounced undulations, except for ridge valleys along the nearby river course. This relatively level physiography is suitable for industrial development, providing natural drainage paths while minimizing the need for extensive land modification.



Plate 2: Project Site Physiographic Features

2.4.2. Geology/geomorphology

The geology of the area is predominantly characterized by the Nyeri Tuff, a volcanic deposit originating from the historic eruptions of Mount Kenya. The Nyeri Tuff forms the main geological unit across the project region and plays a significant role in the local topography and resource availability. Stratigraphically, the Nyeri Tuff overlies the Simbara Series and is capped by the Lakiopian Basalts in some locations. In certain areas, such as Kiganjo–Chieni–Ngondi, the Nyeri Tuff oversteps the Simbara Series and rests directly on the Basement System, reflecting the complex volcanic and tectonic history of the region (Shackleton, 2007).

The Nyeri Tuff has an approximate thickness of 30 meters and is pale grey in color. It contains numerous sub-angular pumice fragments measuring up to one inch, and scattered fresh feldspar fragments up to one millimeter long. These fragments are embedded within a fine-grained clay matrix that contains minor claystone lenticles. Notably, both pumice fragments and lenticles exhibit a sub-horizontal parallel alignment, indicative of depositional processes and post-depositional settling. The tuff is durable and extensively used as a source of building stone, with multiple active and abandoned quarries visible within the area, highlighting its potential for industrial applications.

Soils

Soils within the project area are predominantly Vertisols, characterized by high clay content and montmorillonite minerals, which are notable for their shrink-swell behaviour. These soils exhibit significant changes in volume with variations in moisture content, leading to seasonal cracking and swelling. Vertisols are fertile but challenging for construction, requiring careful consideration in foundation design, drainage, and earthworks.

2.4.3. Climate

Nyeri County lies within Kenya's highland equatorial zone and experiences a highland equatorial climate characterized by moderate temperatures and a bimodal rainfall pattern. The area generally receives long rains from March to May and short rains from October to December, although these patterns are occasionally disrupted by sudden dry spells or unseasonal rainfall. Rainfall varies considerably across the county due to differences in altitude and topography. The Kieni Plateau, where the proposed project is located, is among the driest parts of Nyeri County, receiving approximately 500mm of rainfall annually, whereas the Aberdare Ranges and the slopes of Mount Kenya receive up to 1,500mm annually. Temperatures across the county range from a minimum of 12°C to a mean of 27°C, providing generally moderate conditions suitable for industrial operations. The proposed project site in Kieni East Sub-County lies on the leeward slopes of Mount Kenya, where rainfall is limited due to orographic effects.

2.4.4. Wind Analysis

Wind patterns are a critical environmental factor to consider for industrial projects, particularly for cement and cement products manufacturing plants, due to their influence on dust dispersion, air quality, and emissions control. Understanding the prevailing wind direction and speed is essential for the placement of plant structures, stockpiles, and emission control devices to minimize environmental impacts on surrounding communities.

Wind Direction and Speed: The proposed project area, located on the leeward slopes of Mount Kenya, experiences predominantly easterly to south-easterly winds during most of the year. Seasonal variations are observed, with winds intensifying during the dry season (June–September) and becoming more moderate during the wet seasons (March–May and October–December). Wind speeds generally range from 2 to 6 meters per second (m/s) under normal conditions, with occasional gusts exceeding 10 m/s during storms or local convection event as shown in the diagram below.

Wind Rose for Proposed Project Area (Leeward Slopes of Mount Kenya)

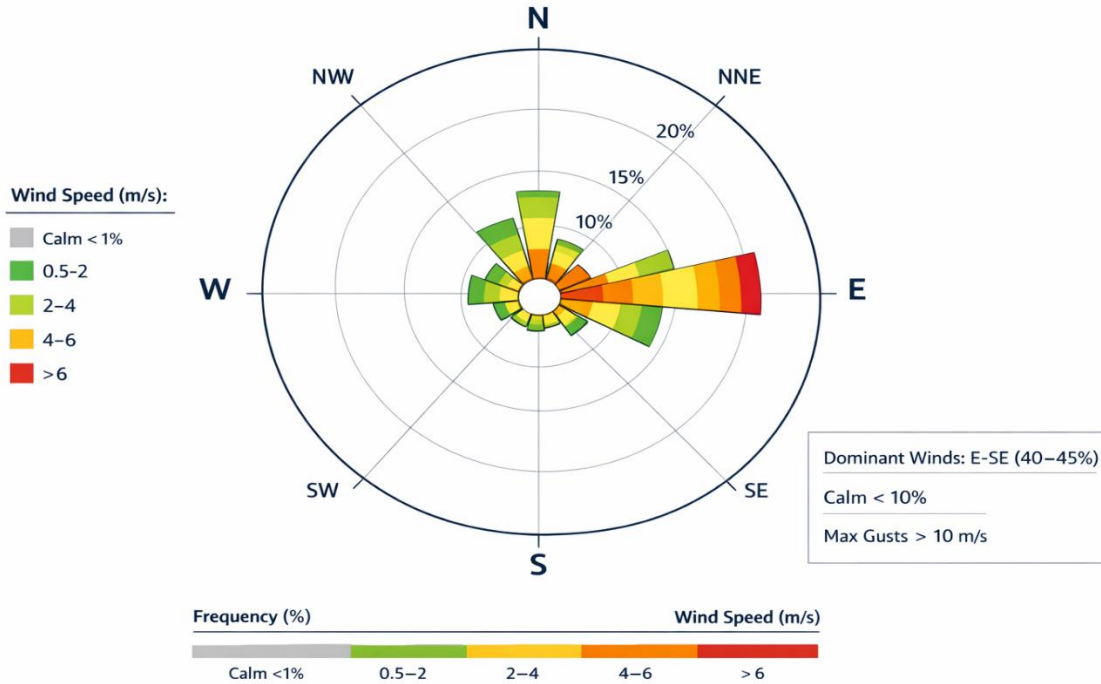


Figure 5: Nyeri County Windrose Diagram

A wind rose diagram was developed based on historical meteorological data from nearby stations and represents the frequency and strength of winds from different directions. The analysis indicates that:

- Easterly and south-easterly winds dominate, occurring approximately 40–45% of the time.
- North-easterly and north-westerly winds are less frequent, accounting for around 20% of observations.
- Calm conditions, where wind speeds are below 1 m/s, occur roughly 10% of the time, typically during early morning.

2.4.5. Hydrology and Hydrogeology

The main river in Central Kenya is the Tana River, which provides water to approximately 17 million people, representing nearly 50% of the country’s population (IFAD/UNEP/GEF, 2004). The Upper Tana River basin receives its flow from the higher elevation areas, notably the Aberdare Range and Mount Kenya, which serve as critical water catchments for the region. Nyeri County, including the area influenced by the proposed cement and cement products manufacturing plant, falls within the Sagana River catchment (Catchment 4A), covering an area of approximately 2,738 km².

Several rivers and streams traverse Nyeri County, forming an intricate network that contributes to both surface water availability and ecological sustainability. The Chania River, which flows through Nyeri town, is an important tributary of the Sagana River, while smaller streams such as Gathwariga feed into the Chania River system. Other permanent rivers in the county include the Sagana, Gura, Honi, and Ragati rivers, among others. In total, the county has 49 permanent rivers and 32 water dams, which provide water for domestic, agricultural, and industrial uses. The proposed project site is specifically drained by the Nairobi River, which serves as the immediate surface water resource for the area.

2.4.6. Land tenure, Zoning and Use

The proposed project area is predominantly characterized by agricultural land use, with the landscape largely dominated by small-scale farming activities, including cultivation of crops and livestock rearing. Scattered throughout the area are rural homesteads, community structures, and associated infrastructure such as access roads, water points, and small-scale service facilities. The agricultural activities form the

primary livelihood source for the local population, shaping both the socio-economic and cultural landscape of the region. Despite the predominance of farming, the proposed project site has been zoned for industrial activities under the Nyeri County Integrated Development Plan (CIDP). This zoning reflects the county's strategy to promote industrial development and economic diversification, particularly in areas that can support manufacturing and processing activities while minimizing conflicts with agricultural operations. The location is therefore suitable for the establishment of a cement and cement products manufacturing plant.

2.5. Biological Resources

The Central Kenya region contains some of Kenya's largest tracts of indigenous forest on Mount Kenya and the Aberdare ranges. Almost all of these forests are on government land - either as forest reserves or national parks set up to safeguard biodiversity or hydrological services. The areas surrounding these forests are densely populated with intensive agricultural production in the foothills of the two mountain ranges. Over the past 100 years, much of the land in the foothills that once was forest or a mosaic of forest and other habitats has now been cleared and converted to agriculture, resulting in significant losses of biological diversity. The most extensive vegetation type in the Aberdare's Conservation Area (ca. 2,185 km²) is bamboo (ca. 556 km², 25% coverage), followed by "wetter evergreen forest" (ca. 398 km², 18% coverage). Of the tree-dominated habitats, "drier evergreen forest" (ca. 12 km²).

2.5.1. Terrestrial Ecology

The vegetation within the proposed project area and its zone of influence reflects a combination of indigenous forest species, agroforestry, and exotic plantations, shaped by altitude, land use, and human activities. In the higher elevations, the most abundant indigenous tree species include *Nuxia congesta*, *Juniperus procera*, *Olea europaea*, *Podocarpus latifolius*, and *Neboutonia macrocalyx*, which are characteristic of montane forest ecosystems. These species contribute to biodiversity, soil stabilization, and microclimate regulation in the area. The middle zones are predominantly under agroforestry management, featuring a mix of exotic and fruit trees. Common species include *Grevillea* and *Eucalyptus*, alongside fruit trees such as mango, pawpaw, and avocado, reflecting local livelihood practices and small-scale farming activities. These areas demonstrate a balance between productive land use and the maintenance of tree cover, which supports soil fertility and provides shade and windbreaks.

The lower, drier zones are largely dominated by fruit trees, particularly mangoes, interspersed with remnants of indigenous vegetation such as *Ficus sycomorus* (mikuyu) and *Cordia africana*, which have either been left intact or regenerated naturally. Other scattered indigenous species in these zones include *Commiphora spp.*, *Combretum molle*, *Acacia spp.*, and *Cassia spp.*, contributing to local biodiversity and serving as habitats for birds and small mammals. Within the project site and immediate area of influence, vegetation is primarily composed of exotic plantations, including *Eucalyptus spp.* and *pine*, which have been introduced for timber and fuelwood purposes. Natural vegetation is largely restricted to riparian zones along rivers and streams, where indigenous plant communities are preserved, providing important ecological services such as soil erosion control, water quality maintenance, and habitat for aquatic and terrestrial species.



Plate 3: Vegetation Along Nairobi River (Source: Fieldwork)

2.5.2. Terrestrial Mammals

The proposed project site is largely devoid of significant wildlife populations, as most terrestrial mammals in the region are restricted to protected areas, natural forests, riverine corridors, and ranchlands where suitable habitats and cover are available. The immediate project area, being dominated by agricultural land, exotic plantations, and human settlements, does not provide sufficient habitat to support sizeable populations of wild mammals. While small mammals such as rodents and insectivores may be present within degraded or cultivated areas, larger species including antelopes, primates, and carnivores are largely absent due to habitat disturbance, agricultural activities, and human presence.

2.6. Socio-Economic Baseline Condition

2.6.1. Population and Local Demographics

Settlement patterns within the proposed project area and the wider Central Kenya region are influenced by a combination of climatic conditions, infrastructure availability, agricultural potential, food resources, and proximity to urban centres. The majority of residents in this region tend to settle in the upper zones, where fertile soils and reliable rainfall create favorable conditions for agriculture, which remains the primary livelihood activity. This distribution also corresponds to the natural endowment of resources, as communities cluster in areas capable of supporting crop production, livestock rearing, and other economic activities.

According to the 2019 Kenya Population and Housing Census, Nyeri County had a total population of 759,164 people, with an average population density of 228.3 people per square kilometre. The highest urban population and density are found in Nyeri Town, the county headquarters, which serves as the central hub for commerce, governance, and social services. Outside urban centres, population concentrations are higher along major roads and in areas with productive soils and dependable rainfall, reflecting the combined influence of accessibility, livelihood opportunities, and resource availability. In contrast, rural and marginal areas with lower soil fertility or limited water resources exhibit sparse settlement. The growth of towns and the development of infrastructure have further contributed to clustered settlement patterns, resulting in higher population densities in urban and peri-urban areas compared to sparsely populated rural zones.

| Age Cohort | 2019 (Census) | | | | 2022 (Projection) | | | | 2025 (Projection) | | | | 2027 (Projection) | | | |
|------------|---------------|---------|-----------|---------|-------------------|---------|-----------|---------|-------------------|---------|-----------|---------|-------------------|---------|------------|---------|
| | M | F | Inter-sex | T | M | F | Inter-sex | T | M | F | Inter-sex | T | M | F | In-ter-sex | T |
| 0-4 | 37,016 | 36,082 | | 73,098 | 39,976 | 40,230 | | 80,206 | 39,912 | 40,002 | | 79,914 | 39,598 | 39,684 | | 79,281 |
| 5-9 | 77,943 | 37,313 | | 75,079 | 39,199 | 39,917 | | 79,116 | 39,533 | 40,373 | | 79,906 | 39,495 | 40,221 | | 79,716 |
| 10-14 | 78,855 | 37,479 | | 76,522 | 37,322 | 37,818 | | 75,140 | 38,442 | 39,204 | | 77,646 | 38,666 | 39,512 | | 78,178 |
| 15-19 | 37,969 | 35,558 | | 73,527 | 35,785 | 36,429 | | 72,214 | 36,014 | 36,788 | | 72,802 | 36,755 | 37,716 | | 74,471 |
| 20-24 | 29,778 | 29,391 | | 59,169 | 34,861 | 36,153 | | 71,014 | 36,147 | 36,516 | | 72,663 | 36,300 | 36,765 | | 73,065 |
| 25-29 | 24,018 | 25,279 | | 49,297 | 33,935 | 34,997 | | 68,932 | 34,521 | 36,121 | | 70,642 | 35,407 | 36,384 | | 71,791 |
| 30-34 | 26,380 | 28,205 | | 54,585 | 29,823 | 31,849 | | 61,672 | 33,290 | 33,879 | | 67,169 | 33,683 | 34,634 | | 68,316 |
| 35-39 | 25,905 | 27,229 | | 53,134 | 27,377 | 28,943 | | 56,319 | 26,915 | 29,674 | | 56,589 | 29,182 | 31,003 | | 60,185 |
| 40-44 | 23,836 | 24,202 | | 48,038 | 25,455 | 26,701 | | 52,156 | 26,871 | 27,477 | | 54,349 | 26,582 | 27,966 | | 54,547 |
| 45-49 | 21,774 | 21,794 | | 43,568 | 21,316 | 23,043 | | 44,359 | 23,461 | 25,074 | | 48,536 | 24,372 | 25,581 | | 49,952 |
| 50-54 | 18,644 | 20,024 | | 38,668 | 18,173 | 19,447 | | 37,620 | 18,660 | 20,581 | | 39,241 | 20,001 | 21,868 | | 41,868 |
| 55-59 | 15,916 | 16,562 | | 32,478 | 15,828 | 16,260 | | 32,088 | 16,207 | 17,546 | | 33,754 | 16,518 | 18,263 | | 34,781 |
| 60-64 | 10,311 | 11,207 | | 21,518 | 11,644 | 12,073 | | 23,716 | 13,623 | 14,493 | | 28,116 | 13,848 | 15,289 | | 29,137 |
| 65-69 | 8,661 | 9,507 | | 18,168 | 9,314 | 9,868 | | 19,182 | 8,470 | 9,817 | | 18,287 | 9,576 | 11,325 | | 20,901 |
| 70-74 | 7,986 | 9,208 | | 17,194 | 8,529 | 9,140 | | 17,669 | 7,371 | 9,159 | | 16,530 | 6,983 | 9,128 | | 16,111 |
| 75-79 | 3,991 | 6,447 | | 10,438 | 6,379 | 7,146 | | 13,525 | 6,163 | 8,136 | | 14,300 | 5,691 | 8,147 | | 13,838 |
| 80+ | 5,289 | 9,353 | | 14,642 | 10,798 | 11,079 | | 21,876 | 10,839 | 11,332 | | 22,171 | 10,995 | 12,265 | | 23,259 |
| Age NS** | 5 | 5 | 31 | 41 | 5 | 5 | 33 | 43 | 6 | 6 | 34 | 45 | 6 | 6 | 36 | 47 |
| Total | 454,277 | 384,845 | 31 | 759,164 | 405,714 | 421,093 | | 826,847 | 416,445 | 436,178 | 34 | 852,660 | 423,658 | 445,757 | 36 | 869,444 |

*The age of the intersex population was not provided in the census data and thus they were included among the 5 individuals who did not state their age.
**Age Not Specified

Figure 6: Nyeri County Population and Projections (KNBS 2022)

2.7. Infrastructures and Utilities

2.7.1. Water and Sanitation

Nyeri County relies on both surface and groundwater sources to meet domestic, agricultural, and industrial water needs. The county is within the Upper Tana River catchment, with key rivers including the Sagana, Chania, Gura, Honi, and Ragati rivers. These rivers, along with permanent streams such as Gathwariga and Nairobi River near the proposed project site, form the main sources of surface water. The county also has several small dams and water storage facilities to support irrigation, livestock, and domestic use. Groundwater resources are tapped through boreholes and shallow wells, particularly in drier areas such as Kieni Sub-County, which has limited surface water availability. Access to clean and safe drinking water varies across the county, with most urban households connected to piped water systems, while rural communities often rely on rivers, streams, or communal wells.

Sanitation services in the county are mixed. Urban centers such as Nyeri Town have sewer networks and waste treatment facilities, whereas rural areas primarily depend on pit latrines, septic tanks, and other on-site sanitation systems. Coverage and functionality of sanitation infrastructure remain variable, with some areas experiencing challenges in solid waste management and wastewater treatment.

The proposed project site will require a reliable water supply for cement production processes, dust suppression, and domestic use. Water is expected to be sourced primarily from nearby streams, with the potential development of boreholes as a supplementary source. Proper wastewater management systems shall also be incorporated.

2.7.2. Transport and other Infrastructure

Nyeri County has a total classified road network of approximately 3,092.73 km, comprising a mix of bitumen, gravel, and earth-surfaced roads that provide critical connectivity across urban centres, rural settlements, and agricultural zones. The bitumen roads, totalling about 478.25 km, form the main arterial network connecting major towns and economic hubs, including Nyeri Town, Nanyuki, Karatina, Othaya, and Mweiga. These all-weather roads support efficient movement of goods, services, and people, and will serve as the primary route for accessing the proposed cement and cement products manufacturing plant.

The majority of the network, approximately 2,492.85 km, consists of gravel or murram roads. These roads link rural areas, small-scale farming communities, and trading centres to the main highways. Gravel roads are vital for transporting raw materials, construction inputs, and labor to sites across the county. A smaller portion, about 121.63 km, comprises earth-surfaced roads, which generally serve remote settlements and minor feeder routes. These roads may be seasonally affected by rainfall, potentially impacting accessibility during the wet season. The proposed project site will be accessed via the Nyeri–Nanyuki Highway, a major bitumen road, before branching onto a gravel access road leading directly to the plant. Given the anticipated heavy-duty transport requirements for cement production, raw materials, and finished products, periodic maintenance and potential upgrades to the access road may be required to accommodate increased traffic and ensure safe and efficient transport.

2.7.3. Energy

The primary source of energy for lighting within Nyeri County is electricity, which is used by approximately 68% of residents. As of August 2018, over 80.78% of households in the county were connected to the national electricity grid (Kenya Power, 2019), reflecting significant penetration of modern energy infrastructure. For cooking, the predominant energy source is firewood, used by about 61% of households, with the highest reliance observed in wards such as Rugi and Gikondi, while lower usage is noted in areas like Rware and Ruring'u. This reliance on biomass reflects both traditional cooking practices and limited access to alternative fuel sources in some rural areas.

The proposed project site is well connected to the national electricity grid, and power supply will primarily be drawn from Kenya Power and Lighting Company (KPLC). Should the demand from the cement and cement products manufacturing plant exceed current capacity, necessary upgrades or supplementary power sources will be considered to ensure continuous and reliable operations. This includes the potential installation of backup generators to maintain operations during power interruptions and support critical production processes.

2.7.4. Economic Activities and Household Income

Nyeri County's economy is largely supported by agriculture, livestock, and tourism. The county hosts private ranches that supply dairy and beef products, some of which also serve as private wildlife sanctuaries, attracting both local and international tourists and contributing to the vibrant tourism sector. Key tourist attractions, including Mount Kenya and the Aberdare National Park, further bolster economic activity in the region. Agriculture remains a central economic pillar, with the highland tea zones dominated by tea plantations covering approximately three-quarters of the land, managed primarily by the Kenya Tea Development Agency (KTDA), which also operates local tea factories. Other cash crops cultivated in the county include coffee, wheat, cotton, macadamia, tobacco, Irish potatoes, and pyrethrum, while staple food crops such as maize, beans, sorghum, bulrush millet, and finger millet are widely grown.

Agriculture currently employs about 33% of the county's population, with an estimated 758.5 km² of arable land suitable for crop production. Agribusiness activities, including crop farming, livestock rearing, and agro-processing, therefore constitute one of the main sources of household income and livelihood. The proposed project site is predominantly characterized by agricultural land use, interspersed with scattered homesteads and associated rural infrastructure, highlighting the potential for integrating local economic participation in the project.

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 cement and cement products manufacturing plant is not developed. Under this option, the growing demand for cement and related construction materials in Kenya would remain unmet, limiting the availability of essential building materials needed to support the country's economic growth and infrastructure 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 cement plant will have some environmental impacts, it is projected to create approximately 600 direct employment opportunities during the operational phase. Additionally, the project is expected to generate further economic benefits for residents of Kieni East Sub-County (Lusoi Village) through the development of supply and distribution chains, transport, and associated services.

The project will also facilitate the transfer of technology related to the installation, operation, and maintenance of plant equipment, contributing to local skill development. Furthermore, the plant is expected to reduce foreign exchange outflows by producing cement domestically rather than relying on imports. Under the “Do Nothing” scenario, the proposed investment of approximately Ksh. 2 billion by the project proponents would remain unutilized, and the associated employment, technology transfer, and economic benefits would not be realized. For these reasons, proceeding with the project is considered the preferred and most viable alternative.

3.3. Site Alternatives

The proposed location for the cement and cement products manufacturing plant has been carefully selected based on multiple technical, logistical, and environmental considerations. The site is in close proximity to key limestone reserves, which will minimize the need for long-distance transport of raw materials, thereby reducing operational costs, fuel consumption, and associated emissions.

In addition to logistical advantages, this location has been identified as the most suitable from an environmental and social perspective. The site currently consists predominantly of agricultural land, with small-scale farming being the main land use in Lusoi Village and its environs. However, according to the Nyeri County Integrated Development Plan (CIDP), the area has been designated for industrial activities, making it appropriate for the establishment of a cement manufacturing facility while remaining consistent with county-level land use planning and zoning regulations.

Selecting this location also helps to minimize potential negative impacts on sensitive ecosystems, residential areas, and community livelihoods. The site's relatively sparse settlement pattern, combined with its industrial zoning, ensures that the project can be developed with minimal disruption to the existing social and environmental setting. Overall, the proposed site represents a strategic balance between operational efficiency, regulatory compliance, and sustainable development objectives.

3.4. Technological Alternatives

Cement production at the proposed plant will primarily utilize modern dry-method technology, which is recognized as the industry standard for energy-efficient operations. Compared to the traditional wet method, the dry method requires approximately 50% less energy to burn clinker, the primary raw material in cement production. Clinker, once milled and blended with other ingredients, forms cement, and the reduction of energy required for its production is crucial, as fuel constitutes one of the highest operational costs in the cement manufacturing process.

The new facility will be designed and constructed in accordance with the Best Available Technologies (BAT) for the cement industry. This includes the implementation of pre-calcining technology in the clinker production process, which improves thermal efficiency and reduces fuel consumption while maintaining high-quality cement output. By adopting these advanced technologies, the plant will achieve enhanced energy efficiency, reduced greenhouse gas emissions, and lower operational costs, aligning with both economic and environmental sustainability objectives. Each technology is as described in the Table below:

Table 6: Different Technology Comparison

| Technology | Process Description | Energy Requirement (kJ/kg clinker) | Advantages | Limitations | Suitability for Proposed Plant |
|--|--|------------------------------------|---|--|---|
| Wet Process | Raw materials are mixed with water to form a slurry, which is fed into a kiln for clinker formation. The clinker is cooled, ground, and blended with gypsum to produce cement. | 6,000–7,000 | Simple process control; can handle wet raw materials | Very high energy consumption; high fuel costs; higher CO ₂ emissions | Not recommended due to inefficiency and high operational cost |
| Dry Process | Raw materials are ground and fed into the kiln as a dry powder, where clinker formation occurs without added water. | 3,000–3,500 | Energy-efficient (~50% less than wet); lower fuel costs; reduced CO ₂ emissions; better clinker quality | Requires dry raw materials; higher initial investment | Suitable; energy-efficient and aligns with modern industrial practices |
| Semi-Dry Process | Raw materials are mixed with a small amount of water to form nodules/pellets before entering the kiln. | 4,000–4,500 | Can handle slightly moist raw materials; moderately energy-efficient | Less efficient than dry and pre-calcining processes | Less preferred; moderate efficiency but not optimal for large-scale plant |
| Pre-Calcining Dry Process (BAT) | Raw materials are partially calcined in a pre-calciner before entering the rotary kiln. Fuel is supplied to both the pre-calciner and kiln for maximum thermal efficiency. | 2,800–3,000 | Highest energy efficiency; low fuel cost; minimal CO ₂ emissions; high clinker quality; short kiln residence time; higher throughput | High initial capital cost; requires skilled operation | Highly recommended; aligns with Best Available Technology (BAT) and environmental standards |
| Vertical Shaft Kiln (VSK) | Clinker is produced in a vertical shaft kiln using layered raw materials and fuel. Mostly used for small-scale plants. | 3,000–4,000 | Low capital cost; simple operation; suitable for small/remote plants | Low production capacity; higher emissions per ton; less control over clinker quality | Not suitable for large-scale cement and cement products plant |

3.4.1. Conventional Batching Technology

Conventional batching technology involves the use of stationary or mobile concrete mixers, where the weighing and proportioning of cement, aggregates, and water is carried out either manually or using semi-automatic systems before the materials are combined in the mixer. In this process, operators typically measure each component according to predefined mix ratios and feed them into the mixer, either by hand, wheelbarrow, or simple mechanical conveyors. While this method is widely adopted and cost-effective, it has several limitations. The reliance on manual measurement and handling can lead to variability in mix proportions, resulting in inconsistent concrete quality between batches. The process also demands higher labor input, as multiple personnel are needed for weighing, loading, mixing, and quality checks. Furthermore, conventional batching offers limited automation or integration with environmental control systems, such as dust suppression or wastewater treatment. This can lead to increased emissions of cement dust, spillage of raw materials, and inefficient use of water during washing of mixers and trucks, potentially impacting air quality and local water resources.

3.4.2. Automated/Computerized Batching Systems

Automated or computerized batching systems employ computer-controlled equipment to precisely measure and mix cement, aggregates, water, and any additives according to predefined mix designs. The process is fully or partially automated, with sensors, load cells, and programmable logic controllers (PLCs) ensuring accurate material proportions for every batch. This precision guarantees consistent concrete quality, reducing the variability often associated with manual or semi-automatic methods.

One of the key advantages of automated systems is the ability to integrate environmental management technologies. Dust suppression systems, such as baghouse filters or enclosed conveyors, can be synchronized with the batching process to capture particulate emissions at the source. Similarly, water recycling systems can collect wash water from mixers and trucks, treating and reusing it in subsequent concrete production cycles, thereby minimizing freshwater consumption and preventing wastewater discharge into municipal systems. Emission control equipment can also be linked to the automated system to monitor and mitigate airborne dust and other pollutants. While the initial capital investment for automated batching plants is higher compared to conventional systems, the benefits are significant. Automation reduces human error, ensuring that mix designs are accurately followed and that material wastage is minimized.

Productivity is improved through faster batch cycles and reduced downtime, while computerized monitoring allows for real-time tracking of raw material usage, production volumes, and maintenance needs. This not only enhances operational efficiency but also supports regulatory compliance, particularly regarding air quality, water management, and occupational health and safety standards.

3.4.3. Conclusion

The alternative analysis demonstrates that the proposed establishment of a cement and cement products manufacturing plant at Lusoi Village, Nyeri County, represents the optimal balance between economic benefits, technical feasibility, and environmental and social sustainability. The “No-Project” or “Do Nothing” option would forego critical socio-economic opportunities, including the creation of approximately 600 direct jobs, hundreds of indirect jobs through supply chains, technology transfer, and the stimulation of local and national economic growth. Additionally, it would fail to address the growing demand for high-quality cement and cement products, which are essential for Kenya’s expanding infrastructure and Vision 2030 development goals.

Among the location alternatives, the proposed site was selected for its proximity to raw material sources, accessibility to the national grid, and minimal environmental and social disruption. Industrial zoning in the area, as confirmed by the Nyeri CIDP, further supports its suitability.

Regarding technological alternatives, the adoption of modern dry-process and pre-calcliner cement production technology ensures high energy efficiency, reduced CO₂ emissions, and adherence to Best Available Technologies (BAT). In contrast, wet or semi-dry processes are less efficient, more resource-

intensive, and environmentally burdensome. In summary, the selected project alternative maximizes economic, social, and environmental benefits while minimizing adverse impacts. It aligns with Kenya's long-term development objectives, complies with environmental regulations, and provides a sustainable pathway for industrial growth, making it the most viable and responsible option.

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.

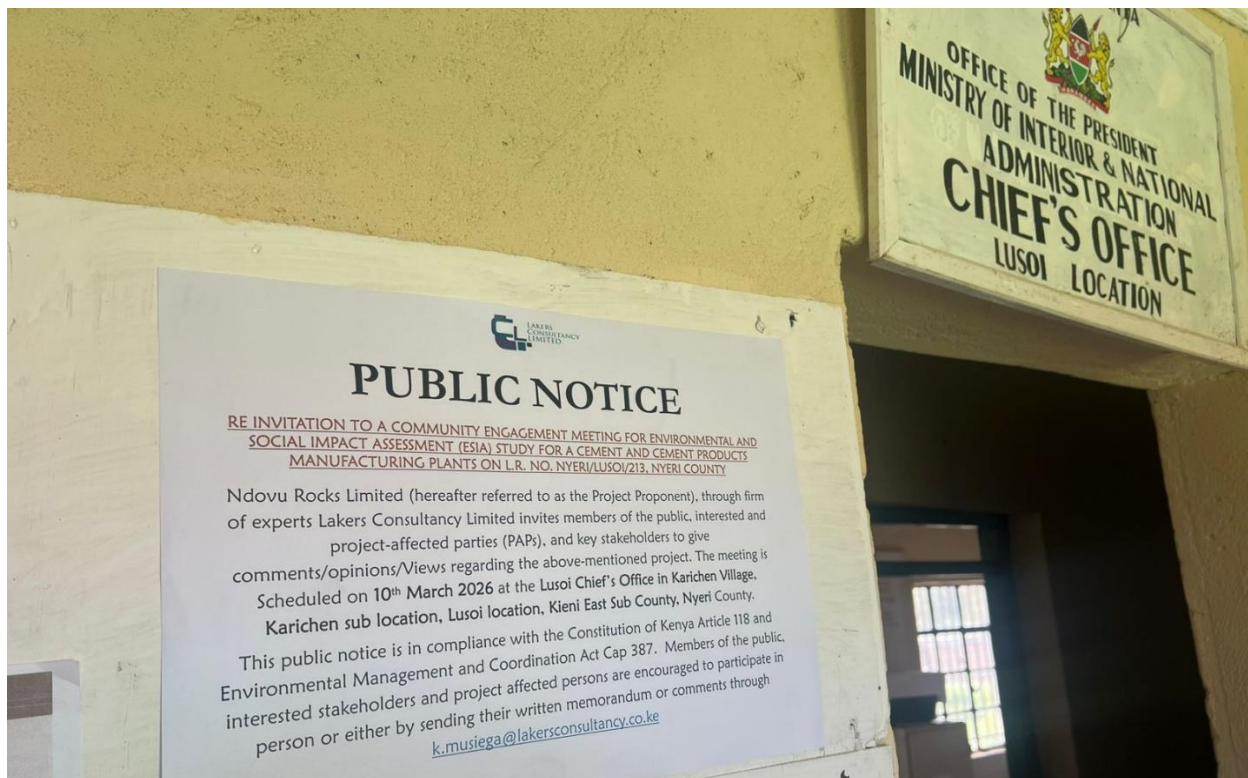


Plate 4: Public Notice Posted at the Chief's Camp

4.4.2. Feedback

Public engagement for the proposed cement and cement products manufacturing plant was conducted through a series of public barazas held at the Lusoi Chief's camp. Three consecutive meetings were organized between the 10th and 13th 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 5: Proponent Representative (Mr. Gitonga Making a Point)



Plate 6: Community Members During Public Engagement Baraza



Plate 7: Upstanding Community Member Raising Concern

Based on the feedback received during public engagement, the majority of stakeholders expressed concerns related to the operations of the proposed plant (Cement manufacturing plant). The key issues raised include:

- **Dust emissions:** Community members highlighted the potential for dust to affect the surrounding environment, including nearby residential areas, schools, and other sensitive environment including vegetation.
- **Noise pollution:** The operation of plant machinery and the frequent movement of delivery trucks were noted as significant sources of noise that could impact the quality of life in the neighboring community.

- **Road infrastructure damage:** Concerns were raised regarding the deterioration of road access, particularly due to the heavy traffic generated by trucks transporting raw materials and finished products.

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 7: Impact Characterization Criteria

| | | | |
|-------------------------------|--|---|---|
| <i>Duration</i> | 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. |
| <i>Extent</i> | Local: Impact affecting the environment or communities within the Project Aol. | 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 |
| <i>Frequency</i> | One-off/ Occasional: Impacts that occur once only or occasionally. | Intermittent: Impacts that occur periodically or repeatedly | Continuous: Impacts that happen continuously |
| <i>Intensity/Impact scale</i> | 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 |
| <i>Likelihood</i> | 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 8: 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 9: 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 mitigation 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 Cement and Cement Products Manufacturing Plant in Lusoi, Nyeri 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 cement and cement products manufacturing 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 of the proposed plant 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 cement and cement products manufacturing 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

Cement and cement products manufacturing operations, while essential for infrastructure development, present several potential environmental risks if not properly managed. These impacts arise from activities such as raw material handling, aggregate washing, cement storage, concrete mixing, and wastewater disposal. Common issues include dust emissions, noise, water and soil contamination, and improper waste management. However, with sound environmental management practices, proper site layout, and the application of proven control technologies, these risks can be effectively minimized or eliminated to levels that are as low as reasonably practicable. Adherence to best practice design, operational controls, and regulatory compliance ensures that plants will operate efficiently while safeguarding the surrounding environment and community health.

5.6.1.Excessive Dust (Air Pollution)

Excessive dust generation is one of the most common environmental challenges associated with cement and cement manufacturing plant operations. Dust is typically produced during the delivery, storage, and transfer of raw materials such as cement, sand, and aggregates, as well as during truck movements and processing activities. When cement is offloaded from bulk tankers into silos, or when aggregates are handled and transferred, fine particles can easily become airborne if proper containment and filtration systems are not in place. Similarly, open stockpiles of sand and gravel are prone to wind erosion, especially during dry and windy conditions, resulting in fugitive dust emissions across the site.

During processing, the loading of cement and aggregates into equipment can also release dust, particularly where hoppers, conveyors, or pneumatic systems are inadequately sealed. Additionally, the movement of trucks on unpaved or poorly maintained internal roads stirs up dust, contributing further to air quality degradation within and around the site. If left uncontrolled, excessive dust can reduce air quality, cause respiratory discomfort for workers, and create nuisance conditions for nearby resident.

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 cement, sand, and dust 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, cement residue, and aggregate spillage, ensuring a tidy and safe working environment,
- Vehicle movements within the plant yard should be restricted to **10–15 km/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 cement or fly ash dust escaping,
- Ensure the high-level sensor alarm is set at a point that prevents the silo from overflowing and automatic shut-down switch is also required to minimize spillage and dust, and

- Cement 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 cement and cement products manufacturing plant operations. Noise at the plant can originate from multiple sources, including the delivery and handling of raw materials such as cement, sand, and aggregates. During loading and unloading, the dropping and movement of these materials can produce high-impact sounds, particularly when conducted on hard surfaces or within metallic hoppers and silos. The mixing of concrete itself also generates considerable noise due to the operation of mixers, vibrators, and associated equipment.

Truck movements within the plant especially during loading, idling, and reversing are frequent contributors to overall noise levels. The use of reversing alarms or “beepers” on trucks and heavy machinery, though essential for safety, adds to the cumulative sound intensity within and around the site. Additionally, continuous operation of mechanical components such as conveyor belts, pumps, compressors, and motors creates a persistent background noise that may affect both workers and nearby communities. Another intermittent but significant noise source is the “de-dagging” of agitator bowls, a cleaning activity that involves striking or chipping hardened concrete residues from the inside of mixer drums. If not properly managed, these noise emissions can lead to occupational hearing risks, disturbance to adjacent land uses, 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 Vibration Pollution Control*) Regulations, 2009.

5.6.3.Surface Water Quality (Pollution)

Wastewater generated from concrete batching plants poses a significant environmental risk if not properly managed. This wastewater typically originates from equipment washing, concrete mixer cleaning, stormwater runoff from material storage areas, and process water overflow. It often contains fine cement particles, sand, gravel residues, and other suspended solids that can greatly increase turbidity in local waterways if discharged untreated. Additionally, cement-contaminated water is characteristically highly alkaline, with pH levels that can exceed 11, posing a serious threat to aquatic life and soil health by altering the natural chemical balance of receiving environments.

Beyond process-related discharges, the improper storage, handling, or accidental spillage of fuels, lubricants, admixtures, and other construction chemicals at the plant can result in the contamination of both surface and groundwater. Such pollutants, including hydrocarbons and additives, may infiltrate the soil or be washed away during rainfall events, compounding the risk of environmental degradation.

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, including concrete admixtures, must be strictly kept out of stormwater drains, creeks, and other waterways, as they are classified as prescribed water contaminants that pose significant risks to both the natural environment and human health. When such contaminants enter stormwater systems, they can pollute surface water bodies, accumulate in sediments, and cause the death of aquatic organisms, thereby disrupting ecosystems and degrading water quality. Polluted stormwater can also negatively affect recreational and economic activities such as swimming, fishing, and aquaculture, while toxic substances may bioaccumulate through the food chain, ultimately posing health risks to humans. Additionally, fuels and chemicals should be prevented from seeping into the ground, as they can accumulate in soils and eventually migrate to groundwater systems, leading to long-term contamination and reduced water quality. Proper handling, storage, and spill containment measures must therefore be implemented to prevent such pollution and to safeguard both surface and groundwater resources.

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 cement and cement products manufacturing plant including concrete batching operations presents a major environmental hazard. Wastes such as unused wet concrete, waste oils, chemical residues, contaminated wash water, and additives like bagged oxides and silica are common by-products of batching activities. If these materials are irresponsibly discharged into stormwater drains, open land, or nearby watercourses, they can cause significant environmental pollution and long-term ecological damage. Wet waste concrete, when dumped on land, can harden and obstruct drainage systems, alter soil structure, and prevent natural infiltration of rainwater. Similarly, cement-laden water or slurry is highly alkaline and can increase the pH of soils and receiving waters, leading to toxicity for plants and aquatic organisms. Waste oils, fuel residues, and chemical admixtures such as pigments and silica can introduce hydrocarbons and heavy metals into the environment, contaminating both surface and groundwater sources.

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 cement and cement products manufacturing plant present 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 materials such as cement, sand, and aggregates. 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
- Cement, 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 cement and cement products manufacturing 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 cement and cement products manufacturing 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 of the proposed cement and cement products manufacturing plant 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 cement and cement products manufacturing 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 proposed cement and cement products manufacturing 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 December¹.

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.

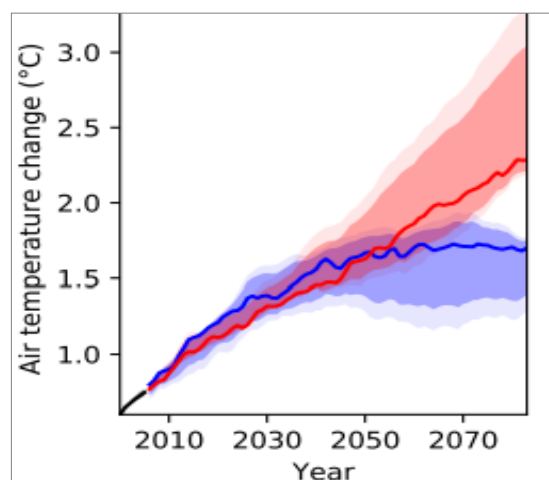


Figure 7: Air temperature projections for Kenya for different GHG emissions scenarios.

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.

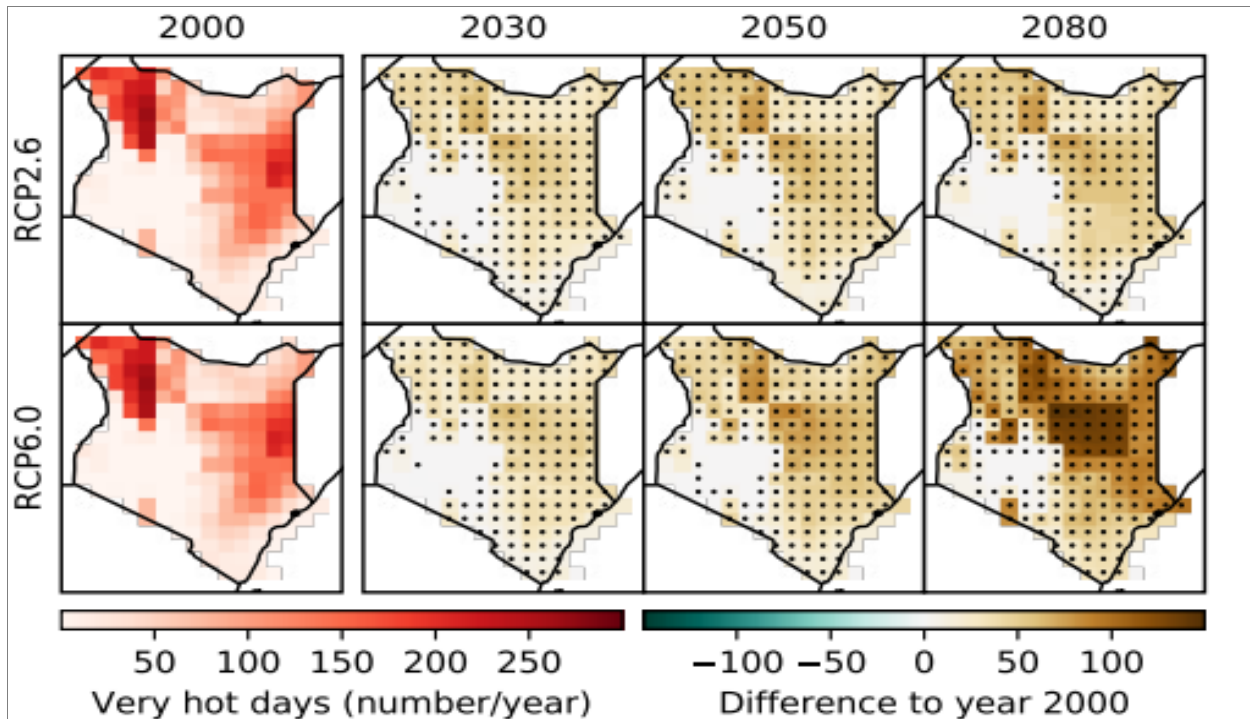


Figure 8: Projections of the annual number of very hot days (daily maximum temperature above 35 °C) for Kenya for different GHG emissions scenarios.

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.

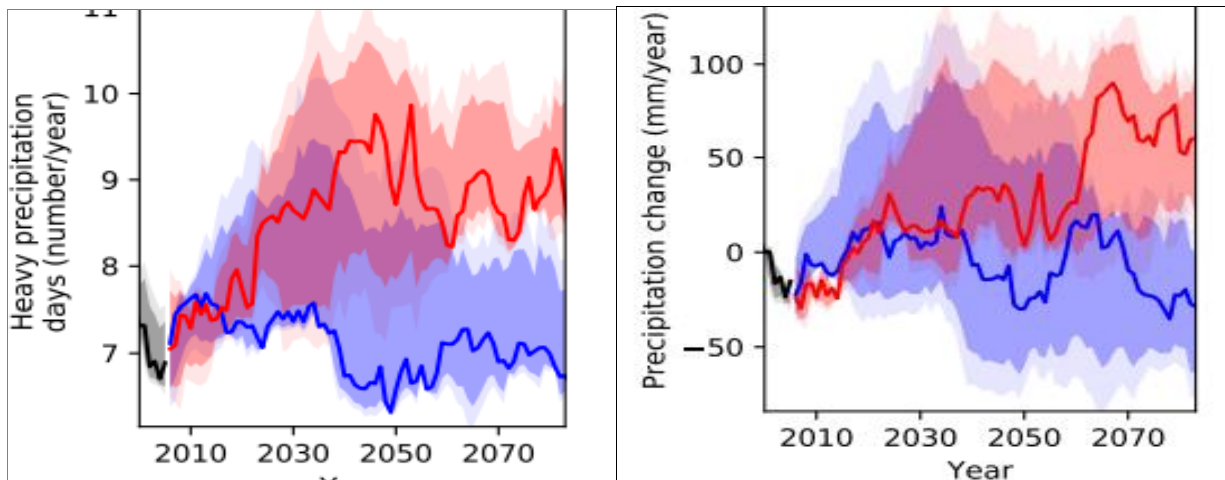


Figure 9: Projections of the number of days with heavy precipitation over Kenya for different GHG emissions scenarios, relative to the year 2000

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

| Sector | Narrative |
|-----------------------|--|
| Infrastructure | <p>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.</p> <p>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.</p> |
| Ecosystems | <p>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.</p> |

| 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

Climate variability is increasingly being experienced in Nyeri County and has manifested in several ways, including prolonged cold seasons, increased incidences of frost, unpredictable rainfall patterns, prolonged droughts, and rising temperatures during dry spells. Farmers and local residents have reported noticeable changes in seasonal patterns, with the cold season now extending from May through August instead of the traditional July–August period. Rainfall distribution has also become unreliable and unevenly distributed across the county. For instance, areas such as Mukurweini occasionally experience extended rainy seasons that may lead to mudslides, while areas in Kieni East Sub-County, including Lusoi, frequently experience prolonged dry spells and drought conditions. These observed climate variations are consistent with broader national climate trends documented in Kenya’s climate change assessments².

Given that the proposed cement and cement products manufacturing plant will be located in Lusoi within Kieni East Sub-County one of the driest parts of Nyeri County the project may be exposed to several climate-related risks. These risks include water scarcity due to prolonged droughts, increased dust generation during dry periods, potential flooding during intense rainfall events, and increased operational stress on infrastructure and workers due to extreme temperatures.

8.4.1. Potential Climate Risks

One of the primary climate-related risks for the proposed project is water scarcity. Cement manufacturing operations require water for dust suppression, equipment cleaning, and domestic uses within the facility. However, the project area already experiences periodic water deficits, and prolonged drought conditions

² Climate Risk Profile Nyeri County 2013 Report

may further strain available water resources. Another potential risk is increased dust emissions during extended dry spells and high temperatures, which are becoming more common in Kieni East Sub-County. Strong winds and dry conditions may increase the dispersion of fine particles from raw material handling, stockpiles, and vehicle movements within the facility, potentially affecting nearby communities and the surrounding environment.

The project may also face stormwater management challenges during periods of intense rainfall. Although the area is generally dry, unpredictable rainfall events could lead to surface runoff, soil erosion, and flooding if adequate drainage systems are not in place. In addition, extreme temperatures associated with climate variability may affect working conditions for employees and may increase energy demand for plant operations.

8.4.2. Climate Adaptation Measures

To enhance resilience to climate variability in Lusoi, Kieni East Sub-County, the proposed cement and cement products manufacturing plant will integrate a range of climate adaptation measures within its design and operational framework. Given the increasing occurrence of prolonged droughts, unpredictable rainfall patterns, and rising temperatures in the area, the project will prioritize sustainable resource management and climate-resilient infrastructure.

- Sustainable water management will be a key adaptation strategy due to the water scarcity challenges experienced in the region. The project will implement rainwater harvesting systems, install adequate water storage facilities, and promote recycling and reuse of process water to reduce reliance on external water sources. In addition, the development of a borehole, subject to the relevant regulatory approvals (WRA), will provide a supplementary water supply. Efficient water use practices will also be incorporated into plant operations to minimize wastage and ensure sustainable utilization of available water resources.
- To address the increased likelihood of dust emissions during dry and windy conditions, enhanced dust control measures will be implemented. These will include regular water sprinkling on internal access roads and exposed surfaces, enclosure of material handling and storage areas, and installation of dust collection systems such as bag filters at key emission points. Vegetative buffers and windbreaks will also be established along the plant boundary to minimize the dispersion of dust into surrounding areas.

The project will further incorporate climate-resilient infrastructure to manage the effects of extreme weather events. This will include the construction of well-designed stormwater drainage systems, paving of operational areas to reduce soil erosion, and installation of settlement ponds to capture and manage surface runoff during intense rainfall events. Green infrastructure will also be promoted within the facility through tree planting and landscaping programs. Vegetation cover will act as natural wind barriers, contribute to dust suppression, improve the local microclimate, and enhance the overall environmental quality of the project site.

Finally, occupational health and safety measures will be implemented to safeguard workers from the effects of extreme temperatures and harsh weather conditions. These measures will include provision of adequate drinking water, establishment of shaded rest areas, and adjustment of work schedules during periods of extreme heat. Through the integration of these climate adaptation strategies, the proposed cement and cement products manufacturing plant will strengthen its capacity to withstand climate-related risks while ensuring sustainable operations in Lusoi, Kieni East Sub-County.

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

8.5.1 Base Air Quality Analysis

CSI International conducted a baseline air quality assessment on 11th March 2026 at the proposed site with land reference no. Nyeri/Lusoi/213, Lusoi Sub-Location, Thegu River Ward, Kieni Sub County, Nyeri Count, Kenya 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.

8.5.2 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 (CO₂), Hydrocarbons (CxHy), Nitrogen Monoxide (NO), Nitrogen Dioxide (NO₂), total Nitrogen Oxides (NO_x), Oxygen (O₂), Ozone (O₃), Particulate Matter (PM₁₀ and PM_{2.5}), and Sulphur Dioxide (SO₂). Results from the monitoring exercise shown in Table 6 and Table 7 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. 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 6: Summary of results

| Company | | Ndovu Rock Limited | | | | | | | | | | | |
|--------------------|-------------------|--------------------------------------|-----------|-------------------|-------------------|-------------------|----------------|-------------------|-------------------|-------------------|-------------------|-------------------|-----------|
| Monitoring Purpose | | EM - Residential, Rural & Other area | | | | | | | | | | | |
| Sample Location | CO | CO ₂ | HC | NO | NO ₂ | NO _x | O ₂ | O ₃ | PM ₁₀ | PM _{2.5} | SO ₂ | H ₂ S | VOC |
| | mg/m ³ | ppm | ppb | µg/m ³ | µg/m ³ | µg/m ³ | % | µg/m ³ | µg/m ³ | µg/m ³ | µg/m ³ | ug/m ³ | ppb |
| Point A | 0.41 | 278.05 | 0.00 | 0.0148 | 0.0336 | 0.0484 | 20.91 | 0.00 | 15.41 | 1.23 | 19.565 | 0.000 | 0.00 |
| Point B | 0.41 | 278.02 | 0.00 | 0.0147 | 0.0338 | 0.0485 | 20.92 | 0.00 | 15.37 | 1.21 | 19.433 | 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: milligram 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 7: Ambient air quality result

| POINT A | | | | |
|--|-------------------------|--|--------------------------|--------------|
| | Average Pollutant | Average in Standard units | TWA OEL-RL | Remarks |
| Carbon Monoxide (CO) | 0.35 ppm | 0.41 mg/m ³ | 4 mg/m ³ ** | Within Limit |
| Carbon Dioxide (CO ₂) | 278.05 ppm | 278.05 ppm | 9000 ppm** | Within Limit |
| Hydrocarbons (C _x H _y) | 0.00 ppm | 0.00 ppm | NP | Not Provided |
| Nitrogen Monoxide (NO) | 14.82 ppb | 0.01 ppm | NP | Not Provided |
| Nitrogen Oxides (NO ₂) | 33.61 ppb | 0.03 ppm | 0.2 ppm | Within Limit |
| Nitrogen Oxides (NO _x) | 48.43 ppb | 0.05 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) | 15.41 µg/m ³ | 15.41 µg/m ³ | 75 µg/m ³ ** | Within Limit |
| Particulate Matter (PM _{2.5}) | 1.23 µg/m ³ | 1.23 µg/m ³ | NP | Not Provided |
| Sulphur Dioxide (SO ₂) | 19.56 ppb | 19.56 µg/m ³ | 125 µg/m ³ ** | Within Limit |
| Hydrogen Sulphide (H ₂ S) | 0.00 ppb | 23.34 µg/m ⁴ | 150 µg/m ³ ** | Within Limit |
| Volatile Organic Compound (VOCs) | 0.00 ppb | 0.00 ppb | NP | Not Provided |
| Relative humidity (RH) | 56.65 % | Activate Windows Go to Settings to activate Win | | |
| Temperature | 23.34 °C | | | |
| Wind direction | 141.23 ° | | | |
| Wind speed | 5.61 kph | | | |
| KEY: µg/m ³ - microgram per cubic metre, mg/m ³ - milligram per cubic metre, ppm - parts per million, ppb - parts per billion, Values at Standard | | | | |

8.5.3 Conclusion

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

8.6 Baseline Noise Assessment

CSI International carried out baseline noise assessment at the proposed site (Nyeri/Lusoi/213, Lusoi Sub-Location, Thegu River Ward, Kieni Sub County, Nyeri Count, Kenya) 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.

8.6.1 Results

Table 1: Summary of results (standard noise level meter)

| Noise Assessment - Ndovu Rock Limited, Chaka | | | | | | | | | | |
|--|---------------------------|------------|----------|-----------------------|-----------------|-----------------|------------------|------------------|-------------------------|-------------------------|
| Purpose: | Baseline Assessment | | | Date of assessment | 3/11/2026 | | | | | |
| 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 |
| Point A | 11/03/2026 | 10:23:15 | 11:23:32 | 40.99 | 40.50 | 43.29 | 44.00 | 37.00 | 50 | 140 |
| Point B | 11/03/2026 | 11:38:55 | 12:39:12 | 40.90 | 40.42 | 43.28 | 44.00 | 37.02 | 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).

8.6.2. 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.

8.7 Baseline Soil Analysis

The results are tabulated below in the certificate of analysis:

| CERTIFICATE OF ANALYSIS | | | |
|---------------------------------|--------------------|-------------------------------|-----------------------|
| Client: | Ndovu Rock Limited | Sample Type: | Soil |
| Contact Details: | Chaka | Sampled By: | CSI International Ltd |
| Sample ID: | Soil | Sampling Date: | 11/03/2026 |
| Lab Batch No.: | 26/0173 | Lab. Ref. No.: | CSII6446 |
| Date Received: | 16/03/2026 | Date Analysis Started: | 17/03/2026 |
| Date Analysis Completed: | 24/03/2026 | Date Released: | 01/04/2026 |

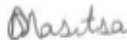
| PARAMETER | METHOD | RESULTS | ¹ STANDARD (Max Limits) |
|--|------------------|---------|------------------------------------|
| <u>Chemical</u> | | | |
| pH | CSITP 002 | 8.05 | np |
| Electrical Conductivity, $\mu\text{S}/\text{cm}$ | CSITP 004 | 89.7 | np |
| Total Dissolved Solids (TDS), ppm | CSITP 012 | 45 | np |
| Sodium as Na^+ , ppm | CSITP 003 | 6.60 | np |
| Potassium as K^+ , ppm | CSITP 003 | 1.85 | np |
| Iron as Fe^{2+} , ppm | CSITP 003 | 0.24 | np |
| Zinc as Zn^{2+} , ppm | CSITP 003 | 0.17 | np |
| Calcium as Ca^{2+} , ppm | CSITP 003 | 4.67 | np |
| Magnesium as Mg^{2+} , ppm | CSITP 003 | 2.62 | np |
| Lead as Pb^{2+} , ppm | CSITP 003 | <0.01 | np |
| Copper as Cu^{2+} , ppm | CSITP 003 | 0.10 | np |
| Manganese as Mn^{2+} , ppm | CSITP 003 | 0.16 | np |
| Phosphates as PO_4^{3-} , ppm | HACH Method 8048 | 4.58 | np |

8.8 Baseline Water Analysis

Results have been tabulated below in the certificate of analysis:

| CERTIFICATE OF ANALYSIS | | | |
|--|--------------------|-------------------------------|------------------------------------|
| Client: | Ndovu Rock Limited | Sample Type: | Potable Water |
| Contact Details: | Chaka | Sampled By: | CSI International Ltd |
| Sample ID: | River Water | Sampling Date: | 11/03/2026 |
| Lab Batch No.: | 260173 | Lab. Ref. No.: | CSI 6445 |
| Date Received: | 16/03/2026 | Date Analysis Started: | 17/03/2026 |
| Date Analysis Completed: | 24/03/2026 | 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 | 7.04 | 5.5 - 9.5 |
| ² Electrical Conductivity, $\mu\text{S}/\text{cm}$ | CSITP 004 | 36.8 | 2500 |
| ² Total Dissolved Solids (TDS), mg/L | CSITP 012 | 18 | 1500 |
| Suspended Matter, mg/L | CSITP 007 | 2 | Not detectable |
| ² Sodium as Na^+ , mg/L | CSITP 003 | 5.26 | 200 |
| ² Potassium as K^+ , mg/L | CSITP 003 | 0.30 | 50 |
| ² Iron as Fe^{2+} , mg/L | CSITP 003 | <0.01 | 0.3 |
| ² Zinc as Zn^{2+} , mg/L | CSITP 003 | <0.01 | 5.0 |
| ² Calcium as Ca^{2+} , mg/L | CSITP 003 | 2.74 | 150 |
| ² Magnesium as Mg^{2+} , mg/L | CSITP 003 | 0.75 | 100 |
| Total Hardness as CaCO_3 , mg/L | CSITP 003 | 9.95 | 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 | 3.55 | 250 |
| ² Sulphates as SO_4^{2-} , mg/L | HACH Method 8051 | 2.00 | 400 |
| ² Nitrate as NO_3^- , mg/L | HACH Method 8039 | 0.12 | 45 |
| ² Fluoride as F^- , mg/L | HACH Method 8029 | <0.01 | 1.5 |
| ¹ up - No standard reference for the parameter <0.01 - Below Detection Level ² Standard values quoted are taken from KS EAS 12:2018 Potable water — Specification (Untreated Water) ³ 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: River Water Uncertainty of Measurement and QA Data will be provided on request. These results relate to the items sampled. Sampling Method: CSI/QMS/STIR/SP 20 - Test Item Receipt, Sampling, and Handling Procedure History is 30 days | | | |

Chemistry Lab:



Gloria Masitsa
 Chemical Analyst
 01/04/2026

Authorized by:



Isaac Namachi
 Quality Assurance Manager
 01/04/2026

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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 Rock 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 ESMMP 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 ESMMP 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 ESMMP 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 | <ul style="list-style-type: none"> Restrict vegetation clearance strictly to designated project areas to minimize unnecessary habitat loss. Clearly demarcate and protect “no-go” zones, including sensitive habitats and buffer areas, to prevent accidental disturbance during construction activities, Implement progressive rehabilitation by replanting indigenous vegetation on non-operational areas, road verges, and buffer zones, Support conservation initiatives in adjacent ecosystems local community conservancies to enhance habitat protection, wildlife monitoring, and ecological connectivity, Establish a biodiversity monitoring program to track changes in vegetation cover, wildlife movement patterns, and species diversity within and around the project site. Undertake periodic reviews of monitoring data and apply adaptive management by adjusting mitigation strategies where necessary to address emerging impacts or trends Engage local communities in tree planting and habitat restoration initiatives, thereby enhancing project ownership, creating livelihood opportunities, and ensuring long-term sustainability of restored habitats. Integrate local ecological knowledge into biodiversity monitoring programs to improve understanding of wildlife movement and habitat health, while strengthening collaboration between the project and surrounding communities | <p>% of area cleared vs. approved footprint</p> <p>Hectares rehabilitated with indigenous vegetation</p> <p>Community participation records in restoration/tree planting</p> <p>Biodiversity monitoring reports (species richness, abundance)</p> | Contractor, Proponent | Monthly, with annual biodiversity audits | 1,500,000.00 |
| Noise and Vibration | <ul style="list-style-type: none"> Maintain equipment in good condition; install silencers, Limit construction to daytime hours, Provide ear protection (earplugs, earmuffs) for exposed workers, Erect temporary noise barriers near sensitive areas., Inform communities in advance of high-noise activities. | Noise level measurements at nearest receptors; site inspection | | Weekly; during noisy operations | |
| Soil Degradation and Erosion | <ul style="list-style-type: none"> Restrict excavation and earthworks to designated project footprints to minimize unnecessary soil disturbance and preserve surrounding areas. Clearly demarcate and enforce boundaries of working | Visual inspection; erosion tracking | Contractor, Proponent | Weekly | 500,000 |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|-------------------------|--|--|-----------------------|-----------|---------------------|
| | <p>areas using visible markers or fencing to prevent accidental disturbance of soils outside the construction zones</p> <ul style="list-style-type: none"> • Install temporary drainage structures such as 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 | <ul style="list-style-type: none"> • 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, | Inspection of waste segregation, storage, and disposal records | Contractor, Proponent | Weekly | 1,200,000 |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|---|--|--|-----------------------|----------------------------------|---------------------|
| | licensed, and holds the necessary permits from relevant regulatory authorities | | | | |
| Occupational Health & Safety (OHS) | <ul style="list-style-type: none"> • Develop a comprehensive Construction Health & Safety Plan in compliance with the Occupational 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, <ul style="list-style-type: none"> ○ 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. | Safety audits; PPE compliance checks; incident reports | Contractor, Proponent | Weekly; daily checks for PPE use | 2,000,000 |
| Traffic & Access Disruptions | <ul style="list-style-type: none"> • The Proponent and Contractor shall develop and implement a comprehensive Traffic Management Plan (TMP) that includes: <ul style="list-style-type: none"> ○ 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, | Traffic inspections; community feedback | Contractor, Proponent | Daily; during deliveries | To be determined |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|--------------------------------------|--|--|---|-----------|---------------------|
| | <p>investigation, and corrective actions to minimize recurrence.</p> <ul style="list-style-type: none"> All project vehicles shall be regularly serviced and maintained to ensure safe and reliable operation. 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 | <ul style="list-style-type: none"> 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 | <ul style="list-style-type: none"> 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 | 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) |
|---|---|--|--|---------------------------|---------------------|
| | <p>any form of misconduct.</p> <ul style="list-style-type: none"> • 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. | | | | |
| Gender-Based Violence & Harassment | <ul style="list-style-type: none"> • 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, | <ul style="list-style-type: none"> • The contractor shall develop and implement a comprehensive HIV/AIDS and disease transmission Policy for all workers directly associated with the | 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) |
|--|--|--|---------------------------------------|-----------|---------------------|
| HIV/AIDS, Waterborne) | <p>Project. The policy will include an information document that:</p> <ul style="list-style-type: none"> ○ Provides education and awareness on prevention, testing, and treatment. ○ 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, <ul style="list-style-type: none"> • 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 | <ul style="list-style-type: none"> • 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) | <ul style="list-style-type: none"> • 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 cement, sand, and dust should be carefully managed to prevent spillage onto paved surfaces and minimize wind-blown particulate emissions, | 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) |
|----------------------------|--|---|-----------------------------|-----------|---------------------|
| | <ul style="list-style-type: none"> Paved surfaces within the plant should be regularly cleaned using a mobile vacuum sweeper or water flushing system to remove dust, cement residue, and aggregate spillage, ensuring a tidy and safe working environment, Vehicle movements within the plant yard should be restricted to 10–15 km/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 cement or fly ash dust escaping, Ensure the high-level sensor alarm is set at a point that prevents the silo from overflowing and automatic shut-down switch is also required to minimize spillage and dust, and Cement should only be delivered from suppliers using sealed vehicles equipped with pneumatic transfer systems for silo loading. | | | | |
| Noise and Vibration | <ul style="list-style-type: none"> 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 | Noise measurements at site boundary; PPE usage compliance; maintenance logs | HSE Officer / Plant Manager | Quarterly | 300,000.00 |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|--|--|--|--|-----------|---------------------|
| | <p>appropriate on a site-specific basis to manage noise, and</p> <ul style="list-style-type: none"> Periodic noise monitoring shall be undertaken at site boundaries and key operational points to ensure compliance with the Environmental Management and Coordination (<i>Noise and Excessive Vibration Pollution Control</i>) Regulations, 2009 | | | | |
| Water Quality (Water Pollution) | <ul style="list-style-type: none"> 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. | Water quality test results; functionality of drainage system; Incidents of contaminated runoff | Environmental Officer / Plant Engineer | Quarterly | 450,000.00 |
| Hazardous Material Handling (Chemicals) | <ul style="list-style-type: none"> 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. | Inventory audits; SDS availability; Training attendance records; Incident reports | Environmental Officer / HSE Officer | Quarterly | 300,000.00 |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|--|--|---|---------------------------------------|-----------|---------------------|
| | <ul style="list-style-type: none"> 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. | | | | |
| Waste Management (Inappropriate Disposal) | <ul style="list-style-type: none"> Prepare and implement a comprehensive Waste Management Plan (WMP) to identify, quantify, and characterize all waste streams generated during the 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 | Waste disposal records; waste segregation audits; compliance with WMP | Environmental Officer / Plant Manager | Monthly | 200,000.00 |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|---|---|---|--|---------------|---------------------|
| | <p>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.</p> <ul style="list-style-type: none"> • 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. | | | | |
| Occupational Health and Safety (OSH Risks) | <ul style="list-style-type: none"> • 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 | <p>Safety audits; Training records; PPE usage; Incident and near-miss reports</p> | <p>Environmental Officer / HSE Officer</p> | <p>Weekly</p> | <p>1,200,000,00</p> |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|-----------------------------|--|---|--|----------------|---------------------|
| | <p>schedules should be implemented to prevent mechanical failures and accidents, and</p> <ul style="list-style-type: none"> • Cement, 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. | | | | |
| Impacts on Utilities | <ul style="list-style-type: none"> • 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 | <p>Water and electricity consumption logs; availability of buffer tanks; Operational continuity</p> | <p>Plant Manager / Environmental Officer</p> | <p>Monthly</p> | <p>2,000,000.00</p> |

| Potential Impact | Mitigation Measures | Monitoring Indicators | Responsible Party | Frequency | Cost Estimate (Ksh) |
|------------------|---------------------|-----------------------|-------------------|-----------|---------------------|
| | operations | | | | |

Table 10: Environmental Monitoring Parameters

| Environmental/Operational Aspect | Parameters to Monitor | Monitoring Method | Frequency | Threshold / Standard |
|--|---|---|------------------|---|
| Air Quality (Dust and Particulates) | Dust levels, particulate emissions | Ambient air monitoring using dust monitors; visual inspections; complaint records | Weekly | PM10 ≤ 150 µg/m ³ (Kenya Ambient Air Quality Standards) |
| Noise and Vibration | Noise levels at site boundary and key operational points | 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, turbidity, total suspended solids (TSS), chemical contamination | 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 | Waste segregation, storage, collection, and disposal compliance | Waste audits; inspection of storage areas; waste transporter records | Monthly | Zero illegal disposal; 100% compliance with WMP |
| Occupational Health and Safety (OHS) | PPE usage; incidents/accidents; emergency preparedness | Safety audits; incident/near-miss reporting; staff training attendance | Weekly / Monthly | Zero fatalities; reduction in reported incidents; 100% PPE compliance |
| Utilities (Water & Power) | Water consumption, pressure, backup supply; electricity load | 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 Nyeri 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 11: Decommissioning Management Plan

| Activity | Description & Mitigation Measures | Responsible Party | Monitoring Indicators | Frequency |
|---|--|--|---|--|
| Planning and Documentation | <ul style="list-style-type: none"> – 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 | <ul style="list-style-type: none"> – 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 | <ul style="list-style-type: none"> – 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 | <ul style="list-style-type: none"> – 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) | <ul style="list-style-type: none"> – Provide PPE for all personnel. – Conduct risk assessments for high-risk | Safety Officer / HSE Officer | PPE compliance; Incident and near-miss reports; training records | Daily / weekly during decommissioning |

| Activity | Description & Mitigation Measures | Responsible Party | Monitoring Indicators | Frequency |
|----------------------------------|---|---------------------------------------|---|-----------------------------------|
| | activities (crane operations, heavy lifting, chemical handling). <ul style="list-style-type: none"> – Maintain first aid kits, fire extinguishers, and spill kits – Train first aiders and fire marshals. | | | |
| Utilities Decommissioning | <ul style="list-style-type: none"> – Disconnect water, electricity, and fuel connections safely. – Remove storage tanks, pipelines, and pumps after proper cleaning and decontamination. | Plant Engineer / Utilities Manager | Verification of safe disconnection; Residual contamination testing | During decommissioning |
| Monitoring and Reporting | <ul style="list-style-type: none"> – 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) for the proposed cement products manufacturing plant in Lusoi Village, Nyeri County, demonstrates that, with the adoption and implementation of the recommended mitigation measures, the project can proceed in a manner that balances economic development, environmental protection, and social responsibility. The assessment has identified potential impacts across air quality, water resources, noise, waste management, occupational health and safety, and community wellbeing, and has proposed comprehensive strategies to minimize negative effects while enhancing positive outcomes such as local employment, skill development, and economic growth.

The study confirms that the project, when implemented in accordance with Environmental Management and Coordination Act (EMCA), Cap. 387, and the Environmental (Impact Assessment and Environmental Audit) Regulations, 2003, can operate sustainably within the environmental and social context of the area. Through effective monitoring, adherence to regulatory requirements, and ongoing engagement with local stakeholders, the project is expected to contribute meaningfully to the socioeconomic development of the local community while maintaining compliance with environmental standards.

In conclusion, the ESIA provides a robust framework for informed decision-making by the National Environment Management Authority (NEMA) and the project proponent, ensuring that the proposed cement products plant achieves its operational objectives while upholding environmental stewardship and community wellbeing. Approval of the project, coupled with diligent implementation of the recommended mitigation and management measures, will allow the plant to realize its economic potential responsibly and sustainably.

Recommendation

To ensure full compliance with environmental and social regulations and to facilitate the issuance of the ESIA license, the following measures are recommended:

- a) Integration of an Environmental and Social Management Plan (ESMP): All operational activities should be integrated into a formal ESMP that comprehensively addresses air quality, water management, noise control, waste management, occupational health and safety, and climate adaptation measures. This plan will provide a structured framework for implementing mitigation, monitoring, and reporting measures throughout the project lifecycle.
- b) Implementation of Best Practices: The project should adopt best available practices to minimize environmental impacts, including:
 - Dust suppression measures, such as water spraying, enclosed material handling, and covered storage areas.
 - Noise reduction strategies, including regular maintenance of machinery, acoustic barriers, and the use of silencers.
 - Responsible waste management through segregation, reuse, recycling, and engagement of licensed waste contractors.
- c) Stakeholder and Community Engagement: The proponent should maintain continuous engagement with the surrounding community and key stakeholders to identify and address potential social and environmental concerns. This includes grievance mechanisms, community awareness programs, and involvement in local development initiatives.
- d) Environmental Monitoring Programs: Robust monitoring programs should be established to track environmental performance, ensuring that emissions, effluents, and waste discharges remain within permissible limits. Regular reporting of monitoring results will demonstrate compliance with regulatory requirements and enable timely corrective actions where needed.

Implementing these measures will ensure that the proposed cement and cement products manufacturing plant operates sustainably, responsibly, and in full compliance with EMCA, Cap. 387, and relevant environmental regulations, thereby facilitating the successful issuance of the ESIA license.

Appendices

Annex (A): Sampled Photos



Annex (C) Certified Bill of Quantity (BOQ)

