

ENVIRONMENTAL IMPACT ASSESSMENT
STUDY (EIAS) REPORT FOR
PROPOSED CEMENT PLANT
BY THE NATIONAL CEMENT COMPANY LIMITED ON PLOT NO L.R
NO 12660-NORTH WEST OF NJORO TOWN, NAKURU COUNTY



This Environmental Impact Assessment Study (EIAS) Report is submitted to the National Environment Management Authority (NEMA) in conformity with the requirements of the Environmental Management and Coordination Act, 1999 and the Environmental (Impact Assessment and Audit) Regulations, 2003

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DECLARATION

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ACRONYMS AND ABBREVIATIONS

EA	Environmental Audit
EHS	Environmental Health and Safety
EIAS	Environmental Impact Assessment Study
EIK	Environmental Institute of Kenya
EMCA	Environmental Management and Co-ordination Act
EMP	Environmental Management/Monitoring Plan
ESIA	Environmental and Social Impact Assessment
NCG	Nakuru County Government
NEAP	National Environment Action Plan
NEC	National Environmental Council
NEMA	National Environment Management Authority
NW&SC	Nakuru Water and Sewerage Company
PPG (E)	Personal Protective Gear (Equipment)
PPM	Parts Per Million
SHE	Safety Health and Environment
SWM	Solid Waste Management
TOR	Terms of Reference
WRMA	Water Resources Management Authority

EXECUTIVE SUMMARY

Kenya's building and construction sector is amongst the most rapidly growing rate, thus the cement industry, cement consumption is highly correlated to a country's performance, cement consumption has experienced superior growth that was more than twice the rate of GDP. Growing in tandem with the construction sector, cement consumption has increased at a rate of 15.1%, key drivers including the rising demand for housing, the commercial construction boom fueled by increased foreign investment, and extensive government and donor-funded spending on the country's mega infrastructure projects. As a result per capita consumption of cement has increased.

The Kenya Government policy on all new projects requires that an environmental impact assessment (EIA) and or a Full study (EIAS), be carried out at the project planning stages to ensure that significant impacts on the environment are taken into consideration at the planning and implementation stages.

The proposed cement plant will be built on LR no 12660 in North West of Njoro Town, Nakuru.

The proposed development is located in an area that was previously agricultural land but has over the past decade experienced rapid transition to commercial, residential, institutional and social services developments. The surrounding land uses to the project site include a mix of residential, commercial, social and recreational, institutional (educational) and agricultural uses. While the land on which the proposed cement plant development is located was previously agricultural, the proponent

has procured a change of user for Nakuru County Government (NCG) from agricultural to a development of cement production industry.

The objective of this EIAS is to ensure that the proposed development takes into consideration appropriate measures to mitigate any adverse impacts to the environment. It will also ensure that the related operations will be in full compliance with the EMCA (1999).

The proposed cement plant will increase the cement production capacity to meet the high demand of cement within Nakuru County and the country as a whole. National Cement Company Ltd is among the largest producer of cement commanding more than 20% share of local market and also exports to neighbouring countries.

The aim of this EIAS study is to identify possible impacts, both positive and negative impacts of the project during the construction and operational phases of the project. Some of the positive impacts that were identified include:

- Employment opportunities especially for the locals
- Accessibility of cement locally
- Economic growth
- Improved land values and aesthetic

The identified negative impacts of the proposed project include:

- Destruction of vegetation
- Dust emissions
- Noise pollution
- Generation of solid waste and land degradation
- Increased demand for water and electricity

To counter the anticipated negative impacts, several mitigation measures have been proposed, including, but not limited to the following;

- Adopting development technologies and approaches that ensure minimum disruption to the environment
- Landscaping during construction
- Pouring water regularly on the construction site to reduce dust emissions

- Adopting safety measures for the construction workers (such as use ear muffs/protectors); and
- Monitoring/regulating noise levels throughout the project lifecycle

This EIAS study also outlines mitigation measures for the impacts that have been identified. An environmental management and monitoring plan has been put in place so as to evaluate and monitor the progress of this project before and after completion. The study has also identified materials and equipment that are environmentally friendly so as to reduce the level of the impact to the site and the surrounding environment. The study also sought to find out if there would be a need to look for an alternative site if the current proposed site is not deemed fit for the proposed project. The finding was that the nature of the envisioned activities are compatible with the existing land uses and hence an alternative site would not be warranted. This EIAS report is informed by the relevant legal framework with regards to the cement production sector in relation to environmental concerns. The methods used to collect data included observations, literature review, and the use of a questionnaires and a checklist that analyzed the degree of the anticipated impacts.

Table 1: Environmental Management Plan Summary

Impact	Proposed Mitigation
Noise and excessive vibration	<ul style="list-style-type: none"> • Construction machinery, vehicles and equipment to be maintained regularly. • Comply with provisions of the Noise and Excessive Vibrations Pollution Control Regulations, 2009 for permissible noise and vibration levels. • Provision of adequate and appropriate PPEs to the workers. • Avoid hooting especially when passing through silent zones areas such as schools, churches, residential areas, offices and hospitals
Soil and water pollution	<ul style="list-style-type: none"> • All heavy trucks and any other motorized machinery must be maintained well to avoid fugitive spills. • Equipment and washing activities during construction to be done in designated areas with impervious surface with interceptors for oily wastes.
Air Pollution (dusts & gas emissions)	<ul style="list-style-type: none"> • Use dust screens to cover the buildings under construction to trap dust. • Provide appropriate personal protective equipment for employees exposed to dusts and gaseous emissions. • Fence construction site. • Cover friable material loads with tarpaulins during transportation. • Observe speed limits of vehicles transporting materials.
Increased Solid waste generation	<ul style="list-style-type: none"> • Appropriate budgets for purchase of raw materials to reduce wastage through exposure to weather elements. • Solid wastes to be put in a designated area for appropriate disposal.

	<ul style="list-style-type: none"> • Segregation of waste at source to determine the recyclables. • Contract a licensed waste handler to collect waste at regular intervals. • Provide skips for wet and dry waste to hold before it is collected. • All wastes to be transported by licensed waste handlers by NEMA and to be disposed in licensed disposal sites.
Increased traffic volumes	<ul style="list-style-type: none"> • Signage will be put in place to give warning and direct the traffic appropriately. • Adhere to Kenya Traffic laws.
Occupational safety and health hazards	<ul style="list-style-type: none"> • Compliance to all international, national or local health and safety standards that may exist during all phases. • Issuance of Personal Protective Equipment (PPE) and enforcing their use during construction and demolition. • Regular inspection, testing and maintenance of equipment and machinery. • Develop and implement site emergency response plans. • Training workers on health and safety precautions. • Provide fully stocked first aid kits. • Use of water sprays to arrest dust. • Containments of hazardous materials. • Fencing of the construction site to restrict onlookers/entry and curb accidents. • Installation of firefighting appliances. • Provision of proper solid waste collection and disposal amenities. • Provision of proper sewerage connections to prevent disease outbreaks.
Increased effluent waste Generation	Ensure that sewage pipes are not blocked or damaged so that the effluent can be delivered to the sewer system to avoid land and water contamination.
Increased water demand	<ul style="list-style-type: none"> • Use of water saving devices (e.g. low volume high pressure cisterns, time delay taps, automatic shut-off taps). • Put in place measures for quick detection and repair of pipes & tanks leaks.

SECTION 1: INTRODUCTION

1.1 Background

This report is a result of an Environmental Impact Assessment Study (EIAS) of the proposed construction of the Cement Plant on **LR NO 12660** in North West of Njoro Town, Nakuru County. The study was conducted between July and October, 2017. It constitutes descriptions of possible environmental impacts likely to occur during the proposed project cycle, - design, site preparation, construction and operation, and how they will be addressed at the project planning phase. This report provides the background to the proposed project as well as an assessment of its likely environmental impacts, both beneficial and adverse. Proposed enhancement and mitigation measures are outlined where necessary together with an initial assessment of costs and responsibilities for their implementation.

Proposed enhancement and mitigation measures are outlined where necessary together with an initial assessment of costs and responsibilities for their implementation. The report has been produced in consultation with the client, the project sponsors and their architect, in fulfillment of the Environmental Management and Coordination Act (EMCA), 1999.

The EMCA requires that an Environmental Impact Assessment Study (EIAS) is undertaken for proposed activities that require a wider Public Participation and In-depth impact analysis and is subject to a decision of a competent National Authority; in Kenya, this is the National Environment Management Authority (NEMA). The Second Schedule of the EMCA provides a list of projects that must undergo EIA subject to agreement of the approach with the National Authority.

1.2 Proposed Study rationale

National Cement Company Ltd is a subsidiary of Devki Group that commenced production and supply of cement in 2010 under the brand name of Simba Cement. The company expanded its grinding capacity by 5 times in 2013.

The proposed project entails the development of a Cement Plant at North West of Njoro Town, Nakuru County, which will include the following phased components;

- Raw material extraction
- Raw material preparation
- Solid fuel preparation

- Raw material heating
- Cement grinding and storage
- Bagging and dispatch

The proposed project, on completion will be producing cement, which is justified by the fast-increasing demand for cement in Nakuru County and Kenya as a whole due to the high rates of development. The strategic location of the proposed development thus not only offers opportunities for enhancing cement production within Nakuru County and Kenya at large, but also offers massive opportunities for attracting rapid urbanization and its associated economic and social benefits within the project area. Since the proposed project is on a previously-undeveloped land, the parcel can easily be planned for future needs in the fast urbanizing project area of Nakuru County.

The provisions of EMCA require projects, programs and/or activities of such nature and scale to carry out an EIA and in special instances carry out a full study. This EIAS report, is prepared with the sole aim of achieving a wider public participation and in depth coverage of foreseen impacts.

1.3 Detailed Project Description

1.3.1 General overview

The proposed plant will produce cement from solid raw materials; limestone, clay and red mud which is a by-product of the bauxite bayer process. The raw materials are heated to a very high temperature (1450 °C) in the pyro-processing system via rotary kiln, causing thermal reactions which produce cement clinker. This clinker is then cooled and pulverized to produce the fine powder (cement) for sale. A Process Flow Diagram illustrating the cement manufacturing process is presented below

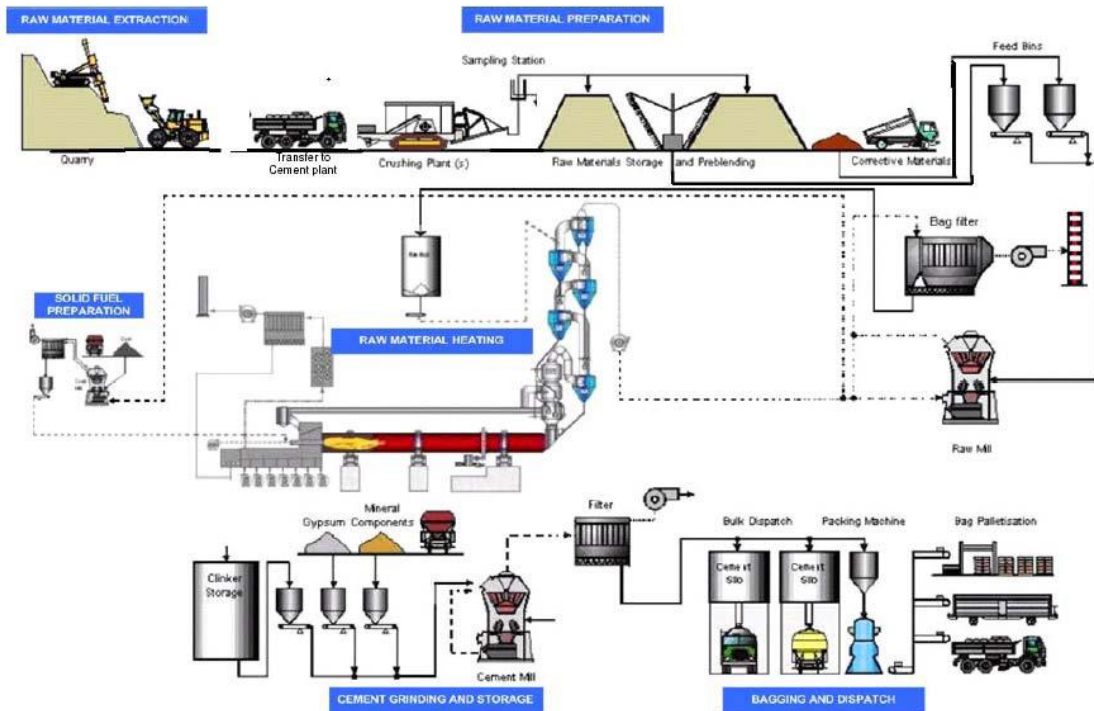


Figure 1: OVERVIEW OF THE CEMENT MANUFACTURING PROCESS

The proposed cement plant includes the following facilities

- I. Raw material extraction
- II. Raw material preparation
- III. Solid fuel preparation
- IV. Raw material heating
- V. Cement grinding and storage
- VI. Bagging and dispatch

1.3.2 Proposed project infrastructure

Building infrastructure

The proposed cement plant is designed to be one unit structure consisting of grinding machines, a loading and offloading zone, packaging unit and a store. Other structures include offices, clinic and a canteen.

ICT infrastructure

The proposed Cement plant will follow the National Cement Company Limited standard of ICT infrastructure. Key ICT areas for the cement plant will include cement wireless networks, which connect managers and workers mobile devices.

Green building and landscaping

The design of the cement plant will incorporate green building design principles, construction and operational practices that significantly reduce or eliminate the negative impact of development on the environment and people.

The proposed development will be green, with emphasis on:

1. Energy efficient
2. Resource efficient
3. Environmentally responsible and
4. Have a healthy and productive environment for people

The green building strategy for the proposed cement plant will incorporate the following

1. **Management:** This will entail incorporating a green building professional with a thorough understanding of green building principles; recycling construction waste; managing construction activities to minimize pollution and maximize soil and air quality protection; enhance commissioning and tuning of building systems.
2. **Indoor environment quality:** This is targeted at the well-being of the occupants of buildings. The strategies employed here will ensure that the heating and cooling systems, lighting, indoor air pollutants, and some building attributes contribute to a healthier indoor environment quality. This will also address comfort factors such as thermal comfort and noise levels. Most buildings will be naturally ventilated and designed for thermal comfort; encourage use of daylighting and daylight glare control; optimally designed electric lighting levels; visual connection to external environments; maintain internal noise levels at an appropriate level etc
3. **Energy:** The buildings will be designed to minimize the greenhouse gas emissions associated with operational energy consumption
4. **Water:** The development will address the reduction of potable water use through design of water efficient systems, rainwater collection and water reuse. Other strategies will include greywater recycling, installation of water-efficient irrigation systems (such as sub-soil or drip irrigation) or through the use of sustainable water for landscape irrigation.
5. **Materials:** The design of the cement plant will ensure that selection and reuse of materials,

and efficient management practices reduce the amount of natural resources used, reuse whatever materials can be reused, and recycle whenever possible through; recycling waste storage; uptake of materials with recycled content and reuse of materials; the specification of reused timber products or timber that has certified environmentally-responsible forest management practices; local sourcing

6. Land use ecology: The design will also incorporate initiatives that will improve or reduce impacts on ecological systems and biodiversity e.g. through construction practices that preserve the ecological integrity of topsoil

7. Community facilities: integrated planning and shared land use in developments through the provision of on-site outdoor facilities for use by the local community
8. Emissions: Management of emissions including and relating to watercourse pollution, light pollution, ozone depletion and sewerage;
 - a. Minimise stormwater run-off to, and the pollution of, natural watercourses and wetlands
 - b. Minimise discharge to the municipal sewerage system.
 - c. Minimise light pollution into the night sky
 - d. Use of boilers and generators that minimise harmful emissions

1.3.3 Local Services/ Utilities

Energy/Power

Whereas the proponent proposes to get electricity supply from the KPLC, provisions will be made for a standby generator to supply power when there are power outages. A separate space has been provided for fuel storage and generator installation. The proposed development will be connected to the 11KV electricity overhead line crossing the site which will be used in all phases of the project. The total estimated power demand of this project is around 1000KVA.

LV distribution shall be installed by armored cable direct buried to every individual utilization buildings. LV cables shall be armored XLPE insulated 0.6/1KV copper cables. Cable bury depth shall not be lesser than 700mm as per IEC standard, and shall be protected by C20 concrete encased PVC duct bank where crossing road. The voltage drop between the origin of projected substations and the equipment should not be greater than 4 % of the nominal voltage of the installation. To ensure security of electrical supplies, the developer intends to have his own individual dedicated standby diesel generator. This generator shall be outdoor type, equipped with silencer to minimize the noise, and the enclosure shall be IP44, with the same colour with the nearby prefabricated substation to ensure the aesthetic aspect. The underground bulk fuel storage tank shall be provided at a suitable adjacent location to the generator to provide 15 days /3hrs per day at full load

Portable water supply

The potable water service will be provided from a bulk storage tank that will be mounted on site. The tank will be fed with water from an onsite borehole. Potable water will be boosted to serve outlets throughout the cement plant including wash hand basins, the equipment rooms and small washrooms. The proponent will also install hose reels for the use of occupants in the event of fire. Various protection systems including oil leak detection, local water leak detection, major water leak protection, water supply protection and high temperature alarms will be installed for critical installations where required

Solid waste management

The proponent takes cognizance of a significant volume of waste that will be generated during the land preparation, construction, and operation of the project i.e. from the production plant and other premises. An integrated solid waste management system will be applied at all phases of the project. First, the proponent will give priority to Reduction at Source of the waste materials. Under this option, the proponent will implement a solid waste management awareness programme for the management and all the residents. Secondly, Recycling, Reuse and compositing of the waste will be the second alternative in priority. Under these options the proponent plans to a management system of separating waste at the source. The recyclables will be sold to waste buyers in the town. Finally, sanitary land-filling in legally designated sites will be the last option for the proponent to consider.

The proponent will provide facilities for handling solid waste generated within the facility. These will include dust bins/skips for temporarily holding waste within the premises before final disposal at designated sites.

Sewerage and stormwater

Wastewater from the project site will be connected to the expected waste water treatment works while storm water will be channeled to the open storm water drainage system. Liquid effluents may contain domestic waste, organic matter, salts and detergents, oils and fats. The effluent may also contain some pathogens. The effluent will be treated per the provisions of the Environmental Management and Coordination (Water Quality) Regulations, 2006.

A sewage treatment plant (STP) of 300m³/day shall be implemented. The effluent will be collected in an irrigation tank for irrigation purpose. The STP will be in the service block. The system to be used is:

Option 1: a biological treatment by means of sludge activation, implementing extended Aeration. The STP will be properly ventilated with a separate extraction and fresh air duct.

Option 2: MBR (Membrane bioreactor): is the combination of a membrane process like microfiltration or ultrafiltration with a suspended growth bioreactor.

All storm water will be intercepted and channeled into the storm water drains and appropriate landscaping will be undertaken to check the runoff and soil erosion

1.3.4 Project construction activities

Preconstruction activities

The implementation of the project's design and construction phase started with preliminary surveys and cost-benefit analysis to establish the development program of the cement plant. Investigations also covered identification of any existing legal and regulatory requirements that may affect the project at any stage of its implementation, and doing a baseline survey of the site and its surrounding to establish; Location Context of the Study Area the site topography, drainage, climate, geotechnical information and utilities.

Excavation and foundation works

Excavation will be carried out to prepare the site for construction of foundations, pavements and drainage systems. The excavation will involve the use of heavy earthmoving machinery such as tractors and bulldozers

Storage of materials

Building materials will be stored on site. Bulky materials such as rough stones, ballast, sand and steel will be carefully piled on site. To avoid piling large quantities of materials on site, the proponent will order bulky materials such as sand, gravel and stones in phases and as needed. Materials such as cement, paints and glasses among others will be stored in temporary storage structures built for this purpose. The site will also incorporate a recycling waste storage facility.

Masonry, concrete work and related activities

The construction of the building walls, foundations, floors, pavements, drainage systems, perimeter fence landscaping among other components of the project involves a lot of masonry work and related activities. General masonry and related activities include stone shaping, concrete mixing, plastering, slab construction, construction of foundations, and erection of building walls and curing of fresh concrete surfaces. These activities are known to be labor intensive and are supplemented by machinery such as concrete mixers or a batching plant

Concrete: Concrete compressive strength based on cubic test will be taken as 30MPa. The structural elements exposed to earth should be cast with the appropriate high density concrete.

Reinforcement: The steel reinforcements are high yield deformed bars with a yield strength of 460 MPa and a modulus of elasticity of 200 000 MPa

Steel: If steel elements are needed, the used steel quality will be S275 which have yield strength of 275MPa. Their modulus of elasticity is 210 000 MPa.

Roofing works

Roofing activities will include raising the roofing materials such as tiles and structural timber to the roof and fastening the roofing materials to the roof

Mechanical, electrical and plumbing (MEP)

Envelope design - The envelope design shall be in compliance with ASHRAE Standard 90.1-2007 Section 5 “Building Envelope”, and ASHRAE Handbook Fundamentals 2013. Walls and windows: The U-Values to be used as a Minimum are as follows:

External walls: $U = 0.857 \text{ W/m}^2\text{.K}$

Windows (Double glazing): $U = 2.8 \text{ W/m}^2\text{.K}$, SHGC = 0.6

Roof (insulated): $U = 0.273 \text{ W/m}^2\text{.K}$

HVAC system

Climatic External / Internal Conditions

Climatic External conditions for the site are as follows:

Summer: 29°C Dry Bulb, 23% RH

Winter: 9.4°C

Ventilation:

All mechanically ventilated zones will be designed in compliance with the requirements of Volume 4: Building services, section N of KS code. Air volumes will be balanced with adjacent areas or individually to maintain negative or positive pressure as required in each space.

Fire-fighting system

The building will follow BSi (British standards) & KS code (Building code of the republic of Kenya). Two water tanks will be in the service block, and they will be filled with water and cistern. Firefighting Electrical Driven Pumps (One Duty, One standby + Jockey pump) will be installed. They will supply Fire hose reels and fire hydrants and sprinklers if required. Siamese connection shall be installed at the ground level, near the accessible roads.

Portable fire extinguisher:

The number of portable fire extinguishers relative to floor area.

Fire suppression:

- Automatic fire suppression will be implemented for high risk room (Fuel Rooms, Generator room MDB Rooms, IT Room and UPS Room).
- FM200 will be used as the safe means for fire suppression, for the high-risk room and foam system for fuel.
- An automatic wet chemical fire suppression system with fusible link shall be installed on the hood and connected to the Fire Alarm Control Panel. Class K, wet chemical, kitchen use fire extinguishers shall be provided where required.
- Motorized smoke and fire dampers shall be installed on ducts penetrating these rooms

Drainage system

The drainage will be done per the BSi (British standards) & KS code (Building code of the republic of Kenya). Soil & waste will have a common stack with secondary vent system. Condensate drainage will have an independent riser. Rain water will have an independent system.

Lighting

- LED or Fluorescent T5 lighting (to be decided) will be used in classrooms, administration offices, and technical areas, LED lighting at entrances, lobbies and throughout the project depending on functionality of the area. Lighting distribution and control in noble areas shall follow the ID and architect.
- The lighting levels and lighting power densities shall be as recommended by the CIBSE Lighting Handbook.
- Movement detectors will be used in lobbies to turn off part of lighting at unoccupied periods to save energy.
- The emergency lighting levels and installation shall be in accordance with BS 5266 & BS 1838. The emergency lighting shall be mainly using self-contained battery system, with emergency lighting fittings on all escape routes, high risk task areas, open areas (anti panic), technical and hazardous areas. Exit signs will be provided on exit doors and passages leading to exits. Exit luminaires will be equipped with LED lights. The autonomy of the emergency lighting should minimum be 1h.
- External lighting will be provided in coordination with the architect. The control will be done by a photocell and timer.

Power distribution

The low voltage electric power will be at 240/415 V - 50 Hz. The power required for the whole project is about 2500KVA.

1.3.5 Repairs and maintenance plan

The proposed development and associated facilities will be repaired and maintained regularly during the operational phase of the project. Such activities will include repair of building walls and floors, repair and maintenance of furniture, electrical gadgets, painting and replacement of worn out materials among others

1.3.6 Project decommissioning activities

Demolition works: Upon decommissioning, the project components including buildings, pavements, drainage systems, parking areas and perimeter fence will be demolished. This will produce a lot of solid waste, which will be re-used for this or other construction works or if not re-usable, disposed of

appropriately by a licensed waste disposal company.

Dismantling of equipment and fixtures: All equipment including electrical installations, furniture, finishing fixtures partitions, pipe-work and sinks among others will be dismantled and removed from the site on decommissioning of the project. Priority will be given to reuse of these equipment in other projects. This will be achieved through resale of equipment to other building owners or contractors or donation of these equipment to schools, churches and charitable institutions

Site restoration: Once all the waste resulting from demolition and dismantling works is removed from the site, the site will be restored through replenishment of the top soil and re-vegetation using indigenous plant species

1.4 Objectives of the EIAS

Environmental Impact Assessment Study (EIAS) is a process having the ultimate objective of providing decision makers with an indication of the likely environmental consequences of a proposed activity. The purpose of the EIAS is to carry out an assessment of the proposed Cement Plant project and to determine whether the proposed project and its associated activities will have any adverse impacts on the environment, considering environmental and legal factors. This process will facilitate major decisions and commitments being made regarding the project.

The main objectives of the EIAS are to:

- Identify and assess the anticipated environmental impacts of the proposed project – both positive and negative;
- Identify and analyse alternatives to the proposed project;
- Propose mitigation measures for negative impacts and enhancement measures for positive impacts to be undertaken during and after the implementation of the proposed project;
- Generate baseline data for monitoring and evaluation of how well the mitigation measures have been implemented during the project life cycle;
- Recommend cost effective measures to be used to mitigate against the anticipated negative impacts;
- Seek the views of affected persons in consultation with the proponent and the National Environment Management Authority (NEMA);

- Prepare an Environmental Impact Assessment Report compliant with the Environmental Management and Coordination Act (1999); and
- Incorporate environmental management plans and monitoring mechanisms compliant with the Environmental Management and Coordination Act (1999)
- Create a framework for ensuring that the proposed project conforms to appropriate environmental standards and design criteria.

SECTION 2: METHODOLOGY

2.1 General Approach

The proposed project is located within an agricultural area with no rich natural resources; and is expected to complement the neighbourhood which has a mix of residential, institutional, agricultural and commercial developments. While the impact to the proposed project is not expected to be adverse to the environment and surroundings, this EIAS has been undertaken to fulfill the legislative requirements of the Environmental Management and Coordination Act (EMCA) 1999, the subsequent Kenya Gazette Supplement on Environmental Impact Assessment and Environmental Audit Regulations 2003. As such, our approach has been guided by this document and TORS approved by NEMA.

The EIAS identifies potential environmental impacts (both positive and negative) of the proposed project and proposes mitigation and enhancement measures. The studies in support of the preparation of the EIAS have comprised discussions and consultations with the proponent and stakeholders; initial site reconnaissance; desk study and literature review; preparation of data collection instruments; field visits for consultations and observations; data analysis and report writing.

The EIA experts have gathered environmental data already available in the public domain backed up by observations in the field and analysis of the project area's geological structure. In order to conduct a broad based and inclusive study, the proponent and the consultant have from the onset ensured the exercise is participatory. As such, discussions have been held with community members (affected persons) in the project area and relevant stakeholders have been interviewed by the EIA expert team with the assistance and coordination of the proponent.

2.2 Reconnaissance Field Visits / Field Observations

Initial field visits to the project area was conducted in 1st August 2017 for data collection, identification of environmentally sensitive issues of the project area, observations, interviews and conducting public consultation in collaboration with the project proponent. During the field visits, the consultants made field observations and took photographs of the project areas. A photograph gallery is attached as Appendix 1 of this report.

2.3 Desk Study Review

The EIA experts collated and presented baseline information on the environmental characteristics as currently exist at the project site and areas near it with respect to the following:

- Social and economic environment: both current and projected as appropriate, with respect to population, land use, planned development activities, Employment and labour market, etc;
- Physical environment with respect to topography, landform, geology, soils, climate and meteorology, air quality, hydrology, etc.; and
- Biological environment with respect to flora and fauna including endangered species and sensitive and protected habitats.

A literature review has been undertaken which includes but is not limited to, a review of the following documents:

- EMCA (1999) and associated Regulations and Guidelines made under the Act;
- The Water Act 2002;
- 4.3.3 The Public Health Act (Cap. 242)
- 4.3.4 The Mining Act (Cap 306)
- 4.3.5 The County Governments Act, 2012
- 4.3.6 The Science and Technology Act (Cap 250)
- 4.3.7 The Land Planning Act (Cap. 303)
- 4.3.8 The Building Code 2000
- 4.3.9 The Penal Code (Cap. 63)
- 4.3.10 Wastewater guidelines

The relevance of these and other legislation and guidance to the proposed projects are further described in Section 4 of this report.

2.4 Public Consultation

As a requirement of EMCA 1999 section 58 on Environmental Impact Assessment (EIA), public participation is an important component in undertaking a successful EIAS process. Members of the immediate community to the proposed Cement Plant project site were involved in the study by filling in questionnaires through which their views about the proposed project were collected. The administered

questionnaires covered issues ranging from the significance of the project, anticipated positive to negative impacts and their potential mitigation measures. These views have been discussed in the report.

Further print media i.e the Kenyan Gazette and a local daily will be used to reach wider public participation.

2.5 Key Stakeholder Consultation

Consultation was undertaken with the following key stakeholders:

- the project’s architect, Quantity Surveyor, Civil structural engineer, Services engineers
- Geologist & Surveyor
- 50 members of the neighbouring communities and other stakeholders
- Ministry of land
- Nakuru county
- Ministry of Mining
- Ministry of Health

A summary of the consultation findings is provided in Section 6 of this report.

2.6 Data Analysis

The EIA experts have used their experience and knowledge to analyse the data from the desk studies and field visits to determine the potential impacts of the proposed project, the severity of effects arising from these impacts and how any adverse impacts can be best mitigated and positive impacts enhanced. This analysis provides the framework for the recommendations on corrective actions and remedial measures and provides the basis for the formulation of the environmental and social management plan which forms part of this report. The data has also been considered in terms of occupational health and safety with respect to the construction and operational phases of the proposed project. Other factors observed included project alternatives including technology.

2.7 The EIAS Report Format

This report follows the format prescribed in the Legal Notice No. 101 of 13th June 2003 which deals with the Environmental (Impact Assessment and Audit) Regulations. The EIAS report looks at the background of the project; nature of the project; activities of the project; project design, materials and equipment to be used; potential environmental impacts; mitigation and enhancement measures; legislative and regulatory

framework; prevention and management of possible accidents; health and safety issues; the budget; and proposes an environmental management plan for the proposed project.

2.8 Terms of Reference (ToR)

This Environmental Impact Assessment considered the following aspects and others that proved of significance during the study.

- The evaluation of ecological effects.
- Determination of the effects on landscape and land use
- Effects of the development on current demands on support services as well as possible implications on the available support services.
- Proposition of mitigation measures to be undertaken during and after implementation of the project; and development of an Environmental Management Plan with mechanisms for monitoring and evaluating the compliance and environmental performance.

SECTION 3: BASELINE INFORMATION

3.1 Overview

This section outlines the project location/site, and the project area's social, economic, physical and natural environment, including climate, topography, geology, vegetation, hydrology drainage and wildlife.

3.2 Project Location

Nakuru County is located in the Great Rift Valley region of Kenya and it borders Kericho and Bomet County to the West, Baringo and Laikipia County to the North, Nyandarua to the East, Narok to the South West and Kajiado and Kiambu to the South. The county lies between latitudes 0⁰ 13' and 1⁰ 20' South of the Equator and Longitude 35⁰ 28' and 35⁰ 36' East. The county covers an area of 7,495.1 Km² according to the 2009 Kenya Population and Housing Census.

All the demarcated Townships are constructed in terms of urban developments. Urbanization is fast replacing agricultural land in the county, especially in areas bordering Nakuru Town and other small urban areas throughout the county. The county is coupled with well tarmacked roads has largely contributed to the county becoming a place to invest.

The proposed project is in a fast urbanizing area at the centre of Nakuru County. The proposed project site LR no 12660 in North West of Njoro Town area of Nakuru County. Based on its physical location, the site experiences physiographic features that are similar to the entire Nakuru county save for factors like altitude and land uses. There are no nearby environmentally sensitive areas such as rivers, forests or protected areas.

The proposed project area is within the larger Nakuru metropolitan region and is experiencing the effects of Nakuru's sprawl, which is majorly influenced by among other things, a growing town population; proximity to the town and many interest areas such as well developed and/or rapidly developing infrastructure; and increasing presence of commercial and social services and amenities such as banks, shopping malls, recreation areas among others.

The total land in which the proposed project will be developed on is 150 acres.

3.3 Land Use Pattern and Neighborhood Analysis

The proposed project is in North West of Njoro Town, Nakuru County. What is more interest are the immediate abutting land uses to the project site. As it's evident on the ground, the project is completely compatible with the existing land uses in the area, which is a mix of agricultural, residential and commercial. Although the proposed project site was previously zoned as agricultural land, it has since

acquired a change of user to “Industrial User”

Plate 1: A paper making on the neighborhood



Plate 2: The fence separates an ongoing construction ABM factory



Plate 3: vegetation on the proposed site



From the above it is evident that the proposed cement plant development does not pose any challenge or constraint to the neighborhood but rather easily fits in, and contributes to the richness of land use in the larger area.

3.4 Physiographic information

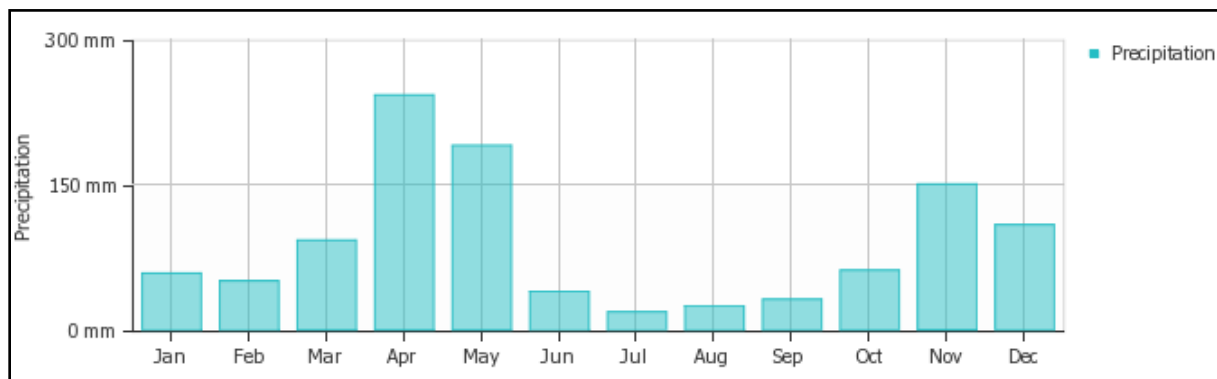
3.4.1 Climate

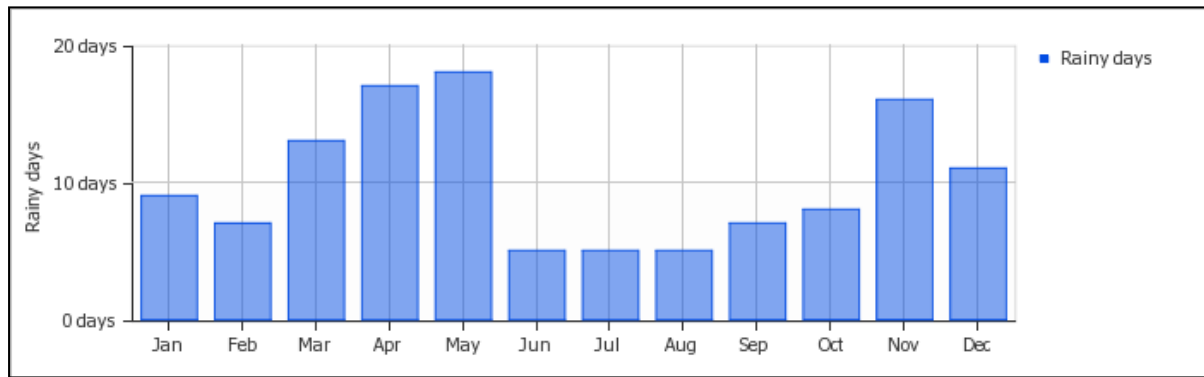
Nakuru County is divided into three climatic regions which are greatly influenced by the altitude and physical features: The zone two covers areas with an altitude of 1980m and 2700m above sea level, zone three covers areas with an altitude of between 900-1800m above sea level and zone five occupies more or less the same elevation 900-1800m as zone 3. The proposed project site and the surrounding areas are located in zone two, which is receives minimum rainfall of 1000mm per annum.

3.4.2 Rainfall

Nakuru County in which the project site is located experiences bi-modal type of rainfall. The long rains fall between Mid-march to May, followed by a cold season usually with drizzles and frost between June and August. The short rains fall from mid-October to November. The average rainfall received by the county is 1,200 mm per annum.

Figure 2: Average Annual Rainfall





3.4.3 Slope analysis

The proposed project's site and immediate environment is generally flat, with a gentle slope. The proposed works will have little or no influence to the movement of surface materials (mostly soil) once set loose-during earth works

3.4.4 Geology

The area of study and its surroundings fall in a well-drained area dominated by Red volcanic soils characterized with high bulk density, overlaying highly to extremely weathered.

3.4.5 Soils

The study area mainly consists of latosolic, that are well-drained red volcanic soils that have been influenced by climatic conditions, volcanic activities and underlying rock.

3.4.6 Vegetation

The site for the proposed project has some trees, flowers and grass. However, the vegetation has no conservation value. The proponent has reserved ample space for tree planting and landscaping to compensate for affected vegetation and further improve the environment.

3.4.7 Environmentally Fragile areas

There are no notable environmentally fragile aspects in the proposed project area. The Mau Forest and their associated forest and mountain ecosystems are within a radius of more than 30kilometers from the proposed project site. Equally, the proposed project is not intrusive to the previous agricultural land use, which has since successfully undergone a change of user to educational facilities. Most of the surrounding areas, which were also previously undeveloped have already been developed for commercial, residential and public services without any major effects on the environment.

The only notable aspect is that a section of the site has been constructed a small structure that will be demolished. There are no foreseeable adverse effects on the existing environment.

Plate 4: Existing infrastructure on the proposed site



3.5 Socio-economic Characteristics

Nakuru County has historically been a major agricultural hub in Kenya. In addition, the county has many urban centers which act as important hubs for commerce and industrial development. The presence of forests and natural scenes in the county also act as important tourist attractions to the county. As the population has continued to grow, so has the need and demand for services, products, infrastructure and employment opportunities.

The proposed project is uniquely located within a population that demands a cement plant. This includes a large expatriate population from the nearby town, counties among others. The proposed project is thus timely, and will greatly contribute to meeting the cement production needs of the surrounding areas.

3.5. 1 Population Distribution

The proposed project is located within Nakuru County with a population of approximately 1,756,950 people according to population projections from the 2009 census and its population was projected to hit 2,046,395 people by the end of 2017. This population forms part of the people who shall be directly or indirectly affected by the proposed project socially and environmentally. Jobs created during construction ought to target the local skilled and unskilled persons for purposes of positive economic implications of the project. Thus, there is need to anticipate and determine the sphere of influence of the project and put measures in place curb the negative ones but enhance the positives in the social and economic dimensions.

3.5.2 Infrastructure and Services

The project site and general area is well served with good infrastructure which comprises of tarmac roads, electricity supplied by KPLC, water, good drainage system and telecommunication/ICT.

Plate 5: Road infrastructure around proposed project site



Plate 6: Power infrastructure on the proposed project site

3.5.2.1 Potable water

About 90 percent of the county's water resources comprise of both surface and ground water resource potential. Domestic water supply has recorded a noticeable growth over the last 5 years; 35 percent of the population have access to potable water. This project will use water from a borehole within the site. The water will be treated by filtration and chlorination. The water will be treated to the allowed quality standards of the Water Quality Regulations of 2006.

3.5.2.2 Sewerage and storm water drainage

The site area is characterized with good drainage which is greatly facilitated by the site sloppy topography and presence red silty clay which allow water to penetrate to the ground. These silty clays have low to medium permeability with high water-storage capacity. These conditions therefore contribute to the high weathering of the rocks at lower profiles.

3.5.2.3 Solid waste management

Garbage disposal around the urban Centres within the county of Nakuru cover a small percentage of

waste/garbage collection as only 2.6 percent of the total population has facilities for waste disposal. About 0.7 percent of the total population uses private firms, 29.1 percent use garbage pits, 29.6 percent use farm gardens, 12.1 use public garbage heap and 25.9 percent opt to burn the waste/ garbage. This has a negative effect on the environment and hence proper mechanisms for waste disposal need to be put in place to ensure the county remains clean.

SECTION 4: POLICY, LEGAL AND INSTITUTIONAL FRAMEWORK

4.1 General Overview

Environmental impact Assessment (EIA) is a tool for environmental conservation has been identified as a key component in new project implementation. At the national level, Kenya has put into place necessary legislation that requires EIA be carried out on every new project, activity or programme. (EMCA, 1999.), and a report submitted to the National Environmental Management Authority (NEMA) for approval and issuance of relevant certificates.

To facilitate this process, regulations on EIA and environmental audits have been established under the Kenya Gazette Supplement No. 56 of 13th June 2003. Besides, a number of other national policies and legal states have been reviewed to enhance environmental sustainability in national development projects across all sectors.

4.2 Policies

4.2.1 National Environmental Action Plan (NEAP)

According to the Kenya National Environment Action Plan (NEAP, 1994) the Government recognized the negative impacts on ecosystems emanating from industrial, economic and social development programmes that disregarded environmental sustainability. Following on this, establishment of appropriate policies and legal guidelines as well as harmonization of the existing ones have been accomplished and/or are in the process of development. Under the NEAP process EIA was introduced and among the key participants identified were the industrialists, communities and county governments.

4.2.2 National Policy on Water Resources Management and Development

While the National Policy on Water Resources Management and Development (1999) enhances a systematic development of water facilities in all sectors for promotion of the country's socio-economic progress, it also recognizes the by-products of this process as waste water. It, therefore, calls for development of appropriate sanitation systems to protect people's health and water resources from plant pollution.

Development projects, therefore, should be accompanied by corresponding waste management systems to handle the waste water and other waste emanating there from. The same policy requires that such projects should also undergo comprehensive EIAs that will provide suitable measures to be taken to ensure

environmental resources and peoples' health in the immediate neighborhood and further downstream are not negatively impacted by the emissions.

In addition, the policy provides for charging levies on waste water on quantity and quality (similar to polluter-pays-principle) in which those contaminating water are required to meet the appropriate cost on remediation, though the necessary mechanisms for the implementation of this principle have not been fully established under the relevant Acts. However, the policy provides for establishment of standards to protect water bodies receiving waste water, a process that is ongoing.

4.2.3 Policy Guidelines on Environment and Development

Among the key objectives of the Policy Paper on Environment and Development (Sessional Paper No. 6 of 1999) are: -

- i. To ensure that from the onset, all development policies, programmes and projects take environmental considerations into account,
- ii. To ensure that an independent environmental impact assessment Study (EIAS) report is prepared for any industrial venture or other development before implementation,
- iii. To come up with effluent treatment standards that will conform to acceptable health guidelines.

Under this paper, broad categories of development issues have been covered that require sustainable approach. These issues include the waste management and human settlement sectors. The policy recommends the need for enhanced re-use/recycling of residues including wastewater, use of low non-waste technologies, increased public awareness

Raising and appreciation of clean environment. It also encourages participation of stakeholders in the management of wastes within their localities. Regarding human settlement, the paper encourages better planning in both rural and urban areas and provision of basic needs such as water, drainage and waste disposal facilities among others.

4.3 Legal Framework

4.3.1 The Environment Management and Coordination Act, 1999

Part II of the Environment Management & Coordination Act, 1999 states that every person in Kenya is entitled to a clean and healthy environment and has the duty to safeguard and enhance the environment. In order to ensure this is achieved, part VI of the same Act directs that any proponent of a new project should

undertake EIA study and prepare an appropriate report for submission to the National Environmental Management Authority (NEMA), who in turn may issue a license as appropriate. The second schedule of the same Act lists proposed project among the key urban developments that must undergo EIA prior to implementation.

Part VIII section 72 of the Act prohibits discharging or applying poisonous, toxic, noxious or obstructing matter, radioactive or any other pollutants into aquatic environment. Section 73 require that operators of projects which discharges effluent or other pollutants to submit to NEMA accurate information about the quantity and quality of the effluent. Section 74 demands that all effluent generated from point sources are discharged only into the existing sewerage system upon issuance of prescribed permit from the County Governments.

4.3.2 The Water Act 2002

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

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

Section 76 states that no person shall discharge any trade effluent from any trade premises into sewers of a licensee without the consent of the licensee upon application indicating the nature and composition of the effluent, maximum quantity anticipated, flow rate of the effluent and any other information deemed necessary. The consent shall be issued on conditions including payment of rates for the discharge as may be provided under section 77 of the same Act

4.3.3 The Public Health Act (Cap. 242)

Part IX section 115 of the Act states that no person/institution shall cause nuisance or condition liable to be injurious or dangerous to human health. Section 116 requires county governments to take all lawful, necessary

and reasonably practicable measures to maintain their jurisdiction clean and sanitary to prevent occurrence of nuisance or condition liable for injurious or dangerous to human health.

Such nuisance or conditions are defined under section 118 waste pipes, sewers, drains or refuse pits in such a state, situated or constructed as in the opinion of the medical officers of health to be offensive or injurious to health. Any noxious matter or waste water flowing or discharged from any premises into a public street or into the gutter or side channel or watercourse, irrigation channel or bed not approved for discharge is also deemed as a nuisance. Other nuisances are accumulation of materials or refuse which in the opinion of the medical officer of health is likely to harbour rats or other vermin.

On the responsibility of county governments, Part XI section 129 of the Act states in part “It shall be the duty of every county government to take all lawful, necessary and reasonably practicable measures for preventing any pollution dangerous to health of any supply of water which the public within its district has a right to use and does use for drinking or domestic purposes”.

Section 130 provides for making and imposing regulations by the county governments and others the duty of enforcing rules in respect of prohibiting use of water supply or erection of structures draining filth or noxious matter into water supply as mentioned in section 129. This provision is supplemented by Section 126A that requires local authorities to develop by-laws for controlling and regulating among others private sewers, communication between drains and sewers and between sewers as well as regulating sanitary conveniences in connection to buildings, drainage, cesspools, etc. for reception or disposal of foul matter.

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

4.3.4 The Mining Act, Cap 306

This is an Act of parliament that consolidates the law relating to mining. The Act spells out licensing conditions set by the government and duties of the licencees. This Act will specifically apply to the cement plant because of mining the raw materials

4.3.5 The County Governments Act, 2012

The act makes various provisions on matters related to devolution, governance and development of counties and their sub-regions. Clauses of particular interest to the proposed cement plant include section 48 (1a) on the functions and provisions for development of urban areas and cities; section 87, which makes provisions and defines modalities for citizen participation and protection of community interests; and section 102, which defines principles of planning and facilitation of county development in line with local and national interests, as well as on the protection and development of natural resources

4.3.6 The Local Government Act (Cap. 265)

Section 160 helps local authorities ensure effective utilization of the sewerage systems. It states in part that municipal authorities have powers to establish and maintain sanitary services for the removal and destruction of, or otherwise deal with all kinds of refuse and effluent and where such service is established, compel its use by persons to whom the service is available. However, to protect against illegal connections, section 173 states that any person who, without prior consent in writing from the council, erects a building on; excavate or opens-up; or injures or destroys on sewers, drains or pipes shall be guilty of an offence. Any demolitions and repairs thereof shall be carried out at the expense of the offender.

Section 170, allows the right of access to private property at all times by local authorities, its health officers and servants for purposes of inspection, maintenance and alteration or repairs of sewers. To ensure sustainability in this regard, the local authority is empowered to make by-laws in respect of all such matters as are necessary or desirable for the maintenance of health, safety and wellbeing of the inhabitants of its area as provided for under section 201 of the Act.

The Act under section 176 gives power to the local authority to regulate sewerage and drainage, fix charges for use of sewers and drains and require connecting premises to meet the related costs. According to section 174, any charges so collected shall be deemed to be charges for sanitary services and will be recoverable from the premise owner connected to the facility. Section 264 also requires that all charges due for sewerage, sanitary and refuse removal shall be recovered jointly and severally from the owner and occupier of the premises in respect of which the services were rendered. This in part allows for application of the “polluter-pays-principle”

4.3.7 The Land Planning Act (Cap. 303)

Section 9 of the subsidiary legislation (The development and use of land regulations 1961) under this Act, requires that before the County governments submit any plans to the Minister for approval, steps should be taken as may be necessary to acquaint the owners of any land affected by such plans. Particulars of comments and objections made by the landowners should also be submitted. This is intended to reduce conflict with other interests such as settlement and other social and economic activities

4.3.8 The Building Code 2000

Section 194 requires that where a sewer exists, the occupants of the nearby premises shall apply to the county government for a permit to connect to the sewer line and that all wastewater must be discharged into the sewers. The code also prohibits construction of structures or buildings on sewer lines

4.3.9 The Penal Code (Cap. 63)

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

4.3.10 Wastewater guidelines

Part of the study involves a review of the environmental standards that provides a basis for monitoring and future audits.

4.3.11 EIA Guidelines

The EIA guidelines require that EIAS be conducted in accordance with the issues and general guidelines spelt out in the second and third schedules of the regulations. These include coverage of the issues on schedule 2 (ecological, social, landscape, land use and water considerations) and general guidelines on schedule 3 (impacts and their sources, project details, national legislation, mitigation measures, a management plan and environmental auditing schedules and procedures.

SECTION 5: ANALYSIS OF PROJECT ALTERNATIVES

This section analyses the project alternatives in terms of site, technology scale and waste management options

5.1 The proposed Alternative

The EIAS Project report has been prepared for submission to NEMA; facts, findings and recommendations/proposals of which are based on the proposed site, materials and proposed technologies. This helps in evaluating and examining the foreseeable effects of the project on the environment and therefore assisting in addressing how the proposed development has to ensure that all environmental and social measures are complied with during the premises preparation and during operational phase.

The alternative consists of the proponent's/applicant's final proposal with the inclusion of the legal guidelines, regulations and procedures as stipulated in the EMCA, 1999 which aims at reducing environmental impacts to the maximum extent practicable. Appropriate Environmental and Social Management Plans have been prepared as per the proposed project.

5.2 Relocation alternative

Relocation option to a different site is not an option for the project implementation. At the moment, the proponents have no alternative sites for the proposed development. Looking for alternative land of size such, and with similar characteristics to accommodate the type of the project and completing official transactions on it may take a long period. Additionally, the developer will spend another two years on design and approvals since design and planning has to be according to site conditions. Project design and planning before the stage of implementation will cost the developer millions of Kenya shillings. Whatever has been done and paid to date will be counted as a loss to the developer. Besides, the proposed site is ideal for the project and the nature of proposed activities will integrate well into the larger area land uses. This may also lead to a No Action Alternative situation.

5.3 The No Action Alternative

The No Action Alternative in respect to the proposed project implies that the status quo is maintained. This option is the most suitable alternative from an extreme environmental perspective as it ensures non-interference with the existing conditions. The anticipated insignificant environmental impacts resulting from construction, and occupation activities would not occur.

This option will however, involve several losses both to the project proponents and other stakeholders; society and Government. The proponents shall continue to pay high taxes on the underutilized property. This option will also be out of line with the government agenda of increasing the available industries, so as to improve Kenya's global development prospects. The associated benefits of the project such as spurring of fast growth in the local area and creative economic opportunities through the project lifecycle will also not be realized – generally slowing the local and national growth. From this analysis, it is evident apparent that the No Project Alternative is not the appropriate alternative.

5.4 Alternative design and technology

The proposed cement plant development will be constructed using modern, locally and internationally accepted materials to achieve public health, safety, security and environmental aesthetic requirements. Key among the alternative technology considerations will include

1.1. Use of Efficient equipment

Equipment that save energy and water will be given first priority without compromising on cost or availability factors.

1.2. Use of Local Raw Materials

The concrete pillars and walls will be made using locally sourced stones, cement, sand (washed and clean), metal bars and fittings that meet the Kenya Bureau of Standards requirements. Beautiful and durable reinforced concrete roofs with tiles finishing will be used because they are good in heat insulation as compared to the iron sheet roofs, and afford more security. This will ensure that the rainwater harvested will be used in the factory.

Heavy use of timber during construction is discouraged because of destruction of forests. The exotic species would be preferred to indigenous species in the construction where need will arise. However, this housing methods and technologies to be used will require very little timber.

1.3. Solid waste management alternative

The proposed commercial development shall generate a considerable amount of solid waste. An integrated solid waste management system is recommendable.

- First, the project proponent will give priority to reduction at source of the materials. This option will demand a solid waste management awareness programme in the management and the residents.

- Secondly, Recycling, Reuse and composting of the waste will be the second alternative in priority. This will call for a source separation programme to be put in place. The recyclables will be sold to waste buyers within Nakuru.
- The third priority in the hierarchy of options is combustion of the waste that is not recyclable in order to produce energy.
- Finally, sanitary land filling will be the last option for the proponent to consider.

1.4. Domestic waste water management alternatives

Four locally available technologies are discussed below:-

1.4.1.Waste water treatment plant

This involves the construction of a plant that will enable the recycling of the waste water from the project activities to reusable standards and utilized within the site in activities such as flushing of the toilets. It is usually expensive to construct and maintain, but it is the most reliable, efficient and cost-effective in the long term. This is the most preferred option for such project because of its benefits.

1.4.2.Use of stabilization ponds/lagoons

This refers to the use of a series of ponds/lagoons which allow several biological processes to take place, before the water is released back to the river. The lagoons can be used for aquaculture purposes and irrigation. However, they occupy a lot of space but are less costly. No chemicals are used/heavy metals sink and decomposition processes take place.

1.4.3.Use of Constructed/Artificial wetland

This is one of the powerful tools/methods used in raising the quality of life and health standards of local communities in developing countries. Constructed wetland plants act as filters for toxins.

The advantages of the system are the simple technology, low capital and maintenance costs required. However, they require space and a longer time to function. Long term studies on plant

species on the site will also be required to avoid weed biological behavioral problems. Hence it is not the best alternative for this kind of project

1.4.4. Use of a septic tank

This involves the construction of underground concrete-made tanks to store the sludge with soak pits. This is a viable alternative for sewage waste management to reduce pressure on the existing sewer system.

1.4.5. Connection to the existing sewer system

Connection to the existing large main sewer line near the site will solve the waste water management issue at a very minimal cost and in an environmental efficient manner. Unfortunately, there exists no sewer line in the site. In conclusion, the recommended course of action for this site would be a waste water treatment plant.

5.5 The comparison of alternatives

Under the proposed Development Alternative, the project would create a cement plant in Kenya, and would provide employment directly and indirectly to the public over and above the benefits of enhanced cement production to Kenyan nationals. It would provide jobs for the workers during construction. After completion more jobs would be generated by the within the project. Under the No Action Alternative, there would be no development at all. There would be no benefits from the site and neither would there be the significant negative environmental Impacts.

Provided the Environmental Impact mitigation measures are implemented as well as adoption of sound construction management practices, negative impacts will be avoided /minimized. However, commitments related to the development alternative would ensure that potential impacts are minimized at levels of significance as envisaged in the Environmental Management Plan.

SECTION 6: PUBLIC CONSULTATION AND PARTICIPATION

6.1 Introduction

Public consultation and participation process is a requirement by the Government of Kenya and a mandatory procedure as mandated in section 58 of the EMCA 1999. The aim of consultation is to ensure that the public and stakeholder interests are identified during the EIA study and that their views are taken into account at the project planning stage. Stakeholders' views are also important in shaping the development of the Environmental Management Plan (EMP). The main findings and feedback from these events are summarized within this section. A sample of the survey instruments used and copies of the lists of attendees at the various consultations are provided in the annexes section of report.

6.2 Methods used in Public consultation

The exercise was conducted by a team of environmental experts with the assistance of experienced and registered associate experts. Data collection methods included the following:

- Administering of Questionnaires
- Checklists
- Field surveys
- Observations

The purpose of the above process was to identify the positive and negative impacts expected during the construction and operation phase of the project and to get suggestions on appropriate mitigation measures that minimize on the negative impacts and promote positive impacts. The views raised from the different respondents who were interviewed are summarized below

6.3 Views raised

6.3.1 Positive Impacts

- **Employment Opportunities** - Respondents were optimistic that the construction and operation of the cement plant will open up new employment opportunities, especially for the youth who would be casual workers and for women who would vend food to the construction workers.
- **Improved infrastructure** - The project is also expected to improve infrastructure in the area which will also contribute to economic growth, and in turn boost the county's Gross Domestic Income

- **Economic Growth** - The locals expressed optimism that the proposed project would spur local economic growth and increase money circulation in the area throughout the project lifespan
- **Business Opportunities** - The respondents reported that with the proposed construction, there will be a boost in sales to local traders through the supply of construction materials.

6.3.2 Negative Issues

- **Dust emissions** - The respondents expressed concern over generation of large amounts of dust during the construction of the cement plant. The proponent should ensure that the dust levels at the site are minimized through sprinkling of water at regular intervals during the construction phase
- **Noise Pollution** - The respondents expressed their fears over noise pollution that would arise during the construction and operation of the cement plant. The proponent should use machinery that produces less noise and also employ machine-silencing technologies. The proponent will also regulate the noise during the operation by providing strict regulations.
- **Solid Waste Generation and Land degradation** - Large amounts of solid waste will be generated during construction and operation of the project. The proponent should dispose off solid waste in a manner that is acceptable. Waste that is found to be recyclable will be separated.
- **Increased water and Electricity demand** - It is expected that both the workers and the construction works will lead to an increase in demand for water and electricity. The contractor should obtain enough water and energy for construction and should seek for alternative and renewable sources of electricity and water e.g. Rain harvesting and solar energy.
- **Air pollution** - Respondents raised concerns that air pollution is likely to occur during the operation phase from the increased vehicular traffic. The proponent should take all the appropriate measures to curb all forms of air pollution as much as possible.

6.3.3 Suggestions to the Proponent

The respondents were slightly resistant to the proposed project. However, they proposed the following to the proponent:

- Ensure proper solid and liquid waste management system in the cement plant.
- Employ local youth in the project.
- After completion of the project, the management should develop a proper traffic management plan to ensure smooth flow of traffic and reduce congestion

The issues raised and many others foreseeable have been adequately addressed in the report and in the EMP. Some completed questionnaires are attached in the annex.

SECTION 7: POTENTIAL ENVIRONMENTAL IMPACTS AND MITIGATION

7.1 Introduction

Human activities have a positive or negative, direct or indirect impact on the biological and physical environment. The nature and degree of impact however varies depending on the location and the type of operation. The magnitude of each impact is described in terms of being significant, minor or negligible, temporary or permanent, long-term or short-term, specific (localized) or widespread, reversible or irreversible. Some mitigation of impacts has already been addressed in the proactive design and other mitigations can only be guaranteed through active, responsible management, helped by following the guidelines in the project environmental management plan.

This section highlights the anticipated impacts of the proposed project and outlines measures to be put in place to minimize the predicted adverse impacts.

7.2 Potential Positive Impacts of the proposed project

Employment Opportunities - Employment opportunities shall be one of the long-term major impacts associated with the proposed project that will be realized during construction, operation, maintenance and decommissioning phases of the proposed development.

Both direct and indirect forms of employment shall arise from the project initiation. Direct employment will be mainly through skilled and unskilled laborers whose workforce shall be needed to build the commercial development. When complete, the project will also house different machines which will be run and maintained by skilled employees.

Local and National Economic Gains - Both the local and national economy shall gain much from the project in that materials for building shall be sourced locally within the country and that all the materials are charged VAT hence increasing revenue collection. Local material sellers will be able to earn income, and in turn contribute to the local and national economy.

Provision of Market for Supply of Building Materials - The project will require supply of large quantities of building materials most of which will be sourced locally within the county of Nakuru and other surrounding areas. This will provide ready market for building material suppliers such as quarrying companies, hardware shops and individuals.

Increased Revenue - There will be positive gain for the revenue system arising from the processing of the building plans to the proposed commercial development to the City-Town Council of Nakuru. This is in

addition to the annual rates to be paid to the council. The proponent will also benefit directly from the proposed project through revenue because of selling of the cement bags.

Informal business growth - During construction period the informal sector will benefit from the operations. This will involve Jua Kali operators selling their products to be used on site. Such a move shall promote Jua Kali entrepreneurs in the local areas. Food business will also emerge as most of the workers who will be working on the proposed project site will be buying food from the informal business owners who shall be operating in the vicinity.

Gender issues –which will manifest through opportunities for women in income generating activities e.g. through provision of catering services, selling of local goods/products. Women will also be engaged in various tendered activities as provided by the law.

Capacity building – which will be achieved through training and awareness campaigns on Occupational Health and Safety issues for workers, local residents, and any other affected/interested stakeholders

7.3 Potential Negative Environmental Impacts

The nature and magnitude of impacts and their mitigation will be evaluated based on the classification/matrix in the tables below:

Key	Type of impact	Key	Type of impact
++	Major positive impact	+	Minor positive impact
--	Major negative impact	-	Minor negative impact
0	Negligible/zero impact	NC	No change
SP	Specific/ localized	W	Wide spread
r	reversible	ir	irreversible
sh	short term	l	long term
t	temporary	p	permanent

On the basis of information gathered during the field study, potential environmental impacts of the project are tabulated below.

Table 2: Anticipated Negative Environmental Impacts

Impact	Construction	Occupation	Remarks
Vegetation / flora	- sp,ir,sh	+	The grass and shrubs on the project site will be cleared during construction works. Landscaping will be done after construction.
Fauna	-, t	+/-	The insects, rodents and birds on the project site will be disturbed during clearing and construction works. This disturbance will be temporary or minimal. The fauna will have to find new nesting homes
Change in land use-extent	-/+	-/0	The proposed project is within an area that has previously been used for agricultural purposes. The new educational functions will increase population in the area. The project itself will increase plot density.
Pollution: Air/dust Noise Oil waste	-, t, ir -, t, ir -, l, ir	-/ 0 0 0	Construction works will contribute to release of considerable amounts of dust to the environment. Hooting of vehicles and workers will generate noise. Petrol and diesel powered machines and vehicles may leak oil products to the soil and water systems.
Soil erosion	-, l, sp	0	Earth works during construction will contribute to soil erosion. During occupation, there will be no soil erosion as the site will be well landscaped.
Changes in hydrology	-/ 0	0	There will be no obstruction on the flow of surface and underground water resources.
Site drainage	-/ 0	+/ 0	Run-off might increase due to impervious surfaces. Roof catchments during occupation will ease the problem

Public health	-, t, ir	NC	Increased dust, noise and air pollution might impact public health during construction. During occupation, there will be no change on pollution.
Water resources	-, sh	+	Construction work will require a lot of water. Water will be from a private water to supplement borehole water supply. During occupation period the population may increase water demand, although roof water harvesting and storage will solve this.
Sites of cultural, historic or traditional significance	0	0	There are no sites of historic, cultural and traditional significance.
Visual intrusion	-, t / p	+ / -, p	Construction traffic and dust could contribute to visual intrusion. The project should be blended like the neighbourhood. Construction work should take place during day time. Debris should be cleared and landscaping done.
Disturbance of the public	-, t, ir, sp	-	Noise during construction will affect the public. Noise generated by students during occupation may also be destructive, though this is projected to be minimal due to the large expanse the project site occupies.
Construction materials	-	0	Building stones, sand and cement are required. These will be sourced from licensed suppliers. Hazardous, undesirable and unauthorized materials should not be used.
Construction waste	Sp, sh	0	This will be minimal. Waste will be disposed off in approved dumpsites.
Clean up on completion	-, sp	0	The contractor should ensure that the site should be left clean and tidy after completion.

7.4 Mitigation Measures.

The construction of the building will involve a series of distinct yet interdependent physical operations. These include site clearing, excavation works; building works etc. all are potentially significant sources of impacts. This part includes impacts during implementation: construction, occupation and decommissioning phases. The following issues are addressed: soil degradation, air quality, noise, oil wastes, water resources, solid and liquid wastes management, drainage, terrestrial/ ecology, visual and landscape, traffic, public comfort, occupation health and safety (OHS), and energy. Most of these key issues were identified during the scoping exercise and are clearly elaborated as follows:

7.4.1 Soil Erosion

This is the removal of the top- most fertile soil material down slope or transportation using machinery or other equipment including animals. Removal or clearing of vegetation accompanied with soil disturbances arising from foundation excavations will expose soils to erosion. Loosened soil particles if exposed to heavy rain droplets, surface run-off, trampling and wind are easily eroded. Erosion threats will be most prevalent during the construction phase and particularly on the initial stages. It will be minimal during the operation phase. Hence this will not be a major impact.

Potential Mitigation measures

- Channel surface run-off into the paved drains rather than onto bare soil surfaces.
- Landscaping scheme including creation of soil traps such as gabions, stones and boulders at the lower section of the site.
- Terracing and leveling of the site to reduce run-off velocity and increase water infiltration
- Undertake excavation activities during dry spells to minimize soil erosion.
- Compaction will be undertaken to further stabilize the loose soils.
- Planting of trees and other vegetation on the garden and all other exposed surfaces
- Restricted vehicles to designated areas to avoid soil compaction within the project site, and ripping any compacted areas to reduce run-off.

7.4.2 Flora and Fauna

The clearance of the affected area will potentially lead to the destruction of vegetation, destruction of fauna habitats, and loss of scenic beauty and enhancement of soil erosion. Decreased vegetation cover leads to

microclimate change and increased soil erosion. The grass on the project site and some trees will be cleared during the implementation of the project. The trees at the boundary may not be affected.

Potential Mitigation measures

- Avoiding clearing the areas that will not be affected by the project
- Replant trees once the construction activities have been completed
- Employ gardeners to tend and care for the new trees, flowers, grass and hedges to be planted.
- Landscaping as proposed in the designs should be done by specialists
- Reserve vegetation having conservation value and those along the boundary

7.4.3 Air quality

Controlling dust during construction is useful in minimizing nuisance conditions. It is recommended that a standard set of feasible dust control measures be implemented for all construction activities. Emissions of other contaminants that would occur in the exhaust from heavy equipment are also included.

The project proponent is committed to implementing measures that shall reduce air quality impacts associated with construction. Construction vehicles drivers will be under strict instructions to minimize unnecessary trips, refill petrol fuel tanks in the afternoon, and minimize idle running of engines. In addition, dust emissions will be controlled by the following measures:

- Watering all active construction areas as and when necessary to lay dust.
- Cover all trucks hauling soil, sand and other loose materials or require all trucks to maintain at least two feet of freeboard.
- Pave, apply water when necessary, or apply (non-toxic) soil stabilizers on all unpaved access roads, parking areas and staging areas at construction sites.
- Sweep regularly (with physical sweepers) the parking areas at the construction site.
- Plant fast growing trees around the project area to act as a wind breakers to reduce the uplift of particulate matter that lead to respiratory diseases.
- All construction machinery shall be maintained and serviced in accordance with the contractors' specifications.
- Dust generating activities like excavation, handling and transportation of soil will be avoided during strong winds.
- Vehicle speed shall be limited to minimize the generation of dust on the proposed project site.

- Water spray shall be used on all earthworks areas within 200 meters of human settlement and water shall be applied wherever dust emission occurs at the proposed housing site.

7.4.4 Noise and Vibration

Noise is any unwanted / undesirable sound that can affect job performance, safety and health. Psychological effects of noise include annoyance and disruption of concentration. Physical effects include loss of hearing, pain, nausea and interference with communication when the exposure is severe. The natural silence in the neighborhood may be interfered by noise emanating from the construction activities. This will affect workers on site and the residents of the nearby houses. This noise will be felt most by the neighbors in the plots adjacent to the project site. Vibration is likely to be felt during the construction period. This could arise from the heavy trucks driving in and out of the construction site, compressors and mixers and other combined activities of the laborers.

Potential Mitigation measures

- Construction work to take place between 0700hrs to 1700hrs
- Install portable barriers to shield compressors and other small stationary equipment where necessary.
- Use quiet equipment (i.e. equipment designed with noise control elements) and ensure construction machinery is kept in good condition
- Engines of trucks and other vehicles to be switched off when idle.
- Construction workers and particularly those operating machines to be provided with ear mufflers.
- Install a notice at the entry to the compound notifying construction activity and timings.
- Prohibit entry of non-workers to the site to ward off idlers who are likely to cause more noise.
- Limit pickup trucks and other small equipment to a minimum idling time and observe a common-sense approach to vehicle use, and encourage workers to shut off vehicle engines whenever possible.
- Instruct drivers to avoid gunning of vehicle engines and hooting
- Vibration will be minimized in the project site and surrounding areas through sensitization of construction truck drivers to switch off vehicle engines while offloading materials.

7.4.5 Generation of Exhaust Emission

In order to control exhaust emissions the following measures shall be implemented during construction.

- Vehicle idling time shall be minimized
- Alternatively fueled construction equipment shall be used where feasible
- Equipment shall be properly tuned and maintained
- proper planning of transportation of materials will be adopted to ensure that vehicle fills are increased in order to reduce the number of trips done or the number of vehicles on the road

7.4.6 Increased Water Demand

Obviously, the construction work and operation of the cement plant will result in an increase in water demand. High water consumption occurs during both the construction and operation phases. These will in turn strain the existing water.

Potential Mitigation measures

- Recycling of wastewater where appropriate
- Install water pipes which turn off automatically when water is not in use
- Provide on-site water storage tanks to harness rainwater and therefore reduce demand on the piped water sources especially after the completion of the development.
- Work ethics: Provide notices and information signs to sensitize on means and needs to conserve water resources i.e. “keep/ leave the tap closed.” This will awaken the civic consciousness of the workers and occupants with regard to water usage and management.
- Private water undertaker should be hired to supplement water supply.

7.4.7 Increased Energy Demand

The proposed development will a substantial amount of energy resources. This will be attributed to the optimum use of petroleum products (diesel and gasoline), electrical appliances (equipment), lighting systems, and other electric machinery as may be used for different purposes. It also includes use of renewable energy resources.

Potential Mitigation measures

Electrical appliances

- Installation of a stand-by generator.
- Switch off electrical appliances when not in use
- Optimize operations of electrical appliances to enhance energy conservation

Lighting

- Put off lights immediately when not in use or are not wanted
- Provide for adequate natural lighting in the design of houses so as to reduce domestic consumption.
- Use energy saving bulbs including those for street and security lights within the development.
- Make use of alternative source of energy such as solar power which is renewable

7.4.8 Oil Leaks and Spills

It is important to note that oil spills are prevalent in construction sites. The proponent and contractor shall ensure that such spills are avoided and keenly monitored during all stages of the project cycle.

Potential mitigation measures

- All machinery should be keenly observed not to leak oils on the ground. This can be ensured through regular maintenance.
- Maintenance should be carried out in well-protected areas where oil and grease will be restrained from reaching the ground. Such areas should be covered to prevent storm from carrying away oils into soils and water systems. Wastewater and wash water from these areas should be properly disposed.
- All oils/ grease and materials should be stored in a sites store in the contractor's yard.

7.4.9 Waste

During the construction activities, waste materials such as sand, concrete, cement, timber planks, used water, human wastes from the construction workers, glass, paints, cans, plastics and paper packaging, pieces of steel, building stones, ballast and oil spills among others will be generated. In the occupation phase, waste materials likely to be generated are mainly solid and liquid wastes. These include paper wastes, cans,

foodstuffs, liquid wastes, fecal material, textiles and other general wastes. The amount of wastes can be considerable and, if improperly managed, could significantly litter the site and overspill into the neighboring properties. The wastes can also accumulate into large heaps harboring rats, flies etc which disseminate germs of diseases.

Potential Mitigation measures

- Undertake an efficient estimation of quantities by experts to and order only for what is required minimize wastes
- Recycling of construction wastes where applicable – such as re-spreading of the topsoil excavated from the construction site for landscaping
- Collection of wastes and regular disposal at designated Council disposal sites.
- Regular on-site incineration or shredding of some wastes such as waste paper
- Contract a NEMA licensed private waste collection firm for disposal of wastes
- Proponent to subscribe to the NEMA registered private refuse collection firms operating in the area.
- Provide conveniently located dustbin cubicles protected from rain and scavengers to each dwelling unit.
- Use of an integrated solid waste management system through a hierarchy of options source reduction, recycling, composting and reuse and sanitary land filling will facilitate waste handling during occupation phase.
- Train both construction workers and project occupiers on integrated waste management techniques

7.4.10 Construction Materials

They include stones, sand, cement, ballast; reinforcing steel rods etc. They should be of the appropriate quality and well-handled to minimize wastage and spilling over to neighbouring sites. Inappropriate building materials could be harmful to the builders, dwellers, and the recipient environment at large.

Potential mitigation measures

- These should be sourced from licensed dealers and suppliers and those that are environmentally conscious.
- Quality should be thoroughly monitored through regular tests of the material used.

- Materials should be appropriately stored on site and issued cautiously to avoid clutter and spillovers.
- Use of durable, long- lasting materials that will not need to be replaced as often, thereby reducing the amount of construction waste generated over time
- Use of building materials that have minimal packaging to avoid the generation of excessive packaging waste
- Use of construction materials containing recycled content when possible and in accordance with accepted standards.

7.4.11 Visual Impacts

Visual impacts are likely to occur during earthworks for the foundation of the project. Since the proposed development is on a largely agricultural area, the level of visual disturbance is expected to be minimal.

Potential mitigation measures

- On completion of the earth works the excavated or disturbed areas should be restored immediately especially through back filling, leveling and planting of suitable vegetation.
- All solid waste from the construction site should be cleared on completion and disposed suitably bin to the approved dumpsites.
- The project should be blended in a way to merge with the existing environment. It should in fact upgrade the quality of the surrounding.
- The visual impact will in addition be contained within the site.
- Visual intrusion shall be avoided by orienting most of the visual links to the street and public areas of buildings.

7.4.12 Occupational Health and Safety (OHS)

Human safety risks are likely to occur in the project especially during the construction period. There is significant exposure to hazards such as moving trucks, falling rocks or objects, timber, sharp objects, slips or accidental falls, or contacts with corrosive chemicals etc. During construction there will be increased dust, air and noise pollution. Food for the construction workforce is usually provided by mobile vendors most of who operate without licenses. This can compromise health of the workers especially if such food stuffs are prepared in unhygienic conditions. Other issues that are of health concern are sanitation especially

for the workers. Improper design of the buildings can also expose the expected residents to health and safety issues during the operation phase.

Potential Mitigation measures

- Integrate safety considerations in the design of the buildings such as contractor to take an insurance cover against occupational accidents on workers during the construction period
- Provide first aid kits at the site fully equipped always and managed by qualified persons.
- Provide mandatory personal protective equipment like headgear (shields), boots, overalls, helmets, goggles, earmuffs, masks and gloves to all workers.
- Provide clean water and food to the workers
- Install handrails and balustrades to engineer's details to minimize accidental falls.
- Safety awareness may be gained through regular safety meetings, safety training or personal interest in safety and health.
- The contractor should have workmen's compensation cover. It should comply with work men's compensation Act as well as other ordinances regulations and union agreements.
- Workers should always be sensitized on social issues such as drugs, alcohol, diseases etc.
- Avoid unnecessary idling of all machinery related to the project
- Sanitary facilities should be provided and maintain standard cleanliness of the facilities.

7.4.13 Public Disturbance

This refers to construction-related disturbances mainly resulting from noise, pollution, and lighting especially if construction activities are extended into the night. There will be such disturbances during the project construction/ implementation.

Proposed mitigation

- Construction activities should be done only during the day
- Billboards should be suitably erected at the start of the project. The signs should indicate and inform the public when works start and when it will be completed.
- Contain construction activities on the project site as much as it is practicable and seek permission/approval where overspills are unavoidable.

7.4.14 Security

Security is a prerequisite for any development. During construction security is very important in any project site. This ensures that materials are safe but also controls movement within the site especially for the intruders who might be injured by the materials and other hazardous features available within the site.

Mitigation

- There should be a guardhouse at the gate. Security guards should always monitor the gate of the facility to keep away intruders and to control movement within the site.
- The project site should be enclosed using suitable walls to beef- up security and to control movement within the site.
- The contractor should provide adequate security during the construction period when there are no works being done on the site.
- The guards stationed at the gate should document movements in and out of the site/property.
- Lighting as well as security alarms should be installed in strategic positions all over the site during construction and after the completion of the project.

7.4.15 Fire preparedness

There are likely fire accidents on the site and they usually subject detrimental effects to the environment. Fire causes both economic and social drawbacks. There are operations that are prone to such outbreaks at construction sites. It is therefore always important to consider the issue of fire.

Mitigation:

Recommended firefighting equipment:

- Install fire alarm system for entire project during construction and operation.
- All installation of firefighting facilities to follow the Nakuru County Fire Master's requirements and approval.

In addition to the above, the structure management should consider the following:-

- Adapt an emergency response plan for the project during construction and implementation stages
- Conduct regular firefighting drills within the site
- Ensure that all firefighting equipment are regularly maintained and serviced

- Provide fire safety signs such as “No Smoking” and those showing direction to Exit in case of any fire incidence and emergency numbers.

7.4.16 Construction Safety

Construction work can be particularly hazardous. Personal protective equipment, fire safety, electrical safety and other precautions are essential for safe construction work. The following section provides general guidelines and procedures for construction safety during project implementation process; these guidelines are to be followed whenever visiting or working at the construction site:

Mitigation:

- To avoid walking, standing, or working under suspended loads; if a load is raised be sure to crib, block, or otherwise secure the load as soon as possible.
- To be prepared for unexpected hazards. BE ALERT!
- To avoid placing unusual strain on equipment or materials.

7.4.17 Barriers and guards

Barriers, guards and warning signs are required to ensure safety against existing hazards. Contractors and project managers shall use barriers and guards as necessary to protect employees, and visitors from physical hazards. Any area that poses a physical threat to workers and/ or pedestrians requires barriers or guards. Areas that typically require permanent or temporary protection include the following: stairways, open manholes, elevated plat forms areas with moving machinery, construction sites, temporary wall or floor openings, doors opening to construction. The common types of barriers include physical obstructions and solid separators (dust barriers, hazard barriers, temporary walkways etc)

Mitigation:

- If it is suspected that a hazard is not sufficiently protected, it will be necessary to notify the attending workers or the Environmental Health and Safety Office on site immediately.
- Signs that state DANGER, WARNING or CAUTION are also important when barriers or guards are necessary

7.4.18 Traffic density

The proposed project will come along with increased (vehicle) traffic along the connecting routes especially during construction phase. The effect may also be felt during occupation phase.

Mitigation:

- Notify the motorists about the proposed development once implementation has started. It is important that warning/ informative signs (bill boards) be erected at the site. The signs should be positioned in a way to be easily viewed by the public and mostly motorists.
- The traffic along the connecting road should be controlled especially during construction phase and mostly when large trucks are turning in to the site say when doing delivery of materials.
- Provide adequate parking within the project site to avoid parking on the access road.

SECTION 8: ENVIRONMENTAL MANAGEMENT PLAN (EMP)

8.1 Introduction

This Environmental Management Plan (EMP) provides a logical framework within which the negative environmental and social impacts identified during the EIA study can be mitigated and any beneficial environment effects can be enhanced. Monitoring and management practices as well as cost estimates are also included where applicable. Responsibilities and time frames for the implementation of the various aspects of the ESMP will be identified.

The actions have been grouped into three phases of the project cycle – the construction, operation and decommissioning phases. This categorization shall improve the implementation of the suggested mitigation measures through the project cycle. Each phase has a distinct set of activities that will need to be undertaken. The various agencies within Nakuru County responsible for the supervision of the implementation of the project (including the project Architect) will thus have a clear basis of decision making as they certify each phase of implementation.

The EMP will be provided to prospective bidders for the construction contracts to ensure that environmental mitigation costs are factored into their costing. The Contractor(s) will also be required to prepare a separate and specific EMP for their works in order to control construction impacts and ensure compliance with applicable environmental and health and safety legislation and standards. The proponent will ultimately be responsible for ensuring that the EMP is implemented on site via reviewing the Contractor's EMP and ensuring its implementation on site via audits.

8.2 EMP for Construction Phase

Environmental integration will be essential during the construction phase. This will include training and awareness creation on all environmental issues, control of health and safety risks of the contractor's workmanship, Prevention of negative environmental impacts during construction; and prevention of residual risk or accidental environmental damage.

As part of the construction progress reports, environmental considerations should be covered and progress indicated on the implementation of mitigation measures, as outlined in table 3 below

Table 3: Environmental Management and Monitoring Plan for construction phase

Environmental management plan during construction					
Anticipated impact	Proposed management & mitigation measure	Responsible party	Means of monitoring	Frequency monitoring	Estimated cost
Generation of Solid Waste	<ul style="list-style-type: none"> •Reduce, recycling and reuse of solid waste •Separate collection plastic bins for recyclables, biodegradables, hazardous wastes •Create awareness to workers on waste management •Disposing at nearest NEMA licensed dumping 	Proponent Contractor	Observation Daily waste collection records	Daily Annually	350,000
Water quality and drainage	<ul style="list-style-type: none"> •Recycle waste water •Replace all leaking water taps, valves and pipes. •Train workers on economical use of water 	Proponent Contractor	Daily water check records Readings from smart meters	Daily Annually	240,000
Increased water demand	<ul style="list-style-type: none"> •Install water meters to monitor water use •Install plastic tanks to store water 	Proponent Contractor	Daily meter readings Inspections	Daily Annually	150,000
Increased demand for natural	<ul style="list-style-type: none"> •Procure construction material from approved local sites 	Proponent Contractor	Observations	Daily Half yearly	200,000

construction resources	<ul style="list-style-type: none"> • Establish a storage yard to secure material that can be damaged by water or affected by direct sunlight 		<p>Daily records of material requirement.</p> <p>Inventory records</p>		
Air pollution and dust operation	<p>Spray of water during construction work</p> <ul style="list-style-type: none"> • Control of speed and movements of construction vehicles • Building a buffer fence around the construction site • Use of low-Sulphur diesel for diesel-operated construction machinery • Avoid burning waste materials at the site • Material drop heights to be kept to minimum • Positioning of stockpiles to minimize effect of wind • Dust sheets over surface of stockpiled materials • Control earthworks and minimal 	<p>Proponent</p> <p>Contractor</p>	<p>Inspections</p> <p>Routine air quality checks</p>	<p>Daily</p> <p>Annually</p>	<p>900,000</p>

	clearance of vegetation				
Noise pollution	<ul style="list-style-type: none"> •Use of ear protection aids by construction workers •Use of equipment designed with noise control elements •Temporarily fencing off noisy machinery such as vibrators •No unnecessary hooting by project and occupants vehicles •Restriction of construction activities to day time 	Proponent Contractor NEMA	Regular review of complaints from the publics Routine checks Inspections	Daily Annually	950,000
Clearing of vegetation	<ul style="list-style-type: none"> •Maintaining (where possible) of some of the existing trees and vegetation at the site •Planting of indigenous trees and plants to maintain ecological system integrity •Coordination with National Museums of Kenya biologists on habitat impacts •Engagement of a supervisory 	Proponent Landscaping company Nature Kenya	Observation Routine checks	Daily annually	200,000

Disturbance of soil structure	<ul style="list-style-type: none"> •Put soil traps around perimeter fence and on steep areas to capture soil that might be washed away •Appoint a landscaping company to plant indigenous and ornamental trees and grass once construction is over •Maintaining specified routes for construction vehicles •Control earthworks •Use of light machinery and equipment 	Contractor	Inspection	Daily Monthly	250,000
Workers accidents and fire hazards	<ul style="list-style-type: none"> •provision of appropriate personal protective equipment to workers on site •Register the site as a workplace •refresher training of workers on occupational health and safety •risk assessment •first aid kits •fire extinguisher 	Proponent Contractor	Observation Routine checks	Daily Random	250,000

Public health and safety	<ul style="list-style-type: none"> •Ensure use of provided pit latrines by construction staff •Proper handling and disposal of solid waste •Operation of noisy machinery at daytime only •Control of visitors to the site •Traffic control •Installation of adequate water supply •Enhanced site security 	Proponent	Proper solid waste disposal Minimal incidences of disease outbreaks or accidents at the site	Daily Weekly Monthly	400,000
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Environmental management plan during operation

At operation aspects to be monitored include, but are not limited to the following issues:

- Noise pollution
- Air pollution
- Discharge of effluent;
- Solid waste handling and disposal;
- Energy consumption;

Emphasis should be placed on record keeping, establishing trends in utility consumption, records of effluent analysis, solid waste collection and compliance with legislation. Details of operation and decommissioning are provided in table *** below

Table 4: Environmental Management and Monitoring Plan for Operation Phase

Environmental management plan during operation					
Anticipated impact	Proposed management and mitigation measure	Responsibility for Mitigation	Means for monitoring	Frequency of monitoring	Estimated cost (kes)
Environmental acceptability	<ul style="list-style-type: none"> •Notification of intent to all relevant regulatory agencies •Obtaining all required permits and licenses from regulatory bodies •Consulting with architects , planners, engineers and all experts on possible mitigation measures 	Proponent Contractor	Observation Analysis	At completion	1,250,000
Compromised environmental aesthetics	<ul style="list-style-type: none"> •All demolition waste that cannot be recycled should be taken to licensed waste disposal landfill. •Donate reusable waste to charitable organization 	Proponent Contractor	Environmental daily checklist Daily records Observation	At completion	900,000

Security	<ul style="list-style-type: none"> • Incorporate all necessary 	Proponent Contractor	Environmental daily checklist	Daily Annually	1,000,000
	measures to deter any security threats inside and around the site		Daily records Observation		
Solid waste generation	<ul style="list-style-type: none"> • Contract a NEMA licensed solid waste company to handle solid waste management. • Maintenance of solid waste management bins • Avoid solid waste dumping 	Proponent Inspector NEMA	Environmental daily checklist Daily records Observation	Daily Routine Annually	250,000
Noise pollution	<ul style="list-style-type: none"> • Put in measures to regulate hooting. • Regulate the noise levels allowed from the machines 	Proponent Inspector NEMA	Observation Daily checklists Daily records	Daily Routine Annually	1,250,000

Oil spillage from automobiles	<ul style="list-style-type: none">•Put in measures to prevent oil spillage mixing with portable water.•Setting up a designated site for repair to prevent spillage all over the site	Proponent Inspector NEMA	Observation Daily checklists Daily records	Daily Annually	400,000
Increased Traffic					

8.4 EMP for the decommissioning phase

Table 5: Environmental Management/monitoring Plan (EMP) for the Decommissioning phase

Environmental & Social Management and Monitoring Plan for Decommissioning Phase					
Expected negative impacts	Recommended mitigation measures	Responsibility party	Time frame	Cost (KShs)	
<ul style="list-style-type: none"> • Construction machinery/ structures and wastes • Scrap and other debris on site 	<ul style="list-style-type: none"> • use an integrated solid waste management system through a hierarchy of options • Waste generated as a result of facility decommissioning activities will be characterized in compliance with standard waste management procedures. The contractor based on the properties of the particular waste stream will select disposal locations. • All buildings machinery, equipment, structures and portions that will not be used for other purposes should be removed and recycled reused say in other projects • Where recycling, reuse of the machinery equipment implements, structures, portions and other demolition waste is not possible the materials should be taken to approved dumpsites 	<p>Project manager and contractor</p> <p>Project manager and contractor</p> <p>Project manager and contractor</p>	<p>One-off</p> <p>One-off</p> <p>One-off</p>	250,000	

	<ul style="list-style-type: none">• Assist with re-employment and job-seeking of the involved work force• Compensates and suitably recommend the workers to help in seeking opportunities elsewhere• Offer advice and counseling on issues such as financial matters			
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SECTION 9: CONCLUSIONS AND RECOMMENDATIONS

9.1 Conclusion

It is a legal requirement that Environmental Impact Assessment Study (EIAS) be undertaken on any new development to protect the environment since without adequate environmental protection, socio-economic development is undermined. An Environmental Impact Assessment was commissioned by the proponent for the proposed project and associated support infrastructure. This report serves as the documentation in support of the assessment level of study as part of the procedure carried out on the subject project.

The analysis of the EIA study has evidenced that the implementation and occupation/operation of the proposed project will have positive impacts on the Kenyan society. The proposed project will have numerous positive impacts including creation of employment; improved infrastructure, and increase in revenue among others as outlined in the report.

However, the proposed project will also exhibit negative impacts such as increased pressure on infrastructure (i.e water, roads, electricity); congestion in the area; increased waste generation; and pollution (to air, water, soil) and clearing of vegetation which will mostly be experienced during the construction phase.

The proposed project's design has integrated some mitigation measures with a view to ensuring compliance with the applicable laws and procedures as well as the legislation and regulatory framework that govern environmental management. To this effect, the proposed project shall be developed to the required planning/architectural/ structural standards of the Nakuru County. Ministry of Lands, Ministry of Environment, and Ministry of Health. During project implementation and occupation, Sustainable Environmental Management (SEM) shall be ensured; avoiding inadequate/ improper use of natural resources, conserving nature sensitivity to guarantee respectful and fair treatment of all people working on the project, general public at the vicinity as well as the inhabitants of the project.

In relation to the proposed mitigation measures that will be incorporated during implementation and occupation phases; the development's input to the national education sector; and cognation that the project proponent is environmentally conscious; the proposed project is beneficial to the county of Nakuru and Kenya at large.

1.1. Recommendations

Following our (EIA study team) in-depth study and analysis, it is our considerable opinion that the proposed development is a timely venture that will significantly subscribe to the increasing need for cement in the country. We thus recommend that the The National Environment Management Authority does consider, approve and grant required Environmental Impact Assessment License to the proponent in respect to the proposed Cement Plant on Plot No. L.R 12260 North West of Njoro Town, Nakuru County provided the outlined mitigation measures are adhered to. Upon approval by NEMA, the project proponent shall work closely with the Environmental Experts and NEMA, residents and the County Government of Nakuru to enhance the facilitation of the issues of concern such as water, ecology, soil, surface drainage and waste generated. This will ensure that environmental concerns are integrated into the project at every stage of successive implementation phases and the co-existence of the proposed project with the environment during occupation phase.

10 REFERENCES

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11 APPENDICES

- 1.1. Sample of completed Interview Questionnaires
- 1.2. Project drawings/ plans/ site/ master plan
- 1.3. Ownership Documents
- 1.4. Change of User Documents
- 1.5. A Copy of certificate of incorporation of the developer
- 1.6. Copy of Lead Expert & Firm NEMA Registration License